INFECTIOUS DISEASES OF ZAMBIA

Stephen Berger, MD

gideon
E-BOOK SERIES

2016 Edition

Infectious Diseases of Zambia - 2016 edition
Stephen Berger, MD
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Scope of Content
Disease designations may reflect a specific pathogen (ie, Adenovirus infection), generic pathology (Pneumonia - bacterial) or etiologic grouping (Coltiviruses - Old world). Such classification reflects the clinical approach to disease allocation in the Infectious Diseases Module of the GIDEON web application. Similarly, a number of diseases which are generally diagnosed and treated outside of the field of Infectious Diseases are not included, despite the fact that a clear infectious etiology exists. Examples include Peptic ulcer, Creutzfeldt-Jakob disease, Human papilloma virus infections, etc. In contrast, a number of other entities of unknown etiology which do present to Infectious Diseases specialists have been included: Kawasaki's disease, Chronic fatigue syndrome, Kikuchi and Kimura diseases. Several minor infections having minimal relevance to the field of Geographic Medicine are not covered: Paronychia, Otitis externa, Molluscum contagiosum, etc.

Introduction: The GIDEON e-book series

Infectious Diseases of Zambia is one in a series of GIDEON ebooks which summarize the status of individual infectious diseases, in every country of the world. Data are based on the GIDEON web application (www.gideononline.com) which relies on standard text books, peer-review journals, Health Ministry reports and ProMED, supplemented by an ongoing search of the medical literature.

Chapters are arranged alphabetically, by disease name. Each section is divided into four sub-sections:
1. Descriptive epidemiology
2. Summary of clinical features
3. Status of the disease in Zambia
4. References

The initial items in the first section, Descriptive epidemiology, are defined as follows:

Agent	Classification (e.g., virus, parasite) and taxonomic designation.
Reservoir	Any animal, arthropod, plant, soil or substance in which an infectious agent normally lives and multiplies, on which it depends primarily for survival, and where it reproduces itself in such a manner that it can be transmitted to a susceptible host.
Vector	An arthropod or other living carrier which transports an infectious agent from an infected organism or reservoir to a susceptible individual or immediate surroundings.
Vehicle	The mode of transmission for an infectious agent. This generally implies a passive and inanimate (i.e., non-vector) mode.

A chapter outlining the routine vaccination schedule of Zambia follows the diseases chapters.
There are 354 generic infectious diseases in the world today. 218 of these are endemic, or potentially endemic, to Zambia. A number of other diseases are not relevant to Zambia and have not been included in this book.

In addition to endemic diseases, we have included all published data regarding imported diseases and infection among expatriates from Zambia.

The availability and quality of literature regarding specific infectious diseases vary from country to country. As such, you may find that many of the sections in this book are limited to a general discussion of the disease itself - with no data regarding Zambia.

This is a book about the geography and epidemiology of Infection. Comprehensive and up-to-date information regarding the causes, diagnosis and treatment of each disease is available in the GIDEON web application. Many of the diseases are generic. For example, such designations as Pneumonia bacterial and Urinary tract infection include a number of individual diseases. These appear under the subheading, Synonyms, listed under each disease.

We welcome feedback, and will be pleased to add any relevant, sourced material. Email us at ebook@gideononline.com

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* Not endemic. Imported, expatriate or other context reported.

+ Country specific note exists for disease

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Actinomycosis

Agent	BACTERIUM. Actinomycetes, Actinomyces spp. Anaerobic gram-positive bacillus
Reservoir	Human - oral fecal vaginal flora
Vector	None
Vehicle	Endogenous
Incubation Period	Unknown
Diagnostic Tests	Gram stain and bacteriological culture using strict anaerobic technique. Growth is apparent in 3-7 days.
Typical Adult Therapy	Ampicillin 50 mg/kg/day IV X 4 to 6 weeks - then Amoxicillin 1.5 g/d PO X 6 months. OR Penicillin G 10 to 20 million units/day X 4 to 6w; then Penicillin V X 6 to 12m. Alternatives: Doxycycline, Ceftriaxone, Erythromycin Excision/drainage
Typical Pediatric Therapy	Ampicillin 50 mg/kg/day IV X 4 to 6 weeks - then Amoxicillin 20 mg/kg/day PO X 6 months. Penicillin G 100,000 units/kg/day X 4 to 6w; then Penicillin V 25,000 units/day X 6 to 12m. Excision/drainage
Clinical Hints	Mandibular osteomyelitis with fistulae (sulfur granules) in the setting of poor dental hygiene [oral actinomycosis]; intrauterine device and pelvic abscesses [pelvic actinomycosis]; fever, right lower quadrant mass and fistulae [abdominal actinomycosis].
Synonyms	Actinomyces, Aktinomykose, Lumpy jaw. ICD9: 039. ICD10: A42

Clinical

Anatomic variants of Actinomycosis

Oral-cervical actinomycosis accounts for 55% of actinomycosis, and may be manifested as soft tissue swelling, an abscess, or a mass lesion. [1]
• Lesions may be multiple, and relapse following short courses of therapy.
• The disease often spreads to adjacent structures (masseter muscle, carotid artery, cranium, cervical spine, trachea, or thorax) without regard for normal tissue planes.
• Lymphatic spread and lymphadenopathy are rare.
• Infection is associated with pain, fever, and leukocytosis.

Periapical actinomycosis [2] is common and responds to dental care and antibiotics.
• The most common location for actinomycosis is the perimandibular region.
• Periapical infection often precedes infection, which is usually seen at the angle of the jaw; however, the cheek, submental space, retromandibular space, and temporomandibular joint may be affected.
• The overlying skin is often blue to red-purple in color, and sinuses may appear.
• An abscess may ensue, with trismus.
• Mandibular periostitis and osteomyelitis are rarely encountered.
• Maxillary or ethmoid disease, with or without osteomyelitis, is uncommon; but maxillary sinusitis and associated cutaneous fistulas can occur.
• Masses of the hard palate, tongue, nasal septum, head and neck, salivary glands, thyroglossal ducts, thyroid, branchial cleft cysts, lacrimal ducts, orbital structures and larynx have also been reported.
• The tonsils are rarely, if ever, involved; however, infection of the external or middle ear, temporal bone and mastoid may occur following spread of facial disease.

Thoracic actinomycosis [3] accounts for 15% of actinomycosis cases, and represents aspiration of organisms from the pharynx (rarely direct extension from the head and neck or abdominal cavity).
• Most cases present as an indolent, slowly progressive process involving the lung parenchyma and pleura.
• Chest pain, fever, and weight loss are common; occasionally with hemoptysis and a productive cough.
• X-ray findings are non-specific.
• The usual appearance is either a mass lesion or pneumonitis with or without pleural involvement.

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• An air bronchogram within a mass lesion is suggestive when present, pleural thickening, effusion, or empyema is seen in more than 50% of cases.
• An isolated pleural effusion may drain spontaneously through the chest wall or produce a soft tissue or breast mass; or posteriorly, to involve the vertebrae or paraspinal structures or spinal cord
• Pulmonary disease may extend across fissures or pleura, and involve the mediastinum, pericardium (rarely endocardium) or contiguous bone.

Abdominal actinomycosis [4] accounts for 20% of actinomycosis and represents ingestion of bacteria, hematogenous infection or extension from the female pelvis.
• Associated fever, weight loss, abdominal pain or fullness and changing bowel habits may be present for months before the diagnosis is suspected.
• Physical findings include mass lesions and sinus tracts of the abdominal wall.
• Lymphadenopathy is uncommon.
• 65% of cases are associated with appendicitis, and 65% of lesions present in the right iliac fossa.
• Associated tuboovarian infection, hepatic abscesses [5] , diverticulitis or foreign body perforation in the transverse or sigmoid colon may also be encountered.
• Other associated factors include previous gastric of bowel surgery, typhoid fever, amebic dysentery, trauma, and pancreatitis.
• Abdominal infection may extend to the liver hematogenously [6] ; and perirectal or perianal infection is occasionally encountered, resulting in chronic fistulae, sinuses and strictures.

Pelvic actinomycosis [7] may represent spread from intra-abdominal infection; but is most often a complication of intra-uterine device (IUD) placement.
• Any type of IUD can cause infection; and on average, the device has been in place for eight years prior to the appearance of actinomycosis.
• Infection may even occur months following removal of the device.
• Infection is manifest as endometritis or a mass/abscess of the tubes or ovaries. [8]
• Presenting features consist of chronic fever, weight loss, abdominal pain, and vaginal bleeding .
• A "frozen pelvis" suggestive of malignancy or endometriosis is often encountered; and the infection may involve the ureters, bladder, rectum, small or large bowel or peritoneum.
• The diagnostic value of smears and cultures for Actinomyces among asymptomatic women with IUD's is controversial.

Other forms of actinomycosis include:
• brain abscess
• chronic meningitis
• urogenital infection
• musculoskeletal infection
• isolated skin [9] and muscle disease (including mycetoma)
• infected orthopedic prostheses
• esophagitis [10]
• thyroiditis
• disseminated hematogenous infection of multiple organs

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Adenovirus infection

Agent	VIRUS - DNA. Adenoviridae, Adenovirus Enteric strains are classified in genus Mastadenovirus
Reservoir	Human Non-human primates
Vector	None
Vehicle	Droplet Water
Incubation Period	4d - 12d
Diagnostic Tests	Viral culture/serology or antigen assay. Direct fluorescence of secretions. Nucleic acid amplification.
Typical Adult Therapy	Enteric/secretion precautions. Cidofovir has been used in some cases. Symptomatic therapy
Typical Pediatric Therapy	As for adult
Vaccine	Adenovirus vaccine
Clinical Hints	Atypical pneumonia, upper respiratory infection, tracheitis, bronchiolitis or keratoconjunctivitis with preauricular adenopathy; uncomplicated illness usually lasts 3 to 5 days; this agent may also cause hemorrhagic cystitis.
Synonyms	Adenovirus gastroenteritis, Epidemic keratoconjunctivitis, Pharyngoconjunctival fever. ICD9: 047.9,077.1,077.2,008.62,480.0 ICD10: A08.2,B30.1,B34.0,J12.0

Clinical

Only 50% of Adenovirus infections are clinically apparent.
• Infection in children usually presents as mild pharyngitis or tracheitis.
• Adenovirus type 7 can cause fulminant bronchiolitis and pneumonia in infants.
• Severe respiratory infection is associated with serotype 14 [1]
• Adenoviruses have been isolated more often than any other nonbacterial pathogen from patients with the whooping cough syndrome; however, a causal relation has not been established.

Respiratory infection:

Cough, fever, sore throat, tonsillitis [2] and rhinorrhea are the most common findings [3] , and usually last 3 to 5 days. [4] [5]
• Rales and rhonchi may be present.
• X-ray studies in patients with pneumonias reveal patchy ground-glass infiltrates primarily in the lower lung fields.
• Outbreaks among military personnel are characterized by tracheobronchitis, with 20% requiring hospitalization.
• The disease is usually is self-limited, superinfection and death are rare.
• Severe infections are increasingly reported among immunocompromised patients. [6-9]
• There are also case reports of severe Adenovirus pneumonia in immunocompetent adults. [10] [11]
• Rare instances of rhabdomyolysis [12] and fatal myocarditis have been reported. [13] [14]
• In one series of 3,298 adenoviral infections, pneumonia was found in only 2.4%. [15]
• Adenoviral pneumonia is often followed by bronchiolitis obliterans in children. [16] [17]
• Central nervous system dysfunction is present in 3.3% of children with adenoviral respiratory tract infection, and may include seizures, altered consciousness or lethargy. [18]

Pharyngoconjunctival fever:

Pharyngoconjunctival fever often occurs in the setting of small outbreaks.
• Illness is characterized by conjunctivitis, pharyngitis, rhinitis, cervical lymphadenitis, and fever to 38 C.
• The onset is acute, and symptoms last 3 to 5 days.
• Bulbar and palpebral conjunctivitis, usually bilateral, may be the only finding.
• The palpebral conjunctivae have a granular appearance.
• Bacterial superinfection and permanent residua are unusual.
• Respiratory involvement usually does not progress to the bronchi or lungs.
• Contaminated swimming pools and ponds have been implicated as sources of spread.

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Epidemic keratoconjunctivitis:
Epidemic keratoconjunctivitis has an incubation period of 4 to 24 days, and lasts for 1 to 4 weeks.
- The conjunctivitis is often bilateral, and preauricular adenopathy is common. [19-21]
- Multiple subepithelial corneal infiltrates are often present. [22]
- Visual disturbance may persist for several months.
- Secondary spread to household contacts occurs in 10% of the cases.
- Patients may present with concurrent adenoviral conjunctivitis and urethritis. [23]

Hemorrhagic cystitis:
Hemorrhagic cystitis is two to three times more common in boys than girls (unlike bacterial cystitis which is predominantly seen in girls). [24]
- Hematuria usually persists for approximately three days.
- There was no seasonal preponderance.
- Adenoviral urethritis [25-27] and obstructive uropathy are also reported. [28]
- Patients may present with concurrent adenoviral conjunctivitis and urethritis. [29]

Infantile adenoviral enteritis:
Infantile adenoviral enteritis is characterized by watery diarrhea is watery with fever, and may last for 1 to 2 weeks.
- Adenoviruses have also been implicated in the etiology of intussusception, encephalitis and meningoencephalitis. [30]
- Rare instances of intestinal intussusception have been associated with adenoviral gastroenteritis. [31]

Other forms of infection:
Adenoviruses have emerged as important pathogens in immunosuppressed patients, particularly those undergoing bone marrow or solid organ transplantation.
- Syndromes include infection of the transplanted organ, or disseminated infection involving the lung, colon (ie, chronic diarrhea [32]), and central nervous system.
- Infection, notably of the urinary [33] and gastrointestinal tracts, is also a common complication of AIDS.
- Adenoviral parotitis and encephalitis are also reported in AIDS patients.

Adenovirus infection in Zambia

Prevalence surveys:

16.8% of hospitalized children with severe non-influenza acute respiratory illness (Lusaka, 2011 to 2012) [34] [35]

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Aeromonas & marine Vibrio infx.

Agent	BACTERIUM. Aeromonas hydrophila & Vibrio vulnificus, et al Facultative gram-negative bacilli
Reservoir	Salt or brackish water Fish
Vector	None
Vehicle	Water/shellfish Contact
Incubation Period	Range 2d - 7d
Diagnostic Tests	Culture. Notify laboratory if these organisms are suspected in stool.
Typical Adult Therapy	Fluoroquinolone or Sulfamethoxazole/trimethoprim . Other antimicrobial agent as determined by susceptibility testing
Typical Pediatric Therapy	Sulfamethoxazole/trimethoprim . Or other antimicrobial agent as determined by susceptibility testing
Clinical Hints	Diarrhea, fever, vomiting or sepsis after marine injury or ingestion of raw oysters/contaminated fresh or brackish water; fecal leukocytes present; severe or fatal in immunosuppressed or alcoholic patients.
Synonyms	Aeromonas, Aeromonas hydrophila, Vibrio mimicus, Vibrio vulnificus. ICD9: 005.81,027.9 ICD10: A48.8

Clinical

***Aeromonas hydrophila* gastroenteritis:**
There is controversy as to whether *Aeromonas hydrophila* can cause gastroenteritis.
Two types of gastroenteritis have been associated with *A. hydrophila* [1] :
• a cholera-like illness with a watery diarrhea
• a dysenteric illness characterized by loose stools containing blood and mucus.
• cases of hemolytic uremic syndrome have followed *Aeromonas* infection [2]
• Volunteer feeding studies using as many as 1 billion cells have failed to elicit illness.
• The presence of this species in the stools of individuals with diarrhea, in the absence of other known enteric pathogens, suggests that it has some role in disease. [3]
• *Aeromonas caviae* and *A. sobria* are considered by many as "putative pathogens," in diarrheal disease.

Aeromonas species are often implicated in traumatic and surgical wound sepsis [4] [5] and a variety of localized infections. [6-11]
• Generalized systemic infection has been observed in individuals with underlying illness.
• 84 cases (24 fatal) of *Aeromonas* pneumonia were treated at a hospital in Taiwan during 2004 to 2011 • most among elderly men, often as a complication of diabetes or malignancy. [12]

***Vibrio vulnificus*:**
Vibrio vulnificus causes septicemia in persons with chronic liver disease, alcoholism or hemochromatosis, and immunosuppressed patients. [13] [14]
• The disease appears 12 hours to 3 days after eating raw or undercooked seafood, especially oysters.
• One third of the patients are in shock within 12 hours after hospital admission.
• Three quarters have distinctive, bullous skin lesions which may be mistaken for pemphigus or pemphigoid.
• Thrombocytopenia is common and there is often evidence of disseminated intravascular coagulation.
• Over 50 percent of patients with septicemia die; and the mortality rate exceeds 90 percent among those with hypotension.

Relatively high mortality rates are associated with necrotizing fasciitis caused by *Aeromonas* or *Vibrio* species. [15]

V. vulnificus can also infect wounds sustained in coastal or estuarine waters.
• Infections range from mild self limited lesions to rapidly progressive cellulitis or myositis that can mimic clostridial myonecrosis clinically.

Additional species of *Aeromonas* and *Vibrio* are described in the Microbiology module.

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African tick bite fever

Agent	BACTERIUM. Rickettsiales: Rickettsia africae
Reservoir	Sheep Goat Cattle Tick
Vector	Tick (Rhipicephalus, Haemaphysalis, Amblyomma)
Vehicle	None
Incubation Period	6d - 7d (range 3d - 18d)
Diagnostic Tests	Serology. Demonstration of rickettsiae by immunofluorescence or culture. Nucleic acid amplification
Typical Adult Therapy	Doxycycline 100 mg PO BID X 3 to 5d. OR Chloramphenicol 500 mg PO QID X 3 to 5d
Typical Pediatric Therapy	Doxycycline 2 mg/kg PO BID X 3 to 5d (maximum 200 mg/day). OR Chloramphenicol 10 mg/kg PO QID X 3 to 5d
Clinical Hints	Fever and rash following a tick bite. Unlike Mediterranean spotted fever: 1) multiple eschars may be present; and 2) the rash is vesicular, and present in only 30% of patients.
Synonyms	Rickettsia africae, South African spotted fever. ICD9: 082.1 ICD10: A77.1

Clinical

Signs and symptoms:
As in other rickettsial spotted fevers, African tick bite fever is an acute illness associated with fever, lethargy, headache and myalgia. [1]
• Unlike *Rickettsia conorii*, *R. africae* infection is characterized by a low incidence of rash (usually vesicular) and the common finding of regional lymphadenopathy and multiple eschars. [2]
• The most common presentation is a flu-like illness. [3]
• An inoculation eschar is present in up to 50% of cases, with 20% to 45% having multiple eschars -they may be overlooked in dark skin, in the hair, or in the anogenital region. [4-6]
• Among elderly patients, rash is present in 87.5% (vesicular in 100%), enanthem in 50%, prolonged fever in 75%, chills 87.5%, asthenia 50%, anorexia 50% and weight loss (12.5%) [7]
• Reactive arthritis occurs occasionally. [8]
• Fever usually defervesces within 48 hours of anti-rickettsial therapy. [9]
• There are case reports of prolonged fever up to 3 weeks • consider in returned travelers from endemic areas with prolonged fever.
• Aphthous ulceration and lymphangitis have also been reported rarely. [10] [11]

Laboratory studies:
• Moderate lymphopenia, elevated CRP are seen at presentation in most cases. 40% have elevated liver enzymes, and 20% have thrombocytopenia. [12]
• Median time to development of IgM and IgG antibodies are 25 and 28 days respectively.
• Seroconversion may not occur in mild cases, or if treated early with doxycycline. [13]
• Complications are rare, and there have been no known fatal cases. [14]
Although African tick bite fever is not endemic to Zambia, imported, expatriate or other presentations of the disease have been associated with this country.

African tick bite fever in Zambia

2008 (publication year) - A British tourist developed spotted fever (type not established) after returning from a trip to Kenya and Zambia. [15]

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AIDS

Agent	VIRUS - RNA. Retroviridae, Lentivirinae: Human Immunodeficiency Virus, HIV
Reservoir	Human
Vector	None
Vehicle	Blood Semen Sexual Transplacental Breastfeeding
Incubation Period	2m - 10y (50% within 10y)
Diagnostic Tests	HIV antibody (ELISA, Western blot). Nucleic acid amplification. Tests for HIV antigen & viral load as indicated.
Typical Adult Therapy	Nucleoside/-nucleotide reverse transcriptase inhibitor + A Non-nucleoside reverse transcriptase inhibitor OR a Protease Inhibitor OR a Strand-transfer integrase inhibitor
Typical Pediatric Therapy	Regimens vary - in general: 2 Non-nucleoside reverse transcriptase inhibitors + Ritonavir / Lopinavir OR Nevirapine OR Atazanavir
Clinical Hints	Most often associated with drug abuse, blood products, men who have sex with men, hemophilia. Hints: severe herpes simplex or moniliasis, chronic cough, diarrhea, weight loss, lymphadenopathy, retinitis, encephalitis or Kaposi's sarcoma.
Synonyms	ARC, Gay cancer, GRID, HIV-1, HIV-2, HIV-AIDS, SIDA, Slim disease. ICD9: 042 ICD10: B20,B21,B22,B23,B24

Clinical

CDC case surveillance definition:
As of 1993, the CDC (The United States Centers for Disease Control) surveillance case definition for AIDS includes all HIV-infected persons age 13 or over who have either. [1]
• a) a <200 CD4+ T-lymphocytes
• b) a CD4+ T-lymphocyte percentage of total lymphocytes of <14%
• or c) any of the following: pulmonary tuberculosis, recurrent pneumonia, or invasive cervical cancer; or any of the 23 clinical conditions defined in the case definition published in 1987. [2]
• Revised WHO case definitions 1994 [3] 2008 [4]

The clinical features of AIDS are protean and often characterized by multisystem illness, evidence of immune suppression and the presence of one or more superinfections (tuberculosis [5] , Cytomegalovirus infection, cerebral toxoplasmosis [6] , pneumocystosis [7] [8] , penicilliosis [9] [10] , severe or recalcitrant candidiasis, disseminated *Acanthamoeba* infection [11] , etc).

Acute HIV infection is characterized by fever, generalized lymphadenopathy, headache, fatigue, myalgia, rash, nausea, vomiting, night sweats, sore throat, diarrhea or weight loss. [12]
• 40% to 90% of persons have symptoms suggestive of an acute viral infection.
• Symptoms tend to subside within two weeks; however, some patients continue to be ill for as long as ten weeks.
• In most cases, a history of likely acquisition within the past several weeks can be established: unprotected sex, extra-medical injection, transfusion, etc.

HIV infection and opportunistic pathogens:

HIV infection increases the incidence and severity of a wide variety of infectious diseases [13] caused by viruses, mycobacteria, actinomycetes, treponemes, fungi [14-20] , protozoa [21] [22] and helminths.
• HIV infection increases the incidence and severity of clinical malaria; however, in severe malaria the level of parasitemia is similar in HIV-positive and HIV-negative patients. [23-30]
During pregnancy, HIV infection increases the incidence of clinical malaria, maternal morbidity, and fetal and neonatal morbi-mortality.
HIV infection increases severity of malaria, the risk of malaria treatment failure, and for cerebral malaria in children. [31] [32]

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Some antimalarial drugs may inhibit HIV, while certain anti-retroviral drugs are effective against *Plasmodium* species. [33]

• Reactivation of Chagas disease encephalopathy has been reported among infected HIV-positive patients. [34]

• Acquired syphilis in patients with HIV infection is characterized by severe and accelerated infection, often with overt meningitis, hepatitis [35] and other forms of systemic involvement. [36-46] The presence of concurrent syphilis does not affect the progression of AIDS. [47]

• *Haemophilus ducreyi* has been associated with esophageal ulceration in HIV-positive patients. [48]

• Rectal Lymphogranuloma venereum in HIV-positive patients can mimic lymphoma. [49]

• Lesions of Herpes simplex in HIV-positive patients may be vegetative, hypertrophic, condyloma-like, nodular, ulcerative, or tumor-like nodules or plaques. [50]

• Hepatitis G infection appears to improve survival among persons with concurrent HIV infection. [51] 41% of infants born to mothers with HIV-HGB-C coinfection acquired HGB-C infection (Thailand, 2009 publication) [52]

• Concurrent HIV infection increases the incidence of cirrhosis and HCC among Hepatitis B carriers [53-56] ; and shortens the time to development of chronic liver disease in patients with Hepatitis C. [57]

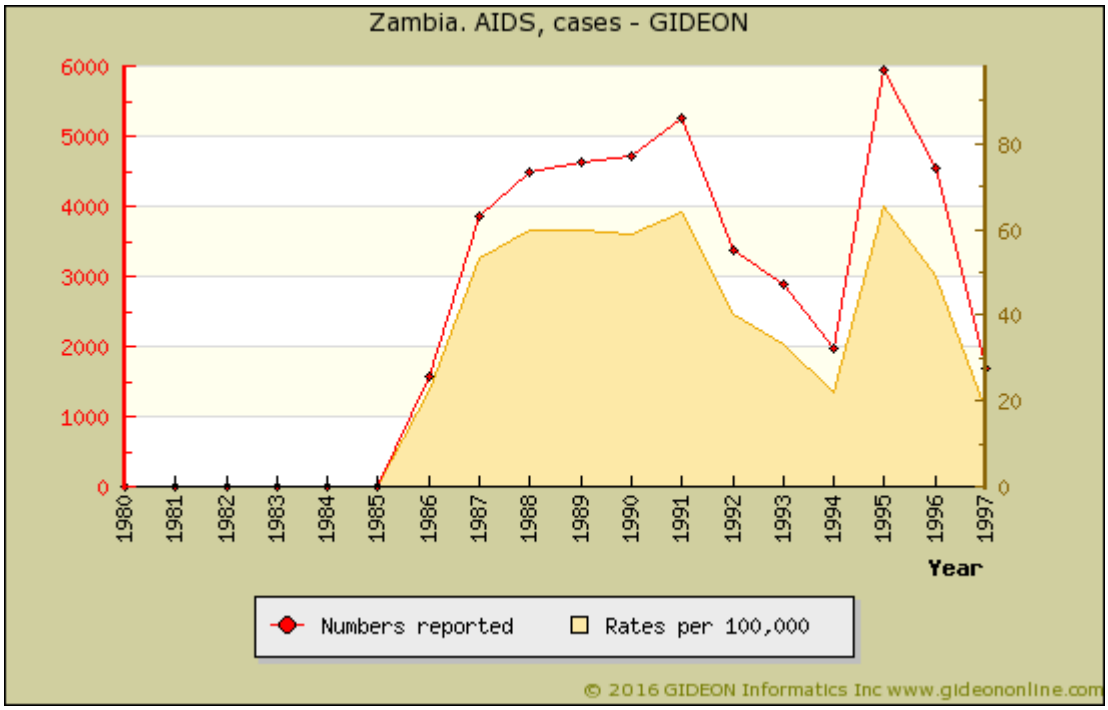
• HIV-HCV and HIV-HEV coinfections are characterized by more rapid progression to cirrhosis and diminished response to peginterferon/ribavirin therapy. [58-66]

• Hepatitis D is associated with relatively aggressive disease among patients with HIV-HBV coinfection. [67]

• Concurrent HIV infection may prolong the duration of viremia in patients with hepatitis A. [68]

AIDS in Zambia

First case of AIDS was reported in 1984.



Graph: Zambia. AIDS, cases

Notes:
1. 1,676 cases were reported during January to July 1997.

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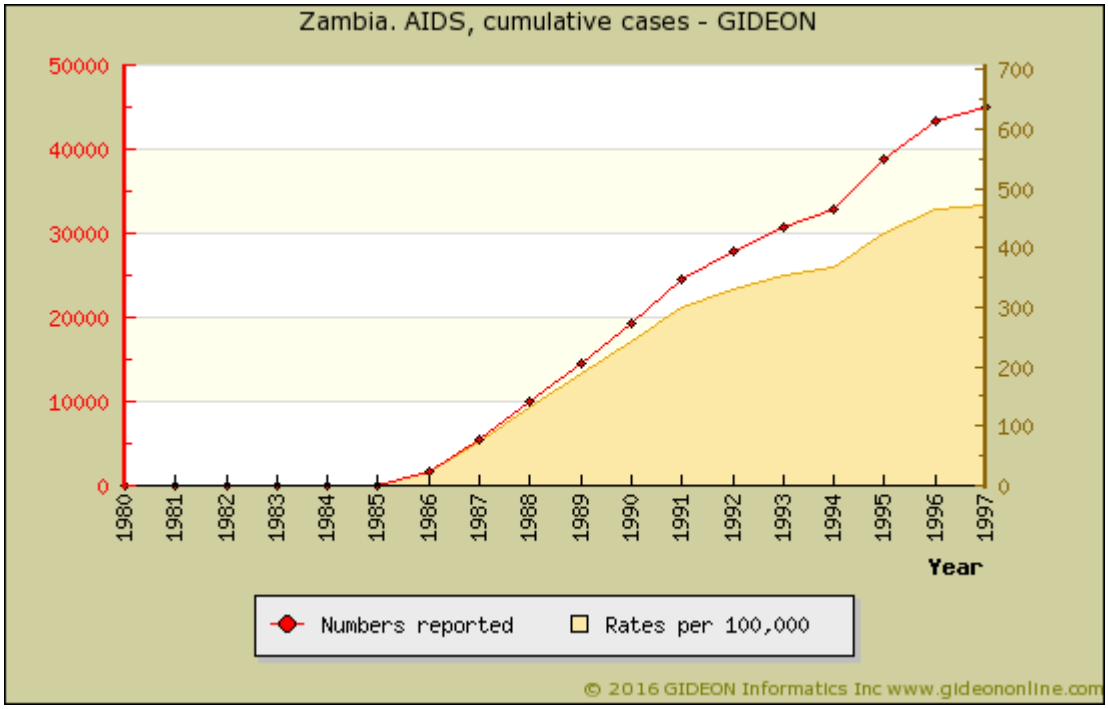
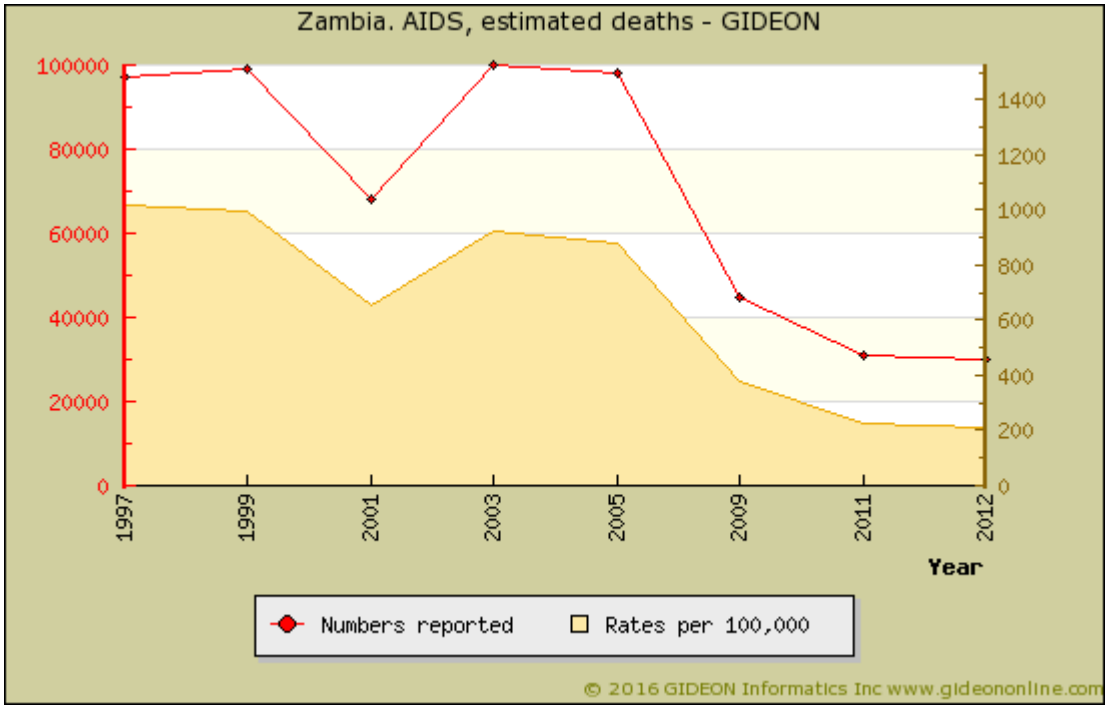


Graph: Zambia. AIDS, cumulative cases

Notes:
1. The true number of AIDS cases to December 1997 is estimated at 630,000, with 590,000 AIDS deaths.

Cases to July 1997: 89% ages 15 to 49; 47.9% males; 94% heterosexual; 1% IDU; 5% transfusion or hemophilia-related.



Graph: Zambia. AIDS, estimated deaths

Notes:
1. 650,000 AIDS orphans were estimated to December 1999; 570,000 in 2001.
2. An estimated 650,000 AIDS orphans were alive in 2003; 710,000 in 2005.

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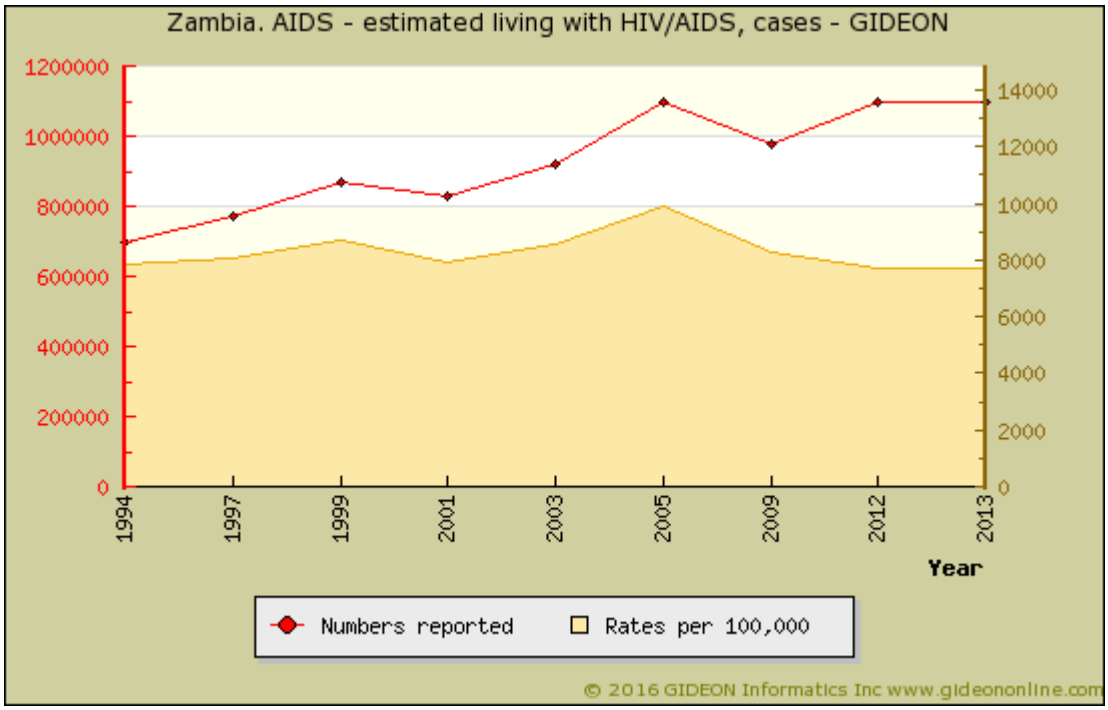
The rate of disease among at risk women in South Africa (Durban and Hlabisa), Tanzania (Moshi) and Zambia (Lusaka) was estimated at 3.8 per 100 person-years at risk (2003 to 2004). [69]

Seroprevalence surveys:

7.7% of famale- and 5.2% of male-adults, nationwide (2013 to 2014) [70]
15.6% of adults (2001 to 2002) [71]
14.3% of the population in 2001; 13.5% in 2009 (estimates) [72]
28% of adults in Ndola (2001 publication) [73]
28.4% of adults ages 15 to 49 years, in Ndola (2001 publication) [74]
4.2% of males and 8.9% of females ages 15 to 24 (2007) [75]
60% of clinic outpatients and 49% of patients with pulmonary tuberculosis in Lusaka (1990 publication) [76]
23.4% of hospitalized children suffering from severe acute malnutrition (1998) [77]
54.1% of hospitalized children suffering from severe acute malnutrition (2001 and 2005) [78]
6% of children ages 9 months to 5 years (Lusaka, 2009 publication) [79]
19.8% of women of childbearing age 19.8% (1994) [80]
28.7% of urban pregnant women in 1994; 26.3% in 1998; 25.5% in 2002 [81] ; 20.7% in 2004
12.8% of rural pregnant women in 1994; 11.7% in 1998; 11.1% in 2002; 16% in 2003
24.2% of pregnant women in 1994, 25.9% in 1998, 24.3% in 2002; 21.4% in 2006 (Lusaka) [82]
24.4% of pregnant women (urban Lusaka and rural Mposhi district, 1995-96) [83]
13.2% of pregnant women in Nchelenge District (PCR, 2013 to 2014) [84]
17.7% of baseline and 17.8% of intervention-program pregnant women (2012 publication) [85]
38.7% of urban women ages 16 to 49 years (2009 publication) [86]
23.2% of men and 31.9% of women in Ndola (1997 to 1998) [87]
97% of adults with diarrhea lasting > 1 month (Lusaka, 1996 publication) [88]
20.7% of farm workers from a sugar estate (2006 to 2007) [89]
28% of prisoners in 1992; 19% during 1998 to 1999 [90]
68.7% of CSW (Ndola, 1997 to 1998)
69% of CSW in Ndola (2001 publication) [91]
59.7% of urban STD patients (1991); 37.65% of rural STD patients (1991)
10.4% of blood donors in Kitwe in 1994, and 7.2% in 1998
22.9% of prisoners and 13.8% of residents of adjacent encampments (2015 publication) [92]

Nationwide seropositivity was estimated at 1% to 5% in 1985; >5% during 1990 to 1994; 19.07% in December 1997.



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Graph: Zambia. AIDS - estimated living with HIV/AIDS, cases

Notes:
1. Figure for 2001 represented 21.5% of all adults; 16.5% in 2003; 17.0% in 2005.

Associated infections:

- 70 percent of tuberculosis patients were found to be HIV-positive (2006 to 2010) [93]
  The incidence of tuberculosis among persons living with HIV/AIDS was 4.9% per year (1998).
  49% of outpatients with pulmonary tuberculosis were HIV-positive (Lusaka, 1990 publication) [94]
  88% of patients with tuberculous lymphadenitis were HIV-positive (Lusaka, 1981 to 1998) [95]
- A hospital in Lusaka reported 230 cases of cryptococcal meningitis in AIDS patients during a single year - 100% fatal (2001 publication) [96]
- 23% of HIV-positive patients with diarrhea carried *Enterocytozoon bieneusi*. [97]
- 14% of HIV-positive schoolchildren with diarrhea were infected by *Cryptosporidium*, vs. 6% of HIV-negative controls (1995 publication) [98]
  Cryptosporidium was found in 4% to 4.7% of HIV-positive patients with diarrhea; *Isospora belli* in 6% to 9% (Lusaka, 1992 to 1993) [99]
  Cryptosporidium was found in 2.2% of AIDS patients with diarrhea, *Isospora belli* 7.8% and *Strongyloides* 2.2% (1992 publication) [100]
- Malaria was identified in 65.2% of HIV-positive and 56.7% of HIV-negative pregnant women in Nchelenge District (PCR, 2013 to 2014) [101]
- 4% of HIV-positive patients, and 11% of controls were seropositive toward *Toxoplasma gondii*. [102]
- Cryptococcosis was identified in 19.5% of central nervous system infections among HIV-positive patients, EBV 27.5%, tuberculosis 14.5%, CDMV 6.0%, VZV 3.9%, HSV 1.5% and toxoplasmosis 0% (2014 publication) [103]
- 52.7% of HIV-positive patients were infested with *Ascaris lumbricoides*, 39.2% hookworm, 9.4% *Schistosoma mansoni*, 6.8% *Strongyloides stercoralis*, 2.7% *Hymenolepis nana* and 1.4% *Taenia*. [104]
- 47.8% of HIV-infected pregnant women in Blantyre and Lilongwe (Malawi), Dar es Salaam (Tanzania) and Lusaka (Zambia) were found to have bacterial vaginosis, 22.4% vaginal candidiasis, 18.8% trichomoniasis, 2.6% *Chlamydia trachomatis* infection and 1.7% gonorrhea (2008 publication) [105]
  1% of HIV-infected women in urban Lusaka were infected by *Chlamydia trachomatis* and 1.4% by *Neisseria gonorrhoeae* (2012 publication) [106]
  63.3% of HIV-positive women in Lusaka were found to have bacterial vaginosis (2015 publication) [107]
- 9.9% of HIV-positive patients were found to be HBsAg-positive and 1.2% anti-HCV positive (Lusaka, 2011 publication) [108]
  10.4% of HIV-positive children and adolescents were found to be HBsAg-positive (2011 to 2014) [109]
  28% of HIV-negative and 71% of HIV-positive adults were seropositive toward Hepatitis E virus (2013 publication) [110]
- 23% of HIV-positive children with a history of vaccination were seropositive toward measles virus (2010). [111]

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Amoeba - free living

Agent	PARASITE - Protozoa. Centramoebida, Acanthamoebidae: Acanthamoeba and Balamuthia Schizopyrenida, Vahkampfidae: Naegleria
Reservoir	Water Soil
Vector	None
Vehicle	Water (diving, swimming) Contact
Incubation Period	5d - 6d (range 2d - 14d) Granulomatous ? to 2m
Diagnostic Tests	Wet preparation. Specialized cultures. Serology available in reference centers.
Typical Adult Therapy	CNS Naegleria: Amphotericin B to 1 mg/kg/d IV + 1.5 mg intrathecal X 8 days; plus Miconazole 350 mg/sq m/d IV + 10 mg intrathecal qod X 8d Acanthamoeba: Sulfonamides + Flucytosine Miltefosine successful in cases of Acanthamoeba / Balamuthia enceph.
Typical Pediatric Therapy	CNS Naegleria: Amphotericin B to 1 mg/kg/d IV + 1.5 mg intrathecal X 8 days; plus Miconazole 350 mg/sq m/d IV + 10 mg intrathecal qod X 8d Acanthamoeba: Sulfonamides + Flucytosine Miltefosine successful in some cases of Acanth. / Balamuthia enceph.
Clinical Hints	Severe, progressive meningoencephalitis (*Naegleria*, *Acanthamoeba* or *Balamuthia*) following swimming or diving in fresh water; or keratitis (*Acanthamoeba*), often following use of contaminated solutions to clean contact lenses.
Synonyms	Acanthamoben, Acanthamoeba, Amebic keratitis, Balamuthia, Balmuthia, Dictyostelium, Free-living ameba, Leptomyxid ameba, Naegleria, Paravahlkampfia, Primary amebic meningoencephalitis, Sappinia, Vahlkampfia. ICD9: 136.2 ICD10: B60.1,B60.2

Clinical

Primary amebic meningoencephalitis usually occurs in children and young adults who have been swimming in warm fresh water. [1]

Infection is heralded by abnormal sensations of taste or smell followed by abrupt onset of fever, nausea, and vomiting.
• The majority of patients have headache, meningitis and disorders of mental status changes.
• Coma and death may ensue within one week
• Only three nonfatal infections had been reported to 2003.

***Acanthamoeba* encephalitis:**
Granulomatous amebic encephalitis due to *Acanthamoeba* occurs in immunocompromised and debilitated patients.
• Infection has a gradual onset characterized focal neurological deficits, mental status abnormalities, seizures, fever, headache, hemiparesis and meningismus.
• Visual disturbances and ataxia are often encountered.
• Death may ensue within 7 to as long as 120 days.
• Secondary infection of a cerebral ependymal cyst has been reported. [2]
• Disseminated *Acanthamoeba* infection has been reported in patients with HIV infection [3] and leukemia. [4]

***Balamuthia* encephalitis:**
Balamuthia mandrillaris infection is most commonly reported among rural males of Hispanic ethnicity. [5]
• *Balamuthia mandrillaris* encephalitis may be associated with headache, low-grade fever, vomiting, ataxia, photophobia, cranial nerve palsy, speech disturbances, cerebellar nystagmus, seizures, and altered mental status. [6] [7]
• Initial skin lesions, commonly present in Peruvian patients, are characterized by thin, painless plaques • most often on the

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nose, but also reported on knees, chest or elbows. [8]
• The case-fatality rate for *Balamuthia* encephalitis is over 90%.

Acanthamoeba keratitis:

Acanthamoeba keratitis is clinically similar to herpetic infection, and presents with a foreign-body sensation followed by severe pain, photophobia, tearing, blepharospasm, conjunctivitis, iritis, anterior uveitis, dendriform keratitis, radial keratoneuritis, ptosis and blurred vision. [9-16]
• In rare instances, the infection is painless. [17] [18]
• Rupture of Descemet's membrane may occur. [19]
• Bilateral infection is common. [20]
• Dacryoadenitis may be present in some cases. [21]
• Ocular discharge and endophthalmitis are very rare. [22]
• Sympathetic ophthalmia of the un-infected eye has been reported. [23]
• Atypical presentations have been described in patients with keratoconus. [24]

Acanthamoeba infection has also been associated with skin ulcers [25] , pneumonia, adrenalitis, vasculitis, osteomyelitis, and sinusitis.
• Cutaneous acanthamoebiasis has been associated with ulceronecrotic lesions, an infiltrative bluish plaque, or periorbital tumor. [26]
• Fatal disseminated *Acanthamoeba lenticulata* infection has been reported in a heart transplant patient.
• Four cases of disseminated *Acanthamoeba* infection in stem-cell transplant recipients had been reported as of 2008 [27] and five in lung transplant recipients as of 2013 (publication year) [28]

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Amoebic abscess

Agent	PARASITE - Protozoa. Sarcomastigota, Entamoebidea: Entamoeba histolytica (must be distinguished from non-invasive, Entamoeba dispar)
Reservoir	Human
Vector	Fly (Musca) - occasionally
Vehicle	Food Water Sexual contact Fly
Incubation Period	2w - 6m (rarely years; 95% within 6m)
Diagnostic Tests	Imaging. Serology. Nucleic acid amplification. Note: Amoebae are usually not present in stool at this stage.
Typical Adult Therapy	Metronidazole 750 mg TID X 10d OR Tinidazole 800 mg TID X 5d
Typical Pediatric Therapy	Metronidazole 15 mg/kg TID X 10d OR Tinidazole 15 to 20 mg/kg TID X 5d
Clinical Hints	Fever, local pain, weight loss. Remember that liver abscess may be bacterial or amoebic - latter most often single and in right hepatic lobe.
Synonyms	Absceso amebiano, Amebic liver abscess. ICD9: 006.3,006.4,006.5,006.6,006.8 ICD10: A06.4,106.5,A06.7,106.8

Clinical

Amebic liver abscess:
The clinical presentation may be acute or subacute in onset.
• Fever than 50% of patients have fever, hepatomegaly or abdominal pain.
• 30% to 40% have concurrent diarrhea.
• Other findings may include shoulder pain, cough, chest pain, pleural or pericardial effusion. [1] [2]
• The findings of ameboma may mimic those of malignancy. [3]
• Cases of IVC thrombosis [4] and Budd-Chiari syndrome complicating amebic abscess have been reported. [5]

Laboratory findings include leukocytosis without eosinophilia in 80%, anemia in over 50%, elevated serum alkaline phosphatase levels in 80%.

Extrahepatic infection:
Pleuropulmonary amebiasis is the most common complication of amebic liver abscess, usually representing rupture of a superior right lobe abscess through the diaphragm.
• Symptoms include cough, pleuritic pain, and dyspnea.
• Empyema, hepatobronchial fistula or pericarditis (from left lobe abscesses) may follow.
• Thrombosis of the inferior vena cava due to compression from hepatic abscess may occur, resulting in pulmonary thromboembolism in some cases. [6]
• Although most cases involve the liver, abscesses may occur in virtually any organ. [7-9]
• *Entamoeba histolytica* encephalitis has been reported. [10] [11]

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Amoebic colitis

Agent	PARASITE - Protozoa. Sarcomastigota, Entamoebidea: Entamoeba histolytica (must be distinguished from non-invasive, Entamoeba dispar)
Reservoir	Human
Vector	Fly (Musca) - occasionally
Vehicle	Food Water Sexual contact Fly
Incubation Period	1w - 3w (range 3d - 90d)
Diagnostic Tests	Fresh stool/aspirate for microscopy. Stool antigen assay. Stool PCR. Note: serological tests usually negative.
Typical Adult Therapy	Metronidazole 750 mg PO TID X 10d Follow with: Paromomycin 500 mg PO TID X 7d OR Iodoquinol 650 mg PO TID X 20d
Typical Pediatric Therapy	Metronidazole 15 mg/kg TID X 10d Follow with: Paromomycin 10 mg/kg PO TID X 7d OR Iodoquinol 10 mg/kg PO TID X 20d
Clinical Hints	Dysentery, abdominal pain, tenesmus - without hyperemia of rectal mucosa or fecal pus (i.e., unlike shigellosis); liver abscess and dysentery rarely coexist in a given patient.
Synonyms	Amebiasis, Amebiasis intestinal, Amebic dysentery, Amoebenruhr, Entamoeba bangladeshi, Entamoeba gingivalis, Entamoeba moshkovskii. ICD9: 006.0,006.1,006.2 ICD10: A06.0,A06.1,A06.2

Clinical

Most infections by *Entamoeba histolytica* are characterized by asymptomatic carriage. [1]

Patients with noninvasive infection may present with nonspecific gastrointestinal complaints such as chronic intermittent diarrhea, mucus, abdominal pain, flatulence and weight loss [2] [3]

Infection has been documented in children as young as two weeks of age. [4] [5]

A review of amebiasis among men who have sex with men • see reference [6]

Cases of cutaneous amebiasis of the penis have been acquired through insertive anal intercourse. [7]

Invasive amebiasis:
The onset of invasive infection is usually gradual (over 1 to 3 weeks) and characterized by abdominal pain, tenderness, and bloody stools.
• Fever is present in one third of cases, and the may be enlarged and tender.
• Signs of fluid loss and electrolyte loss may be seen in severe infections.
• In children, colitis can present as rectal bleeding alone without diarrhea.
• Fecal leukocytes may not be present, and are not as numerous as in shigellosis.
• Charcot-Leyden crystals are often seen in the stool.

Fulminant colitis:
Fulminant colitis is rare and carries a very high mortality.
• Predisposing factors include malnourishment, pregnancy and corticosteroid treatment.
• Such patients are severely ill with fever, leukocytosis, profuse bloody and mucoid diarrhea, generalized abdominal pain.

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- Hypotension and peritonitis may be evident.
- Intestinal perforation and necrosis, or hepatic abscess may ensue.
- The clinical features of Cytomegalovirus colitis in AIDS patients may mimic those of amebic colitis. [8]

Additional complications:

Additional complications include toxic megacolon (complicates 0.5% of amebic colitis cases); appendicitis [9-12] ; and annular ameboma of the colon, which may mimic carcinoma. [13]

- Chronic, irritative bowel syndromes, ulcerative post-dysenteric colitis or perianal amebiasis may also follow acute amebic colitis.
- Extraintestinal amebiasis may involve a wide variety of organs, including colocutaneous fistula [14] or amebiasis cutis [15] , brain abscess [16] , meningoencephalitis [17] , cervicitis [18] [19] , rectovaginal fistulae, urinary tract infection [20] and penile infection.

Liver abscess is discussed separately in this module.

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Anaplasmosis

Agent	BACTERIUM. Anaplasmataceae Anaplasma phagocytophilum. (E. phagocytophila, E. equi "HE agent" have merged into this species) Intracellular Rickettsia-like
Reservoir	Rodent Rabbit Deer Tick Primate Cattle Horse Goat Sheep
Vector	Ixodes dammini (scapularis); I. pacificus and I. ricinus also implicated
Vehicle	Blood or secretions (rare)
Incubation Period	Unknown; mean 8d
Diagnostic Tests	Intraleucocytic inclusions ('morulae') seen in blood smear. Serology. Nucleic acid amplification/
Typical Adult Therapy	Doxycycline 100 mg PO BID X 7 to 14 days OR Tetracycline 500 mg PO QID X 7 to 14 days
Typical Pediatric Therapy	Above age 8 years: Doxycycline 2 mg/kg PO BID X 7 to 14 days OR Tetracycline 500 mg PO QID X 7 to 14 days OR Rifampin 10 mg/kg/day PO
Clinical Hints	Fever, headache and myalgia following tick bite or exposure; arthralgia or macular rash may be present; leukopenia, thrombocytopenia or hepatic dysfunction common; inclusions in granulocytes; case-fatality rate 5%.
Synonyms	Anaplasma capra, Anaplasma ovis, Anaplasma phagocytophilum, Anaplasma platys, Anaplasmosis - human granulocytic, Ehrlichia equi, Ehrlichia ewingii, Ehrlichia microti, Ehrlichia phagocytophila, Ehrlichiosis - human granulocytic, Human granulocytic anaplasmosis, Human granulocytic ehrlichiosis. ICD9: 082.4 ICD10: B28.8

Clinical

Human Monocytic Ehrlichiosis (HME) and Anaplasmosis (Human Granulocytic Ehrlichiosis, HE) are characterized by fever, headache, myalgia, thrombocytopenia, leukopenia, and elevated liver enzyme levels. [1-3]
• A rash occurs in approximately one third of patients with HME but is less common in patients with HE.
• Rare instances of pneumonia have been reported.
• Most cases of anaplasmosis are mild; however, complications such as acute respiratory distress syndrome [4] [5], renal failure, neurological disorders, sensorineural hearing loss [6], and disseminated intravascular coagulation can occur. [7-10]
• Co-infection by *Borrelia burgdorferi* is common. [11]
• Case-fatality ratios in severe cases are as high as 5% for HME and 10% for Anaplasmosis.

The clinical features of anaplasmosis are similar to those of Lyme disease; however, patients with anaplasmosis are more likely to exhibit headache, dizziness, myalgias, abdominal pain, anorexia, leukopenia, lymphopenia, thrombocytopenia, and elevated liver enzymes. [12]
Although Anaplasmosis is not endemic to Zambia, imported, expatriate or other presentations of the disease have been associated with this country.

Anaplasmosis in Zambia

Prevalence surveys:

13.6% of baboons and vervet monkeys (2014 publication) [13]

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Animal bite-associated infection

Agent	BACTERIUM. Pasteurella multocida, and other zoonotic bite pathogens
Reservoir	Cat Dog Marsupial (Tasmanian devil) Other mammal Rarely bird
Vector	None
Vehicle	Cat (60%), dog (30%) or other bite. No obvious source in 10%
Incubation Period	3h - 3d
Diagnostic Tests	Gram stain/culture. Hold specimen for 2 weeks to discount Capnocytophaga & other genera.
Typical Adult Therapy	Penicillin, a Tetracycline or Cefuroxime. Dosage and duration appropriate for nature and severity of infection
Typical Pediatric Therapy	Penicillin or Cefuroxime. Dosage and duration appropriate for nature and severity of infection
Clinical Hints	Infection of cat, dog or other bite wound - acquired during the preceding 3 to 72 hours (no history of bite in 10%); systemic infection (meninges, bone, lungs, joints, etc) may occur.
Synonyms	Bacteroides pyogenes, Bacteroides tectus, Bergeyella zoohelcum, Bisgaard's taxon 16, Capnocytophaga canimorsus, Capnocytophaga cynodegmi, CDC EF-4, CDC NO-1, Coryebacterium kutscheri, Corynebacterium canis, Corynebacterium freiburgense, Fusobacterium canifelinum, Halomonas venusta, Kingella potus, Moraxella canis, Mycobacterium vulneris, Neisseria animaloris, Neisseria canis, Neisseria weaveri, Neisseria zoodegmatis, Pasteurella caballi, Pasteurella canis, Pasteurella dagmatis, Pasteurella multocida, Pasteurella stomatis, Psychrobacter immobilis, Staphylococcus intermedius, Vibrio harveyi. ICD9: 027.2 ICD10: A28.0

Clinical

These are typically skin and soft infections which follow the bites of cats, dogs or other animals • usually during the preceding 3 to 72 hours. [1]
• There is no history of bite in ten percent of cases.
• Systemic infection (meninges [2] , bone, lungs [3] , joints, etc) may occur, with rare instance of severe septicemia. [4-10]

See the Microbiology module for a comprehensive discussion of bacterial species associated with animal-bite wound infection in humans.

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Anisakiasis

Agent	PARASITE - Nematoda. Secernentea: Anisakis simplex and Pseudoterranova decipiens
Reservoir	Marine mammals Fish
Vector	None
Vehicle	Undercooked fish
Incubation Period	Hours - 14d
Diagnostic Tests	Endoscopic identification of larvae.
Typical Adult Therapy	Endoscopic removal of larvae; surgery for complications
Typical Pediatric Therapy	As for adult
Clinical Hints	Allergic reactions; or acute and chronic abdominal pain, often with "peritoneal signs" or hematemesis; follows ingestion of undercooked fish (e.g., sushi), squid or octopus.
Synonyms	Anasakis, Bolbosoma, Cod worm disease, Contracaecum, Eustrongylides, Herring worm disease, Hysterothylacium, Pseudoterranova, Whaleworm. ICD9: 127.1 ICD10: B81.0

Clinical

The location of the worms and presenting features depend somewhat on the genus.
• *Phocanema* is more commonly associated with infection of the stomach.
• *Anisakis* is usually associated with intestinal disease. [1]

Invasive anisakiasis:
Symptoms occur within 48 hours after ingestion.
• Gastric anisakiasis is characterized by intense abdominal pain, nausea, and vomiting. [2]
• Small intestinal involvement results in lower abdominal pain and signs of obstruction [3-7], and may cause [8] or mimic appendicitis. [9] [10]
• CT studies reveal severe circumferential bowel-wall thickening, submucosal edema and ascites. [11] [12]
• Concurrent gastric and colonic invasion may occur in a given patient. [13]
• Rare instances of duodenal ulcer [14], overt hemorrhage [15], mesenteric tumor [16], intussusception [17] [18] and asymptomatic colonic infection are reported. [19]
• Symptoms may last for months, rarely for years.
• The disease may also suggest tumor, regional enteritis or diverticulitis. [20]
• Patients may also experience a pharyngeal "tickling sensation", cough or a foreign body in the mouth or throat. [21]

Allergic anisakiasis:
Ingestion of *Anisakis* larvae with seafood is often responsible for acute allergic manifestations such as urticaria and anaphylaxis [22] [23], with or without accompanying gastrointestinal symptomatology. [24]
• Eosinophilia is usually not present in either gastric or intestinal anisakiasis; however, leukocytosis is noted in two thirds of patients with intestinal involvement.
• Urticaria is present in 20% of cases [25]

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Anthrax

Agent	BACTERIUM. Bacillus anthracis An aerobic gram positive bacillus
Reservoir	Soil Goat Cattle Sheep Water Horse
Vector	Fly (rare)
Vehicle	Hair Wool Hides Bone products Air Meat Contact
Incubation Period	1d-7d; 1-12 cutaneous, 1-7 GI; 1-43 pulmonary
Diagnostic Tests	Bacteriological culture. Alert laboratory that organism may be present. Serology and rapid tests by Ref. Centers.
Typical Adult Therapy	Isolation (secretions). Ciprofloxacin (or Penicillin if susceptible). If systemic infection, add Meropenem (or Imipenem) + Linezolid (or Rifampin or Clindamycin) Dosage/route/duration as per severity If inhalational anthrax, add Raxibacumab
Typical Pediatric Therapy	As for adult
Vaccine	Anthrax vaccine
Clinical Hints	Edematous skin ulcer covered by black eschar - satellite vesicles may be present; fulminant gastroenteritis or pneumonia; necrotizing stomatitis; hemorrhagic meningitis. Acquired from contact with large mammals or their products (meat, wool, hides, bone).\
Synonyms	Antrace, Antrax, Antraz, Carbunco, Carbunculo, La fievre charbonneuse, Malcharbon, Malignant pustule, Miltbrann, Miltvuur, Milzbrand, Mjaltbrand, Siberian plague, Siberian ulcer, Splenic fever, Wool-sorter's disease. ICD9: 022 ICD10: A22

Clinical

Most cases of anthrax occur in one of four forms: cutaneous, gastrointestinal, oropharyngeal and inhalational. [1]

CDC case definition for reporting:
As of 1996, the CDC (The United States Centers for Disease Control) case definition for reporting purposes consists of any illness with acute onset characterized by one or more of the following:
• cutaneous (a skin lesion evolving during a period of 2-6 days from a papule, through a vesicle to a depressed black eschar)
• pulmonary (hypoxia, dyspnea and mediastinal widening following a brief "viral-type" prodrome)
• intestinal (severe abdominal distress followed by fever or signs of septicemia)
• oropharyngeal (mucosal lesion, cervical adenopathy and edema, and fever)
• demonstration of *Bacillus anthracis* by culture, immunofluorescence or serological response.

WHO case definition for surveillance:
The WHO Case definition for surveillance is as follows:
Clinical description:
An illness with acute onset characterized by several clinical forms. These are:
(a) localized form:
• cutaneous: skin lesion evolving over 1 to 6 days from a papular through a vesicular stage, to a depressed black eschar invariably accompanied by edema that may be mild to extensive
• systemic forms:
• gastro-intestinal: abdominal distress characterized by nausea, vomiting, anorexia and followed by fever
• pulmonary (inhalation): brief prodrome resembling acute viral respiratory illness, followed by rapid onset of hypoxia, dyspnea and high temperature, with X-ray evidence of mediastinal widening
• meningeal: acute onset of high fever possibly with convulsions, loss of consciousness, meningeal signs and symptoms; commonly noted in all systemic infections
Laboratory criteria for diagnosis
• isolation of *Bacillus anthracis* from a clinical specimen (e.g., blood, lesions, discharges)

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• demonstration of *B. anthracis* in a clinical specimen by microscopic examination of stained smears (vesicular fluid, blood, cerebrospinal fluid, pleural fluid, stools)
• positive serology (ELISA, Western blot, toxin detection, chromatographic assay, fluorescent antibody test (FAT)
• Note: It may not be possible to demonstrate B. anthracis in clinical specimens if the patient has been treated with antimicrobial agents.
Case classification
• Suspected: A case that is compatible with the clinical description and has an epidemiological link to confirmed or suspected animal cases or contaminated animal products.
• Probable: A suspected case that has a positive reaction to allergic skin test (in non-vaccinated individuals).
Confirmed: A suspected case that is laboratory-confirmed.

Cutaneous anthrax:
• 95% of anthrax cases (worldwide) are cutaneous.
• The incubation period for cutaneous anthrax ranges from 12 hours to 12 days.
• Cutaneous anthrax begins with pruritus at the affected site, typically followed by a small, painless papule that progresses to a vesicle in 1 to 2 days. [2]
• The lesion erodes, leaving a necrotic ulcer with a characteristic black center.
• Secondary vesicles are sometimes observed.
• Lymphadenopathy may occur, and local edema may be extensive.
• Patients may have fever, malaise, and headache.
• The most common sites of cutaneous anthrax are the hands, forearms, and head.
• Anthrax related to illicit drug injection may present as subcutaneous infection rather than overt skin lesions. [3]
• Rarely infection may involve the genital area [4] , eyelids [5-9] , lips [10] [11] or other sites.
• Cutaneous anthrax is fatal in approximately 20% of cases if left untreated.

Inhalational anthrax: [12] [13]
• Infection may progress to respiratory failure and shock within 1 to 2 days following onset of symptoms.
• The case-fatality rate exceeds 80%, even with appropriate antibiotic therapy. [14]
• Symptoms include pharyngeal pain, cough, fever and myalgia • followed by respiratory distress, cervical edema and venous engorgement suggestive of mediastintis. [15] [16]

Gastrointestinal anthrax: [17]
• Infection is characterized by pharyngeal pain, nausea, vomiting, and bloody diarrhea. [18]
• Intestinal gangrene, obstruction and perforation may ensue. [19]
• The case-fatality rate for intestinal infection ranges from 25% to 60%.
• Ulcerative lesions, usually multiple and superficial, may occur in the stomach, sometimes in association with similar lesions of the esophagus and jejunum.
• Ulcers may bleed, and in severe cases the hemorrhage may be massive and fatal.
• Ascites may be present.
• Lesions in the mid-jejunum, terminal ileum, or cecum tend to develop around a single site or a few sites of ulceration and edema, similar to cutaneous anthrax.

Oropharyngeal anthrax:
• Infection is characterized by painful neck swelling and fever.
• The other common symptoms are sore throat, dysphagia, and hoarseness, enlargement of cervical lymph nodes and soft tissue edema.
• Oral lesions are located on the tonsils, posterior pharyngeal wall, or the hard palate. [20]
• In severe cases, the tonsillar lesions extended to involve the anterior and posterior pillars of fauces, as well as the soft palate and uvula.
• Early lesions are edematous and congested.
• By the end of the first week, central necrosis and ulceration produce a whitish patch, which evolves to a pseudomembrane which covers the ulcer after an additional week.

Meningeal anthrax: [21]
• Infection is characterized by fever, malaise, meningeal signs, hyperreflexia, and delirium, stupor, or coma. [22]
• CSF analyses demonstrated hemorrhagic meningitis, with positive Gram's stains and CSF cultures.
• 75% of patients die within 24 hours of presentation; mortality rates of 100% are reported in some series. [23] [24]
• Pathologic findings include hemorrhagic meningitis, multifocal subarachnoid and intraparenchymal hemorrhages, vasculitis, and cerebral edema. [25]

Published case-fatality rates are as follows: cutaneous <1%, gastrointestinal 25% to 60%, inhalational 46% and injectional 33%. [26]

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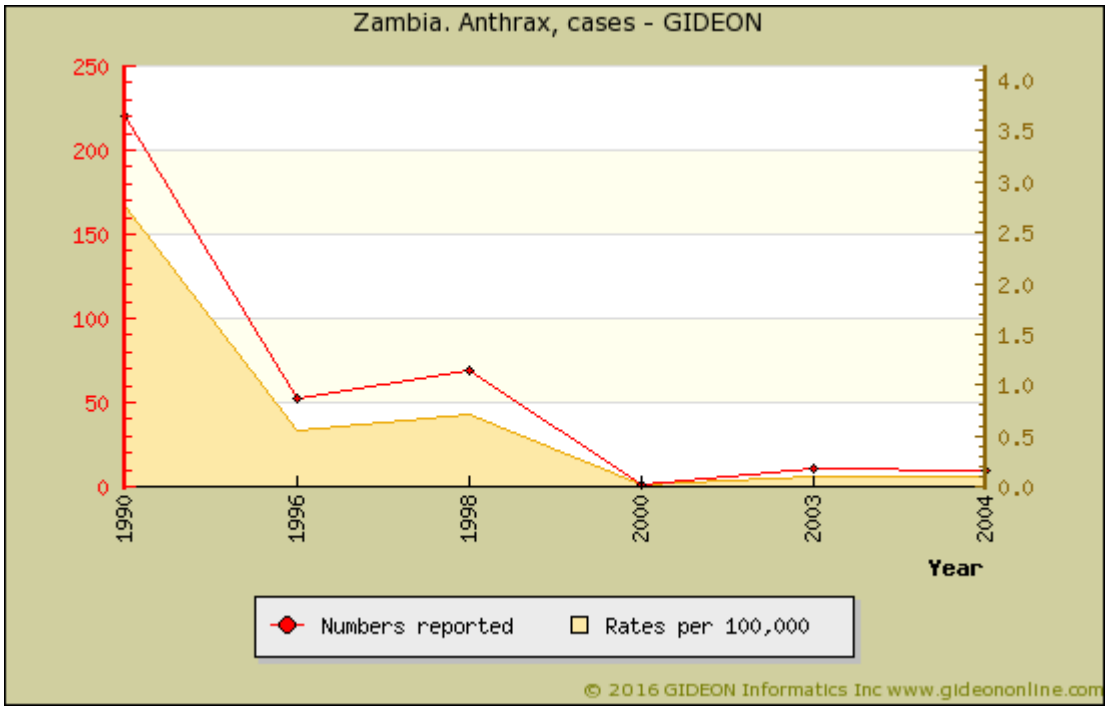
Anthrax in Zambia



Graph: Zambia. Anthrax, cases

Notes:

1. 248 cases were reported during 1991 to 1998. [27]
2. 1,790 cases (83 fatal) were reported in Western Province during 1999 to 2007. [28]
   Individual years:
   1997 - Included over 70 cases in Western Province.
   1998 - Included 3 fatal cases.

Two epizootics were reported in 1989; 20 in 1990; 25 in 1991; 2 in 1992.

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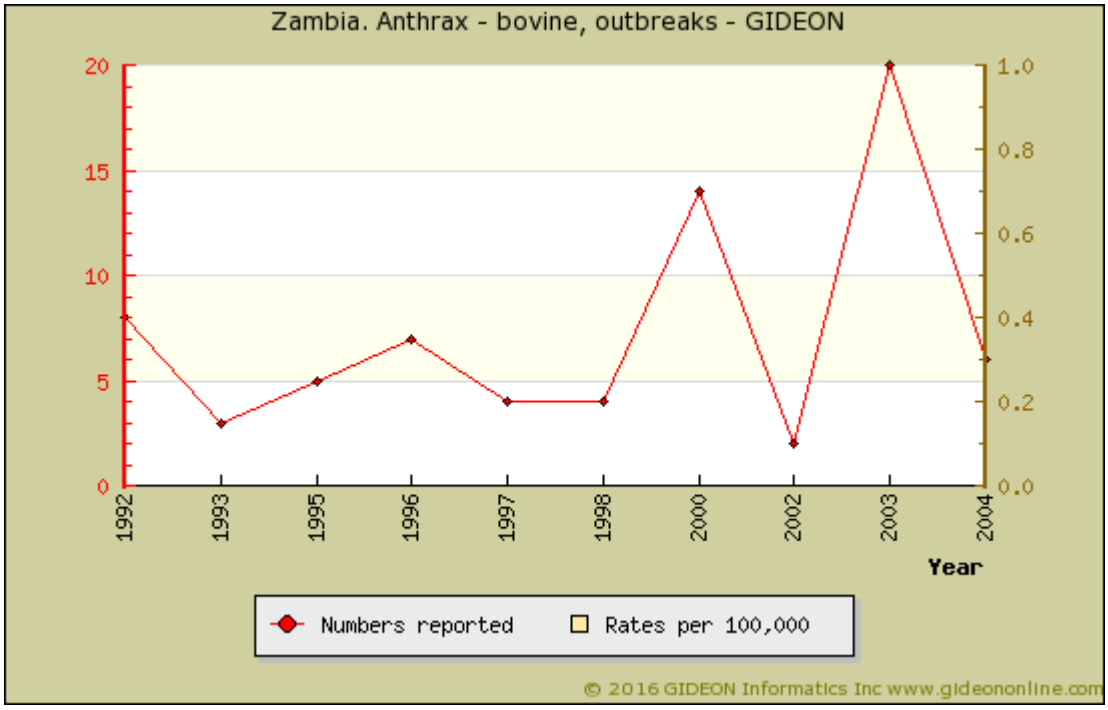
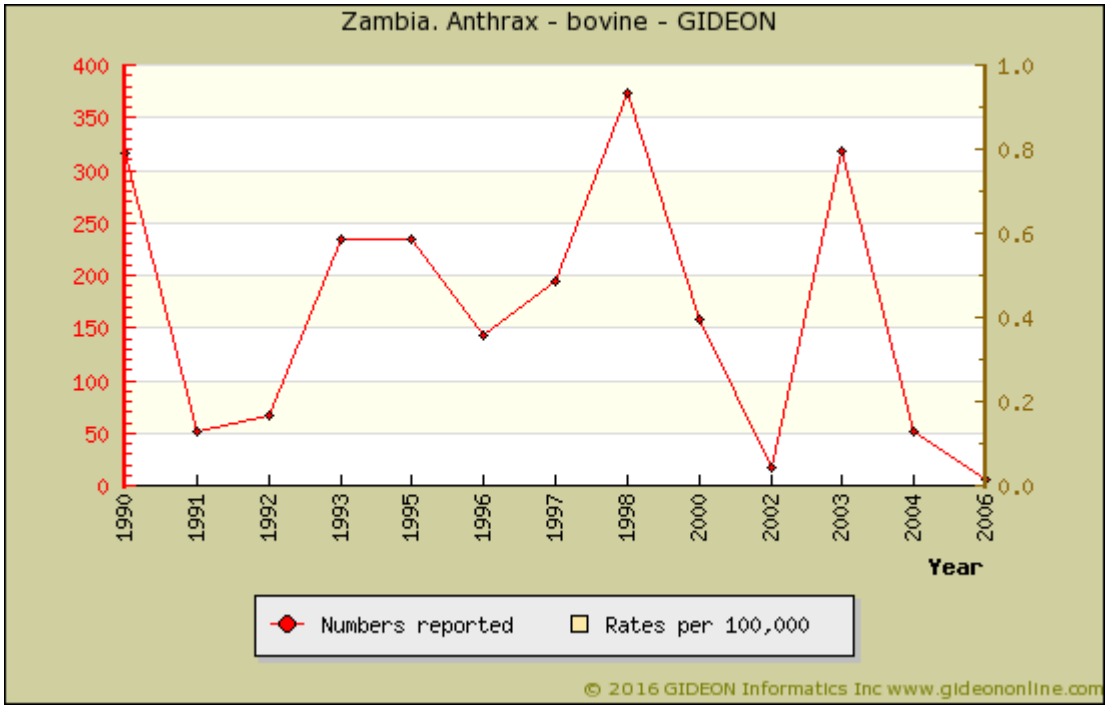


Graph: Zambia. Anthrax - bovine, outbreaks



Graph: Zambia. Anthrax - bovine

Notes:
1. 1,626 suspected cases of bovine anthrax (51 confirmed) were reported in Western Province during 1991 to 1998. [29]
2. 1,216 cases were reported in Western Province during 1999 to 2007. [30]

Notable outbreaks:

1987 - An outbreak of anthrax in the Luangwa River valley resulted in the deaths of over 4,000 animals - notably hippopotamus (*Hippopotamus amphibius*). [31] [32]

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2001 - An outbreak of anthrax in South Luangwa National Park resulted in the deaths of 120 hippopotamus (*Hippopotamus amphibius*) and 4 buffaloes (*Syncercus caffer*) [33]

2002 - An outbreak involving 20 cattle herds and five human fatalities was reported in the western region. [34]

2004 - An outbreak (22 human cases, 4 fatal) of human and bovine (20 cattle) anthrax was reported in the western region (Mwandi and Magondo area). [35]

2007 - An outbreak (6 cases) in Mongu District, Western Province was associated with ingesting contaminated beef. [36]

2008 - An outbreak of animal anthrax was reported in Eastern Province. [37]

2010 - An outbreak (3 cases) in Sesheke District was associated with infected cattle. [38]

2011 - An outbreak (278 cases, 5 fatal) of suspected anthrax in Eastern Province was associated contaminated hippopotamus meat. [39-42] Outbreaks were reported among animals in Lower Zambezi National Park and Chiawa Game Management Area. [43-45]

2013 - An outbreak (9 cases) of suspected anthrax was reported in Nakayembe, western Zambia. Three herds of cattle were also affected. [46]

2015 - An outbreak (18 cases) in Western Province was associated with ingestion of contaminated meat. [47]

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Ascariasis

Agent	PARASITE - Nematoda. Secernentea: Ascaris lumbricoides
Reservoir	Human ? Dog
Vector	None
Vehicle	Vegetables Fly
Incubation Period	10d - 14d (range 7d - >200d)
Diagnostic Tests	Stool microscopy.
Typical Adult Therapy	Albendazole 400 mg X 1 dose OR Mebendazole 100 mg BID X 3d
Typical Pediatric Therapy	Albendazole 200 mg PO single dose OR Mebendazole 100 mg BID X 3 d (> age 2).
Clinical Hints	An acute illness characterized by cough, wheezing and eosinophilia; adult worms are associated with abdominal pain (occasionally obstruction), pancreatic or biliary disease; highest rates among children and in areas of crowding and poor sanitation.
Synonyms	Ascaris, Ascaris lumbricoides, Askariasis. ICD9: 127.0 ICD10: B77

Clinical

The pulmonary manifestations of ascariasis occur during the stage of larval migration through the lungs and resemble Loffler's syndrome: cough, wheezing, pulmonary infiltration and eosinophilia. [1] [2]
• Children with heavy *Ascaris* infection experience impaired digestion and absorption of proteins, often with moderate steatorrhea.
• A mass of worms may block the lumen of the small bowel, resulting in acute intestinal obstruction, with vomiting, abdominal distention, cramps [3-6] • and occasionally hemorrhage [7] [8], gangrene or perforation. [9]
• Gastric perforation [10], Ileal volvulus and intussusception are also reported. [11]

Worms may also invade and obstruct the biliary duct (pancreatic-biliary ascariasis) [12-26], producing abdominal pain, which may be associated with ascending cholangitis, liver abscess [27] [28], acute or recurrent pancreatitis [29-33], pancreatic pseudotumor [34] or obstructive jaundice. [35-38]
• The majority of patients with hepatobiliary and pancreatic ascariasis present with biliary colic. [39]
• Choledocholithiasis, hepatolithiasis, liver abscess and cirrhosis are associated with the presence of dead, rather than viable worms. [40]
• Aberrant worms may appear at umbilical and hernial fistulas [41], Meckel's diverticula [42], the fallopian tubes, ovaries [43], lower esophagus [44], urinary bladder, peritoneal cavity [45], pleural space [46], trans-nasal [47] or trans-ostomy [48] feeding tubes, lungs, nose [49], paranasal sinuses [50] and other sites. {p 25225578

Ascaris suum has been reported to cause rare cases of myelitis, eosinophilic pneumonia and focal liver lesions in humans, and is discussed under "Toxocariasis." [51-54]

Ascariasis in Zambia

Prevalence surveys:

43.4% of schoolchildren in Chawama, Lusaka (2001) [55]
53.7% of geophageous schoolchildren in Lusaka (2001) [56]
12.0% of pre-schoolchildren in Kafue District (2007) [57]
52.7% of HIV-positive patients (2005 publication) [58]

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Aspergillosis

Agent	FUNGUS. Ascomycota, Euascomycetes, Eurotiales: Aspergillus. A hyaline hyphomycete
Reservoir	Compost Hay Cereal Soil
Vector	None
Vehicle	Air
Incubation Period	3d - 21d
Diagnostic Tests	Fungal culture. Biopsy. Nasal culture or serologic testing may be useful in select cases.
Typical Adult Therapy	Voriconazole 6 mg/kg IV Q12h, day 1; follow with 4 mg/kg IV OR Amphotericin B - if invasive, rapidly increase to max dose 0.6 mg/kg/d and to total 2.5g. OR Itraconazole
Typical Pediatric Therapy	Voriconazole 3 to 9 mg/kg IV Q12h OR Amphotericin B - if invasive, rapidly increase to max dose 0.6 mg/kg/d X 6w. OR Itraconazole
Clinical Hints	Pulmonary "fungus ball"; adult-onset asthma; consolidation or infected "pulmonary infarct" in setting of immune suppression (e.g., AIDS, leukemia, etc) leads to widespread hematogenous dissemination if not treated promptly.
Synonyms	Aspergillose, Aspergillus. ICD9: 117.3 ICD10: B44

Clinical

Clinical forms of aspergillosis include: [1] [2]
- allergy (allergic bronchopulmonary aspergillosis)
- colonization of air spaces (otomycosis, fungus ball or mycetoma of the paranasal sinuses [3] or lungs)
- non-pulmonary invasive (eye, sinuses, cardiac valve, skin, DNS, gastrointestinal tract, genitourinary tract) [4-7]
- pulmonary-invasive

Invasion of the ears and sinuses can cause extensive necrosis in immunocompromised hosts.
- The most common central nervous system manifestations include brain abscess or cerebral infarction
- Meningitis is rare
- Endophthalmitis and keratitis usually occur following injury
- Wound infections and infection of vascular access sites has also been reported. [8]
- Sporadic instances of Isolated invasive *Aspergillus* tracheobronchitis [9] and chronic necrotizing pulmonary aspergillosis are encountered. [10]

Case-fatality rates range from 10% to 90%.
- One series of 289 cases cited a mortality rate of 40.2% (2008 publication) [11]

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Bacillary angiomatosis

Agent	BACTERIUM. Bartonella henselae or Bartonella quintana. Rickettsia-like bacteria
Reservoir	Human ? Tick ? Cat
Vector	Cat flea Tick (ixodid) - rare
Vehicle	None
Incubation Period	Unknown
Diagnostic Tests	Histology with special stains. Specialized culture techniques. Serology. Nucleic acid amplification.
Typical Adult Therapy	Clarithromycin 500 mg BID X 3 months Alternatives Azithromycin 250 mg QD Ciprofloxacin 500 mg BID OR Doxycycline 100 mg BID Erythromycin 500 mg po QID
Typical Pediatric Therapy	Clarithromycin 7.5 mg/kg PO BID X 8 months. OR Gentamicin 2 mg/kg IMq12h
Clinical Hints	Hemangiomatous papules and nodules of skin, spleen, liver (peliosis hepatis), bone or other tissues; virtually all in the setting of AIDS or other immune deficiency; rare instances following tick bite in immune-competent individuals.
Synonyms	Bacillary peliosis, Peliosis hepatis. ICD9: 757.32,083.8 ICD10: K76.4,A44.0

Clinical

Bacillary angiomatosis was originally described as involving skin and regional lymph nodes of HIV-infected persons. [1]
• Subsequent infections have involved patients with other forms of immune suppression, and presented in a variety of organs including liver, spleen, bone, brain, lung, bowel, and uterine cervix.

Cutaneous lesions often arise in crops and resemble the lesions of verruga peruana.
• Lesions may present as fixed or mobile subcutaneous or dermal nodules.
• Single or multiple dome-shaped, skin-colored, red or purple papules are also described, which may ulcerate and discharge serosanguinous fluid. [2] [3]
• Lesions can range in diameter from millimeters to centimeters, and may mimic pyogenic granuloma [4] or Kaposi sarcoma. [5]
• Regional lymph nodes are frequently enlarged in a variety of distributions.
• Involved organs contain multiple blood-filled cystic structures that range from microscopic to several millimeters in size.
• Bone disease may present as multiple osteolytic lesions.

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Bacillus cereus food poisoning

Agent	BACTERIUM. Bacillus cereus (toxin). An aerobic gram-positive bacillus
Reservoir	Soil Processed & dried foods
Vector	None
Vehicle	Food
Incubation Period	2h - 9h (range 1h - 24h)
Diagnostic Tests	No practical test available. Isolation of organism from suspect food.
Typical Adult Therapy	Supportive
Typical Pediatric Therapy	As for adult
Clinical Hints	Usually follows ingestion of rice or other vegetables; vomiting within 1 to 6 hours and/or diarrhea within 6 to 24 hours; no fecal leucocytes.
Synonyms	Bacillus cytotoxicus. ICD9: 005.89 ICD10: A05.4

Clinical

Two types of illness are caused by two distinct metabolites. [1]
• Diarrhea is caused by a large molecular weight protein.
• Vomiting is caused by a low molecular weight, heat-stable peptide. [2]

Symptoms of *B. cereus* diarrheal food poisoning mimic those of *Clostridium perfringens* food poisoning.
• Symptoms of the emetic form mimic *S. aureus* food poisoning. [3]

Diarrheal form:

The onset of watery diarrhea, abdominal cramps, and pain occurs 6 to 15 hours after consumption of contaminated food. [4]
• Nausea may accompany diarrhea, but vomiting (emesis) rarely occurs.
• Symptoms persist for 24 hours in most instances.

Emetic form:

The emetic type of food poisoning is characterized by nausea and vomiting within 0.5 to 6 h after consumption of contaminated foods.
• Occasionally, abdominal cramps and/or diarrhea may also occur.
• Duration of symptoms is generally less than 24 h.

Only two fatal cases had been reported to 2005. [5] [6] Illness was characterized by rhabdomyolysis and renal failure.
• A case of encephalopathy and hepatic failure • similar to Reye's syndrome • was related to *Bacillus cereus* food poisoning. [7]

• A case report of fatal *Bacillus cereus* food poisoning was published from Belgium in 2011. [8]

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Bacterial vaginosis

Agent	BACTERIUM. Gardnerella vaginalis (facultative gram-negative bacillus), Mobiluncus curtisii, Mobiluncus mulieris, Prevotella, et al
Reservoir	Human
Vector	None
Vehicle	Sexual contact - normal flora in 14% (girls) to 70% (women)
Incubation Period	Unknown
Diagnostic Tests	Identification of "clue cells" or positive KOH test in vaginal discharge. Culture.
Typical Adult Therapy	Metronidazole 500 mg BID X 7d OR Tinidazole 2 g PO daily X 3d OR Clindamycin 300 mg BID X 7d + intravaginal Clindamycin or Metronidazole ? Also treat sexual partner
Typical Pediatric Therapy	Metronidazole 7.5 mg/kg BID X 7d
Clinical Hints	Thin vaginal discharge - "fishy" odor when mixed with KOH; mild to moderate pruritus; occasionally urethritis in sexual partner.
Synonyms	Gardnerella, Gardnerella vaginalis, Mobiluncus. ICD9: 041.89,616,10,099.8 ICD10: N76.1

Clinical

The diagnosis of bacterial vaginosis required three of the following: [1-3]
1. A white, noninflammatory vaginal discharge or coating
2. The presence of clue cells [4]
3. A vaginal pH above 4.5
4. A fishy odor following addition of 10% KOH to the vaginal discharge (presumably due to liberated trimethylamine).

Note that routine culture is unnecessary.

Associated conditions:
Sequelae of bacterial vaginosis include preterm birth [5-8] and neonatal distress [9], low birth weight [10], chorioamnionitis, cervicitis [11], scalp abscess of the newborn, an increased risk of late miscarriage [12] [13] and maternal infection. [14]
- Some studies have suggested a correlation between bacterial vaginosis and infertility. [15-21]
- Bacterial vaginosis may increase the risk for acquisition of HIV infection.
- Bacterial vaginosis may predispose to urinary tract infection [22] and endometritis. [23]

Gardnerella vaginalis has rarely been associated with balanitis, urethritis, urinary tract infections, asymptomatic bacteremia and infectious endocarditis in adult males. [24]

Cases of osteomyelitis, discitis and septic arthritis due to *Gardnerella vaginalis* have been reported. [25-28]

Bacterial vaginosis in Zambia

Prevalence surveys:
47.8% of HIV-infected pregnant women in Blantyre and Lilongwe (Malawi), Dar es Salaam (Tanzania) and Lusaka (Zambia) (2008 publication) [29]
35% of HIV-negative women in Malawi, South Africa, United States, Zambia, and Zimbabwe (2014 publication) [30]
63.3% of HIV-positive women in Lusaka (2015 publication) [31]

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Balantidiasis

Agent	PARASITE - Protozoa. Ciliate (Ciliophora), Litostomatea: Balantidium coli
Reservoir	Pig Non-human primate Rodent
Vector	None
Vehicle	Water Food
Incubation Period	1d - 7d (range 1d - 60d)
Diagnostic Tests	Microscopy of stool or colonic aspirates.
Typical Adult Therapy	Tetracycline 500 mg QID X 10d. OR Metronidazole 750 mg TID X 5d. OR Iodoquinol 650 mg TID X 20d
Typical Pediatric Therapy	Age >= 8 years: Tetracycline 10 mg/kg QID (max 2g/d) X 10d. Age <8 yrs, Metronidazole 15 mg/kg TID X 5d; or Iodoquinol 13 mg/kg TID X 20d
Clinical Hints	Dysentery, often with vomiting; mimics intestinal amebiasis. The disease is most common in pig-raising areas. Symptoms last for one to four weeks, and may recur.
Synonyms	Balantidiose, Balantidiosis, Balantidium coli, Balantidosis, Balindosis, Ciliary dysentery. ICD9: 007.0 ICD10: A07.0

Clinical

Most cases are asymptomatic.

• Clinical manifestations, when present, include persistent diarrhea, occasionally dysentery [1] , abdominal pain, and weight loss. [2]

Symptoms can be severe in debilitated individuals.

• *Balantidium* pneumonia has been reported in immune-compromised patients [3] and persons with occupational exposure. [4]

Diagnosis is based on detection of trophozoites in stool specimens or in tissue collected during endoscopy.

• Cysts are less frequently encountered.

• *Balantidium coli* is passed intermittently and once outside the colon is rapidly destroyed. Thus stool specimens should be collected repeatedly, and immediately examined or preserved.

• Cases of pulmonary infection [5] and osteomyelitis have been reported. [6]

• In rare cases, *Balantidium coli* has been identified in the urine. [7-10]

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Bartonellosis - cat borne

Agent	BACTERIUM. Afipia felis, Bartonella henselae, Bartonella clarridgeiae, Bartonella grahamii, et al. A facultative gram-negative coccobacillus
Reservoir	Cat Possibly tick
Vector	Flea (cat flea = Ctenocephalides)
Vehicle	Cat scratch Plant matter (thorn, etc)
Incubation Period	3d - 14d
Diagnostic Tests	Visualization of organisms on Warthin Starry stain. Culture. Serology. Nucleic acid amplification.
Typical Adult Therapy	Aspiration of nodes as necessary. Azithromycin 500 mg day 1, then 250 daily X 4 days Alternatives: Clarithromycin, Ciprofloxacin, Sulfamethoxazole/trimethoprim
Typical Pediatric Therapy	Aspiration of nodes as necessary. Azithromycin 10 mg/kg day 1, then 5 mg/kg daily X 4 days
Clinical Hints	Tender suppurative regional adenopathy following cat scratch (usually kitten); fever present in 25%. systemic infection (liver, brain, endocardium, bone, etc) occasionally encountered; most cases resolve within 6 weeks.
Synonyms	Afipia felis, Bartonella clarridgeiae, Bartonella grahamii, Bartonella henselae, Bartonella koehlerae, Cat scratch disease, Debre's syndrome, Foshay-Mollaret cat-scratch fever, Katszenkratz-Krankheit, Petzetakis' syndrome, SENLAT. ICD9: 078.3 ICD10: A28.1

Clinical

Clinical history:.
Approximately 90% of patients have a history of exposure to a cat.
• The disease has also been reported after exposure to squirrels, dogs, goats, thorns and barbed wire. [1]
• 75% of patients report a bite or scratch to the head, neck or upper limbs.
• Subclinical bacteremia is common among immuno-competent persons with animal and arthropod contact.

Symptoms:
Following an incubation period of 3 to 10 days, a small skin lesion appears consisting of a macule, papule, pustule or vesicle.
• Within 1 to 2 weeks, edema and tenderness of the regional lymph nodes appear.
• In some cases, the patient may present with Parinaud oculoglandular syndrome (conjunctival granuloma with suppurative preauricular adenitis), encephalopathy, erythema nodosum, thrombocytopenic purpura, arthritis, synovitis or pneumonia.

Signs:
Physical examination reveals involvement of a single node in 50% of cases.
• 30% have involvement of multiple sites, and 20% involvement of several nodes in the same region.
• Lymph nodes typically measure 1 to 5 cm.
• The majority of lesions regress over 2 to 6 months, but may last for as long as 2 years.
• Suppuration occurs in 10% of cases, and cellulitis is rare.
• Inguinal lymphadenopathy in cat-scratch disease may suggest a diagnosis of lymphogranuloma venereum. [2]

Additional findings:
One third of patients manifest fever, lasting 1 to 7 days; and some cases may present as Fever of Unknown Origin. [3]
• Malaise, fatigue, anorexia, vomiting, weight loss, headache, splenomegaly and pharyngitis are occasionally observed.
• 10.5% of patients have musculoskeletal manifestations [4], including osteitis [5] and osteomyelitis [6-10]
• Rare features include a transient truncal maculopapular rash, encephalopathy [11] or encephalitis [12] with seizures [13], lethargy, coma, parotitis [14], pleuritis [15], cranial or peripheral nerve involvement, facial nerve paresis, myelitis [16] [17], uveitis or neuroretinitis [18-32], optic neuritis [33] with transient blindness, macular hole [34], vitreal hemorrhage [35], retinal

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artery occlusion [36], polyneuritis, radiculitis, Guillain-Barre syndrome [37] [38], disseminated visceral infection [39] [40], osteomyelitis [41-44], endocarditis of native or prosthetic valves [45-51] or vascular prostheses [52], hepatosplenomegaly with hepatic granulomata [53] [54], autoimmune thyroiditis [55], splenic abscess [56-58], renal microabscesses [59], erythema marginatum, erythema multiforme, erythema nodosum [60] and thrombocytopenic purpura. [61]

• Scalp eschar with neck lymphadenopathy (SENLAT) has been reported in some cases [62], and could be confused with tularemia or infection by *Rickettsia slovaca* or *Rickettsia raoultii*. [63]

• *B. henselae* accounts for 6.1% of bacterial species causing uveitis (2001 to 2007) [64]

29 cases of *Bartonella henselae* infection of solid-organ transplant recipients were reported to 2011 • many with disseminated disease. [65]

In one case, *Bartonella koehlerae* infection was associated with depression, anxiety, mood swings, severe headaches, muscle spasms, interphalangeal joint stiffness, decreased peripheral vision, diminished tactile sensation and hallucinations. [66]

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Bartonellosis - other systemic

Agent	BACTERIUM. Bartonella quintana, B. koehlerae, B. elizabethae, B. tamiae, B. washoensis, etc A fastidious gram-negative coccobacillus
Reservoir	Human Louse Rat Cat Dog Sheep
Vector	Louse (Pediculus) Flea - rare (Ctenocephalides, Pulex) Mite - rare (Dermanyssus)
Vehicle	Wound or eye contact with secretions/louse feces Contact
Incubation Period	9d - 25d (range 4d - 35d)
Diagnostic Tests	Serology. Culture. Nucleic acid amplification.
Typical Adult Therapy	Doxycycline 100 mg PO BID X 3 to 5 days (if endocarditis, add Gentamicin 3 mg/kg daily X 28 days) Alternatives: Clarithromycin, Azithromycin, Gentamicin, Fluoroquinolone (Levofloxacin, Trovafloxacin, Pefloxacin, Sparfloxacin or Moxifloxacin)
Typical Pediatric Therapy	Erythromycin 10 mg/kg PO QID X 3 to 5 days. OR Gentamicin 2 mg/kg IM q12h. Alternatives: Clarithromycin, Azithromycin
Clinical Hints	Headache, myalgias, shin pain, macular rash, splenomegaly; endocarditis & bacteremia seen; relapse common; often associated with poor hygiene & crowding.
Synonyms	Bartonella alsatica, Bartonella bovis, Bartonella capreoli, Bartonella doshiae, Bartonella elizabethae, Bartonella quintana, Bartonella rochalimae, Bartonella schoenbuchensis, Bartonella tamiae, Bartonella tribocorum, Bartonella vinsonii, Bartonella vinsonii berkhoffii, Bartonella volans, Bartonella washoensis, Candidatus Bartonella mayotimonensis, Candidatus Bartonella melophagi, Candidatus Bartonella merieuxii, Candidatus Bartonella rochalimae, Five day fever, His-Werner disease, Meuse fever, Quintan fever, Quintana fever, Shank fever, Shin fever, Shinbone fever, Trench fever, Volhynian fever. ICD9: 083.1 ICD10: A44.0,A44.8,A79.0

Clinical

Infection is characterized by abrupt onset of headache, postorbital pain, conjunctivitis, leg and back pain, relapsing fevers, splenomegaly and an erythematous maculopapular rash on the chest, back and abdomen. [1]
• In 50% of cases, as many as 3 to 8 relapses occur.

Subclinical bacteremia is common among immuno-competent persons with animal and arthropod contact.

No fatalities have been reported in classic trench fever.

Bartonella quintana (formerly *Rochalimaea quintana*) and related bacteria may also produce bacillary angiomatosis (discussed separately in this module), bacteremia, endocarditis [2-6], aortitis [7], myocarditis [8], meningoencephalitis [9], glomerulonephritis [10], uveitis [11] [12], neuroretinitis [13] or chronic lymphadenopathy.
• *Bartonella* species other than *B. henselae* account for 8.1% of bacterial uveitis (France, 2008 publication) [14]
• A single reported case of *Bartonella rochalimae* infection was characterized by fever, myalgia, headache and splenomegaly. [15]
• *Bartonella vinsonii* subsp *berkhoffii* genotype has been implicated in a case of epithelioid hemangioendothelioma. [16]

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Bertiella and Inermicapsifer

Agent	PARASITE - Platyhelminthes, Cestoda. Cyclophyllidea, Anoplocephalidae: Bertiella spp. and Inermicapsifer spp.
Reservoir	Rodent Non-human primate
Vector	None
Vehicle	Mite (ingestion)
Incubation Period	Unknown
Diagnostic Tests	Identification of ova or proglottids in stool.
Typical Adult Therapy	Not established
Typical Pediatric Therapy	As for adult
Clinical Hints	Abdominal pain, vomiting, diarrhea or constipation following contact with primates.
Synonyms	Bertiella, Bertiella, Bertiella mucronata, Bertiella studeri, Bertielliasis, Inermicapsifer. ICD9: 123.8 ICD10: B71.8

Clinical

The few cases reported have ranged from asymptomatic infection to moderate abdominal pain, vomiting and diarrhea. [1]

- Symptoms may be intermittent or continuous. [2]
- Adult tapeworms are know to live for at least two years.
- Diagnosis is based on finding worms, worm segments or ova in stool.

Bertiella and Inermicapsifer in Zambia

Inermicapsifer madagascariensis has been reported to cause intestinal infection in Zambia. [3]

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Blastocystis hominis infection

Agent	PARASITE - Protozoa. Chromista, Bigyra, Blastocystea: Blastocystis hominis. (taxonomic status remains uncertain)
Reservoir	Human
Vector	None
Vehicle	Fecal-oral Water
Incubation Period	Unknown
Diagnostic Tests	Stool microscopy. Nucleic acid amplification.
Typical Adult Therapy	Nitazoxanide 500 mg BID X 3 d. OR Metronidazole 750 mg TID X 10d. OR Iodoquinol 650 mg TID X 20 d. OR Sulfamethoxazole/trimethoprim
Typical Pediatric Therapy	Nitazoxanide - Age 1 to 3 years: 5 ml (100 mg) PO Q12h X 3 days - Age 4 to 11 years: 10 mg (200 mg) PO Q12h X 3 days; OR Metronidazole 15 mg/kg/d X 10d. Sulfamethoxazole/trimethoprim
Clinical Hints	Diarrhea and flatulence; usually no fever; illness similar to giardiasis; increased risk among immune-suppressed patients; the exact role of this organism in disease is controversial.
Synonyms	Apoi, Blastocystiose, Blastocystis hominis, Zierdt-Garavelli disease. ICD9: 007.8 ICD10: A07.8

Clinical

Symptoms ascribed to blastocystosis include leucocyte-negative diarrhea, nausea, pain [1], flatulence and abdominal distention. [2] [3]

- Some reports suggest an association between urticaria and *Blastocystis* infection. [4-12]
- Symptoms usually last for 3 to 10 days, but may persist for weeks or months.
- *Blastocystis hominis* has also been implicated in the etiology of irritable bowel syndrome [13] [14], and may contribute to the development of anemia among infected pregnant women. [15]
- A case of presumed *Blastocystis* appendicitis with peritonitis has been reported. [16]

A search for alternative etiologies (including other infectious agents) should always be made in such patients. [17] [18]

Blastocystis hominis infection in Zambia

Prevalence surveys:

53.8% of schoolchildren in Southern Province (2005 publication) [19]

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Blastomycosis

Agent	FUNGUS. Ascomycota, Euascomycetes, Onygenales. Blastomyces dermatitidis. A dimorphic fungus
Reservoir	Soil Beaver Dog Rodent
Vector	None
Vehicle	Air
Incubation Period	14d - 44d (range 7d - 100d)
Diagnostic Tests	Microscopy and culture. Skin tests and serology not useful. Nucleic acid amplification.
Typical Adult Therapy	Itraconazole 200 to 400 mg PO daily X 6 months. OR Ketoconazole 400 mg/d X 6 months. OR Amphotericin B - total dose 2.0g. Excision as required
Typical Pediatric Therapy	Ketoconazole (if age >2) 5 mg/kg/d X 6 months. OR Amphotericin B - total cumulative dose 30 mg/kg
Clinical Hints	Acute or chronic lung infection, often complicated by hematogenous involvement of skin (verrucous or ulcerated skin/subcutaneous lesions), osteomyelitis of vertebrae or long bones, meningitis, prostatitis, etc.
Synonyms	Blastomyces dermatitidis, Blastomyces gilchristii, Blastomykose, Chicago disease, Gilchrist's disease, North Amercian blastomycosis. ICD9: 116.0 ICD10: B40

Clinical

Blastomycosis typically presents as a flu-like illness and is often diagnosed as a pneumonia.
• Symptoms include sudden onset of fever, cough, chest pain, weight loss, hemoptysis, shortness of breath and fatigue. [1]
• Hematogenous, lymphatic, or macrophage-borne dissemination occur.
• Pulmonary involvement occurs in approximately 60%, and is manifest as airspace consolidation, focal masses, intermediate-sized nodules, interstitial disease, miliary disease, or cavitary lesions. [2] [3]
• Cavities favor the upper lobes.
• 35% have involvement of both lung and skin; and 19% have infection of skin only.

Dissemination may involve the genitourinary tract, skin, liver, CNS [4] [5], spleen [6], bone, lymph nodes, heart, adrenals [7-11], GI tract, peritoneum [12] [13], head and neck (larynx, oral cavity, nasal cavity, sinuses, orbit, calvarium) [14] [15], skeletal muscles [16] [17] and pancreas.
• Central nervous system infection may present as epidural abscess [18], intracranial mass lesions [19-21] or meningitis. [22]
• A case of hypopituitarism associated with blastomycosis has been reported. [23]

Mortality rates are highest among elderly persons, men, Native Americans, Blacks and younger persons of Asian origin (United States, 1990 to 2010) [24]

In chronic cutaneous blastomycosis the initial skin lesion presents as one or more verrucous or pustular nodules which eventually ulcerate. [25] [26]
• Lesions are most common on exposed skin such as the face [27], hands, wrists, and lower legs.
• If untreated, elevated granulomatous lesions with advancing borders develop.
• Skeletal involvement has been reported in 33% of patients • therefore, an extensive radiographic examination is recommended for all patients with blastomycosis.
• The lesions of cutaneous blastomycosis may be mistaken for pyoderma gangrenosum. [28] [29]

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Blastomycosis in Zambia

Three cases of blastomycosis had been reported in Zambia as of 1988. [30-32]

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Borna virus encephalitis

Agent	VIRUS - RNA Mononegavirales Bornavirus
Reservoir	Squirrel Horse Sheep
Vector	None
Vehicle	Unknown
Incubation Period	Unknown
Diagnostic Tests	Metagenomic analysis of brain tissue and cerebrospinal fluid Culture on specialized cell lines Serology
Typical Adult Therapy	Supportive
Typical Pediatric Therapy	As for adult
Clinical Hints	Borna virus infection is generally subclinical and may be manifested in some cases by mood disorders or possibly schizophrenia. Overt and fatal encephalitis reported, with fever, gait disturbance and ocular palsy. May follow animal contact.
Synonyms	Borna disease, Heated head disease, Sad horse disease, Staggering disease of cats, Variegated squirrel 1 bornavirus, VSBV-1. ICD9: 323.9 ICD10: A83.9

Clinical

Human infection by Borna virus is generally subclinical, and has been implicated in the etiology of mood disorders, depression and schizophrenia.

A possible role for Borna virus in human psychiatric disorders was first proposed in 1985. [1]
• Subsequent seroprevalence studies have suggested a correlation between Borna virus disease and psychiatric disorders (neurosis, personality adjustment and mood-disorders and schizophrenia) [2-36] and chronic fatigue syndrome. [37-45]

Only three cases of overt encephalitis had been reported as of 2015, in Germany.
• All three had been engaged in breeding squirrels.
• Following a prodrome of 2 weeks or longer, the patients developed fever, fatigue, weakness and gait disturbances.
• Increasing confusion and psychomotor impairment were followed by ocular paralysis, progressing to death. [46]
• The patients died between two and four months following onset of symptoms. [47]

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Botulism

Agent	BACTERIUM. Clostridium botulinum. An anaerobic gram-positive bacillus
Reservoir	Soil Animal Fish
Vector	None
Vehicle	Food Occasionally soil (wound contamination)
Incubation Period	1d - 2d
Diagnostic Tests	Electrophysiologic (EMG) pattern. Isolation of organism from food (occ. from infant stomach). Mouse toxin assay
Typical Adult Therapy	Heptavalent (types A-G) or trivalent (types A, B, E) antitoxin (following test dose) 10 ml in 100 ml saline over 30 min Additional 10 ml at 2 and 4 hours if necessary. Respiratory support
Typical Pediatric Therapy	As for adult
Vaccine	Botulism antitoxin
Clinical Hints	Clinical manifestations similar to those of atropine poisoning: dysarthria, diplopia, dilated pupils, dry mouth, constipation, flaccid paralysis, etc); onset approximately 36 hrs after ingestion of poorly-preserved food.
Synonyms	Botulisme, Botulismo, Botulismus, Kerner's disease. ICD9: 005.1 ICD10: A05.1

Clinical

For reporting purposes, the CDC (The United States Centers for Disease Control) case definitions for Foodborne, Infant and Wound Botulism are as follows:
• 1) Neurological syndrome (diplopia, blurred vision, bulbar weakness, symmetric paralysis); or
• 2) Infant exhibiting constipation, poor feeding and failure to thrive, followed by progressive weakness, impaired respiration and death. [1]

Food-borne botulism:

Symptoms and signs of botulism reflect characteristic electrophysiological abnormalities [2] and include diplopia [3] [4], blurred vision, ptosis, slurred speech, difficulty swallowing, dry mouth [5], and muscle weakness.
• In food-borne botulism, symptoms generally begin 18 to 36 hours after ingestion (range 6 hours to 10 days). [6]
• Type F botulism is characterized by the appearance of respiratory failure within 24 hours, quadriplegia by the fifth day and rapid recovery beginning on the eighth day. [7] [8]
• A case of asymmetric cranial nerve demyelination due to type F botulism has been reported. [9]
• If untreated, these symptoms progress to paralysis of the arms, legs, trunk and respiratory muscles.
• Patients who experience nausea and vomiting, cranial neuropathy or urinary retention are most likely to develop respiratory failure. [10]
• Botulinum toxin may persist in the serum of patients for as long as 12 days. [11]

Infant botulism:

Infant botulism should be suspected if a previously healthy infant (age <12 months) develops constipation and weakness in sucking, swallowing, or crying; hypotonia; and progressive bulbar and extremity muscle weakness. [12]
• Infants are lethargic, "floppy," constipated and feed poorly• exhibiting a weak cry and poor muscle tone. [13] [14]
• Approximately 50% of patients require mechanical ventilation.
• Lumbar puncture and brain imaging studies are usually normal, in contrast to other causes of flaccid weakness.
• The findings of infant botulism may mimic those of Hirschprung's disease [15] or acute abdomen. [16]

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Brain abscess

Agent	BACTERIUM OR FUNGUS. Mixed oral anaerobes / streptococci, Staphylococcus aureus (from endocarditis), etc.
Reservoir	Human
Vector	None
Vehicle	None
Incubation Period	Variable
Diagnostic Tests	Imaging techniques (CT, scan, etc).
Typical Adult Therapy	Antibiotic(s) appropriate to likely pathogens + drainage Typical empiric therapy: Intravenous Ceftriaxone 2 gm + Metronidazole 15 mg/kg, Q12h
Typical Pediatric Therapy	Typical empiric therapy: Intravenous Ceftriaxone 50 mg/kg + Metronidazole 15 mg/kg IV, Q12h
Clinical Hints	Headache, vomiting and focal neurological signs; often associated with chronic sinusitis or otitis media, pleural or heart valve infection; patients are often afebrile.
Synonyms	Ascesso cerebrale, Cerebral abscess. ICD9: 324.0 ICD10: G06.0

Clinical

The clinical presentation of brain abscess may range from indolent to fulminant. [1]
• Most manifestations are due to the size and location of this space-occupying lesion within the brain and the virulence of the infecting microorganism, and not to infection per se.
• Headache is observed in approximately 70% of patients and may be moderate to severe and unilateral or generalized.
• Sudden worsening of the headache, accompanied by meningismus, may herald rupture of the abscess into the ventricular space.
• Less than 50% of patients present with a classic triad of fever, headache, and focal neurological deficit.
• Mental status changes are seen in 70% of cases, fever in 45 to 50%, seizures in 25 to 35%, vomiting in 25 to 50%, nuchal rigidity in 25% and papilledema in 25%.

Metastatic infections are most often associated with endocarditis, and may present with multiple abscesses.
• Although the distribution of the middle cerebral artery is most often involved, any part of the brain may be infected.
• Common pathogens in this setting reflect the usual flora of endocarditis and bacteremia.

Etiological associations:
• Congenital heart disease: viridans streptococci, *Haemophilus* spp.
• Endocarditis: *Staphylococcus aureus*, streptococci
• Immunodeficiency: Toxoplasmosis, *Nocardia*, fungi
• Otitis: Peptostreptococci, streptococci, Enterobacteriaceae
• Pleuropulmonary infection: anaerobes, *Nocardia*
• Sinusitis: Streptococci, Enterobacteriaceae, *Bacteroides*, *Haemophilus influenzae*
• Traumatic or post-surgical: *Staphylococcus aureus*, streptococci, Enterobacteriaceae

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Brucellosis

Agent	BACTERIUM. Brucella abortus, Brucella melitensis, Brucella suis, Brucella canis An aerobic gram-negative bacillus
Reservoir	Pig Cattle Sheep Goat Dog Coyote Caribou
Vector	None
Vehicle	Food Air Dairy products Animal excretions Breastfeeding
Incubation Period	10d - 14d (range 5d - 60d)
Diagnostic Tests	Culture of blood or bone marrow. Serology. Note: Alert laboratory to possibility of Brucella.
Typical Adult Therapy	Doxycycline 100 mg BID + Rifampin 600 mg BID X 6 weeks. Alternatives Tetracycline + Gentamicin
Typical Pediatric Therapy	Rifampin 20 mg/kg/day (maximum 600 mg) plus: >age 8 years: Doxycycline 2 mg/kg BID PO X 6w age < 8 years Sulfamethoxazole/trimethoprim 4/20 mg/kg BID X 4 to 6w Add Gentamicin if severe
Clinical Hints	Prolonged fever, hepatosplenomegaly, lymphadenopathy, arthritis, osteomyelitis or chronic multisystem infection following ingestion of unpasteurized dairy products, contact with farm animals or meat processing.
Synonyms	Bang's disease, Bangsche Krankheit, Brucella, Brucellemia, Brucelliasis, Brucellose, Brucellosen, Brucellosi, Brucelose, Brucelosis, Cyprus fever, Febris melitensis, Febris sudoralis, Febris undulans, Fievre caprine, Gibraltar fever, Goat fever, Malta fever, Maltafieber, Melitococcosis, Neapolitan fever, Rock fever, Typhomalarial fever, Undulant fever. ICD9: 023 ICD10: A23

Clinical

For surveillance purposes the CDC (The United States Centers for Disease Control) case definition of brucellosis consists of "an illness characterized by acute or insidious onset of ever, night sweats, undue fatigue, weight loss, headache and arthralgia" associated with epidemiological or laboratory evidence for infection.

WHO Case definition for surveillance:

The WHO Case definition for surveillance is as follows:
Clinical description
• An illness characterized by acute or insidious onset, with continued, intermittent or irregular fever of variable duration, profuse sweating particularly at night, fatigue, anorexia, weight loss, headache, arthralgia and generalized aching. Local infection of various organs may occur
Laboratory criteria for diagnosis
• Isolation of *Brucella* spp. From clinical specimen or
• *Brucella* agglutination titer (e.g., standard tube agglutination tests: SAT>160) in one or more serum specimens obtained after onset of symptoms or
• ELISA (IgA, IgG, IgM), 2-mercaptoethanol test, complement fixation test, Coombs, fluorescent antibody test (FAT), and radioimmunoassay for detecting antilipopolysaccharide antibodies; and counterimmunoelectrophoresis (CIEP)
Case classification
• Suspected: A case that is compatible with the clinical description and is epidemiologically linked to suspected or confirmed animal cases or contaminated animal products.
• Probable: A suspected case that has a positive Rose Bengal test.
• Confirmed: A suspected or probable case that is laboratory-confirmed.

Clinical manifestations: [1]

The clinical picture of brucellosis is nonspecific, and most often consists of fever, sweats, malaise, anorexia, headache, depression and back pain. [2] [3] Asymptomatic infection has been reported. [4]
• The fever of brucellosis may mimic that of enteric fever [5] ; and an undulant fever pattern is seen in chronic infections.
• Fever may be absent among patients with end-stage renal disease who acquire brucellosis. [6]
• Mild lymphadenopathy is seen in 10 to 20% of patients; and splenomegaly or hepatomegaly in 20 to 30%. Hepatosplenic

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abscesses are visualized through imaging in 1.2% of cases [7], and rare instances of splenic rupture have been reported. [8]
• Bone and joint infections are common [9-13], including a high rate of vertebral osteomyelitis. [14-19] Rare instances of acute or sternotomy infection [20], granulomatous myositis [21], bursitis [22] and soft tissue or muscular abscesses have also been reported. [23-26] Most cases of brucellar monoarthritis represent reactive rather than septic disease. [27] [28] Infection of natural [29] or prosthetic joints [30] [31] and soft tissue has been reported. [32] Subclinical salcroiliitis is common. [33]
• Vertebral osteomyelitis is characterized by osteolysis, often associated with paravertebral masses, spondylodiscitis [34] [35], epidural abscess [36-38], or psoas abscesses. [39-41] Although spondylodiscitis is also encountered in tuberculosis, the latter is more likely than brucellosis to produce prevertebral, paravertebral, epidural, and psoas abscesses, with calcification and loss of vertebral body height. [42]
• Epididymoorchitis is found in 7.6% to 12.7% of male patients with brucellosis. [43-51] Brucellar orchitis may be mistaken for testicular tumor. [52] Prostatitis has also been reported. [53] [54]
• Endocarditis is well documented [55-64], including isolated case reports of *Brucella* infection of prosthetic valves [65-67] and devices such as implantable defibrillators [68] and pacemaker leads. [69] Rare instances of aortitis [70-73], venous [74] [75] or arterial thrombosis [76], myocarditis [77] and pericarditis are also reported. [78-82]
• Pulmonary infiltrates [83-87], pleural effusion [88], ileitis [89], chest wall infection [90], cholestatic jaundice [91], acalculous cholecystitis [92], pancreatitis [93] [94], acute gastroenteritis [95], spontaneous bacterial peritonitis [96] or peritonitis associated with dialysis [97], and abscesses of the liver [98-100], kidneys [101] and spleen have been reported. [102-105]
• Ocular manifestations include uveitis, visual loss due to suprasellar mass [106], keratitis, conjunctivitis, papillitis, retinal hemorrhages and third-nerve palsy. [107] [108]
• Neurological manifestations may include encephalitis [109], meningitis [110-114], cranial [115] or peripheral neuropathy [116] [117], progressive paraparesis [118], polyradiculopathy [119] or Guillain-Barre syndrome [120] [121], spinal epidural abscess [122], cerebral venous [123] or arterial vasculitis with infarct [124], intracranial hypertension or hydrocephalus [125] [126], infection of ventriculo-peritoneal shunt [127], psychosis [128], and parenchymal granulomata [129] or abscesses. [130-138]
• Renal infection may present as hematuria, proteinuria, pyuria, overt nephritis or renal failure. [139] Rare instances of renal abscess [140] and glomerulonephritis have also been reported. [141-143]
• Persons working with animals may present with severe pharyngitis as an initial feature of brucellosis. [144]
• Abscesses involving a variety of body areas and solid organs may occur [145-155]
• Various forms of rash occur in 6% to 13% of patients including generalized or localized papules or macules [156], ulcers, purpura, vasculitis / leukocytoclastic vasculitis [157] [158], panniculitis [159] and erythema nodosum [160] [161]
• Brucellosis has been implicated in cases of human abortion [162] [163] and maternal death. [164]

Virtually any organ or body system may be infected during the course of illness [165-176]
• Chronic brucellosis generally represents persistence of local infection in bone, joints, liver [177], spleen or kidneys.
• Relapses are common, especially following inadequate therapy.
• Pancytopenia is reported in approximately 15% of cases [178-181]
• Brucellosis has been reported to cause myelofibrosis [182], and to trigger hemolytic anemia in patients with Glucose-6-Phosphate Dehydrogenase deficiency. [183]
• Isolated thrombocytopenia mimicking ITP is reported in 6% of cases. [184-190] Hepatic dysfunction [191] [192], colitis [193], spontaneous brucellar peritonitis [194], Coombs-positive hemolytic anemia [195-197], reactive hemophagocytic [198-201] or myelodysplastic syndrome [202], pancytopenia [203] [204], disseminated intravascular coagulation [205], TTP [206] [207], Guillain-Barre syndrome [208] and syndrome of inappropriate secretion of antidiuretic hormone (SIADH) have also been documented. [209] [210]

Brucellosis in Zambia

Human disease in this country is due to *Brucella abortus* and *B. melitensis*. [211] [212]

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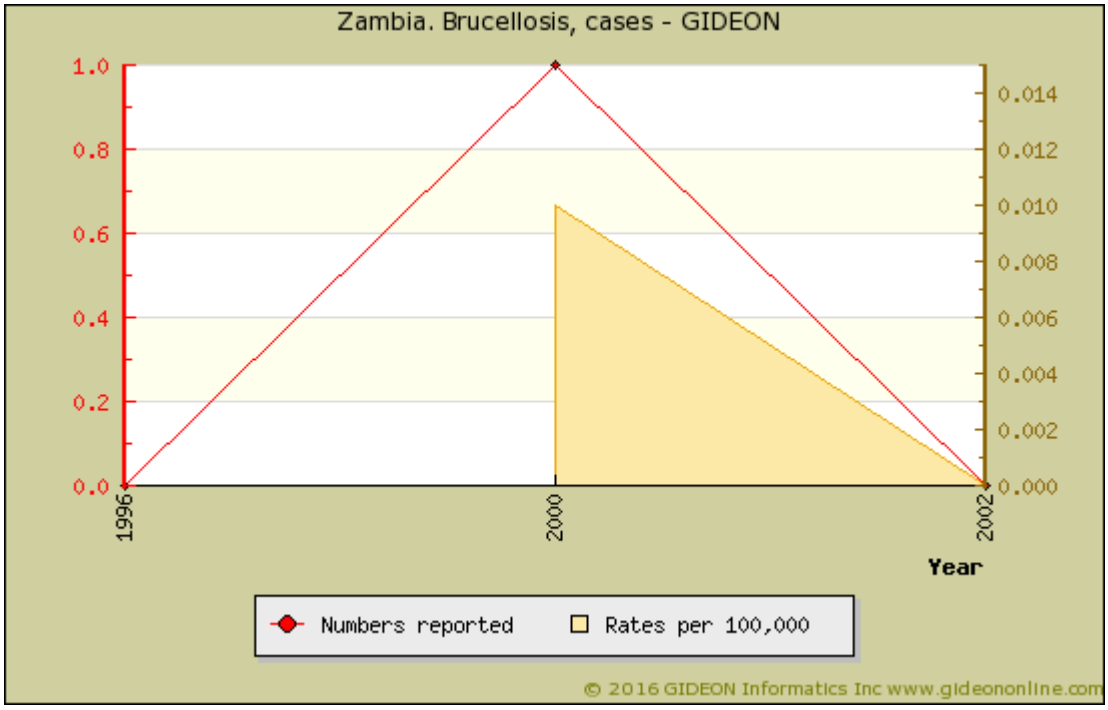

Graph: Zambia. Brucellosis, cases

Seroprevalence surveys:

14.1% to 28.1% of cattle in interface areas of Lochinvar and Blue Lagoon National Parks and the non-interface area of Kazungula (2006 publication) [213]

71% of cattle herds in livestock-wildlife interface areas of Blue Lagoon and Lochinvar National Parks (2003 to 2004) [214]

7.9% of cattle in Lusaka province and 18.7% in Chibombo district (2007 to 2008) [215]

6.0% of cattle kept by smallholder dairy farmers, in Southern and Lusaka provinces (2008) [216]

20.7% of traditionally-reared cattle in Southern Province (2013 publication) [217]

28.5% of cattle in Kafue Flats (1991 publication) [218]

21.6% of Kafue lechwe (*Kobus leche kafuensis*) antelopes on the Kafue flats (2003, 2004 and 2008) [219]

42.9% of Kafue lechwe (*Kobus leche kafuensis*) and 0% of Black (*Kobus leche smithemani*) lechwe antelopes (2011 publication) [220]

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Bunyaviridae infections - misc.

Agent	VIRUS - RNA. Bunyaviridae, Orthobunyavirus. Over 30 strains have been associated with human disease (see Synonyms)
Reservoir	Rat Bird Marsupial Chipmunk Cattle Sheep Horse Bat
Vector	Mosquito (exceptions: Shuni is transmitted by culicoid flies; Bhanja, Tamdy, Wanowrie and Zirqa by ticks)
Vehicle	None
Incubation Period	3d - 12d
Diagnostic Tests	Serology and virus isolation. Nucleic acid amplification. Biosafety level 2 or 3.
Typical Adult Therapy	Supportive
Typical Pediatric Therapy	As for adult
Clinical Hints	Abrupt onset of fever, chills, headache; photophobia, rash arthralgia, myalgia, vomiting, diarrhea or cough may be present; meningitis or myocarditis may occur with Bwamba virus; usual course 2 to 7 days.
Synonyms	Avalon, Bangui, Batai, Bhanja, Bunyamwera, Bwamba, Cache Valley, Calovo, Catu, Fort Sherman, Garissa, Germiston, Guama, Hartland virus, Ilesha, Ingwavuma, Issyk-Kul, Kairi, Lumbo, Ngari, Northway, Nyando, Pongola, Shokwe, Shuni, Tacaiuma, Tamdy, Tataguine, Tensaw, Wanowrie, Wyeomyia, Zirqa. ICD9: 066.3 ICD10: A93.8

Clinical

As a group, these diseases are characterized by acute febrile illness occurring in persons exposed to wild or forest environments. [1] [2]
• Additional features may include headache, myalgia, arthralgia, rash or aseptic meningitis.

Avalon virus has been implicated in isolated cases of conjunctivitis [3] and polyradiculitis. [4] [5]

Ilesha virus infection may be associated with fever or rash, or hemorrhagic fever.

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Campylobacteriosis

Agent	BACTERIUM. Campylobacter jejuni subsp jejuni, et al A microaerophilic gram-negative bacillus
Reservoir	Human Mammal Bird
Vector	None
Vehicle	Water Food
Incubation Period	2d - 4d (range 1d - 10d)
Diagnostic Tests	Stool (rarely blood, CSF) culture. Nucleic acid amplification. Alert laboratory when these organisms are suspected.
Typical Adult Therapy	Stool precautions. Azithromycin 500 mg QD X 3 days Alternatives Erythromycin, Fluoroquinolone (Ciprofloxacin, Levofloxacin, Trovafloxacin, Pefloxacin, Sparfloxacin or Moxifloxacin), Gentamicin
Typical Pediatric Therapy	Stool precautions. Azithromycin 10 mg/kg QD X 3 days Alternatives - Erythromycin, Gentamicin
Clinical Hints	Febrile diarrhea or dysentery; vomiting or bloody stool often noted; severe abdominal pain may mimic appendicitis; disease is most common among children and lasts one to four days.
Synonyms	Campylobacter. ICD9: 008.43 ICD10: A04.5

Clinical

Following an incubation period of 1 to 10 days, patients develop diarrhea (often bloody) and abdominal pain.
- Initial symptoms of malaise, dizziness, fever, headache and myalgia are common.
- Vomiting is unusual.
- Leucocytes are usually seen on stool smears.
- Leukopenia and thrombocytopenia are occasionally encountered. [1]

Infection may be complicated by cholecystitis [2], pancreatitis [3], pseudoappendicitis, peritonitis [4] [5] (including peritonitis associated with dialysis [6] [7]), massive lower-gastrointestinal hemorrhage [8], hemolytic-uremic syndrome [9], bacteremia [10-13], myocarditis [14-19], endocarditis [20-22], pericarditis [23] [24], pleurisy [25-27], mycotic iliac [28] [29], popliteal [30] and aortic aneurysms [31-33], meningitis [34] [35], splenic abscess [36], encephalopathy [37], epidural abscess [38] [39], septic arthritis of native [40] or prosthetic joints [41], cellulitis [42], Sweet's syndrome [43], spontaneous abortion, reactive arthritis or Guillain-Barre syndrome.
- Reactive arthritis has been reported in 1% to 13% of cases [44-46]
- The risk for reactive arthritis following *Campylobacter* infection was 2.1/100,000 cases (United States, 2002 to 2004) [47]
- Elderly patients are at risk for complicated or fatal infection. [48]

Guillain Barre syndrome (GBS) has been estimated to complicate 0.07% to 0.1% of *Campylobacter* infections. [49-55]
- *Campylobacter* infection is implicated in 14% to 40% of GBS episodes. [56-61]
- Risk for GBS continues for up to 2 months following an episode of Campylobacteriosis.
- The rate of GBS is 19.2 per 100,000 episodes of Campylobacteriosis. [62]
- There have been case reports of brain stem encephalitis [63], cranial neuropathy [64], acute transverse myelitis [65] and demyelization of the central nervous system or spinal cord following *C. jejuni* infection. [66]

There is evidence that campylobacteriosis may increase the risk for later development of inflammatory bowel disease. [67]

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Candidiasis

Agent	FUNGUS - Yeast. Ascomycota, Hemiascomycetes, Saccharomycetales. Candida albicans, and other species.
Reservoir	Human
Vector	None
Vehicle	Contact Catheter
Incubation Period	Variable
Diagnostic Tests	Culture. Serology and assays for cell-specific antigens are performed in some centers,
Typical Adult Therapy	Topical, oral, systemic antifungal agent depending on clinical presentation and species (in Therapy module, scroll through upper left box)
Typical Pediatric Therapy	As for adult
Clinical Hints	Dermal erythema with satellite pustules; "cheesy" mucosal discharge; severe, widespread or intractable disease should suggest the possibility of underlying diabetes, AIDS or other form of immune suppression.
Synonyms	Candida, Candida-Mykosen, Candidiase, Candidiasi, Candidose, Monilia, Moniliasis, Salmonella, Thrush. ICD9: 112 ICD10: B37

Clinical

The clinical features of candidiasis range from localized mucosal or skin inflammation to multi-organ candidal sepsis.

Often infection represents overgrowth of *Candida* species following use of antimicrobial agents, or in the presence of the high mucosal glucose concentrations found in diabetics.
• Other predisposing factors include chronic intertrigo, oral contraceptive use, and cellular immune deficiency.
• Candidiasis is a common initial event in HIV-infected individuals.
• White exudative plaques may occur on the tongue or buccal mucosa (thrush), vaginal or rectal mucosa.
• Fissured, macerated lesions at the corners of the mouth (perleche) are common among individuals with poorly-fitting dentures. In fact, candidal infections have a predilection for sites that are chronically wet and macerated.
• Intertriginous lesions are edematous, erythematous, and scaly; and associated with scattered "satellite pustules." [1]
• The glans penis and scrotum as inner aspect of the thighs are often involved.

Systemic *Candida* infections may involve virtually any organ or organ system, and mimic bacterial sepsis. [2-5]
• Case fatality rates for patients with infected vascular catheters range from 26% to 38%; 33% for infected prosthetic cardiac valves; 20% to 40% for urinary catheters.

Candidiasis in Zambia

Prevalence surveys:
22.4% of HIV-infected pregnant women in Blantyre and Lilongwe (Malawi), Dar es Salaam (Tanzania) and Lusaka (Zambia) (2008 publication) [6]

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Chancroid

Agent	BACTERIUM. Haemophilus ducreyi. A facultative gram-negative bacillus
Reservoir	Human
Vector	None
Vehicle	Sexual contact
Incubation Period	3d - 10d (2d - 21d)
Diagnostic Tests	Culture (inform laboratory when this diagnosis is suspected). Fluorescent staining under development
Typical Adult Therapy	Azithromycin 1.0 g PO X 1 dose. OR Ceftriaxone 250 mg IM X 1 dose. OR Ciprofloxacin 500 mg PO BID X 3 days OR Erythromycin 500 mg PO TID X 7d.
Typical Pediatric Therapy	Azithromycin 12 mg/kg PO X 1 dose OR Erythromycin 10 mg/kg PO TID X 7d. OR Ceftriaxone 10 mg/kg IM X 1
Clinical Hints	Soft, painful and tender chancre on erythematous base, with regional lymphadenopathy (generally unilateral and painful); onset 3 to 10 days following sexual exposure.
Synonyms	Blot sjanker, Chancre mou, Chancro blando, Haemophilus ducreyi, Nkumunye, Soft chancre, Ulcera mole, Ulcus molle, Weeke sjanker, Weicher Schanker. ICD9: 099.0 ICD10: A57

Clinical

For surveillance the CDC (The United States Centers for Disease Control) case definition consist of a sexually-transmitted disease characterized by painful genital ulceration and inflammatory inguinal adenopathy; but without evidence for *Treponema pallidum* by dark field and serological examination (after at least 7 days) and without clinical or laboratory evidence for herpes simplex infection.

Infection begins with a papule or pustule which ulcerates and enlarges over a period of 1 to 2 days. [1]
- The lesion is soft, painful and bleeds easily; and the ulcer edges are undermined and irregular. [2]
- Two thirds of patients present with more than one ulcer
- Painful unilateral or bilateral lymphadenopathy is present in 40% of cases.
- Systemic signs are unusual.
- Extragenital skin ulcers are occasionally encountered. [3-6]
- *Haemophilus ducreyi* has been associated with esophageal ulceration in HIV-positive patients. [7]

Although yaws and chancroid may co-exist in some regions, lesions of yaws tend to be more circular in shape, and are more likely to have central granulating tissue and indurated edges. [8]

Chancroid in Zambia

In one study, chancroid was found to be the most common STD among men in Zambia (1992 to 1993). [9]

Prevalence surveys:

0% of genital ulcers (2012 publication) [10]

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Chikungunya

Agent	VIRUS - RNA. Togaviridae, Alphavirus: Chikungunya virus. Related Semliki Forest and Me Tri viruses are found in Africa & Asia
Reservoir	Non-human primate
Vector	Mosquito (Aedes spp. ; Ae. furcifer-taylori group in Africa)
Vehicle	None
Incubation Period	2d - 12d
Diagnostic Tests	Viral culture (blood). Serology. Nucleic acid amplification. Biosafety level 3.
Typical Adult Therapy	Supportive
Typical Pediatric Therapy	As for adult
Clinical Hints	Abrupt fever, leukopenia, myalgia and prominent bilateral joint pain; maculopapular rash appears on 2nd to 5th days in greater than 50% of cases; fever resolves within 7 days, but joint pain may persist for months.
Synonyms	Buggy Creek, Getah, Kidenga pepo, Knuckle fever, Me Tri, Semliki Forest. ICD9: 062.8,066.3 ICD10: A92.1

Clinical

Chikungunya: Case definitions (WHO Expert Committee, 2015): [1]

Acute clinical case:
1) Clinical criterion: Fever >38.5 C (101.3 F) and joint pain (usually incapacitating) with acute onset
• AND
2) Epidemiological criterion: resident or visitor in areas with local transmission of Chikungunya on the last 15 days. (suspect case for epidemiological surveillance) –
• OR
3) Laboratory criterion: confirmation by laboratory: PCR, serology, or viral culture (confirmed case for epidemiological surveillance)

Atypical case
Clinical case of laboratory-confirmed chikungunya accompanied by other manifestations: neurological, cardiovascular, dermatological, ophthalmological, hepatic, renal, respiratory, or hematological, among others.

Severe acute case
Clinical case of laboratory-confirmed chikungunya presenting dysfunction of at least one organ or system that threatens life and requires hospitalization.

Suspect and confirmed chronic cases:
Suspect chronic case
Person with previous clinical diagnosis of chikungunya after 12 weeks of the onset of the symptoms presenting with at least one of the following articular manifestations: pain, rigidity, or edema, continuously or recurrently.
Confirmed chronic case
Every chronic case with a positive chikungunya laboratory test.

Clinical features of Chikungunya:
The fever of Chikungunya is characterized by a rapid rise in temperature to as high as 40 C, often accompanied by rigors, myalgia, headache, photophobia, retro-orbital pain, sore throat with objective signs of pharyngitis, nausea, and vomiting. [2]
• Fever may abate after a few days, only to recrudesce ("saddle-back" fever curve").
• Polyarthralgia occurs in 70% of cases, favors small joints and sites of previous injury, and is most intense on arising.
• Joints may swell, but without significant fluid accumulation. [3] [4]
• Joint pain is most severe in adults.

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• Symptoms may last for from 1 week to several months. [5]
• Joint involvement may progress to residual chronic pain [6] [7] or destructive arthritis. [8]
• Arthralgia may persist for as long as 36 months. [9-20] In one series, 57% of patients continued to experience rheumatological symptoms for 15 months or more [21] [22] ; and in another, 66.5% reported myalgia, asthenia or arthralgia for more than 12 months. [23] Overt post-Chikungunya rheumatoid arthritis has also been reported. [24]
• Painful lymphadenopathy has been noted in some cases. [25]
• Imaging studies may reveal joint effusion, bony erosion, marrow edema, synovial thickening, tendonitis and tenosynovitis. [26] [27]
• Laboratory tests reveal mild leukopenia and relative lymphocytosis; persistent mixed cryoglobulinemia is present in most cases. [28] Cases of hepatic dysfunction have also been reported. [29]

Dermatological manifestations:
A rash characteristically appears on the first day of illness, but may be delayed.
• The patient exhibits erythema of the face and neck, which evolves to a macular or maculopapular exanthem of the trunk, limbs, face, palms, and soles in 50% of cases. [30]
• Common findings also include hyperpigmentation, xerosis, excoriated papules, aphthous-like ulcers, vesiculobullous and lichenoid eruptions, and exacerbation of pre-existing or quiescent dermatoses. [31] [32] Extensive nasal skin necrosis is also encountered in some cases. [33]
• Pigmentary changes are seen in 42% of cases, intertriginous aphthous-like ulcers in 21.37% and a vesiculbullous eruption in 2.75% (only in infants). [34]
• Morbilliform eruptions are most common, followed by scaling, macular erythema, intertrigo, hypermelanosis, xerosis, excoriated papules, urticaria and petechiae. [35]
• Vesiculo-bullous lesions are most common in children [36] [37] ; and extensive bullous lesions have been reported in infected infants. [38]
• Pruritus is common, and petechiae have been seen in some patients.
• Purpuric macules [39] , genital ulcers, desquamation of the facial skin [40] , erythema multiforme and erythema nodosum have also been reported in patients with Chikungunya. [41]
• In one series, erythema / chondritis of the external ear was present in 25% of cases. [42]

Complications:
Complications include hemorrhagic syndrome, myopericarditis [43] [44] , hemodynamic disorders [45] and rare instances of renal failure. [46]
• Fatal infection [47-49] and transplacental transmission are reported. [50-53]
• Peritonitis, encephalitis [54] and secondary bacterial infections have been reported among immunocompromised patients with Chikungunya. [55]
• The case fatality rate may be as high as 1 per 1,000 cases. [56] [57]
• Children occasionally present with seizures or convulsions.
• Sudden sensorineural hearing loss has been reported [58]
• Eye involvement may present as transient granulomatous and nongranulomatous anterior uveitis, optic neuritis [59] [60] , retinitis [61] [62] , retrobulbar neuritis [63] , retinal detachment [64] , Fuchs' heterochromic iridocyclitis. [65] and dendritic lesions. [66] [67]
• Chikungunya has no observable effect on the outcome of pregnancy [68] ; however, infection of infants during the perinatal period is characterized by fever, rash, peripheral edema, thrombocytopenia, lymphopenia, decreased prothrombin value, and elevation of aspartate aminotransferase levels.
• Neurological complications have included altered mental function, seizures [69] , encephalitis [70-74] , myelopathy [75] [76] , myeloradiculopathy [77] , acute demyelinating encephalomyelitis [78] , acute flaccid paralysis [79] , focal neurological deficit [80] with abnormal CT scan of head, auditory neuropathy spectrum disorder [81] , Guillain-Barre syndrome [82-84] , urinary retention [85] and altered CSF biochemistry. [86-88]

Congenital infection may present as neonatal respiratory distress, sepsis, necrotizing enterocolitis, meningoencephalitis, myocarditis, edema, bullous dermatitis and pericarditis. [89]
• Intrauterine infection may also result in neonatal encephalopathy and neurocognitive residua. [90]

In some cases Chikungunya may mimic seronegative rheumatoid arthritis [91] or Kawasaki disease. [92] Overt post-Chikungunya rheumatoid arthritis has also been reported. [93]
• Although the clinical features of dengue and chikungunya are similar, chikungunya patients are more likely to exhibit early myalgia or arthralgia; while sore throat, cough, nausea, vomiting, diarrhea, abdominal pain, anorexia, tachycardia and thrombocytopenia will favor a diagnosis of dengue. [94]
• Dengue-Chikungunya [95-97] co-infection may occur in regions which are endemic for both diseases.

Infection by a related agent, **Semliki Forest virus**, is characterized by fever, myalgia, arthralgia and persistent headache.

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[98]

Although Chikungunya is not endemic to Zambia, imported, expatriate or other presentations of the disease have been associated with this country.

Chikungunya in Zambia

Notable outbreaks:

1961 (publication year) - An outbreak of suspected Chikungunya was reported. [99]

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Chlamydia infections, misc.

Agent	BACTERIUM. Chlamydiaceae, Chlamydiae, Chlamydia trachomatis; Simkania negevensis; Waddlia chondrophila
Reservoir	Human
Vector	None
Vehicle	Sexual contact
Incubation Period	5d - 10d
Diagnostic Tests	Microscopy and immunomicroscopy of secretions. Serology. Tissue culture. Nucleic acid amplification.
Typical Adult Therapy	Doxycycline 100 mg BID X 7d. OR Azithromycin 1g as single dose OR Levofloxacin 500 mg daily X 7 days OR Ofloxacin 300 mg BID X 7 days
Typical Pediatric Therapy	Weight <45 kg: Erythromycin 12.5 mg/kg QID X 14d Weight >=45 kg, but age <8 years: Azithromycin 1 g as single dose Age >= 8 years: Azithromycin 1 g as single dose OR Doxycycline 100 mg BID X 7 d
Clinical Hints	Thin, scant penile discharge; cervicitis; conjunctivitis; neonatal pneumonia; pelvic inflammatory disease; concurrent gonorrhea may be present.
Synonyms	Bedsonia, Chlamydia suis, Chlamydia trachomatis, Chlamydien-Urethritis, Chlamydien-Zervizitis, Chlamydophila, Inclusion blenorrhea, Non-gonococccal urethritis, Nonspecific urethritis, Parachlamydia, Parachlamydia acanthamoebae, Prachlamydia, Protochlamydia, Protochlamydia naegleriophila, Rhabdochlamydia, Simkania negevensis, Waddlia chondrophila. ICD9: 099.41,099.5 ICD10: A56,A55

Clinical

Genito-urinary infection with *Chlamydia trachomatis* may result in urethritis, epididymitis [1], obstructive uropathy [2], cervicitis, Fitz-Hugh-Curtis syndrome [3-5], acute salpingitis, tubal scaring, reduced conception rates (even in the absence of scarring) [6 7], ectopic pregnancy [8-11], miscarriage [12 13], preeclampsia [14], low birth weight or pre-term delivery. [15-19]
• The rates of orchitis/epididymitis, prostatitis, infertility, and urethral stricture following genital infection in males [20] are 4.28%, 1.41%, 1.27%, and 0.13% • respectively. [21]
• The extent to which *Chlamydia* infection contributes to male and female infertility is unclear. [22-26]
• Levels of serum Prostate-specific Antigen (PSA) may be elevated in patients with *Chlamydia trachomatis* infection. [27 28]
• Perinatal infections may result in inclusion conjunctivitis or pneumonia in the newborn. [29 30]
• Asymptomatic pharyngeal infection or acute chlamydial tonsillopharyngitis may follow oro-genital contact. [31] Pharyngeal or rectal infection may persist for as long as 667 days and 579 days, respectively. [32]

Chlamydia trachomatis infection is implicated in the etiology of reactive arthritis. [33-57]

Parachlamydiaceae (including *Parachlamydia acanthamoebae*) have been associated with human respiratory infections, conjunctivitis, keratitis and uveitis. [58 59]
• The signs and symptoms of infection are similar to those of genital *Mycoplasma* infection. [60]
• Recurrent infection may represent either reinfection or treatment failure. [61]

For surveillance purposes, the CDC (The United States Centers for Disease Control) case definition of nongonococcal urethritis requires that gonorrhea has been discounted in the setting of:
• a visible abnormal urethral discharge
• or, a positive leukocyte esterase test from a male aged <60 who does not have a history of kidney disease or bladder infection, prostatic enlargement, anatomical abnormality of the urogenital tract, or recent urinary tract instrumentation
• or microscopic evidence of urethritis (over 5 leukocytes per high-power field) on stain of a urethral smear.

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Chlamydia infections, misc. in Zambia

Prevalence surveys:

2.6% of HIV-infected pregnant women in Blantyre and Lilongwe (Malawi), Dar es Salaam (Tanzania) and Lusaka (Zambia) (2008 publication) [62]

1% of HIV-infected women in urban Lusaka (2012 publication) [63]

The rate of disease among at risk women in Lusaka was estimated at 4.9 per 100 person-years at risk (2003 to 2004). [64]

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Chlamydophila pneumoniae infection

Agent	BACTERIUM. Chlamydiaceae, Chlamydiae, Chlamydophila (Chlamydia) pneumoniae
Reservoir	Human
Vector	None
Vehicle	Droplet
Incubation Period	7d - 28d
Diagnostic Tests	Direct fluorescence of sputum. Serology and culture in specialized laboratories. Nucleic acid amplification.
Typical Adult Therapy	Respiratory isolation. Azithromycin 500 mg day 1, then 0.25 g daily X 4 days OR Levofloxacin 750 mg po BID X 7d. OR Alternatives: Doxycycline 100 mg BID X 7d. Erythromycin 500 mg QID X 10d. Clarithromycin 0.5 g BID X 7d
Typical Pediatric Therapy	Respiratory isolation Azithromycin 10 mg/kg PO day 1; 5 mg/kg PO days 2 to 5
Clinical Hints	Atypical pneumonia, often associated with pharyngitis and myalgia; consider when Mycoplasma, Legionella and influenza are discounted.
Synonyms	Chlamydia pneumoniae, Chlamydia TWAR, Chlamydophila pneumoniae, TWAR. ICD9: 078.88 ICD10: J16.0

Clinical

Asymptomatic infection is common.
• Pneumonia and bronchitis are the most common clinical syndromes associated with *C. pneumoniae*. [1]
• Sinusitis and pharyngitis may also occur, even in the absence of lower respiratory tract infection.
• Initial symptoms may consist of rhinitis, sore throat, or hoarseness; followed after several days or weeks prominent cough.
• Fever is often absent.
• Cough and malaise may persist for months; and reinfection may occur.

A single, subsegmental, patchy infiltrate may be seen on chest X ray.
• Other findings described include, lobar pulmonary consolidation, interstitial infiltrates, bilateral pneumonia, pleural effusion, acute respiratory distress syndrome [2], hilar adenopathy [3], myo-pericarditis. [4], Stevens-Johnson syndrome [5] and encephalitis associated with respiratory infection. [6]
• The appearance of a miliary infiltrate may suggest a diagnosis of tuberculosis. [7]
• *Chlamydophila pneumoniae* has been identified as an agent of otitis media. [8]
• Rare instances of acute glomerulonephritis [9], granulomatous hepatitis [10] and intra-hepatic cholestasis have been reported. [11]
• The peripheral white blood cell count is usually not elevated.

C. pneumoniae has been identified as a cause of acute respiratory exacerbations in patients with cystic fibrosis and acute respiratory infection in children with sickle cell disease.
• *C. pneumoniae* infection is implicated in the etiology of recurrent tonsillitis. [12]
• The organism has also been implicated in development of asthma [13-16], chronic rhinosinusitis [17], otitis media, migraine [18], endocarditis, lumbosacral meningoradiculitis, erythema nodosum, erythema multiforme [19], erythema exsudativum multiforme [20], nodular vasculitis [21], Guillain-Barre syndrome, keratoconjunctivitis sicca [22], hemophagocytic lymphohistiocytosis [23-25], reactive arthritis and atherosclerosis. [26]

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Cholecystitis & cholangitis

Agent	BACTERIUM. Escherichia coli, Klebsiella pneumoniae, enterococci, et al.
Reservoir	Human
Vector	None
Vehicle	Endogenous bacteria
Incubation Period	Variable
Diagnostic Tests	Roentgenograms/imaging (cholecystogram, ultrasound, CT, etc).
Typical Adult Therapy	Antibiotics and surgical intervention as required
Typical Pediatric Therapy	As for adult
Clinical Hints	Fever, chills and right upper quadrant abdominal pain; often "female, fat and 40"; may be associated with gallstones or pancreatitis, or present as "fever of unknown origin".
Synonyms	Acute cholecystitis, Angiocholite, Ascending cholangitis, Cholangitis, Cholecystite, Cholecystitis, Cholezystitis, Colangite, Colangitis, Colecistite, Gall bladder. ICD9: 575.0,576.1 ICD10: K81,K83.0

Clinical

Cholangitis is caused by obstruction of the common bile duct, which subsequently becomes infected. [1]
• Strictures, stenosis, tumors, or endoscopic manipulation of the CBD cause bile stasis.
• The resultant infection ascends into the hepatic ducts, while increased biliary pressure spreads infection into the biliary canaliculi, hepatic veins and perihepatic lymphatics, leading to bacteremia.

Charcot's triad (fever, right upper quadrant pain, and jaundice) is found in 70% of patients.
• Additional findings include right upper quadrant pain, mild hepatomegaly, tachycardia, altered mental status, rigors, fever, hypotension, jaundice, pruritis, acholic stools.
• The case-fatality rate is 7% to 40%, and is highest in patients with hypotension, renal failure, liver abscess, cirrhosis, inflammatory bowel disease, malignant strictures and advanced age, or delays in diagnosis or surgery.

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Cholera

Agent	BACTERIUM. Vibrio cholerae A facultative gram-negative bacillus
Reservoir	Human
Vector	None
Vehicle	Water Fecal-oral Seafood (oyster, ceviche) Vegetables Fly
Incubation Period	1d - 5d (range 9h - 6d)
Diagnostic Tests	Stool culture. Advise laboratory when this organism is suspected.
Typical Adult Therapy	Stool precautions. Doxycycline 100 mg BID X 5d, or Fluoroquinolone (Levofloxacin, Trovafloxacin, Pefloxacin, Sparfloxacin or Moxifloxacin), or Azithromycin Fluids (g/l): NaCl 3.5, NaHCO3 2.5, KCl 1.5, glucose 20
Typical Pediatric Therapy	Stool precautions. Age >=8 years: Doxycycline 2 mg/kg BID X 5d. Age <8 years: Sulfamethoxazole/trimethoprim Fluids (g/l): NaCl 3.5, NaHCO3 2.5, KCl 1.5, glucose 20
Vaccines	Cholera - injectable vaccine Cholera - oral vaccine
Clinical Hints	Massive, painless diarrhea and dehydration; occasionally vomiting; apathy or altered consciousness common; rapid progression to acidosis, electrolyte imbalance and shock; fever is uncommon.
Synonyms	Colera, Kolera. ICD9: 001 ICD10: A00

Clinical

WHO Case definition:
The WHO Case definition for surveillance is as follows: [1]
Clinical case definition
• In an area where the disease is not known to be present: severe dehydration or death from acute watery diarrhea in a patient aged 5 years or more or
• In an area where there is a cholera epidemic: acute watery diarrhea, with or without vomiting in a patient aged 5 years or more
Laboratory criteria for diagnosis
• Isolation of *Vibrio cholerae* O1 or O139 from stools in any patient with diarrhea.
Case classification
• Suspected: A case that meets the clinical case definition.
• Probable: Not applicable.
• Confirmed: A suspected case that is laboratory-confirmed.
Note: In a cholera-threatened area, when the number of confirmed cases rises, shift should be made to using primarily the suspected case classification.
• Cholera does appear in children under 5 years; however, the inclusion of all cases of acute watery diarrhea in the 2-4 year age group in the reporting of cholera greatly reduces the specificity of reporting.
• For management of cases of acute watery diarrhea in an area where there is a cholera epidemic, cholera should be suspected in all patients.

Symptoms and signs of cholera reflect the degree of fluid loss: thirst, postural hypotension, tachycardia, weakness, fatigue and dryness of the mucous membranes.
• Following an incubation period of 12 hours to 5 days [2] , the patient experiences sudden onset of painless, watery diarrhea, which may later be accompanied by vomiting. [3]
• Abdominal cramps may occur.
• Fever is typically absent in adults, but present in children.
• The diarrhea has a "rice water" appearance and fishy odor.

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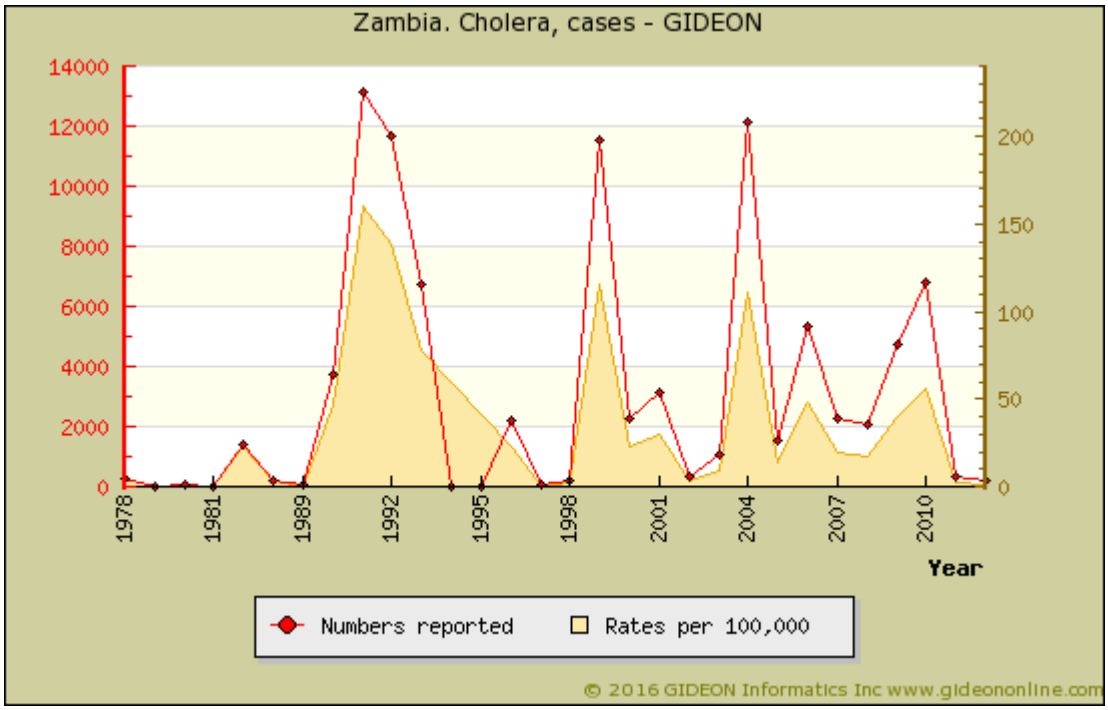
• In patients with severe disease, stool volume can exceed 250 ml per /kg during the first 24 hours (17.5 liters in a 70 kg adult!).
• Severe cases exhibit sunken eyes (depressed fontanelles in infants), thready pulse, somnolence or coma.
• Without replacement of fluids and electrolytes, hypovolemic shock and death ensue.
• The clinical features of cholera due to *Vibrio cholerae* O139 are indistinguishable from disease due to other strains. [4]
• Rare cases of acalculous [5-7] and infectious cholecystitis have been ascribed to *Vibrio cholerae*. [8]

Cholera in Zambia

In recent years cholera has been reported from: [9] [10]
Central Province:
Lusaka
Copperbelt Province
Eastern Province
Luapula Province
Northern Province
Southern Province



Graph: Zambia. Cholera, cases

Notes:
1. An ongoing outbreak began in 1989 at Lake Tanganyika.
Individual years:
1993 - Cases were reported in Central, Copperbelt, Eastern, Luapula, Northern and Southern Provinces.
1999 - Primary activity was reported in Ndola (northern border)
2003 - Included 224 cases (9 fatal) in Nchelenge district during January to June.
2007 - 529 cases (10 fatal) were reported during January to February.

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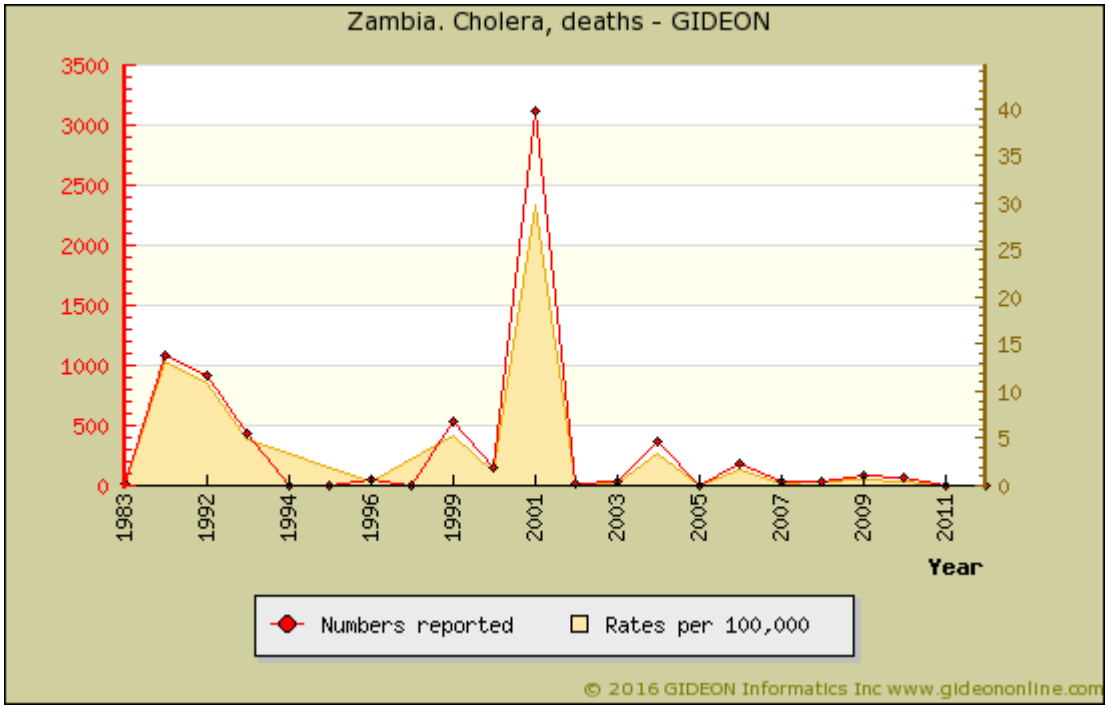

Graph: Zambia. Cholera, deaths

Prevalence surveys:

3.3% of diarrhea among children below age 5 years (Lusaka, 1992 to 1993) [11]

Notable outbreaks:

1990 - An outbreak (2,166 cases, 128 fatal) was reported in Lusaka. [12]

1996 (publication year) - An outbreak was reported in Kaputa district. [13]

2003 to 2004 - An outbreak (6,542 cases, 187 fatal) was reported in Lusaka district. [14-17] The outbreak also involved four other provinces (Southern, Copperbelt, Northern and Central). 2,529 cases in Lusaka during this period were ascribed to consumption of contaminated vegetables. [18] [19]

2006 to 2007 - An outbreak was reported in Lusaka and Eastern Provinces. [20-23] Inadequate rain drainage systems were implicated in spread of the disease. [24]

2008 to 2009 - Outbreaks (2,267 cases, 28 fatal) were reported in Copperbelt Province (204 cases) [25], Lusaka (1,386 cases, 38 fatal) [26-30], Northern Province (98 cases, 0 fatal) [31], Northwest Province (20 cases, 5 fatal) [32], Southern Province (64 cases) [33-36], Central Province (14 fatal) [37], and Luapula Province (9 cases). [38-42] An additional case (fatal) was reported at a border crossing from affected regions of Zimbabwe. [43]

2010 to 2011 - Outbreaks (564 cases, 11 fatal - to March; 151 during November 2010 to January 2011) were reported. [44-52]

2012 - An outbreak (55 cases) was reported in Kapiri Mposhi and Kabwe, Central Province. [53]

2012 to 2013 - Outbreaks were reported in Luapula Province (4 fatal cases) [54] [55] and Central Province (55 cases). [56]

2014 - Outbreaks were reported in Northern Province (10 cases) [57] [58] and Central Province. [59] [60]

2016 - An outbreak (13 cases to February) was reported in Lusaka Province. [61]

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Chromomycosis

Agent	FUNGUS. Ascomycota, Euascomycetes, Chaetothyriales. Dematiaceous molds: Phialophora, Cladiophialophora, Fonsecaea, Rhinocladiella
Reservoir	Wood Soil Vegetation
Vector	None
Vehicle	Minor trauma
Incubation Period	14d - 90d
Diagnostic Tests	Biopsy and fungal culture.
Typical Adult Therapy	Itraconazole 100 mg PO QID X (up to) 18 m. OR (for late disease) Flucytosine 25 mg/kg QID X 4m. OR Posaconazole 400 mg PO BID Terbinafine has been used in some cases. Local heat; excision as necessary
Typical Pediatric Therapy	Itraconazole 1 mg/kg PO BID X (up to) 18 m. OR Ketoconazole (if age >2) 5 mg/kg/d X 3 to 6m. Local heat; excision as necessary
Clinical Hints	Violaceous, verrucous, slowly-growing papule(s) or nodules, most commonly on lower extremities; usually follows direct contact with plant matter in tropical regions.
Synonyms	Chromoblastomycosis, Chromomykose, Veronaea, Verrucous dermatitis. ICD9: 117.2 ICD10: B43.0

Clinical

The lesions of chromomycosis typically progress from a papule to cicatricial fibrosis: nodules, tumors, plaques, warty lesions, and scarring lesions. [1] [2]

- The verrucous form appears at the site of inoculation.
- The primary lesion, a small pink scaly papule, may be pruritic but rarely painful. [3]
- Over time (often months to years), new crops of lesions appear in the same or adjacent areas as warty, purplish, scaly nodules or smooth, firm tumors. [4] [5]
- Peripheral spread may occur with healing in the center, as lesions enlarge and become grouped.
- Older lesions resemble cauliflower, with small ulcerations or "black dots" of hemopurulent material on the surface. [6]
- These lesions can be pruritic and are rarely painful.
- Satellite lesions may develop through autoinoculation or lymphatic spread, in some cases suggesting a diagnosis of sporotrichosis. [7]
- Coalesced lesions form a large verrucous mass.
- Occasionally, an annular, flattened, papular lesion having a raised border is encountered.
- Keloid formation, fibrosis, lymphostasis and marked edema may follow.
- Fistulae are not seen.
- Malignant transformation has been reported in long-lasting lesions. [8] [9]

Signs of mucosal infection may mimic those of rhinosporidiosis [10] , while those of cutaneous infection may mimic dermal leishmaniasis [11] or carcinoma. [12]

Rare cases of mycotic keratitis [13] [14] and postoperative eye infection have been reported. [15]

Rare cases of primary pulmonary infection [16] ; and hematogenous spread to the brain [17] , lymph nodes, liver, lungs [18] , bones and joints [19] , soft tissues and other organs have been reported. [20]

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Chronic meningococcemia

Agent	BACTERIUM. Neisseria meningitidis An aerobic gram-negative coccus
Reservoir	Human
Vector	None
Vehicle	Air Infected secretions
Incubation Period	Unknown
Diagnostic Tests	Blood culture. Test patient for complement component deficiency.
Typical Adult Therapy	Intravenous Penicillin G 20 million units daily X 7 days
Typical Pediatric Therapy	Intravenous Penicillin G 200,000 units daily X 7 days
Clinical Hints	Recurrent episodes of low-grade fever, rash, arthralgia and arthritis - may persist for months; rash is distal, prominent near joints and may be maculopapular, petechial or pustular; may be associated with complement component deficiency.
Synonyms	Meningococcemia, chronic. ICD9: 036.2 ICD10: A39.3

Clinical

Chronic meningococcemia is characterized by persistent meningococcal bacteremia associated with low-grade fever, rash and arthritis.

- The rash is similar to that of gonococcemia. [1] [2]
- The illness may recur over a period of weeks to months.
- Patients (or their contacts) may ultimately present with acute bacterial meningitis or septicemia.

Chronic meningococcemia without fever has been reported. [3]

Non-bacteremic cases occur, and may be diagnosed through demonstration of meningococci in skin lesions. [4]

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Clostridial food poisoning

Agent	BACTERIUM. Clostridium perfringens An anaerobic gram-positive bacillus
Reservoir	Soil Human Pig Cattle Fish Poultry
Vector	None
Vehicle	Food
Incubation Period	8h - 14h (range 5h - 24h)
Diagnostic Tests	Laboratory diagnosis is usually not practical. Attempt culture of food for C. perfringens.
Typical Adult Therapy	Supportive
Typical Pediatric Therapy	As for adult
Clinical Hints	Abdominal pain; watery diarrhea (usually no fever or vomiting) onset 8 to 14 hours after ingestion of meat, fish or gravy; no fecal leucocytes; usually resolves within 24 hours.
Synonyms	

Clinical

Seven to 15 hours after ingestion of toxin (range 6 to 24), the patient develops watery diarrhea (90%), abdominal cramps (80%); and occasionally nausea (25%), vomiting (9%) or fever (24%). [1]

- Symptoms may persist for 8 to 72 hours (usually one day)
- Fatal cases are rare [2] [3]

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Clostridial myonecrosis

Agent	BACTERIUM. Clostridium perfringens An anaerobic gram-positive bacillus
Reservoir	Soil Human
Vector	None
Vehicle	Soil Trauma
Incubation Period	6h - 3d
Diagnostic Tests	Gram stain of exudate. Wound and blood cultures. Presence of gas in tissue (not specific).
Typical Adult Therapy	Prompt, aggressive debridement. Penicillin G 3 million units IV Q3h + Clindamycin 900 mg IV Q8h. Hyperbaric oxygen
Typical Pediatric Therapy	Prompt, aggressive debridement. Penicillin G 50,000 units/kg IV Q3h + Clindamycin 10 mg/kg IV Q6h. Hyperbaric oxygen
Vaccine	Gas gangrene antitoxin
Clinical Hints	Gas gangrene is heralded by rapidly progressive tender and foul smelling infection of muscle associated with local gas (crepitus or seen on X-ray), hypotension, intravascular hemolysis and obtundation.
Synonyms	Anaerobic myonecrosis, Clostridial gangrene, Gas gangrene. ICD9: 040.0 ICD10: A48.0

Clinical

Gas gangrene is a fulminant infection with prominent findings at the infection site and severe systemic disease. [1]

The process may follow trauma (usually of an extremity), surgery (notably intestinal or biliary), septic abortion or delivery, vascular insufficiency or burns, underlying colorectal or pelvic cancer, or neutropenia complicating leukemia or cytotoxic therapy.

Following an incubation period of 1 to 4 days (range 6 hours to 3 weeks) the patient develops severe local pain, heaviness or pressure.
• The infection then progresses within minutes to hours, with localized edema, pallor and tenderness.
• Gas may be noted in the soft tissues by palpation, x-ray or scans, but crepitance is a late finding .
• The skin initially appears pale, and progresses to a magenta or bronze discoloration with hemorrhagic bullae and subcutaneous emphysema.
• A thin, brown, serosanguinous discharge may be present, associated with an offensive odor described as sweetish or "mousey.
• Gram's stain of the discharge shows a large number of gram-positive or gram-variable rods, with few or no white blood cells.

Profound systemic toxicity is also present, diaphoresis, anxiety, and tachycardia disproportionate to fever.
• In fact, fever may be low or absent in the early stages.
• Other complications include intravascular hemolysis, hemoglobinuria, hypotension, renal failure, and metabolic acidosis.
• Central nervous system manifestations are rare and most frequently comprise meningitis with or without pneumencephalon, encephalitis, plexitis, cerebral abscess, or subdural empyema. [2]
• Coma and generalized "bronze' edema are seen preterminally.

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Clostridium difficile colitis

Agent	BACTERIUM. Clostridium difficile An anaerobic gram-positive bacillus
Reservoir	Human
Vector	None
Vehicle	Endogenous
Incubation Period	Variable
Diagnostic Tests	Assay of stool for C. difficile toxin.
Typical Adult Therapy	Metronidazole 500 mg PO TID X 10d. OR Vancomycin 125 mg (oral preparation) QID X 10d OR Fidaxomicin 200 mg PO BID X 10d Fecal transplantation (PO or by enema) has been effective in some cases.
Typical Pediatric Therapy	Vancomycin 2 mg/kg (oral preparation) QID X 10d
Clinical Hints	Fever, leukocytosis, abdominal pain; mucoid or bloody diarrhea during / following antibiotic therapy; fecal leucocytes present; suspect even when mild diarrhea follows antibiotic intake.
Synonyms	Klebsiella oxytoca colitis, Pseudomembranous colitis. ICD9: 008.45 ICD10: A04.7

Clinical

Symptoms may appear as early as the first or second day of antimicrobial therapy; or as late as 10 weeks after cessation. [1]

• Occasionally, a single dose of an antimicrobial or antineoplastic agent has been implicated. [2]

The frequency of diarrhea ranges from three to as many as 20 stools per day.
• Stools may be soft or watery, but rarely demonstrate overt blood.
• Occult blood in the stool is found in approximately 25% of patients. [3]
• Abdominal pain is present in 22% of patients, fever in 28% and leukocytosis in 50%.
• Reactive polyarthritis [4] , venous thromboembolism [5] and hemolytic-uremic syndrome [6] have been reported in some cases.
• Rare instances of *Clostridium difficile* bacteremia are reported (15 published cases to 2009). [7-13] Bacteremia due to other pathogens (*Candida*, enteric bacteria) may complicate *Clostridium difficile* colitis. [14]
• Disease caused by *C. difficile* 027 is relatively severe and carries a higher mortality rate than infection by other strains. [15] [16]

Increased risk for recurrence is associated with glucocorticoids or proton-pump inhibitors, and the presence of end-stage renal disease. [17]

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Common cold

Agent	VIRUS - RNA. Picornaviridae. Rhinoviruses, Coronavirus, et al.
Reservoir	Human
Vector	None
Vehicle	Droplet Contact
Incubation Period	1d - 3d
Diagnostic Tests	Viral culture and serology are available, but not practical.
Typical Adult Therapy	Supportive; Pleconaril under investigation
Typical Pediatric Therapy	As for adult
Clinical Hints	Nasal obstruction or discharge, cough and sore throat are common; fever >38 C unusual in adults; illness usually lasts one week, occasionally two.
Synonyms	Acute coryza, Raffreddore. ICD9: 079,460 ICD10: J00

Clinical

In young adults, the common cold runs its course in an average of 7 days.

Fever is uncommon, and in most cases, rhinorrhea and nasal obstruction predominate. [1]
• Sore throat, cough and hoarseness are often present.
• The nasal tip is often red, and mucoid secretions and a glistening nasal mucosa are evident.
• The pharynx may be mildly edematous and erythematous, but without exudate.

Complications include bacterial sinusitis, otitis media, exacerbation of chronic bronchitis and precipitation of asthma. [2]
• Rare instances of pneumonia have been attributed to infection by Coronavirus strains OC43 and 229E.
• Severe symptoms, including bronchiolitis are associated with Coronavirus HCoV-NL63 infection in young children.

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Conjunctivitis - inclusion

Agent	BACTERIUM. Chlamydiae, Chlamydia trachomatis
Reservoir	Human
Vector	None
Vehicle	Infected secretions Sexual contact Water (swimming pools)
Incubation Period	5d - 12d
Diagnostic Tests	Demonstration of chlamydiae on direct fluorescence or culture of exudate.
Typical Adult Therapy	Secretion precautions. Topical Erythromycin. Erythromycin 250 mg PO QID. X 14 days OR Doxycycline 100 mg PO BID X 14 days
Typical Pediatric Therapy	Secretion precautions. Topical Erythromycin. Azithromycin 1 g PO as single dose. Alternative If age >8 years, Doxycycline 100 mg PO BID X 7 days.
Clinical Hints	Ocular foreign body sensation, photophobia and discharge which may persist for months to as long as 2 years; keratitis and conjunctival follicles may be evident.
Synonyms	Inclusion conjunctivitis, Paratrachoma. ICD9: 077.0 ICD10: P39.1,A74.0

Clinical

Ophthalmia neonatorum caused by *Chlamydia* is characterized by conjunctival injection without follicles. [1]

Follicular conjunctivitis in adults is most prominent on the lower lid, and the presence of bulbar follicles is highly suggestive of a Chlamydia etiology. [2]
• The infection is usually bilateral and accompanied by profuse discharge.

Parachlamydiaceae (including *Parachlamydia acanthamoebae*) have been associated with conjunctivitis, keratitis and uveitis. [3]

Trachoma may be differentiated from inclusion conjunctivitis by the presence of corneal scarring and a preference of the latter for the upper tarsal conjunctivae.

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Conjunctivitis - viral

Agent	VIRUS. Picornavirus, Adenovirus
Reservoir	Human
Vector	None
Vehicle	Contact
Incubation Period	1d - 3d
Diagnostic Tests	Viral isolation is available but rarely practical.
Typical Adult Therapy	Supportive
Typical Pediatric Therapy	As for adult
Clinical Hints	Watery discharge, generalized conjunctival injection and mild pruritus; may be associated with an upper respiratory infection.
Synonyms	Apollo conjunctivitis, Apollo eye, Congiuntivite virale, Hemorrhagic conjunctivitis, Viral conjunctivitis. ICD9: 077.1,077.2,077.3,077.4,077.8,372.0 ICD10: B30,B30.3,H10

Clinical

The symptoms of viral conjunctivitis include erythema, itching and lacrimation.
• The presence of large quantities of pus may suggest a bacterial etiology. [1] [2]

Hemorrhagic conjunctivitis is characterized by sudden onset of painful, swollen, red eyes with subconjunctival hemorrhaging, palpebral follicles, photophobia, foreign body sensation, eyelid edema, punctate keratitis, and excessive tearing. [3] [4]
• Symptoms usually persist for 3 to 5 days.

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Cryptococcosis

Agent	FUNGUS - Yeast. Basidiomycota, Hymenomycetes, Sporidiales: Cryptococcus neoformans
Reservoir	Pigeon Soil
Vector	None
Vehicle	Air
Incubation Period	Variable
Diagnostic Tests	Fungal culture and stains. Latex test for fungal antigen in CSF and serum. Nucleic acid amplification.
Typical Adult Therapy	Amphotericin B 0.3 mg/kg/d X 6w (+/- Flucytosine); then 0.8 mg/kg qod X 8w. OR Fluconazole 200 mg/d
Typical Pediatric Therapy	Amphotericin B 0.3 mg/kg/d X 6w (+/- Flucytosine); then 0.8 mg/kg qod X 8w. OR Fluconazole 3 mg/kg/d
Clinical Hints	Chronic lymphocytic meningitis or pneumonia in an immune-suppressed patient; meningitis may be subclinical, or "wax and wane" - nuchal rigidity absent or minimal; bone, skin, adrenals, liver, prostate and other sites may be infected.
Synonyms	Busse-Buschke disease, Cryptococcus, European blastomycosis, Torulosis. ICD9: 117.5,321.0 ICD10: B45

Clinical

Central nervous system infection:
Central nervous system infection may be acute or gradual in onset, with acute manifestations most common in immunosuppressed patients (eg, with AIDS). [1]
• Often, the onset is characterized by waxing and waning manifestations over weeks to months, interspersed by asymptomatic periods.
• Complaints may be mild and nonspecific, and consist of headache, nausea, dizziness, irritability, somnolence, confusion, or obtundation. [2]
• Decreased visual acuity, diplopia, and facial weakness may be evident.
• Fever is often absent, and patients have minimal or no nuchal rigidity.
• Papilledema is noted as many as one third of cases, and cranial nerve palsies in 20%. Bilateral amaurosis [3] [4] and bilateral ophthalmoplegia [5] have also been reported.
• Hyperreflexia, choreoathetoid movements or myoclonic jerks may be present.
• Elevated CSF protein concentrations are present in 50%, hypoglycorrhachia in 33% and pleocytosis above 20 cells per cu. Mm. In 20%.
• Cerebrospinal fluid [6] or peripheral blood eosinophilia may be present. [7] [8]

Respiratory tract infection:
Respiratory tract cryptococcosis may be asymptomatic, or limited to a mild productive cough with blood-streaked sputum and minor ache in the chest. [9] [10]
• Pulmonary infection may present as a single rounded lesion, lobar pneumonia, cavitation [11] , bronchiolitis obliterans [12] or miliary disease. [13] [14]
• Rales or pleural friction rub are unusual, and pleural effusions are uncommon.
• Pulmonary infection in immunocompetent patients may progress or regress spontaneously over long periods.
• Cryptococcosis among patients with AIDS often presents as a solitary cavitary pulmonary nodule. [15]
• Concurrent CNS infection may be evident in some cases.
• Rare instances of laryngeal cryptococcosis are reported. [16-19]

One-half of AIDS patients with cryptococcal meningitis have concurrent pulmonary involvement, and two-thirds are fungemic. [20]
• Initial cough and dyspnea are found in 5 to 25% of HIV-positive patients with cryptococcosis.
• Cryptococcal immune reconstitution inflammatory syndrome may present as a clinical worsening of cryptococcal disease after initiation of antiretroviral therapy. [21]

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• Case-fatality rates for treated cryptococcosis in AIDS patients are 10% to 25%.
• Concurrent diabetes is associated with a poor prognosis in HIV-positive patients with cryptococcal meningitis. [22]

The clinical features of *Cryptococcus gattii* infection are similar to those of *C. neoformans* infection. [23]
• *C. gattii* infections usually involve the lungs (75 percent), although neurological (8 percent) and combined (9 percent) infections are seen. [24]
• Blindness due to high cerebrospinal fluid pressure, optic neuropathy or endophthalmitis, is relatively common among immunocompetent individuals infected with *C. gattii*. [25]

Cryptococcosis may involve a variety of other sites including skin [26-39] and soft tissues [40-44], blood stream [45-47], colon or intestine [48-51], gall bladder and bile ducts [52] [53], liver, peritoneum [54-57], lymph nodes [58-61], bones and joints [62-70], breasts, pericardium, ventriculo-peritoneal shunt [71] [72], genital tract [73-75], prostate [76], placenta (without neonatal involvement) [77], adrenals [78] [79], eyes [80] [81], parotid glands [82], tongue [83] [84], larynx [85] [86] and retropharyngeal space. [87]

The cutaneous features of cryptococcosis include papules, pustules, nodules, subcutaneous swelling, abscesses, molluscum contagiosum-like or tumor-like lesions [88], cellulitis, blisters, ulcers and very rarely, necrotizing fasciitis [89]
• Primary cutaneous cryptococcosis may occur in persons working with birds. [90]

Note: *Cryptococcus neoformans* is one of at least a dozen *Cryptococcus* species. See the Microbiology • Yeasts module.

Cryptococcosis in Zambia

A hospital in Lusaka reported 230 cases of cryptococcal meningitis in AIDS patients during a single year - 100% fatal (2001 publication) [91]

Prevalence surveys:

19.5% of central nervous system infections among HIV-positive patients (2014 publication) [92]

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Cryptosporidiosis

Agent	PARASITE - Protozoa. Apicomplexa, Eimeriida: Cryptosporidium hominis and C. parvum (rarely C. muris, felis, meleagridis, et al).
Reservoir	Mammal (over 150 species)
Vector	None
Vehicle	Water Feces Oysters Fly
Incubation Period	5d - 10d (range 2d - 14d)
Diagnostic Tests	Stool/duodenal aspirate for acid-fast, direct fluorescence staining, or antigen assay. Nucleic acid amplification
Typical Adult Therapy	Stool precautions. Nitazoxanide 500 mg PO BID X 3 days
Typical Pediatric Therapy	Stool precautions. Nitazoxanide: 1 to 3 years: 100 mg PO BID X 3 days 4 to 11 years: 200 mg PO BID X 3 days >12 years: 500 mg PO BID X 3 days
Clinical Hints	Watery diarrhea, vomiting, abdominal pain; although self-limited in healthy subjects, this is a chronic and wasting illness and may be associated with pulmonary disease among immunosuppressed (e.g., AIDS) patients.
Synonyms	Cryptosporidium, Cryptosporidium andersoni, Cryptosporidium chipmunk genotype, Cryptosporidium cunulicus, Cryptosporidium fayeri, Cryptosporidium felis, Cryptosporidium hedgehog genotype, Cryptosporidium hominis, Cryptosporidium meleagridis, Cryptosporidium parvum, Cryptosporidium pestis, Cryptosporidium suis, Cryptosporidium tyzzeri, Cryptosporidium ubiquitum, Cryptosporidium viatorum, Kryptosporidiose. ICD9: 007.4 ICD10: A07.2

Clinical

Cryptosporidiosis affects the gastrointestinal tract and may be asymptomatic or associated with watery diarrhea and abdominal cramps.
• Fever and anorexia are uncommon, and fecal leukocytes are not seen.
• Although vomiting is not common among adults, it is often encountered in children. [1]

Rare instances of pulmonary infection [2-4] and post-infectious hemolytic-uremic syndrome have been reported. [5]

There is some evidence that *Cryptosporidium hominis* infection in children is associated with diarrhea, nausea, vomiting, general malaise, and increased oocyst shedding intensity and duration.
• In contrast, infections caused by *C. parvum*, *C. meleagridis*, *C. canis*, and *C. felis* are associated with diarrhea only.

Illness persists for 1 to 20 days (mean 10) in immunocompetent individuals
• Protracted, severe diarrhea leading to malabsorption, dehydration, extraintestinal (ie, biliary or pulmonary [6-8]) and fatal infection may develop in immunocompromised individuals. [9] [10]

Cryptosporidiosis in Zambia

Prevalence surveys:

18% of childhood diarrhea in Lusaka (1995 to 1996) [11]
8.6% of schoolchildren in Southern Province (2005 publication) [12]
28.0% of pre-schoolchildren in Kafue District (2007) [13]
30.7% of pre-schoolchildren in Kafue (2007) [14]
26% of malnourished children with diarrhea (2001 publication) [15]
21% of patients with persistent diarrhea (1997 publication) [16]
2.2% of AIDS patients with diarrhea (1992 publication) [17]

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4% to 4.7% of HIV-positive patients with diarrhea (Lusaka, 1992 to 1993) [18]
14% of HIV-positive schoolchildren with diarrhea, vs. 6% of HIV-negative controls (1995 publication) [19]
34% of dairy calves and 6% of asymptomatic dairy farm workers (2007 publication) [20]
0% of dairy calves (PCR, 2011 publication) [21]
44.2% of pigs in Lusaka (2012 publication) [22]

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Cutaneous larva migrans

Agent	PARASITE - Nematoda. Secernentea: Ancylostoma braziliense, A. caninum, Bunostomum phlebotomum, Strongyloides myopotami
Reservoir	Cat Dog Cattle
Vector	None
Vehicle	Soil Contact
Incubation Period	2d - 3d (range 1d - 30d)
Diagnostic Tests	Biopsy is usually not helpful.
Typical Adult Therapy	Albendazole 200 mg BID X 3d OR Ivermectin 200 micrograms/kg as single dose. OR Thiabendazole topical, and oral 25 mg/kg BID X 5d (max 3g).
Typical Pediatric Therapy	Albendazole 2.5 mg/kg BID X 3d OR Ivermectin 200 micrograms/kg once OR Thiabendazole topical, and oral 25 mg/kg BID X 5d (max 3g).
Clinical Hints	Erythematous, serpiginous, pruritic advancing lesion(s) or bullae - usually on feet; follows contact with moist sand or beach front; may recur or persist for months.
Synonyms	Creeping eruption, Pelodera, Plumber's itch. ICD9: 126.2,126.8,126.9 ICD10: B76.9

Clinical

Cutaneous larva migrans is characterized by one or more erythematous linear, vesicular or bullous [1] lesions which tend to be raised and palpable. [2-4]

- The lesions are intensely pruritic and extend in length from day to day. [5]
- The site of the lesions reflects contact with sand / soil, as from walking barefoot or lying on a beach. [6]
- Infection may persist for over one year. [7]

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Cyclosporiasis

Agent	PARASITE - Protozoa. Apicomplexa, Eimeriida: Cyclospora cayetanensis
Reservoir	Human ? Non-human primate
Vector	None
Vehicle	Water Vegetables
Incubation Period	1d - 11d
Diagnostic Tests	Identification of organism in stool smear. Cold acid fast stains and ultraviolet microscopy may be helpful.
Typical Adult Therapy	Sulfamethoxazole/trimethoprim 800/160 mg BID X 7d Ciprofloxacin 500 mg PO BID X 7 d (followed by 200 mg TIW X 2 w) has been used in sulfa-allergic patients
Typical Pediatric Therapy	Sulfamethoxazole/trimethoprim 10/2 mg/kg BID X 7d
Clinical Hints	Watery diarrhea (average 6 stools daily), abdominal pain, nausea, anorexia and fatigue lasting up to 6 weeks (longer in AIDS patients); most cases follow ingestion of contaminated water in underdeveloped countries.
Synonyms	Cryptosporidium muris, Cyanobacterium-like agent, Cyclospora. ICD9: 007.5 ICD10: A07.8

Clinical

Symptoms appear abruptly in 68% of cases
• Patients usually present with intermittent watery diarrhea, with up to eight or more stools per day. [1] [2]
• Other symptoms may include anorexia, nausea, abdominal cramps, bloating, flatulence, mild to moderate weight loss, fatigue, and myalgia.
• Fever is rare.

In the immunocompetent patient, the diarrhea may last from a few days to up to three months, with the organism detectable in the stool for up to two months.
- In immune compromised individual, particularly AIDS patients, the disease can persist for weeks to several months.

Reactive arthritis syndrome (Reiter's syndrome) has been associated with progression of the disease. [3]

Acalculous *Cyclospora* cholecystitis has been demonstrated in a patient with AIDS.

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Cysticercosis

Agent	PARASITE - Platyhelminthes, Cestoda. Cyclophyllidea, Taeniidae: Taenia solium
Reservoir	Pig Human
Vector	None
Vehicle	Soil (contaminated by pigs) Fecal-oral Fly
Incubation Period	3m - 3y
Diagnostic Tests	Serology (blood or CSF) and identification of parasite in biopsy material.
Typical Adult Therapy	Albendazole 400 mg PO BID X 30d. OR Praziquantel 30 mg/kg TID X 14d (15 to 30d for neurocysticercosis). Combination of Albendazole + Praziquantel may be superior for neurocysticercosis. Surgery as indicated Add corticosteroids if brain involved.
Typical Pediatric Therapy	Albendazole 15 mg/kg PO BID X 30d. OR Praziquantel 30 mg/kg TID X 14d (15 to 30d for neurocysticercosis). Combination of Albendazole + Praziquantel may be superior for neurocysticercosis. Surgery as indicated Add corticosteroids if brain involved.
Clinical Hints	Cerebral, ocular or subcutaneous mass; usually no eosinophilia; calcifications noted on X-ray examination; lives in area where pork is eaten; 25% to 50% of patients have concurrent *Taenia* infestation.
Synonyms	Taenia crassiceps, Taenia martis. ICD9: 123.1 ICD10: B69

Clinical

Cysticercosis is manifest as painless, rubbery (average 2 cm) nodules in skin and soft tissues, or other body sites. [1-3]
• "Rice grain" calcifications are often visible on routine roentgenograms of soft tissue, notably the pelvis and upper legs.
• Cysts have been reported in the breast [4-8], pharynx [9] [10], tongue [11-16], lips [17-20], heart [21] [22], thyroid [23] [24], carpal tunnel [25] and forearm muscles [26], oral cavity [27], lacrimal sac [28], masseter and temporalis muscles [29-36], spleen, pancreas [37] [38], kidneys [39-41], liver [42] [43] and virtually every other area of the body. [44-55]
• Cysticercosis involving the breast, subcutaneous tissues or lymph nodes may mimic malignancy or tuberculous lymphadenitis. [56-61]
• Rare instances of cysticercosis are reported among infants and young children. [62-64]

Cysticercosis of the central nervous system:

Central nervous system infection may present as seizures, increased intracranial pressure or hydrocephalus [65-68], altered mental status, reversible dementia [69], eosinophilic meningitis [70], ventriculitis [71], intrasellar mass [72], focal neurological defects, isolated monocular blindness [73], stroke [74], intramedullary [75-82] or extramedullary spinal mass [83-92], quadriplegia [93], Brown-Sequard syndrome [94], pseudobulbar palsy [95], spinal subarachnoid infection [96] or encephalitis. [97-99]
• Cysts may be either parenchymal or extraparenchymal (racemose). [100]
• In humans, cysticerci are more frequently located in the ventricles and subarachnoid space at the base of the brain, while in pigs, cysticerci are more frequently found in the parenchyma. [101]
• Parenchymal infestation and epilepsy are most common among children, while ventricular cysts with blockage of cerebrospinal fluid predominates among adults. [102]
• There is evidence suggesting a relationship between neurocysticercosis and the subsequent development of brain tumors. [103]

Cysticercosis of the eyes:

The eyes are infested in 15% to 45% of patients [104] [105], usually presenting as a cyst in the vitreous cavity. [106-108], less commonly the anterior chamber. [109] [110]
• The first ophthalmologic signs of cysticercosis are papilledema, pupillary abnormalities, or nystagmus. [111]

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• Cysticercosis of the extraocular muscles is associated with limitation of eye movement, ptosis, proptosis and local mass. [112-119]

Cysticercosis in Zambia

Prevalence surveys:

5.8% of individuals in eastern Zambia (antigenemia, 2012 publication) [120]
12.2% to 14.5% of individuals in Eastern Province (antigenemia, 2013 publication) [121]
23.2% of persons with epilepsy, in Eastern Province (antigenemia, 2015 publication) [122]

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Cytomegalovirus infection

Agent	VIRUS - DNA. Herpesviridae, Betaherpesvirinae: Human herpesvirus 5 (Cytomegalovirus)
Reservoir	Human
Vector	None
Vehicle	Droplet (respiratory) Urine Dairy products Tears Stool Sexual contact (rare) Transplacental Breastfeeding
Incubation Period	3w - 5w (range 2w - 12w)
Diagnostic Tests	Viral culture (blood, CSF, urine, tissue). Serology. Direct viral microscopy. Nucleic acid amplification
Typical Adult Therapy	(Most cases self-limited). Ganciclovir 5 mg/kg q12h IV X 2 to 3w. OR Foscarnet 90 mg/kg Q12h IV OR Cidofovir 5 mg/kg IV weekly
Typical Pediatric Therapy	(Most cases self-limited) Ganciclovir 5 mg/kg q12h IV X 2 to 3w
Vaccine	Cytomegalovirus immunoglobulin
Clinical Hints	Heterophile-negative "mononucleosis"; mild pharyngitis (without exudate); variable lymphadenopathy and splenomegaly; retinitis in AIDS patients; pneumonia in setting of immune suppression.
Synonyms	Cytomegalovirus, Zytomegalie. ICD9: 078.5 ICD10: B25

Clinical

Acute Cytomegalovirus infection is clinically similar to infectious mononucleosis (IM), and characterized by fever, generalized lymphadenopathy and hepatosplenomegaly. [1]

• In contrast to IM, pharyngitis is uncommon in Cytomegalovirus infection.

• Cytomegalovirus infection is often identified in cases of fatal myocarditis in immunocompetent patients. [2]

• Primary CMV infection may be associated with uveitis [3] , retinitis or pneumonia [4] • even in immunocompetent patients [5] [6]

• Additional manifestations of CMV infection may include prostatitis [7] , cervicitis, vulvovaginitis [8] , adrenal failure [9] , protracted diarrhea [10] , esophagitis [11] , gastritis [12] , duodenitis / enteritis [13] [14] , colitis with megacolon [15] [16] , appendicitis [17] , colonic pseudotumor [18] or colonic polyposis [19] , pancreatitis [20] , myocarditis [21] , rhabdomyolysis [22] and protein-loosing gastropathy (Menterier's disease). [23]

• Sexually-acquired Cytomegalovirus proctitis is characterized by rectal bleeding associated with a mononucleosis-like syndrome. [24]

• The clinical features of Cytomegalovirus colitis in AIDS patients may mimic those of amebic colitis [25] [26] or Crohn's disease. [27]

• Cases of pruritic maculo-papular exanthem due to CMV infection are reported among patients with AIDS. [28]

• Evidence for primary CMV infection is often present among infants hospitalized for wheezing. [29]

• Ocular infection may present as inflammatory ocular hypertensive syndrome (IOHS), corneal endothelitis [30] , or retinitis with retinal necrosis. [31-33]

• Rare instances of splenic rupture [34] and erythema multiforme complicating Cytomegalovirus infection have been reported. [35] [36]

• CMV / EBV co-infection may be associated with prolonged illness. [37]

Severe or fatal multisystem disease is encountered in congenital infection [38-44] and infection of immune-suppressed individuals. [45-48]

• Instances of pure red-cell aplasia [49] , severe leukemoid reaction [50] , and hemophagocytic syndrome have been reported. [51]

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• Sensorineural hearing loss [52-54] is detected in 10% to 21% of asymptomatic and 7% to 33% of symptomatic congenital infections [55-60] A meta-analysis published in 2014 identified hearing loss in 12.6% of children with congenital CMV infection, and noted that CMV is responsible for 10% to 20% of hearing impairment among children. [61]
• Residual neurological damage including epilepsy is common among infants with congenital infection. [62]
• Rare instances of persistent pulmonary hypertension have been reported in infants with congenital infection. [63]

Immunocompetent persons may also develop major complications [64] : cerebral sinus thrombosis [65] [66] ; peripheral venous [67-76] , mesenteric [77-81] or portal vein thrombosis [82-96] , colitis [97] [98] , transverse myelitis [99] , hemolytic anemia [100] , hemophagocytic lymphohistiocytosis [101] , rhabdomyolysis [102-104] , prostatitis [105] , appendicitis [106] and cholecystitis. [107]

Cytomegalovirus infection in Zambia

Prevalence surveys:

3.8% of neonates (congenital infection, 2013 publication) [108]
6.0% of central nervous system infections among HIV-positive patients (PCR, 2014 publication) [109]
41.3% of infants ages 3 weeks to 2 years (DNAemia, 2014 publication) [110]

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Dengue

Agent	VIRUS - RNA. Flaviviridae, Flavivirus: Dengue virus
Reservoir	Human Mosquito ? Monkey (in Malaysia and Africa)
Vector	Mosquito - Stegomyia (Aedes) aegypti, S. albopictus, S. polynesiensis, S. scutellaris
Vehicle	Blood Breastfeeding
Incubation Period	5d - 8d (range 2d - 15d)
Diagnostic Tests	Viral isolation (blood). Serology. Nucleic acid amplification. Biosafety level 2.
Typical Adult Therapy	Supportive; IV fluids to maintain blood pressure and reverse hemoconcentration
Typical Pediatric Therapy	As for adult
Vaccine	Dengue vaccine
Clinical Hints	Headache, myalgia, arthralgia, relative bradycardia, leukopenia and macular rash; dengue hemorrhagic (DHF) = dengue + thrombocytopenia and hemoconcentration; dengue shock = DHF + hypotension.
Synonyms	Bouquet fever, Break-bone fever, Dandy fever, Date fever, Dengue Fieber, Duengero, Giraffe fever, Petechial fever, Polka fever. ICD9: 061 ICD10: A90,A91

Clinical

WHO Case definitions for surveillance (1997):
1. DENGUE FEVER:
Clinical description
• An acute febrile illness of 2-7 days duration with 2 or more of the following: headache, retro-orbital pain, myalgia, arthralgia (as many as 41% of cases [1] , rash, hemorrhagic manifestations, leucopenia.
Laboratory criteria for diagnosis • One or more of the following:
• Isolation of dengue virus from serum, plasma, leukocytes, or autopsy samples
• Demonstration of a fourfold or greater change in reciprocal IgG or IgM antibody titers to one or more dengue virus antigens in paired serum samples
• Demonstration of dengue virus antigen in autopsy tissue by immunohistochemistry or immunofluorescence or in serum samples by EIA
• Detection of viral genomic sequences in autopsy tissue, serum or CSF samples by polymerase chain reaction (PCR)
Case classification
• Suspected: A case compatible with the clinical description.
• Probable: A case compatible with the clinical description with one or more of the following:
• Supportive serology (reciprocal hemagglutination-inhibition antibody titer >1280, comparable IgG EIA titer or positive IgM antibody test in late acute or convalescent-phase serum specimen).
• Occurrence at same location and time as other confirmed cases of dengue fever.
• Confirmed: A case compatible with the clinical description, laboratory confirmed.

2. DENGUE HEMORRHAGIC FEVER:
A probable or confirmed case of dengue and hemorrhagic tendencies evidenced by one or more of the following:
• Positive tourniquet test (sensitivity questioned • see reference [2])
• Petechiae, ecchymoses or purpura
• Bleeding: mucosa, gastrointestinal tract, injection sites or other
• Hematemesis or melena
• And thrombocytopenia (100 000 cells or less per mm3)
• And evidence of plasma leakage due to increased vascular permeability, manifested by one or more of the following:
• 20% rise in average hematocrit for age and sex
• 20% drop in hematocrit following volume replacement treatment compared to baseline
• signs of plasma leakage (pleural effusion, ascites, hypoproteinemia)

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3. DENGUE SHOCK SYNDROME:
All the above criteria, plus evidence of circulatory failure manifested by rapid and weak pulse, and narrow pulse pressure (<=20 mm Hg) or hypotension for age, cold, clammy skin and altered mental status.

In 2009, WHO introduced the designations Dengue and Severe Dengue. These will replace the 1997 designations (above) of Dengue Fever, Dengue Hemorrhagic Fever and Dengue Shock Syndrome: [3]

CDC case definition:
For surveillance purposes, the U.S. Centers for Disease Control (CDC) case definition of dengue fever consists of "acute febrile illness characterized by frontal headache, retro-ocular pain, muscle and joint pain, and rash."
• The initial fever rises rapidly and lasts for two to seven days.
• Occasionally "saddleback" fever pattern is evident, with a drop after a few days and rebound within 24 hours. [4] Relative bradycardia is common. [5]
• Conjunctival injection and pharyngeal inflammation may occur as well as lymphadenopathy.
• Rash occurs in up to 50 percent of patients, either early in the illness with flushing or mottling, or between the 2nd to the 6th day as a scarlatiniform or maculopapular rash that usually spreads centrifugally.
• The later rash usually lasts for two to three days.
• Diffuse erythema and late desquamation of hands and feet may be confused with toxic shock syndrome.
• As fever drops, petechiae may be seen.
• Additional manifestations of dengue may include post-dengue depression, acalculous cholecystitis, uveitis, retinitis and psychological depression.

Additional clinical features:
• The likelihood of encountering classic clinical findings of dengue fever increases with patient age. [6]
• The rash of dengue may be mistaken for measles or rubella. [7]
• A long time interval between attacks of dengue may actually increase the risk of dengue hemorrhagic fever. [8]
• Rare instances of encephalopathy or encephalitis [9-11], seizures, sensorineural hearing loss [12], splenic rupture [13] [14], pancreatitis [15] myocarditis, pericarditis [16] [17], hemophagocytic lymphohistiocytosis [18] [19] and aplastic anemia have been reported. [20]
• Hepatic dysfunction is often encountered [21-23]; however, overt hepatitis is less common [24], and over liver failure is rare. [25]
• Retinal involvement may manifest as macular neuroretinopathy [26] or foveolitis. [27]
• Prolonged post-dengue fatigue is common. [28]
• Renal failure is associated with increased mortality rates in dengue. [29] [30]
• Risk factors for fatal dengue hemorrhagic fever among elderly patients in include male sex, chronic obstructive pulmonary disease, dengue shock syndrome and acute renal failure. [31]

The diagnosis of Dengue Hemorrhagic Fever (DHF) is defined by [32]
• thrombocytopenia (<100,000/mm3)
• evidence of plasma leakage (hematocrit increased by at least 20%) or other objective evidence of increased capillary permeability
• Dengue Shock Syndrome (DSS) consists of DHF in addition to hypotension or narrow pulse pressure (less than 21 mm Hg). [33]

Note that Leptospirosis [34], Zika, Malaria [35], Crimean-Congo hemorrhagic fever [36], Mayaro [37] and dengue are clinically similar, and may coexist in a given country. Fatal cases of leptospirosis / dengue co-infection are reported (2014 publication). [38]
• Although the clinical features of dengue and chikungunya are similar, chikungunya patients are more likely to exhibit early myalgia or arthralgia; while sore throat, cough, nausea, vomiting, diarrhea, abdominal pain [39], anorexia, tachycardia and thrombocytopenia will favor a diagnosis of dengue. [40]
• Dengue-Zika [41], Dengue-Chikungunya [42-44], Dengue-Typhoid [45] and Dengue-Mayaro co-infections may occur in regions which are endemic for these diseases. [46]
• Elevated levels of serum bilirubin or C-reactive protein favor a diagnosis of malaria rather than dengue. [47]

Dengue in Zambia

Seroprevalence surveys:
4.1% of individuals in Western and North-Western Provinces (2014 publication) [48]
4.1% of individuals in Western and North-Western Provinces (2015 publication) [49]

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Dermatophytosis

Agent	FUNGUS. Ascomycota, Euascomyces, Onygenales: Epidermophyton, Microsporum, Trichophyton, Trichosporon spp., Arthroderma, et al
Reservoir	Human Dog Cat Rabbit Marsupial Other mammal
Vector	None
Vehicle	Contaminated soil/flooring Animal Contact
Incubation Period	2w - 38w
Diagnostic Tests	Fungal culture and microscopy of skin, hair or nails. Nucleic acid amplification.
Typical Adult Therapy	Skin - topical Clotrimazole, Miconazole, etc. Hair/nails - Terbinafine, Griseofulvin, Itraconazole or Fluconazole PO
Typical Pediatric Therapy	As for adult
Clinical Hints	Erythematous, circinate, scaling or dyschromic lesions of skin, hair or nails; pruritus, secondary infection and regional lymphadenopathy may be present.
Synonyms	Arthroderma, Dermatomicose, Dermatomycose, Dermatomycosis, Dermatomykose, Dermatomykosen, Emericella, Favus, Granuloma trichophyticum, Gruby's disease, Kodamaea, Leukonychia trichophytica, Microsporum, Nattrassia, Onychocola, Onychomycosis, Pityriasis versicolor, Ringworm, Saint Aignan's disease, Scopulariopsis, Scytalidium, Tinea, Tinea barbae, Tinea capitis, Tinea corporis, Tinea cruris, Tinea favosa, Tinea imbricata, Tinea manum, Tinea pedis, Tinea unguinum, Tokelau ringworm, Triadelphia pulvinata, Trichomycosis, Trichophytosis, Trichophytosis gladiatorum. ICD9: 110,111 ICD10: B35,B36

Clinical

Dermatophytosis is characterized by indolent infection of skin, hair or nails. [1] [2]

Common findings include scaling, pruritis and discoloration • usually without overt signs of inflammation.

Tinea imbricata, a superficial mycosis caused by *Trichophyton concentricum*, an anthropophilic dermatophyte.
• The skin lesions are characteristically concentric and lamellar (imbricata: in Latin, tiled) plaques of scale. [3]
• Predisposing conditions include humidity, inheritance, and immunologic factors. [4]

Rare instances of mycetoma of the scalp due to *Microsporum canis* have been reported. [5]

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Dientamoeba fragilis infection

Agent	PARASITE - Protozoa. Metamonada, Parabasala, Trichomonadea. Flagellate: Dientamoeba fragilis
Reservoir	Human Gorilla Pig
Vector	None
Vehicle	Fecal-oral (? on pinworm ova)
Incubation Period	8d - 25d
Diagnostic Tests	Identification of trophozoites in stool. Nucleic acid amplification. Alert laboratory if this diagnosis is suspected.
Typical Adult Therapy	Stool precautions. Iodoquinol 650 mg PO TID X 20d. OR Tetracycline 500 mg QID X 10d. OR Paromomycin 10 mg/kg TID X 7d OR Metronidazole 750 mg PO TID X 10d
Typical Pediatric Therapy	Stool precautions. Iodoquinol 13 mg/kg PO TID X 20d. OR (age >8) Tetracycline 10 mg/kg QID X 10d OR Paromomycin 10 mg/kg TID X 7d OR Metronidazole 15 mg/kg PO TID X 10d
Clinical Hints	Abdominal pain with watery or mucous diarrhea; eosinophilia may be present; infestation may persist for more than one year.
Synonyms	

Clinical

Most infections are asymptomatic.

• Symptoms may include diarrhea, flatulence, abdominal pain, fatigue and anorexia; and may rarely mimic acute appendicitis. [1-4]

• There appears to be an etiological role for *Dientamoeba fragilis* among children with abdominal pain. [5] [6]

• Clinical features are similar to those of giardiasis; however, vomiting, anorexia and weight loss are less common in *Dientamoeba* infection. [7]

• The presence of abdominal pain or diarrhea in a patient with enterobiasis should suggest the diagnosis of concurrent *Dientamoeba* infection. [8]

• Eosinophilia if often associated with *Dientamoeba fragilis* infection. [9-13]

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Diphtheria

Agent	BACTERIUM. Corynebacterium diphtheriae A facultative gram-positive bacillus
Reservoir	Human
Vector	None
Vehicle	Droplet Contact Dairy products Clothing
Incubation Period	2d - 5d (range 1d - 10d)
Diagnostic Tests	Culture on special media. Advise laboratory when this diagnosis is suspected.
Typical Adult Therapy	Respiratory isolation. Equine antitoxin 20,000 to 80,000 units IM. (first perform scratch test) Erythromycin 500 mg QID (or Penicillin preparation) X 14d
Typical Pediatric Therapy	Respiratory isolation. Equine antitoxin 1,000 units/kg IM. (first perform scratch test) Erythromycin 10 mg/kg QID (or penicillin preparation) X 14d
Vaccines	Diphtheria antitoxin Diphtheria vaccine DTP vaccine DT vaccine DTaP vaccine Td vaccine
Clinical Hints	Pharyngeal membrane with cervical edema and lymphadenopathy; or punched out skin ulcers with membrane; myocarditis or neuropathy (foot/wrist drop) appears weeks later.
Synonyms	Corynebacterium diphtheriae, Difteri, Difteria, Difterie, Difterite, Diphterie. ICD9: 032 ICD10: A36

Clinical

WHO Case definition for surveillance:
Clinical description
• An illness of the upper respiratory tract characterized by laryngitis or pharyngitis or tonsillitis, and adherent membranes of tonsils, pharynx and/or nose
Laboratory criteria for diagnosis
• Isolation of *Corynebacterium diphtheriae* from a clinical specimen.
• Note: A rise in serum antibody (fourfold or greater) is of interest only if both serum samples were obtained before administration of diphtheria toxoid or antitoxin. This is not usually the case in surveillance, where serological diagnosis of diphtheria is thus unlikely to be an issue.
Case classification
• Suspected: Not applicable.
• Probable: A case that meets the clinical description.
• Confirmed: A probable case that is laboratory confirmed or linked epidemiologically to a laboratory confirmed case.
Note: Persons with positive *C. diphtheriae* cultures who do not meet the clinical description (i.e. asymptomatic carriers) should not be reported as probable or confirmed diphtheria cases.

Faucal diphtheria:
Following an incubation period of 2 to 5 days (7 days after primary skin infection for cutaneous diphtheria), the patient presents with nonspecific symptom which may include fever and chills, malaise, sore throat, hoarseness or dysphagia, cervical edema and lymphadenopathy, rhinorrhea (mucopurulent or blood-tinged), cough, stridor, wheezing, nausea and vomiting and headache. [1]
• Respiratory diphtheria may progress rapidly to respiratory arrest from airway obstruction by a tracheobronchial pseudomembrane.
• Tachycardia, pallor, and foul breath may be present.
• The pseudomembrane is generally firm, adherent, thick, fibrinous and of a gray-brown color.
• It may occur over the palate, pharynx, epiglottis, larynx, or trachea • occasionally extending into the tracheobronchial tree.
• The area may bleed if disturbed.

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• Marked edema of the tonsils, uvula, submandibular region and anterior neck ("bull neck) may be observed and may be associated with thick speech, stridor, anterior cervical lymphadenopathy, and petechial hemorrhages.

Cutaneous diphtheria:
Cutaneous diphtheria is associated with a history of a break in the skin, followed by pain, tenderness, erythema, or exudate.
• Lesions appear as punched-out ulcers with dirty gray membranes at their margins.
• Genital ulcers may be misdiagnosed as venereal disease. [2]

Cardiac complications:
Cardiovascular signs ensue 1 to 2 weeks following the initial illness.
• Myocarditis occurs in as many as two thirds of patients, and approximately 20% develop cardiac dysfunction.
• Circulatory collapse, heart failure, atrioventricular blocks and arrhythmias may occur.
• Endocarditis [3] and mycotic aneurysms also have been reported, typically in intravenous drug users.

Neurological complications:
Approximately 70% of patients with severe infection develop neuropathy, neuritis or motor paralysis 2 to 8 weeks following initial illness.
• Clinical and cerebrospinal fluid findings at this stage are indistinguishable from those Guillain-Barre syndrome.
• Potentially fatal paralysis of the diaphragm may ensue.
• Paralysis typically resolves completely with resolution of infection.

The neurological manifestations of diphtheria include:
• hypesthesia and paralysis of the soft palate
• weakness of the posterior pharyngeal, laryngeal, and facial nerves, resulting in a "nasal tone" to the voice, difficulty in swallowing, and occasionally aspiration
• cranial neuropathies, typically during the fifth week, leading to oculomotor and ciliary paralysis (strabismus, blurred vision, and loss of accommodation)
• symmetric polyneuropathy beginning within 10 days to 3 months after infection, and manifest as motor deficit with diminished deep tendon reflexes
• proximal muscle weakness of the extremities progressing distally (or distal weakness progressing proximally).

Other forms of diphtheria:
Other less common manifestations include infection of the genitourinary tract, gastrointestinal tract, vagina, external ear, and conjunctiva.
• Hemorrhagic conjunctivitis and dissolution of the cornea may occur. [4]
• Focal necrosis of the kidneys [5], liver, and adrenal glands may be observed.
• Cases of septic arthritis, osteomyelitis, splenic abscesses, and bacteremia have been reported.

A rare case of diphtherial urethritis was acquired through orogenital contact. [6]

Diphtheria in Zambia

Vaccine Schedule:

BCG - birth
DTwPHibHepB - 6, 10, 14 weeks
Measles - 9, 18 months
OPV - 6, 10, 14 weeks
Pneumo conj - 6, 10, 14 weeks
Rotavirus - 6, 10 weeks
Td - 1st contact pregnancy; +1, +1, +6 months; +1, +1 year

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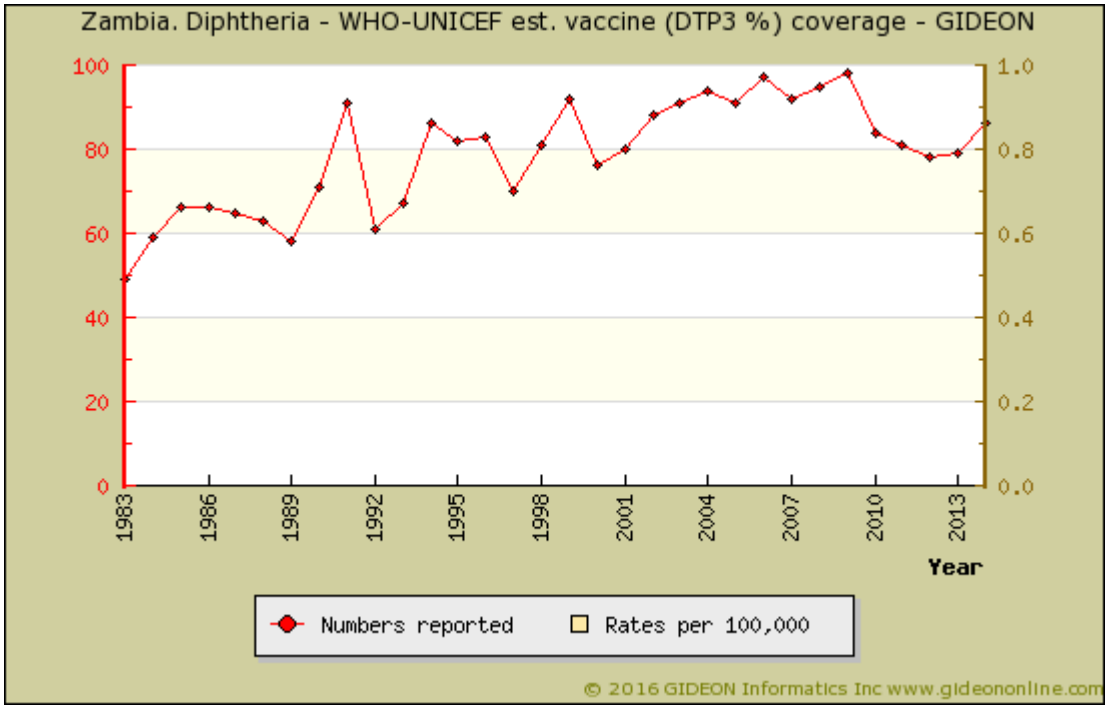
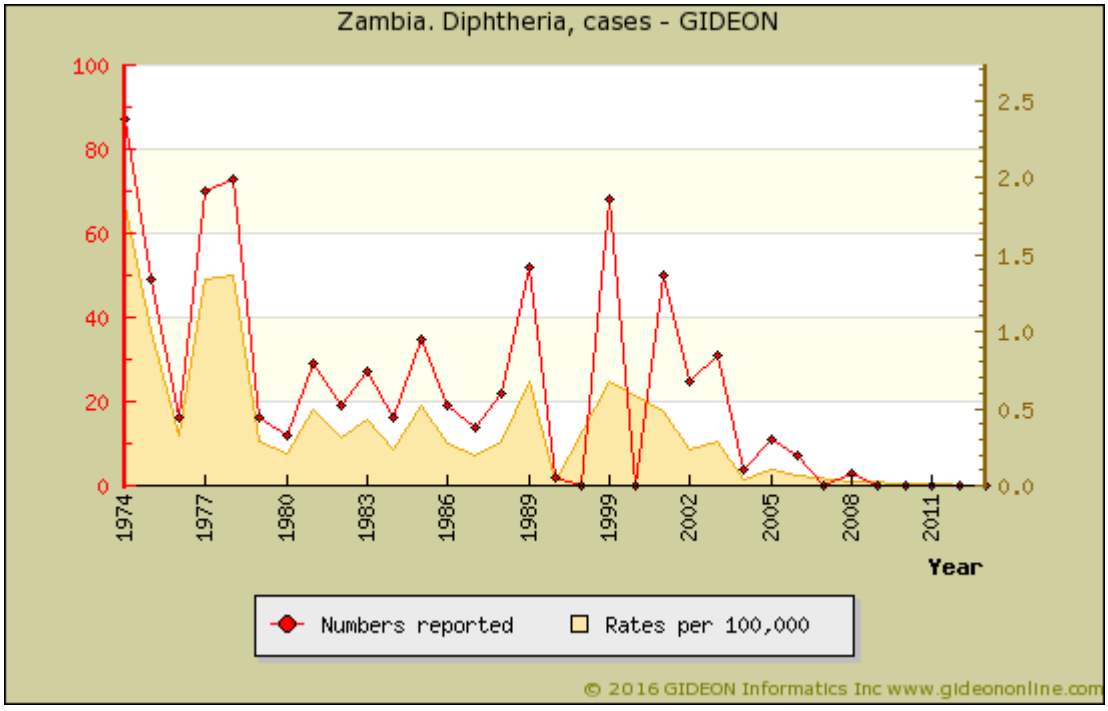


Graph: Zambia. Diphtheria - WHO-UNICEF est. vaccine (DTP3 %) coverage



Graph: Zambia. Diphtheria, cases

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Diphyllobothriasis

Agent	PARASITE - Platyhelminthes, Cestoda. Pseudophyllidea, Diphyllobothriidae: Diphyllobothrium latum, et al
Reservoir	Human Dog Bear Fish-eating mammal
Vector	None
Vehicle	Fresh-water fish - notably (for D. latum) perch, burbot and pike
Incubation Period	4w - 6w (range 2w - 2y)
Diagnostic Tests	Identification of ova or proglottids in feces.
Typical Adult Therapy	Praziquantel 10 mg/kg PO as single dose OR Niclosamide 2 g PO once
Typical Pediatric Therapy	Praziquantel 10 mg/kg PO as single dose OR Niclosamide 50 mg/kg PO once
Clinical Hints	Abdominal pain, diarrhea and flatulence; vitamin B12 deficiency is noted in 0.02% of patients; rare instances of intestinal obstruction have been described; worm may survive for decades in human intestine.
Synonyms	Adenocephalus pacificus, Bandwurmer [Diphyllobothrium], Bothriocephalus acheilongnathi, Bothriocephalus latus, Broad fish tapeworm, Diphyllobothrium latum, Diplogonoporiasis, Fish tapeworm. ICD9: 123.4 ICD10: B70.0

Clinical

Patients may experience abdominal pain, diarrhea, weight loss, asthenia or vertigo. [1]

• Vitamin B-12 deficiency is described in cases of prolonged infestation by *Diphyllobothrium latum* [2-11] (but not other *Diphyllobothrium* species [12] [13]).

A single case of human infection by *Bothriocephalus acheilongnathi* was characterized by abdominal pain (French Guiana, 2013 publication). [14]

Adenocephalus pacificus infestation has been associated with abdominal pain, diarrhea, weight loss, nausea and vomiting. Megaloblastic anemia and vitamin B12 deficiency have also been reported. [15]

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Dipylidiasis

Agent	PARASITE - Platyhelminthes, Cestoda. Cyclophyllidea, Dipylidiidae: Dipylidium caninum
Reservoir	Dog Cat
Vector	None
Vehicle	Flea = Ctenocephalides spp. (by ingestion)
Incubation Period	21d - 28d
Diagnostic Tests	Identification of proglottids in feces.
Typical Adult Therapy	Praziquantel 10 mg/kg PO as single dose OR Niclosamide 2 g PO once
Typical Pediatric Therapy	Praziquantel 10 mg/kg PO as single dose OR Niclosamide 50 mg/kg PO once
Clinical Hints	Diarrhea, abdominal distention and restlessness (in children); eosinophilia may be observed; proglottids may migrate out of anus.
Synonyms	Cucumber tapeworm, Dipylidium caninum, Dog tapeworm, Double-pored dog tapeworm. ICD9: 123.8 ICD10: B71.1

Clinical

Most infections with *Dipylidium caninum* are asymptomatic.

• Severe diarrhea, urticaria, fever and eosinophilia are occasionally encountered. [1]
• The principal sign (in animals and children) consists of the passage of proglottids on the perianal region, feces, diapers, or occasionally on floor covering and furniture.
• Infection has been reported in patients as young as four months [2] to two years. [3]
• Proglottids are motile when freshly passed and may be mistaken for maggots or fly larvae.

Dipylidiasis in Zambia

Prevalence surveys:

24.7% of dogs in Lusaka (1983 publication) [4]
13.1% of rural dogs in Kateke and 2.4% in Lusaka (2011 publication) [5]
2l.2% of domestic dogs in Lusaka, Katete, Petauke and Luangwa Districts (2005 to 2006) [6]

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Dirofilariasis

Agent	PARASITE - Nematoda. Secernentea: Dirofilaria (Nochtiella) immitis (pulmonary); D. tenuis & D. repens (subcutaneous infection) & D. ursi
Reservoir	Mammal Dog Wild carnivore (D. tenuis in raccoons; D. ursi in Bears)
Vector	Mosquito
Vehicle	None
Incubation Period	60d - 90d
Diagnostic Tests	Identification of parasite in tissue. Serology. Nucleic acid amplification.
Typical Adult Therapy	Not available; excision is often diagnostic and curative
Typical Pediatric Therapy	As for adult
Clinical Hints	Most patients are asymptomatic; occasional instances of cough and chest pain, with solitary pulmonary coin lesion; or multiple tender subcutaneous nodules; eosinophilia usually not present.
Synonyms	Candidatus Dirofilaria hongkongensis, Dirofilariosis, Dirofiliaria, Dog heartworm, Filaria conjunctivae, Loaina, Pelecitus. ICD9: 125.6 ICD10: B74.8

Clinical

Pulmonary infections usually present as a well-circumscribed coin lesion. [1]
• Occasionally the lesions are transient or multiple. [2]
• Symptoms such as chest pain, dyspnea, fever, cough and eosinophilia are present in only 50% of cases.
• Isolated infections have been reported in the mesentery, spermatic cord, epididymis [3], peritoneal cavity [4], anterior chamber of the eye [5], buccal mucosa [6], orbital muscles [7] and liver.
• Lesions may suggest malignancy [8], and coexistence of dirofilariasis and lung cancer has been reported. [9]
• In rare cases pulmonary cavitation may occur [10]

Skin and subcutaneous infections are caused by *D. tenuis*, *D. repens* [11], *D. ursi*, *D. immitis* and *D. striata*.
• Clinical manifestations are limited to a small (0.5 to 1.5 cm) discrete nodule which may appear on any area of the body. [12-17]
• Local pain, inflammation, eosinophilia and a sensation of motion may be present in some cases.
• Rare instances of cutaneous larva migrans syndrome [18], buccal mucosal involvement [19], local nerve compression [20] and scrotal pseudotumor are reported. [21]

A novel *Dirofilaria* species ("*Candidatus Dirofilaria hongkongensis*") has been identified as a cause of human (cervical lymphadenopathy, abdominal subcutaneous mass and subconjunctival nodule) and canine infection in Hong Kong. [22]

Dirofilariasis in Zambia

Prevalence surveys:

4.0% of dogs in Lusaka (antigenemia, 2015 publication) [23]

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Dracunculiasis

Agent	PARASITE - Nematoda. Secernentea, Camallanida: Dracunculus medinensis
Reservoir	Human
Vector	None
Vehicle	Copepod (Mesocyclops and Thermocyclops) in drinking water
Incubation Period	12m - 18m
Diagnostic Tests	Identification of adult worm in situ; or identification of discharged larvae from wound.
Typical Adult Therapy	Worm removal Metronidazole 500 mg PO TID X 10d. OR Thiabendazole 30 mg/kg PO BID X 3d have been used to facilitate worm removal.
Typical Pediatric Therapy	Worm removal Metronidazole 8 mg/kg PO TID X 10d. OR Thiabendazole 30 mg/kg BID X 3d have been used to facilitate worm removal.
Clinical Hints	Nausea and urticaria followed by the appearance of a papule or bulla (usually lower leg) which ruptures; calcified worm on x-ray; occasional eosinophilia; worm may survive for 18 months in human.
Synonyms	Dracunculose, Dracunculus medinensis, Drancontiasis, Filaria medinensis, Guinea worm, Medina worm. ICD9: 125.7 ICD10: B72

Clinical

WHO Case definition for surveillance:
Clinical case definition
• A case of dracunculiasis is defined as an individual exhibiting or having a history of a skin lesion with the emergence of a Guinea worm.
• A recent history (within one year) of a skin lesion with emergence of a Guinea worm (*Dracunculus medinensis*) is the only time-frame which must be used in surveillance programs.

As the adult female migrates, a blister develops on the skin where the worm will emerge. [1]
• Symptoms consist of fever, urticaria and other allergic phenomena, swelling, and local pain and burning. [2]
• The blister will eventually rupture, and the patient seeks relief through immersing the affected skin in water.
• The resulting temperature change causes the blister to erupt, exposing the worm, which then releases a milky white liquid containing millions of larvae into the water.
• The process of larval shedding continues for several days after it has emerged from the ulcer.

More than 90% of the worms appear on the legs and feet, but may occur anywhere on the body. [3]
• Ulcers may take many weeks (8 weeks average) to heal; and are secondarily infected with bacteria in approximately 50% of cases.
• Permanent disabling scars and crippling may result.
• Each time a worm emerges, the patient may be unable to work and resume daily activities for an average of 3 months.
• Overtly symptomatic infection become apparent during planting or harvesting season, resulting in heavy crop losses.
• Dermal onchocerciasis may mimic dracunculiasis. [4]
• Calcified worms representing prior infection are occasionally noted on x-ray. [5-7]
Although Dracunculiasis is not endemic to Zambia, imported, expatriate or other presentations of the disease have been associated with this country.

Dracunculiasis in Zambia

As of 2007, this country is certified as free of dracunculiasis transmission. [8]

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Ebola

Agent	VIRUS - RNA. Mononegavirales, Filoviridae, Filovirus: Ebola virus
Reservoir	Primate Guinea pig ? Bat Forest Antelope
Vector	None
Vehicle	Infected secretions Contact Needle Syringe ? Sexual contact Breastfeeding
Incubation Period	5d - 12d (range 1d - 21d)
Diagnostic Tests	Viral culture (blood, liver, spleen). Serology. Nucleic acid amplification. Biosafety level 4.
Typical Adult Therapy	Strict isolation; supportive
Typical Pediatric Therapy	As for adult
Clinical Hints	Fever, myalgia, arthralgia, sore throat, vomiting, diarrhea, conjunctivitis, hepatic dysfunction and maculopapular rash; hemorrhagic diatheses from 3rd to 4th day of illness; case-fatality rate 50% to 90%.
Synonyms	Lloviu virus, Lomela, Makona, Tai Forest. ICD9: 065.8 ICD10: A98.4

Clinical

The symptoms and signs of Marburg and Ebolavirus infections are similar. [1]

As in smallpox [2] , transmission of Ebola [3] has occurred during funerals.

Ebolavirus has been detected in semen for as long as 101 days following infection. [4]

Following an incubation period of 4 to 16 days (range 1 to 21) onset is sudden, marked by anorexia, fever, chills, headache and myalgia. [5] [6]
• Later, the patient develops nausea, vomiting, sore throat, abdominal pain and diarrhea. [7-9]
• Patients are dehydrated, apathetic and disoriented and exhibit pharyngeal and conjunctival [10] injection.
• A non-specific maculo-papular rash may be appear during the fourth to sixth days of the illness. [11] [12]
• Ocular manifestations include conjunctival injection or hemorrhage, excessive lacrimation and uveitis. [13]
• Most develop severe hemorrhagic manifestations between days 5 and 7.
• Bleeding is often from multiple sites, most commonly from the gastrointestinal tract, lungs and gingiva. [14-18]
• Rare instances of viral interstitial pneumonia have been documented. [19] [20]
• Rhabdomyolysis is common. [21]
• Clinical features of infection by Bundibugyo ebolavirus include non-bloody diarrhea (81%), severe headache (81%), and asthenia (77%). [22]
• Hemorrhage and oropharyngeal lesions carry a particularly poor prognosis.
• Death occurs between days 7 and 16. Case-fatality rates are highest in the age group >=45 years. [23]
• Infection by Ebolavirus without development of symptoms has been reported. [24]
• In an analysis of twenty Ebolavirus outbreaks, the mean case-fatality ration was 65.4% • with higher rates for Zaire than for Sudan or Bundibugyo ebolaviruses. [25]
• Survivors of Ebola may experience "Post-Ebolavirus disease syndrome", characterized by persistent arthralgia and myalgia, fatigue, anorexia, hearing loss, blurred vision, headache, sleep disturbance and short-term memory difficulty. [26] [27]
• Late-onset encephalitis and polyarthritis has been reported in survivors of Ebola virus disease. [28]
• A meta-analysis found that the following were associated with risk for fatal outcome: bleeding events, abdominal pain, vomiting, diarrhea, cough, sore throat and conjunctivitis (2015 publication) [29]

WHO Case definition for surveillance: [30]

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Clinical description
• Ebola hemorrhagic fever begins with acute fever, diarrhea that can be bloody (referred to as "diarrhee rouge" in francophone Africa), and vomiting.
• Headache, nausea, and abdominal pain are common.
• Conjunctival injection, dysphagia, and hemorrhagic symptoms such as nosebleeds, bleeding gums, vomiting of blood, blood in stools, purpura may further develop.
• Some patients may also show a maculopapular rash on the trunk.
• Dehydration and significant wasting occur as the disease progresses.
• At a later stage, there is frequent involvement of the central nervous system, manifested by somnolence, delirium, or coma.
• The case-fatality rate ranges from 50% to 90%.
Laboratory criteria for diagnosis
• Supportive: Positive serology (ELISA for IgG and/or IgM), or
• Confirmatory: Positive virus isolation (only in a laboratory of biosafety level 4) or
• Positive skin biopsy (immunohistochemistry) or
• Positive PCR
Case classification
Suspected: A case that is compatible with the clinical description.
Probable: in epidemic situation:
• Any person having had contact with a clinical case and presenting with acute fever, or
• Any person presenting with acute fever and 3 of the following symptoms: headache, vomiting / nausea, loss of appetite, diarrhea, intense fatigue, abdominal pain, general or articular pain, difficulty in swallowing, difficulty in breathing, hiccoughs, or
• Any unexplained death
Confirmed: Any suspected or probable case that is laboratory-confirmed.
Contact: in epidemic situation:
• An asymptomatic person having had physical contact within the past 21 days with a confirmed or probable case or his/her body fluids (e.g., care for patient, participation in burial ceremony, handling of potentially infected laboratory specimens).
• In epidemic situations and after laboratory confirmation of a few initial cases, there is no need for individual laboratory confirmation and the use of .suspected or probable. case classifications is sufficient for surveillance and control purposes.

WHO Case definitions for use during outbreaks: [31]
Alert case:
Illness with onset of fever and no response to treatment of usual causes of fever in the area,
OR at least one of the following signs: bleeding, bloody diarrhea, bleeding into urine
OR any sudden death
Instructions:
If an alert case (living or dead) is identified:
Report the case to a surveillance team or to the closest health centre.

Suspected case:
Any person, alive or dead, suffering or having suffered from a sudden onset of high fever and having had contact with:
• a suspected, probable or confirmed Ebola or Marburg case;
• a dead or sick animal (for Ebola)
• a mine (for Marburg) [as for gold or diamonds]
OR: any person with sudden onset of high fever and at least 3 of the following symptoms:
• headaches
• vomiting
• anorexia/loss of appetite
• diarrhea
• lethargy
• stomach pain
• aching muscles or joints
• difficulty swallowing
• breathing difficulties
• hiccup
OR: any person with inexplicable bleeding
OR: any sudden, inexplicable death.
Instructions when a suspected case has been identified:
• Report the case to the surveillance team.
• After obtaining express consent, collect a sample.
• Fill in a case notification form.
• Draw up a list of contacts of the suspected case.
If the subject is alive, explain to the patient and his/her family the need to go to hospital to receive adequate medical care. After having obtained the consent of the patient or his/her family, arrange for transfer. If the subject has passed away, explain to the family the need for conducting a safe burial. After obtaining consent, coordinate funeral arrangements with the burial team.

Probable case:

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Any suspected case evaluated by a clinician
OR: Any deceased suspected case (where it has not been possible to collect specimens for laboratory confirmation) having an epidemiological link with a confirmed case
Note: if laboratory specimens are collected in due time during the illness, the preceding categories are reclassified as "laboratory confirmed" cases and "non-case."

Laboratory-confirmed case:
Any suspected or probable cases with a positive laboratory result. Laboratory confirmed cases must test positive for the virus antigen, either by detection of virus RNA by reverse transcriptase-polymerase chain reaction (RT-PCR), or by detection of IgM antibodies directed against Marburg or Ebola.
Although Ebola is not endemic to Zambia, imported, expatriate or other presentations of the disease have been associated with this country.

Ebola in Zambia

Seroprevalence surveys:

9.49% of migratory fruit bats (*Eidolon helvum*) (Zaire and Reston viruses, 2006 to 2013) [32]

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Echinococcosis - unilocular

Agent	PARASITE - Platyhelminthes, Cestoda. Cyclophyllidea, Taeniidae: Echinococcus granulosus, Echinococcus canadensis
Reservoir	Dog Wolf Dingo Sheep Horse Pig
Vector	None
Vehicle	Soil Dog Feces Fly
Incubation Period	1y - 20y
Diagnostic Tests	Serology. Identification of parasite in surgical specimens.
Typical Adult Therapy	Albendazole 400 mg BID X 28d. Repeat X 3, with 2 week hiatus between cycles. Praziquantel has been used preoperatively to sterilize cyst. Follow by surgery as indicated. PAIR (puncture-aspiration-injection-reaspiration) is also used
Typical Pediatric Therapy	Albendazole 10 mg/kg/day X 28d. Repeat X 3, with 2 week hiatus between cycles. Praziquantel has been used preoperatively to sterilize cyst. Follow by surgery as indicated. PAIR (puncture-aspiration-injection-reaspiration) also used
Clinical Hints	Calcified hepatic cyst or mass lesions in lungs and other organs; brain and lung involvement are common in pediatric cases.
Synonyms	Echinococcus canadensis, Echinococcus granulosus, Echinococcus ortleppi, Hydatid cyst, Unilocular echinococcosis. ICD9: 122.0,122.1,122.2,122.3,122.4 ICD10: B67.0,B67.1,B67.2,B67.3,B67.4

Clinical

Symptoms are often absent, even when large cysts are present; and cysts are often discovered incidentally on a routine x-ray or ultrasound study. [1]

Hepatic echinococcosis:

Hepatic echinococcosis often presents as abdominal pain with or without a palpable mass in the right upper quadrant. [2]
• Biliary compression or rupture of the cysts into a bile duct may mimic cholecystitis or cholelithiasis.
• Ductal compression may also result in pancreatitis. [3]
• Leakage from a cyst may produce fever, pruritis, urticaria, eosinophilia or even anaphylactic shock. [4]

Pulmonary echinococcosis:

Pulmonary cysts [5] [6] may rupture into the bronchial tree and produce cough, hemoptysis and chest pain. [7]
• Rupture of cysts may disseminate protoscolices to contiguous organs or into the vascular system, resulting in the formation of additional cysts.
• Late intrathoracic complications include intrapulmonary or pleural rupture, infection of the ruptured cysts, reactions of the adjacent tissues, thoracic wall invasion and iatrogenic involvement of pleura [8] or mediastinum. [9]
• Rupture can occur spontaneously or as a result of trauma or surgery. [10]
• Anaphylaxis may follow cyst rupture [11-13], but has also reported in patients with intact cysts. [14] In rare cases, anaphylactic shock (eg, following blunt trauma) may be the initial presenting feature of echinococcosis. [15]
• Secondary colonization of hydatid cysts by *Aspergillus* has been reported. [16]

Echinococcosis of other organs:

In contrast to hepatic echinococcosis, extrahepatic cysts are often non-calcified and may at times be mistaken for malignancy. [17-19]
• **Extra-hepatic echinococcosis** presents as space-occupying lesions of brain [20] [21], epidural space [22], pleura [23], thorax [24], bone (45% of these in the spine) [25-37], muscles [38-52], joints [53] [54], parapharyngeal spaces [55] or paranasal sinuses [56] [57], heart [58-69] and heart valves [70-72], aorta [73], pericardium [74-77], breast [78-83], subcutaneous tissue [84-88], abdominal wall [89] [90], axilla [91], supraclavicular region [92] [93], peripheral nerves [94], thyroid [95-98], orbits [99-104], parotid gland [105] [106], spleen [107-117], pancreas [118-126], adrenals [127], kidneys [128-140], urinary bladder [141-143], peritoneum /

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mesentery / omentum [144-150], appendix [151], retroperitoneal region [152-154], uterus [155], Fallopian tubes and ovaries [156-159], or virtually any other organ. [160-175]

- The brain is involved in 1 to 2% of all *Echinococcus granulosus* infections. [176]
- The spleen is involved in 0.5% to 6.0% of abdominal infections. [177]
- The clinical features of cerebral coenurosis may mimic those of echinococcosis. [178]
- Primary spinal hydatidosis occurs in 1% of cases and may be confused with space-occupying non-infectious disorders [179-183]

Primary superinfection of cysts by bacteria or fungi occurs in approximately 7.3% of cases. [184]

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Ehrlichiosis - human monocytic

Agent	BACTERIUM. Anaplasmataceae Ehrlichia chaffeensis Intracellular Rickettsia-like bacteria
Reservoir	Dog Tick Deer Coyote
Vector	Tick ? (Dermacentor variabilis or Amblyomma americanum)
Vehicle	None
Incubation Period	7d - 21d
Diagnostic Tests	Intramonocytic inclusions seen in blood smear. Serology. Nucleic acid amplification. Cell culture (HL60 cells).
Typical Adult Therapy	Doxycycline 100 mg PO BID X 7 to 14 days OR Rifampin 600 mg daily
Typical Pediatric Therapy	Above age 8 years: Doxycycline 2 mg/kg PO BID X 7 to 14 days. OR Rifampin 10 mg/kg/day PO
Clinical Hints	Headache, myalgia and vomiting 1 to 2 weeks following tick bite; arthralgia or macular rash may be present; leukopenia, thrombocytopenia or hepatic dysfunction common; inclusions in monocytes.
Synonyms	Candidatus Neoehrlichia mikurensis, Cowdria ruminantium, Ehrlichia canis, Ehrlichia chaffeensis, Ehrlichia muris, Ehrlichia runinantium, Ehrlichia sp. Panola Mountain, Human monocytic ehrlichiosis, Human monocytotropic ehrlichiosis, Neoehrlichia mikurensis, Panola Mountain Ehrlichia. ICD9: 082.41 ICD10: B28.8

Clinical

Human Monocytic Ehrlichiosis (HME) and Anaplasmosis (Human Granulocytic Ehrlichiosis, HE) are similar, and characterized by fever, headache, myalgia, thrombocytopenia, leukopenia, and elevated liver enzyme levels. [1] [2]
• A rash occurs in approximately one third of patients with HME but is less common in patients with anaplasmosis. Rash is much more common among children than adults with the disease. [3]
• Most cases of ehrlichiosis are mild; however, complications such as adult respiratory distress syndrome, renal failure, neurological disorders, myocarditis [4] [5] , hemophagocytic lymphohistiocytosis [6-8] and disseminated intravascular coagulation can occur. [9] [10]
• Rare instances of Louria's sign (bilateral anterior thigh pain) have been reported. [11]
• A case of ehrlichiosis presenting with toxic shock like syndrome and hemophagocytic lymphohistiocytosis has been reported. [12]
• Case-fatality ratios in severe cases are as high as 5% for HME and 10% for anaplasmosis.
• Symptomatic infection is more common among patients with AIDS than among immunocompetent persons.

Candidatus Neoehrlichia mikurensis infection is characterized by fever, cough, myalgia, arthralgia and hemorrhagic or thrombotic events. [13] [14]

Ehrlichia muris-like infection is characterized by fever, malaise, thrombocytopenia, and lymphopenia following tick exposure. [15]

Although Ehrlichiosis - human monocytic is not endemic to Zambia, imported, expatriate or other presentations of the disease have been associated with this country.

Ehrlichiosis - human monocytic in Zambia

Ehrlichia canis infection has been identified in dogs imported to Japan from China and Zambia. [16]

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Endocarditis - infectious

Agent	BACTERIUM OR FUNGUS. viridans streptococci, Staphylococcus aureus, enterococci, Candida albicans, et al.
Reservoir	Human
Vector	None
Vehicle	Endogenous
Incubation Period	Variable
Diagnostic Tests	Blood culture, clinical findings, ultrasonography of heart valves.
Typical Adult Therapy	Bactericidal antibiotic appropriate to species
Typical Pediatric Therapy	As for adult
Clinical Hints	Consider in any patient with fever, multisystem disease (i.e., skin lesions, hematuria, neurological symptoms, single or multiple abscesses or bone, brain, lung, etc) and a preexisting cardiac valvular lesion.
Synonyms	Bacterial endocarditis, Endocardite, Endocarditis, Endokarditis, Fungal endocarditis, Infectious endocarditis, S.B.E.. ICD9: 421 ICD10: I33

Clinical

The definitive diagnosis of infective endocarditis requires: [1] [2]
1) Demonstration of microorganisms; and/or histological lesions in the heart or heart valves; or
2) Presence of two major criteria; or 1 major and 3 minor criteria; or 5 minor criteria, as follows:

Major Criteria:
A. Culture:
• 1. Typical microorganisms (HACEK, *Streptococcus viridans*, *Streptococcus bovis*) in 2 separate blood cultures; or community acquired *Staphylococcus aureus* or enterococcus without obvious focus.
• 2. Persistently positive blood cultures (drawn more than 12 hours apart; or three positive cultures at least one hour apart).
B. Evidence of endocardial or valvular involvement (echocardiogram, abscess, new valvular regurgitant lesion)

Minor Criteria:
A. Predisposition (heart condition, drug abuse)
B. Fever
C. Embolic phenomena, mycotic aneurysm, Janeway lesion, or intracranial hemorrhage.
D. Immunological phenomena (Osler nodes, positive rheumatoid factor)
E. Echocardiogram with suggestive, but not specific findings.
F. Positive blood culture, but not meeting Major criteria.

Etiological associations:.
• Injecting drug user: *Staphylococcus aureus*, enterococci, Enterobacteriaceae, *Pseudomonas aeruginosa*, *Candida*
• Prosthetic valve: *Staphylococcus epidermidis* Enterobacteriaceae, *Candida*, *Aspergillus*
• Rheumatic or other valvular disease: viridans Streptococci, enterococci
• "Culture negative" endocarditis: *Coxiella burnetii*, *Bartonella* spp., *Tropheryma whipplei*, et al.

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Enterobiasis

Agent	PARASITE - Nematoda. Secernentea: Enterobius vermicularis
Reservoir	Human
Vector	None
Vehicle	Fecal-oral Air Clothing Sexual contact (rare)
Incubation Period	14d - 42d
Diagnostic Tests	Apply scotch tape to anal verge in a.m. & paste onto glass slide for microscopy.
Typical Adult Therapy	Albendazole 400 mg PO as single dose - repeat in 2w. OR Mebendazole 100 mg PO as single dose - repeat in 2w. OR Pyrantel pamoate 11 mg/kg (max 1g) PO as single dose; or
Typical Pediatric Therapy	Mebendazole 100 mg PO as single dose (>age 2) - repeat in 2w. OR Pyrantel pamoate 11 mg/kg (max 1g) PO X 1
Clinical Hints	Nocturnal anal pruritus; occasionally vaginitis or abdominal pain; eosinophilia is rarely, if ever, encountered.
Synonyms	Enterobio, Enterobius vermicularis, Oxyuriasis, Oxyuris, Pinwom, Seatworm. ICD9: 127.4 ICD10: B80

Clinical

The typical manifestation of enterobiasis is nocturnal pruritus ani related to hypersensitivity to worm antigens.
• Local dermal "tingling" is also encountered. [1]
• Migration of adult females to the vulva may result in vaginal pain [2] and vulvovaginits [3], or predispose to urinary tract infection.
• Eosinophilia is occasionally present.

Complications are rare, and include salpingitis [4-7], oophoritis [8], cystitis [9], intestinal intussusception [10-12], peritonitis [13-17], hepatitis, colonic or anal granuloma [18] [19], urethritis [20], prostatitis [21] and Bartholin gland abscess. [22]
• Although abdominal symptoms may mimic those of appendicitis, *Enterobius* is at least as common in normal as in inflamed appendices. [23-29]
• Symptoms and mucosal lesions suggestive of Crohn's colitis have been reported in patients with enterobiasis. [30] [31]
• Cervical discharge and hypertrophy in some cases may suggest a mis-diagnosis of cervical carcinoma. [32]
• Adults and ova of *Enterobius* have been identified in the kidneys [33] [34] and eyes [35] [36] of infested patients.

The presence of diarrhea or abdominal pain suggests coinfection with *Dientamoeba fragilis*.

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Enterovirus infection

Agent	VIRUS - RNA. Picornaviridae: Coxsackievirus, ECHO virus, Enterovirus, Parechovirus
Reservoir	Human
Vector	None
Vehicle	Droplet Fecal-oral Breastfeeding
Incubation Period	2d-7d
Diagnostic Tests	Viral culture (stool, pharynx, CSF). Serology. Nucleic acid amplification.
Typical Adult Therapy	Supportive. Pleconaril 200 to 400 mg PO TID X 7d has been used for severe infections
Typical Pediatric Therapy	Supportive. Pleconaril 5 mg/kg PO BID has been used for severe infections
Clinical Hints	Summer-to-autumn sore throat; occasionally chest pain, macular or vesicular rash, meningitis, myopericarditis, etc.
Synonyms	Boston exanthem [Caxsackie. A 16], Coxsackie, Coxsackievirus, ECHO, Echovirus, Enteroviruses, Hand, foot and mouth disease, Hand-foot-and-mouth disease, Herpangina [Coxsackievirus A], HEV 68, HPeVs, Human Enterovirus 68, Human Parechovirus, Ljungan virus, Myocarditis, enteroviral, Parechovirus, Pericarditis, enteroviral. ICD9: 049,079.2,008.67,074.0,074.8,074.3,070.4,078.89 ICD10: A88.0,A87.0,B08.4,B08.5,B08.8,B30.3,B34.1

Clinical

The various Enteroviruses are associated with fever and pharyngitis, which may be followed by appearance of: [1] [2]
- rash
- aseptic meningitis
- encephalitis [3]
- acute disseminated encephalomyelitis [4]
- epidemic conjunctivitis
- herpangina
- hand-foot-and-mouth disease
- myocarditis
- pericarditis
- pleurodynia
- pneumonia
- acute flaccid paralysis [5-9]
- conjunctivitis, etc

Hand, foot and mouth disease (HFM) is characterized by a prodrome of fever and sore throat, followed by the appearance of vesicles on the palmar and plantar regions, and oral mucosa.
- Vesicles in the mouth are often pleomorphic, with rectangular and triangular shapes.
- Most patients with HFM disease have additional skin lesions on sites other than the hands, feet and mouth. [10] [11]
- Constipation is a common symptom of mild HFM in children. [12]
- HFM has been associated with onychomadesis • complete nail shedding from the proximal portion, affecting both fingernails and toenails. [13-23]
- HFM due to Enterovirus 71 is often complicated by central nervous system disease and sequelae. [24-51]
- A case of Enterovirus 71 HFM complicated by pancreatitis has been reported. [52]
- In some cases, HFM may present as a more extensive vesiculobullous and erosive eruption ("Eczema coxsakium") [53] [54]
- The case-fatality rate of HFM due to Enterovirus 71 is estimated at 1.7% (meta-analysis, 1998 to 2012). [55]

Coxsackievirus A6 infection may produce widespread blistering mucocutaneous reactions suggestive of Stevens Johnson syndrome. [56]

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The clinical features of Enterovirus infection among neonates and infants are similar to those of Parechovirus infection. [57]

Human Enterovirus D68 infection is associated with respiratory illness ranging from relatively mild illness that did not require hospitalization to severe illness requiring intensive care and mechanical ventilation. Acute flaccid paralysis is also encountered. [58-61] , and some infections have been fatal. [62] [63]

Echoviruses 22 and 23 have been reclassified as Human parechovirus (HPeV) 1 and 2 , respectively. [64]
• Parechovirus infections have been associated with respiratory and gastrointestinal disease [65] [66] , epidemic myalgia [67] [68] and rarely meningitis [69] / seizure disorder [70] , encephalitis, myocarditis [71] and acute flaccid paralysis. [72] [73]
• HPeV2 is usually associated with gastrointestinal illness.
• HPeV3 has been associated with transient paralysis, sepsis-like syndromes, encephalitis, acute disseminated encephalomyelitis [74] , or myalgia with muscle weakness. [75] In one outbreak, infants with HPeV3 infection exhibited a high rate of severe sepsis-like syndrome. [76]
• HPeV4 has been associated with fever in a neonate [77]
• HPeV6 (NII561-2000) has been associated with infectious gastroenteritis, fever with rash, upper respiratory infection and Reye's syndrome

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Epidural abscess

Agent	BACTERIUM. Staphylococcus aureus, facultative gram negative bacilli, etc
Reservoir	Human
Vector	None
Vehicle	Endogenous
Incubation Period	Variable
Diagnostic Tests	Imaging (CT scan, MRI). Gram-stain and culture of blood or pus.
Typical Adult Therapy	Intravenous antibiotic(s) appropriate to identified or suspected pathogens. Drainage as indicated
Typical Pediatric Therapy	Intravenous antibiotic(s) appropriate to identified or suspected pathogen. Drainage as indicated
Clinical Hints	Frontal bone abscess; or spinal cord compression with signs of infection - often in setting of injecting drug abuse or preexisting staphylococcal infection.
Synonyms	

Clinical

Intracranial epidural abscesses:

Intracranial epidural abscesses may appear gradually, with initial findings suggestive of the underlying sinusitis or otitis. [1]
• Early findings include local pain followed by generalized headache, often with alteration of mental status.
• Focal neurological signs and focal or generalized seizures appear, which reflect the local anatomy of the lesion:
• abscess near the petrous bone may involve cranial nerves V and VI, with unilateral facial pain and lateral rectus weakness (Gradenigo's syndrome)
• an occipital epidural abscess may obstruct the superior sagittal sinus

Eventually, papilledema and other signs of elevated intracranial pressure develop.
• Extension into the subdural space is accompanied by rapid neurological deterioration.

Spinal epidural abscess:

Spinal epidural abscess is more common in men than in women and may occur at any age.
• The presentation may be acute or gradual, over several months. [2]
• Most begin with focal vertebral pain, which begins to radiate along the course of involved nerve roots.
• Signs of spinal cord compression (long-tract findings), later progress to paralysis below the level of the lesion.
• Hematogenous infection of the epidural space produces rapid progression with prominent systemic signs, and severe local pain.
• Chronic abscesses may mimic epidural neoplasia, often without systemic signs of infection.
• Cervical abscesses may compromise respiration, and produce rapid evolving flaccid hyporeflexia, suggestive of Guillain-Barre syndrome.
• Epidural abscess has occasionally been reported as a complication of pyomyositis. [3]

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Erysipelas or cellulitis

Agent	BACTERIUM. Erysipelas: Streptococcus pyogenes Cellulitis: Staphylococcus aureus, Streptococcus pyogenes, occasionally others
Reservoir	Human
Vector	None
Vehicle	Endogenous
Incubation Period	1d - 7d
Diagnostic Tests	Clinical diagnosis is usually sufficient. Aspiration of lesion for smear and culture may be helpful in some cases.
Typical Adult Therapy	Antibiotic directed at likely pathogens (Group A Streptococcus and Staphylococcus aureus)
Typical Pediatric Therapy	As for adult
Clinical Hints	Erysipelas is well-circumscribed, tender, edematous (peau d'orange), warm and painful; cellulitis is less painful, flat and without a distinct border.
Synonyms	Cellulite, Cellulitis, Celulite, Celulitis, Erisipela, Erysipelas, St. Anthony's fire (erysipelas), St. Francis' fire (erysipelas), Zellulitis. ICD9: 035,681,682 ICD10: A46,L03

Clinical

Erysipelas:
Erysipelas is characterized by abrupt onset of "fiery-red" superficial swelling of the face or extremities. [1]
• The lesion is typically recognized by the presence of well-defined indurated margins, particularly along the nasolabial fold; rapid progression; and intense pain. [2]
• Flaccid bullae may develop on the second or third day of illness; but extension to deeper soft tissues is rare.
• Desquamation occurs between the fifth and tenth days of illness.

Cellulitis:
Cellulitis is characterized by local pain, erythema, swelling, and heat. [3] [4]
• Cellulitis may be caused by any of a wide variety of bacteria or yeasts; however, *S. aureus* or *S. pyogenes* are most often implicated.
• A history of preceding trauma, insect bite, needle insertion or surgery is often present.
• Cultures of biopsy specimens or aspirates are positive in only 20% of cases.
• Infection by *S. aureus* often spreads out from a localized infection (abscess, folliculitis) or foreign body
• Streptococcal cellulitis tends to be more diffuse and rapid in onset, and associated with lymphangitis and fever.
• Streptococci also cause recurrent cellulitis in the setting of lymphedema resulting from elephantiasis or lymph node damage.

Recurrent staphylococcal cutaneous infections are encountered in patients with "Job's syndrome" (eosinophilia and elevated serum levels of IgE); and nasal carriers of staphylococci.

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Erysipeloid

Agent	BACTERIUM. Erysipelothrix rhusiopathiae A facultative gram-positive bacillus
Reservoir	Mammal Bird Fish
Vector	None
Vehicle	Contact with meat, mammal, poultry or fish
Incubation Period	1d - 4d
Diagnostic Tests	Culture.
Typical Adult Therapy	Oral therapy for 10 days: Penicillin V, Ampicillin, third-generation cephalosporin, Fluoroquinolone (Levofloxacin, Trovafloxacin, Pefloxacin, Sparfloxacin or Moxifloxacin), Erythromycin, Clindamycin or Tetracycline are generally adequate
Typical Pediatric Therapy	Oral therapy for 10 days: Penicillin V, Ampicillin, third-generation cephalosporin or Erythromycin, Clindamycin are generally adequate
Clinical Hints	Annular erythema or "target lesion" on hand following contact with raw animal or fish products; local pain and swelling; no discharge is noted and fever is present in only 10% of cases.
Synonyms	Erysipelothrix rhusiopathiae, Rutlauf. ICD9: 027.1 ICD10: A26

Clinical

Erysipeloid is generally limited to the skin (mainly hands and fingers)

Infection is characterized by pain, edema and purplish erythema with sharp irregular margins which extends peripherally but clears centrally. [1] [2]
- Relapses and extensions of the lesions to distant areas are common, but there is no fever.
- There is no permanent immunity following an attack.
- Lesions of cutaneous leishmaniasis may mimic those of erysipeloid. [3]

Complications:

- 31 cases of endocarditis due to *Erysipelothrix rhusiopathiae* had been reported to 1976 [4] [5] ; and approximately 50 to 1988. [6]
- Rarely-reported complications have included chronic granulomatosis cheilitis [7] , tenosynovitis [8] , peritonitis associated with peritoneal dialysis [9] , bacteremia [10] , pneumonia [11] and spinal infection with epidural empyema. [12]

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Erythrasma

Agent	BACTERIUM. Corynebacterium minutissimum A facultative gram-positive bacillus
Reservoir	Human
Vector	None
Vehicle	Indigenous flora
Incubation Period	Unknown
Diagnostic Tests	Coral fluorescence of skin lesion under Wood's lamp. Culture (alert lab regarding diagnosis).
Typical Adult Therapy	Erythromycin 250 mg PO QID X 14d. Topical Clindamycin 2% and topical Fusidic acid have also been used
Typical Pediatric Therapy	Erythromycin 10 mg/kg PO QID X 14d. Topical Clindamycin 2% and topical Fusidic acid have also been used
Clinical Hints	Pruritic, scaling, slowly-progressive red-brown patch; usually in groin - occasionally in toe webs; common in obese or diabetic males; coral fluorescence with Wood's light.
Synonyms	Corynebacterium minutissimum, Eritrasma. ICD9: 039.0 ICD10: L08.1

Clinical

Erythrasma is characterized by slowly spreading, reddish-brown, pruritic patches • usually in the groin and axillae. [1]
• Other areas include the interdigital regions of the feet [2], the vulva [3] and intergluteal and crural folds.
• Most patients are obese, male diabetics. [4-6]
• The lesions fluoresce red when exposed to Wood's lamp. [7-10]
• The differential diagnosis of erythrasma includes psoriasis, dermatophytosis, candidiasis and intertrigo.

The etiologic agent of erythrasma, *Corynebacterium minutissimum*, has also been associated with bacteremia [11-14], meningitis [15], breast abscess [16], eye infection [17], endocarditis [18] [19], peritonitis [20], cutaneous granulomas [21], postoperative abdominal infection [22], costochondral abscess [23], pueperal infection [24] and pyelonephritis. [25] [26]

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Escherichia coli diarrhea

Agent	BACTERIUM. Escherichia coli A facultative gram-negative bacillus
Reservoir	Human Mammal
Vector	None
Vehicle	Food Water Fecal-oral
Incubation Period	1d - 3d (range 12h - 10d)
Diagnostic Tests	Stool culture. Request characterization of E. coli isolates.
Typical Adult Therapy	Supportive therapy. If EHEC, avoid anti-motility drugs and antimicrobial agents. Plasma exchange may be effective in HUS Note that antimicrobial agents may increase risk for hemolytic-uremic syndrome when used in cases of E. coli O157:H7 infection
Typical Pediatric Therapy	Supportive therapy. If EHEC, avoid anti-motility drugs and antimicrobial agents. Plasma exchange may be effective in HUS Note that antimicrobial agents may increase risk for hemolytic-uremic syndrome when used in cases of E. coli O157:H7 infection
Clinical Hints	Watery diarrhea or dysentery - common among travelers and infants; hemorrhagic colitis and hemolytic uremic syndrome are associated with type O157:H7 (& occasionally other types).
Synonyms	DAEC (Diffusely Adherent E. coli), E. coli diarrhea, EAEC (Enteroadherent E. coli), EAggEC (Enteroaggregative E. coli), EHEC (Enterohemorrhagic E. coli), EIEC (Enteroinvasive E. coli), EPEC (Enteropathogenic E. coli), Escherichia albertii, ETEC (Enterotoxic E. coli), Hamolytisch-uramisches Syndrom, Hemolytic Uremic Syndrome, HUS. ICD9: 008.0 ICD10: A04.0,A04.1,A04.2,A04.3,A04.4

Clinical

Enterotoxic *Escherichia coli* (ETEC) infection is characterized by a short incubation period, and watery diarrhea without blood or mucus.
• Fever and vomiting occur in a minority of patients. [1]
• The disease may be life-threatening in infants.

Enteropathogenic *E. coli* (EPEC) causes watery diarrhea with fever and vomiting, primarily among children under age 2 years.

Enteroinvasive *E. coli* (EIEC) causes watery diarrhea; only a minority of patients experience dysentery.

Enterohemorrhagic *E. coli* (EHEC) causes diarrhea without fever, often with blood and cramps at all ages. [2]
• Rare instances of toxic megacolon have been reported [3]
• One strain of EHEC, O157:H7 is an important cause of hemolytic-uremic syndrome (HUS). [4]
• Approximately 6% to 10% of patients infected by this strain develop HUS • with an overall mortality rate of 0.6% for STEC O157 infections and 4.6% for HUS. [5]
• Nearly 40% of patients with STEC-HUS require at least temporary renal replacement therapy and up to 20% will have permanent residual kidney dysfunction. [6]
• Hemolytic-uremic syndrome can also follow infection by *Clostridium difficile* [7] and by non-O157 strains of *E. coli*. [8]
• Rare cases of recurrent HUS have been reported. [9]
• Reactive arthritis is reported in 10% of cases [10]

Enteroaggregative *E. coli* (EAggEC) causes watery, persistent diarrhea (over 2 weeks) without vomiting. [11]
• Low-grade fever may be observed, and gross blood may occasionally be present in stools. [12]

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Escherichia coli diarrhea in Zambia

Prevalence surveys:

14.9% of diarrhea among children below age 5 years (Lusaka, 1992 to 1993) [13]

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Fascioliasis

Agent	PARASITE - Platyhelminthes, Trematoda. Echinostomatida, Fasciolidae: Fasciola hepatica or Fasciola gigantica
Reservoir	Sheep Cattle Snail (Lymnaea, Galba, Fossaria)
Vector	None
Vehicle	Food Aquatic plants Watercress (Nasturtium officinale)
Incubation Period	2w - 3m
Diagnostic Tests	Identification of ova in stool or duodenal aspirates (adult parasite in tissue). Serology. PCR. CT scan.
Typical Adult Therapy	Triclabendazole 10 mg/kg PO X 2 doses. OR Bithionol 50 mg/kg every other day X 10 doses OR Nitazoxanide 500 mg PO BID X 7d
Typical Pediatric Therapy	Triclabendazole 10 mg/kg PO X 2 doses. OR Bithionol 50 mg/kg every other day X 10 doses OR Nitazoxanide: Age 1 to 3y 100 mg BID X 7 d Age 4 to 11y 200 mg BID X 7d
Clinical Hints	Fever, hepatomegaly, cholangitis, jaundice and eosinophilia; urticaria occasionally observed during the acute illness; parasite may survive more than 10 years in the biliary tract.
Synonyms	Eurytrema, Fasciola gigantica, Fasciola hepatica, Hepatic distomiasis, Lederegelbefall, Sheep liver fluke. ICD9: 121.3 ICD10: B663.

Clinical

The presence and severity of fascioliasis depend on the intensity of infection and the host.

Symptoms may appear a few days after ingestion of larvae, when the immature worms reach the abdominal cavity and begin migrating across or within the liver. [1]

- Typical early symptoms include fever, abdominal pain, gastrointestinal disturbances and urticaria. [2]
- Hepatomegaly, anemia and jaundice may also be present.
- Creeping eruption has been reported. [3]

A latent phase follows during which the only finding is prominent eosinophilia.

- Eventually, the patient enters a chronic phase characterized by biliary colic [4], epigastric pain [5], jaundice, hepatomegaly and abdominal tenderness. [6] [7]
- Ectopic worms have been identified in the brain, orbits [8] or mesocolon. [9]
- Sporadic cases of liver abscess [10], systemic vasculitis [11], pancreatitis [12-17] and hepatic pseudotumor have been reported. [18]
- Ectopic worms have been identified in the brain, epidural space [19], orbits [20] [21], epigastric [22] or cervical soft tissues [23], peritoneum [24] and mesocolon. [25]

Although Fascioliasis is not endemic to Zambia, imported, expatriate or other presentations of the disease have been associated with this country.

Fascioliasis in Zambia

Fasciola gigantica is present throughout the year in cattle, with highest prevalence in the post-rainy season and lowest in the cold dry season. [26]

Prevalence surveys:

46.7% of cattle (2006 publication) [27]

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60.9% of cattle (2005 publication) [28]
35.7% of cattle in the Kafue basin ecosystem (2012 publication) [29]

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Filariasis - Bancroftian

Agent	PARASITE - Nematoda. Secernentea: Wuchereria bancrofti
Reservoir	Human
Vector	Mosquito (Anopheles, Aedes, Culex)
Vehicle	None
Incubation Period	5m - 18m (range 1m - 2y)
Diagnostic Tests	Identification of microfilariae in nocturnal blood specimen. Nucleic acid amplification. Serology may be helpful.
Typical Adult Therapy	Diethylcarbamazine : 50 mg day 1 50 mg TID day 2 100 mg TID day 3 Then 2 mg/kg TID X 18 days. OR Ivermectin 200ug/kg PO as single dose. Doxycycline 200 mg daily X 8 w is also effective.
Typical Pediatric Therapy	As for adult
Clinical Hints	Lymphangitis, lymphadenitis, eosinophilia, epididymitis, orchitis, hydrocoele or progressive edema; episodes of fever and lymphangitis may recur over several years; chyluria occasionally encountered.
Synonyms	Bancroftian filariasis, Rosetta leg, Wuchereria bancrofti. ICD9: 125.0 ICD10: B74.0

Clinical

WHO Case definition for surveillance:
Clinical case definition
• Hydrocoele or lymphedema in a resident of an endemic area for which other causes of these findings have been excluded.
Laboratory criteria for diagnosis
• Microfilaria positive, antigen positive or biopsy positive.
Case classification
Suspected: Not applicable.
Probable: A case that meets the clinical case definition.
Confirmed: A person with laboratory confirmation even if he/she does not meet the clinical case definition.

Clinical manifestations reflect either acute inflammation or lymphatic obstruction. [1-4]
• Repeated episodes of lymphangitis, lymphadenitis, fever, headache, backache and nausea may occur; and arthritis [5] , funiculitis, epididymitis, or orchitis are common.
• In long-standing cases lymphedema or persistent adenopathy may develop.
• Hydrocoele [6] [7] is the most common clinical manifestation of lymphatic filariasis, and causes sexual disability.
• Hydrocoelectomy accounts for 25% of all surgical procedures performed in endemic areas of Ghana and Kenya.
• Lower limb involvement is characterized by initial pretibial pitting edema, which eventually becomes nonpitting and involves the entire leg.
• The skin of the leg or scrotum becomes thick, fissured, and warty; and ulceration and secondary infection may occur.
• Rare instances of pleural [8] or pericardial effusion [9] , multiple subcutaneous nodules [10] and intra-abdominal cysts are reported [11]
• Chyluria reflects rupture of swollen lymphatics into the urinary tract. [12-17] Microscopic (occasionally gross) hematuria is reported in some cases. [18] [19]
• Filarial granuloma may mimic testicular cancer [20] or Kimura disease. [21]

Microfilariae may be found in properly timed blood specimens, hydrocoele fluid, chylous urine and organ aspirates. [22] [23]
• Adult worms are identified in biopsy material.
• Eosinophilia usually appears only during acute episodes of inflammation.

There is extensive evidence that endosymbiont bacteria (***Wolbachia*** spp.) are necessary for the development of filarial

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larvae, and fertility of adult parasites. [24-27]
• Doxycycline has proven effective in therapy, presumably through inhibition of *Wolbachia* spp. [28-31]

Filariasis - Bancroftian in Zambia

Time and Place:
The first case report of bancroftian filariasis in Zambia was published in 1976. [32] [33]
- 92.3% of the population were at risk for Bancroftian filariasis as of 2000.
- 111,036 persons are at risk as of 2006.

Prevalence surveys:
0.6% of the population (microfilaremia, 1946 publication) [34]
1.2% of persons age 1 to 14 years, and 20.6% ages >50 years (Luangwa District, 2013 publication) [35]
10% (approximate) in Ndola (2015) [36]

Analysis of filariasis distribution in Zambia (2003 to 2011) - see reference [37]

94,949 persons received mass treatment in 2006 [38]

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Fungal infection - invasive

Agent	FUNGUS. Various (major syndromes such as Candidiasis, Blastomycosis, etc are discussed separately in this module)
Reservoir	Human
Vector	None
Vehicle	Endogenous
Incubation Period	Variable
Diagnostic Tests	Culture of blood, urine, biopsy material. Serum antigen or antibody assay in some cases.
Typical Adult Therapy	Antifungal agent(s) directed at known or likely pathogen
Typical Pediatric Therapy	As for adult
Clinical Hints	This diagnosis should be suspected in any patient with evidence of severe local or multisystem infection, particularly in the setting of immune suppression.
Synonyms	Acremonium, Acrophialophora, Adiaspiromycosis, Allescheriasis, Alternaria, Arthrographis kalrae, Athopsis, Aureobasidium, Bipolaris, Blastobotrys proliferans, Chaetomium, Chrysosporium, Cladophialophora, Cladosporium, Curvularia, Cyphellophora, Dactylaria, Debaryomyces, Dreschslera, Emmonsia, Exophiala, Exserohilum, Fonsecaea, Fungal meningitis, Fungal sepsis, Fusarium, Geosmithia, Geosmithia argillacea, Geotrichosis, Graphium, Hansenula, Haplomycosis, Hendersonula, Hyalophycomycosis, Kluyveromyces, Lasiodiplodia, Lasiodiplodia, Lecythophora, Malassezia furfur, Monascus, Monosporiosis, Mycocentrospora, Neocosmospora vasinfecta, Neosartorya hiratsukae, Neosartorya udagawae, Ochroconis, Oidiodendron, Paecilomyces, Paraconiothyrium, Pestalotiopsis, Phaeoacremonium, Phaeohyphomycosis, Phialemoniopsis, Phialophora, Phoma, Pichia, Pseudallescheria, Pseudallescheriasis, Pseudochaetosphaeronema martinelli, Purpureocillium, Pyrenochaeta, Ramichloridium, Rhinocladiella, Rhytidhysteron, Saccharomyces, Saprochaete, Sarcopodium, Sarocladium, Scedosporium, Septicemia - fungal, Taeniolella, Thielavia, Trichoderma, Truncatella, Ulocladium, Veronacea, Verruconis, Wallemia. ICD9: 117.6,117.8,117.9,118 ICD10: B43.1,B43.2,B43.8,B48.2,B48.3,B48.7,B48.8

Clinical

Major syndromes (Aspergillosis, Candidiasis, Coccidioidomycosis, Cryptococcosis, Penicilliosis, etc) are discussed elsewhere in this module.

Clinical syndromes associated with systemic fungal infection (in alphabetical order):

Adiaspiromycosis (Haplomycosis) is a pulmonary infection due to *Emmonsia* (*Chrysosporium*) species.
• Most cases have been described in Latin America and Central Europe, with additional reports from Israel and the United States.
• Three forms are recognized: solitary granuloma, localized granulomatous disease and diffuse, disseminated granulomatous disease. [1]

Arthrographis kalrae has been reported as a cause of sinusitis and meningitis in patient with AIDS.

Blastobotrys proliferans is an ascomyetous yeast that has been reported to cause peritonitis in a dialysis patient. [2]

Curvularia inaequalis has been associated with several cases of peritonitis complicating peritoneal dialysis. [3]

Exophiala jaenselmei and *Rhinocladiella* species have been implicated in cases of nosocomial fungemia.
• An outbreak of *Exophalia* infection in the United States was associated with contamination of injectable steroids.

Exserohilum is a dematiaceous fungus that has been associated with skin infections, keratitis, systemic infections and sinusitis. [4]

Fusarium often infects the cornea [5] , but may occasionally cause subcutaneous infection, fungemia, pneumonia, arthritis, bursitis, brain abscess and a variety of other systemic infection. [6]

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• Pathogenic members of the *Fusarium solani* complex are common in the environment. [7]

Geotrichosis is a rare form of pneumonia and systemic mycosis caused by *Geotrichum candidum*.
• The organism is ubiquitous in nature and often found in the stool of healthy humans.
• Pulmonary disease simulates tuberculosis; and mucosal infection is similar to moniliasis.

Graphium basitruncatum has been associated with fungemia in a patient with leukemia. [8]

Hansenula species have been implicated in nosocomial infections, endocarditis, fungemia and urinary tract infection

Lasiodiplodia theobromae has been reported to cause keratomycoses. [9]

Neocosmospora vasinfecta, a plant pathogen, has caused at least 3 cases of soft tissue infection (lower extremities, in Senegal) or fatal disseminated infection in immunocompromised humans. [10]

Neosartorya hiratsukae has been implicated in a case of brain abscess.

Penicillium • 31 cases of invasive infection by *Penicillium* species other than *P. marneffei* were reported during 1951 to 2001 • including 12 of pulmonary disease, and 4 prosthetic valve endocarditis.

Phaeohyphomycosis (infection by demataceous fungi) is manifested as:
• brain abscess (typically *Cladosporium trichoides*; also *Exophiala dermatitidis* [11] , *Fonsecaea pedrosoi*, *Ramichloridium obovoideum*, *Ochroconis gallopavum*, *Chaetomium atrobruneum*, et al),
• sinusitis (*Drechslera*, *Bipolaris*, *Exsorohilum*, *Curvularia*, *Alternaria*, *Cladosporium*)
• subcutaneous infection (typically due to *Exophiala* and *Phialophora* species • occasionally *Fonsecaea*, *Cladosporidium*, *Alternaria*, *Dactylaria*, *Mycocdentrospora*, *Phaeoacremonium* [12] , *Veronaea*, *Cyphellophora pluriseptata*, etc)
• endocarditis.

Pseudoallescheriasis (Petriellidiosis) is caused by *Scedosporium apiospermum* (*Pseudoallescheria boydii*) and may present as mycetoma; or infection of the brain, bone and joints, orbits and other tissues. [13] [14]

Ramichloridium mackenziei has been reported to cause brain abscess in the Middle East.

Sarcopodium oculorum has been implicated as a cause of corneal ulcer in Brazil.

Trichoderma spp. are associated with peritonitis among dialysis patients, and disseminated infection in the immune-suppressed.

Fungal eye infection:
• Fungal endophthalmitis may be exogenous or endogenous.
• Clinically, onset is delayed and more gradual than infection due to bacteria.
• Hyaline fungi:
  Fusarium species are implicated in keratitis, scleritis and intraocular infections
  Aspergillus in keratitis following industrial trauma or surgery, orbital infection, dacryocystitis, scleritis and endophthalmitis
  Scedosporium in keratitis, scleritis, endophthalmitis, orbital infection
  Paecilomyces in keratitis, endophthalmitis and intralenticular infections
  Acremonium in keratitis and endophthalmitis.
• Dematiaceous fungi
  Bipolaris, *Curvularia*, *Exophiala*, *Exserohilum*, *Lecytophora* and *Phialophora* are implicated in keratitis and intraocular infections
  Lasiodiplodia in keratitis and endophthalmitis.
• Other fungal agents (*Candida*, *Cryptococcus*, *Coccidioides*, *Paracoccidioides*, *Blastomyces*, *Histoplasma*, *Sporothrix*) which may cause ocular infection are discussed separately in this module.

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Gastroenteritis - viral

Agent	VIRUS - RNA Calicivirus (Norwalk, Hawaii, Sapporo, Snow Mountain, Norovirus); Torovirus; or Astrovirus
Reservoir	Human
Vector	None
Vehicle	Food Water Shellfish Vegetables
Incubation Period	Norwalk 1d - 2d; Astrovirus 3d - 4d
Diagnostic Tests	Demonstration of virus (electron microscopy or stool antigen analysis). Serology. Nucleic acid amplification.
Typical Adult Therapy	Stool precautions; supportive
Typical Pediatric Therapy	As for adult
Clinical Hints	Vomiting (less common with Astrovirus), abdominal pain; loose, watery diarrhea lasting 1 to 3 days; no fecal leucocytes; fever in 50% - headache and myalgia in some cases.
Synonyms	Aichi, Astroviridae, Astrovirus, Bufavirus, Calicivirus gastroenteritis, Chiba, Cosavirus, Cyclovirus, Diarrhea, Gastroenterite virale, Hawaii agent gastroenteritis, Klassevirus, Mexico virus, Mini-reovirus, Minireovirus, Norovirus gastroenteritis, Norwalk agent gastroenteritis, Norwalk-like, Parkville virus gastroenteritis, Picobirnavirus, Recovirus, Roskilde disease, Saffold Cardiovirus, Salivirus, Sapovirus, Sapporo, Sapporo-like, Snow Mountain, SRSV gastroenteritis, STL polyomavirus, STLPyV, Toronto virus, Torovirus, Tusavirus, Vinterkraksjuka, Viral gastroenteritis, Winter vomiting disease. ICD9: 008.8,008.69,008.62,008.63,008.64,008.65,008.66,008.67 ICD10: A08.1,A08.2,A08.3,A08.4

Clinical

The median incubation period for Astrovirus infection is 4.5 days, 33.5 hours for Norovirus genogroups I and II [1] , 1.7 days for Sapovirus, and 2.0 days for Rotavirus. [2]

The onset of infection due to the Norwalk virus group may be gradual or abrupt, and is heralded by abdominal cramps with or without nausea.
• In most cases, both vomiting and diarrhea occur. [3]
• Four to eight non-bloody stools are passed per day; and fecal leucocytes are absent.
• 87% of patients with NLV infection develop diarrhea within 5 days; and only 60% of patients with Sapporo-like virus [SLV] infection.
• 59% of children below age 1 year develop vomiting with NLV, and 44% with SLV.
• Myalgias, malaise, headaches and benign febrile seizures [4] [5] may also be present.
• A low-grade fever occurs in 50% of cases.
• Original publications stated that symptoms remit in 48 to 72 hours [6] without sequelae ; however, recent studies suggest that illness usually persists for 5 to 6 days.
• The duration of illness has been correlated with fecal concentration of virus.
• Residual dyspepsia, constipation or gastroesophageal reflux disease may persist following Norovirus infection. [7]
• Cases of Guillain-Barre syndrome [8] , encephalitis [9] and necrotizing enterocolitis in newborn infants have been ascribed to Norovirus infection. [10] [11]
• Disease severity and mortality rates for Norovirus infection are higher for adults ages >=65 years than for children ages <5 years. [12]
• Review of the clinical features of fatal Norovirus infection • see reference [13]

Astrovirus diarrhea is similar to NLV infection; however, the former is characterized by a milder illness and lower incidence of vomiting. [14]

Sapovirus gastroenteritis is clinically indistinguishable Norovirus infection. [15]

Rare instances of meningitis have been associated with Saffold virus infection. [16]

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GB virus C infection

Agent	VIRUS - RNA. Flaviviridae, Pegivirus GB virus C (Hepatitis G virus)
Reservoir	Human
Vector	None
Vehicle	Blood Vertical transmission has also been documented Sexual transmission suspected
Incubation Period	Unknown
Diagnostic Tests	Serology. Nucleic acid amplification.
Typical Adult Therapy	Supportive. Alpha interferon has been shown to ? transiently eliminate the carrier state
Typical Pediatric Therapy	As for adult
Clinical Hints	Acute or chronic hepatitis acquired from blood (needles, etc); clinically milder than hepatitis C - most cases limited to anicteric elevation of hepatic enzyme levels; viremia documented for as long as 10 years.
Synonyms	Epatite G, GBV-C, Hepatitis G, Hepatitis GB, HPgV, HPgV-2, Human Pegivirus. ICD9: 070,59 ICD10: B17.8

Clinical

GB virus C infection is characterized by acute or chronic hepatitis acquired from blood (needles, etc). [1]

- The disease is milder than hepatitis C, with most cases limited to anicteric elevation of hepatic enzyme levels. [2]
- Viremia has been documented for as long as 10 years.
- A case of aplastic anemia complicating GB virus C infection has been reported. [3]

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Gianotti-Crosti syndrome

Agent	UNKNOWN
Reservoir	Unknown
Vector	None
Vehicle	Unknown
Incubation Period	Unknown
Diagnostic Tests	Clinical features and skin biopsy findings.
Typical Adult Therapy	None
Typical Pediatric Therapy	None
Clinical Hints	Generalized skin eruption involving the extremities, face and buttocks; lymphadenopathy of the axillae and inguinal region; anicteric hepatitis; resolves in 15 to 42 days. Rare outbreaks have been reported.
Synonyms	Acrodermatitis papulosa infantilis, Papular acrodermititis of childhood, Papulovesicular acrolocated syndrome. ICD9: 693.0 ICD10: L27.8

Clinical

Most patients are in the age group 2 to 6 years; however, the disease has occasionally been reported in infants and young adults. [1] [2]

Clinical features are largely limited to discrete flat-topped papules on the face, extensor surfaces of the extremities and buttocks. [3]
• The eruption is symmetrical, occasionally pruritic, either skin-colored or erythematous, and evolves over a period of two to three days.
• The skin lesions measure 2 to 4 mm in diameter, with a tendency for larger lesions among young children. [4]
• Koebner phenomenon has been described.
• In most cases, the exanthem resolves after 15 to 20 days, but may persist for as long as 5 weeks.
• Hemorrhagic skin lesions and petechiae have been described in some cases. [5]
• Prominent lymphadenopathy is noted, primarily in the inguinal and axillary regions.
• Hepatomegaly and anicteric hepatitis are common.

Gianotti-Crosti syndrome may be the only presenting manifestation of Epstein-Barr virus infection. [6]

The features of Gianotti-Crosti syndrome may mimic those of atopic dermatitis [7] and pityriasis rosea. [8]

The diagnosis is confirmed by skin biopsy, which reveals spongiosis of the upper epidermis and upper dermis, with perivascular lymphocytic and histiocytic infiltrates. [9]

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Giardiasis

Agent	PARASITE - Protozoa. Sarcomastigophora, Metamonada, Trepomonadea. Flagellate: Giardia lamblia (G. intestinalis, G. duodenalis)
Reservoir	Human Beaver Muskrat Dog Cat Carnivores Sheep Goat Horse Cattle
Vector	None
Vehicle	Food Water Fecal-oral Fly
Incubation Period	1w - 3w (range 3d - 6w)
Diagnostic Tests	String test (gelatin capsule containing string). Stool microscopy or antigen assay. Nucleic acid amplification.
Typical Adult Therapy	Tinidazole 2 g PO X1. OR Nitazoxanide 500 mg PO BID X 3d Alternatives: Metronidazole 250 mg PO TID X 5d. OR Furazolidone 100 mg PO QID X 7d. OR Paromomycin 10 mg/kg PO TID X 7d OR Quinacrine 100 mg PO TID X 5d
Typical Pediatric Therapy	Tinidazole 50 mg PO X 1 (maximum 2g). OR Nitazoxanide: Age 1 to 3y 100 mg BID X 7 d Age 4 to 11y 200 mg BID X 7d Alternatives: Metronidazole 5 mg/kg PO TID X 5d. OR Furazolidone 1.5 mg/kg QID X 7d
Clinical Hints	Foul smelling, bulky diarrhea, nausea and flatulence; may "wax and wane"; weight loss and low-grade fever are common.
Synonyms	Beaver fever, Giardia duodenalis, Giardia intestinalis, Giardia lamblia, Lambliasis. ICD9: 007.1 ICD10: A07.1

Clinical

The usual interval between infection and the onset of acute symptoms ranges from one to two weeks.

In most instances, the individual will experience sudden explosive, watery, foul-smelling diarrhea; excessive gas; abdominal pain; bloating; nausea; asthenia; and anorexia. [1]
• Symptoms consistent with irritable bowel syndrome and functional dyspepsia are reported in 80.5% and 24.5% of patients, respectively [2]
• Upper gastrointestinal symptoms such as vomiting may predominate. [3]
• Fever is unusual, and asymptomatic infection is common.
• Blood or mucus in the stool is rare, and there is neither leucocytosis nor eosinophilia.
• Intraepithelial infection in the absence of positive stool examinations has been reported. [4]

Occasionally, the illness may last for months, or even years, causing recurrent episodes of impaired digestion, lactose intolerance, diarrhea, depression, asthenia and weight loss. [5-9]
• Recurrence of symptoms is also common following effective treatment. [10]
• Severe and prolonged infections are reported among patients with IgA deficiency and malnutrition.
• Infection in children may result in stunted growth, delayed development [11] [12] and vitamin A deficiency. [13]

Sequelae:
• Reactive arthritis may occasionally follow infection by *Giardia intestinalis*. [14] [15]
• Giardiasis has been implicated in the etiology of irritable bowel syndrome and chronic fatigue syndrome. [16] [17]

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Giardiasis in Zambia

Prevalence surveys:

19.4% of schoolchildren in Southern Province (2005 publication) [18]
29.0% of pre-schoolchildren in Kafue District (2007) [19]
29.0% of pre-schoolchildren in Kafue (2007) [20]
12% of pigs in Lusaka (2012 publication) [21]
34.5% of dairy cattle in Chilanga and Lusaka districts (2016 publication) [22]

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Gnathostomiasis

Agent	PARASITE - Nematoda. Secernentea: Gnathostoma spinigerum (rarely G. hispidum, G. doloresi and G. nipponicum)
Reservoir	Cat Dog Poultry Frog Fish
Vector	None
Vehicle	Food Fish Amphibian Reptile
Incubation Period	3w - 4w (range 2d - 1y)
Diagnostic Tests	Identification of larva in tissue. Serological testing in specialized laboratories.
Typical Adult Therapy	Albendazole 400 mg daily for 21 days has been recommended as an adjunct to surgical excision Ivermectin, 200 ug/kg PO as a single dose has also been advocated.
Typical Pediatric Therapy	As for adult
Clinical Hints	Follows ingestion of raw meat, poultry, fish or frog; migratory nodules of skin, soft tissues, brain or eye; eosinophilia; parasite may survive for more than 10 years in human tissue.
Synonyms	Gnathostoma, Gongylonematiasis, Larva migrans profundus, Nodular migratory eosinophilic panniculitis, Physaloptera, Spiruroid larva migrans, Wandering swelling, Yangtze edema. ICD9: 128.1 ICD10: B83.1

Clinical

Initial symptoms may include nausea, abdominal pain or urticaria.
• The presence of worms in skin or soft tissue results in migratory, pruritic or painful swellings which may be erythematous and attain a size of several centimeters. [1]
• Swellings may last for 1 to 4 weeks in a given area, and then reappear in a new location • a pattern which can continue for months or years.
• Findings of central nervous system infection (less than 1% of patients with subcutaneous gnathostomiasis) have included radiculopathy, meningitis, encephalitis, subarachnoid or intercerebral hemorrhage or paralysis. [2-6]
• Other syndromes include eye infestation [7-12] , persistent abdominal pain with hepatomegaly, or pneumonitis. [13]
• 74 cases of intra-ocular gnathostomiasis had been reported as of 2012 • including 14 from India. [14]
• Eosinophilia is prominent. Eosinophiles may also be found in CSF and pleural effusions. [15]

Neurognathostomiasis (NG) is clinically similar to angiostrongyliasis. [16]
• Angiostrongyliasis patients present with acute severe headache but without neurological deficit, combined with a history of eating uncooked snails or slugs.
• NG patients always present with motor weakness, migratory swelling, radicular pain and history of eating uncooked poultry or fish.

Gnathostomiasis in Zambia

1998 - Two patients developed gnathostomiasis after returning to South Africa from Zambia, where they had ingested Zambesi River fish. [17]

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Gonococcal infection

Agent	BACTERIUM. Neisseria gonorrhoeae An aerobic gram-negative coccus
Reservoir	Human
Vector	None
Vehicle	Sexual contact Childbirth Exudates
Incubation Period	2d - 7d
Diagnostic Tests	Smear (male), culture. Consult laboratory for proper acquisition & transport. Nucleic acid amplification.
Typical Adult Therapy	Ceftriaxone 250 mg IM X 1. PLUS Azithromycin 1 g PO as single dose.
Typical Pediatric Therapy	Weight <=45 kg: Ceftriaxone 25 - 50 mg/kg IM or IV X 1 (max. 125 mg IM) Weight >45 kg: as for adult. PLUS Azithromycin
Clinical Hints	Copious urethral discharge (male) or cervicitis beginning 2 to 7 days after sexual exposure; PID; fever, painful pustules and suppurative arthritis (primarily encountered in postmenstrual females).
Synonyms	Blennorragie, Blenorragia, Gonococcemia, Gonore, Gonorre, Gonorrea, Gonorrhea, Gonorrhee, Gonorrho, Gonorrhoe, Infeccion gonococica, Infeccoes gonococicas, Neisseria gonorrhoeae. ICD9: 098 ICD10: A54

Clinical

Gonorrhea:
Gonorrhea in males typically presents as urethral discomfort, dysuria, and discharge.
• The degree of discomfort and discharge are variable.
• Asymptomatic infection is common among females, but may also occur in males [1]
• Gonococcal epididymitis presents with unilateral pain and swelling localized posteriorly within the scrotum.
• Gonorrhea in the female are usually manifest as vaginal discharge and endocervicitis.
• The discharge is thin, purulent and mildly odorous.
• Dysuria or a scant urethral discharge may be present.
• Non-gonococcal urethritis, including infection by *Chlamydia trachomatis* and other *Neisseria* species [2] [3] may mimic gonococcal infection.
• Infection can be passed to the male urethra from the pharynx through fellatio. [4]
• Levels of serum Prostate-specific Antigen (PSA) may be elevated in patients with gonorrhea. [5]

Gonococcal PID:
Pelvic or lower abdominal pain suggests infection of the endometrium, fallopian tubes, ovaries or peritoneum.
• Pain may be midline, unilateral, or bilateral.
• Fever and vomiting may be present.
• Right upper quadrant pain from perihepatitis (Fitz-Hugh-Curtis syndrome) may occur following the spread of organisms upward along peritoneal planes to the hepatic capsule [6-8] (The syndrome is also reported as a complication of gonorrhea in males) [9]

Other clinical forms: [10]
Gonococcal proctitis is often asymptomatic, but rectal pain, pruritus, tenesmus, bloody diarrhea and rectal discharge may be present.
Gonococcal pharyngitis may be asymptomatic, or associated with severe inflammation. *Neisseria gonorrhoeae* is often present in throat specimens from patients with urethritis. [11] Pharyngeal / rectal infection may persist for 114 to 138 days / 346 days. [12]
Gonococcal conjunctivitis is usually unilateral in adults; however, neonatal infection (ophthalmia neonatorum) involves both eyes.
• Symptoms include pain, redness, and a purulent discharge and may result in blindness.
• Rare instances of corneal perforation are reported. [13] [14]

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Disseminated gonococcal infection is characterized by joint or tendon pain, of single or multiple joints. [15]
• Severe pain, swelling, and decreased mobility in a single joint (usually the knee) suggest purulent arthritis.
• Tenosynovitis is common, usually affecting the small joints of the hands.
• A rash is present in 25% of patients with gonococcemia. [16]
• Additional complications include meningitis, endocarditis, aortic aneurysm [17], septic shock with ARDS [18], subcutaneous abscess, Fournier's gangrene [19], pyomyositis [20] and other localized infections. [21]

Gonococcal infection in Zambia

Prevalence surveys:

10% of married women attending STD clinics (Lusaka, 1997 publication) [22]

11.3% of pregnant women (1986 publication) [23]

1.7% of HIV-infected pregnant women in Blantyre and Lilongwe (Malawi), Dar es Salaam (Tanzania) and Lusaka (Zambia) (2008 publication) [24]

1.4% of HIV-infected women in urban Lusaka (2012 publication) [25]

The rate of disease among at risk women in Lusaka was estimated at 5.3 per 100 person-years at risk (2003 to 2004). [26]

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Granuloma inguinale

Agent	BACTERIUM. Klebsiella granulomatis (formerly Calymmatobacterium granulomatis) A gram-negative bacillus
Reservoir	Human
Vector	None
Vehicle	Sexual contact Direct contact
Incubation Period	7d - 30d (range 3d - 1 year)
Diagnostic Tests	Identification of organism in stained smears. Culture in specialized laboratories (HEp-2 cells).
Typical Adult Therapy	Azithromycin 1 g weekly X 3 w. Alternatives: Doxycycline 100 mg BID PO X 3w. Sulfamethoxazole/trimethoprim 800/160 mg BID X 3w Erythromycin 500 mg QID X 3w.
Typical Pediatric Therapy	Azithromycin 10 mg / kg po day 1; then 250 mg / kg daily days 2 to 5 Alternatives: Sulfamethoxazole/trimethoprim , Erythromycin or Doxycyeline
Clinical Hints	Slowly expanding, ulcerating skin nodule with friable base; usually painless; may be complicated by edema or secondary infection - rarely spreads to bone or joints.
Synonyms	Calymmatobacterium granulomatis, Donovanosis, Granuloma genitoinguinale, Granuloma inguinale tropicum, Granuloma venereum, Sixth venereal disease. ICD9: 099.2 ICD10: A58

Clinical

The primary lesion of granuloma inguinale appears on the perineum or genitals in 80% to 90% of cases.
• Infection begins as a small painless papule or indurated nodule which progresses to a painless beefy-red ulcer with rolled edges and a friable surface.
• Multiple ulcers may coalesce, and new lesions may also form through autoinoculation. [1]
• Scar formation, deformity, keloids, lymphedema and scar carcinoma [2] may develop. [3]
• The most common sites of infection are the prepuce, coronal sulcus, and penile shaft; the labia and the fourchette .
• Rectal lesions may follow anal intercourse.
• Systemic disease of bones, joints, liver and lymphatics is rare, and may follow infection of the uterine cervix.
• Granuloma inguinale may present as mass lesions which mimic malignancy [4] [5] or elephantiasis [6] ; and cutaneous metastases from mucinous carcinoma may mimic granuloma inguinale. [7]

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Hepatitis A

Agent	VIRUS - RNA. Picornaviridae, Hepatovirus: Hepatitis A virus
Reservoir	Human Non-human primate
Vector	None
Vehicle	Fecal-oral Food Water Milk Fly Breastfeeding
Incubation Period	21d - 30d (range 14d - 60d)
Diagnostic Tests	Serology. Nucleic acid amplification.
Typical Adult Therapy	Stool precautions; supportive
Typical Pediatric Therapy	As for adult
Vaccines	Hepatitis A vaccine Hepatitis A + Hepatitis B vaccine Immune globulin
Clinical Hints	Vomiting, anorexia, dark urine, light stools and jaundice; rash and arthritis occasionally encountered; fulminant disease, encephalopathy and fatal infections are rare (case-fatality rate 0.15% to 2.7%, depending on age).
Synonyms	Botkin's disease, Epatite A, HAV, Hepatite per virus A, Infectious hepatitis, Sosuga. ICD9: 070.0 ICD10: B15.0, B15.9

Clinical

WHO Case definition for surveillance of acute viral hepatitis (all types):
Clinical description
• Acute illness typically including acute jaundice, dark urine, anorexia, malaise, extreme fatigue, and right upper quadrant tenderness.
• Biological signs include increased urine urobilinogen and >2.5 times the upper limit of serum alanine aminotransferase.
• Note: Most infections occur in early childhood. A variable proportion of adult infections is asymptomatic.
Laboratory criteria for diagnosis
• Hepatitis A: IgM anti-HAV positive
• Hepatitis B: positive for Hepatitis B surface antigen (HBsAg) or IgM anti-HBC-positive
• Non-A, non-B: IgM anti-HAV and IgM anti-HBc (or HBsAg) negative
Note 1: The anti-HBc IgM test, specific for acute infection, is not available in most countries.
• HBsAg, often available, cannot distinguish between acute new infections and exacerbations of chronic hepatitis B, although continued HBsAg seropositivity (>6 months) is an indicator of chronic infection.
Note 2: For patients negative for hepatitis A or B, further testing for a diagnosis of acute hepatitis C, D, or E is recommended:
Hepatitis C: anti-HCV positive
Hepatitis D: HBsAg positive or IgM anti-HBc positive plus anti-HDV positive (only as co-infection or super-infection of hepatitis B)
Hepatitis E: IgM anti-HEV positive
Case classification
• Suspected: A case that is compatible with the clinical description.
• Probable: Not applicable.
• Confirmed: A suspected case that is laboratory confirmed or, for hepatitis A only, a case compatible with the clinical description, in a person who has an epidemiological link with a laboratory-confirmed case of hepatitis A (i.e. household or sexual contact with an infected person during the 15-50 days before the onset of symptoms).

Clinical features of Hepatitis A:

The prodrome is characterized by anorexia, asthenia, headache, myalgia and moderate fever.
• Patients develop nausea, vomiting and right upper abdominal pain • and later overt jaundice. [1]
• Symptoms persist for 4 to 8 weeks, and the patient may remain asthenic and anorectic for several months thereafter.
• As many as 90% of cases in children less than 5 years of age are asymptomatic; fewer 50% among adults.
• Relapses may occur for up to 6 months following the initial infection.
• Rare instances of acute disseminated encephalomyelitis [2] , myelitis [3] , acute motor and sensory neuropathy [4] ,

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meningoencephalitis [5] , acute cholestatic syndrome [6] , acalculous cholecystitis [7-10] , urticaria [11] , pancreatitis [12-15] , chylothorax [16] , pleural effusion or ascites [17] [18] , acute glomerulonephritis or renal failure [19-28] , pure red-cell aplasia [29] , hemophagocytic lymphohistiocytosis [30] [31] . cerebral venous thrombosis [32] and rhabdomyolysis have been reported. [33]
• Concurrent HIV infection may prolong the duration of viremia in patients with hepatitis A. [34]

Hepatitis A accounts for 3.1% of acute hepatic failure cases (United States, 1998 to 2005) [35]
• The case-fatality rate is 0.1% among children below age 4 years; 0.4% ages 5 to 29 years; and 1% above age 40.
• 55% of hepatitis A patients with acute hepatic failure recover • the remainder either die of the disease or require transplantation. [36]

A false positive serological reaction toward Epstein-Barr virus has been associated with Hepatitis A. [37]

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Hepatitis B

Agent	VIRUS - DNA. Hepadnaviridae, Orthohepadnavirus: Hepatitis B virus
Reservoir	Human Non-human primate
Vector	None
Vehicle	Blood Infected secretions Sexual contact Transplacental
Incubation Period	2m - 3m (range 1m - 13m)
Diagnostic Tests	Serology. Nucleic acid amplification.
Typical Adult Therapy	Needle precautions. For chronic infection: Peginterferon alfa-2a or Peginterferon alfa-2b OR Entecavir OR Tenofovir
Typical Pediatric Therapy	As for adult
Vaccines	Hepatitis A + Hepatitis B vaccine Hepatitis B + Haemoph. influenzae vaccine Hepatitis B immune globulin Hepatitis B vaccine
Clinical Hints	Vomiting and jaundice; rash or arthritis occasionally noted; risk group (drug abuse, blood products, sexual transmission); cirrhosis or hepatoma may follow years after acute illness; fulminant and fatal infections are encountered.
Synonyms	Epatite B, HBV, Hepatite per virus B, Serum hepatitis. ICD9: 070.1 ICD10: B16.2,B16.9, B16.1

Clinical

WHO Case definition for surveillance of acute viral hepatitis (all types):
Clinical description
• Acute illness typically including acute jaundice, dark urine, anorexia, malaise, extreme fatigue, and right upper quadrant tenderness.
• Biological signs include increased urine urobilinogen and >2.5 times the upper limit of serum alanine aminotransferase.
• Note: Most infections occur in early childhood. A variable proportion of adult infections is asymptomatic.
Laboratory criteria for diagnosis
• Hepatitis A: IgM anti-HAV positive
• Hepatitis B: positive for Hepatitis B surface antigen (HBsAg) or IgM anti-HBc positive
• Non-A, non-B: IgM anti-HAV and IgM anti-HBc (or HBsAg) negative
Note 1: The anti-HBc IgM test, specific for acute infection, is not available in most countries.
• HBsAg, often available, cannot distinguish between acute new infections and exacerbations of chronic hepatitis B, although continued HBsAg seropositivity (>6 months) is an indicator of chronic infection.
Note 2: For patients negative for hepatitis A or B, further testing for a diagnosis of acute hepatitis C, D, or E is recommended:
Hepatitis C: anti-HCV positive
Hepatitis D: HBsAg positive or IgM anti-HBc positive plus anti-HDV positive (only as co-infection or super-infection of hepatitis B)
Hepatitis E: IgM anti-HEV positive
Case classification
• Suspected: A case that is compatible with the clinical description.
• Probable: Not applicable.
• Confirmed: A suspected case that is laboratory confirmed or, for hepatitis A only, a case compatible with the clinical description, in a person who has an epidemiological link with a laboratory-confirmed case of hepatitis A (i.e. household or sexual contact with an infected person during the 15-50 days before the onset of symptoms).

Clinical features of Hepatitis B:
Infection can be asymptomatic (particularly in young children) or quite mild, with only fatigue, anorexia, and malaise.
• Clinical disease with jaundice occurs in 50% of adults and 10% of young children.

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• Extrahepatic manifestations include arthralgia, arthritis [1], rash [2], inflammatory myopathy [3], dry-eye syndrome (similar to Sjogren's syndrome) [4], nephrotic syndrome [5], focal segmental glomerulosclerosis [6] [7] and acute glomerulonephritis. [8-14]

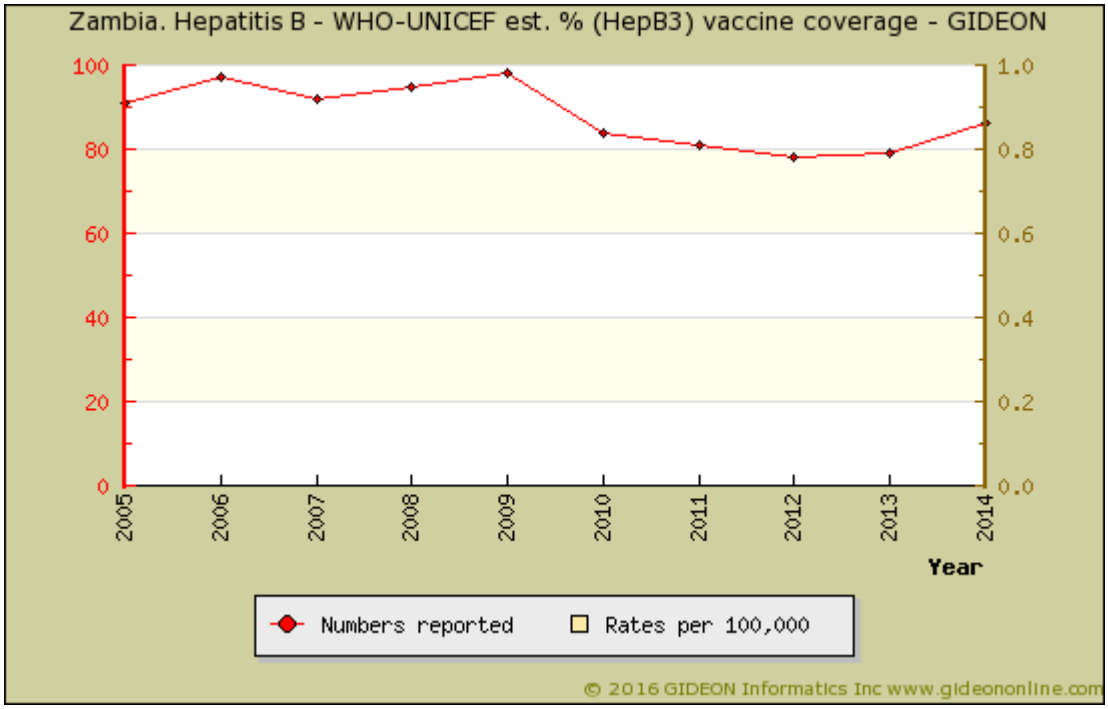
• Rare instances of pure red cell aplasia [15], symmetric sensorimotor polyneuropathy [16], acute acalculous cholecystitis [17] and pancreatitis have been reported. [18]
• Chronic infection occurs in most young children and in 5% to 10% of adults, and can lead to persistent hepatitis, retarded growth in children [19], active hepatitis, cirrhosis, or hepatocellular carcinoma. [20]
• Acute exacerbation of chronic Hepatitis B may occur. [21]
• Patients with HBV-HDV coinfection appear to have more severe acute disease and a higher risk of fulminant hepatitis (2% to 20%) compared with those infected with HBV alone [22]; however, chronic HBV infection appears to occur less frequently in persons with HBV-HDV coinfection.
• Concurrent HIV infection increases the incidence of cirrhosis and HCC among Hepatitis B carriers. [23-26]
• Concurrent chronic Hepatitis B infection enhances the deleterious effect of schistosomiasis on the liver. [27]

One to two million deaths are attributed to hepatitis B annually. 25% of chronic carriers died of primary liver cancer or cirrhosis as adults.
• Hepatitis B is responsible for 60% to 80% of the world's primary liver cancer.
• Primary liver cancer is one of the three leading causes of cancer death in East Asia, Southeast Asia, the Pacific Basin and sub-Saharan Africa.
• Hepatitis B predominates among patients with hepatocellular carcinoma in most Asian, African and Latin American countries; while hepatitis C predominates in Japan, Pakistan, Mongolia, Egypt, Europe and the United States. [28]

Hepatitis B in Zambia

Vaccine Schedule:

BCG - birth
DTwPHibHepB - 6, 10, 14 weeks
Measles - 9, 18 months
OPV - 6, 10, 14 weeks
Pneumo conj - 6, 10, 14 weeks
Rotavirus - 6, 10 weeks
Td - 1st contact pregnancy; +1, +1, +6 months; +1, +1 year



Graph: Zambia. Hepatitis B - WHO-UNICEF est. % (HepB3) vaccine coverage

HBsAg-positivity surveys:

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6.5% of pregnant women (1995 publication) [29]
7.1% of pregnant women (1996 publication) [30]
7.56% of blood donations during 2000 to 2004; 6.02% during 2010 to 2011 [31]
5.2% of blood donors in Kitwe in 1994; 22.3% in 1998
5.0% of blood donors (1979 publication) [32]
1.6% (students) to 15.1% (prisoners) of blood donors in Ndola (1975 publication) [33]
9.9% of HIV-positive patients (Lusaka, 2011 publication) [34]
10.4% of HIV-positive children and adolescents (2011 to 2014) [35]

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Hepatitis C

Agent	VIRUS - RNA. Flaviviridae, Hepacivirus: Hepatitis C virus
Reservoir	Human
Vector	None
Vehicle	Blood Sexual contact Transplacental
Incubation Period	5w - 10w (range 3w - 16w)
Diagnostic Tests	Serology. Nucleic acid amplification.
Typical Adult Therapy	Needle precautions. For chronic infection: Ledipasvir / Sofusbuvir OR Ombitasvir-Paritaprevir-Ritonavir + Dasabuvir + Ribavirin OR Sofusbuvir + Simeprevir + Ribavirin (Regimen / Duration dependent on viral genotype)
Typical Pediatric Therapy	Agents recommended for adult disease are not currently licensed for use in children Peginterferon alfa-2b 3 MU/m2 SC x1 weekly AND Ribavirin 15mg/kg
Clinical Hints	Vomiting and jaundice; may be history of transfusion within preceding 1 to 4 months; chronic hepatitis and fulminant infections are encountered.
Synonyms	Epatite C, HCV, Hepatite per virus C, Non-A, non-B parenteral hepatitis. ICD9: 070.2,070.3,070.44,070.51,070.54,070.7 ICD10: B17.1

Clinical

WHO Case definition for surveillance of acute viral hepatitis (all types):
Clinical description
• Acute illness typically including acute jaundice, dark urine, anorexia, malaise, extreme fatigue, and right upper quadrant tenderness.
• Biological signs include increased urine urobilinogen and >2.5 times the upper limit of serum alanine aminotransferase.
• Note: Most infections occur in early childhood. A variable proportion of adult infections is asymptomatic.
Laboratory criteria for diagnosis
• Hepatitis A: IgM anti-HAV positive
• Hepatitis B: positive for Hepatitis B surface antigen (HBsAg) or IgM anti-HBc positive
• Non-A, non-B: IgM anti-HAV and IgM anti-HBc (or HBsAg) negative
Note 1: The anti-HBc IgM test, specific for acute infection, is not available in most countries.
• HBsAg, often available, cannot distinguish between acute new infections and exacerbations of chronic hepatitis B, although continued HBsAg seropositivity (>6 months) is an indicator of chronic infection.
Note 2: For patients negative for hepatitis A or B, further testing for a diagnosis of acute hepatitis C, D, or E is recommended:
Hepatitis C: anti-HCV positive [1]
Hepatitis D: HBsAg positive or IgM anti-HBc positive plus anti-HDV positive (only as co-infection or super-infection of hepatitis B)
Hepatitis E: IgM anti-HEV positive
Case classification
• Suspected: A case that is compatible with the clinical description.
• Probable: Not applicable.
• Confirmed: A suspected case that is laboratory confirmed or, for hepatitis A only, a case compatible with the clinical description, in a person who has an epidemiological link with a laboratory-confirmed case of hepatitis A (i.e. household or sexual contact with an infected person during the 15-50 days before the onset of symptoms).

Clinical features of Hepatitis C:

Patients with acute infection typically are either asymptomatic or have a mild clinical illness. [2]
• 60% to 70% of patients have no symptoms

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• 20% to 30% of patients have jaundice
• 10% to 20% of patients have non-specific symptoms, such as anorexia, malaise, or abdominal pain.

Clinical illness in patients with acute hepatitis C who seek medical care is similar to that of other types of viral hepatitis.
• The average time period from exposure to symptom onset is 6-7 weeks, whereas the average time period from exposure to seroconversion is 8-9 weeks.
• Anti-HCV can be detected in 80% of patients within 15 weeks after exposure, in >90% within 5 months after exposure, and in >97% by 6 months after exposure.
• In some cases, seroconversion is delayed for as long as 9 months after exposure.
• Rare instances of optic neuritis have been reported. [3]

The clinical course is variable; and fluctuating elevations in serum ALT levels, are the most characteristic feature. [4] [5]
• Fulminant hepatic failure following acute infection is rare.
• 15% to 25% of infections resolve without sequelae.
• Chronic HCV infection develops 75% to 85% of patients who exhibit persistent or fluctuating ALT elevations.
• 75% to 85% of patients with acute hepatitis C infection progress to chronic disease, and 20% to cirrhosis within 20 to 25 years. [6]
• No clinical or epidemiological features among patients with acute infection are predictive of persistent infection or chronic liver disease.
• Chronic liver disease is usually insidious, progressing without symptoms or physical signs in the majority of patients during 20 or more years following acute infection.
• Cirrhosis develops in 10% to 20% of persons with chronic hepatitis C over a period of 20 to 30 years; and hepatic cell carcinoma in 1% to 5%.
• HCV infection appears to have little short-term impact on survival after bone marrow transplantation, but is a risk factor for veno-occlusive disease and graft-versus-host disease. [7]
• Concurrent HIV infection shortens the time to development of chronic liver disease in patients with Hepatitis C. [8-16]

Hepatitis B predominates among patients with hepatocellular carcinoma in most Asian, African and Latin American countries; while hepatitis C predominates in Japan, Pakistan, Mongolia, Egypt, Europe and the United States. [17]

Additional manifestations seen in patients with chronic hepatitis C infection [18] [19] may include nocturnal pruritis {p 25548485) , mixed cryoglobulinemia [20-23] with systemic vasculitis of the skin, erythema induratum [24] , arthritis [25] , retarded growth in children [26] , renal disease [27-36] ; CNS vasculitis [37] , acute disseminated encephalomyelitis [38] , dorsal root ganglionopathy [39] , acute myelitis [40] and other nervous system disorders [41-45] ; thrombocytopenia [46-50] ; non-Hodgkin lymphoma; porphyria cutanea tarda and lichen planus [51-59] ; hypothyroidism [60] ; lymphocytic sialoadenitis (similar to that of Sjogren's syndrome) and ischemic retinitis [61] [62] ; autoimmune and other rheumatological disorders [63-67] , nectolytic acral erythema [68] [69] ; osteosclerosis [70] , scleritis [71] ; and orbital plasmacytoma. [72]

Hepatitis C in Zambia

The nationwide carriage rate in 1997 was estimated at 0.00%.

Seroprevalence surveys:

0.93% of blood donations (2010 to 2011) [73]
0.41% of blood donors and patients with jaundice (Lusaka, 1995 publication) [74]
1.2% of HIV-positive patients (Lusaka, 2011 publication) [75]

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Hepatitis D

Agent	VIRUS - RNA. Deltavirus: Hepatitis D virus - a 'satellite' virus which is encountered as infection with a co-virus (Hepatitis B)
Reservoir	Human
Vector	None
Vehicle	Infected secretions Blood Sexual contact
Incubation Period	4w - 8w (range 2w - 20w)
Diagnostic Tests	Serology. Nucleic acid amplification.
Typical Adult Therapy	Needle precautions; supportive Interferon alfa 2-a has been used.
Typical Pediatric Therapy	As for adult
Clinical Hints	Vomiting and jaundice - biphasic course often noted; occurs as a coinfection or superinfection of hepatitis B; may be chronic or fulminant (combined hepatitis B and delta carries a worse prognosis than seen with hepatitis B alone).
Synonyms	Epatite D, Hepatitis delta. ICD9: 070.41,070.52 ICD10: B17.0

Clinical

WHO Case definition for surveillance of acute viral hepatitis (all types):
Clinical description
• Acute illness typically including acute jaundice, dark urine, anorexia, malaise, extreme fatigue, and right upper quadrant tenderness. [1]
• Biological signs include increased urine urobilinogen and >2.5 times the upper limit of serum alanine aminotransferase.
• Note: Most infections occur in early childhood. A variable proportion of adult infections is asymptomatic.
Laboratory criteria for diagnosis
• Hepatitis A: IgM anti-HAV positive
• Hepatitis B: Positive for Hepatitis B surface antigen (HBsAg) or IgM anti-HBc positive
• Non-A, non-B: IgM anti-HAV and IgM anti-HBc (or HBsAg) negative
Note 1: The anti-HBc IgM test, specific for acute infection, is not available in most countries.
• HBsAg, often available, cannot distinguish between acute new infections and exacerbations of chronic hepatitis B, although continued HBsAg seropositivity (>6 months) is an indicator of chronic infection.
Note 2: For patients negative for hepatitis A or B, further testing for a diagnosis of acute hepatitis C, D, or E is recommended:
Hepatitis C: anti-HCV positive
Hepatitis D: HBsAg positive or IgM anti-HBc positive plus anti-HDV positive (only as co-infection or super-infection of hepatitis B)
Hepatitis E: IgM anti-HEV positive
Case classification
• Suspected: A case that is compatible with the clinical description.
• Probable: Not applicable.
• Confirmed: A suspected case that is laboratory confirmed or, for hepatitis A only, a case compatible with the clinical description, in a person who has an epidemiological link with a laboratory-confirmed case of hepatitis A (i.e. household or sexual contact with an infected person during the 15-50 days before the onset of symptoms).

Clinical features of Hepatitis D:

Hepatitis D is characterized by gradual onset of abdominal pain and vomiting, followed by development of jaundice.
• A biphasic course often noted.
• Hepatitis D coinfection in patients with Hepatitis B increases the rate of gastrointestinal hemorrhage, ascites, hepatic encephalopathy, cirrhosis and other complications. [2] [3]
• 80% of patients with chronic hepatitis D infection progress to cirrhosis within 5 to 10 years. [4]

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Hepatitis E

Agent	VIRUS - RNA. Caliciviridae: Hepatitis E virus
Reservoir	Human Rodent Pig
Vector	None
Vehicle	Fecal-oral Water Shellfish Blood (rare) Meat (rare)
Incubation Period	30d - 40d (range 10d - 70d)
Diagnostic Tests	Identification of virus by immune electron microscopy (stool). Serology. Nucleic acid amplification.
Typical Adult Therapy	Stool precautions; supportive
Typical Pediatric Therapy	As for adult
Vaccine	Hepatitis E vaccine
Clinical Hints	Clinically similar to hepatitis A - no chronic residua; severe or fatal if acquired during pregnancy (10% to 24% case-fatality rate).
Synonyms	Epatite E, Non-A, non-B enteric hepatitis. ICD9: 070.43,070.53 ICD10: B17.2

Clinical

WHO Case definition for surveillance of acute viral hepatitis (all types):
Clinical description
• Acute illness typically including acute jaundice, dark urine, anorexia, malaise, extreme fatigue, and right upper quadrant tenderness.
• Biological signs include increased urine urobilinogen and >2.5 times the upper limit of serum alanine aminotransferase.
• Note: Most infections occur in early childhood. A variable proportion of adult infections is asymptomatic.
Laboratory criteria for diagnosis
• Hepatitis A: IgM anti-HAV positive
• Hepatitis B: positive for Hepatitis B surface antigen (HBsAg) or IgM anti-HBc positive
• Non-A, non-B: IgM anti-HAV and IgM anti-HBc (or HBsAg) negative
Note 1: The anti-HBc IgM test, specific for acute infection, is not available in most countries.
• HBsAg, often available, cannot distinguish between acute new infections and exacerbations of chronic hepatitis B, although continued HBsAg seropositivity (>6 months) is an indicator of chronic infection.
Note 2: For patients negative for hepatitis A or B, further testing for a diagnosis of acute hepatitis C, D, or E is recommended:
Hepatitis C: anti-HCV positive
Hepatitis D: HBsAg positive or IgM anti-HBc positive plus anti-HDV positive (only as co-infection or super-infection of hepatitis B)
Hepatitis E: IgM anti-HEV positive
Case classification
• Suspected: A case that is compatible with the clinical description.
• Probable: Not applicable.
• Confirmed: A suspected case that is laboratory confirmed or, for hepatitis A only, a case compatible with the clinical description, in a person who has an epidemiological link with a laboratory-confirmed case of hepatitis A (i.e. household or sexual contact with an infected person during the 15-50 days before the onset of symptoms).

Clinical features of Hepatitis E:

In contrast to hepatitis A, hepatitis E is characterized by:
• relatively long incubation period
• prolonged clinical course
• severe and often fatal illness among pregnant women [1-6], patients with pre-existing hepatic cirrhosis [7], HIV-positive patients [8], hemodialysis patients [9] and possibly women taking oral contraceptive medication. [10]
• poor protective value of immune serum globulin. [11]

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In most hepatitis E outbreaks, the highest rates of clinically evident disease have been among young to middle-age adults.
• Lower disease rates in younger age groups may be the result of anicteric and/or subclinical HEV infection.
• Clinical disease in western countries and Japan is most common among males and persons above age 60 years. [12]

Clinical signs and symptoms are similar to those of other types of viral hepatitis and include abdominal pain anorexia, dark urine, fever, hepatomegaly, jaundice, malaise, nausea, and vomiting. [13]
• Less common findings [14] include arthralgia, arthritis [15], diarrhea, acute pancreatitis [16-23], pruritus, urticarial rash, severe thrombocytopenia [24-26], photophobia, Guillain-Barre syndrome [27-36], Parsonage Turner syndrome [37] [38], transverse myelitis [39], neuralgic amyotrophy [40-42], paresthesia [43], inflammatory polyradiculopathy [44], vestibular neuritis [45], myocarditis [46], encephalitis or encephalopathy [47-50], myositis [51] ,aplastic anemia [52] [53], pregnancy associated with fetal ascites [54], and hemophagocytic syndrome. [55]
• A false positive serological reaction toward Epstein-Barr virus has been reported in Hepatitis E virus infection. [56]
• Transient signs of auto-immune disease (anti-nuclear antibodies, anti-smooth muscle antibodies, hypergammaglobulinemia) has been reported in a patient with acute Hepatitis E. [57]
• The case fatality rate for young adults is 0.5% to 3%; 15% to 20% for pregnant women. [58]
• A subsequent publication estimated the CFR for all cases at 0.019 among non-pregnant patients vs. 0.198 among pregnant women. [59]
• Poor outcome among pregnant women has been correlated with the presence of ongoing malnutrition and anemia. [60]

The period of infectivity following acute infection is not known; however, virus excretion in stools has been demonstrated up to 14 days after illness onset.
• The period of viral excretion appears to be prolonged among patients with hematological malignancy. [61]

Chronic Hepatitis E virus infection is defined as the presence of HEV RNA in serum or stools for six months or more.
• Cases of chronic Hepatitis E virus infection are reported, notably among immunosuppressed patients. [62-76]
• Rare cases of chronic hepatitis E infection have been reported in immuno-competent individuals. [77] [78]

Hepatitis E in Zambia

Seroprevalence surveys:
8% of children ages 1 to 4 years, 36% ages 10 to 14 years; 28% of HIV-negative and 71% of HIV-positive adults (2013 publication) [79]

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Herpes B infection

Agent	VIRUS - DNA. Herpesviridae, Alphaherpesviridae, Simplexvirus: Cercopithecine herpesvirus 1 (Herpes B virus)
Reservoir	Monkey (usually Macaca species and cynomolgus)
Vector	None
Vehicle	Contact or bite
Incubation Period	10d - 20d (range 2d - 60d)
Diagnostic Tests	Viral culture (skin exudates). Nucleic acid amplification. Biosafety level 4.
Typical Adult Therapy	Therapy: Acyclovir 12 mg/kg IV q8h. OR Ganciclovir 5 mg/kg IV q12h. Follow with prolonged Acyclovir 800 mg PO 5X daily. Postexposure prophylaxis: Valacyclovir 1g PO q8h X 14 days. OR Acyclovir 800 mg PO X 5 X 14 days
Typical Pediatric Therapy	Acyclovir or Ganciclovir as for adult.
Clinical Hints	Vesicles, lymphadenopathy, myalgia, singultus, major neurological signs; usually within one month following contact with monkey; case-fatality rates exceed 80%. permanent neurological residua are common.
Synonyms	Cercopithecine herpesvirus 1, Herpes B, Herpesvirus simiae, Macacine herpesvirus 1. ICD9: 078.89 ICD10: B00.4

Clinical

Most human infections have been fatal, consisting of myelitis and hemorrhagic encephalitis with concomitant multiorgan involvement. [1]

The illness begins with fever, malaise, diffuse myalgia, nausea, abdominal pain and headache.
- Lymphadenitis is seen proximal to the site of inoculation.
- Dermal vesicles and sensory disturbances may be present at the site of inoculation.
- Abdominal pain and nausea may occur.
- Neurological findings then predominate, with dysesthesia, ataxia, diplopia, seizures, and ascending flaccid paralysis. [2]
- A lymphocytic CSF pleocytosis and elevated protein levels are noted, often with numerous erythrocytes.
- In contrast to herpes simplex infection, the encephalitis is multifocal.
- Rarely, isolated skin infection and even an isolated meningitis may be encountered.

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Herpes simplex encephalitis

Agent	VIRUS - DNA. Herpesviridae, Alphaherpesvirinae, Simplexvirus: Human herpesvirus (usually type I)
Reservoir	Human
Vector	None
Vehicle	Infected secretions, including Sexual contact
Incubation Period	Unknown
Diagnostic Tests	Viral culture CSF usually negative. CT brain. Compare CSF/blood antibody levels. Nucleic acid amplification.
Typical Adult Therapy	Acyclovir 10 mg/kg IV Q8h
Typical Pediatric Therapy	Acyclovir 10 mg/kg IV Q8h
Clinical Hints	Rapidly-progressive severe encephalitis, usually without exanthem; often unilateral, temporal and parietal lobe predominance; permanent residua and high case-fatality rate in untreated cases.
Synonyms	

Clinical

Although fever, headache, behavioral changes, confusion, focal neurological findings, and abnormal cerebrospinal fluid are suggestive of herpetic encephalitis, signs are not pathognomonic. [1]

• Typical findings include fever, headache, psychiatric symptoms, altered consciousness, dysphagia, seizures [2] and vomiting. [3]

• Relatively severe and atypical presentations of encephalitis may occur in immunosuppressed patients. [4]

• Focal weakness, ataxia, hemiparesis, and memory loss are common.

• In some cases, patients exhibit memory loss, psychiatric disorders [5-12], photophobia, cranial nerve deficits, papilledema, loss of visual fields, olfactory disturbance [13], new-onset refractory status epilepticus [14], choreoathetosis [15] or other movement disorders. [16]

• Concurrent herpetic encephalitis and cutaneous herpes simplex are uncommon.

• Infection is usually frontotemporal and unilateral, and characterized by severe, often fatal disease. [17]

• Unilateral involvement of the temporoparietal region is typical, and helps distinguish herpetic infection from other forms of viral encephalitis • which tend to be bilateral and symmetrical. [18]

• Cases of overt cerebral hemorrhage [19] [20], acute disseminated encephalomyelitis [21], Charles Bonnet syndrome (complex visual hallucinations) [22] and symmetric brain stem encephalitis have been reported. [23]

• Neurological sequelae are more common following HSV-1 than HSV-2 encephalitis. [24]

Lymphocytic pleocytosis, elevated CSF protein and normal glucose concentrations are typical; however, normal CSF or hypoglycorrhachia have been documented in some cases. [25-28]

The differential diagnosis of temporal lobe encephalitis also includes tuberculosis, varicella-zoster infection and autoimmune diseases. [29]

• West Nile viral encephalitis may mimic herpes simplex encephalitis. [30]

An unrelated condition, severe acute disseminated encephalomyelitis, has been reported as a complication of herpetic gingivostomatitis. [31]

Herpes encephalitis is a risk factor for acute retinal necrosis. [32]

Relapse of encephalitis occurs in 12% of treated patients. [33] [34]

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Herpes simplex encephalitis in Zambia

Prevalence surveys:

1.5% of central nervous system infections among HIV-positive patients (2014 publication) [35]

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Herpes simplex infection

Agent	VIRUS - DNA. Herpesviridae, Alphaherpesvirinae, Simplexvirus: Human herpesvirus I and II
Reservoir	Human
Vector	None
Vehicle	Infected secretions, including Sexual contact Breastfeeding
Incubation Period	1d - 14d
Diagnostic Tests	Viral culture or microscopy of lesions. Serology. Nucleic acid amplification.
Typical Adult Therapy	Famciclovir 250 mg PO TID X 7d. OR Valacyclovir 1 g PO BID X 7d OR Acyclovir 400 mg PO X 3 per day X 7d Dosage and duration may vary for first vs. recurrent vs. suppressive regimens.
Typical Pediatric Therapy	Acyclovir 10 mg/kg PO QID X 7 d
Clinical Hints	Recurring localized crops of painful vesicles on a red base; regional adenopathy often present; may follow a prodrome of neuropathy or hyperesthesia.
Synonyms	Herpes gladiatorum, Herpes rugbiorum, Herpes simplex, Scrum pox. ICD9: 054.0,054.1,054.2,054.4,054.5,054.6,054.7,054.8,054.9 ICD10: A60,B00

Clinical

The initial attack of herpes simplex is generally more overt than recurrent episodes; however, primary infections are often asymptomatic. [1]
• Symptoms will also vary depending on the site of infection (eye [2] [3] , esophagus [4] [5] , anal region, etc).

Signs and symptoms:

Following a prodrome of local discomfort, tender papular, vesicular or ulcerative lesions on an erythematous base appear. [6]
• Anorexia, malaise and fever may accompany individual episodes.
• The lesions coalesce, and tender bilateral lymphadenopathy develops.
• Skin lesions usually heal over the next several days to weeks.
• Patients may give a history of occupational exposure (ie, herpetic whitlow, found in medical or dental personnel; herpes gladiatorum among wrestlers).
• Vesicular skin lesions of tularemia may mimic those of herpes simplex [7] ; and herpetic infection may present as folliculitis. [8]

Complications:

Immunosuppressed patients and neonates are at particular risk for disseminated and severe infections. [9-13] Disseminated skin eruption is also reported among patients with Darier disease. [14]
• Lesions of the tongue may present as herpetic geometric glossitis. [15]
• Mucosal herpetic lesions may serve as a portal for bacterial invasion. [16]
• Ocular complications include conjunctivitis, scleritis [17] , severe keratitis and retinal necrosis. [18] [19]
• Corneal infection may present as epithelial keratitis (dendritica/geographica), stromal keratitis (necrotizing vs. non-necrotizing or "interstitial keratitis"), endotheliitis (disciform keratitis), neurotrophic keratopathy (metaherpetic keratitis) or vascularized corneal scars. [20-22]
• Over 10% of keratouveitis cases are complicated by secondary glaucoma [23] Herpetic keratitis may complicated ocular steroid injection [24]
• Herpes simplex infection has been etiologically linked to facial (Bell's) palsy. [25] [26] Paralysis of the fourth and sixth cranial nerves has also been reported. [27]
• Pancreatitis [28] , esophagitis [29] , cardiomyopathy [30] and rhabdomyolysis with renal failure have been reported to complicate herpes simplex infection. [31]
• Herpes simplex hepatitis is most common in the setting of pregnancy or immune suppression [32] ; however, rare instances

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of hepatitis and fulminant hepatic failure due to HSV infection have been reported in immunocompetent persons. [33-37]
• HSV-related erythema multiforme [38] [39] has been reported in stem-cell transplant recipients [40]
• Disseminated infection among patients with eczema (Eczema herpeticum) may resemble smallpox [41] [42] or present as atopic dermo-respiratory syndrome. [43]
• Chronic (>1 month) mucocutaneous infections may occur in HIV-positive patients, in the absence of disseminated disease. [44]
• Herpetic lesions in HIV-positive patients may be vegetative, hypertrophic, condyloma-like, nodular, ulcerative, or tumor-like nodules or plaques. [45] [46]
• Herpes simplex may contribute to the pathology of periodontitis. [47]
• Herpes simplex has been reported to cause Gerhardt syndrome (inspiratory dyspnea without dysphonia) from vocal cord paralysis [48]

Anterior uveitis • differential diagnosis:
Anterior uveitis due to Rubella virus is characterized by younger age at onset and a chronic course, typically associated with cataract at presentation. [49]
• Rubella virus has been implicated in the etiology of Fuchs heterochromic iridocyclitis. [50]
• Anterior uveitis due to Herpes simplex and Varicella-Zoster viruses is more common in adults, and often follows an acute course.
• Herpes simplex anterior uveitis presents with conjunctival redness, corneal edema, a history of keratitis, and the presence of posterior synechiae. Anterior chamber inflammation is common with Herpes simplex virus, while vitritis is more common with Rubella and Varicella-Zoster virus.
• Rubella, Herpes simplex and Varicella-zoster viruses are associated with intraocular pressure of more than 30 mmHg and development of glaucoma (18%-30%; P = 0.686).
• Focal chorioretinal scars were present in 22% of Rubella cases, 0% of HSV and in 11% of VZV uveitis cases.

Acquisition of Herpes simplex by the newborn at the time of delivery is associated with severe illness and results in death in approximately 50% of cases. [51] [52]
• Neonatal herpes simplex infection is characterized by vesicular rash, hypothermia, lethargy, seizures, respiratory distress, hepatosplenomegaly, thrombocytopenia, hepatic dysfunction and cerebrospinal fluid pleocytosis. [53] [54]

Herpes simplex virus is an important cause of encephalitis (discussed separately in this module). [55] Severe acute disseminated encephalomyelitis has been reported as a complication of herpetic gingivostomatitis. [56]

Herpes simplex infection in Zambia

Prevalence surveys:

28% of genital ulcers (HSV-2, 2012 publication) [57]

Seroprevalence surveys:

50% of women, 23% of young women, and over 25% of men (HSV-2, Ndola, 1997 to 1998) [58]

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Herpes zoster

Agent	VIRUS - DNA. Herpesviridae, Alphaherpesvirinae: Varicella-zoster virus
Reservoir	Human
Vector	None
Vehicle	Air Direct contact
Incubation Period	Unknown
Diagnostic Tests	Viral culture (vesicles). Serology. Nucleic acid amplification.
Typical Adult Therapy	Acyclovir 800 mg PO X 5 daily X 7 to 10d. OR Famciclovir 500 PO TID. OR Valacyclovir 1 g PO TID
Typical Pediatric Therapy	Acyclovir 20 mg/kg PO QID X 7 to 10d
Vaccine	Herpes zoster vaccine
Clinical Hints	Unilateral dermatomal pain, tenderness and paresthesia followed in 3 to 5 days by macular, erythematous rash evolving to vesicles; trunk and chest most common, but other areas possible; patients usually above age 50.
Synonyms	Fuocodi Saint'Antonio, Shingles, Zona, Zoster. ICD9: 053 ICD10: B02

Clinical

The condition represents reactivation of dormant Varicella-Zoster virus in dorsal root ganglia.

Disease is characterized by grouped vesicular lesions distributed along one to three sensory dermatomes, usually unilateral and on the trunk or face. [1]
• Mild pruritis or excruciating pain may be present, and persist after the disappearance of the rash.
• Although pain typically presents for 1 to 3 days prior to the appearance of a rash, the pre-eruptive prodromal period may persist for as long as 18 days. [2]
• Granulomatous dermatitis may appear following the acute eruption. [3] [4]
• In immunocompromised individuals, herpes zoster may become disseminated.
• A chronic verrucous form of herpes zoster seen in HIV-positive patients is associated with antiviral drug-resistance. [5]

Most healthy persons recover without complications; however, individuals above age 50 years are at increased risk of postherpetic neuralgia which may persist for months to years after the rash has healed. [6]
• The possible effect of antiviral drugs in prevention of post-herpetic neuralgia is controversial. [7]
• Immunocompromised patients are risk for chronic herpes zoster; or infection of the central nervous system [8] , liver, lungs or pancreas.
• Chronic (>1 month) mucocutaneous infections may occur in HIV-positive patients, in the absence of disseminated disease. [9]
• Visual impairment or scleral damage may follow zoster ophthalmia. [10-14] Over 10% of keratouveitis cases are complicated by secondary glaucoma [15] Rare instances laryngeal shingles [16] , orbital apex syndrome [17] and optic neuritis are also reported. [18]
• VZ virus infection may be associated with myotomal paresis [19] , urinary dysfunction [20] , facial nerve palsy [21] or Ramsay-Hunt syndrome (Bell palsy unilateral or bilateral, vesicular eruptions on the ears, ear pain, dizziness, preauricular swelling, tingling, tearing, loss of taste sensation, and nystagmus) [22]
• Rare cases of acute pancreatitis complicating herpes zoster have been reported. [23-25]
• VZ virus infection can be a presenting symptom of hyperparathyroidism and occurs twice as often in persons with hypercalcemia than age-matched controls. [26]
• In some cases, reactivation of VZ virus may present as radiculitis, cranial nerve palsy or other features of herpes zoster • but without rash (zoster sine herpete). [27]

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Histoplasmosis - African

Agent	FUNGUS. Ascomycota, Euascomycetes, Onygenales: Histoplasma capsulatum var. duboisii A dimorphic fungus
Reservoir	? Bat ? Chicken Baboon Bird
Vector	None
Vehicle	Air
Incubation Period	Unknown
Diagnostic Tests	Fungal culture or biopsy.
Typical Adult Therapy	Amphotericin B; or Ketoconazole
Typical Pediatric Therapy	As for adult
Clinical Hints	Skin nodule, abscess or ulcer; underlying bone lesion (commonly skull, femur and ribs) - may be multiple and associated with lymphadenopathy and weight loss.
Synonyms	African histoplasmosis. ICD9: 115.1 ICD10: B39.5

Clinical

Although *H. capsulatum* var. *duboisii* is probably acquired through inhalation, primary pulmonary infection has not been demonstrated.
• Infection is characterized by suppurative granulomata in the skin, bones and subcutaneous tissues • rarely in the abdominal viscera, lungs and other organs. [1]
• There is neither pain nor systemic illness in local infection; however, disseminated and even fatal infections are described.

A patient developed signs of African histoplasmosis 40 years after leaving the endemic region. [2]

Skin and bone are most frequently affected.
• Typical findings consist of ulcers, nodules or psoriaform lesions which may resolve spontaneously. [3-5]
• Cutaneous lesions may mimic molluscum contagiosum. [6]
• Tender, subcutaneous "cold abscesses may also be present.
• Osteolytic bone occur in up to 50% of cases • primarily of the skull and ribs, and often involving the vertebrae as well. [7]
• Local, draining lymphadenitis may also be present.

Wide dissemination is occasionally reported in both immuno-competent and -compromised patients. [8-10]
• Immunosuppressed patients may develop miliary infection; or multiorgan involvement of liver, spleen, kidney and lung.
• Addison's disease resulting from adrenal gland involvement has been reported. [11]

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HIV infection - initial illness

Agent	VIRUS - RNA. Retroviridae, Lentivirinae: Human Immunodeficiency Virus
Reservoir	Human
Vector	None
Vehicle	Blood Semen Sexual Transplacental Breastfeeding
Incubation Period	1w - 6w
Diagnostic Tests	HIV antibody (ELISA, Western blot). HIV or HIV antigen assays. Nucleic acid amplification.
Typical Adult Therapy	Antiretroviral therapy - most experts will initiate treatment even if no symptoms + normal CD4 count.
Typical Pediatric Therapy	Antiretroviral therapy - most experts will initiate treatment even if no symptoms + normal CD4 count.
Clinical Hints	Fever, diarrhea, sore throat and a mononucleosis-like illness in a "high risk" patient (eg, men who have sex with men, drug abuser, etc).
Synonyms	HIV, HIV infection, HTLV-III infection. ICD9: 042 ICD10: B20,B21,B22,B23,B24

Clinical

The clinical features of acute HIV infection are protean and often characterized by fever, generalized lymphadenopathy, headache, fatigue, myalgia, rash, nausea, vomiting, night sweats, sore throat, diarrhea or weight loss. [1]
• 40% to 90% of persons have symptoms suggestive of an acute viral infection.
• Symptoms tend to subside within two weeks; however, some patients continue to be ill for as long as ten weeks.
• In most cases, a history of likely acquisition within the past several weeks can be established: unprotected sex, extra-medical injection, transfusion, etc.

HIV infection - initial illness in Zambia

Data and background information regarding HIV infection are included in the note for AIDS

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Hookworm

Agent	PARASITE - Nematoda. Secernentea: Necator americanus, Ancylostoma duodenale, A. ceylonicum (in Calcutta and the Philippines)
Reservoir	Human Non-human primates
Vector	None
Vehicle	Soil Contact
Incubation Period	7d - 2y
Diagnostic Tests	Examination of stool for ova.
Typical Adult Therapy	Albendazole 400 mg X 1 dose. OR Mebendazole 100 mg BID X 3d. OR Pyrantel pamoate 11 mg/kg (max 3g) X 3d
Typical Pediatric Therapy	Albendazole 200 mg PO single dose OR Mebendazole 100 mg BID X 3 d (> age 2).
Clinical Hints	Pruritic papules (usually of feet) - later cough and wheezing; abdominal pain and progressive iron-deficiency anemia; eosinophilia common; dyspnea and peripheral edema in heavy infections; *Ancylostoma caninum* implicated in eosinophilic enteritis.
Synonyms	Anchilostoma, Ancylostoma ceylanicum, Ancylostoma duodenale, Ancylostomiasis, Anquilostomiasis, Cyclodontostomum, Eosinophilis enteritis, Hakenwurmer-Befall, Miner's anemia, Necator americanus, Necator gorillae, Necatoriasis, Uncinariasis. ICD9: 126.0,126.1 ICD10: B76.0,B76.1,B76.8

Clinical

Initial manifestations of hookworm consist of pruritus, erythema, and a papular, or vesicular rash at the site of larval penetration ("ground itch"). [1]

• Migration of larvae through the lungs may result in a Loeffler-like syndrome with transitory cough, wheezing, diffuse opacities on x-ray and eosinophilia in sputum and blood. [2] [3]

• Migration of *A. duodenale* larvae to the breast, with infection of nursing infants ("hypobiosis") has been described. [4]

• The major finding in overt infection is iron-deficiency anemia. [5]

• Heavy intestinal infection may also produce local symptoms of abdominal pain, diarrhea, and occasionally malabsorption with weight loss (most commonly in children).

• Rare instances of overt bleeding [6] [7] or melena have been reported. [8] [9]

Hookworm in Zambia

Prevalence surveys:

39.2% of HIV-positive patients (2005 publication) [10]
33% of rural primary school children (1991 publication) [11]
8.3% of pre-schoolchildren in Kafue District (2007) [12]

Both *Necator americanus* and *Ancylostoma duodenale* are identified. [13]

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HTLV Infections

Agent	VIRUS - RNA Retroviridae. Deltaretrovirus Human T-lymphotrophic virus I to IV (disease limited to I and II)
Reservoir	Human Non-human primate
Vector	None
Vehicle	Blood Needles Semen Sexual Transplacental Breastfeeding Ingestion (bush-meat)
Incubation Period	Variable
Diagnostic Tests	Serology Nucleic acid amplification
Typical Adult Therapy	Specific therapy not available. Advanced symptomatic disease has been treated with combinations of Zidovudine and Interferon, Cyclosporine, or anti-neoplastic agents
Typical Pediatric Therapy	As of adult
Clinical Hints	Overt disease appears in only 1% to 5% of infections; increased susceptibility to pyodermas, sepsis, bronchiectasis; keratoconjunctivitis sicca or uveitis; late development of tropical spastic paraparesis or T-cell leukemia/lymphoma
Synonyms	Adult T-cell leukemia / lymphoma, HTLV-1, HTLV-1/2, HTLV-2, HTLV-4, HTLV-I, HTLV-I/II, HTLV-II, HTLV-IV, Human T-cell lymphotropic virus, Human T-lymphotropic virus, Tropical spastic paraparesis. ICD9: 204.0,208.9 ICD10: C83,C88,G04.1

Clinical

Only 1% to 5% of HTLV-1 infections are associated with disease, and the remainder are subclinical.

Adult T-cell leukemia / lymphoma (ATL, ATLL) [1] [2] is an aggressive form of non-Hodgkin's lymphoma.
• ATL is often characterized by visceral involvement, skin lesions, osteolysis and hypercalcemia.

In addition to paraparesis (often with urinary and fecal incontinence), HTLV infection may present with chronic inflammatory demyelinating polyneuropathy [3-5], isolated peripheral neuropathy [6], recurrent facial palsy [7], bladder dysfunction (urinary frequency, urgency and nocturia) [8-12], erectile dysfunction [13-15], multiple-sclerosis-like syndrome [16], cognitive impairment, arthritis, alveolitis, polymyositis [17-19], uveitis [20-22], retinal vasculitis [23], Sjogren's syndrome [24], keratoconjunctivitis sicca [25-27], chronic interstitial keratitis [28-30] and dermatitis.
• Development of neurological disease occurs in up to 30% of asymptomatic subjects during eight-years follow-up. [31]
• Although progressive, the disease is rarely fatal.

HTLV-1 infection is also associated with an increased incidence of opportunistic infections, including sepsis, bronchiectasis [32-36], infective dermatitis (staphylococcal pyodermas, etc) [37-46], seborrheic dermatitis and xerosis / icthyosis [47], Norwegian (crusted) scabies [48-53], *Strongyloides stercoralis* hyperinfection syndrome [54-58] and recurrent meningitis associated with strongyloidiasis. [59]

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Human herpesvirus 6 infection

Agent	VIRUS - DNA. Herpesviridae, Betaherpesvirinae, Roseolovirus: Herpesvirus 6 (Herpesvirus 7 is also implicated)
Reservoir	Human
Vector	None
Vehicle	Droplet Contact
Incubation Period	10d - 15d
Diagnostic Tests	Viral isolation and serologic tests rarely indicated. Nucleic acid amplification has been used
Typical Adult Therapy	Supportive Gancyclovir has been used in unusual and severe cases.
Typical Pediatric Therapy	As for adult
Clinical Hints	High fever followed by sudden defervescence and fleeting rash; most patients are below the age of 2 years; only 10% to 20% of herpesvirus 6 infections are associated with a rash.
Synonyms	Dreitagefieber, Exanthem criticum, Exanthem subitum, Herpesvirus 6, HHV-6, Pseudorubella, Roseola, Roseola infantilis, Roseola subitum, Sixth disease, Zahorsky's disease. ICD9: 057.8 ICD10: B08.2

Clinical

Roseola typically is characterized by high fever (often to 40 C) lasting from three to seven days, followed by rapid defervescence and a characteristic pink rash. [1] [2]
• The rash is maculopapular or erythematous, beginning on the trunk and spreading to the neck and extremities. [3]
• Skin lesions are discrete, not pruritic, blanch on pressure and fade within 3 to 48 hours.

Diarrhea, cough and irritability are common, and seizures may rarely occur in individual cases. [4]
• HHV-6 infection accounts for 10% to 20% of febrile seizures in children below the age of two years. [5] [6]
• Other findings may include bulging anterior fontanel, Nagayama spots (erythematous papules on the soft palate and uvula), periorbital edema, inflamed tympanic membranes, cervical, post auricular, and post occipital lymphadenopathy, splenomegaly, meningitis with radiculitis [7], encephalopathy or encephalitis [8-17], fourth cranial nerve palsy [18], chorea [19], arthropathy (4.3% of cases) [20], rhabdomyolysis [21], uveitis [22] [23], optic neuritis [24], acute retinal necrosis [25], corneal inflammation [26] and conjunctival injection. [27]
• Rare instances of acute hepatic failure [28] and purpura fulminans have been reported. [29]

Newborns with congenital HHV-6 infection may exhibit neurodevelopmental disorders. [30]

Reactivation and severe disease have been encountered in bone-marrow, solid organ transplant and other immune-deficient patients. [31-34]
• HHV-6-associated pleurisy has been reported following stem-cell transplantation (2007 publication) [35]
• Fatal hepatitis and myocarditis have been reported in immunocompetent adults. [36-38]

Human herpesvirus 6 infection in Zambia

Prevalence surveys:

20.8% of infants ages 3 weeks to 2 years (DNAemia, 2014 publication) [39]
30% of HIV-negative infants (1997 publication) [40]

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Hymenolepis diminuta infection

Agent	PARASITE - Platyhelminthes, Cestoda. Cyclophyllidea, Hymenolepididae: Hymenolepis diminuta
Reservoir	Rodent Various insects
Vector	None
Vehicle	Arthropod - ingestion
Incubation Period	2w - 4w
Diagnostic Tests	Identification of ova in stool
Typical Adult Therapy	Praziquantel 25 mg/kg as single dose. OR Niclosamide 2g, then 1g/d X 6d
Typical Pediatric Therapy	Praziquantel 25 mg/kg as single dose. OR Niclosamide 1g, then 0.5g/d X 6d (1.5g, then 1g for weight >34kg)
Clinical Hints	Nausea, abdominal pain and diarrhea; eosinophilia may be present; primarily a pediatric disease, in rodent-infested areas; infestation resolves spontaneously within 2 months.
Synonyms	Hymenolepis diminuta, Mathevotaenia, Rat tapeworm. ICD9: 123.6 ICD10: B71.0

Clinical

Patients, usually children, may develop mild abdominal pain, nausea diarrhea and eosinophilia. [1]

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Hymenolepis nana infection

Agent	PARASITE - Platyhelminthes, Cestoda. Cyclophyllidea, Hymenolepididae: Hymenolepis (Rodentolepis) nana
Reservoir	Human Rodent (especially hamster)
Vector	None
Vehicle	Food Water Fecal-oral
Incubation Period	2w - 4w
Diagnostic Tests	Identification of ova in stool
Typical Adult Therapy	Praziquantel 25 mg/kg once. OR Nitazoxanide 500 mg daily for 3 days OR Niclosamide 2g/d X 1, then 1g/d X 6d
Typical Pediatric Therapy	Praziquantel 25 mg/kg once. OR Nitazoxanide 100 mg (age 1 to 3 years) to 200 mg (age 4 to 11 years) BID X 3d OR Niclosamide 1g/d X 1, then 0.5g/d X 6d (1.5g, then 1g for weight >34kg)
Clinical Hints	Nausea, abdominal pain, diarrhea, irritability and weight loss; eosinophilia may be present; infection is maintained by autoinfection (worm reproduces within the intestinal lumen).
Synonyms	Dwarf tapeworm, Hymenolepis nana, Rodentolepis microstoma, Rodentolepis nana, Rodentolepsiasis, Vampirolepis nana. ICD9: 123.6 ICD10: B71.0

Clinical

Infestation by *Hymenolepis nana* is largely asymptomatic. [1]

- Children are most likely to exhibit symptoms consisting of abdominal pain and diarrhea. [2]
- Pruritis ani and behavioral and sleep disturbances are occasionally encountered. [3]
- Most patients have eosinophilia (5% to 10% of total leucocyte count).

Hymenolepis nana infection in Zambia

Prevalence surveys:

0.6% of pre-schoolchildren in Kafue District (2007) [4]
2.7% of HIV-positive patients (2005 publication) [5]

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Infection of wound, puncture, IV line, etc

Agent	BACTERIUM. Staphylococcus aureus, streptococci, facultative or aerobic gram negative bacilli, anaerobes, et al
Reservoir	Human Soil Water Air (spores) Various animals and plants
Vector	None
Vehicle	Trauma Water Medications Bandages Autoinoculation
Incubation Period	Variable
Diagnostic Tests	Smear and culture of catheter, material from wound.
Typical Adult Therapy	Drainage, remove catheter, debridement and antibiotics appropriate to infecting species
Typical Pediatric Therapy	As for adult
Clinical Hints	Source (ie, venous line, postoperative, marine, animal bite) may suggest species; onset less than 24 hrs = group A Strep. or *Cl. perfringens*; 2 to 7 days *S. aureus*; over 7 days gram negative bacilli; foul odor anaerobes.
Synonyms	Intravenous catheter infection, Line infection, Surgical wound infection, Wound infection. ICD9: 686.9,451 ICD10: T79.3,I80.0, Y95

Clinical

Wound infection is a self-defined illness.

The features and severity of infection are largely determined by the health status of the patient, and the nature of the wound and infecting organism.

Signs of infection which develop in a patient with an intravenous catheter should be assumed to be related to the catheter until proven otherwise.

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Infectious mononucleosis or EBV infection

Agent	VIRUS - DNA. Herpesviridae. Gammaherpesvirinae, Lymphocryptovirus: Human herpesvirus 4 (Epstein Barr virus)
Reservoir	Human
Vector	None
Vehicle	Saliva Blood transfusion Breastfeeding
Incubation Period	28d - 42d
Diagnostic Tests	Serology. Nucleic acid amplification.
Typical Adult Therapy	Supportive
Typical Pediatric Therapy	As for adult
Clinical Hints	Exudative pharyngitis, symmetrical cervical lymphadenopathy, splenomegaly and hepatic dysfunction; atypical lymphocytes and positive serology appear after 10 to 14 days; acute illness resolves in 2 to 3 weeks, but malaise and weakness may persist for months.
Synonyms	EBV, EBV, Epstein-Barr, Febbre ghiandolare, Filatov's disease, Glandular fever, Infectious mononucleosis, Monocytic angina, Mononucleose, Mononucleosi, Mononucleosis - infectious, Mononukleose, Pfeiffer's disease. ICD9: 075 ICD10: B27.0

Clinical

Symptoms of Infectious Mononucleosis (IM) usually consist of fever, pharyngitis, and lymphadenopathy. [1]
• Patients usually do not recall a history of possible exposure.
• A prodrome consisting of 1 to 2 weeks of fatigue, malaise, and myalgia is common; however, abrupt presentations may occur.
• A low-grade fever is usually present and lasts for 1 to 2 weeks, occasionally up to 5 weeks.
• CMV / EBV co-infection may be associated with prolonged illness. [2]

Pharyngitis may be severe, particularly during the first week of illness. [3]
• Tonsillitis may be present, and lymphadenopathy is almost universal, lasting for 1 to 2 weeks.
• Posterior cervical nodes are often affected, and generalized adenopathy may occur.
• Periorbital edema and palatal petechiae are often present.
• Splenomegaly is found in most cases, and hepatomegaly in 25%.
• Asymptomatic pericardial effusions are common. [4]
• Patients often complain of headache.
• A morbilliform or papular erythematous eruption of the upper extremities or trunk is noted in 5% of cases.
• Lemmiere's syndrome has been reported as a complication of infectious mononucleosis. [5]
• Guillain-Barre syndrome, encephalitis [6] and membranous glomerulonephritis have been reported during the course of primary EBV infection. [7]

A macular erythematous rash will often develop in EBV patients treated with ampicillin, usually appearing 5 to 9 days following the first dose.
• This phenomenon should not be misinterpreted as a penicillin allergy.
• Erythema nodosum and erythema multiforme [8] have been associated with IM, as have petechiae and jaundice.
• The presence of severe abdominal pain may herald splenic rupture.

Other diseases ascribed to Epstein-Barr virus include nasopharyngeal carcinoma, Burkitt's lymphoma (African type) [9], post-transfusion lymphoproliferative disorder (PTLD) [10], hemophagocytic lymphohistiocytosis [11] and hemolytic anemia. [12]
• Epstein-Barr virus infection, like many other infectious diseases, is occasionally followed by Guillain-Barre syndrome.
• Gianotti-Crosti syndrome may be the only presenting manifestation of Epstein-Barr virus infection. [13]

A false positive serological reaction toward Epstein-Barr virus has been associated with a variety of conditions, including rheumatoid arthritis [14] [15], Hepatitis E [16], Hepatitis A [17] and Parvovirus B19 infection. [18]

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Infectious mononucleosis or EBV infection in Zambia

Prevalence surveys:

27.5% of central nervous system infections among HIV-positive patients (EBV PCR, 2014 publication) [19]

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Influenza

Agent	VIRUS - RNA. Orthomyxoviridae, Orthomyxovirus: Influenza virus
Reservoir	Human Occasionally Ferret Bird Pig
Vector	None
Vehicle	Droplet
Incubation Period	1d - 3d
Diagnostic Tests	Viral culture (respiratory secretions). Serology. Nucleic acid amplification techniques are available.
Typical Adult Therapy	Respiratory precautions. Influenza A or B: Oseltamivir 75 mg PO BID X 5d OR Zanamavir 10 mg BID X 5 days
Typical Pediatric Therapy	Respiratory precautions. Influenza A or B: Oseltamivir 2 mg/kg (max 75 mg) PO BID X 5d OR Zanamavir (age > 5 years) 10 mg BID X 5 days
Vaccines	Influenza - inactivated vaccine Influenza - live vaccine
Clinical Hints	Myalgia, headache, cough, fever; pharyngitis and conjunctivitis often present; usually encountered in the setting of an outbreak; leucocytosis, chest pain and lobar infiltrate herald bacterial (pneumococcal or staphylococcal) pneumonia.
Synonyms	Asian flu, Aviaire influenza, Avian flu, Avian influenza, Bird flu, Epidemic catarrh, Grippe, H10N8, H1N1, H2N2, H3N2, H5N1, H7N9, Hong Kong flu, LPAI, Spanish influenza, Swine flu, Swine influenza. ICD9: 487 ICD10: J09,J10,J11

Clinical

Influenza is characterized by acute onset of fever, headache, myalgia, nonproductive cough, sore throat, and rhinitis. [1] • The illness usually resolves in 2 to 7 days; however, symptoms often persist for up to two weeks.
• Severe illness or death may complicate the acute infection, notably in pregnant women [2] , the elderly and patients with underlying medical conditions. [3]
• Complications include primary viral pneumonia or bacterial pneumonia (most commonly pneumococcal) [4] ; myocarditis, myositis, Guillain-Barre syndrome [5] , encephalitis [6] , Gianotti-Crosti syndrome [7] and transverse myelitis. [8-10]

WHO Case definition for surveillance • Influenza:
Clinical case definition
A person with sudden onset of fever of >38°C and cough or sore throat in the absence of other diagnoses.
Laboratory criteria for diagnosis
• Virus isolation: Swab or aspirate from the suspected individual, or
• Direct detection of influenza viral antigen.
• Serology: Fourfold rise in antibody titer between early and late serum.
Case classification
• Suspected: A case that meets the clinical case definition.
• Confirmed: A case that meets the clinical case definition and is laboratory-confirmed (used mainly in epidemiological investigation rather than surveillance).

WHO definition for surveillance • Swine influenza (H1H1):
confirmed case • person with swine influenza A (H1N1) virus infection laboratory confirmed by
• real-time RT-PCR and/or
• viral culture and/or
• 4-fold rise in swine influenza A(H1N1) virus specific neutralizing antibodies
probable case • either
• person with influenza test positive for influenza A, but unsubtypable by reagents used to detect seasonal influenza virus infection , or

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• person with clinically compatible illness or who died of unexplained acute respiratory illness who is considered to be epidemiologically linked to probable or confirmed case

CDC definition for surveillance • Swine influenza (H1H1):
confirmed case • person with acute respiratory illness with swine influenza A (H1N1) virus infection laboratory confirmed at CDC by
• real-time reverse transcriptase polymerase chain reaction (RT-PCR) and/or
• viral culture
probable case • person with acute febrile respiratory illness who is
• positive for influenza A, but negative for H1 and H3 by influenza RT-PCR
• positive for influenza A by influenza rapid test or influenza immunofluorescence assay (IFA) plus meets criteria for suspected case
suspected case • person with acute respiratory illness (defined as recent onset of >= 2 of rhinorrhea or nasal congestion, sore throat, or cough) plus
• close contact to confirmed case of swine influenza A (H1N1) virus infection during case's infectious period, or
• close contact defined as within about 6 feet of ill person
• infectious period defined as 1 day prior to illness onset to 7 days after onset
• travel to or residence in area with confirmed cases of swine influenza A (H1N1) virus infection

Avian influenza H5N1 infection:
Avian influenza H5N1 infection is characterized by fever greater than 38 C, shortness of breath and cough. [11-13]
• The incubation period is 2 to 4 days.
• All patients reported to date have presented with significant lymphopenia and marked chest radiograph abnormalities consisting of diffuse, multifocal or patchy infiltrates.
• Some cases showed segmental or lobular consolidation with air bronchograms.
• Crackles were frequently heard on auscultation.
• Some of the patients reported sore throat, conjunctivitis, myalgia, rash or rhinorrhea.
• Watery diarrhea or loose stools was noted in approximately 50% of the cases.
• Myocardial dysfunction and hepatic dysfunction are also reported.
• Reactive hemophagocytic syndrome is the most characteristic pathological finding and may contribute to the lymphopenia, liver dysfunction, and abnormal clotting profiles observed among patients with severe infection.
• Approximately 90% of patients with H5N1 infection have been below age 40. [14]
• Approximately 60% of patients have died, on an average of 10 days after onset of symptoms.
• Rare instances of subclinical infection have been reported. [15]

Influenza virus H1N1 infection:
• During the "Spanish flu" H1N1 pandemic of 1918 to 1919, illness was characterized by unusual severity, tendency to affect young healthy adults, rapid progression and overwhelming pneumonia.
• During the outbreak of A (H1N1) pdm09 virus infection of 2009 to 2010 [16] [17], children [18] [19] and young adults accounted for a large proportion of cases. [20] [21] Severe cases were not necessarily associated with underlying disease. Obesity [22-37], immune-compromise [38] (but not necessarily AIDS [39]), pregnancy [40-64], infection while hospitalized [65] [66], preexisting neurological disorders [67], sickle cell disease [68] and asthma were identified as risk factors for complications. [69-75] Children below age 5 years, particularly those with neuro-developmental disorders, were also found to be at risk. [76-78]
• Most deaths were caused by primary viral pneumonia [79-89], and bacterial co-infection was identified in as many as 29% of fatal cases. [90-95] The case-fatality rate among patients hospitalized in "wealthy countries" was estimated at 1% to 3%. [96]
• Vomiting and diarrhea were reported in up to 25% of patients [97], and as many as 6% were afebrile. [98] Case-fatality rates were not necessarily higher than those reported for other strains of Influenza virus. [99] [100]
• Additional complications included myopathy or rhabdomyolysis [101-110], encephalitis or encephalopathy [111-140], ischemic stroke [141], aseptic meningitis [142], acute disseminated or hemorrhagic leukoencephalitis [143-153], deafness [154], cerebellitis [155] [156], acute myelopathy [157], Guillain-Barre syndrome [158-161], parkinsonism [162], narcolepsy [163] [164], quadriplegia [165], glomerulonephritis [166] [167], tubulointerstitial nephritis [168], renal failure [169-179], hemolytic-uremic syndrome [180-184], hepatic failure [185], reactive thrombocytosis [186], hemophagocytic lymphohistiocytosis [187-193], myopathy [194], cold agglutinin syndrome [195], autoimmune [196] and thrombotic thrombocytopenic purpura [197], myocarditis [198-220] or reversible myocardial dysfunction [221-223], pericarditis [224-226], subacute thyroiditis [227], rash [228], pancreatitis [229] [230], vascular thrombosis [231] [232], plastic bronchitis [233], hemorrhagic pneumonia [234] and Acute Respiratory Distress Syndrome (ARDS). [235-249]
• In some cases, the clinical features of leptospirosis suggested a diagnosis of H1N1 influenza. [250]

Influenza H7N9 infection:
The most common presenting signs and symptoms of Influenza H7N9 infection are typical of influenza. [251-253] Encephalopathy and conjunctivitis are uncommon, and nasal congestion and rhinorrhea are not encountered as initial presentations. Hemoptysis was a common finding in one series [254] and a nonspecific rash has been reported in some cases. [255] Laboratory findings included normal white cell count, leukocytopenia, lymphocytopenia, thrombocytopenia, and

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mildly elevated hepatic enzymes. Most cases are severe, and often deteriorate within 1 to 2 days of hospitalization to acute respiratory failure, with refractory hypoxemia and multiple organ failure (the major cause of death). [256-268] A few mild cases have been reported, notably in children. [269-271]

• One case of presumed human-to-human transmission was reported. [272]

• Infection occurring below the age of 12 years is associated with relatively mild illness [273] [274], and no deaths had been reported among persons below age 20, as of August 2013. [275-277]

• The case-fatality rate among hospitalized patients was estimated at 36% [278] to 48%. [279]

Influenza in Zambia

GIDEON does not follow routine country reports on human Influenza, since the scope and nature of these data are often diffuse, sporadic or inconsistent. See the "Worldwide" note for material regarding pandemic influenza, influenza vaccine, avian influenza in humans and other relevant subjects.

Notable outbreaks:

2009 to 2010 - An outbreak (90 cases) of H1N1 pdm09 influenza was reported. [280] ***Context:*** A pandemic of H1N1 Influenza virus A (H1N1) pdm09 [281] infection occurred. [282-413] Over 600,000 cases had been officially-reported worldwide as of March, 2010. [414-416] 18,449 fatal cases were reported to August 1, 2010 (true number for first 12 months estimated at 293,500 [417] [418]). [419-445] Indigenous populations from Australia, Canada, the United States and New Zealand were found to have at least a 3-fold greater death rate than others in their countries. [446-470] Reporting of case-number summaries was suspended by WHO as of July 6 [471]; and on August 10, the pandemic was declared to have ended. [472] [473] The pandemic began in Mexico, spreading rapidly to the United States and Canada. Swine were not implicated in the transmission of disease. [474-477] Human-to-swine transmission was confirmed in Argentina [478], Brazil [479], Cambodia [480] [481], Sri Lanka [482] [483], Vietnam [484] [485], Italy [486] and Canada during the outbreak [487-499]; and infected swine were identified in Argentina [500-502], Australia [503-505], Brazil [506] [507], Cameroon [508] [509], China [510-513], Cuba [514], Denmark [515], Finland [516] [517], Germany [518] [519], Greece [520], Hungary [521], Iceland [522], India [523], Indonesia [524], Ireland [525], Italy [526] [527], Japan [528] [529], England [530], Mexico [531], Northern Ireland [532], Norway [533-536], Republic of Korea [537] [538], Reunion Island [539], Russian Federation [540], Scotland [541], Taiwan [542], Thailand [543-545], the United Kingdom [546] [547] and the United States. [548-556] Infected turkeys were subsequently identified in Canada [557-559], Chile [560-564], France [565] the United Kingdom [566] [567] and the United States. [568] [569] Infection was reported in cats [570-582], ferrets [583-588], a badger (*Taxidea taxus*), a captive Bornean binturong (*Arctictis binturong penicillata*) [589] [590], elephant seals (*Mirounga angustirostris*) [591] [592] and a cheetah [593] [594] in the United States [595-601]; skunks in Canada [602]; dogs in Italy [603] and China [604] [605]; farmed American mink (*Neovison vison*) in the Netherlands [606]; and in dogs and swine in the United States, Hong Kong and mainland China. [607-609]

- Reporting dates vary by country. The following updates include incidence data as of December 31, 2010. [610] [611]: Afghanistan (17 fatal) [612] [613], Albania (6 fatal), Algeria (57 fatal cases), American Samoa (94 - 0 fatal), Andorra (1), Angola (37) [614], Anguilla (14), Antigua and Barbuda (0 fatal), Argentina (626 fatal) [615-638], Armenia (3 fatal), Aruba (13), Australia (51,170 - 195 fatal) [639-689], Austria (24 fatal) [690-692], Azerbaijan (2), Bahamas (4 fatal), Bahrain (7 fatal), Bangladesh (7 fatal) [693], Barbados (157 - 3 fatal) [694], Belarus (20 fatal) [695], Belgium (17 fatal) [696-699], Belize (60), Bermuda (1 fatal), Bhutan (487) [700], Bolivia (59 fatal) [701], Bosnia and Herzegovina (10 fatal), Botswana (23), Brazil (53,797 cases, 2,173 fatal) [702-715], British Virgin Islands (25), Brunei (850 - 1 fatal), Bulgaria (40 fatal), Burundi (7), Cambodia (6 fatal) [716-719], Cameroon (4) [720], Canada (429 to 740 fatal) [721-755], Cape Verde (118) [756], Cayman Islands (130 - 1 fatal), Chad (1), Chile (156 fatal) [757-772], Central African Republic [773], China (724 fatal - including 56 in Hong Kong [774-803] and 2 in Macao) [804-860], Colombia (306 fatal) [861], Comoros (2 fatal in Mayotte) [862], Congo (21) [863], Cook Islands (106 - 1 fatal), Costa Rica (65 fatal) [864], Croatia (25 fatal), Cuba (1,805 - 83 fatal) [865] [866], Cyprus (6 fatal) [867] [868], Czech Republic (98 fatal), Democratic Republic of Congo (222) [869] [870], Democratic Republic of Korea (9) [871], Denmark (32 fatal) [872-876], Dominica (51), Dominican Republic (464 - 24 fatal), Ecuador (130 fatal) [877], Egypt (281 fatal) [878-881], El Salvador (34 fatal) [882], Estonia (19 fatal), Ethiopia (12), Falkland Islands (7), Fiji (268 - 0 fatal), Finland (43 fatal) [883-886], France (349 fatal) [887-922], French Guiana (29 - 1 fatal) [923] [924], French Polynesia (185 - 7 fatal) [925] [926], Gabon (72) [927], Georgia (20 fatal), Germany (253 fatal) [928-951], Ghana (1 fatal) [952], Gibraltar (16), Greece (141 fatal) [953-962], Grenada (28), Guadeloupe (5 fatal) [963], Guam (341 - 2 fatal) [964], Guatemala (26 fatal) [965] [966], Guinea [967], Guyana (30), Haiti (95) [968] [969], Honduras (18 fatal), Hong Kong (232 fatal) [970-999], Hungary (133 fatal) [1000], Iceland (2 fatal) [1001] [1002], India (44,958 - 2,703 fatal) [1003-1021], Indonesia (691 - 10 fatal) [1022] [1023], Iran (147 fatal) [1024-1033], Iraq (42 fatal) [1034], Ireland (24 fatal) [1035-1037], Israel (113 fatal, including 28 in Gaza and the West Bank) [1038-1054], Italy (256 fatal) [1055-1068], Ivory Coast (5) [1069], Jamaica (7 fatal), Japan (13,581 hospitalized;198 fatal) [1070-1102], Jordan (19 fatal) [1103], Kazakhstan (17) [1104], Kenya (417) [1105-1109], Kiribati (4 - 0 fatal), Kuwait (30 fatal), Laos (156 - 1 fatal) [1110-1113], Latvia (34 fatal), Lebanon (5 fatal) [1114] [1115], Lesotho (65), Libya (1 fatal), Liechtenstein (5), Lithuania (23 fatal) [1116], Luxembourg (3 fatal) [1117], Macao (2 fatal) [1118], Macedonia (23 fatal), Madagascar (3 fatal) [1119-1124], Malaysia (1,780 - 77 fatal) [1125-1133], Malawi (4), Maldives (1 fatal), Mali (12) [1134], Malta (5 fatal) [1135], Marshall Islands

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(115 - 1 fatal), Martinique (44 - 1 fatal) [1136], Mauritania (15) [1137], Mauritius (8 fatal), Mexico (1,969 fatal) [1138-1185], Micronesia (82 - 0 fatal), Moldova (35 fatal) [1186], Monaco (1), Mongolia (29 fatal) [1187-1190], Montenegro (7 fatal), Montserrat (21), Morocco (64 fatal) [1191-1193], Mozambique (2 fatal), Myanmar (137) [1194-1199], Namibia (1 fatal), Nauru (8 - 0 fatal), Nepal (172 - 3 fatal) [1200-1204], The Netherlands (62 fatal) [1205-1219], Netherlands Antilles (128 cases - 59 in Curacao, including 3 on a cruise ship; 29 in St. Maarten and 38 on Bonaire), New Caledonia (508 - 7 fatal), New Zealand (4,974 - 51 fatal) [1220-1247], Nicaragua (2,175 cases - 11 fatal) [1248], Niger (12), Nigeria (2 fatal) [1249] [1250], Niue (0), Northern Marianas (6 - 0 fatal), Norway (12,513 cases, 29 fatal) [1251-1255], Oman (31 fatal) [1256] [1257], Pakistan (14 fatal) [1258-1262], Palau (47 - 0 fatal), Panama (12 fatal) [1263] [1264], Papua New Guinea (29 - 0 fatal), Paraguay (47 fatal), Peru (238 fatal) [1265-1269], Philippines (3,207 - 30 fatal), Pitcairn Island (0), Poland (182 fatal) [1270-1273], Portugal (83 fatal) [1274-1277], Puerto Rico (20), Qatar (8 fatal) [1278], Republic of Korea (171 fatal) [1279-1293], Reunion (12 fatal) [1294-1310], Romania (122 fatal) [1311] [1312], Russian Federation (61 fatal) [1313-1326], Rwanda (494 - 0 fatal) [1327-1329], Saint Kitts and Nevis (3 fatal), Saint Lucia (1 fatal), Saint Vincent and the Grenadines (19), Samoa (173 - 2 fatal), Sao Tome and Principe (2 fatal), Saudi Arabia (124 fatal) [1330-1347], Scotland (38 fatal) [1348-1361], Senegal (184) [1362], Serbia (71 fatal) [1363] [1364], Seychelles (33), Singapore (19 fatal) [1365-1388], Slovakia (1,014 cases, 53 fatal) [1389], Slovenia (19 fatal) [1390], Solomon Islands (4 - 0 fatal), South Africa (93 fatal) [1391-1396], Spain (271 fatal) [1397-1435], Sri Lanka (48 fatal), Sudan (5 fatal), Suriname (144 - 2 fatal) [1436], Swaziland (2), Sweden (25 fatal) [1437-1441], Switzerland (18 fatal) [1442-1446], Syria (127 fatal) [1447] [1448], Taiwan (44 fatal) [1449-1464], Tanzania (1 fatal), Thailand (212 fatal) [1465-1484], Tokelau (0), Tonga (20 - 1 fatal), Trinidad and Tobago (5 fatal), Tunisia (21 fatal) [1485] [1486], Turkey (627 fatal) [1487-1497], Turks and Caicos Islands (45), Tuvalu (23 - 0 confirmed) [1498], Uganda (263), Ukraine (282 fatal) [1499-1509], United Arab Emirates (6 fatal) [1510-1513], United Kingdom (474 fatal: at least 142 in England, 38 in Scotland - including the first fatal case in Europe [1514-1516], 21 in Wales and 13 in Northern Ireland) [1517-1571], United States (2,718 fatal) [1572-1656], Uruguay (20 fatal), Vanuatu (3 - 0 fatal), Venezuela (137 fatal) [1657] [1658], Vietnam (58 fatal) [1659-1669], Virgin Islands, U.S. (49), Wallis and Futuna (55 - 0 fatal) [1670], Yemen (28 fatal), Zambia (90) [1671] and Zimbabwe (41). [1672-1730]

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Intestinal spirochetosis

Agent	BACTERIUM. Brachyspira pilosicoli and B. aalborgi Anaerobic gram-negative spirochetes
Reservoir	Human Fowl Pigs
Vector	None
Vehicle	Endogenous
Incubation Period	Unknown
Diagnostic Tests	Spirochetes resemble "brush border' on bowel biopsy; identification of Brachyspira by PCR
Typical Adult Therapy	Metronidazole appears to be effective in some cases.
Typical Pediatric Therapy	As for adult.
Clinical Hints	Chronic diarrhea and abdominal pain in the absence of other identifiable etiology
Synonyms	Human intestinal spirochetosis. ICD9: 009.1 ICD10: A04.8

Clinical

This diagnosis should be suspected in patients with persistent or chronic diarrhea lasting more than several weeks, in whom alternative etiologies are not identified.

- Abdominal pain, hematochezia, flatulence and intermittent constipation are also reported in some cases. [1-3]
- *Brachyspira* has been identified in the blood in some cases [4] , even in the absence of intestinal disease. [5]
- Asymptomatic infection is common. [6]
- Intestinal spirochetosis in children may mimic acute appendicitis [7] or inflammatory bowel disease. [8]
- Although some patients improve following administration of Metronidazole, other cases resolve without specific therapy. [9]

Roentgenographic studies may reveal colonic mucosal edema and luminal narrowing. [10]

Standard H & E staining of colonic biopsies reveals a "pseudo-brush border" consisting of tiny spirochetes [11-13] ; or free-floating spirochetes in the intestinal mucus. [14]

- Similar findings are often present in asymptomatic individuals. [15]
- The organism can be identified using specialized culture [16] or molecular methods. [17-19]

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Intra-abdominal abscess

Agent	BACTERIUM. Mixed anaerobic / aerobic, staphylococci, Neisseria gonorrhoeae, Chlamydia trachomatis, etc
Reservoir	Human
Vector	None
Vehicle	None
Incubation Period	Variable
Diagnostic Tests	Various imaging techniques (CT, Gallium scan, ultrasound, etc).
Typical Adult Therapy	Percutaneous or open drainage + antibiotics directed at known or suspected pathogen(s)
Typical Pediatric Therapy	As for adult
Clinical Hints	Fever, chills and localizing pain (e.g., chest pain in subphrenic abscess) - setting of prior surgery, biliary or colonic disease, appendicitis, vaginal discharge (PID); FUO, subdiaphragmatic gas or limited diaphragmatic motion may be present.
Synonyms	Abscess - Abdominal, Acute appendicitis, Appendicitis, Intraabdominal abscess, Intraperitoneal abscess, P.I.D., Pancreatic abscess, Pelvic abscess, Pelvic inflammatory disease, Pylephlebitis, Subhepatic abscess, Subphrenic abscess, Suppurative pancreatitis, Tuboovarian abscess. ICD9: 614,577.0 ICD10: K35,N73,K75.1,K85

Clinical

Intraabdominal abscesses often occur in the setting of prior abdominal trauma, surgery or infection.

Signs and symptoms may include fever, pain, tenderness and leucocytosis.
• In many cases, the sole presenting feature is prolonged fever, which may be accompanied by weight loss, lethargy and anemia.
• One or more localized masses may be detectable on palpation or through the use of imaging techniques.

Comprehensive reviews of clinical presentation:
• Pelvic Inflammatory Disease [1-6]
• Splenic Abscess [7] [8]
• Pancreatic Abscess [9] [10]
• Pylephlebitis. [11]

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Intracranial venous thrombosis

Agent	BACTERIUM. Oral anaerobes, streptococci, et al
Reservoir	Human
Vector	None
Vehicle	Endogenous
Incubation Period	Variable
Diagnostic Tests	Culture (blood, CSF if indicated). Ophthalmoscopy. Roentgenographic studies of skull & sinuses.
Typical Adult Therapy	Antibiotic(s) directed at known or suspected pathogens
Typical Pediatric Therapy	As for adult
Clinical Hints	Headache, seizures and fever; cranial nerve dysfunction may be present; usually occurs in the setting of facial, otic or sinus infection.
Synonyms	Cavernous sinus thrombosis, Cerebral sinus thrombosis, Cortical vein thrombosis, Internal cerebral vein thrombosis, Straight sinus thrombosis, Superior sinus thromobosis, Transverse sinus thrombosis. ICD9: 325 ICD10: G08

Clinical

Cortical vein thrombosis may occasionally be clinically silent, or produce only transient neurological findings. [1]
• Septic cortical vein or venous sinus occlusion may progress to subdural empyema, meningitis, brain abscess, systemic infection or pulmonary embolism.
• Severe headache is present in 90% of cases, and cerebral lesions with neurological signs in 50%. [2]
• If collateral flow is compromised, the resulting neurological may mimic brain abscess, with impairment of consciousness, focal or generalized seizures, and increased intracranial pressure.
• Depending on the site of the lesion, one may encounter hemiparesis, which involves the face and hand if veins; unilateral or bilateral leg weakness; aphasia; etc. [3]

Cavernous sinus thrombosis is characterized by diplopia, photophobia, orbital edema, and progressive exophthalmos.
• Involvement of cranial nerves III, IV, V, and VI is reflected by ophthalmoplegia, fixed pupil, a loss of the corneal reflex and diminished upper facial.
• Papilledema, retinal hemorrhages, and visual loss may also occur.

Anterior superior sagittal sinus thrombosis may produce intracranial hypertension without other signs.
• More extensive blockage of this sinus is associated with bilateral leg weakness followed by arm weakness and clouding of consciousness.

Lateral sinus thrombosis causes pain over the ear and mastoid, occasionally with edema over the mastoid itself (Griesinger's sign); or ipsilateral facial pain and lateral rectus weakness (Gradenigo's syndrome).

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Isosporiasis

Agent	PARASITE - Protozoa. Apicomplexa, Eimeriida: Isospora (Cystoisospora) belli
Reservoir	Human
Vector	None
Vehicle	Food Liquids Fecal-oral Sexual (homosexual) contact
Incubation Period	7d - 10d
Diagnostic Tests	Microscopy of stool or duodenal contents. Advise laboratory when this organism is suspected.
Typical Adult Therapy	Sulfamethoxazole/trimethoprim 800/160 mg BID X 10 days - Then BID X 3 weeks (may be indefinite in AIDS patient) Increase dosage / duration in immune-suppressed patients Pyrimethamine 50 to 75 mg per day + leucovorin if allergic to sulfa
Typical Pediatric Therapy	Sulfamethoxazole/trimethoprim 25/5 mg/kg BID X 10 days - Then BID X 3 weeks
Clinical Hints	Myalgia, watery diarrhea, nausea and leukocytosis; eosinophilia may be present; prolonged and severe in AIDS patients.
Synonyms	Cystoisospora belli, Isospora belli. ICD9: 007.2 ICD10: A07.3

Clinical

Isosporiasis is characterized by abdominal cramps, watery diarrhea, headache, weight loss and myalgias. [1]
• Fever and vomiting may also be present.
• A low-grade eosinophilia is present in 50% of patients
• Fecal leucocytes are not seen.

Infection in AIDS patients may cause significant weight loss and dehydration, requiring hospitalization. [2]
• Disease is also more severe among patients with lymphoma and leukemia. [3]
• Chronic and severe infection may occasionally affect immunocompetent patients as well, and infants and young children are most likely to suffer severe disease. [4]
• Paralysis related to severe potassium depletion has been reported in an AIDS patient with isosporiasis. [5]
• Biliary disease similar to primary sclerosing cholangitis has been reported. [6]
• Disseminated extraintestinal infection has rarely been reported.

Isosporiasis in Zambia

Prevalence surveys:

15% of AIDS-related infection in this country
6% to 9% of HIV-positive patients with diarrhea (Lusaka, 1992 to 1993) [7]
24% of HIV-positive patients with persistent diarrhea (1997 publication) [8]
7.8% of AIDS patients with diarrhea (1992 publication) [9]

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Kawasaki disease

Agent	UNKNOWN
Reservoir	Unknown
Vector	None
Vehicle	Unknown
Incubation Period	Unknown
Diagnostic Tests	Diagnosis is based on clinical criteria only.
Typical Adult Therapy	Intravenous gamma globulin 2.0 g/kg over 10 to 12h X 1 dose. Plus aspirin 100 mg/kg/day X 14d (or until defervescence) - then 5 to 10 mg/kg/day until normal ESR Infliximab 5 mg/kg has been successful in some studies.
Typical Pediatric Therapy	As for adult
Clinical Hints	Fever, conjunctivitis, stomatitis, erythematous rash which desquamates; occasional coronary artery occlusion; the disease is most common among children; case-fatality rates of 1% to 4% are reported.
Synonyms	Kawasaki's disease, Mucocutaneous lymph node syndrome. ICD9: 446.1 ICD10: M30.3

Clinical

Diagnostic criteria: [1] [2]

Fever for at least five days in addition to at least 4 of the following:

1. Changes in the oral mucosa (erythema, strawberry tongue, etc)
2. Changes in hands and feet (erythema, swelling, periungual desquamation, rarely gangrene [3] [4])
3. Rash, primarily on trunk (maculopapular, scarlatiniform, erythema multiforme).
4. Cervical lymphadenopathy [5]
5. Absence of other etiology.

Kawasaki disease is encountered among adults [6-8] as well as children.

• The incidence of specific diagnostic criteria are roughly similar in both groups

• Cheilitis, meningitis, and thrombocytosis are more common in children. Rare instances of thrombocytopenia are also reported [9]

• Arthralgia is common, and may involve one or multiple joints [10]

• Arthralgia, adenopathy, and liver function abnormality [11] [12] are more common in adults. [13]

• Older children may have a more marked inflammatory response and worse outcome, as compared to young children. [14]

• Absence of fever [15] , acute hepatitis [16] , pleural effusion, disseminated intravascular coagulopathy [17] , pancreatitis [18] [19] and cholestasis have been reported in some cases. [20]

• Recurrence of Kawasaki disease is reported in 1.7% of American cases and 3.5% of Asian / Pacific Island cases. [21-25]

There is no specific diagnostic test for Kawasaki disease.

Atypical or Incomplete Kawasaki Disease:

As many as 23% of patients may present with "incomplete (atypical) Kawasaki disease" characterized by fever >=5 days and the presence of <4 "classic signs." [26-29]

• The clinical picture in atypical Kawasaki disease may be dominated by one unusual finding: seizure, bloody diarrhea, acute abdomen [30] , nephrotic syndrome, hyponatremia or compressive cervical lymphadenopathy. [31]

• Of 232,263 cases reported in Japan during 2007 to 2008, 80% had classic clinical findings and 20% had "incomplete" Kawasaki disease. [32]

• Occasionally, the initial presentation of Kawasaki disease may be limited to erythema multiforme [33] or fever with cervical lymphadenopathy. [34]

• Patients with incomplete and atypical Kawasaki disease are more likely than those with other febrile diseases to present with mucosal changes, conjunctivitis, extremity abnormalities, perineal desquamation [35] , and later development of coronary

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artery abnormalities. [36]
• Patients with incomplete Kawasaki disease are less likely to develop coronary artery lesions, than are those with overt illness. [37]
• Incomplete Kawasaki disease was diagnosed in a 75-year-old man. [38]

The appearance of redness or crusting at a BCG inoculation site is a valuable predictive sign for Kawasaki disease. [39] [40]
• Orange-brown discoloration of nails (chromonychia) is a common finding in some series. [41]

Additional findings:
Neonates account for 1/5,500 cases of Kawasaki disease (2014 publication). [42] Infants below age 1 year have a relatively high incidence of cardiac involvement. [43]
• Cardiac involvement is present in 13.6% of cases (Japan, 2003 to 2004) [44]
• Coronary arteritis is common, and coronary artery aneurysms may rupture [45] [46] or persist into adulthood. [47-50]
• Meningoencephalitis, often with seizures, has been reported as a presenting feature of Kawasaki disease. [51] [52]
• Additional complications may include oculomotor [53] or facial palsy [54-56], uveitis [57], sensorineural hearing loss [58] [59], Bell's palsy [60], stroke (carotid artery occlusion) [61], parotitis [62], large pleural effusions [63], retropharyngeal cellulitis [64] or mass [65], parapharyngeal abscess [66], gallbladder distention [67] or cholestatic jaundice [68-70], colitis [71], appendicitis [72], duodenal perforation [73], nephrotic syndrome [74], autoimmune hemolytic anemia [75], sterile pyuria [76] [77], sensorineural hearing loss [78] [79], peripheral vascular gangrene [80] [81], necrotic lesions on the face [82] and recurrent lip swelling. [83]
• 7% of affected children develop Kawasaki disease shock syndrome, with decreased systolic blood pressure or evidence of hypoperfusion. The shock syndrome is characterized by an increased rate of echocardiographic abnormalities and is less likely to respond to IVIG therapy [84-86]
• Neutrophilia, anemia, thrombocytosis, hemophagocytic lymphohistiocytosis [87-89], hepatic dysfunction [90] and sterile pyuria [91] [92] are common. Syndrome of inappropriate ADH secretion has been reported. [93]

Diseases which may mimic Kawasaki disease include Chikungunya [94], meningococcal septicemia [95], Takayasu's arteritis [96], retropharyngeal abscess [97] [98], systemic onset juvenile idiopathic arthritis [99] and Q fever. [100]

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Kikuchi's disease and Kimura disease

Agent	UNKNOWN
Reservoir	Unknown
Vector	None
Vehicle	Unknown
Incubation Period	Unknown
Diagnostic Tests	Biopsy.
Typical Adult Therapy	Supportive Hydroxychloroquine and corticosteroids have been successful for Kikuchi's disease in some cases.
Typical Pediatric Therapy	As for adult
Clinical Hints	Most patients of Asian origin. Kikuchi disease: prolonged (1 to 12 months) cervical lymphadenopathy (rubbery, non-matted - may be tender), fever (40%), weight loss, "sweats', leukopenia. Salivary gland involvement, glomerulitis, painless subcutaneous masses and eosinophilia suggest Kimura disease.
Synonyms	Angiolymphoid hyperplasia, Angiolymphoid hyperplasia-eosinophia, Eosinophilic follicular lymphadenitis, Histiocytic necrotizing lymphadenitis, Kikuchi's disease, Kikuchi-Fujimoto disease, Kimura disease. ICD9: 289.3 ICD10: I89.8

Clinical

Kikuchi's disease:
Kikuchi's disease (histiocytic necrotizing lymphadenitis) is characterized by histiocytic necrotizing lymphadenitis, usually of the cervical region [1] [2] ; however, other anatomic regions may be involved. [3] [4]
• Generalized lymphadenopathy is occasionally encountered [5]
• The disease is primarily seen in young Japanese women or women of Oriental descent in the third decade of life. [6]
• Pediatric [7] , male and elderly patients are occasionally encountered. [8]
• Leukopenia is present in 50% of cases, and atypical lymphocytes may be seen in the peripheral blood smear.
• Additional features may include aseptic meningitis [9] [10] , ataxia, paraparesis [11] , fever of unknown origin [12] [13] , maculopapular or urticarial rash [14] , arthralgia, myalgia, hepatosplenomegaly, hepatic dysfunction, neuropathy, venous thrombosis [15] , optic neuritis [16] , orbital pseudotumor [17] , pericarditis, pulmonary infiltrates with pleural effusion [18] and pulmonary hemorrhage.
• Biopsy material reveals paracortical hyperplasia without granulocytic infiltration and a typical "starry sky" pattern. [19] [20]
• Clinical features may mimic those of lupus erythematosus [21] , tuberculous meningitis [22] , or lymphoma. [23-27]
• The prognosis is good, and patients recover after an average period of three months.
• A case of fatal disseminated intravascular coagulopathy complicating Kikuchi disease has been reported. [28]
• Relapse occurs in 20% of cases [29] and recurrence in 3% to 4%. [30]
• Hydroxychloroquine and corticosteroids have been advocated by some authorities.

Kimura disease:
Kimura disease (angiolymphoid hyperplasia with eosinophiles; eosinophilic follicular lymphadenitis) is also most common among Oriental males. [31]
• Most present as painless subcutaneous masses and lymphadenopathy of the cervical region.
• Cases of isolated Kimura disease of the pulmonary hilum [32] , epiglottis [33] , earlobe [34] , buccal region [35] and eyelid have been reported [36] [37]
• In contrast to Kikuchi's disease, salivary gland involvement [38] [39] , glomerulitis, nephrotic syndrome [40] [41] , elevated IgE and eosinophilia are often encountered. [42]
• Hypercoagulability [43] and arterial thromboses of the intestines and extremities have been reported. [44] Rare instances of pulmonary embolism are reported. [45]
• Kimura disease may be misdiagnosed as filariasis. [46]

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Angiolymphoid hyperplasia with eosinophilia is clinically similar to Kimura disease, but is histologically distinct from the latter. [47-53]

• The condition is characterized by reddish-brown nodules and plaques in the dermis and the subcutaneous tissues, typically occurring on the neck and head. [54] [55]

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Kingella infection

Agent	BACTERIUM. Kingella kingae, et al A facultative gram-negative coccobacillus
Reservoir	Human
Vector	None
Vehicle	Endogenous
Incubation Period	Unknown
Diagnostic Tests	Culture of blood, joint fluid, CSF, etc. Alert laboratory if these organisms are suspected.
Typical Adult Therapy	Penicillin G or Penicillin V usually effective - dosage per severity/site
Typical Pediatric Therapy	As for adult
Clinical Hints	A relatively rare cause of septic arthritis, endocarditis, meningitis and other infections; most infections have been in young children.
Synonyms	

Clinical

Kingella kingae, *K. (Suttonella) indologenes*, *K. denitrificans* and *K. oralis* are found in the normal respiratory tract, and occasionally associated with bacteremia, bone and joint infection (notably in young children) [1] [2] and endocarditis (the "K" in the HACEK group). [3]
• *Kingella potus* has been isolated from a kinkajou wound in a zookeeper. [4]

Clusters of *Kingella kingae* infection among children have been characterized by high rates of illness and contact carriage.
• Illness has been characterized by osteomyelitis, septic arthritis, bacteremia, endocarditis and meningitis. [5]

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Laryngotracheobronchitis

Agent	VIRUS OR BACTERIUM. Parainfluenza virus, Influenza virus, Mycoplasma, et al
Reservoir	Human
Vector	None
Vehicle	Droplet
Incubation Period	3d - 8d
Diagnostic Tests	Viral culture (respiratory secretions). Serology. Nucleic acid amplification.
Typical Adult Therapy	Supportive
Typical Pediatric Therapy	As for adult
Clinical Hints	Usually encountered in the setting of bronchiolitis, laryngitis or croup following a minor upper respiratory infection in young children.
Synonyms	Bronchitis, Croup, Laringitis, Laryngite, Laryngitis, Laryngotracheitis. ICD9: 464,466 ICD10: J04,J05,J20,J21

Clinical

Laryngotracheobronchitis is a self-defined syndrome consisting of hacking cough, often with an "itching" or "foreign body" sensation in the airways, and hoarseness. [1]
• Viral croup and epiglottitis are two major inflammatory causes of airway obstruction in children.
• Spasmodic croup and membranous laryngotracheobronchitis may be associated with obstruction. [2]

Bacterial tracheitis is an uncommon (>200 cases reported worldwide) severe condition usually affecting children that manifests as cough, stridor, mucopurulent tracheal secretions and lack of response to therapeutic modalities used for treating viral croup. [3]
• Fever may be low-grade or even absent.
• 75% of patients require intubation and mechanical ventilation.
• The case/fatality rate is approximately 2%.
• Causative pathogens include *Staphylococcus aureus* (50% of cases) and *S. pneumoniae*, *H. influenzae*, *M. catarrhalis* and *S. pyogenes*. Gram-negative bacilli are also reported in some cases.
• Occasionally, co-infection with viral croup agents is found.

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Lassa fever

Agent	VIRUS - RNA. Arenaviridae, Arenavirus: Lassa virus
Reservoir	Multimammate rat (Mastomys natalensis)
Vector	None
Vehicle	Rodent secretions Contact Dust Food Patient secretions
Incubation Period	8d - 14d (range 3d - 21d)
Diagnostic Tests	Viral culture (blood, urine, throat, liver, spleen). Serology. Nucleic acid amplification. Biosafety level 4.
Typical Adult Therapy	Strict isolation. Ribavirin 2g IV Then 1g q6h IV X 4d Then 0.5g IV q8h X 6d
Typical Pediatric Therapy	Strict isolation. Ribavirin 30 mg/kg IV Then 15 mg/kg IV q6h X 4d Then 7.5 mg/kg IV q8h X 6d
Clinical Hints	Gastrointestinal symptoms, cough, pharyngitis, conjunctivitis and retrosternal pain; leukopenia, proteinuria and hepatic dysfunction may be present; case-fatality rates of 15% to 25% are reported.
Synonyms	Lassa-Fieber, Lujo, Luna virus. ICD9: 078.89 ICD10: A96.2

Clinical

WHO Case definition for surveillance:
Clinical description
An illness of gradual onset with one or more of the following:
• malaise, fever, headache, sore throat, cough, nausea, vomiting, diarrhea, myalgia, chest pain, hearing loss, and
• A history of contact with excreta of rodents or with a probable or confirmed case of Lassa fever.
Laboratory criteria for diagnosis
• Isolation of virus (only in laboratory of biosafety level 4) from blood, urine or throat washings or
• Positive IgM serology or seroconversion (IgG antibody) in paired serum specimens or
• Demonstration of Lassa virus antigen in autopsy tissues by immunohistochemistry or in serum by ELISA
• Positive PCR from serum or autopsy tissues
Case classification
• Suspected: A case compatible with the clinical description.
• Probable: A suspected case that is epidemiologically linked to a confirmed case.
• Confirmed: A suspected case that is laboratory-confirmed.
• Contact: A person having close personal contact with the patient (living with, caring for) or a person testing the laboratory specimens of a patient in the 3 weeks after the onset of the illness.

Acute illness:
The onset of symptoms is gradual, with fever, malaise, headache, sore throat, cough, nausea, vomiting, diarrhea, myalgia and chest and abdominal pain. [1] [2]
• The fever may be either constant or intermittent with spikes. [3]
• Inflammation of the throat and eyes is commonly observed.
• In severe cases, hypotension or shock, pleural effusion, hemorrhage, seizures, encephalopathy and swelling of the face and neck are commonly encountered [4]
• Case-fatality rates of 15% to 28% are reported. [5]
• The disease is more severe in pregnancy, and fetal loss occurs in greater than 80% of cases. [6]

Additional signs and symptoms:
Hair loss and loss of coordination may occur in convalescence.

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• Sensorineural deafness occurs in 29%, making this the most common cause of deafness in West Africa. [7-10]

The clinical syndrome of Lassa fever is difficult to distinguish from severe malaria, septicemia, yellow fever and other viral hemorrhagic fevers (e.g., Ebola).
• Inflammation of the throat with white tonsillar patches is an important distinguishing feature.

Definitive diagnosis requires testing that is available only in highly-specialized laboratories.
• Laboratory specimens may be hazardous and must be handled with extreme care at the highest level of biosafety containment.
Although Lassa fever is not endemic to Zambia, imported, expatriate or other presentations of the disease have been associated with this country.

Lassa fever in Zambia

A non-pathogenic Arenavirus tentatively named "Luna virus" has been recovered from rodents (*Mastomys natalensis*) in Zambia. [11]

Notable outbreaks:
2008 - An outbreak (5 cases, 4 fatal) of Lujo virus infection in South Africa followed hospitalization of an index patient from Zambia. [12-25]

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Legionellosis

Agent	BACTERIUM. Legionella pneumophila, et al An aerobic gram-negative bacillus
Reservoir	Water
Vector	None
Vehicle	Water Aerosols Droplet (rare)
Incubation Period	5- 6d (range 2-12d); Pontiac fever = 1-2d
Diagnostic Tests	Serology. Culture. Urine antigen (certain types). Nucleic acid amplification. Alert lab if organism suspected.
Typical Adult Therapy	Fluoroquinolone (Levofloxacin, Trovafloxacin, Pefloxacin, Sparfloxacin or Moxifloxacin). OR Azithromycin. OR Erythromycin + Rifampin OR Clarithromycin
Typical Pediatric Therapy	Azithromycin. OR Erythromycin + Rifampin OR Clarithromycin
Clinical Hints	Respiratory illness with extrapulmonary manifestations (diarrhea, confusion, renal or hepatic dysfunction, relative bradycardia, etc.); most cases reported during summer in temperate areas; case-fatality rates of 5% to 25% are reported.
Synonyms	Doenca dos legionarios, Legionarsjuka, Legionarssjuka, Legionella, Legionellose, Legionellosi, Legionnaire's disease, Pontiac fever. ICD9: 482.84 ICD10: A48.1,A48.2

Clinical

WHO Case definition for surveillance:
Clinical description
An illness characterized by an acute lower respiratory infection with focal signs of pneumonia on clinical examination and/or radiological evidence of pneumonia.
Laboratory criteria for diagnosis
Presumptive: one or more of the following:
• Detection of specific *Legionella* antigen in respiratory secretions or urine
• Direct fluorescent antibody (DFA) staining of the organism in respiratory secretions or lung tissue, using evaluated monoclonal reagents
• A fourfold or greater rise in specific serum antibody titer to *Legionella* species other than *Legionella pneumophila* serogroup 1, using a locally validated serological test
Confirmative: one or more of the following:
• Isolation of *Legionella* from respiratory secretions, lung tissue, pleural fluid, or blood
• A fourfold or greater rise in specific serum antibody titer to *L. pneumophila* serogroup 1 by indirect immunofluorescence antibody test or microagglutination
• Most European countries and others such as the United States now include the detection of *L. pneumophila* serogroup 1 antigen in urine as a confirmatory test.
Case classification
• Suspected: Not applicable.
• Probable: A case compatible with the clinical description, with presumptive laboratory results.
• Confirmed: A case compatible with the clinical description, with confirmative laboratory results.

Pneumonia associated with extrapulmonary findings should suggest the possibility of Legionnaire's disease.
• Q-fever may be mistaken for Legionnaires' disease [1]
• Legionnaire's disease may rarely present as fever of unknown origin (FUO) [2]
• The most common clinical manifestation is pneumonia, ranging from mild • to severe, with respiratory failure and death.
• Risk factors for overt disease include advanced age, smoking, chronic obstructive pulmonary disease, immunosuppression, and recent surgery.

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• Person-to-person transmission has not been demonstrated.

Legionnaire's disease vs. Pontiac fever:
There are 2 currently recognized distinct clinicoepidemiological manifestations of legionellosis:
• Both forms are characterized initially by anorexia, vomiting, myalgia and headache, followed within a day by rising fevers and chills.
• Legionnaires. disease. (pneumonic form) and
• Pontiac fever (non-pneumonic Legionnaires disease)

Legionnaires disease [3] [4]
• In the pneumonic form, non-productive cough, abdominal pain / diarrhea, confusion / delirium are common.
• It is not possible, clinically, to distinguish *Legionella* pneumonia from other pneumonias [5] ; suspicion should be raised in any pneumonia connected with epidemiological information (e.g., recent traveling, hospitalization, gatherings, immunosuppression).
• In addition, age (>50), sex (M), smoking, alcohol consumption have been shown to be risk factors.

Pontiac fever:
Pontiac fever is a self-limited, influenza-like illness lasting 2 to 5 days, often in healthy persons following exposure to contaminated whirlpools or spas. [6-8]
• Pontiac fever is not associated with pneumonia. It is thought to represent a reaction to inhaled antigen, rather than to bacteria.
• Proposed case definition for Pontiac fever include occurrence of at least one symptom among headache, myalgia, fever and rigors, beginning 2 to 8 days following exposure. [9]

Complications:
Reported complications of legionellosis have included empyema, pleural effusion, lung abscess, cutaneous nodules [10] , renal failure (in 10% to 50% of cases), endocarditis [11] [12] , peritonitis, cerebellar ataxia [13] , cutaneous and visceral abscesses [14] , arteriovenous fistula infection, pericarditis and myocarditis.
• Case-fatality rates may approach 40%, particularly among patients with underlying disease or immunosuppression.
• Additional risk factors for fatal infection include heart disease, malignancy, alcoholism and renal disease. [15]

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Leishmaniasis - visceral

Agent	PARASITE - Protozoa. Euglenozoa, Kinetoplastea. Flagellate: Leishmania donovani, L. infantum, L. cruzi; rarely, L. tropica
Reservoir	Human Rodent Dog Fox Hares
Vector	Fly (sandfly = Phlebotomus for old world; Lutzomyia for new world)
Vehicle	Blood
Incubation Period	2m - 6m (10d - 12m)
Diagnostic Tests	Smear / culture of bone marrow, splenic aspirate, lymph nodes. Serology. Nucleic acid amplification.
Typical Adult Therapy	Pentavalent antimonials (Stibogluconate) 20 mg/kg/d X 28d. OR Amphotericin B 1 mg/kg/QOD X 8w (or lipid complex 3 mg/kg/d X 5d) OR Paromomycin 11 mg/kg IM QD X 21 days OR Miltefosine 50 to 150 mg PO daily X 4 to 6 weeks.
Typical Pediatric Therapy	Pentavalent antimonials (Stibogluconate) 20 mg/kg/d X 28d. OR Amphotericin B 1 mg/kg/QOD X 8w (or lipid complex 3 mg/kg/d X 5d) OR Paromomycin 11 mg/kg IM QD X 21 days OR Miltefosine 2.5 mg/kg daily (maximum 150 mg) X 28d
Clinical Hints	Chronic fever, weight loss, diaphoresis, hepatosplenomegaly, lymphadenopathy and pancytopenia; grey pigmentation (Kala Azar = "black disease') may appear late in severe illness; case-fatality rate = 5% (treated) to 90% (untreated).
Synonyms	Burdwan fever, Cachectic fever, Dum Dum fever, Kala azar, Leishmania donovani, Leishmania infantum, Leishmania siamensis, Leishmania tarentolae, Leishmaniose: Viszerale, Leishmaniosi viscerale, Ponos, Visceral leishmaniasis. ICD9: 085.0 ICD10: B55.0

Clinical

WHO Case definition for surveillance:
Clinical description
• An illness with prolonged irregular fever, splenomegaly and weight loss as its main symptoms.
Laboratory criteria for diagnosis
• positive parasitology (stained smears from bone marrow, spleen, liver, lymph node, blood or culture of the organism from a biopsy or aspirated material)
• positive serology (IFA, ELISA)
Case classification
WHO operational definition:
• A case of visceral leishmaniasis is a person showing clinical signs (mainly prolonged irregular fever, splenomegaly and weight loss) with serological (at geographical area level) and/or parasitological confirmation (when feasible at central level) of the diagnosis.
• In endemic malarious areas, visceral leishmaniasis should be suspected when fever lasts for more than two weeks and no response has been achieved with anti-malaria drugs (assuming drug resistant malaria has also been considered).

Following an incubation period of two to eight months, the patient develops chronic fever, abdominal pain (from an enlarged spleen) and swelling, weight loss, cough and occasionally, diarrhea.
• The classical fever rises twice daily, without rigors; however, single "spikes," irregular or undulant fevers are common.
• Caucasians may experience an abrupt onset of high fever, with rapid progression of illness, toxemia, weakness, dyspnea, and anemia.
• Visceral leishmaniasis in HIV-positive patients is characterized by short incubation period, high incidence of multi-organ disease, and tendency to relapse. [1] [2]

Physical signs may be limited to splenomegaly; but chronically-ill patients are typically pale and cachetic.
• Hyperpigmentation of face, extremities and abdomen (Kala azar) may be present in advanced cases.
• The spleen is non-tender, and may be massively enlarged, reaching the left or even right iliac fossa. Imaging studies may demonstrate multiple nodular lesions in some cases. [3] Absence of splenomegaly is rarely reported. [4]
• Moderate hepatomegaly is present in one-third of cases.

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• Rare instances of granulomatous hepatitis are reported. [5]
• Generalized lymphadenopathy is found in 50% of African patients, and a smaller percentage of Indian and European cases. In some cases, localized lymphadenopathy may be the only sign of infection. [6]
• Jaundice, mucosal and retinal hemorrhage, laryngeal lesions [7], uveitis, chronic diarrhea with malabsorption [8], interstitial nephritis [9], glomerulonephritis [10], pericardial effusion [11] and panniculitis [12] are occasionally encountered.
• Skin lesions with regional adenopathy may suggest a diagnosis of cutaneous leishmaniasis. [13]
• Other rare manifestations include the hemophagocytic syndrome [14-16], laryngeal infection [17], leukemoid changes, myelodysplasia, cryoglobulinemia [18] or pyothorax [19]
• The clinical features of visceral leishmaniasis may mimic those of autoimmune hepatitis, primary biliary cirrhosis, and systemic lupus erythematosus. [20]

A chronic rash (Post kala-azar dermal leishmaniasis = PKDL) , resembling leprosy, typically appears between two and ten years following infection. [21-23]
• Skin lesions of PKDL involve primarily the extremities and face, suggesting a role for ultraviolet light exposure.
• PKDL appears to be more common following treatment with antimonials, as compared with other anti-leishmanial drugs.
• The South Asian variant is characterized by coexisting macules and papular nodules, primarily affecting young adults
• The Sudanese variant presents as either papular or nodular lesions, primarily affecting children.

Laboratory studies reveal pancytopenia, hypoalbuminemia, hyperglobulinemia, and only mild hepatic dysfunction.
• In endemic countries, leishmaniasis is the principal cause of febrile pancytopenia among children without hematologic malignancy. [24]
• Intercurrent infections are common notably pneumococcal disease (otitis, pneumonia or septicemia), tuberculosis and measles.
• Evidence of primary adrenal insufficiency, hypoparathyoridism and hypothyroidism are common. [25]

The case/fatality rate without treatment is 80% to 90%.
• Rare instances of spontaneous remission have been reported. [26]

Leishmaniasis - visceral in Zambia

Isolated reports of kala azar in Zambia were published in 1973 [27] and 1976. [28]
- No cases were reported during 1977 to 2012. [29]

A report of canine infection was published in 1997. [30]

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Leprosy

Agent	BACTERIUM. Mycobacterium leprae An acid-fast bacillus
Reservoir	Human ? Armadillo
Vector	None
Vehicle	Patient secretions
Incubation Period	3y - 5y (range 3m - 40y)
Diagnostic Tests	Visualization of organisms in exudate, scrapings or biopsy. Nucleic acid amplification.
Typical Adult Therapy	Multibacillary: One year therapy Dapsone 100 mg + Clofazimine 50 mg daily; and, Rifampin 600 mg + Clofazimine 300 mg once monthly Paucibacillary: Six month therapy Dapsone 100 mg daily; and Rifampin 600 mg once monthly
Typical Pediatric Therapy	Multibacillary: One year therapy Dapsone 1 to 2 mg/kg + Clofazimine 1 mg/kg daily; and, Rifampin 10 mg/kg + Clofazimine 1 mg/kg once monthly Paucibacillary: Six month therapy Dapsone 1 to 2 mg/kg daily; and Rifampin 10 mg/kg once monthly
Clinical Hints	Anesthetic, circinate hypopigmented skin lesions and thickened peripheral nerves (tuberculoid leprosy); or diffuse, destructive papulonodular infection (lepromatous leprosy); or combined/ intermediate forms.
Synonyms	Aussatz, Doence de Hansen, Hansen's disease, Lebbra, Lepra, Mycobacterium leprae, Mycobacterium lepromatosis. ICD9: 030 ICD10: A30

Clinical

WHO Case definition for surveillance:
Clinical description
• The clinical manifestations of the disease vary in a continuous spectrum between the two polar forms, lepromatous and tuberculoid leprosy:
• In lepromatous (multibacillary) leprosy, nodules, papules, macules and diffuse infiltrations are bilateral symmetrical and usually numerous and extensive; involvement of the nasal mucosa may lead to crusting, obstructed breathing and epistaxis; ocular involvement leads to iritis and keratitis
• In tuberculoid (paucibacillary) leprosy, skin lesions are single or few, sharply demarcated, anesthetic or hypoesthesic, and bilateral asymmetrical, involvement of peripheral nerves tends to be severe
• Borderline leprosy has features of both polar forms and is more labile
• Indeterminate leprosy is characterized by hypopigmented maculae with ill-defined borders; if untreated, it may progress to tuberculoid, borderline
or lepromatous disease
Laboratory criteria for confirmation
• Alcohol-acid-fast bacilli in skin smears (made by the scrape-incision method).
• In the paucibacillary form the bacilli may be so few that they are not demonstrable.
• In view of the increasing prevalence of HIV and hepatitis B infection in many countries where leprosy remains endemic, the number of skin smear sites and the frequency of smear collection should be limited to the
minimum necessary.

Case classification:
WHO operational definition:
A case of leprosy is defined as a person showing one or more of the following features, and who as yet has to complete a full course of treatment:

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• hypopigmented or reddish skin lesions with definite loss of sensation
• involvement of the peripheral nerves, as demonstrated by definite thickening with loss of sensation
• skin smear positive for acid-fast bacilli
Classification (microbiological):
Paucibacillary (PB): includes all smear-negative cases
Multibacillary (MB): includes all smear-positive cases.
Classification (clinical):
Paucibacillary single lesion leprosy: 1 skin lesion.
Paucibacillary leprosy: 2 to 5 patches or lesions on the skin.
Multibacillary leprosy: >5 patches or lesions on the skin.

The major forms of leprosy are as follows: [1] [2]

Tuberculoid • one or a few well-demarcated, hypopigmented, and anesthetic skin lesions, frequently with active, spreading edges and a clearing center; peripheral nerve swelling or thickening also may occur.

Lepromatous • a number of erythematous papules and nodules or an infiltration of the face (including oral mucosa [3] , hands, and feet with lesions in a bilateral and symmetrical distribution that progress to thickening of the skin. Histoid leprosy, a variant of lepromatous leprosy, is characterized by well-defined, skin-colored smooth, soft shiny papules and nodules. [4] [5]

Borderline (dimorphous) • skin lesions characteristic of both the tuberculoid and lepromatous forms.

Indeterminate • early lesions, usually hypopigmented macules, without developed tuberculoid or lepromatous features.

Relapsing disease may manifest as lymphadenopathy mimicking tuberculosis [6]
• Relapses may follow effective antimicrobial therapy. [7-9]

The skin lesions of paracoccidioidomycosis may mimic those of tuberculoid leprosy. [10]
• Lepromatous leprosy may mimic sarcoidosis. [11] [12]
• Lupus vulgaris may mimic actinomycosis or mycetoma. [13]
• Post-kala-azar dermal leishmaniasis [14] and diffuse cutaneous leishmaniasis may mimic lepromatous leprosy [15] The lesions of both cutaneous and mucocutaneous leishmaniasis could be mistaken for those of borderline tuberculoid leprosy. [16]
• Leprosy may be initially misdiagnosed as adult stills disease or an auto-immune disorder. [17]

Leprosy may be associated with endocrine dysfunction including hypogonadism, sterility and osteoporosis [18] [19]

Six percent of leprosy patients exhibit rheumatological manifestations, most commonly resembling rheumatoid arthritis [20] [21]
• Rare instances of spondylodiscitis have been reported. [22]

Lucio's phenomenon is a rare and aggressive necrotizing variant of erythema nodosum leprosum [23] that classically occur in patients with undiagnosed, diffuse non-nodular lepromatous leprosy. [24]

Erythema multiforme [25] and lesions suggestive of erythema gyratum repens [26] are occasionally encountered among patients with leprosy. [27]
• Rare instances of hemophagocytic lymphohistiocytosis have been reported. [28]

Chronic skin lesions may undergo malignant transformation. [29]

Cranial nerve involvement, most often trigeminal, olfactory and facial, is not uncommon. [30] [31]
• Neuropathic pain may persist for decades following successful antimicrobial treatment. [32]
• Segmental necrotizing granulomatous neuritis is reported in some cases. [33]

Leprosy in Zambia

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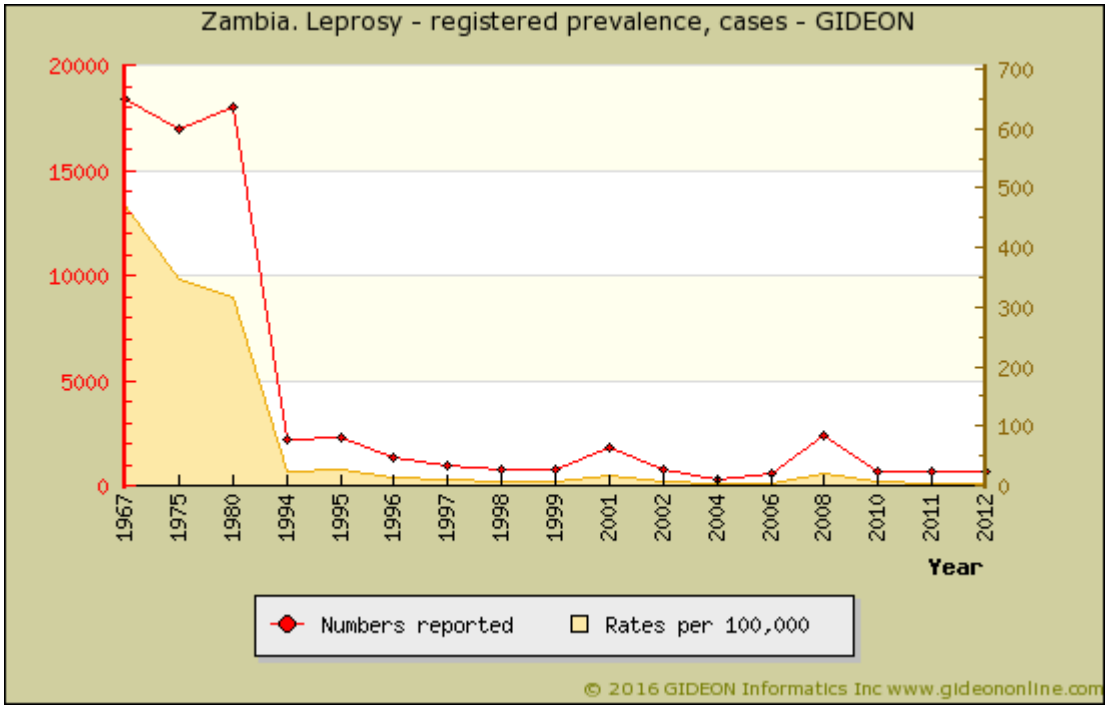
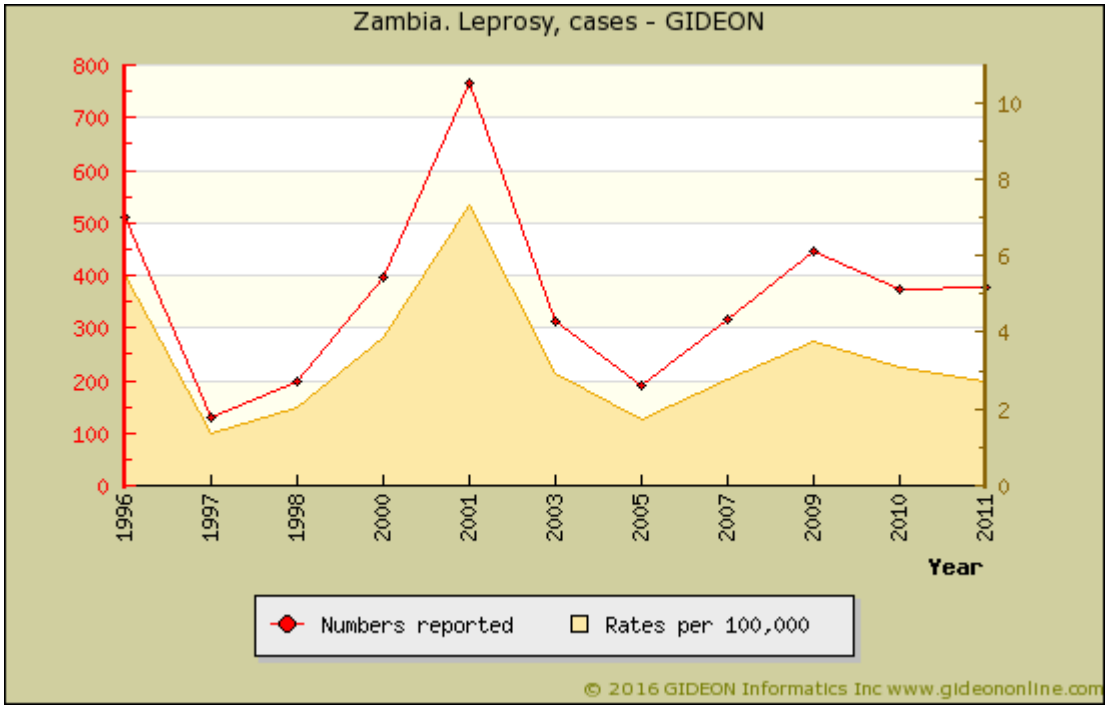


Graph: Zambia. Leprosy - registered prevalence, cases

Notes:
Individual years:
1975 - True number estimated at 40,000 cases.

Multibacillary cases are twice as common as paucibacillary cases.



Graph: Zambia. Leprosy, cases

Notes:
1. The case-notification rate for leprosy declined from 2.73 per 10,000 population in 1991, to 0.43 per 10,000 in 2009. [34]

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MDT coverage is 100% (1998).

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Leptospirosis

Agent	BACTERIUM. Leptospira interrogans An aerobic non-gram staining spirochete
Reservoir	Cattle Dog Horse Deer Rodent Fox Marine mammal Cat Marsupial Frog
Vector	None
Vehicle	Water Soil urine contact Breastfeeding
Incubation Period	7d - 12d (range 2d - 26d)
Diagnostic Tests	Culture on specialized media. Dark field microscopy of urine, CSF. Serology.
Typical Adult Therapy	Penicillin 1.5 million units Q6h iv OR Doxycycline 100 mg BID X 5 to 7d OR Ceftriaxone 1g IV daily
Typical Pediatric Therapy	Penicillin G 50,000u/kg q6h iv X 5 to 7d Age >= 8y: Doxycycline 2.2 mg/kg BID X 5 to 7d may also be used
Clinical Hints	"Sterile" meningitis, nephritis, hepatitis, myositis and conjunctivitis; often follows recent skin contact with fresh water in rural or rodent-infested areas; case-fatality rates of 5% to 40% are reported.
Synonyms	Andaman hemorrhagic fever, Canefield fever, Canicola fever, Field fever, Fish handler's disease, Fort Bragg fever, Japanese autumnal fever, Leptospira, Leptospirose, Leptospirosen, Leptospirosi, Mud fever, Pre-tibial fever, Rat fever, Rice field fever, Swamp fever, Swineherd disease, Weil's disease. ICD9: 100 ICD10: A27

Clinical

WHO Case definition for surveillance:
Clinical description
Acute febrile illness with headache, myalgia and prostration associated with any of the following symptoms:
• conjunctival suffusion
• meningeal irritation
• anuria or oliguria and/or proteinuria
• jaundice
• hemorrhages (from the intestines; lung bleeding is notorious in some areas)
• cardiac arrhythmia or failure
• skin rash
and a history of exposure to infected animals or an environment contaminated with animal urine.
Other common symptoms include nausea, vomiting, abdominal pain, diarrhea, arthralgia.
Laboratory criteria for diagnosis
• Isolation (and typing) from blood or other clinical materials through culture of pathogenic leptospires
• Positive serology, preferably Microscopic Agglutination Test (MAT), using a range of *Leptospira* strains for antigens that should be representative of local strains
Case classification
• Suspected: A case that is compatible with the clinical description.
• Probable: Not applicable.
• Confirmed: A suspect case that is confirmed in a competent laboratory.
Note: Leptospirosis is difficult to diagnose clinically in areas where diseases with symptoms similar to those of leptospirosis occur frequently.
SPECIAL ASPECTS
• Serology by Microscopic Agglutination Test (MAT) may provide presumptive information on causative serogroups.
• Attempts should be made to isolate leptospires, and isolates should be typed to assess locally circulating serovars.
• Questioning the patient may provide clues to infection source and transmission conditions.
• Animal serology may give presumptive information on serogroup status of the infection Isolation followed by typing gives definite information on serovar.

Disease due to *Leptospira interrogans* serovar. *icterohaemorrhagiae* is usually overt, and often manifest as hepatitis, meningitis and nephritis. [1]

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• Canicola fever is due to serovar. *canicola* (occasionally *L. interrogans* serovar. *pomona*) and characterized by a milder lymphocytic meningitis, without hepatic or renal involvement.
• Serovar. *autumnalis* (occasionally *L. interrogans* serovar. *pomona*) produces Fort Bragg fever, a febrile illness associated with raised, erythematous, and mildly tender pretibial skin lesions.

Acute phase

Subclinical infection is common.
• Overt leptospirosis (90% of cases) is characterized by a self-limited, systemic illness.
• Patients are at risk for severe and potentially fatal illness which may present with renal failure, liver failure, pneumonia [2] [3] or hemorrhagic diathesis. [4]
• Illness begins abruptly with such symptoms as fever (38 to 40 C), headache (over 95% of cases), rigors, myalgia (over 80%), conjunctivitis (30 to 40%), abdominal pain (30%), vomiting (30 to 60%), diarrhea (15 to 30%), cough, muscular (calf) tenderness, pharyngitis (20%) and a pretibial maculopapular rash (fewer than 10%).
• Additional findings have included lymphadenopathy, splenomegaly, atypical lymphocytosis [5], hemophagocytic syndrome with thrombocytopenia [6], myocarditis with heart failure [7], transitory paraparesis [8], hepatomegaly, polyarthritis, mononeuritis multiplex and pancreatitis. [9] [10]
• During the acute illness, bacteria can be recovered from or seen in blood, CSF, or tissue using specialized techniques.
• Organisms are demonstrated in urine after the 5th to 7th days. Pyuria, hematuria and proteinuria may be evident as well.
• Severe hypomagnesemia has been reported during the acute phase of infection. [11-13]

Latency and relapse:

The acute phase is followed by an asymptomatic period of 4 to 30 days.
• At this point, illness reappears, with conjunctival suffusion, photophobia, eye pain, myalgia, lymphadenopathy and hepatosplenomegaly.
• Additional findings may lymphocytic meningitis (70 to 80% of patients) with normal glucose levels; pretibial purpura, uveitis [14] [15], iridocyclitis or chorioretinitis, facial nerve palsy [16], cavernous sinus thrombosis [17], thrombocytopenia, hypotension, myopericarditis [18-20], cardiac arrhythmias [21-23] and pancreatitis. [24] [25]
• Weil's disease is characterized by hepatic and renal function which may progress to severe and even fatal hepatorenal failure which carries a case-fatality rate of 5 to 40%.
• Renal involvement, principally interstitial nephritis and tubular necrosis [26] may be severe, even in the absence of jaundice. [27]
• Pulmonary infiltrates [28], severe hemorrhagic pneumonia [29-31] and acute pulmonary distress syndrome may be encountered, even in the absence of hepatic and renal failure. [32-34]
• Congestive heart failure is rare; however, cardiac arrhythmias may occur and result in sudden deaths.
• Acute disseminated encephalomyelitis has been reported as a complication of leptospirosis. [35]
• Relatively severe infection is reported among pregnant women. [36]

Persistent, asymptomatic renal colonization by Leptospirae may follow infection in humans. [37]

The clinical features of dengue [38], influenza pneumonia [39] and pyomyositis may mimic those of leptospirosis. [40]
• Fatal cases of leptospirosis / dengue co-infection are reported (2014 publication). [41]

Leptospirosis in Zambia

No cases of leptospirosis were reported in 2002.

Prevalence surveys:

14.9% of straw-colored fruit bats (*Eidolon helvum*) migrating from Zambia to Democratic Republic of Congo (2008 to 2013) [42]

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Listeriosis

Agent	BACTERIUM. Listeria monocytogenes A facultative gram-positive bacillus
Reservoir	Mammal Human Bird Soil Water
Vector	None
Vehicle	Transplacental Dairy products (eg, soft cheeses), Infected secretions Vegetables Poultry Water
Incubation Period	3d - 21d (-60d post-ingestion)
Diagnostic Tests	Culture of blood or CSF.
Typical Adult Therapy	Ampicillin 2g IV q6h X 2w (higher dosage in meningitis) + Gentamicin. Sulfamethoxazole/trimethoprim recommended for Penicillin-allergic patients
Typical Pediatric Therapy	Ampicillin 50 mg/kg IV Q6h X 2w (higher dosage in meningitis). Sulfamethoxazole/trimethoprim recommended for Penicillin-allergic patients
Clinical Hints	Meningitis or sepsis, often immune-suppressed patients (lymphoma, AIDS, etc); gastroenteritis - may follow ingestion of "over-the-counter" foods; neonatal septicemia occasionally encountered.
Synonyms	Listeria monocytogenes, Listeriose, Listeriosi. ICD9: 027.0 ICD10: A32

Clinical

Major risk factors for invasive Listeriosis reflect T-cell mediated immune compromise, including old age, pregnancy, hematological malignancy, chemotherapy, corticosteroid therapy and anti-TNF-alpha agents

Signs of *Listeria* meningitis are often atypical: [1]
- brain stem and cerebellar involvement (rhombencephalitis) occurs in 11% of cases [2-5]
- nuchal rigidity in only 80% to 85%
- movement disorders (ataxia, myoclonus) in 15% to 20% [6]
- seizures in 25%. [7]

The blood culture is positive in 75% of meningitis cases; and the cerebrospinal fluid gram stain is positive in only 40%.

Symptoms of food-borne listeriosis develop between one day and three months after ingestion the bacteria in food. [8]
- Most cases are characterized by diarrhea and fever [9] [10]
- Headache, myalgia and arthralgia are common. [11]
- The bacteria may be excreted in stool for several months.

Other forms of listeriosis:
- Hepatic listeriosis may present as single or multiple abscesses, or diffuse granulomatous hepatitis. [12]
- Numerous cases of *Listeria* endocarditis of both native and prosthetic valves have been reported. [13-29] Instances of pericarditis [30] [31], cardiac pseudotumor [32] [33], endovascular graft infection [34] and aortitis / mycotic aneurysm with aortic dissection have also been reported. [35-38]
- Sporadic cases of prosthetic joint infection [39-44], renal failure, brain abscess [45], cutaneous infections [46] [47] including septic vasculitis [48], mycotic aortic aneurysm [49] [50], pneumonia [51], empyema [52], uveitis [53], endophthalmitis [54] [55], panophthalmitis [56], perianal abscess [57] and rhabdomyolysis are encountered. [58]
- *Listeria* peritonitis has been reported in a patient undergoing peritoneal dialysis [59] and in a patient with biliary cirrhosis. [60] Cholecystitis [61] [62], cholangitis [63], spontaneous bacterial peritonitis [64-71] and ventriculo-peritoneal shunt infections due to *Listeria monocytogenes* have also been reported. [72]

Listeriosis in Zambia

Listeriosis, cases: None reported between 1996 and 2002

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Liver abscess - bacterial

Agent	BACTERIUM. Various species from portal (Bacteroides, mixed aerobe-anaerobe) or biliary (Escherichia coli, etc) source
Reservoir	Human
Vector	None
Vehicle	Endogenous
Incubation Period	Variable
Diagnostic Tests	Ultrasonography, CT or radionucleotide scan. If amoebic abscess suspected, perform Entamoeba serology
Typical Adult Therapy	Intravenous antibiotic(s) directed at likely or suspected pathogens. Percutaneous or open drainage
Typical Pediatric Therapy	As for adult
Clinical Hints	Tender liver, and prolonged fever in a patient with history of diverticulosis, cholecystitis, appendicitis, etc; clinically similar to amoebic abscess, but often multiple.
Synonyms	Ascesso fegato, Bacterial liver abscess, Hepatic abscess - bacterial, Liver abscess. ICD9: 572.0 ICD10: K75.0

Clinical

Symptoms of pyogenic hepatic abscess include fever and rigors of several days' to several weeks' duration.
• Dull right upper quadrant pain may be associated with cough and pleuritic pain with radiation to the right shoulder and an associated pleural rub. [1]
• Tender hepatomegaly is present in 50 to 70% of the patients.
• Jaundice is uncommon, unless the abscess is extensive or associated with ascending.
• In some cases, the sole presentation may be fever of unknown origin.

Serological studies, a history of diarrhea, edema of the right chest wall, and limitation to a single abscess in the posterior, superior right hepatic lobe may be suggestive of amoebic abscess. [2] [3]

Alkaline phosphatase is the most consistently elevated serum enzyme in patients with liver abscess.
• Blood cultures are positive in 50% of cases.
• Acute kidney injury is common in patients with pyogenic liver abscess. [4]

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Lymphocytic choriomeningitis

Agent	VIRUS - RNA. Arenaviridae, Arenavirus: Lymphocytic choriomeningitis virus
Reservoir	House mouse Guinea pig Hamster Monkey
Vector	None
Vehicle	Urine Saliva Feces Food Dust
Incubation Period	8d - 12d (range 6d - 14d)
Diagnostic Tests	Viral culture (blood, throat, CSF). Serology. Nucleic acid amplification. Biosafety level 3.
Typical Adult Therapy	Supportive
Typical Pediatric Therapy	As for adult
Clinical Hints	Headache, myalgia, meningitis and encephalitis; photophobia or pharyngitis may be present; prior exposure to rodents; infection resolves within 2 weeks, however convalescence may require an additional 2 months.
Synonyms	

Clinical

Acute infection:
35% of Lymphocytic choriomeningitis virus infections are asymptomatic and 50% are characterized by a nonspecific flu-like illness.
• Overt infections are characterized by fever, headache, nausea and systemic symptoms, leukopenia and thrombocytopenia. [1] [2]
• Patients may also exhibit lymphadenopathy and a maculopapular rash (12% to 15% of patients have rash and/or meningitis or encephalitis).
• Relapses characterized by a more severe headache with meningitis may occur after initial improvement.
• Papilledema may be noted

The CSF protein concentration ranges from 50 to 300 mg/dl.
• A pleocytosis of several hundred lymphocytes/mm3 is commonly observed.
• Decreases in CSF glucose concentration are documented in over 20% of cases.

Complications:
Complications include encephalitis, psychosis, paraplegia, transitory aqueductal stenosis, and disturbances of cranial, sensory, or autonomic nervous function.
• Occasionally, orchitis, myocarditis, arthritis, or alopecia are encountered.
• Lymphocytic choriomeningitis is increasingly recognized as a cause of hydrocephalus, psychomotor retardation, congenital chorioretinitis and blindness, most often when acquired during the first or second trimesters of pregnancy. [3] [4]
• Congenital infection is also associated with microencephaly, periventricular calcifications, ventriculomegaly, pachygyria, cerebellar hypoplasia, porencephalic and periventricular cysts. [5]

The case-fatality rate for Lymphocytic choriomeningitis is less than one percent; however, patients with sustained viremia lacking an inflammatory response seem to be at risk for fatal outcome. [6]

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Lymphogranuloma venereum

Agent	BACTERIUM. Chlamydiaceae, Chlamydiae, Chlamydia trachomatis, types L1, L2, L3
Reservoir	Human
Vector	None
Vehicle	Sexual contact
Incubation Period	7d - 12d (range 3d - 30d)
Diagnostic Tests	Serology. Culture of pus performed in specialized laboratories.
Typical Adult Therapy	Doxycycline 100 mg PO BID X 3w. OR Erythromycin 500 mg QID X 3w OR Azithromycin 1g po weekly X 3w
Typical Pediatric Therapy	Age < 8 years: Erythromycin 10 mg/kg PO QID X 2 to 4w. Age >= 8 years: Doxycycline 2 mg/kg PO BID X 2 to 4w
Clinical Hints	Genital nodule or vesicle with large, suppurating regional nodes; generalized lymphadenopathy or proctitis may be present; late complications include genital edema, rectal strictures and perianal abscesses.
Synonyms	Bubonulus, Durand-Nicolas-Favre disease, Linfogranuloma venereo, Lymphogranuloma inguinale, Lymphopathia venereum, Maladie de Nicolas et Favre, Tropical bubo, Venereal bubo, Venerisk lymfogranulom. ICD9: 099.1 ICD10: A55

Clinical

Acute illness:
The first stage of Lymphogranuloma venereum (LGV) is characterized by a papule or ulcer on the genital or anal mucosa, or of the adjacent skin. [1-4]
• Occasionally, the lesion is intraurethral or cervical, producing urethritis or cervicitis.
• The secondary stage occurs days to weeks after the primary lesion and is characterized by lymphadenopathy and systemic illness.
• Cervical lymphadenopathy may occur if infection is acquired through oro-genital contact. [5]

Lymphadenitis:
The inguinal lymph nodes are most often affected, and are unilateral in two thirds of patients.
• The obturator and iliac nodes are occasionally affected in women.
• Initially the lymph nodes are discrete and tender with overlying erythema.
• A characteristic "groove" may be evident between the femoral and inguinal lymph nodes.
• In some cases, patients may present with a "bubonulus": penile adenopathy and secondary local acute lymphedema. [6]
• Later, the nodes may suppurate and coalesce, forming a bubo that may rupture spontaneously (30% of cases) to produce fistulae [7] or sinus tracts which may drain for months.

Inguinal lymphadenopathy in cat-scratch disease may suggest a diagnosis of lymphogranuloma venereum. [8]
• Rectal involvement may suggest a diagnosis of inflammatory bowel disease. [9] [10]
• Rectal LGV in HIV-positive patients can mimic lymphoma. [11]

Systemic manifestations at this stage include fever, headache, and myalgia.
• Meningitis may also occur.
• LGV is increasingly recognized as a cause of hemorrhagic proctitis in men who have sex with men. [12] [13]
• Reactive arthritis has been reported following LGV proctitis [14-16]

Relapse occurs in 20% of untreated patients.

Only 25% of women present with inguinal lymphadenopathy.
• Women and homosexual men may present with proctitis or pain in the lower abdomen and back pain related to involvement of pelvic and lumbar lymph nodes.

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• Late complications include esthiomene (chronic hypertrophic and ulceration of the vulva, scrotum or penis), and elephantiasis of the male or female genitalia.
• Major lower leg involvement may suggest a diagnosis of deep-vein thrombosis. [17]

Lymphogranuloma venereum in Zambia

Prevalence surveys:

3% of genital ulcers (2012 publication) [18]

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Malaria

Agent	PARASITE - Protozoa. Apicomplexa, Haemosporida: Plasmodium spp.
Reservoir	Human Primate (Plasmodium knowlesi)
Vector	Mosquito (Anopheles)
Vehicle	Blood
Incubation Period	12d -30d
Diagnostic Tests	Examination of blood smear. Serology, antigen & microscopic techniques. Nucleic acid amplification.
Typical Adult Therapy	Resistant falcip: Lumefantrine/Artemether OR Quinine + Doxycycline or Clindamycin OR Atovaquone/proguanil OR Artesunate IV if severe malaria If sens., Chloroquine 1g, then 500 mg at 6, 24 & 48 hrs. If P. ovale or P. vivax - follow with Primaquine
Typical Pediatric Therapy	Resistant falcip: Lumefantrine/Artemether OR Quinine + Clindamycin OR Atovaquone/proguanil OR Artesunate (>age 8) IV (severe malaria) If sens, Chloroquine 10 mg/kg, then 5 mg/kg at 6, 24, & 48 hrs. If P. ovale or P. vivax - follow with Primaquine
Clinical Hints	Fever, headache, rigors ("shaking chills"), vomiting, myalgia, diaphoresis and hemolytic anemia; fever pattern (every other or every third day) and splenomegaly may be present; clinical disease may relapse after 7 (ovale and vivax) to 40 (malariae) years.
Synonyms	Ague, Bilious remittent fever, Chagres fever, Estiautumnal fever, Marsh fever, Marsh fever, Paludism, Paludismo, Plasmodium brasilianum, Plasmodium falciparum, Plasmodium knowlesi, Plasmodium malariae, Plasmodium ovale, Plasmodium vivax. ICD9: 084 ICD10: B50,B51,B52,B53,B54

Clinical

WHO Case definition for surveillance (For use in endemic areas and people exposed to malaria, e.g., a history of visit to endemic area)

• Malaria must be defined in association with clinical disease symptoms.
• The case definition for malaria cannot be uniform: it will vary according to how malaria is perceived in a given country, local patterns of transmission, and disease consequences.
• The suggested definitions are deliberately broad.
• Each national malaria control program must adapt the definition and introduce additional indicators to make it more applicable to local epidemiology and control targets.

Clinical description

• Signs and symptoms vary; most patients experience fever.
• Splenomegaly and anemia are commonly associated signs.
• Common but non-specific symptoms include otherwise unexplained headache, back pain, chills, sweating, myalgia, nausea, vomiting.
• Untreated *Plasmodium falciparum* infection can lead to coma, generalized convulsions, hyperparasitemia, normocytic anemia, disturbances of fluid, electrolyte, and acid-base balance, renal failure, hypoglycemia, hyperpyrexia, hemoglobinuria, circulatory collapse / shock, spontaneous bleeding (disseminated intravascular coagulation), pulmonary edema, and death.

Laboratory criteria for diagnosis

Demonstration of malaria parasites in blood films (mainly asexual forms).

Case classification

In areas without access to laboratory-based diagnosis.

• Probable uncomplicated malaria: A person with symptoms and/or signs of malaria who receives anti-malarial treatment.
• Probable severe malaria: A patient who requires hospitalization for symptoms and signs of severe malaria and receives anti-malarial treatment.

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• Probable malaria death: death of a patient diagnosed with probable severe malaria.
In areas with access to laboratory-based diagnosis.
• Asymptomatic malaria: A person with no recent history of symptoms and/or signs of malaria who shows laboratory confirmation of parasitemia.
• Confirmed uncomplicated malaria: A patient with symptoms and/or signs of malaria who received anti-malarial treatment, with laboratory confirmation of diagnosis.

Acute infection:

Most cases present with non-specific signs suggestive of "sepsis," such as fever, rigors, headache and myalgia.
• Clinical findings include cough, fatigue, malaise, arthralgia, myalgia, headache, and diaphoresis.
• In Africa, tickborne relapsing fever [1] and rabies are often mis-diagnosed as malaria. [2]
• Elevated levels of serum bilirubin or C-reactive protein favor a diagnosis of malaria rather than dengue. [3]

The typical malarial paroxysm begins with rigors lasting 1 to 2 hours, followed by high fever.
• This is followed by marked diaphoresis and a fall in temperature.
• Tertian (fever every other day) fever may occur in infection by *P. falciparum*, *P. vivax* and *P. ovale*; quartan (every third day) fever with *P. malariae* infection; and daily fever with *P. knowlesi* infection. [4] [5]
• *P. knowlesi* malaria appears to be more severe than *P. malariae* malaria, with higher rates of parasitemia and fatality. [6-12]
• "Classical" fever patterns are rarely helpful, and anemia and splenomegaly develop only after several attacks.
• Less common findings include anorexia, vomiting, diarrhea and hypotension.
• In some cases, malaria may present as fever accompanied by an urticarial rash. [13]

Complications:

Complications include pulmonary disease (ARDS) [14-16], encephalopathy (cerebral malaria) [17-20], nephropathy, retinopathy [21-24] or optic neuritis [25-27], cranial nerve palsy, cerebral venous thrombosis [28], cerebellar ataxia [29] [30], acute disseminated encephalomyelitis [31], hypocalcemia with tetany [32], shock ("algid malaria"), purpura fulminans [33], disseminated intravascular coagulation (DIC) [34], symmetrical peripheral gangrene [35-37], endotoxemia [38], massive diarrhea, pancreatitis [39-41], splenic infarction or rupture [42-46], acalculous cholecystitis [47], myocarditis [48] and dysfunction of other organs. [49] [50]
• Patients with *falciparum* malaria are at increased risk for bacteremia. [51] [52]
• Occasionally, patients experience Post-malaria Neurological Syndrome: acute confusion, cerebellar ataxia, diffuse cerebral demyelination, seizures, hearing loss [53], cognitive dysfunction [54] or other neuropsychiatric findings several days to weeks following successful treatment of falciparum malaria. [55-60] Long-term sequelae may include neurological impairment, including epilepsy. [61]
• *Plasmodium falciparum* infection accounts for most complications and deaths from malaria [62]; however, severe disease may occasionally complicate infection by other species. [63-68]
• The presence of malarial retinopathy is associated with a poor prognosis. [69] In contrast with *Plasmodium falciparum* malaria, retinal changes are rare in *Plasmodium knowlesi* infection. [70]
• *P. falciparum* is also responsible for most malarial drug resistance.
• Maternal infection is associated with vertical transmission to the newborn [71], fetal loss and low birth weight in infants. [72-77]
• 5% of African children with severe malaria were found to have concomitant bacteremia [78]
• Severe and fatal disease associated with *Plasmodium vivax* infection is increasingly reported in recent years. [79-105] Instances of acute glomerulonephritis [106-111], IgA nephropathy [112], renal cortical necrosis [113], acalculous cholecystitis [114], jaundice [115], pancreatitis [116] [117], thrombocytopenia [118-122], disseminated intravascular coagulation [123-126], hemolytic-uremic syndrome [127], shock, peripheral gangrene [128] [129], splenic infarction [130] or rupture [131-134], cerebral malaria [135] [136], optic neuritis [137], cerebral venous thrombosis [138], cranial nerve palsy [139], myelitis [140], hemiparesis with seizures [141], myocarditis [142-147], hypoglycemia and acute respiratory distress syndrome have been reported with *Plasmodium vivax* infections. [148-156]
• *Plasmodium malariae* infection is rarely associated with severe illness [157]; and may lead to renal glomerular damage and nephrotic syndrome. [158-161] Relapse following treatment is rarely reported. [162]
• Rare instances of severe and fatal infection have been associated with *Plasmodium ovale* infection. [163-165]
• Pericarditis [166], splenic rupture [167] and acute respiratory distress syndrome have been reported in *Plasmodium ovale* infection. [168] [169]
• There appear to be subtle clinical differences between infections caused by *Plasmodium ovale curtisi* vs. *P. ovale wallikeri*. [170]

Malaria and HIV infection:

HIV infection increases the incidence and severity of clinical malaria; however, in severe malaria the level of parasitemia is similar in HIV-positive and HIV-negative patients. [171-180]
• During pregnancy, HIV infection increases the incidence of clinical malaria, maternal morbidity, and fetal and neonatal morbi-mortality.

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• HIV infection increases the risk for malaria treatment failure, and for cerebral malaria in children. [181]
• Some antimalarial drugs may inhibit HIV, while certain anti-retroviral drugs are effective against *Plasmodium* species. [182]

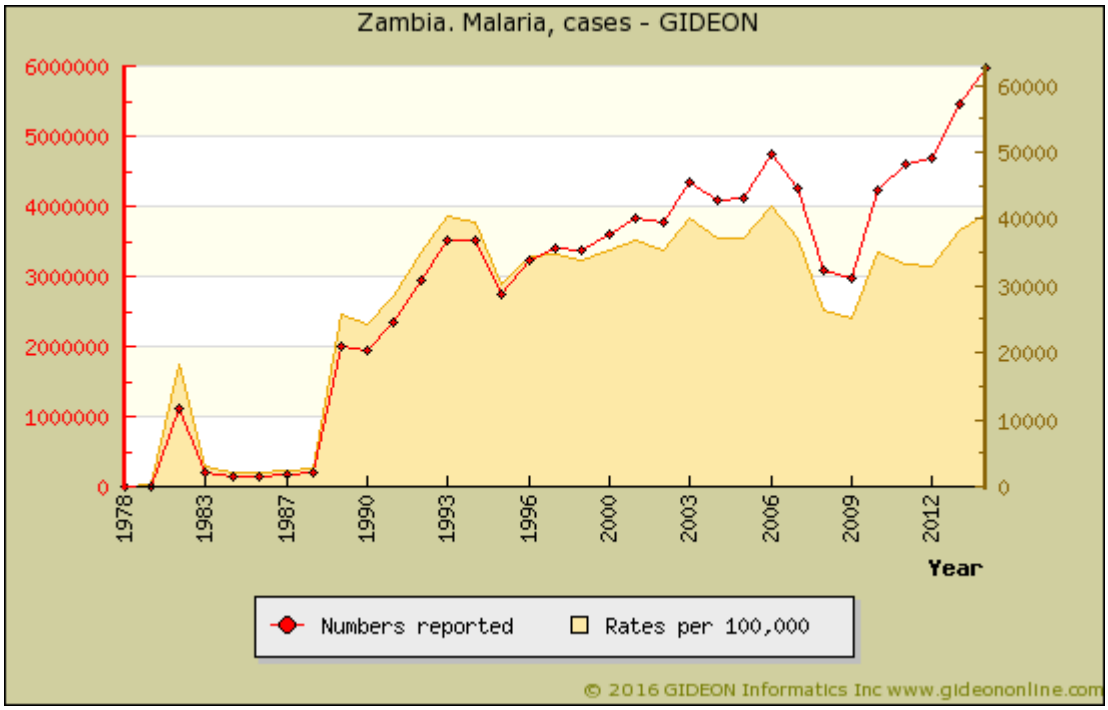
Relapse:
Relapse may occur months to years following the initial episode.
• Relapses of *P. vivax* and *P. ovale* infection result from release of parasites which had remained dormant in the liver.
• As such, treatment of infection by either of these two species should include a drug (eg, primaquine) active against intrahepatic parasites.
• Although infections caused by *P. falciparum* and *P. knowelsi* do not relapse, reinfection may occur. [183]

Plasmodium malariae persists without symptoms in the blood, rather than the liver.
• Relapse has been reported as long as 40 to 50 years following exit from an endemic area. [184]
Chloroquine resistant falciparum malaria endemic to 81 countries. Chloroquine-sensitive malaria endemic to 28 countries.

Malaria in Zambia

Time and Place:
Malaria occurs throughout the country
- Most cases occur during November to June.
- Recent reviews of malaria trends (2000 to 2010) [185] and control programs (2014 publication) in Zambia. [186]

Infecting species:
Plasmodium falciparum accounts for over 85% of cases.
- Chloroquine-resistant *P. falciparum* **IS** reported.
- Reduced sensitivity to chloroquine was first noted in Zambia in 1978 [187] , and resistance was first reported in 1983. [188]



Graph: Zambia. Malaria, cases

Notes:
1. Malaria is the most common cause for hospitalization in Zambia, in all age groups.
2. Incidence for 2000 to 2005 includes data from reference [189]

Prevalence surveys:

37.8% of persons given antibacterials for fever (2011) [190]
28% of individuals in Southern Province in 2007, 8.1% in 2008 and 1.4% in 2009 [191]
38% of individuals in Nchelenge District, Luapula Province in 2006; 53% in 2012 [192] ; 48% during 2012 to 2014 [193]
45% of household contacts of malaria patients (Chongwe District, 2012 to 2013) [194]
22% of pregnant women in Nchelenge District, Luapula Province (2013) [195]

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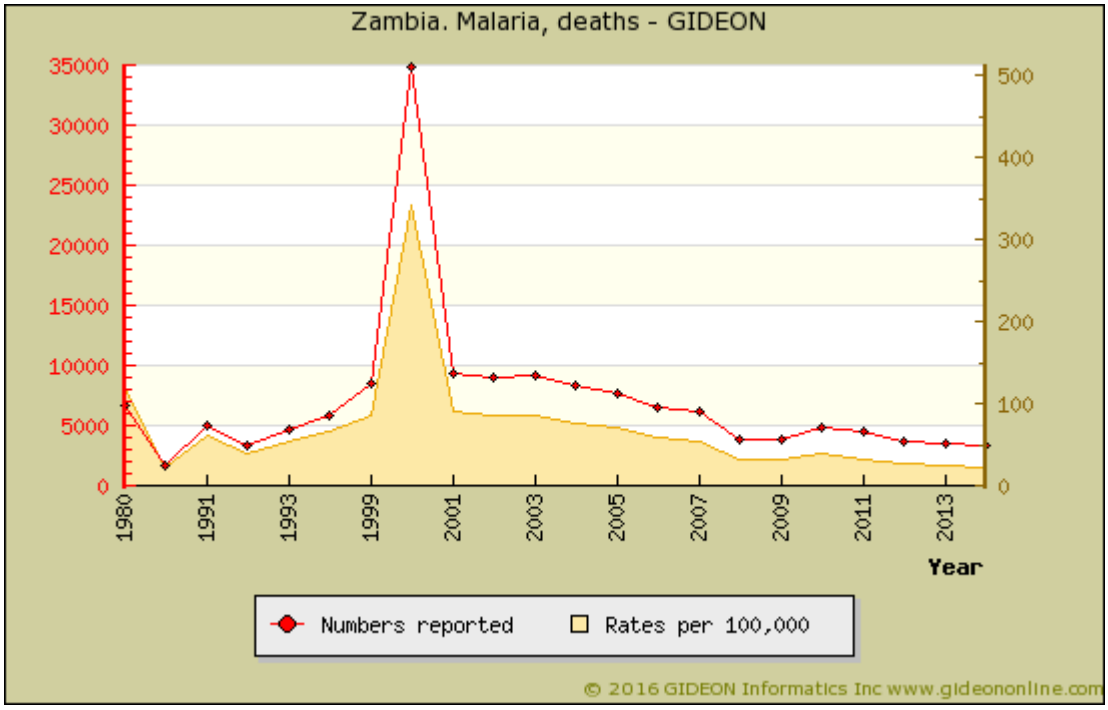
57.8% of pregnant women in Nchelenge District (PCR, 2013 to 2014) [196]
30.2% of children below age 10 years in Nchelenge District, Luapula Province (2012) [197]
54.3% of children below age 6 years, in Eastern and Luapula Provinces (2012) [198]
27% / 19% of hospital admissions / hospital deaths in 1998; 35% / 22% in 1999; 62%/44% in 2001
9.7% of children below age 5 years in Luangwa District (2008 to 2010) [199]
2% of malaria cases with an initially negative rapid diagnostic test result (PCR, North A and Micheweni districts, 2010) [200]

The estimated burden of malaria among children is 2.6 fever days per child-year (2009 to 2010) [201]



Graph: Zambia. Malaria, deaths

Notes:
1. Figures for 1980, 1990, 2000 and 2010 are based on estimates of true mortality. [202] Since these estimates are significantly higher than official Health Ministry reports for other years during this period, resultant graphs will suggest unusual fluctuation in trends.

Vectors:
27 *Anopheles* species have been identified in Zambia.
- The principal vectors are *Anopheles arabiensis* [203] , *An. gambiae* [204] , *An. funestus* [205] , *An. pharoensis* and *An. merus* (in the southern region).
- Additional vectors include *An. nili* and *An. quadriannulatus*. [206]

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Malignant otitis externa

Agent	BACTERIUM. Pseudomonas aeruginosa: aerobic gram-negative bacillus (virtually all cases)
Reservoir	Human
Vector	None
Vehicle	Endogenous
Incubation Period	Variable
Diagnostic Tests	Culture of otic exudate and biopsy material. Careful roentgenographic and neurological examinations.
Typical Adult Therapy	Early debridement Ciprofloxacin 400 mg iv Q8h Alternatives: Imipenem, Meropenem, Ceftazidime, Cefepime Early debridement
Typical Pediatric Therapy	Early debridement Imipenem: Age 0 to 7 days: 25 mg/kg IV Q12h Age 8 to 28 days: 25 mg/kg IV Q8h Age >28 days: 15 to 25 mg/kg IV Q6h (maximum 2 g/day) Alternatives: Meropenem, Ceftazidime, Cefepime
Clinical Hints	Otic pain, swelling and discharge; infection of bony and cartilaginous ear canal; over 80% of patients are diabetics over age 50; cranial nerve (usually VII) signs in 50%. case-fatality rate > 55%.
Synonyms	

Clinical

The case definition of Malignant Otitis Externa consists of pain, edema, exudate, granulations, microabscesses (when explored), positive bone scan or failure of local treatment often more than 1 week. [1]
• Additional criteria may include cranial nerve involvement, positive radiograph, debilitating condition and old age.

Severe pain and tenderness in the mastoid area are accompanied by drainage of pus from the external canal. [2]
• Involvement of the temporal bone, meninges, venous sinuses, internal carotid arteries [3] , orbital apex [4] , cranial nerves (IX, X, XII [5]) and brain may follow.

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Mansonelliasis - M. perstans

Agent	PARASITE - Nematoda. Secernentea: Mansonella (Esslingeria) perstans
Reservoir	Human
Vector	Midge (Culicoides spp.)
Vehicle	None
Incubation Period	5m - 18m (range 1m - 2y)
Diagnostic Tests	Identification of microfilariae in blood. Nucleic acid amplification.
Typical Adult Therapy	Albendazole 400 mg PO BID X 10 d OR Mebendazole 100 mg PO BID X 30 d. Recent data suggest that addition of doxycycline may be of benefit.
Typical Pediatric Therapy	Age >2 years: As for adult. OR Albendazole 10 mg/kg/day PO X 10d
Clinical Hints	Recurrent pruritic subcutaneous lesions, arthralgia and eosinophilia; headache, fever or abdominal pain may also be present.
Synonyms	Acanthocheilonema perstans, Bung eye disease, Dipetalonema berghei, Dipetalonema perstans, Dipetalonema semiclarum, Esslingeria perstans, Filaria perstans, Mansonella perstans, Mansonella rhodhaini, Mansonella semiclarum, Mansonella sp. DEUX, Meningonema peruzzii, Tetrapetalonema berghei, Tetrapetalonema perstans. ICD9: 125.4 ICD10: B74.4

Clinical

Patients develop recurrent pruritic subcutaneous swellings, fever, headache, joint pain, abdominal or chest pain and eosinophilia.
• Hepatosplenomegaly and intraocular lesions are occasionally seen.
• Asymptomatic microfilaremia from transfusion of infected blood has been reported.
• "Bung eye," characterized by the formation of yellowish nodules on the bulbar conjunctivae with proptosis and lid edema, has been reported in Uganda and neighboring countries. [1]
• Microfilariae of *Mansonella perstans* have been identified in vaginal secretions. [2] [3]

Human cerebral infection by *Meningonema peruzzii* has been reported. [4]

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Measles

Agent	VIRUS - RNA. Mononegavirales Paramyxoviridae, Paramyxovirinae, Morbillivirus: Measles virus
Reservoir	Human
Vector	None
Vehicle	Droplet
Incubation Period	8d - 14d
Diagnostic Tests	Viral culture (difficult and rarely indicated). Serology. Nucleic acid amplification.
Typical Adult Therapy	Respiratory isolation; supportive. Ribavirin 20 to 35 mg/kg/day X 7 days has been used for severe adult infection
Typical Pediatric Therapy	As for adult
Vaccines	Measles vaccine Measles-Mumps-Rubella vaccine Measles-Rubella vaccine
Clinical Hints	Coryza, fever, headache, conjunctivitis, photophobia and a maculopapular rash after 3 to 5 days; Koplik's spots (bluish-grey lesions on buccal mucosa, opposite second molars) often precede rash; encephalitis or viral pneumonia occasionally encountered.
Synonyms	Masern, Massling, Mazelen, Meslinger, Morbilli, Morbillo, Rubeola, Rugeole, Sarampion, Sarampo. ICD9: 055 ICD10: B05

Clinical

WHO Case definition for surveillance:
Any person with:
• fever, and
• maculopapular (i.e. non-vesicular) rash, and
• cough, coryza (i.e. runny nose) or conjunctivitis (i.e. red eyes).
or
Any person in whom a clinician suspects measles infection.
Laboratory criteria for diagnosis
• At least a fourfold increase in antibody titer or
• Isolation of measles virus or
• Presence of measles-specific IgM antibodies
Case classification
• Clinically confirmed: A case that meets the clinical case definition.
• Probable: Not applicable.
• Laboratory-confirmed: only for outbreak confirmation and during elimination phase A case that meets the clinical case definition and that is laboratory-confirmed or linked epidemiologically to a laboratory-confirmed case.

Acute illness:
Symptoms begin to appear about 10 to 12 days after exposure to the virus, with fever followed by cough, rhinorrhea, and/or conjunctivitis. [1]
• The rash appears approximately 14 days after exposure and lasts 5 to 6 days.
• The rash begins at the hairline, spreading to the face and neck.
• Over the next three days, the rash gradually extends, eventually reaching the hands and feet. [2]

Complications:
Complications of measles include diarrhea, otitis media (10%), pneumonia (5%), encephalitis (0.1%) [3] [4], sudden deafness [5], arthropathy (28%) [6], seizures, and death. [7]
• As many as 0.01% of measles patients will later develop Subacute sclerosing panencephalitis.
• Twenty percent of patients experience one or more complications, most often children below five years of age and adults

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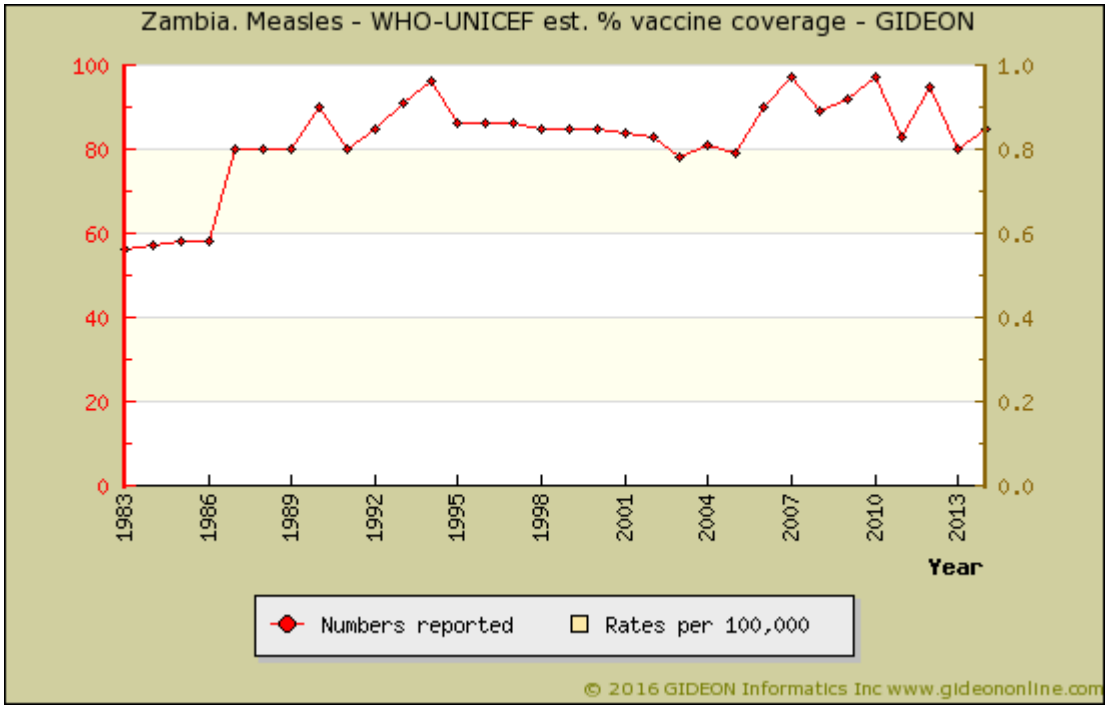
over 20.
• Measles in pregnancy may be associated with maternal pneumonia, abortion, low birth weight [8] [9] or congenital infection of the newborn. [10] [11]
• In developing countries, measles has been known to kill as many as one out of four people.
• Measles is the leading cause of blindness among African children, as a result of concomitant vitamin A deficiency.
• Measles pneumonia accounts for approximately 17% of bronchiolitis obliterans in children (Beijing, 2001 to 2007) [12]
• Rare instances of thyroiditis, pancreatitis and sialoadenitis have been reported. [13]

Measles in Zambia

Vaccine Schedule:

BCG - birth
DTwPHibHepB - 6, 10, 14 weeks
Measles - 9, 18 months
OPV - 6, 10, 14 weeks
Pneumo conj - 6, 10, 14 weeks
Rotavirus - 6, 10 weeks
Td - 1st contact pregnancy; +1, +1, +6 months; +1, +1 year



Graph: Zambia. Measles - WHO-UNICEF est. % vaccine coverage

Seroprevalence surveys:

67% of children ages 9 months to 5 years - following a mass vaccination campaign (Lusaka, 2009 publication) [14]
23% of HIV-positive children with a history of vaccination (2010) [15]

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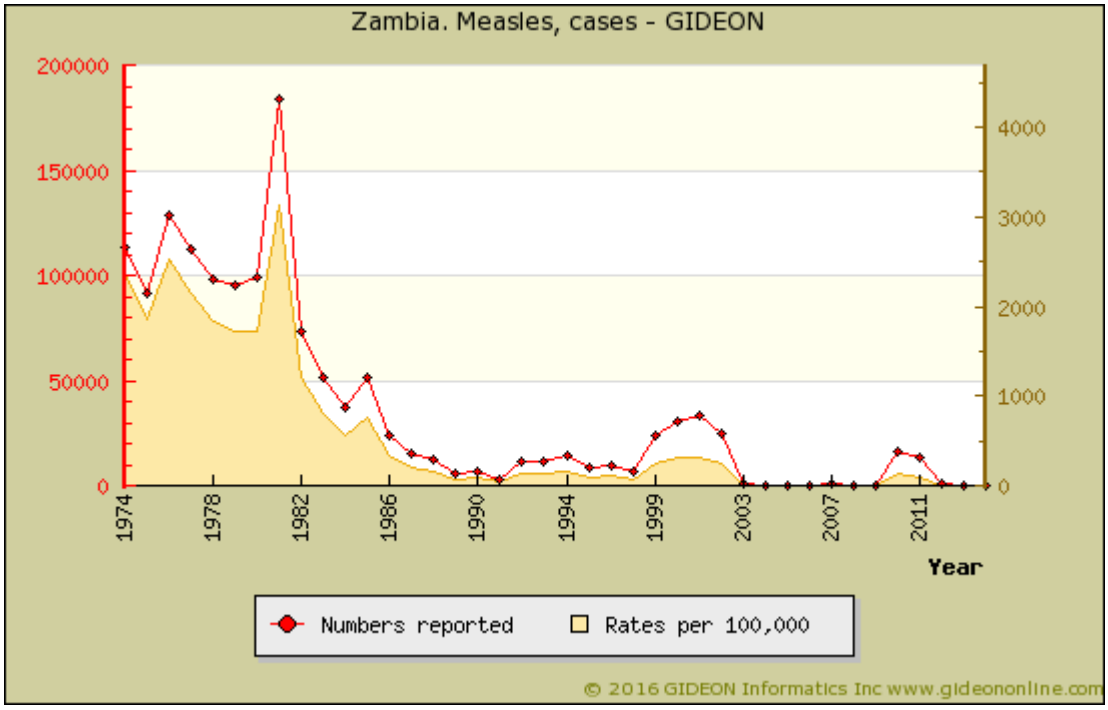

Graph: Zambia. Measles, cases

Notes:
1. 2,048 hospitalized cases were reported in Lusaka during September 1996 to September 1999. [16] [17]

The mean mortality was 217 per year during 1999 to 2002.
- 98 fatal cases were reported in 2003, and only three in 2004. [18] [19]

Notable outbreaks:

2010 - An outbreak (5,289 cases, 110 fatal - to August) of measles was reported. [20-31]
2011 - An outbreak (13,324 cases) was reported. [32-35]
2012 - An outbreak (53 cases) was reported at a school in Kitwe. [36] [37]

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Meningitis - aseptic (viral)

Agent	VIRUS - RNA. Picornaviridae, enteroviruses
Reservoir	Human
Vector	None
Vehicle	Fecal-oral Droplet
Incubation Period	Variable
Diagnostic Tests	Viral isolation (stool, CSF, throat). Serology.
Typical Adult Therapy	Supportive
Typical Pediatric Therapy	As for adult
Clinical Hints	Lymphocytic meningitis (normal CSF glucose); often follows sore throat; typically occurs during late summer and early autumn in temperate regions.
Synonyms	Aseptic meningitis, Encephalitis - viral, Meningite virale, Meningitis, viral, Meningo-encefalite virale, Viral encephalitis, Viral meningitis. ICD9: 047,048,049,320.2 ICD10: A87,G03.0

Clinical

WHO Case definition for surveillance:
Clinical case definition
A case with fever 38.5°C and one or more of the following:
• neck stiffness
• severe unexplained headache
• neck pain and 2 or more of the following: photophobia, nausea, vomiting, abdominal pain, pharyngitis with exudates
For children <2 years of age a case is defined as
• A case with fever 38.5°C and one or more of the following: irritability, bulging fontanelle
Laboratory criteria for confirmation
• The specific virus confirmed on cell culture.
Case classification
Suspected: A case that meets the clinical case definition and one or more of the following:
• normal CSF glucose and normal or mild increase in CSF protein (>50 mg/dl), moderate increase CSF cells (<500/mm3) and lymphocyte predominance (>50%)
• CSF Positive for viral genomic sequences using PCR (Polymerase Chain Reaction)
• Epidemiological link to a confirmed case
Confirmed: A suspected or probable case with laboratory confirmation.

As a group, the viral meningitides are characterized by fever, headache, meningismus and lymphocytic pleocytosis. [1] [2]
• Major complications and sequelae are unusual. [3] [4]
• The cerebrospinal fluid glucose level is normal, and a transitory neutrophilic pleocytosis is occasionally encountered.
• CSF pleocytosis is often absent among children with enteroviral meningitis. [5-7]

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Meningitis - bacterial

Agent	BACTERIUM. Neisseria meningitidis, Streptococcus pneumoniae, Haemophilus influenzae, et al
Reservoir	Human
Vector	None
Vehicle	Air Infected secretions
Incubation Period	Variable
Diagnostic Tests	CSF microscopy and culture. Blood culture. Note: Antigen detection is non-specific and rarely useful.
Typical Adult Therapy	Bactericidal agent(s) appropriate to known or suspected pathogen + dexamethasone
Typical Pediatric Therapy	As for adult
Vaccines	H. influenzae (HbOC-DTP or -DTaP) vaccine Haemophilus influenzae (HbOC) vaccine Haemophilus influenzae (PRP-D) vaccine Haemophilus influenzae (PRP-OMP) vaccine Haemophilus influenzae (PRP-T) vaccine Meningococcal vaccine Hepatitis B + Haemoph. influenzae vaccine
Clinical Hints	Headache, stiff neck, obtundation, high fever and leukocytosis; macular or petechial rash and preceding sore throat suggest meningococcal infection.
Synonyms	Bacterial meningitis, Enfermedad Meningococica, Haemophilus influenzae, Haemophilus influenzaes, HIB meningitis, HIBs, Infections a meningocoque, Meningite batterica, Meningite meningococcica, Meningococcal, Meningokokken Erkr., Meningokokkose. ICD9: 036.0,320 ICD10: A39,G00,G01,G02

Clinical

WHO Case definition for surveillance of Meningococcal infection:
Clinical case definition
• An illness with sudden onset of fever (>38.5°C rectal or >38.0°C axillary) and one or more of the following:
• Neck stiffness
• Altered consciousness
• Other meningeal sign or petechial or purpuric rash
• In patients <1 year, suspect meningitis when fever accompanied by bulging fontanelle.
Laboratory criteria for diagnosis
• Positive CSF antigen detection or
• Positive culture
Case classification
• Suspected: A case that meets the clinical case definition.
• Probable: A suspected case as defined above and turbid CSF (with or without positive Gram stain) or ongoing epidemic and epidemiological link to a confirmed case
• Confirmed: A suspected or probable case with laboratory confirmation.

WHO Case definition for surveillance of *Haemophilus influenzae* type b (Hib disease):
Clinical description
• Bacterial meningitis is characterized by fever of acute onset, headache and stiff neck.
• Meningitis is not a specific sign for Hib disease, and Hib disease cannot be diagnosed on clinical grounds.
Laboratory criteria for diagnosis
• Culture: isolation of Hib from a normally sterile clinical specimen, such as cerebrospinal fluid (CSF) or blood.
• Culture of Hib from non-sterile sites such as the throat, where bacteria can grow without causing disease, does not define Hib disease.
• Antigen detection: identification of Hib antigen in normally sterile fluids, by methods such as latex agglutination or counter-immunoelectrophoresis (CIE).
Case classification

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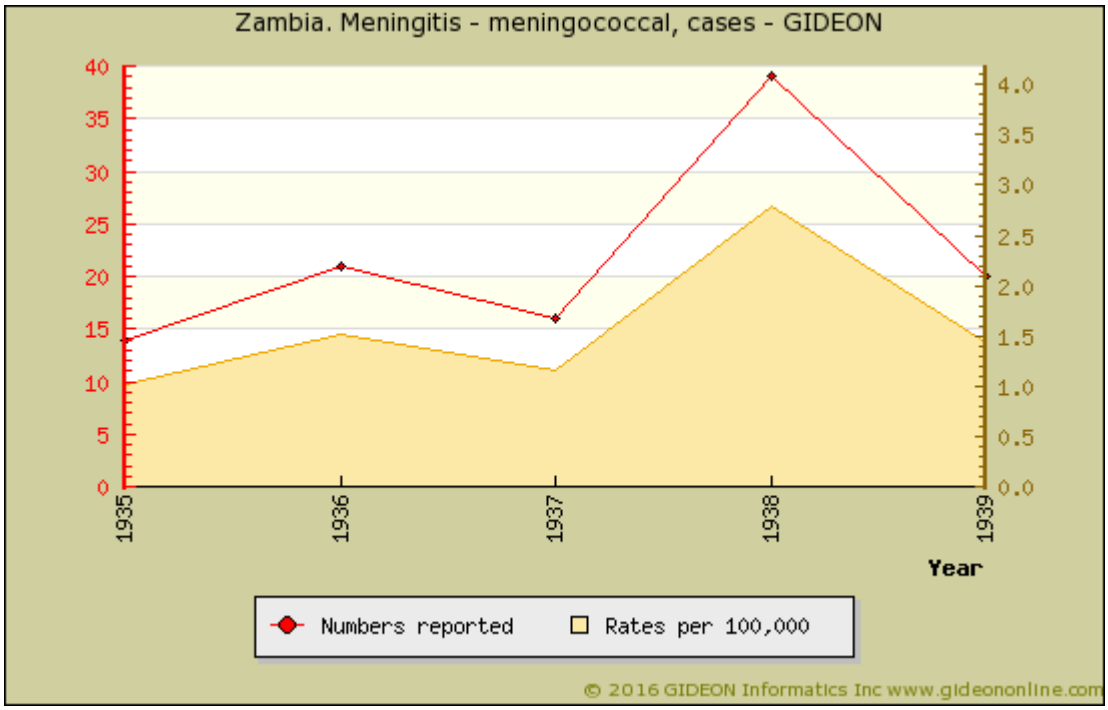
• Potential: (bacterial meningitis case): a child with a clinical syndrome consistent with bacterial meningitis.
• Probable: Not applicable.
• Confirmed: A case that is laboratory-confirmed (growth or identification of Hib in CSF or blood).
Note: Any person with Hib isolated from CSF or blood may be reported as a confirmed case, regardless of whether their clinical syndrome was meningitis.

As a group, the bacterial meningitides are characterized by signs of sepsis, fever, headache, meningismus and neutrophilic pleocytosis. [1] [2]
• 33% to 69% of patients with meningococcal infection have hyperglycemia on admission [3] [4]
• 7.5% of patients with meningococcal infection present with arthritis. [5]
• Major complications and sequelae are common.
• Delayed cerebral thrombosis is encountered in 1.1% of cases. [6]

Meningitis - bacterial in Zambia



Graph: Zambia. Meningitis - meningococcal, cases

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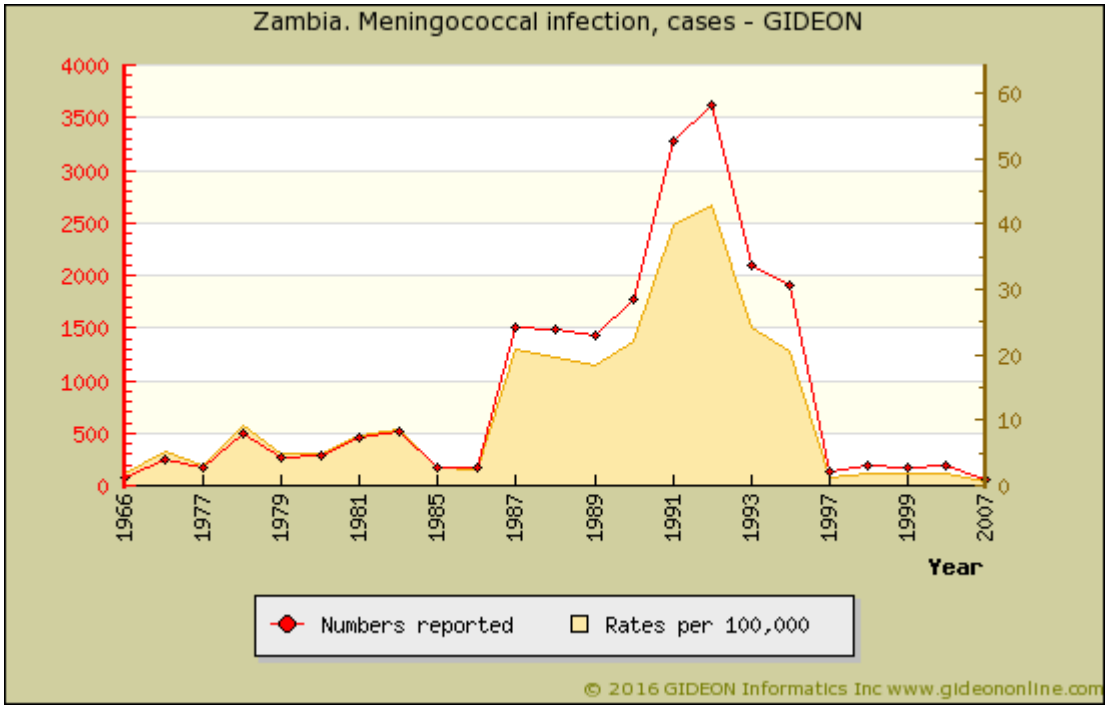
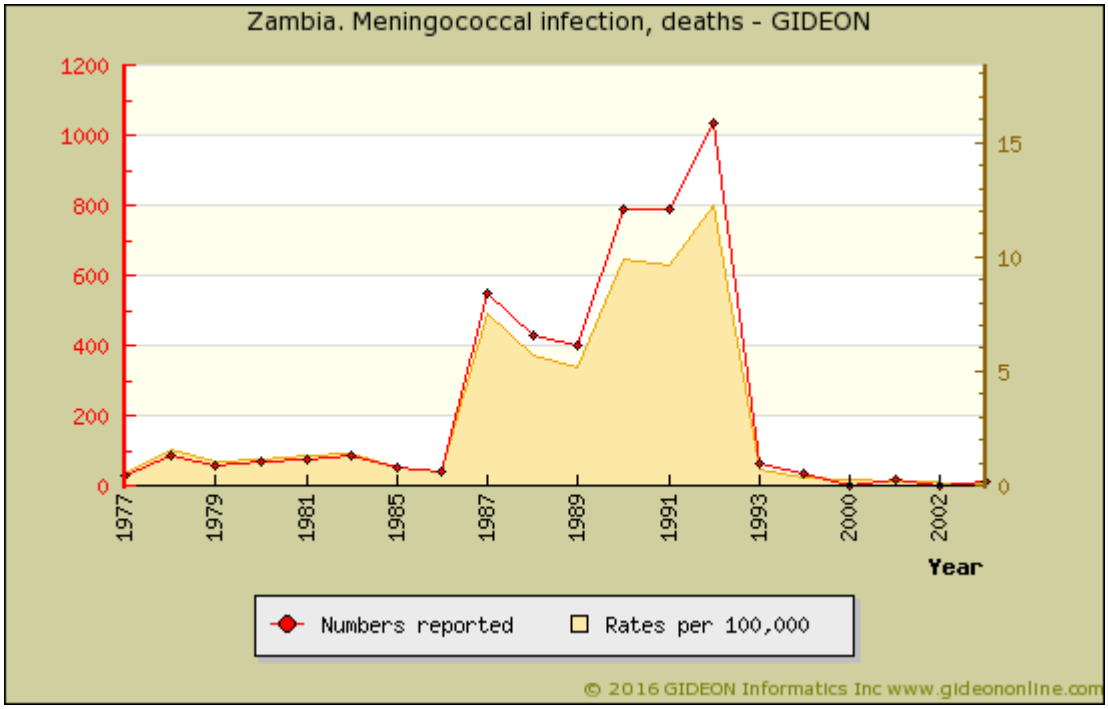


Graph: Zambia. Meningococcal infection, cases

Notes:
Individual years:
1992 - Group A infection. [7]
1993 - Group A infection. [8]
1996 - Group A infection.



Graph: Zambia. Meningococcal infection, deaths

Notes:
1. The case-fatality rate for meningococcal meningitis during 1986 to 1997 was 10.2%.

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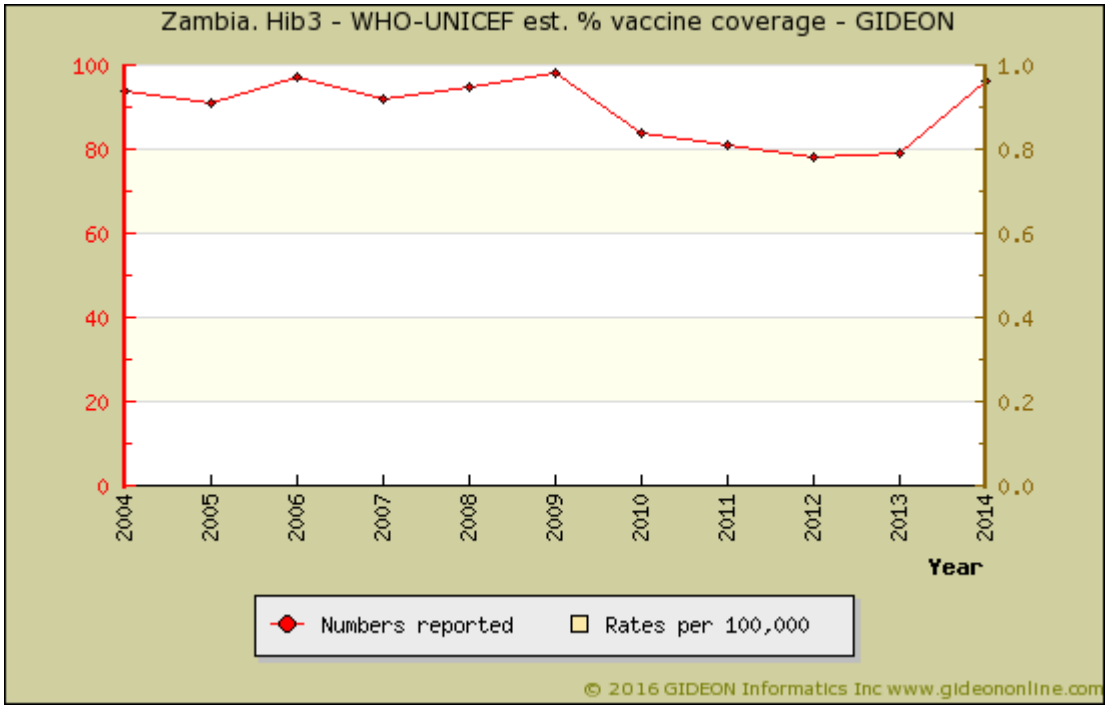
Vaccine Schedule:

BCG - birth
DTwPHibHepB - 6, 10, 14 weeks
Measles - 9, 18 months
OPV - 6, 10, 14 weeks
Pneumo conj - 6, 10, 14 weeks
Rotavirus - 6, 10 weeks
Td - 1st contact pregnancy; +1, +1, +6 months; +1, +1 year

Routine use of *Haemophilus influenzae* vaccine was introduced in 2004. [9]



Graph: Zambia. Hib3 - WHO-UNICEF est. % vaccine coverage

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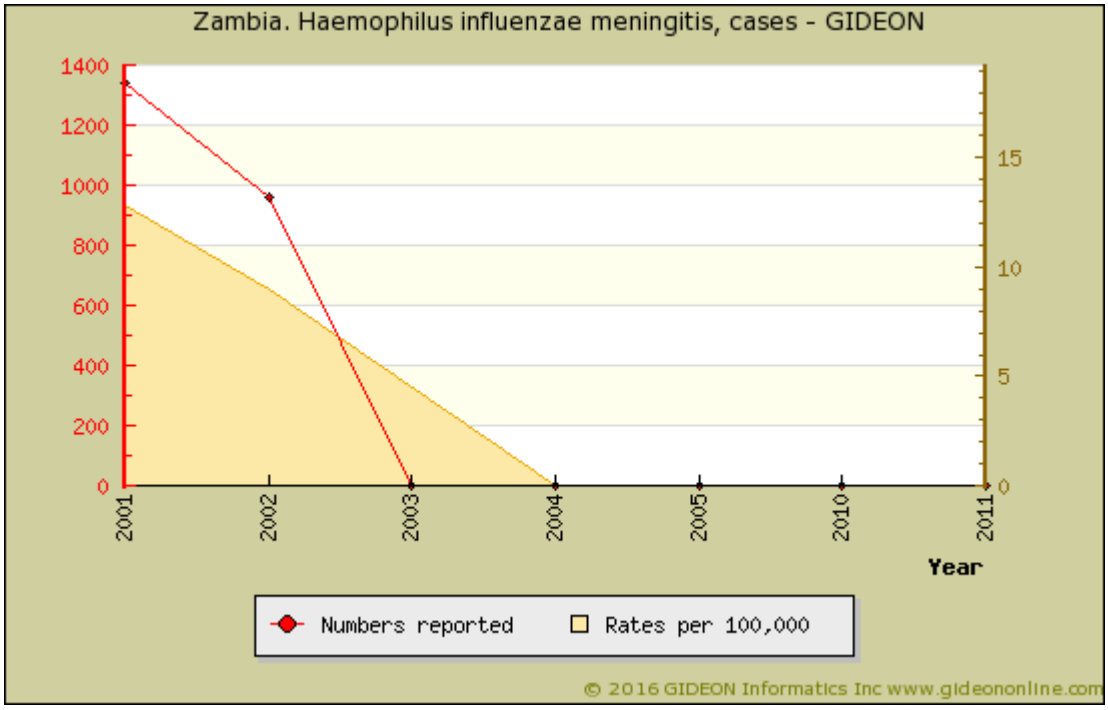

Graph: Zambia. *Haemophilus influenzae* meningitis, cases

Notable outbreaks:

1992 to 1994 - An outbreak of group A meningococcal infection was reported. [10]

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Microsporidiosis

Agent	FUNGUS. Microsporidia: Enterocytozoon, Encephalitozoon (Septata), Vittaforma (Nosema), Pleistophora, Trachipleistophora, et al.
Reservoir	Rabbit Rodent Carnivore Non-human primate Fish Dog Bird
Vector	None
Vehicle	? Fecal-oral
Incubation Period	Unknown
Diagnostic Tests	Microscopy of duodenal aspirates. Inform laboratory if this organism is suspected. Nucleic acid amplification.
Typical Adult Therapy	Albendazole 400 mg PO BID X 3 weeks. Add Fumagillin for ocular S. intestinalis may respond to Albendazole and Fumagillin Nitazoxanide has been used for E. bieneusi.
Typical Pediatric Therapy	Albendazole 200 mg PO BID X 3 weeks. Add Fumagillin for ocular S. intestinalis may respond to Albendazole and Fumagillin Nitazoxanide has been used for E. bieneusi.
Clinical Hints	In AIDS patients, infection is characterized by chronic diarrhea, wasting and bilateral keratoconjunctivitis; hepatitis and myositis may be present.
Synonyms	Anncaliia, Brachiola, Encephalitozoon, Enterocytozoon, Microsporidium, Nosema, Pleistophora, Trachipleistophora, Tubulinosema, Vittaforma. ICD9: 136.8 ICD10: A07.8

Clinical

Intestinal disease in immunocompetent patients is characterized by self-limited diarrhea, traveler's diarrhea or asymptomatic carriage. [1]

• Immunocompromised patients present with diarrhea, cholangitis, cholecystitis, sinusitis or pneumonia. [2] [3]

Ocular microsporidiosis is associated with keratoconjunctivitis.

Other syndromes include sinusitis, nephritis, cerebritis, myositis and prostatitis. [4-6]

Microsporidiosis in Zambia

Prevalence surveys:

34% of patients with persistent diarrhea (1997 publication) [7]

23% of HIV-positive patients with diarrhea (*Enterocytozoon bieneusi*) (2005 publication) [8]

8.6% of schoolchildren in Southern Province (*Encephalitozoon intestinalis*) (2005 publication) [9]

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Moniliformis and Macracanthorhynchus

Agent	PARASITE - Archiacanthocephala. Moniliformida: Moniliformis moniliformis, Oligocanthorhynchida: Maracanthorhynchus hirudinaceus.
Reservoir	Pig (Maracanthorhynchus), rat and fox (Moniliformis),
Vector	None
Vehicle	Insect (ingestion)
Incubation Period	Unknown - presumed 15 to 40 days
Diagnostic Tests	Identification of worm in stool.
Typical Adult Therapy	Infection is usually self-limited. Pyrantel pamoate has been used against Moniliformis moniliformis - 11 mg/kg PO - repeat once in 2 weeks
Typical Pediatric Therapy	Infection is usually self-limited. Pyrantel pamoate has been used against Moniliformis moniliformis - 11 mg/kg PO - repeat once in 2 weeks
Clinical Hints	Most infections are characterized by asymptomatic passage of a worm; however, vague complaints such as 'periumbilical discomfort' and 'giddiness' have been described.
Synonyms	Acanthocephalan worms, Macracanthorhynchus, Moniliform acanthocephalan, Moniliformis moniliformis. ICD9: 128.9 ICD10: B83.8

Clinical

Most infections are characterized by asymptomatic passage of a worm; however, vague complaints such as "periumbilical discomfort" and "giddiness" have been described. [1]

- In one instance, a man developed marked abdominal pain following experimental self-infection.
- In another case, intestinal perforation was associated with *Macracanthorhynchus hirudinaceus* infestation. [2]
- *Moniliformis* or a related parasite has been associated with a case of conjunctival infection. [3]

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Monkeypox

Agent	VIRUS - DNA. Poxviridae, Orthopoxvirus: Monkeypox virus
Reservoir	Monkey Squirrel Rodent
Vector	None
Vehicle	Contact
Incubation Period	10d - 12d (range 5d - 21d)
Diagnostic Tests	Viral culture (vesicle fluid, serum). Serology. Nucleic acid amplification. Biosafety level 2.
Typical Adult Therapy	Strict isolation; supportive. Cidofovir is effective in vitro
Typical Pediatric Therapy	As for adult
Clinical Hints	Vesiculopustular rash and painful lymphadenopathy beginning 1 to 3 weeks after contact with a squirrel or monkey; infection resolves within 2 to 4 weeks; case-fatality rate = 10% to 15%.
Synonyms	

Clinical

Although clinical features of the disease resemble those of smallpox, most infections are mild. [1] [2]

Typically, a papular rash with marked regional lymphadenopathy follows a 3-day prodrome, with most lesions appearing on the face and extremities (including palms and soles).
- Umbilicated pustules evolve, and leave a scar on healing.
- Prior smallpox vaccination appears to prevent monkeypox, or attenuate the severity of illness. [3]
- Atypical varicella, including lesions on palms and soles, may mimic monkeypox in endemic areas. [4]

Although Monkeypox is not endemic to Zambia, imported, expatriate or other presentations of the disease have been associated with this country.

Monkeypox in Zambia

Seroprevalence surveys:

14.7% of rodents, 33.3% of shrews and 2.1% of non-human primates (ELISA, anti-Orthopox antibodies, 2014 publication) [5]

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Mumps

Agent	VIRUS - RNA. Mononegavirales Paramyxoviridae, Paramyxovirinae, Rubulavirus: Mumps virus
Reservoir	Human
Vector	None
Vehicle	Aerosol
Incubation Period	14d - 24d (range 12d - 24d)
Diagnostic Tests	Viral culture (saliva, urine, CSF) indicated only in complicated cases. Serology. Nucleic acid amplification.
Typical Adult Therapy	Respiratory isolation; supportive
Typical Pediatric Therapy	As for adult
Vaccines	Measles-Mumps-Rubella vaccine Mumps vaccine Rubella - Mumps vaccine
Clinical Hints	Fever, parotitis, orchitis (20% of post-pubertal males), meningitis (clinically apparent in 1% to 10%), oophoritis, or encephalitis (0.1%); most cases resolve within 1 to 2 weeks.
Synonyms	Bof, Epidemic parotitis, Fiebre urliana, Infectious parotitis, Kusma, Oreillons, Paperas, Parotidite epidemica, Parotiditis, Parotite epidemica, Passjuka. ICD9: 072 ICD10: B26

Clinical

One third of Mumps virus infections are asymptomatic.

Acute illness:
The prodrome of mumps consists of low-grade fever, anorexia, malaise, and headache.
• Usually within one cay, the patient complains "earache" and tenderness is noted over the parotid gland. [1]
• The gland is soon visibly enlarged and progresses to maximum size over the next 2 to 3 days, often with lifting of the ear lobe upward and outward.
• The orifice of Stensen's duct is edematous and erythematous, and trismus and pain on chewing may be present.
• It is important to remember that the enlarged gland obscures the angle of the mandible, while cervical adenopathy does not.
• Parotid involvement if unilateral in 25% of cases.
• As the disease progresses, fever may reach 40C.
• Subsequently pain, fever, and tenderness resolve, and the parotid gland returns to normal size within a week.
• Involvement of the other salivary glands occurs in 10% of cases, but are rare in the absence of parotid involvement.
• Presternal edema develops in 6% of patients, most often in those who have submandibular adenitis.

8% to 15% of patients will continue shedding Mumps virus 5 days after the onset of symptoms. [2]

Neurological manifestations:
Central nervous system involvement is the most common extrasalivary gland manifestation of this disease.
• Cerebrospinal fluid pleocytosis has been documented in 51% patients with mumps, without other evidence of meningitis.
• Clinical meningitis occurs in 1 to 10% of persons with mumps parotitis; while parotitis is documented in less than 50% of patients with mumps.
• Meningitis may occur before, during or after salivary gland involvement.
• The features of mumps meningitis are similar to those of other viruses, and the clinical course is benign; however, polymorphonuclear CSF pleocytosis and reduced glucose levels are not unusual.

Encephalitis occurs in less than 0.1% of cases, and may be accompanied by altered consciousness, seizures, paresis, aphasia, involuntary movements; and sequelae such as psychomotor retardation, deafness (1 per 1,000 to 20,000 cases [3]) [4] and convulsive disorders.
• Other neurological complications of mumps include cerebellar ataxia [5] , facial nerve palsy, transverse myelitis, Guillain-

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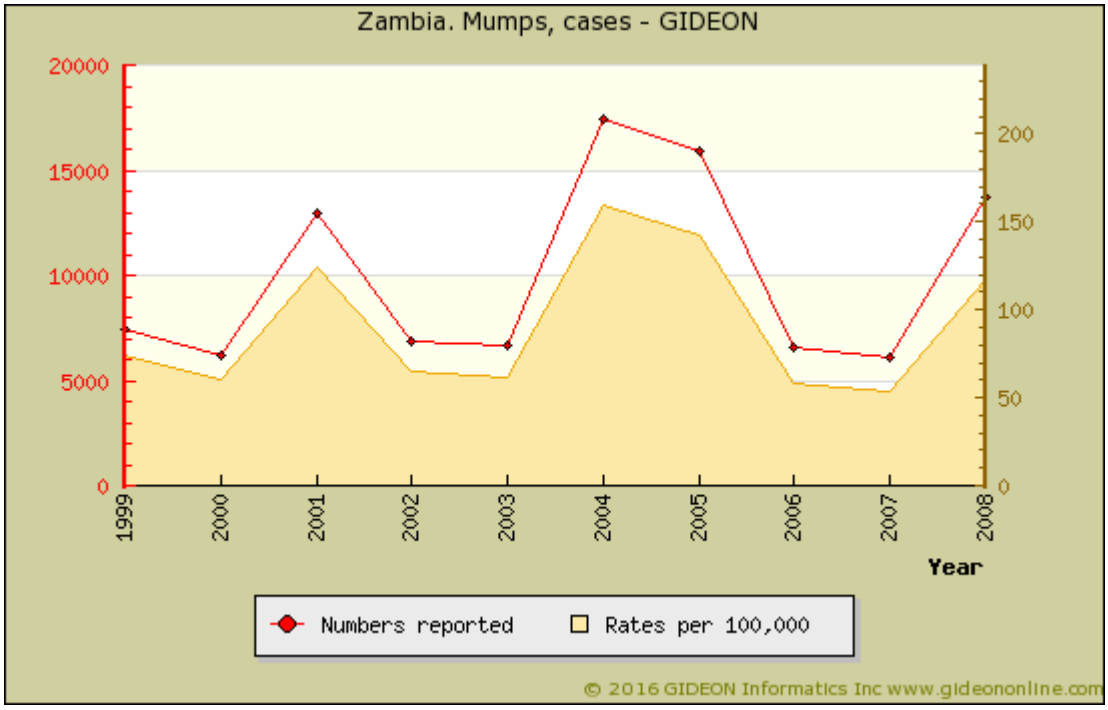
Barre syndrome, and aqueductal stenosis.

Epididymo-orchitis:
Epididymo-orchitis is the most common extra-salivary gland manifestation in adults, developing in 20 to 30% of infected postpubertal males.
• This complication is bilateral in 15% of cases, and appears during the first week of mumps in 70% of cases.
• Rarely, this is the only manifestation of mumps.
• Onset is abrupt, with elevation of fever, chills, headache, vomiting, and testicular pain.
• The testis is warm, swollen (to as much as four times normal size), and tender, with erythema of the scrotum.
• Epididymitis is present in 85%, and usually precedes the orchitis.
• Tenderness may persist for more than 2 weeks in 20% of cases; and some degree of atrophy is noted in 50% of the patients, even after 2 years.
• Impotence is not encountered, and sterility is rare.

Additional manifestations of mumps:
Other features of mumps include oophoritis, fetal wastage [6] , migratory polyarthritis, monoarticular arthritis and arthralgia, electrocardiographic changes (with or without overt myocarditis), nephritis, thyroiditis, mastitis, prostatitis, hepatitis, cholecystitis and thrombocytopenia.

Mumps in Zambia



Graph: Zambia. Mumps, cases

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Myalgic encephalomyelitis

Agent	UNKNOWN
Reservoir	Unknown
Vector	None
Vehicle	Unknown
Incubation Period	Unknown
Diagnostic Tests	Clinical diagnosis; ie, discount other diseases.
Typical Adult Therapy	Supportive; ? immune modulators (experimental)
Typical Pediatric Therapy	As for adult
Clinical Hints	Unexplained depression, fatigue, cognitive disorders, sleep disturbance, recurrent bouts of pharyngitis and adenopathy, rheumatological symptoms and fever lasting more than six months.
Synonyms	Chronic fatigue syndrome, Systemic exercise intolerance disease. ICD9: 780.71 ICD10: G93.3

Clinical

Myalgic encephalomyelitis/chronic fatigue syndrome is a chronic condition characterized by symptoms which include excessive fatigue and malaise which worsen following exertion, cognitive and immune dysfunction, pain, autonomic dysfunction and symptoms suggestive of neuroendocrine and immune disorders.

As of 2015, nine sets of clinical criteria had been published for definition of Myalgic encephalomyelitis / Chronic fatigue syndrome. [1]

The CDC (The United States Centers for Disease Control) consensus definition of Chronic Fatigue Syndrome (currently Myalgic encephalomyelitis [2-4]) requires the presence of two major criteria, in addition to at least six symptom criteria and at least two physical criteria (or the presence of eight symptom criteria, without need for physical criteria) as follows: [5-14]

Major criteria:
A. New onset of persistent or relapsing, debilitating fatigue or fatigability without a history of similar illness. Fatigue does not resolve with bed rest, and reduces daily activity by at least 50% for at least 6 months.
B. Exclusion of other disorders through history, physical examination and laboratory studies.

Minor criteria:
A. Symptoms.
1. Mild fever or chills
2. Sore throat
3. Painful cervical or axillary adenopathy
4. Myalgia
5. Muscle weakness
6. Migratory arthralgia
7. Prolonged fatigue not meeting major criteria
8. Generalized headaches
9. Neuropsychological complaints (photophobia), scotomata, forgetfulness, irritability, confusion, problems in thinking or concentration [15-17] , depression)
10. Sleep disturbances
11. Description of the initial symptom complex as developing over a period of hours to days.

B. Physical criteria.
1. Low grade fever
2. Nonexudative pharyngitis
3. Cervical or axillary lymphadenopathy (nodes may be tender, and are usually no larger than 2 cm).

Some authorities suggest that several features (cognitive impairment, muscle weakness, circulatory disturbances, marked variability of symptoms, and post-exertional malaise) are present in Myalgic encephalomyelitis, but not in Chronic fatigue

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syndrome. [18]

Affected children present with low levels of school attendance, fatigue, anxiety, functional disability and pain. [19] [20]
• Three phenotypes of Chronic Fatigue Syndrome are described in children: musculoskeletal, migraine and "sore throat." [21]

Patients with disease onset above age 50 years present with relatively high rates of fatigue, depression and autonomic dysfunction. [22]

Additional findings described in Chronic fatigue syndrome have included sleep disorders [23] , generalized hyperalgesia [24] [25] , impaired cardiac function [26] , intracranial hypertension [27] , migraine headache [28] and postural orthostatic tachycardia. [29] [30]

Patients suspected of suffering from "Chronic Lyme disease" are often found to have Chronic Fatigue Syndrome. [31] [32]

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Mycetoma

Agent	BACTERIUM OR FUNGUS. Nocardia spp, Madurella mycetomatis, Actinomadura pellitieri, Streptomyces somaliensis, et al
Reservoir	Soil Vegetation
Vector	None
Vehicle	Contact Wound Soil
Incubation Period	2w - 2y
Diagnostic Tests	Bacterial and fungal culture of material from lesion.
Typical Adult Therapy	Antimicrobial or antifungal agent as determined by culture. Excision as indicated
Typical Pediatric Therapy	As for adult
Clinical Hints	Painless, chronic, draining, fistulous subcutaneous nodule - usually involving lower extremity; osteolytic lesions may be noted on x-ray; usually no fever; most patients are males age 20 to 40 (ie, occupational exposure).
Synonyms	Curvularia lunata, Fusarium subglutinans, Leptosphaeria tompkinsii, Madura foot, Madura-Fuss, Madurella, Mycetom, Pleurostomophora, White grain eumycetoma. ICD9: 039.4,117.4 ICD10: B47

Clinical

Mycetoma is typically characterized by a painless nodule or thickening, which involve the feet in 80% of cases. [1]
• The lesions slowly enlarge and form sinus tracts which drain bloody, serous or purulent fluid containing granules of various colors. [2]
• Systemic findings are absent.
• Lesional hyperhydrosis is common, and tendons and nerves are usually spared until late stages of the infection. [3]
• Regional lymphadenopathy is encountered in 1% to 3% of cases.
• Lupus vulgaris may mimic mycetoma. [4]

Hematogenous spread of infection is extremely rare. [5]
• Mycetoma may spread to involve contiguous bone or regional lymph nodes.
• In Actinomycotic infections, the course is more rapid and aggressive, with prominent inflammation and early destruction of bone.

Dark granules characterize Madurella infection, while pale colored granules are seen in Acremonium infection.
• *Actinomadura madurae*, *Nocardia brasiliensis*, and *Streptomyces somaliensis* produce smaller white, yellow, or brownish granules.

Rare instances of mycetoma of the scalp due to *Microsporum canis* have been reported. [6]
• Perianal actinomycetoma may mimic other chronic diseases of the anal region.
• Palpebral [7] and ocular mycetoma have been reported as complications of trauma [8] or sub-tenon injection [9]
• Rare cases of thoracic [10], oral-palatal [11-13], lingual [14], paranasal and cavernous sinus infection have been reported. [15-17]
• The clinical features of mycetoma may mimic those of soft tissue tumors. [18]

Diagnosis is based on radiological and ultrasonic imaging, histology, culture and serology.
• A characteristic "dot in circle" sign may be seen on magnetic resonance imaging (MRI) studies. [19]
• Although Actinomycotic lesions may be amenable to antibiotic therapy, eumycetoma requires aggressive surgical excision.

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Mycobacteriosis - M. marinum

Agent	BACTERIUM. Actinomycetes, Mycobacterium marinum An aerobic acid-fast bacillus
Reservoir	Fresh and salt water (eg, swimming pools, aquaria) Fish (ornamental, salmon, sturgeon, bass)
Vector	None
Vehicle	Water per areas of minor skin trauma Contact
Incubation Period	5d - 270d (median 21d)
Diagnostic Tests	Mycobacterial culture from lesion. Alert laboratory when this organism is suspected.
Typical Adult Therapy	Clarithromycin 500 mg BID X 3m Or Rifampicin 600 mg/day + Ethambutol 20 mg/kg/day X 6w. OR Minocycline 100 mg /day X 3m
Typical Pediatric Therapy	Sulfamethoxazole/trimethoprim 5 mg-25 mg/kg BID X 6w. Alternative Minocycline (Age >= 8)
Clinical Hints	Violaceous papule, ulcer, plaque, psoriaform lesion; onset weeks after exposure (swimming pool, aquarium); commonly involves the elbow, knee, hand or foot.
Synonyms	Aquarium granuloma, Fish fanciers' finger syndrome, Fish tank granuloma, Mariner's TB, Mycobacterium balnei, Mycobacterium marinum, Mycobacterium scrofulaceum, Spam, Swimming pool granuloma. ICD9: 031.1 ICD10: A31.1

Clinical

The incubation period varies from 5 to 170 days (median 21 days); with 35% of cases exceeding 30 days.

- Characteristic painful, slowly-growing blue papules usually involve the extremities, and may ulcerate. [1]
- The upper extremities are involved in 75% to 95%, and spread to deeper structures (tendons, bones, joints) occurs in 29%. [2-7]
- Dissemination is rare, but has been described in AIDS patients. [8]
- Multiple sporotrichoid subcutaneous nodules have been reported. [9] [10]
- Extensive verrucous dermal plaques have been reported among Pacific Islanders infected by *Mycobacterium marinum*. [11] [12]
- Tenosynovitis ("fish-tank finger") is occasionally encountered. [13-16]
- A rare case of nasal infection presenting as epistaxis has been reported. [17]
- Scarring may occur, but is less pronounced than that which follows *M. ulcerans* infection.

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Mycobacteriosis - M. scrofulaceum

Agent	BACTERIUM. Actinomycetes, Mycobacterium scrofulaceum An aerobic acid-fast bacillus
Reservoir	Water (lakes, rivers) Soil Raw milk Plant material
Vector	None
Vehicle	Water Soil ? Areas of minor trauma Contact
Incubation Period	Unknown
Diagnostic Tests	Culture of tissue or aspirates.
Typical Adult Therapy	Excision. Drugs (Isoniazid - Rifampin - streptomycin - Cycloserine) are rarely indicated
Typical Pediatric Therapy	As for adult
Clinical Hints	Painless lymphadenopathy, most commonly unilateral and submandibular (true tuberculosis involves the lower neck and produces a strongly positive tuberculin reaction and/or suggestive chest X ray). The disease is most common during early childhood.
Synonyms	

Clinical

Mycobacterium scrofulaceum is a common cause of lymphadenitis, most commonly among children ages 1 to 3 years.
• Most infections involve the submandibular region, however involvement of other lymph node groups or body organs may occur. [1]
• Rare instances of dissemination are reported. [2] [3]

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Mycobacteriosis - miscellaneous nontuberculous

Agent	BACTERIUM. Actinomycetes, Mycobacterium spp. An aerobic acid-fast bacillus
Reservoir	Water Soil Fish Mammal Bird
Vector	None
Vehicle	Air Water Milk (M. bovis) Contact Ingestion Trauma
Incubation Period	Variable
Diagnostic Tests	Microscopy & culture of tissue, secretions, blood. Nucleic acid amplification. Inform laboratory if suspected
Typical Adult Therapy	Drug, route and duration appropriate to clinical setting and species (in Therapy module, scroll through upper left box)
Typical Pediatric Therapy	As for adult
Clinical Hints	Pneumonia, or chronic granulomatous infection of various tissues; systemic disease may complicate immune suppression; *M. avium-intracellulare* characterized by aggressive course and resistance to most antimycobacterial drugs.
Synonyms	Mycobacterium abscessus, Mycobacterium avium, Mycobacterium avium-intracellulare, Mycobacterium franklinii, Mycobacterium immunogenum, Mycobacterium jacussii, Mycobacterium kyorinense, Mycobacterium xenopi, Segniliparus. ICD9: 031.9,031.2 ICD10: A31.0,A31.1,A31.8

Clinical

The clinical features of systemic mycobacterial infection are protean, and can involve disease of virtually any organ or tissue. [1-6]

• Specific syndromes reflect the immune status of the patient and the specific fungal species involved (see Worldwide note)

Mycobacterium avium-intracellulare infection is clinically similar to tuberculosis, producing localized pulmonary disease [7] or disseminated lesions of virtually any organ. [8] [9]
- Bacteremia is common, and can be detected using specialized blood culture systems.

Mycobacterium kansasii infection is characterized by productive cough, dyspnea, and chest pain.
• 16% of patients are asymptomatic.
• A right sided, apical or subapical, thin walled cavitary infiltrate is characteristic. [10]

Mycobacterium malmoense infection is usually characterized by pulmonary disease suggestive of tuberculosis, or pediatric cervical lymphadenopathy. [11]

Note: Over 110 species of *Mycobacterium* have been associated with human infection.
• See Microbiology • Mycobacteria module

Mycobacteriosis - miscellaneous nontuberculous in Zambia

Prevalence surveys:

15.1% of patients with presumptive evidence of tuberculosis (2015 publication) [12]
17% of hospitalized patients with chronic respiratory disease (Katete district, 2002 to 2003) [13]

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Mycoplasma (miscellaneous) infection

Agent	BACTERIUM. Mycoplasmatales Mycoplasma genitalium, Mycoplasma hominis, Mycoplasma fermentans, Mycoplasma penetrans, Ureaplasma urealyticum
Reservoir	Human
Vector	None
Vehicle	Secretion, Sexual transmission
Incubation Period	Unknown
Diagnostic Tests	Culture (urine, pharynx). Serology. Nucleic acid amplification.
Typical Adult Therapy	Azithromycin 1 g orally as single dose OR Doxycycline 100 mg PO BID X 7 days OR Levofloxacin 500 mg daily X 7 days OR Ofloxacin 300 mg BID X 7 days
Typical Pediatric Therapy	Erythromycin 10 mg/kg PO QID X 2w
Clinical Hints	Urethritis, vaginitis, neonatal pneumonia; rarely stillbirth, prematurity or infertility
Synonyms	Acholeplasma laidlawii, Epirythrozoon, Hemotrophic Mycoplasma, Mycoplasma amphoriforme, Mycoplasma buccale, Mycoplasma faucium, Mycoplasma felis, Mycoplasma fermentans, Mycoplasma genitalium, Mycoplasma hominis, Mycoplasma lipophilum, Mycoplasma orale, Mycoplasma penetrans, Mycoplasma pirum, Mycoplasma primatum, Mycoplasma salivarium, Mycoplasma spermatophilum, T Mycoplasmas, T strains, Ureaplasma parvum, Ureaplasma urealyticum. ICD9: 041.81 ICD10: A49.3

Clinical

Asymptomatic pharyngeal and vaginal carriage of *Mycoplasma* species and *Ureaplasma* is common.
• As many as 70% of sexually-active persons are colonized.

The signs and symptoms of infection are similar to those of *Chlamydia* infection. [1]
• Urogenital infection may present as vaginitis, cervicitis, non-gonococcal urethritis, epididymitis [2], prostatitis [3] or urethral discharge.
• Less common findings may include pelvic inflammatory disease [4-6], post-partum fever [7] [8], chorioamnionitis, infertility [9], prematurity [10] and stillbirth. [11-16]
• Bronchitis, arthritis [17] [18], neonatal meningitis and encephalitis [19-21], osteitis [22], endocarditis [23] [24], brain abscess [25], soft tissue infections [26], genital under disease [27], bacteremia [28], respiratory distress in the newborn [29] and pneumonia have been reported. [30-33]

Infection by hemotrophic *Mycoplasma* species (formerly *Epirythrozoon*) is characterized by fever, anemia and hemolytic jaundice • notably among pregnant women and newborns. [34]

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Mycoplasma pneumoniae infection

Agent	BACTERIUM. Mollicutes. Mycoplasma pneumoniae
Reservoir	Human
Vector	None
Vehicle	Droplet
Incubation Period	6d - 23d
Diagnostic Tests	Culture (sputum, throat). Serology. Nucleic acid amplification.
Typical Adult Therapy	Erythromycin 500 mg PO BID X 2w. OR Azithromycin 1 g, followed by 500 mg PO daily X 5 days. OR Doxycycline 100 mg PO BID OR Levofloxacin 750 mg PO X 5d
Typical Pediatric Therapy	Azithromycin 10 mg/kg PO day 1; 5 mg/kg PO days 2 to 5 OR Erythromycin 10 mg/kg PO QID X 2w
Clinical Hints	Coryza, "hacking" cough; subsegmental infiltrate; bullous otitis media is often present; most patients below age 30; cold agglutinins are neither sensitive nor specific for infection, and appear only during second week.
Synonyms	Mycoplasma pneumoniae, Primary atypical pneumonia. ICD9: 041.81,483.0 ICD10: B96.0

Clinical

Acute infection:
Onset is insidious and gradual, and characterized by fever, malaise, a dry cough, headache, "scratchy" throat and chest wall (ie, muscular) pain. [1]
• Pleuritic pain, productive cough and rigors are unusual and should suggest infection by other bacterial species.
• A lymphocytic pleural effusion may be present [2] and rare instances of overt empyema are reported. [3-5]
• The pharynx and tympanic membranes are often erythematous, without adenopathy; and the lungs are usually normal to auscultation.
• A macular, urticarial or vesicular rash is occasionally present; and erythema nodosum [6] and erythema multiforme / mucositis [7] [8] (including Toxic epidermal necrolysis [9] and Stevens-Johnson syndrome) are reported in some cases. [10-19]
• A distinct syndrome of *Mycoplasma*-induced rash and mucositis (prominent mucositis with sparse rash and mild clinical course) is reported in some cases, and may be distinct from Stevens-Johnson syndrome. [20]

Atypical manifestations: [21]
Atypical and severe disease is encountered among older adults.
• Rare instances of acute hepatitis [22] [23], necrotizing pancreatitis [24], glomerulonephritis [25] [26], rhabdomyolysis [27-29], septic shock [30], endocarditis [31], myocarditis [32-41], pericarditis [42-46], ARDS [47] [48], sepsis without pulmonary findings [49], multi-organ failure [50], acute respiratory distress syndrome [51] [52] and empyema have been reported. [53]
• Neurological findings may include encephalitis / meningoencephalitis [54-68], brainstem / striatal encephalopathy [69], acute disseminated encephalomyelitis [70], acute hemorrhagic leukoencephalitis (Weston Hurst syndrome) [71], transient parkinsonism [72], post-encephalitic seizures [73] [74], ocular flutter, ataxia [75], cerebellar ataxia or cerebellitis with obstructive hydrocephalus [76], aseptic meningitis [77-79], acute transverse myelitis [80-82], Guillain-Barre syndrome [83-89], stroke [90-92], optic neuritis [93], or polyradiculopathy. [94-97]
• Obsessive-compulsive disorder has been ascribed to *Mycoplasma pneumoniae* infection [98]
• Extrapulmonary manifestations may also include hematologic abnormalities (including autoimmune hemolytic anemia [99] [100], pancytopenia [101], acute thrombocytosis [102] and hemophagocytic syndrome [103-105]); arterial thromboembolism [106], priapism [107], renal [108]; gastrointestinal; genitourinary [109]; hepatic [110] [111]; osteoarticular [112]; cutaneous (rash, angioedema with eosinophilia [113] [114]), hemolytic-uremic syndrome [115] [116], papular purpuric gloves and socks syndrome (PPGSS) [117], leukocytoclastic vasculitis [118], urticarial vasculitis suggestive of adult Still's disease [119], toxic epidermal

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necrolysis [120], mucositis [121] [122]; myositis [123]; possible splenic infarction [124]; and ocular involvement (including vasculitis [125] and optic neuritis [126] / papillitis). [127]).

- *Mycoplasma pneumoniae* infection is implicated in the etiology of recurrent tonsillitis [128] and asthma. [129-135]
- *Mycoplasma pneumoniae* may play an etiologic role in some cases of acute hemorrhagic edema of infancy. [136]
- *Mycoplasma pneumoniae* infection is independently associated with risk of subsequent development of ischemic stroke [137] and may play a role in the development of atherosclerosis. [138]
- *Mycoplasma pneumoniae* infection may result in exacerbation of Henoch-Schonlein purpura in children. [139]

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Myiasis

Agent	PARASITE - Insecta (Diptera) larvae
Reservoir	Mammal
Vector	Biting arthropod
Vehicle	Fly eggs deposited by biting arthropod
Incubation Period	1w - 3m
Diagnostic Tests	Identification of extracted maggot.
Typical Adult Therapy	Removal of maggot
Typical Pediatric Therapy	As for adult
Clinical Hints	Pruritic or painful draining nodule; fever and eosinophilia may be present; instances of brain, eye, middle ear and other deep infestations are described.
Synonyms	Calliphora, Chrysomya, Chrysomyia, Cochliomyia, Cordylobia, Cuterebrosis, Dermatobia, Eristalis, Furuncular myiasis, Gasterophilus, Hypoderma, Lucilia, Lund's fly, Maggot infestation, Megaselia, Musca, Muscina, Oedemagena, Oestrus larvae, Ophthalmomyiasis, Parasarcophaga, Psychoda, Rectal myiasis, Sarcophaga, Screw worm, Telmatoscopus, Urinary myiasis, Vaginal myiasis, Wohlfarthia. ICD9: 134.0 ICD10: B87

Clinical

Myiasis may be primary (active invasion) or secondary (colonization of wound). [1]
• Primary furuncular myiasis is usually characterized by one or more erythematous, painful "pustules" having a central perforation. [2]
• Eosinophilia may be present. [3]
• Other clinical forms include ophthalmomyiasis (migrating larvae in the conjunctival sac), pharyngeal, nasal [4] , urinary, vaginal, tracheopulmonary and rectal infestation.
• Migratory myiasis is characterized by migratory dermal swellings and regional lymphadenopathy of the head and face. [5]
• Larvae may rarely invade the paranasal sinuses and even cause eosinophilic meningitis. [6]
• Penile myiasis may mimic a sexually transmitted disease [7]

Myiasis in Zambia

Myiasis due to *Cordylobia anthropophaga* has been reported. [8]

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Necrotizing skin/soft tissue infx.

Agent	BACTERIUM. Streptococcus pyogenes, Clostridium perfringens, mixed anaerobic and/or gram-negative bacilli
Reservoir	Human
Vector	None
Vehicle	Endogenous
Incubation Period	Variable
Diagnostic Tests	Clinical features. Smear and culture (including anaerobic culture) of exudate.
Typical Adult Therapy	Debridement and parenteral antibiotics directed by smear and culture results. Hyperbaric oxygen in more severe infections
Typical Pediatric Therapy	As for adult
Clinical Hints	At least 7 syndromes in this category: most characterized by local pain and swelling, skin discoloration or edema, gas formation, foul odor and variable degrees of systemic toxicity.
Synonyms	Anaerobic cellulitis, Chancrum oris, Clostridial cellulitis, Clostridium novyi, Fasciitis, Fournier's gangrene, Gangrenous cellulitis, Gangrenous stomatitis, Invasive group A strep. Infections, Meleney's synergistic gangrene, Necrotizing fasciitis, Noma, Streptococcal fasciitis, Synergistic necrotizing cellulitis. ICD9: 686.8,528.1 ICD10: M72.6,A69.0

Clinical

Infections often begin in areas of minor trauma or loss of dermal integrity (as in varicella), and may spread within hours to involve large areas and endanger life. [1-5]

Clinical forms of necrotizing skin and soft tissue infection (in alphabetical order):

Clostridial cellulitis usually follows local trauma or surgery, and has a gradual onset following an incubation period of 3 or more days.
• There is minimal pain and discoloration, with moderate swelling.
• A thin, occasionally foul and dark colored exudate is noted and copious gas is present.
• Systemic signs are minimal.

Clostridial myonecrosis is discussed elsewhere in this module • but is distinguishable from the above syndromes by its severity, prominent systemic toxicity and the presence of overt muscle involvement.

Fournier's gangrene is a form of necrotizing fasciitis which involves the scrotum and penis. [6-9]
• Most patients are over the age of 50 • diabetic, alcoholic or suffering from rectal cancer.
• The lesion is markedly destructive and mutilating, and typically due to a mixed flora of anaerobic and facultative or aerobic gram negative bacilli.
• Fournier's gangrene may occasionally complicate varicella [10]
• The case fatality rate for Fournier's gangrene is over 20% [11]

Gangrenous stomatitis (chancrum oris, Noma) is a mutilating condition of the skin and soft tissues of the face which affects primarily immune-suppressed [12-14] and malnourished children. [15-20]
• Most patients are under the age of 6 years.
• The disease usually begins as a painful red or purple intraoral lesion, which rapidly spreads to destroy surrounding bone and soft tissues of the mouth and face.
• The case-fatality rate is 70% to 90%.

Infected vascular gangrene is a complication of peripheral vascular insufficiency and has a gradual onset beginning 5 or more days after the initiating event.
• Onset is gradual, and pain may vary from absent to prominent.
• The area is discolored and painful, and associated with foul malodorous gas and involvement of underlying muscle.
• Systemic signs are minimal.

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Meleney's gangrene (progressive bacterial synergistic gangrene) usually involves sites of fistulae, retention sutures or draining empyema. [21] [22]
• The infection begins 1 to 2 weeks following surgery, and is characterized by erythema and moderate swelling, with minimal crepitus.

Necrotizing fasciitis is typically associated with diabetes mellitus or recent abdominal surgery. [23] [24]
• Following an incubation period of 1 to 4 days, the patient becomes increasingly ill, with moderate local pain and gas formation, and a foul seropurulent discharge.
• Pain may be severe, and areas of erythema and necrosis are evident.
• Relatively high mortality rates are associated with necrotizing fasciitis caused by *Aeromonas* or *Vibrio* species. [25]

Non-clostridial anaerobic cellulitis is usually associated with diabetes mellitus or a preexisting local infection.
• Onset may be gradual or rapid, with moderate swelling, dark pus, minimal discoloration and copious foul-smelling gas.
• Pain is minimal, and the patient is moderately ill.

Synergistic necrotizing cellulitis is associated with diabetes, renal disease, obesity or preexisting perirectal infection.
• The incubation period varies from 3 to 14 days, and onset is acute.
• Swelling may be marked, and associated with intense local pain, foul "dishwater" pus and small amounts of gas.
• Moderate muscle involvement and marked systemic disease are present.

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Neutropenic typhlitis

Agent	BACTERIUM. Clostridium septicum (occasionally Clostridium tertium, Clostridium sporogenes, Clostridium sordellii or Clostridium tertium)
Reservoir	Human
Vector	None
Vehicle	Endogenous
Incubation Period	Unknown
Diagnostic Tests	Typical findings in the setting of neutropenia. Ultrasonography may be helpful.
Typical Adult Therapy	Broad spectrum antimicrobial coverage, which should include clostridia and Pseudomonas aeruginosa; ie Piperacillin-Tzobactam (or Imipenem or Meropenem) OR Cefepime + Metronidazole Role of surgery is controversial
Typical Pediatric Therapy	As for adult
Clinical Hints	Fever, abdominal pain, diarrhea (occasionally bloody) and right lower quadrant signs in a neutropenic (leukemic, etc) patient; may spread hematogenously to extremities; case-fatality rate 50% to 75%.
Synonyms	Neutropenic enterocolitis. ICD9: 540.0 ICD10: A04.8

Clinical

Neutropenic typhlitis is clinically similar to acute appendicitis, but limited to patients with severe neutropenia. [1-3]

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Nocardiosis

Agent	BACTERIUM. Actinomycetes, Nocardia spp. An aerobic gram positive bacillus (acid-fast using special technique)
Reservoir	Soil
Vector	None
Vehicle	Air Dust Wound Contact
Incubation Period	? days to weeks
Diagnostic Tests	Culture and gram stain of exudates, sputa, tissue specimens. Advise laboratory when Nocardia suspected.
Typical Adult Therapy	Lymphadenitis or skin / soft tissue infection: Sulfamethoxazole/trimethoprim OR Minocycline Pneumonia: Sulfamethoxazole/trimethoprim + Imipenem; OR Imipenem + Amikacin Brain abscess: Sulfamethoxazole/trimethoprim + Imipenem; OR Linezolid + Meropenem
Typical Pediatric Therapy	As for adult
Clinical Hints	Pneumonia, lung abscess, brain abscess, or other chronic suppurative infection; often in the setting of immune suppression.
Synonyms	Nocardia, Nocardiose. ICD9: 039 ICD10: A43

Clinical

Nocardiosis may present as an acute or chronic suppurative infection with a tendency to remission and exacerbation. [1]

- Infections are most common among immunocompromised patients. [2] [3]
- The most common presentation is pneumonia.
- Brain abscesses account for 33% of cases.
- Infection of virtually any other organ may occur. [4-8]

Nocardiosis may mimic tuberculosis, particularly in the setting of HIV infection. [9]

- Nodular lymphadenitis, seen with *Nocardia brasiliensis* infection, may mimic sporotrichosis. [10]

The ecology and phenotypic characteristics of *Nocardia* species [11] are discussed in the Microbiology module.

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O'nyong nyong

Agent	VIRUS - RNA. Togaviridae, Alphavirus: O'nyong nyong virus
Reservoir	Unknown
Vector	Mosquito (Anopheles funestus and An. gambiae)
Vehicle	None
Incubation Period	3d - 12d
Diagnostic Tests	Viral culture (blood). Serology. Nucleic acid amplification. Biosafety level 2.
Typical Adult Therapy	Supportive
Typical Pediatric Therapy	As for adult
Clinical Hints	Myalgia and severe arthralgia; maculopapular rash (often pruritic) and leukopenia; conjunctivitis and cervical lymphadenopathy; fever resolves within 7 days, however arthralgia may persist.
Synonyms	Igbo Ora. ICD9: 066.3 ICD10: A92.8

Clinical

O'nyong nyong is characterized by fever, arthralgia, headache, conjunctivitis, myalgia and lymphadenopathy. [1]
• Knees and ankles are most commonly involved, and lymphadenopathy affects primarily the cervical region.
• Most patients develop a generalized rash which may be pruritic.

Infection by a related virus, Igbo Ora, is characterized by fever, headache, rash and arthralgia.

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Oesophagostomiasis

Agent	PARASITE - Nematoda. Oesophagostomum bifurcum (O. apiostomum, O. stephanostomum)
Reservoir	Non-human primate Soil
Vector	None
Vehicle	Feces Water Soil
Incubation Period	2w - 2m
Diagnostic Tests	Demonstration of parasite in tissue.
Typical Adult Therapy	Albendazole (400 mg as single dose), or Pyrantel pamoate may be effective. Excision as necessary
Typical Pediatric Therapy	Albendazole or Pyrantel pamoate may be effective. Excision as necessary
Clinical Hints	Right lower quadrant abdominal pain and tenderness, often with intraabdominal mass or peritoneal signs.
Synonyms	Dapaong tumor, Oesophagostomum aculeatum, Oesophagostomum apiostomum, Oesophagostomum bifurcum, Oesophagostomum stephanostomum, Ternidens. ICD9: 127.7 ICD10: B81.8

Clinical

Oesophagostomiasis is contracted through ingestion of soil-contaminated food or water, and is characterized by development of an inflammatory mass in the ileum or colon.
• Approximately 15% of patients present with multinodular disease, characterized by abdominal pain, fever, vomiting and mucous diarrhea. [1] [2]
• 85% of patients develop an intestinal mass adherent to the overlying abdominal wall (helminthoma = Dapaong tumor), often associated with pain and fever. [3] [4]

Oesophagostomiasis in Zambia

A similar parasite, *Ternidens diminutus*, has been reported to cause human infections in this country.
- The organism is carried by local monkeys - and human disease is usually asymptomatic.

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Orbital and eye infection

Agent	BACTERIUM OR FUNGUS. Streptococcus pyogenes, oral anaerobes, Aspergillus spp., facultative gram-negative bacilli, et al
Reservoir	Endogenous Introduced flora (trauma, surgery)
Vector	None
Vehicle	Trauma Surgery Contiguous (sinusitis) Hematogenous
Incubation Period	Variable
Diagnostic Tests	Imaging techniques (CT or MRI). Culture of aspirates or surgical material.
Typical Adult Therapy	Local and systemic antimicrobial agents appropriate for species and severity
Typical Pediatric Therapy	As for adult
Clinical Hints	Proptosis, chemosis, extraocular palsy, or hypopyon associated with sinusitis, bacteremia, eye trauma or surgery. Involves the eye (endophthalmitis); periosteum (periorbital infection); orbit (orbital cellulitis); orbit + eye (panophthalmitis).
Synonyms	Bacterial keratitis, Ceratite, Cheratite, Endophthalmitis, Eye infection, Keratite, Keratitis, Orbital infection, Panopthalmitis, Queratitis. ICD9: 360.0 ICD10: H05.0

Clinical

Endophthalmitis involves the ocular cavity and adjacent structures. [1] [2]
• Infection may occur in the setting of endocarditis or other bacteremic infections, or follow surgery or penetrating trauma.
• The onset of fungal endophthalmitis is more gradual than infection due to bacteria.
• Several species of parasites (ie, *Toxoplasma*, *Toxocara*, *Onchocerca*, etc) and viruses (CMV, Herpes simplex, measles) may also infect a variety of orbital structures, and are discussed elsewhere in this module.

Panophthalmitis involves all ocular tissue layers, including the episclera. [3] [4]
• Pain on eye movement is prominent.

Orbital cellulitis is an acute infection of the orbital contents.
• Infection can easily spread to the cavernous sinuses.
• The most common sources for infection are the paranasal sinuses (most commonly ethmoid in children).
• Fever, lid edema, orbital pain, proptosis and limited motion of the globe are important symptoms.

Keratitis can be caused by viruses (Herpes simplex, zoster, smallpox), bacteria, fungi, protozoa (*Acanthamoeba*) or helminths (*Onchocerca volvulus*)
• Microbial keratitis complicating orthokeratology is mainly caused by *P. aeruginosa* or *Acanthamoeba* [5]

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Orf

Agent	VIRUS - DNA. Poxviridae, Parapoxvirus: Orf virus
Reservoir	Sheep Goat Reindeer Musk ox
Vector	None
Vehicle	Contact Infected secretions Fomite Cat-scratch (rare)
Incubation Period	3d - 6d (range 2d - 7d)
Diagnostic Tests	Viral culture (skin lesion or exudate). Serology. Nucleic acid amplification. Biosafety level 3.
Typical Adult Therapy	Supportive
Typical Pediatric Therapy	As for adult
Clinical Hints	Skin pustule or ulcer following contact with sheep or goats; most lesions limited to finger or hand; heals without scarring within 6 weeks.
Synonyms	Contagious ecthyma, Contagious pustular dermatitis, Ecthyma contagiosum, Ovine pustular dermatitis, Scabby mouth. ICD9: 078.89 ICD10: B08.0

Clinical

Human infection is milder than that of sheep, and usually limited to indolent vesicles and pustules on the hands. [1] [2]
• Pustules may attain a size of 1 to 2 cm, and are often associated with low-grade fever and regional lymphadenitis.
• Lesions heal over a period of 2 to 6 weeks, without scarring.
• Bullous lesions [3] , secondary bacterial infection, disseminated orf, Guillain-Barre syndrome [4] and erythema multiforme [5-13] have been described in some cases.

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Ornithosis

Agent	BACTERIUM. Chlamydiaceae, Chlamydiae, Chlamydophila (Chlamydia) psittaci
Reservoir	Parakeet Parrot Pigeon Turkey Duck Cat Sheep Goat Cattle ? Dog
Vector	None
Vehicle	Bird droppings Dust Air Aerosol from cat (rare)
Incubation Period	7d - 14d (range 4d - 28d)
Diagnostic Tests	Serology. Culture (available in special laboratories) rarely indicated.
Typical Adult Therapy	Doxycycline 100 mg PO BID X 10d. Alternatives: Azithromycin 1 g, then 0.5 g daily X 4 days. Clarithromycin 0.5 g BID Erythromycin 500 mg PO QID X 10d. Levofloxacin 750 mg PO X 7 days
Typical Pediatric Therapy	Azithromycin 10 mg/kg PO day 1; 5 mg/kg PO days 2 to 5 OR Erythromycin 10 mg/kg QID X 10d Alternative (Age >=8 years): Doxycycline 100 mg PO BID X 10d.
Clinical Hints	Headache, myalgia and pneumonia, often with relative bradycardia, hepatomegaly or splenomegaly; onset 1 to 4 weeks following contact with pigeons, psittacine birds or domestic fowl; case-fatality rate without treatment = 20%.
Synonyms	Chlamydophila abortus, Chlamydophila psittaci, Ornitose, Papegojsjuka, Parrot fever, Psitacosis, Psittacosis, Psittakose. ICD9: 073 ICD10: A70

Clinical

Onset may be insidious or abrupt, and the illness may subclinical, or take the form of nonspecific fever and malaise, pharyngitis, hepatosplenomegaly, and adenopathy. [1]
• Bradycardia and splenomegaly may suggest typhoid at this stage.

A more common presentation consists of atypical pneumonia, with nonproductive cough, fever, headache and pulmonary infiltrates. [2] [3]
• Additional findings may include photophobia, tinnitus, ataxia, deafness, anorexia, vomiting, abdominal pain [4] , diarrhea, constipation, hemoptysis, epistaxis, arthralgia, and rash (Horder's spots) reminiscent of the rose spots of typhoid. [5]
• Fever, pharyngitis, rales and hepatomegaly are noted in over 50% of cases.

Complications include pericarditis, myocarditis, and "culture-negative" endocarditis, ARDS [6] , overt hepatitis, hemolytic anemia, DIC, reactive arthritis, cranial nerve palsy, cerebellar dysfunction, transverse myelitis, meningitis, encephalitis and seizures, thrombophlebitis, pancreatitis and thyroiditis.
• Subclinical infection by *Chlamydophila psittaci* has been implicated in the etiology of chronic polyarthritis. [7]
• Rare instances of abortion have been reported.

Chlamydophila abortus, a related species which affects goats, cattle and sheep, had been associated with rare instances of abortion, stillbirth and even maternal death in humans.

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Osteomyelitis

Agent	BACTERIUM OR FUNGUS. Staphylococcus aureus, facultative gram-negative bacilli, Candida albicans, etc
Reservoir	Endogenous Introduced flora (trauma, surgery)
Vector	None
Vehicle	Trauma Hematogenous Extension from other focus
Incubation Period	Variable
Diagnostic Tests	Radiography, including bone scan. Culture of biopsy material.
Typical Adult Therapy	Systemic antimicrobial agent(s) appropriate to known or suspected pathogen. Surgery as indicated
Typical Pediatric Therapy	As for adult
Clinical Hints	Limb pain or gait disturbance; obscure fever; prior skin infection; may be hematogenous, or arise from contiguous (soft tissue, joint) infection; X-ray changes are not apparent for at least 10 days in acute infection.
Synonyms	Osteomielite, Osteomielitis, Osteomyelite, Paravertebral abscess. ICD9: 015,730.9 ICD10: M86

Clinical

Osteomyelitis is a self-defined condition characterized by infection of one or more bones.
• Signs and symptoms vary widely, and reflect associated underlying conditions, infecting species and location of the infection. [1-3]

Etiological associations:
• Animal bite: *Pasteurella multocida*
• Diabetes and vascular insufficiency: Usually mixed infection (*Staphylococcus aureus*, *Staphylococcus epidermidis*, Gram-negative bacilli, Anaerobes)
• Hematogenous: Usually single organism (*Staphylococcus aureus*, Enterobacteriaceae)
• Injecting drug user: staphylococci, Gram-negative bacilli, Candida spp.
• Secondary to contiguous infection: Often mixed infection (*Staphylococcus aureus*, Gram-negative bacilli)
• Sickle cell anemia: *Staphylococcus aureus*, *Salmonella* spp.

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Otitis media

Agent	BACTERIUM OR VIRUS. Haemophilus influenzae & Streptococcus pneumoniae in most acute cases; RSV, Parainfluenza, et al
Reservoir	Human
Vector	None
Vehicle	None
Incubation Period	Variable
Diagnostic Tests	Clinical findings. Culture of middle ear fluid if available.
Typical Adult Therapy	If evidence of bacterial infection (severe otalgia >48 hours / fever >39 C): Amoxicillin/clavulanate 1000/62.5 mg BID X 3 days Alternatives: Cefdinir, Cefpodoxime proxtil, Cefprozin, fluoroquinolone
Typical Pediatric Therapy	If evidence of bacterial infection (severe otalgia >48 hours / fever >39 C): Amoxicillin/clavulanate 45/3.2 mg/kg BID X 3 days
Vaccine	Pneumococcal conjugate vaccine
Clinical Hints	Acute bacterial otitis media often represents the final stage in a complex of anatomic, allergic or viral disorders of the upper airways; recurrent or resistant infections may require surgical intervention.
Synonyms	Otitis media aguda. ICD9: 382.0 ICD10: H65,H66

Clinical

Signs and symptoms of otitis media consist of local pain and tenderness, with or without fever and signs of sepsis. [1] [2]

Otitis media in Zambia

Vaccine Schedule:

BCG - birth
DTwPHibHepB - 6, 10, 14 weeks
Measles - 9, 18 months
OPV - 6, 10, 14 weeks
Pneumo conj - 6, 10, 14 weeks
Rotavirus - 6, 10 weeks
Td - 1st contact pregnancy; +1, +1, +6 months; +1, +1 year

Pneumococcal infection - WHO-UNICEF est. % vaccine (PCV3) coverage was 77 in 2014.

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Parainfluenza virus infection

Agent	VIRUS - RNA. Paramyxoviridae: Respirovirus - Human Parainfluenza virus 1 and 3. Rubulavirus - Human Parainfluenza virus 2 and 4.
Reservoir	Human
Vector	None
Vehicle	Droplet
Incubation Period	3d - 8d
Diagnostic Tests	Viral culture (respiratory secretions). Serology. Nucleic acid amplification.
Typical Adult Therapy	Supportive
Typical Pediatric Therapy	As for adult
Clinical Hints	Upper respiratory infection - often croup or laryngitis. The disease is most common during infancy; older children develop a "cold-like" illness; the infection is complicated by pneumonia in 7% to 17% of cases.
Synonyms	Parainfluenza, Sendai. ICD9: 078.89,480.2 ICD10: J12.2

Clinical

Clinical forms of Parainfluenza virus infection include "the common cold," otitis media, croup (acute laryngotracheobronchitis) [1] , "flu-like illness" [2] , bronchiolitis [3] and pneumonia.

Parainfluenza virus infection in Zambia

Human parainfluenza virus type 3 was detected in baboons in Zambia. [4]

Seroprevalence surveys:

4% of yellow baboons (*Papio cynocephalus*), 22% of chacma baboons (*Papio ursinus*) and 7% of vervet monkeys (*Chlorocebus pygerythrus*) (Human Parainfluenza 3 virus, 2013 publication) [5]

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Parvovirus B19 infection

Agent	VIRUS - DNA. Parvoviridae, Parvovirinae: Erythrovirus B19
Reservoir	Human
Vector	None
Vehicle	Droplet Breastfeeding
Incubation Period	4d - 14d (range 3d - 21d)
Diagnostic Tests	Serology. Nucleic acid amplification (testing should be reserved for the rare instance of complicated infection).
Typical Adult Therapy	Supportive
Typical Pediatric Therapy	As for adult
Clinical Hints	Erythema infectiosum (erythema of cheeks; lacelike or morbilliform rash on extremities); febrile polyarthralgia, or bone marrow aplasia/hypoplasia may be present.
Synonyms	Duke's disease, Erythema infantum febrile, Erythema infectiosum, Erythema simplex marginatum, Erythrovirus B19, Fifth disease, Fourth disease, Funfte Krankheit, Parascarlatina, Parvovirus 4, Parvovirus B19, Sticker's disease. ICD9: 057.0 ICD10: B08.3

Clinical

Acute infection:
Erythema infectiosum is a mild childhood illness characterized by a facial rash ("slapped cheek" appearance), and a reticulated or lacelike rash on the trunk and extremities. [1] [2]
• Papular-purpuric gloves-and-socks syndrome [3] , or localized and generalized petechial rashes may occur in some cases. [4-9]
• Reappearance of the rash may occur for several weeks following nonspecific stimuli such as change in temperature, sunlight, and emotional stress.
• The patient is otherwise well at rash onset but often gives a history of a systemic prodrome lasting 1 to 4 days.
• In some outbreaks, pruritis has been a common clinical feature. [10]
• Generalized edema [11] , as well as Rubella-like, morbilliform [12] , vesicular and purpuric [13] rashes have also been reported.
• Asymptomatic infection has been reported in approximately 20% of children and adults.
• Rare instances of hepatosplenomegaly [14] and heart failure have been reported. [15]
• Co-infection with parvovirus and other hepatitis viruses may result in fulminant hepatic failure [16]

Joint manifestations:
In some outbreaks, arthralgias and arthritis have been commonly reported. [17]
• Infection may produce a symmetrical peripheral polyarthropathy.
• The hands are most frequently affected, followed by the knees and wrists.
• Symptoms are usually self-limited but may persist for several months.
• Joint symptoms, more common in adults, are encountered in approximately 20% of cases [18] and may occur as the sole manifestation of infection.

Instances of seizure [19] , coma, encephalitic ataxia or chorea [20-23] , meningoencephalitis [24] [25] , autonomic or sensory neuropathy [26] , cranial nerve palsy [27] , acute transverse myelitis [28] , myocarditis [29] [30] , severe endothelialitis (Degos-like syndrome) [31] , myositis [32] , hepatitis (acute, fulminant, chronic, cholestatic) have been reported. [33-37]
• Sequelae remain in 22% of patients with neurological involvement [38]
• A distinct form of Parvovirus infection known as "papular-purpuric gloves and socks syndrome" is characterized by fever and edematous rash, often associated with conjunctivitis and arthritis [39] [40]
• Additional complications may include glomerulonephritis [41-43] , inflammatory myocarditis [44] / cardiomyopathy [45] , Melkersson-Rosenthal syndrome and hemophagocytic lymphohistiocytosis [46] [47]
• Hepatic dysfunction may be present in some cases. [48]

Parvovirus B19 infection and hematological disease:

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Parvovirus B19 is the primary etiologic agent causing Transient Aplastic Crisis (TAC) in patients with chronic hemolytic anemias (e.g., sickle cell disease, hemoglobin SC disease, hereditary spherocytosis, alpha-thalassemia, and autoimmune hemolytic anemia) and occasionally follows anemia due to blood loss. [49] [50]
• Patients with TAC typically present with pallor, weakness, and lethargy and may report a nonspecific prodromal illness during the preceding 1 to 7 days.
• Few patients with TAC report a rash.
• In the acute phase, patients usually have a moderate to severe anemia with absence of reticulocytes; and bone marrow examination shows a hypoplastic or an aplastic erythroid series with a normal myeloid series.
• Recovery is indicated by a return of reticulocytes in the peripheral smear approximately 7 to 10 days after their disappearance.
• TAC may require transfusion and hospitalization and can be fatal if not treated promptly.

A false positive serological reaction toward Epstein-Barr virus has been reported in Parvovirus B19 infection. [51]

A Parvovirus B19-related severe chronic anemia associated with red cell aplasia has been described in transplant recipients [52] , patients on maintenance chemotherapy for acute lymphocytic leukemia, patients with congenital immunodeficiencies, and patients with human immunodeficiency virus (HIV)-related immunodeficiency. [53]

Infection of the intestinal mucosa may produce symptoms of inflammatory bowel disease. [54]

Intrapartum infections:
Intrauterine infections can lead to specific or permanent organ defects in the fetus (e.g. heart anomalies, eye diseases, micrognathy, chronic anemia, myocarditis, hepatitis, meconium peritonitis and central nervous system anomalies). [55-58]
• Thrombocytopenia is reported in 46% of cases [59]
• Rare cases of transient neonatal leukoerythroblastosis have been reported [60]
• In most reported B19 infections occurring during pregnancy, the fetus has not been adversely affected; however, in some cases B19 infection has been associated with fetal death. [61-63]
• The risk of fetal death attributable to maternal parvovirus infection is estimated at less than 10%.
• Fetal death most commonly occurs from the 10th through the 20th weeks of pregnancy.
• Although maternal infection appears to be common in late pregnancy, hydrops is relatively rare. [64]

A related member of the family Parvovirinae, Human Bocavirus, is discussed under "Respiratory viruses • miscellaneous"

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Pediculosis

Agent	PARASITE - Insecta. Anoplura: Pediculus humanus, Phthirus pubis.
Reservoir	Human
Vector	Louse
Vehicle	Contact
Incubation Period	7d
Diagnostic Tests	Identification of adults and "nits."
Typical Adult Therapy	Permethrin 1%; or malthion 0.5%; or lindane OR Ivermectin 200 mcg/kg PO
Typical Pediatric Therapy	Permethrin 1%; or malthion 0.5%; or lindane OR Ivermectin 200 mcg/kg PO (> 15 kg body weight)
Clinical Hints	Pruritus in the setting of poor personal hygiene; adults or nits may be visible; note that the body louse (*Pediculus humanus* var. corporis; not the head louse) transmits diseases such as epidemic typhus, trench fever and relapsing fever.
Synonyms	Crab louse, Lausebefall, Pediculose, Pediculus capitus, Pediculus corporis, Pedikulose, Phthirus pubis, Pidocci. ICD9: 132 ICD10: B85

Clinical

Most louse infestations are asymptomatic, with only 15% to 36% of patients complaining of pruritis.

- The principal clinical finding consists of presence of the lice themselves, and their eggs ("nits"). [1] [2]

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Pentastomiasis - Linguatula

Agent	PARASITE - Pentastomid worm. Linguatula serrata
Reservoir	Herbivore
Vector	None
Vehicle	Meat (liver or lymph nodes of sheep/goat)
Incubation Period	Unknown
Diagnostic Tests	Identification of larvae in nasal discharge.
Typical Adult Therapy	No specific therapy available
Typical Pediatric Therapy	As for adult
Clinical Hints	Pharyngeal or otic itching, cough, rhinitis or nasopharyngitis which follows ingestion of undercooked liver.
Synonyms	Linguatula, Marrara syndrome. ICD9: 128.8 ICD10: B83.8

Clinical

Infestation ("halzoun" or "marrara syndrome") is associated with pain and itching in the throat or ear, lacrimation, cough, hemoptysis, rhinorrhea or hoarseness. [1] [2] (Halzoun is also associated with infection by *Dicrocoelium dendriticum*) [3]
• Complications include respiratory obstruction, epistaxis, facial paralysis or involvement of the eye.

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Pericarditis - bacterial

Agent	BACTERIUM. Streptococcus pneumoniae, Staphylococcus aureus, et al
Reservoir	Human
Vector	None
Vehicle	Endogenous
Incubation Period	Variable
Diagnostic Tests	Ultrasonography and cardiac imaging techniques. Culture of pericardial fluid (include mycobacterial culture).
Typical Adult Therapy	Antimicrobial agent(s) appropriate to known or anticipated pathogen. Drainage as indicated
Typical Pediatric Therapy	As for adult
Clinical Hints	Fever, chest pain and dyspnea; patients are acutely ill and have overt signs such as venous distention, and an enlarged cardiac "shadow"; concurrent pneumonia or upper respiratory infection may be present; case-fatality rate = 20%.
Synonyms	Bacterial pericarditis, Pericardite. ICD9: 074.23,074.2,115.03,420 ICD10: I30

Clinical

Viral pericarditis often follows a prodrome of upper respiratory infection.
• Typical findings include fever and chest pain. [1] [2]
• The pain may be pleuritic or positional (ie, exacerbated by bending forward) and associated with signs and symptoms of congestive heart failure.
• Concurrent myocarditis, pneumonia or pleuritis are often present.

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Perinephric abscess

Agent	BACTERIUM OR FUNGUS. Escherichia coli, other facultative gram negative bacilli, Candida albicans, et al
Reservoir	Human
Vector	None
Vehicle	None
Incubation Period	Variable
Diagnostic Tests	Urine and blood culture. Renal imaging (CT, etc).
Typical Adult Therapy	Antimicrobial agent(s) appropriate to known or anticipated pathogen. Surgery as indicated
Typical Pediatric Therapy	As for adult
Clinical Hints	Unexplained fever, leukocytosis and flank pain; patients are typically over age 50, often diabetic; consider in the patient with nonresponsive "pyelonephritis" or a renal mass (by examination or x-ray).
Synonyms	

Clinical

Symptoms may be overt or subtle, and limited to unexplained fever; indeed, 33% of such lesions are first diagnosed at autopsy.

• Typical patients are female and over the age of 50. [1-3]

• Diabetes and evidence for preceding or current urinary tract infection or bacteremia (including endocarditis) may be present.

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Perirectal abscess

Agent	BACTERIUM. Various (often mixed anaerobic and aerobic flora)
Reservoir	Human
Vector	None
Vehicle	Endogenous
Incubation Period	Variable
Diagnostic Tests	Culture of drainage material.
Typical Adult Therapy	Surgical drainage and antibiotics effective against fecal flora
Typical Pediatric Therapy	As for adult
Clinical Hints	Anal or perianal pain with fever and a tender mass suggest this diagnosis; granulocytopenic patients commonly develop small, soft and less overt abscesses - often due to *Pseudomonas aeruginosa*.
Synonyms	

Clinical

Perirectal abscess is a self-defined illness usually associated with overt local pain, swelling, tenderness and fluctuance. [1]
• Abscesses in neutropenic patients are often more subtle, and may present as unexplained fever without marked local findings.

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Peritonitis - bacterial

Agent	BACTERIUM. Various (often mixed anaerobic and aerobic flora)
Reservoir	Human
Vector	None
Vehicle	Endogenous
Incubation Period	Variable
Diagnostic Tests	Culture of blood and peritoneal fluid. Peritoneal fluid cell count may also be useful.
Typical Adult Therapy	Antimicrobial agent(s) appropriate to known or anticipated pathogens. Surgery as indicated
Typical Pediatric Therapy	As for adult
Clinical Hints	Abdominal pain and tenderness, vomiting, absent bowel sounds, guarding and rebound; diarrhea may be present in children; search for cause: visceral infection or perforation, trauma, underlying cirrhosis (spontaneous peritonitis) etc.
Synonyms	Acute peritonitis, Bacterial peritonitis, Peritonite. ICD9: 567 ICD10: K65

Clinical

Bacterial peritonitis following trauma, infection or perforation of an abdominal viscus is usually overt clinically. [1]

The features of spontaneous bacterial peritonitis are somewhat more subtle, and should be suspected when unexplained deterioration occurs in a patient with ascites or chronic liver disease. [2] [3]
- As many as 30% of patients are asymptomatic, and the remainder present with fever, chills, abdominal pain, diarrhea, increasing ascites, encephalopathy or renal dysfunction.
- Abdominal tenderness, guarding and hypotension may be present.
- Bacteremia is a poor prognostic factor in these patients. [4]

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Pertussis

Agent	BACTERIUM. Bordetella pertussis An aerobic gram-negative coccobacillus
Reservoir	Human
Vector	None
Vehicle	Air Infected secretions
Incubation Period	7d - 10d (range 5d - 21d)
Diagnostic Tests	Culture & direct fluorescence (nasopharynx). Alert laboratory when suspected. Serology.
Typical Adult Therapy	Respiratory precautions. Azithromycin 500 mg po X 1, then 250 mg daily X 4 days OR Clarithromycin 500 mg po BID X 7 days OR Sulfamethoxazole/trimethoprim
Typical Pediatric Therapy	Respiratory precautions: Azithromycin 10mg /kg po daily for 5 days OR Clarithromycin 15/mg/kg BID X 7 days OR Sulfamethoxazole/trimethoprim
Vaccines	DTaP vaccine DTP vaccine
Clinical Hints	Coryza, paroxysmal cough, occasional pneumonia or otitis; lymphocytosis; most often diagnosed in young children; epistaxis and subconjunctival hemorrhage often noted; seizures (below age 2); case-fatality rate = 0.5%.
Synonyms	Bordetella holmesii, Bordetella parapertussis, Bordetella pertussis, Coqueluche, Keuchhusten, Kikhosta, Kikhoste, Kinkhoest, Parapertussis, Pertosse, Syndrome coqueluchoide, Tos convulsa, Tos farina, Tosse convulsa, Tussis convulsa, Whooping cough. ICD9: 033 ICD10: A37

Clinical

WHO Case definition for surveillance: [1-3]
Clinical case definition
A person with a cough lasting at least 2 weeks with at least one of the following:
• paroxysms (i.e. fits) of coughing
• inspiratory .whooping.
• post-tussive vomiting (i.e. vomiting immediately after coughing)
• without other apparent cause
Laboratory criteria for diagnosis
• Isolation of *Bordetella pertussis*, or
• Detection of genomic sequences by polymerase chain reaction (PCR)
Case classification
• Suspected: A case that meets the clinical case definition.
• Confirmed: A person with a cough that is laboratory-confirmed.

Acute illness:
Following an incubation period of 7 to 10 days (range 6 to 20) the patient develops coryza and cough (the catarrhal stage).
• After one to two weeks, the cough progresses into the paroxysmal stage. [4] [5]
• Post-tussive vomiting is common, and young children and older infants may exhibit an inspiratory "whoop."
• Among infants younger than six months, apnea is common and the whoop may be absent. [6]
• The paroxysmal stage lasts three to four weeks (range one to six).
• The convalescent stage lasts for two to four weeks.

Complications:
Infants are at increased risk of complications from pertussis, while pertussis among adolescents and adults tends to be milder and may be limited to a persistent cough. [7]

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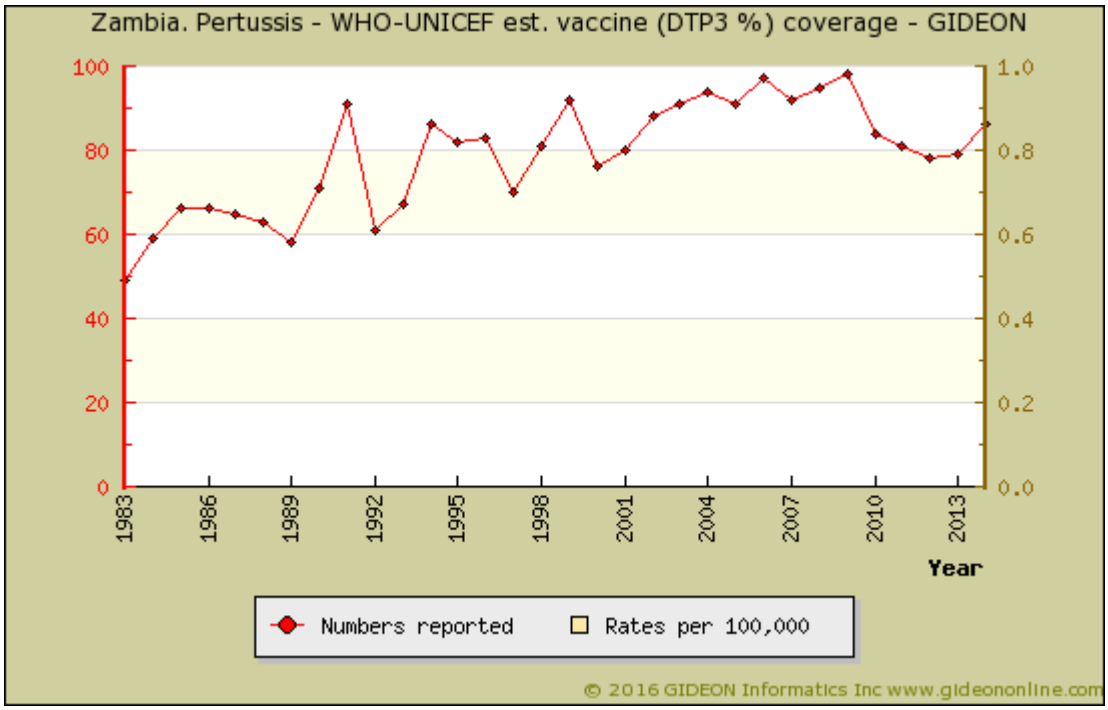
• Over 70% of infants younger than 6 months require hospitalization.
• Complications of pertussis can include secondary bacterial pneumonia (the most common cause of death in pertussis), seizures and encephalopathy. [8]
• Other, less serious complications include otitis media and dehydration.
• Severe coughing can lead to pneumothorax, pneumomediastinum [9], epistaxis, subdural hematoma, acute carotid dissection with stoke [10], hernia, and rectal prolapse.
• Pertussis in adults is often characterized by unexplained prolonged cough. [11-13]
• Pertussis-RSV infection is common. [14]
• Rare cases of acute disseminated encephalomyelitis [15] and hemolytic-uremic syndrome have been ascribed to pertussis [16] [17]
• Some studies have suggested that later development of epilepsy is more common following episodes of severe pertussis. [18]
• Human Bocavirus infection may mimic the symptoms of pertussis [19]

Parapertussis is caused by *Bordetella parapertussis*, and shares many of the clinical features of pertussis.
• 70% of infections are asymptomatic.

Pertussis in Zambia

Vaccine Schedule:

BCG - birth
DTwPHibHepB - 6, 10, 14 weeks
Measles - 9, 18 months
OPV - 6, 10, 14 weeks
Pneumo conj - 6, 10, 14 weeks
Rotavirus - 6, 10 weeks
Td - 1st contact pregnancy; +1, +1, +6 months; +1, +1 year



Graph: Zambia. Pertussis - WHO-UNICEF est. vaccine (DTP3 %) coverage

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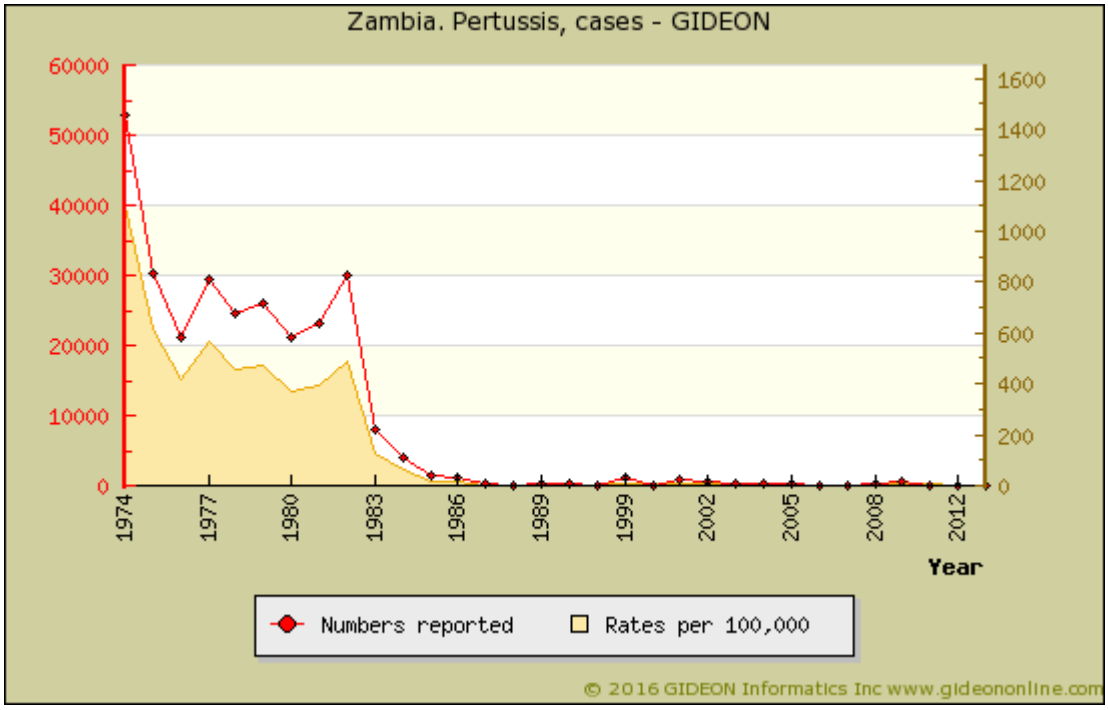

Graph: Zambia. Pertussis, cases

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Pharyngeal & cervical space infx.

Agent	BACTERIUM. Streptococcus pyogenes, mixed oral anaerobes, etc.
Reservoir	Human
Vector	None
Vehicle	Endogenous
Incubation Period	Variable
Diagnostic Tests	Careful examination of region and X-ray (or CT scan). Smear and culture of pus if available.
Typical Adult Therapy	Surgical drainage and parenteral antibiotics effective against oral flora
Typical Pediatric Therapy	As for adult
Clinical Hints	Fever, painful swelling and displacement of the tongue, fauces and other intraoral structures; dysphagia, dyspnea or jugular phlebitis may ensue in more virulent infections.
Synonyms	Cervical space infection, descending necrotizing mediastinitis, Lemmier's syndrome, Ludwig's angina, Post-anginal septicemia, Quinsy. ICD9: 682.0,682.1 ICD10: J36,J39.0,J39.1

Clinical

Signs and symptoms reflect the site of infection: [1]
• masticator, buccal, canine or parotid spaces
• submandibular, submaxillary and submandibular spaces (Ludwig's angina)
• lateral pharyngeal, retropharngeal or paratracheal spaces
• peritonsillar tissues (quinsy)
• jugular vein (post-anginal septicemia = Lemmiere's syndrome) [2] [3]

Lemmiere's syndrome is a potentially fatal infection caused by *Fusobacterium necrophorum*.
• The condition is most common among young healthy persons and typically begins with pharyngotonsillitis which spreads to the parapharyngeal spaces to produce septic phlebitis of the internal jugular vein. [4-6]
• Submandibular edema and tenderness along the sternocleidomastoid muscle are noted, usually unilaterally.
• After one to two weeks, the patient develops multiple metastatic abscesses of the lungs, muscles [7] , bones, joints • or rarely, brain.
• Hyperbilirubinemia and mild disseminated intravascular coagulation may be present.
• The case-fatality rate is 4% to 33%, even with appropriate antimicrobial therapy.

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Pharyngitis - bacterial

Agent	BACTERIUM. Most often Streptococcus pyogenes; Str. groups B, C, F and G are occasionally isolated
Reservoir	Human
Vector	None
Vehicle	Droplet Rarely food
Incubation Period	1d - 5d
Diagnostic Tests	Throat swab for culture or antigen detection (group A Streptococcus) ASLO titer may not indicate current infection
Typical Adult Therapy	Penicillin G or Penicillin V or other antistreptococcal antibiotic to maintain serum level for 10 days
Typical Pediatric Therapy	As for adult
Clinical Hints	Purulent pharyngitis and cervical lymphadenopathy usually indicate streptococcal etiology; however, viruses (mononucleosis, Enteroviruses) and other bacteria (gonorrhea, diphtheria) should also be considered.
Synonyms	Acute pharyngitis, Bacterial pharyngitis, Mal di gola batterica, Oral thrush, Streptococcal pharyngitis, Tonsillitis - bacterial, Vincent's angina. ICD9: 034.0,462 ICD10: J02,J03

Clinical

This is a self-defined condition characterized by erythema and pain in the pharynx, often associated with fever, dysphagia and upper respiratory tract infection. [1]

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Philophthalmosis

Agent	PARASITE - Platyhelminthes, Trematoda. Philophthalmus gralli, Ph. lucipetus, Ph. lacrimosus
Reservoir	Snail
Vector	None
Vehicle	Aquatic plants
Incubation Period	Unknown Less than 24 hours in birds
Diagnostic Tests	Identification of excised worm
Typical Adult Therapy	Removal of worm
Typical Pediatric Therapy	As for adult
Clinical Hints	Conjunctivitis, lacrimation and the finding of an adult worm in the conjunctival sac.
Synonyms	Oriental avian eye fluke, Oriental eye fluke, Philophthalmus. ICD9: 121.8 ICD10: b66.8

Clinical

Philophthalmosis is characterized by conjunctivitis, lacrimation and the finding of an adult worm (length ca. 1 to 3 mm) in the conjunctival sac.

In some cases, infection had persisted for months before extraction of the worm. [1]

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Pityriasis rosea

Agent	UNKNOWN. Human herpesvirus 7 has been implicated
Reservoir	Unknown
Vector	Unknown
Vehicle	Unknown
Incubation Period	Unknown
Diagnostic Tests	Clinical features.
Typical Adult Therapy	Supportive; ultraviolet B exposure is suggested
Typical Pediatric Therapy	As for adult
Clinical Hints	3 to 8 week illness; herald patch followed by crops of salmon-colored macules and papules; pruritus; systemic symptoms rare.
Synonyms	

Clinical

Pityriasis rosea is a mild exanthem characterized by oval or round macules or papules which evolve following the appearance of a "herald patch" (80% of cases). [1-5]
• The typical illness lasts for 6 to 8 weeks.
• Fine desquamation and pruritus are common.
• In some cases, the condition may persist or relapse. [6-10]
• In Black patients, Pityriasis rosea may present with facial and scalp involvement, post-inflammatory disorders of pigmentation and papular lesions. [11]
• Acral lesions [12] or dermal follicles may predominate in some cases. [13]

A form of persistent (>12 weeks) pityriasis rosea has been reported, associated with active HHV-6 and HHV-7 infection. [14]

Pityriasis rosea should be distinguished from secondary syphilis • the latter characterized by prominent lymphadenopathy, lack of pruritis and herald patch, and accompanying fever and systemic signs. [15]
• Gianotti-Crosti syndrome [16] and Hodgkin's lymphoma may present with a pityriasis rosea-like rash. [17]

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Plague

Agent	BACTERIUM. Yersinia pestis A facultative gram-negative bacillus
Reservoir	Rodent Rabbit Cat Dog Wild carnivore
Vector	Flea (Pulex; Xenopsylla)
Vehicle	Air Contact
Incubation Period	2d - 7d (range 1d - 14d)
Diagnostic Tests	Culture (blood, sputum, pus). Fluorescent (DFA) staining of pus. Nucleic acid amplification.
Typical Adult Therapy	Strict isolation. Gentamicin 2 mg/kg IV loading dose, then 1.7 mg/kg Q8h. OR Streptomycin 15 mg/kg q12h X 10d. OR Doxycycline 100 mg PO BID X 10d. OR Chloramphenicol 20 mg/kg PO QID
Typical Pediatric Therapy	Gentamicin 2 mg/kg IV loading dose, then 1.7 mg/kg Q8h OR Streptomycin 10 mg/kg q8h X 10d. OR Chloramphenicol 15 mg/kg PO QID X 10d
Vaccine	Plague vaccine
Clinical Hints	Suppurative lymphadenitis; septicemia; hemorrhagic pneumonia; history of animal contact in many cases; case-fatality rates for bubonic plague without therapy are 50% to 60%.
Synonyms	Black death, Black plague, Bubonic plague, Glandular plague, Hemorrhagic plague, Peste, Pneumonic plague, Saint Roch's disease, Yersinia pestis. ICD9: 020 ICD10: A20

Clinical

WHO Case definition for surveillance:
Disease characterized by rapid onset of fever, chills, headache, severe malaise, prostration, with
• bubonic form: extreme painful swelling of lymph nodes (buboes)
• pneumonic form: cough with blood-stained sputum, chest pain, difficult breathing
• Note: Both forms can progress to a septicemic form with toxemia: sepsis without evident buboes rarely occurs.
Laboratory criteria for diagnosis
• Isolation of *Yersinia pestis* in cultures from buboes, blood, CSF or sputum or
• Passive hemagglutination (PHA) test, demonstrating an at least fourfold change in antibody titer, specific for F1 antigen of *Y. pestis*, as determined by the hemagglutination inhibition test (HI) in paired sera.
Case classification
• Suspected: A case compatible with the clinical description. May or may not be supported by laboratory finding of Gram stain negative bipolar coccobacilli in clinical material (bubo aspirate, sputum, tissue, blood).
• Probable: A suspected case with Positive direct fluorescent antibody (FA) test for *Y. pestis* in clinical specimen; or passive hemagglutination test, with antibody titer of at least 1:10, specific for the F1 antigen of *Y. pestis* as determined by the hemagglutination inhibition test (HI); or epidemiological link with a confirmed case.
• Confirmed: A suspected or probable case that is laboratory-confirmed.

Symptoms:
The initial features of plague are nonspecific and include fever, chills, myalgias, pharyngitis, headache.
• Regional lymph nodes are enlarged, painful and extremely tender. [1]
• Additional features, notably in patients with septicemic or pneumomic plague include nausea, vomiting, diarrhea, hematemesis, hematochezia, cough with hemoptysis, dyspnea and signs of meningitis.

Signs:
The physical examination reveals fever, tachycardia, tachypnea, and hypotension.
• Buboes are usually inguinal (60% to 90%), axillary (30%), cervical (10%), or epitrochlear (10%).
• Femoral nodes are involved more frequently than inguinal nodes. [2]
• Nodes are typically no larger than 5 cm, extremely tender, erythematous, and surrounded by a boggy hemorrhagic area.

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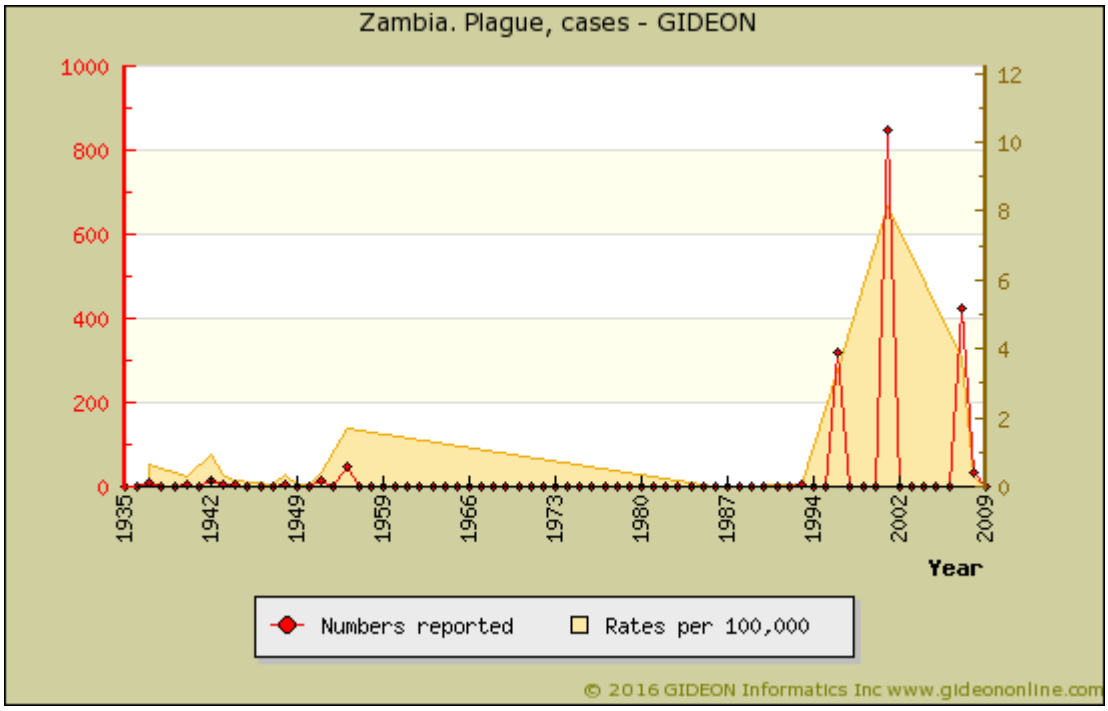
• A maculopapular lesion may be found at the site of the flea bite.
• Acral cyanosis, ecchymosis, petechiae, and digital gangrene are seen in patients with septicemic plague.
• Signs of septic shock or DIC may also be present.

Plague pneumonia: [3] [4]
Primary plague pneumonia follows an incubation period of 1 to 3 days, with sudden onset of fever, chills, headache and malaise. [5]
• Cough is prominent, with copious sputum production, chest pain and dyspnea.
• Profuse hemoptysis is common.
• Physical examination reveals rales and diffuse areas of dullness to percussion. [6]
• Untreated plague pneumonia is virtually always fatal.

Rare instances of gastrointestinal plague have been associated with ingestion of contaminated meat. [7]

Plague in Zambia

In recent years plague has been reported from: [8] [9]
Southern Province:
Namwala District
Eastern Province:
Petauke District



Graph: Zambia. Plague, cases

1. 44 cases were reported during 1935 to 1949. [10]
Notes:
Individual years:
1986 - Nonfatal case.

Prevalence surveys:
3.81% of rodents from a suspected endemic area (2012 publication) [11]

Notable outbreaks:
1956 - An outbreak (36 cases, 5 fatal) was reported in Luangwa Valley. [12]
1995 (publication year) - An outbreak (3 cases) of pneumonic plague was reported in northwestern province. [13]
1996 to 1997 - An outbreak (319 cases, 26 fatal) of bubonic plague (319 cases, 26 fatal) was reported in Namwala District, Southern Province. [14]

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2001 - An outbreak (850 cases, 3 fatal) was reported in Petauke district, Eastern Province. [15]
2015 - An outbreak (13 cases, 3 fatal) of suspected plague was reported in Eastern Province. [16]

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Plesiomonas infection

Agent	BACTERIUM. Plesiomonas shigelloides A facultative gram-negative bacillus
Reservoir	Fish Animal Soil Reptile Bird
Vector	None
Vehicle	Water Food
Incubation Period	1d - 2d
Diagnostic Tests	Stool culture - alert laboratory when this organism is suspected. Nucleic acid amplification.
Typical Adult Therapy	Stool precautions. Ciprofloxacin 400 mg IV or 750 mg PO, BID Alternatives: Sulfamethoxazole/trimethoprim, Amoxicillin/Clavulanate, Ceftriaxone
Typical Pediatric Therapy	Stool precautions. Sulfamethoxazole/trimethoprim, Amoxicillin/Clavulanate, Ceftriaxone
Clinical Hints	Fever, abdominal pain, vomiting and severe diarrhea; symptoms often persist for 2 to 4 weeks; follows ingestion of shellfish or recent travel to developing countries in many cases.
Synonyms	Plesiomonas shigelloides. ICD9: 008.8 ICD10: A04.8

Clinical

The infection is characterized by a self-limited diarrhea, often with blood or mucus in stool. [1]

- Watery diarrhea is most common; however, a cholera-like illness with as many 30 bowel movements per day may occur.
- Associated abdominal pain may mimic that of appendicitis, including enlargement of peritoneal lymph nodes. [2]
- Fecal leucocytes are present.
- As many as 30% of cases continue for over four weeks, and symptoms may persist for as long as 3 months.
- *Plesiomonas* has been rarely associated with fatal meningitis and septicemia [3-14], proctitis [15], cellulitis and dermal abscesses [16], pneumonia [17], pleural effusion [18], osteomyelitis [19], cholecystitis [20], peritonitis [21] [22] (including spontaneous bacterial peritonitis [23]), salpingitis [24], epididymo-orchitis [25], pancreatitis [26], splenic abscess [27], keratitis [28] and endophthalmitis. [29]
- 21 cases of *Plesiomonas* septicemia had been reported as of 1996. [30]

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Pleurodynia

Agent	VIRUS - RNA. Picornaviridae: Coxsackievirus
Reservoir	Human
Vector	None
Vehicle	Air Fecal-oral Fomite
Incubation Period	3d - 5d
Diagnostic Tests	Viral culture (throat, stool). Serology. Nucleic acid amplification.
Typical Adult Therapy	Supportive
Typical Pediatric Therapy	As for adult
Clinical Hints	Sore throat followed by pleuritic chest pain - a late summer illness in temperate regions; pain is often recurrent and appears in "waves" - local pressure on affected area may elicit identical pain; usually resolves within one week.
Synonyms	Balme disease, Bamble disease, Bamie disease, Bornholm disease, Devil's grip, Drangedal disease, Epidemic benign dry pleurisy, Epidemic myalgia, Sylvest's disease. ICD9: 074.1 ICD10: B33.0

Clinical

Pleurodynia is characterized by a prodrome of upper respiratory tract infection, followed by abrupt onset of pleuritic chest pain. [1]
• The pain may be severe and lead to a misdiagnosis of myocardial infarction.
• Some patients present with abdominal pain suggestive of peritonitis.
• Important diagnostic features include appearance of cases in clusters (often in late summer to autumn) and lack of leucocytosis or other findings suggestive of pneumonia or peritonitis.

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Pneumocystis pneumonia

Agent	FUNGUS. Ascomycota, Archiascomycetes, Pneumocystidales: Pneumocystis jiroveci (now separate from Pneumocystis carinii)
Reservoir	Human
Vector	None
Vehicle	? Air
Incubation Period	4d - 8w
Diagnostic Tests	Identification of organisms in induced sputum, bronchial washings, tissue. Serology. Nucleic acid amplification.
Typical Adult Therapy	Therapy: Sulfamethoxazole/trimethoprim 25 mg/5 mg/kg QID X 14d. OR Pentamidine 4 mg/kg/d X 14d. OR Dapsone + Trimethoprim. OR Atovaquone OR Primaquine + Clindamycin Prophylaxis - similar, but at altered dosage. Dapsone also used.
Typical Pediatric Therapy	Therapy: Sulfamethoxazole/trimethoprim 25 mg/5 mg/kg QID X 14d. OR Pentamidine 4 mg/kg/d X 14d. OR Dapsone + Trimethoprim. OR Atovaquone OR Primaquine + Clindamycin Prophylaxis - similar, but at altered dosage.
Clinical Hints	Dyspnea, hypoxia and interstitial pneumonia; usually encountered in the setting of severe immune suppression (AIDS, leukemia, etc); roentgenographic findings (typically bilateral alveolar pattern) may follow symptoms only after several days.
Synonyms	PCP, Pneumocystis carinii, Pneumocystis jiroveci. ICD9: 136.3 ICD10: B59

Clinical

P. jiroveci infection often presents as a self-limiting upper respiratory tract infection in infants, predominantly in the age group 1.5 to 4 months of age.

The major presenting symptoms are shortness of breath, fever, and a nonproductive cough. [1]
• Sputum production, hemoptysis and chest pain are rarely encountered. [2]
• Tachypnea and tachycardia are usually prominent
• Children may demonstrate cyanosis, flaring of the nasal alae, and intercostal retractions.

Lung auscultation is usually not helpful, with rales present in only 1/3 of adults with this disease.
• The x-ray usually shows bilateral diffuse infiltrates extending from the perihilar region. [3]
• Other findings can unilateral infiltrates, nodules, cavities, pneumatoceles, hilar lymphadenopathy and pleural effusion.
• Patients receiving aerosolized pentamidine as prophylaxis have an increased incidence of apical infiltrates and pneumothorax.
• Impaired oxygenation is common.

Extrapulmonary infection by *P. jiroveci* may occur in as many as 3% of infected patients and is reported as an unexpected finding at autopsy.
• The main sites of involvement are lymph nodes, spleen, liver, bone marrow, gastrointestinal tract, eyes [4] , thyroid, adrenal glands, and kidneys. [5]
• The clinical correlate of these findings is rapidly progressive multisystem disease, an enlarging thyroid mass, pancytopenia,

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retinal infiltrates, pleural effusion, splenic lesions, and calcifications in the spleen, liver, adrenal, or kidney.
• Rare instances of intestinal pseudotumor [6] and cutaneous infection have been reported. [7]

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Pneumonia - bacterial

Agent	BACTERIUM. Streptococcus pneumoniae, Klebsiella pneumoniae ssp pneumoniae, other aerobic and facultative gram negative bacilli, etc.
Reservoir	Human
Vector	None
Vehicle	Droplet Endogenous infection
Incubation Period	1d - 3d
Diagnostic Tests	Culture of sputum, blood. Analyze ("grade") sputum cytology to assess significance of culture.
Typical Adult Therapy	Antimicrobial agent(s) appropriate to known or suspected pathogen
Typical Pediatric Therapy	As for adult
Vaccine	Pneumococcal vaccine
Clinical Hints	Rigors ("shaking chills"), pleuritic pain, hemoptysis, lobar infiltrate and leukocytosis; empyema and lung abscess suggest etiology other than pneumococcus; foul sputum with mixed flora may herald anaerobic (aspiration) pneumonia.
Synonyms	Bacterial pneumonia, Empiema, Empyeem, Empyem, Empyema, Empyeme, Lung abscess, Neumonia, Pleurisy, Pneumococcal infection - invasive, Pneumococcal pneumonia, Polmonite batterica, Streptococcus pneumoniae, Streptococcus pneumoniae - invasive. ICD9: 481,482,483,484 ICD10: J13,J14,J15,J17,J18,J85,J86

Clinical

The designation "Pneumonia • bacterial" in this module is generic, and includes an extensive variety of etiological agents and anatomical presentations (ie, empyema, lung abscess, lobar• vs. broncho-pneumonia, etc.)

• The clinical features of bacterial pneumonia are largely determined by the infecting species and clinical setting. [1-4]

• All forms are characterized by fever, chest pain, productive cough, and physical or roentgenographic evidence for pulmonary consolidation.

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Poliomyelitis and acute flaccid paralysis

Agent	VIRUS - RNA. Picornaviridae, Picornavirus: Polio virus
Reservoir	Human
Vector	None
Vehicle	Fecal-oral Dairy products Food Water Fly
Incubation Period	7d - 14d (range 3d - 35d)
Diagnostic Tests	Viral culture (pharynx, stool). Serology. Nucleic acid amplification.
Typical Adult Therapy	Stool precautions; supportive
Typical Pediatric Therapy	As for adult
Vaccines	Poliomyelitis - injectable vaccine Poliomyelitis - oral vaccine
Clinical Hints	Sore throat, headache, vomiting and myalgia followed by flaccid paralysis; meningeal involvement in 1% of cases - paralysis in only 0.1%. paralysis tends to be more extensive in adult patients.
Synonyms	Acute flaccid paralysis, Heine-Medin disease, Infantile paralysis, Kinderlahmung, Kinderverlamming, Paralisi infantile, Paralisis flaccida, Paralisis flacida aguda, PFA (Paralisis Flacidas Agudas), Polio, Poliomyelite, Poliomyelitt. ICD9: 045 ICD10: A80

Clinical

CDC (The United States Centers for Disease Control) case definition for surveillance:
For surveillance purposes, the CDC (The United States Centers for Disease Control) case definition of paralytic poliomyelitis requires, "Acute onset of a flaccid paralysis [1] of one or more limbs with decreased or absent tendon reflexes in the affected limbs, without other apparent cause, and without sensory or cognitive loss."
• A "confirmed case" requires persistence of the neurological deficit 60 days after onset of initial symptoms, fatal illness or unknown follow-up status.

The WHO Case definition for surveillance includes any child under fifteen years of age with acute, flaccid paralysis or any person with paralytic illness at any age when poliomyelitis is suspected. [2]

Poliomyelitis is typically a late summer illness in temperate climates, and often begins as a mild upper respiratory tract infection.
• In some cases, the disease follows vaccination (live vaccine) or recent contact with a vaccinee.
• Patients have been known to excrete virus for as long as ten years following an episode of poliomyelitis [3]
• Antecedent injection in a given site may precipitate paralytic poliomyelitis in the same limb. [4-9]

90% to 95% of poliomyelitis infections are asymptomatic.
• Symptoms include fever, sore throat, headache, vomiting and still neck.
• Paralysis is typically asymmetrical, and most often involves the lower extremities.
• Bulbar paralysis or encephalitis may occur in patients in the absence of limb paralysis.
• 4% to 8% experience minor symptoms, and 1% to 2% develop paralysis.
• Paralysis is most common in the very young and very old, following minor blunt trauma to a limb, and among persons who had undergone tonsillectomy.
• The case/fatality rate for paralytic poliomyelitis in 2% to 10%.

Post polio syndrome affects an estimated 15 to 20 million people worldwide, and is characterized by progressive disability which may develop decades following an episode of paralytic poliomyelitis. [10-17]

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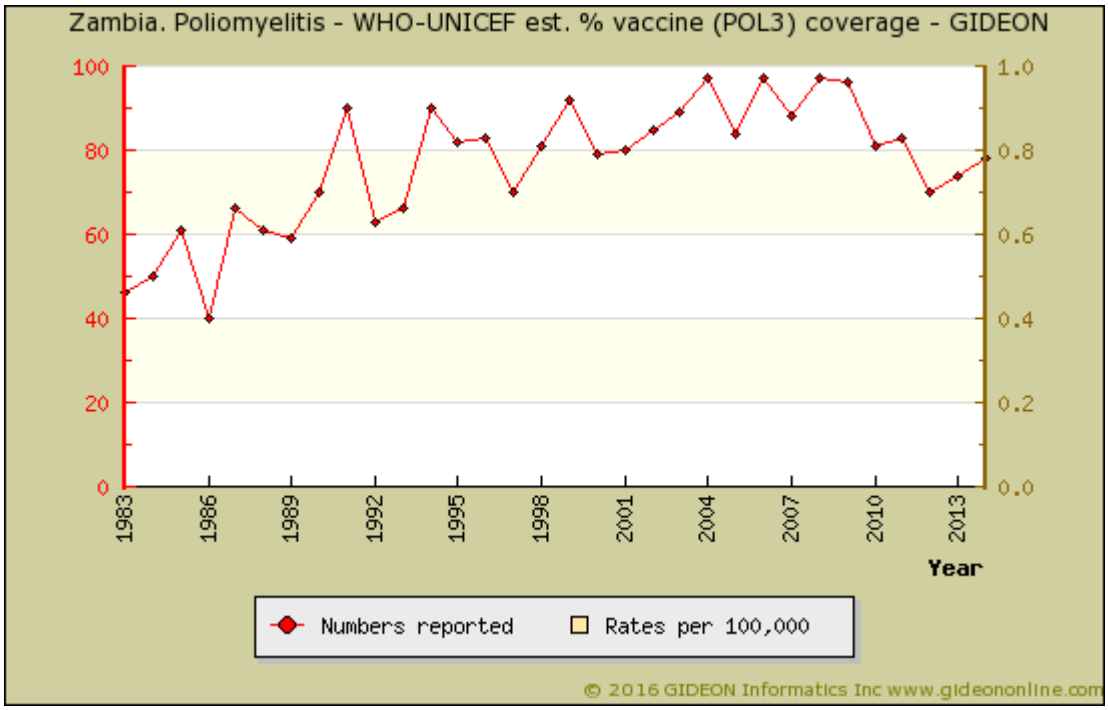
Poliomyelitis and acute flaccid paralysis in Zambia

Vaccine Schedule:

BCG - birth
DTwPHibHepB - 6, 10, 14 weeks
Measles - 9, 18 months
OPV - 6, 10, 14 weeks
Pneumo conj - 6, 10, 14 weeks
Rotavirus - 6, 10 weeks
Td - 1st contact pregnancy; +1, +1, +6 months; +1, +1 year



Graph: Zambia. Poliomyelitis - WHO-UNICEF est. % vaccine (POL3) coverage

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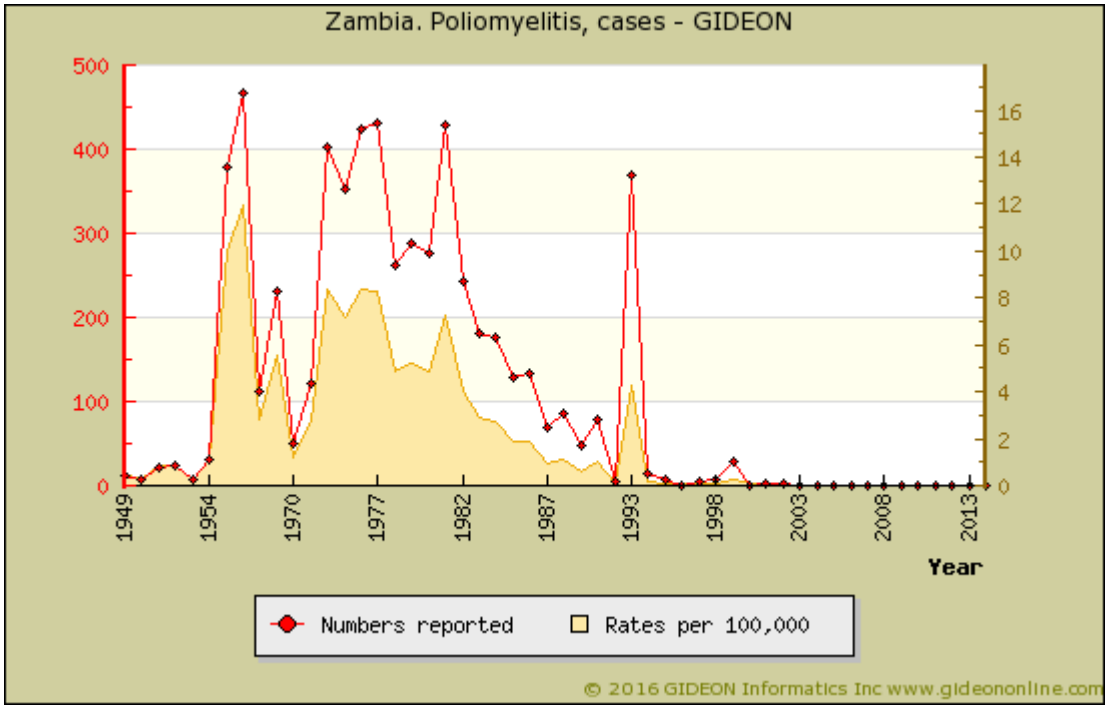
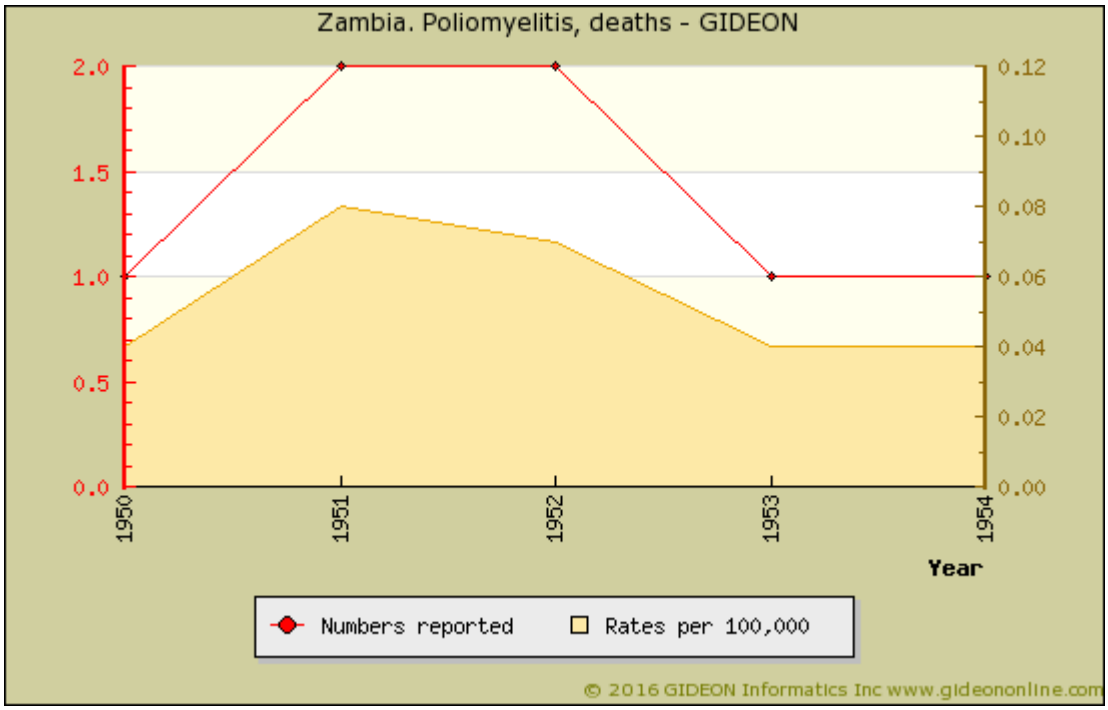


Graph: Zambia. Poliomyelitis, cases

Notes:

1. Historical data from references [18] [19]
   Individual years:
   1997 - None due to wild virus.
   1998 - None due to wild virus.
   1999 - None due to wild virus.
   2001 - Children in Mambolomoka, Western Province - disease imported from Angola.
   2002 - Both due to wild virus - imported from Angola. [20]



Graph: Zambia. Poliomyelitis, deaths

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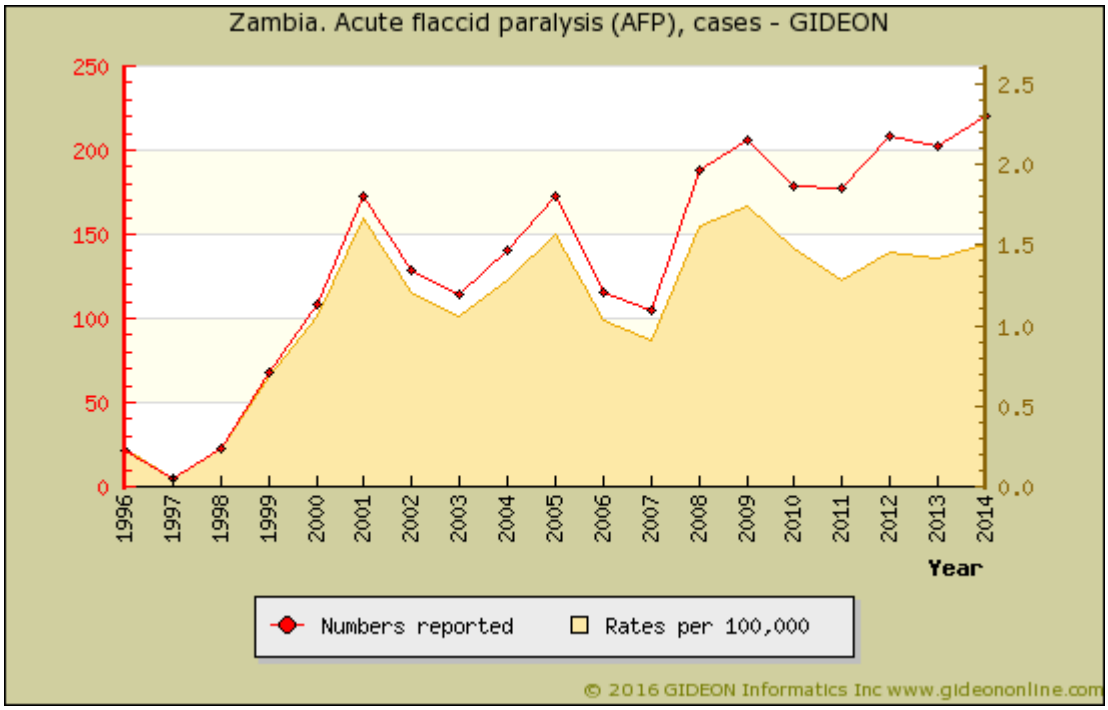
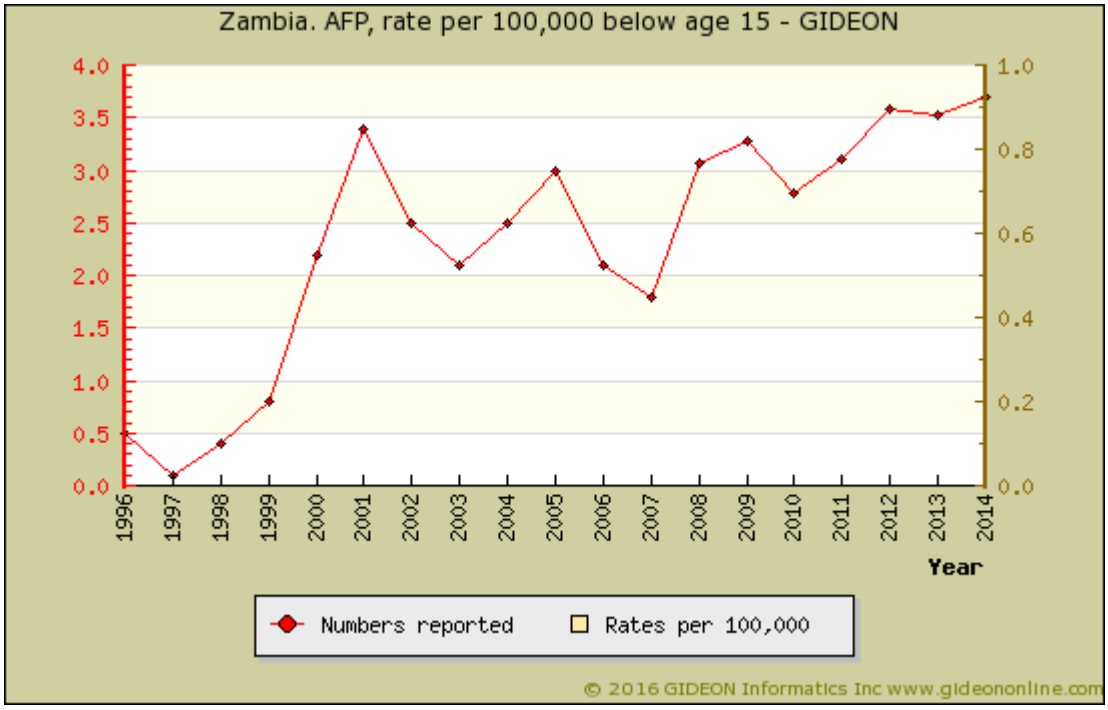


Graph: Zambia. Acute flaccid paralysis (AFP), cases



Graph: Zambia. AFP, rate per 100,000 below age 15

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Protothecosis and chlorellosis

Agent	ALGA. Prototheca wickerhamii; rarely Pr. zopfii, Pr. cutis Achloric algae Chlorella spp. contain chloroplasts
Reservoir	A rare animal pathogen (cat, dog, cattle). Chlorella spp. are reported to infect domestic and wild mammals.
Vector	None
Vehicle	Water Sewage Food Local trauma
Incubation Period	Unknown
Diagnostic Tests	Culture on fungal media. Biopsy. Nucleic acid amplification.
Typical Adult Therapy	Surgical excision. There are anecdotal reports of successful therapy with Amphotericin B, Ketoconazole and Itraconazole (latter 200 mg/day X 2 months) or voriconazole
Typical Pediatric Therapy	As for adult (Itraconazole 2 mg/kg/day X 2 months)
Clinical Hints	May follow immune suppression or skin trauma; dermal papules, plaques, eczematoid or ulcerated lesions; olecranon bursitis; systemic infection also reported.
Synonyms	Chlorellosis, Prototheca, Protothecosis. ICD9: 136.8 ICD10: B99

Clinical

Four forms of disease are reported:
• cutaneous infection
• olecranon bursitis
• disseminated
• onychomycosis [1-3]

The incubation period of protothecosis is unknown; however, infections which have followed trauma have appeared after approximately two weeks. [4]
• Most cases presented as a single painless, slowly progressive, well-circumscribed plaque or papulonodular skin lesion that may become eczematoid or ulcerated. [5-8]
• Soft tissue lesions favor the olecranon bursa; sites of minor trauma or corticosteroid injection; or surgical wounds which have been exposed to soil or water. [9] [10]
• Lesions enlarge gradually over weeks to months, with no tendency for healing.
• Other presentations have included tenosynovitis [11] ; algemia complicating immune-suppression [12] ; nasopharyngeal ulcerated lesion followed prolonged intubation, and infection of ambulatory peritoneal catheters.
• Skin lesions in HIV-infected patients are similar to those of healthy patients
• Peritonitis due to *P. wickerhamii* has been reported in peritoneal dialysis patients. [13]
• A case of subacute endocarditis due to *Prototheca wickerhamii* has been reported. [14]

Rare cases of *Chlorella* wound infection have been reported. [15] [16]

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Pseudocowpox

Agent	VIRUS - DNA. Poxviridae, Parapoxvirus: Pseudocowpox virus
Reservoir	Cattle
Vector	None
Vehicle	Contact
Incubation Period	5d - 14d
Diagnostic Tests	Viral culture (skin lesion or exudate). Serology. Nucleic acid amplification. Biosafety level 3.
Typical Adult Therapy	Supportive
Typical Pediatric Therapy	As for adult
Clinical Hints	Umbilicated nodule on the hand following contact with cattle; mild regional lymphadenopathy.
Synonyms	Bovine papular stomatitis, Farmyard pox, Milker's nodule, Noduli mulgentinum, Sealpox. ICD9: 051.1 ICD10: B08.0

Clinical

Pseudocowpox is mild and self-limited and characterized by a red-to-blue dermal nodule associated with minimal lymphadenopathy. [1]

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Pyodermas (impetigo, abscess, etc)

Agent	BACTERIUM. Various (Staphylococcus aureus & Streptococcus pyogenes predominate)
Reservoir	Human
Vector	None
Vehicle	Endogenous & contact with infected secretions Contact
Incubation Period	Variable
Diagnostic Tests	Clinical diagnosis usually sufficient. Aspiration of lesion for smear and culture may be helpful in some cases.
Typical Adult Therapy	Antibiotic directed at likely pathogens (Group A Streptococcus and Staphylococcus aureus)
Typical Pediatric Therapy	As for adult
Clinical Hints	Impetigo characterized by vesicles which progress to pustules ("honey-colored pus"'); highly contagious; may be complicated by acute glomerulonephritis.
Synonyms	Acne vulgaris, Carbonchio, Carbuncle, Folicolite, Follicolite, Folliculite, Folliculitis, Follikulitis, Foroncolosi, Foronculose, Foruncolosi, Furunculosis, Furunkulose, Furunulose, Hydradenitis, Impetigine, Impetigo, Paronychia, Pyoderma. ICD9: 680,684,686 ICD10: L01,L02,L08.0,L73.2

Clinical

Impetigo is characterized by multiple superficial lesions caused by group A-hemolytic streptococci and/or *Staphylococcus aureus*. [1]
• The lesions consist of pustules that rupture and form a characteristic honey-colored crust.
• Lesions caused by staphylococci are associated with tense, clear bullae (bullous impetigo.).
• Ecthyma is a variant of impetigo that usually presents as punched-out ulcers on the lower extremities.
• Streptococcal impetigo is most common among children 2 to 5 years of age, and epidemics may occur in settings of poor hygiene, lower socioeconomic status or tropical climates.
• The most important complication of impetigo is poststreptococcal glomerulonephritis.

Folliculitis is most often caused by *Staphylococcus aureus*. [2]
• Blockage of sebaceous glands may result in sebaceous cysts, which may present as extensive abscesses or become secondarily infected.
• Infection of specialized sweat glands (hidradenitis suppurativa) occur in the axillae.
• Chronic folliculitis is a hallmark of acne vulgaris, in which normal flora (e.g., *Proprionibacterium acnes*) may play a role.
• Diffuse folliculitis may herald infection by *Pseudomonas aeruginosa* or *Aeromonas hydrophila* [3] , in waters that are insufficiently chlorinated and maintained at temperatures above 37 C. Although such Infection is usually self-limited, bacteremia and septic shock have been reported.

Erysipelas is caused by *Streptococcus pyogenes* and is characterized by abrupt onset of "fiery-red" superficial swelling of the face or extremities.
• The lesion is typically recognized by the presence of well-defined indurated margins, particularly along the nasolabial fold; rapid progression; and intense pain.
• Flaccid bullae may develop on the second or third day of illness; but extension to deeper soft tissues is rare.
• Desquamation occurs between the fifth and tenth days of illness.

Cellulitis is characterized by local pain, erythema, swelling, and heat.
• Cellulitis may be caused by any of a wide variety of bacteria or yeasts; however, *S. aureus* or *S. pyogenes* are most often implicated.
• A history of preceding trauma, insect bite, needle insertion or surgery is often present.
• Cultures of biopsy specimens or aspirates are positive in only 20% of cases.
• Infection by *S. aureus* often spreads out from a localized infection (abscess, folliculitis) or foreign body.
• Streptococcal cellulitis tends to be more diffuse and rapid in onset, and associated with lymphangitis and fever.
• Streptococci also cause recurrent cellulitis in the setting of lymphedema resulting from elephantiasis or lymph node damage.
• Recurrent staphylococcal cutaneous infections are encountered in patients with "Job's syndrome" (eosinophilia and elevated

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serum levels of IgE); and nasal carriers of staphylococci.

Cellulitis associated with animal bites is commonly caused by *Pasteurella multocida*, *Staphylococcus intermedius* and *Capnocytophaga canimorsus* (formerly DF-2) and is discussed separately in this module under "Animal-bite infections"
• Human bites contain a variety of anaerobic organisms (*Fusobacterium*, *Bacteroides*), aerobic and anaerobic streptococci, and *Eikenella corrodens*.
• *Aeromonas hydrophila* causes an aggressive form of cellulitis following minor trauma in marine environments.
• *P. aeruginosa* is the most common cause of ecthyma gangrenosum and infection following penetrating injuries to the foot.
• Gram-negative bacillary cellulitis, (including *P. aeruginosa* infection) is common among hospitalized, immunocompromised patients.

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Pyomyositis

Agent	BACTERIUM. Usually Staphylococcus aureus
Reservoir	Human
Vector	None
Vehicle	Hematogenous
Incubation Period	Variable
Diagnostic Tests	Ultrasonography or CT scan.
Typical Adult Therapy	Antibiotic directed at confirmed or suspected pathogen (usually Staphylococcus aureus); drainage
Typical Pediatric Therapy	As for adult
Clinical Hints	Pain, swelling and "woody" induration of a large muscle (usually lower limb or trunk) associated with fever and leukocytosis; often follows trauma to the involved region; lymphadenopathy uncommon; leucocytosis in most cases.
Synonyms	Tropical pyomyositis. ICD9: 040.81 ICD10: M60.0

Clinical

The initiating lesion may be overt blunt or penetrating trauma; however, some cases may represent complications of viral or parasitic myositis. [1]
• An increasing percentage of reported patients have been HIV-positive. [2]
• 20 to 50% of patients with pyomyositis recall recent blunt trauma or vigorous exercise involving the area of infection; and most infections involve a single muscle or muscle group.
• Rare cases of pyomyositis have been associated with spinal epidural abscess [3] , Lemmiere's syndrome [4] and pyopericardium. [5]
• The major muscles of the lower extremities and trunk muscles are most often infected [6] ; however, virtually any muscle can be involved. [7-14]

Onset is often subacute with fever, swelling with or without erythema, mild pain and minimal tenderness. [15]
• The involved area is indurated or has a wooden consistency.
• 10 to 21 or more days later, the patient complains of fever, with muscle tenderness and swelling.
• Overlying skin is intact and warm, usually without erythema.
• There is no regional lymphadenitis.
• At this point, pus can be aspirated from the involved muscle.
• Eventually, manifestations of sepsis appear, with local erythema, tenderness and fluctuance. [16]
• Additional symptoms may reflect compression of contiguous structures. [17] [18]
• Septicemia, ARDS and rapidly progressive or fatal infections are also encountered. [19] [20]

Leukocytosis is present.
• Eosinophilia suggests a diagnosis of "tropical myositis' but is thought to represent the presence of concurrent parasitic infection.

The clinical features of pyomyositis may mimic those of leptospirosis. [21]

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Q-fever

Agent	BACTERIUM. Coxiella burnetii Intracellular organism related to Rickettsiae
Reservoir	Cattle Sheep Goat Bird Fish Rodent Rabbit Tick Bandicoot Marsupial Dog Cat
Vector	None
Vehicle	Air Dust Infected secretions Dairy products
Incubation Period	18d - 21d (range 4d - 40d)
Diagnostic Tests	Serology. Culture possible in specialized laboratories. Nucleic acid amplification.
Typical Adult Therapy	Doxycycline 100 mg BID X 2w OR Fluoroquinolone Add Hydroxychloroquine 600 mg per day if endocarditis
Typical Pediatric Therapy	Age < 8 years: Erythromycin 10 mg/kg QID X 2 weeks Age >= 8 years: Doxycycline 100 mg BID X 2 weeks
Vaccine	Q fever vaccine
Clinical Hints	Headache, myalgia, cough and hepatic dysfunction; hepatosplenomegaly, "F.U.O." and endocarditis encountered; proximity to farming or animals during 2 to 4 weeks preceding illness; most infections resolve in 1 to 2 weeks; case-fatality rate = 1.5%.
Synonyms	Balkan grippe, Candidatus Coxiella massiliensis, Coxiella burnetii, Febbre australiana, Febre Q, Nine Mile fever, Q-Fieber, Q-koorts, Query fever, Red River fever. ICD9: 083.0 ICD10: A78

Clinical

The typical clinical presentation of Q-fever (pneumonia vs. hepatitis) seems to vary from region to region. [1] [2]

Q-fever is often asymptomatic or mistaken for an acute viral illness.
• Q-fever may be mistaken for Legionnaires' disease [3]
• After an incubation period of 2 to 3 weeks, the patients develops fever, headache, and myalgias. [4]
• Cough is present in 25% to 70%, and hepatosplenomegaly in 30% to 50%.
• An evanescent rash may appear in 5% of cases.
• The blood CRP is elevated; however leukocytosis is present in only 20% of cases. [5]
• Acute thrombocytosis may also be encountered. [6]
• False-positive tests toward a variety of non-related agents and conditions may be encountered: anti-nuclear antibody (ANA), smooth muscle antibody, rheumatoid factor, Epstein-Barr Virus, Cytomegalovirus, Mycoplasma pneumoniae, Parvovirus, *Bordetella pertussis*, *Rickettsia conorii* and *Rickettsia typhi*. [7]

The frequency of pneumonitis is highly variable (10% to 60%) [8] [9] ; and clinical and radiological features are non-specific. [10-12]

• Neurological complications may include encephalitis [13] , brachial plexopathy [14] , Guillain-Barre syndrome [15] , status epilepticus and pseudotumor cerebri [16]
• Several cases of Q-fever uveitis have been reported. [17] In one case, a patient developed anterior uveitis accompanied by exudative bilateral inferior retinal detachment and optic disk edema. [18]
• Q-fever during pregnancy increases the risk for fetal death and malformation. [19] [20]

Occasionally, the illness may be prolonged, with severe pneumonitis [21] [22] and hepatic involvement. [23-25]
• Independent risk factors for development of chronic Q fever include valvular surgery, vascular prosthesis, aneurysm, renal insufficiency, and older age. [26]
• Chronic fatigue is common following Q-fever, and in some cases may actually represent persistent infection. [27-33]

Although the acute disease is usually self-limited, Q-fever endocarditis may occasionally develop 3 to 20 years following the

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acute infection and is often fatal. [34] [35]
• Over 16% of patients with acute Q fever experience endocarditis, approximately 16% to 37% of patients with Q fever endocarditis will have a history compatible with previous symptomatic acute Q fever infection. [36]
• Over 80% of patients with Q-fever endocarditis have a history of underlying valvular disease.
• Vascular complications of Q-fever include aortitis [37], aneurysm rupture, aorto-enteric fistulae [38] and lower-limb embolisation. [39] [40]

Pericarditis [41-44], myocarditis [45] [46], optic neuritis [47], uveitis [48-50], disseminated intravascular coagulation [51], hemophagocytic syndrome [52-54], bleeding phenomena (melena, epistaxis, petechiae) [55], autoimmune hemolytic anemia [56], osteomyelitis [57-62], monoarthritis [63] [64], prosthetic joint infection [65] [66], recurrent subcutaneous abscesses and nodules [67], spontaneous abortion [68] [69], splenic and hepatic abscesses, and cerebral venous thrombosis [70], aseptic meningitis [71], cholecystitis [72] and tubulointerstitial nephritis [73] have been reported as complications of Q-fever. [74-76]
• Q fever may mimic Kawasaki disease [77], lupus erythematosus [78] or Crimean-Congo hemorrhagic fever. [79]

A related pathogen, *Candidatus Coxiella massiliensis*, has been identified in ticks associated with scalp eschar and cervical lymphadenopathy in France. [80]

Q-fever in Zambia

Prevalence surveys:

7.8% of cattle and 7.5% of goats in Chama, Chongwe, Monze, and Petauke districts (PCR, 2008 to 2010) [81]

Seroprevalence surveys:

8.2% of the population - 11.8% in the East and 7.4% in the North (1989) [82]
0.9% of cattle in Kafue Flats (1991 publication) [83]

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Rabies

Agent	VIRUS - RNA. Rhabdoviridae, Mononegavirales, Lyssavirus: Rabies virus. Other human Lyssaviruses = Mokola, Duvenhage, European Bat (EBL)
Reservoir	Dog Fox Skunk Jackal Wolf Cat Raccoon Mongoose Bat Rarely rodent or Rabbit
Vector	None
Vehicle	Saliva Bite Transplants Air (bat aerosol)
Incubation Period	1m - 3m (range 4d to 19 years !)
Diagnostic Tests	Viral culture & direct immunofluorescence of saliva, CSF, corneal smears. Serology. Nucleic acid amplification.
Typical Adult Therapy	Strict isolation; supportive. The Milwaukee protocol (prolonged deep sedation and support) has been successful in some cases. See Vaccines module for pre- and post-exposure schedules
Typical Pediatric Therapy	As for adult
Vaccines	Rabies vaccine Rabies immune globulin
Clinical Hints	Follows animal bite (rarely lick) - often after months: agitation, confusion, seizures, painful spasms of respiratory muscles, progressive paralysis, coma and death; case-fatality rate > 99%.
Synonyms	Aravan, Australian bat lyssavirus, Ballina, BBLV, Bokeloh bat lyssavirus, Duvenhage, EBL, European bat Lyssavirus, Hondsdolheid, Hydrophobia, Ikoma lyssavirus, Irkut, Khujand, Lyssa, Mokola, Pteropus lyssavirus, Rabia, Rage, Raiva, Saint Hubert's disease, Shimoni bat virus, Tollwut, West Caucasian bat, Wutkrankheit. ICD9: 071 ICD10: A82

Clinical

WHO Case definition for surveillance:
• An acute neurological syndrome (encephalitis) dominated by forms of hyperactivity (furious rabies) or paralytic syndromes (dumb rabies) that progresses towards coma and death, usually by respiratory failure, within 7 to 10 days after the first symptom if no intensive care is instituted.
• Bites or scratches from a suspected animal can usually be traced back in the patient medical history.
• The incubation period may vary from days to years [1] [2] but usually falls between 30 and 90 days.
Laboratory criteria for diagnosis
One or more of the following
• Detection of rabies viral antigens by direct fluorescent antibody (FA) in clinical specimens, preferably brain tissue (collected post mortem)
• Detection by FA on skin or corneal smear (collected ante mortem)
• FA positive after inoculation of brain tissue, saliva or CSF in cell culture, in mice or in suckling mice
• Detectable rabies-neutralizing antibody titer in the CSF of an unvaccinated person
• Identification of viral antigens by PCR on fixed tissue collected post mortem or in a clinical specimen (brain tissue or skin, cornea or saliva)
• Isolation of rabies virus from clinical specimens and confirmation of rabies viral antigens by direct fluorescent antibody testing
Case classification
Rabies:
• Suspected: A case that is compatible with the clinical description.
• Probable: A suspected case plus history of contact with suspected rabid animal.
• Confirmed: A suspected case that is laboratory-confirmed.
Rabies exposure:
• Possibly exposed: A person who had close contact (usually a bite or scratch) with a rabies-susceptible animal in (or originating from) a rabies-infected area.
• Exposed: A person who had a close contact (usually a bite or scratch) with a laboratory-confirmed rabid animal.

Clinical variants:

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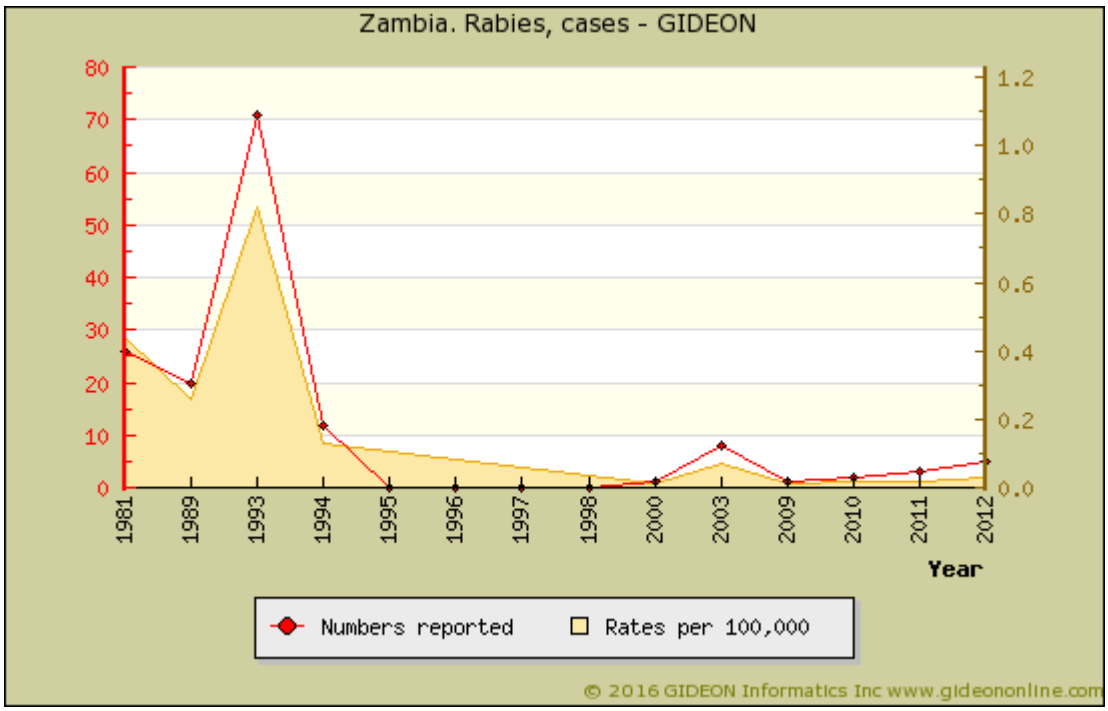
The initial symptoms of rabies are often limited to low grade fever and pain or paresthesia at the site of inoculation.
• Progressive encephalitis then ensues. [3]
• "Furious rabies" is characterized by hyperactivity, fluctuating level of consciousness, aerophobia and hydrophobia.
• Bizarre behavior and lack of focal neurological signs are typical.
• Hydrophobia may manifest as "jerky" inspiratory spasms progressing to opisthotonus, generalized seizures or cardiorespiratory arrest.
• Similar reactions may be elicited by fanning the patient ("aerophobia).
• Paralytic ("dumb") rabies is characterized by progressive flaccid paralysis, with fasciculation and pain in the affected muscles.
• Minor sensory disturbances may be present. Such patients may survive for as long as one month, ultimately dying of bulbar and respiratory paralysis.
• In rare instances, the initial presentation of rabies has been limited to severe abdominal pain. [4]
• Rare instances of survival from clinical rabies have been documented (13 cases as of 2014). [5-22]
• In Africa, rabies is often mis-diagnosed as cerebral malaria.

Dog-associated vs. Bat-associated rabies: [23]
Bat-associated rabies is more often misdiagnosed than dog-associated rabies, and more likely to lack a bite history.
• Encephalopathy, hydrophobia, and aerophobia are more common in dog-acquired cases; while abnormal cranial nerve, motor and sensory examinations, tremor, myoclonus, local sensory symptoms, symptoms at the exposure site and local symptoms in the absence of a bite or scratch are more common in bat-acquired cases.
• Bat-acquired cases are more commonly associated with increased cerebrospinal fluid protein levels.

Rabies in Zambia

As of 1975, rabies was most prevalent in the Central, Southern, Copperbelt and Eastern Provinces - with dogs responsible for 82.7% of cases. [24]
- Domestic dogs accounted for 69.7% of rabid animals identified during 1985 to 2004, cattle 13.0%, humans 9.2% and wildlife 4.5% (primarily jackals, *Canis adujstis*) [25]



Graph: Zambia. Rabies, cases

Notes:
Individual years:
1993 - 20 from dogs and 50 from unknown sources.
1994 - All from dogs

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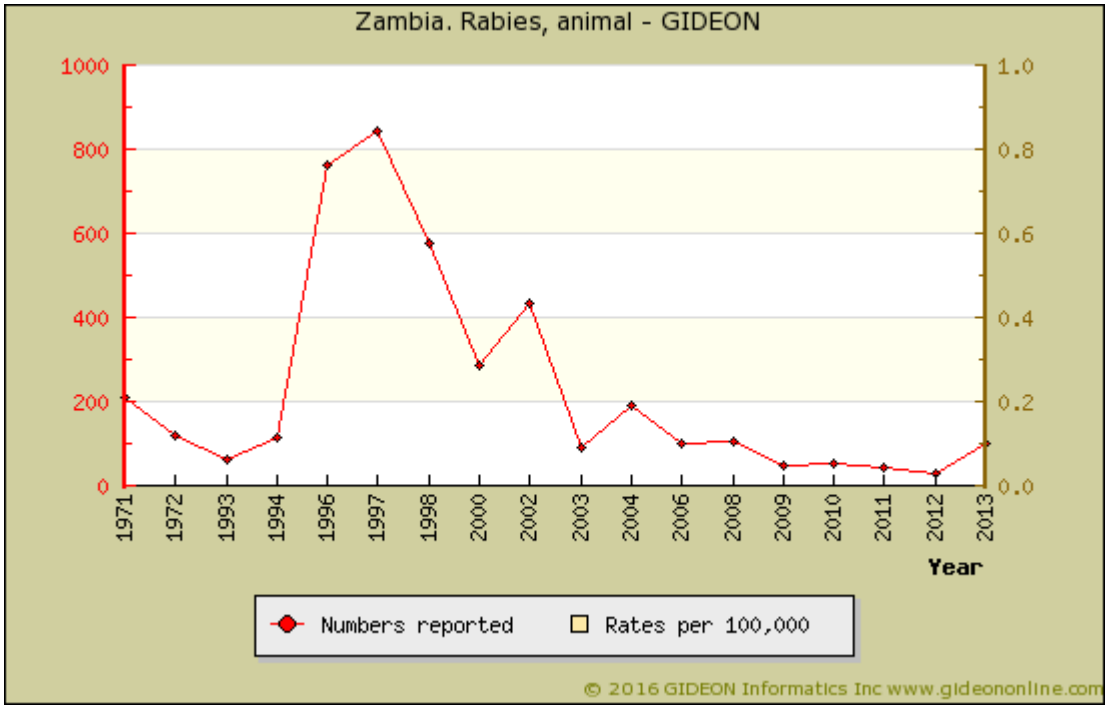

Graph: Zambia. Rabies, animal

Notes:
1. 1,304 rabid animals were registered during 1969 to 1976 - including 26 wild animal species. [26]

3. Bat rabies has been reported. [27]
Individual years:
1972 - 102 dogs and 16 ruminants.
2006 - 100 dogs.

Seroprevalence surveys:

40% of lions (*Panthera leo*), 0% of African wild dogs (*Lycaon pictus*), and 0% of spotted hyenas (*Crocuta crocuta*) in South Luangwa National Park and Liuwa Plain National Park regions (2013 publication) [28]

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Rat bite fever - spirillary

Agent	BACTERIUM. Spirillum minus An aerobic gram-negative spirochete
Reservoir	Rat Mouse Cat
Vector	None
Vehicle	Bite
Incubation Period	7d - 21d (range 5d - 40d)
Diagnostic Tests	Dark-field exam of wound. Animal inoculation.
Typical Adult Therapy	Amoxicillin/clavulanate 875/125 mg PO BID X 7d. OR Procaine Penicillin G 600,000u IM q12h X 7d. OR Doxycycline 200 mg BID X 7d
Typical Pediatric Therapy	Amoxicillin/clavulanate 10 mg/kg PO BID X 7d OR Procaine Penicillin G 25,000u/kg IM q12h X 7d
Clinical Hints	Lymphadenopathy, myalgia, maculopapular rash and recurrent fever beginning 1 to 3 weeks after rat bite; infection resolves after 3 to 6 days; case-fatality rate = 6%.
Synonyms	Sodoku, Spirillosis, Spirillum minor, Spirillum minus. ICD9: 026.0 ICD10: A25.0

Clinical

Most patients present with a recent rat bite wound, which may later form an ulcer with local swelling, pain and skin changes.
• Regional lymphatics and lymph nodes are enlarged and tender.
• Fever rises to as high as 40 C, with accompanying rigors.
• After 3 days, fever ends in "crisis," followed by a quiescent interval of 5 to 10 days.
• One or more relapses follow, and are associated with a purple papular exanthem on the chest and arms.
• Additional findings include generalized hyperreflexia, arthralgia, myalgia and hyperesthesia.
• The fatality rate without treatment is 10%.

Features which may distinguish spirillary [S] from streptobacillary [B] rat bite fever include the following: [1] [2]
Features which may distinguish spirillary [S] from streptobacillary [B] rat bite fever include the following: [3] [4]

Incubation
• S up to 30 days
• B up to 10 days
Bite wound
• S may produce a chancre
• B heals promptly
Relapses
• S regular
• B intermittent
Rash
• S generalized macular
• B macular, pustular or petechial
Arthritis
• S rare
• B common [5]

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Rat bite fever - streptobacillary

Agent	BACTERIUM. Streptobacillus moniliformis A facultative gram-negative bacillus
Reservoir	Rat Squirrel Weasel Turkey
Vector	None
Vehicle	Infected secretions Bite Dairy products
Incubation Period	3d - 10d (range 1d - 22d)
Diagnostic Tests	Culture of blood or joint fluid. Nucleic acid amplification.
Typical Adult Therapy	Amoxicillin/clavulanate 875/125 mg PO BID X 7d. OR Doxycycline 100 mg PO BID X 7d
Typical Pediatric Therapy	Amoxicillin/clavulanate 10 mg/kg TID X 7d. OR (if age>8 years) Doxycycline 2 mg/kg PO BID X 7 days (maximum 200 mg/day)
Clinical Hints	Headache, myalgia, maculopapular rash and arthralgia or arthritis; history of a rat bite during the preceding 1 to 3 weeks in most cases; case-fatality rate = 10%.
Synonyms	Haverhill fever, Streptobacillosis, Streptobacillus moniliformis. ICD9: 026.1 ICD10: A25.1

Clinical

Most patients present with a recent rat bite wound, which may later form an ulcer with local swelling, pain and skin changes. [1]

• Symptoms include fever, prostration, marked myalgia and muscle tenderness, headache and a generalized morbilliform rash • most marked on the hands and feet. [2]
• Generalized lymphadenopathy is present, and migratory arthropathy is often present.
• Fever resides in 5 to 10 days, but may relapse repeatedly over a period of weeks to months.

One or more relapses follow, and are associated with a purple papular exanthem on the chest and arms.
• Additional findings include generalized hyperreflexia, migratory polyarthralgia (over 50% of cases), myalgia and hyperesthesia.
• Arthritis affects more than one joint in 83.3% of patients, involving the knee in most. [3]
• Rare instances of endocarditis [4] [5] , psoas abscess, epidural abscess [6] and spondylodiscitis have been reported. [7]

The fatality rate without treatment is 10%, and results from endocarditis or multiple visceral abscesses.

Features which may distinguish spirillary [S] from streptobacillary [B] rat bite fever include the following: [8] [9]

Incubation
• S up to 30 days
• B up to 10 days
Bite wound
• S may produce a chancre
• B heals promptly
Relapses
• S regular
• B intermittent
Rash
• S generalized macular
• B macular, pustular or petechial
Arthritis
• S rare
• B common [10]

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Relapsing fever

Agent	BACTERIUM. Borrelia spp. A microaerophilic spirochete
Reservoir	Human Tick Rodent
Vector	Tick (Ornithodoros), louse (Pediculus)
Vehicle	Blood products
Incubation Period	7d - 8d (range 2d - 18d)
Diagnostic Tests	Examination of blood smears (thick and thin smears). Some species (B. hermsii) may grow in BSK II medium.
Typical Adult Therapy	Doxycycline 100 mg PO BID X 7d. OR Erythromycin 500 mg QID X 7d A single dose of Tetracycline 500 mg or erythromycin 500 mg may suffice for louse-borne infection
Typical Pediatric Therapy	Chloramphenicol 12.5 mg/kg PO QID X 7d. OR Erythromycin 10 mg/kg QID X 7d
Clinical Hints	Headache, myalgia, hepatosplenomegaly, rash and relapsing illness; louse-borne (vs. tick borne) characterized by higher case fatality rate, fewer relapses and higher incidence of hepatosplenomegaly, jaundice and neurological complications.
Synonyms	Bilious typhoid, Borrelia anserina, Borrelia braziliensis, Borrelia caucasica, Borrelia coriaceae, Borrelia crocidurae, Borrelia dipodilli, Borrelia duttonii, Borrelia graingeri, Borrelia hispanica, Borrelia latyschewii, Borrelia mazzottii, Borrelia merionesi, Borrelia microti, Borrelia miyamotoi, Borrelia parkeri, Borrelia persica, Borrelia queenslandica, Borrelia recurrentis, Borrelia theileri, Borrelia turicatae, Borrelia uzbekistana, Borrelia venezuelensis, Borreliosis, Candidatus Borrelia algerica, Famine fever, Febbre recidiva, Febbre ricorrente, Febris recurrens, Fiebre recurrente, Lauseruckfallfieber, Mianeh fever, Ruckfall fieber, Tilbakefallsfeber, Tilbakefallsfever, Vagabond fever, Yellow famine fever, Yellow plague. ICD9: 087.9,087.0,087.1 ICD10: A68

Clinical

The clinical manifestations of louse-borne and tick-borne [1] relapsing fevers are similar. [2] [3]
• Louse-borne disease is characterized by a longer incubation period, longer febrile periods and afebrile intervals, and fewer relapses.
• Both types have an acute onset of high fever with rigors, headache, myalgia, arthralgia, photophobia and cough.
• In Africa, tickborne relapsing fever is often mis-diagnosed as malaria. [4]

Physical findings often include conjunctivitis, petechiae, and abdominal tenderness with hepatomegaly and splenomegaly.
• Nuchal rigidity, pulmonary rales, lymphadenopathy, jaundice and ARDS [5] are occasionally encountered.
• Hemorrhagic phenomena are common but rarely severe.
• Iritis and iridocyclitis may lead to permanent impairment of vision. Uveitis is also described. [6]
• A petechial, macular, or papular rash over the trunk may be noted toward the end of the illness.
• As many as 30% of patients develop neurological findings such as coma, cranial nerve palsies, hemiplegia, meningitis, and seizures. [7]
• Rare instances of acute respiratory distress syndrome [8] [9] and dermal eschar [10] have been associated with tick-borne relapsing fever.
• Deaths are ascribed to myocarditis with associated arrhythmias, cerebral hemorrhage or hepatic failure.
• "Tropical thrombophlebitis" has been associated with outbreaks of relapsing fever in South Africa. [11]

Borrelia miyamotoi infection is characterized by fever, headache, chills, myalgia, arthralgia and multiple relapses. [12-15]
• *B. miyamotoi* meningoencephalitis was reported in an immunocompromised patient. [16]

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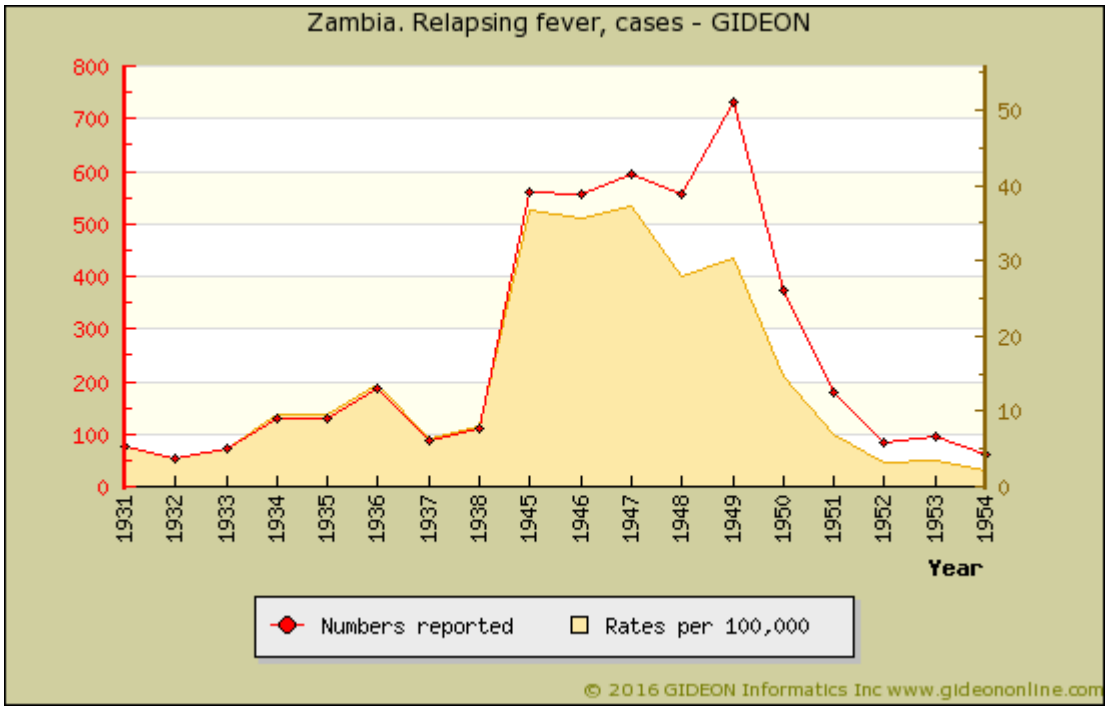
Relapsing fever in Zambia



Graph: Zambia. Relapsing fever, cases

Notes:

1. Historical data from reference [17]

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Respiratory syncytial virus infection

Agent	VIRUS - RNA. Paramyxoviridae, Pneumovirinae: Human respiratory syncytial virus
Reservoir	Human
Vector	None
Vehicle	Droplet Infected secretions (hands)
Incubation Period	2d - 8d
Diagnostic Tests	Viral culture or DFA (nasal and other respiratory secretions). Serology. Nucleic acid amplification.
Typical Adult Therapy	Ribavirin aerosol 20 mg/ml for 12h/d X 3 to 5d (severe infections). Effectiveness not proven
Typical Pediatric Therapy	As for adult
Vaccine	RSV immune globulin
Clinical Hints	Rhinorrhea, cough, wheezing, bronchiolitis and respiratory distress; encountered primarily in infancy.
Synonyms	Chimpanzee coryza agent, Respiratory syncytial virus, RSV. ICD9: 079.6,480.1 ICD10: B97.4,J12.1

Clinical

RSV infections are manifested as:
• lower respiratory tract disease (pneumonia, bronchiolitis, tracheobronchitis)
• upper respiratory tract illness, often accompanied by fever and otitis media. [1]

Asymptomatic infection is rare.
• Pneumonia or bronchiolitis occurs in 30% to 71% of patients (89% among closed populations of infants).
• Croup accounts for only 5% to 10% of cases.
• Wheezing [2-6] , rhonchi, rales, and pulmonary infiltrates are encountered with bronchiolitis as well as pneumonia. [7]
• Bronchiolitis is characterized by wheezing and hyperaeration of the lung.
• RSV infection in adults is usually mild; however severe disease may develop. [8-11]

Lower respiratory tract infection is heralded by nasal congestion and often pharyngitis.
• Fever occurs in young children, with temperatures ranging from 38 to 40C.
• Fever is present for 2 to 4 days; however, the extent and duration of the fever does not correlate with the severity of the disease.
• Fever is frequently absent at the time of admission to the hospital.
• Cough is often a predominant sign.
• The cough may be paroxysmal and associated with vomiting, but without the "whoop" typical of pertussis.
• Laryngitis and hoarseness are not common.

Dyspnea, increased respiratory rate, and retractions of the intercostal muscles are common.
• In bronchiolitis, expiration is prolonged, and the respiratory rate may be remarkably elevated. [12]
• Intercostal retractions are also prominent in bronchiolitis.
• On auscultation, the infant may have crackles and wheezing, which may be present intermittently and may fluctuate in intensity.
• Cyanosis is rare, despite hypoxemia. In most infants, the duration of illness is 7 to 21 days, and hospitalization, if required, averages 3 to 7 days.
• Thrombocytosis is common among children hospitalized with RSV bronchiolitis. [13]
• The severity and / or duration of RSV bronchiolitis is exacerbated by concomitant human metapneumovirus infection. [14-17]
• RSV infection accounts for approximately 5% of bronchiolitis obliterans in children (Beijing, 2001 to 2007) [18]
• Spontaneous pneumothorax has been reported as a late complication of RSV infection. [19-22]
• Infection in premature infants may result in long term effects on airway function. [23-25]

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Otitis media is a common complication of RSV infection in young children. [26-29]
• Viral meningitis [30] , encephalopathy / encephalitis and seizures are also encountered. [31-34]
• Repeated or secondary infections occurring after the first 3 years of life are most commonly manifested as an upper respiratory tract illness or tracheobronchitis.
• Young adults may present with flu-like illness, pneumonia, chronic cough suggestive of tracheobronchitis or bronchitis, and occasionally with otitis. [35]
• Infection among the elderly is often nosocomially acquired, and may result in pneumonia in 5% to 50% of the cases, with a fatal outcome in up to 20%.
• Additional extrapulmonary manifestations of RSV infection have included myocarditis [36] , supraventricular tachycardia, ventricular tachycardias, pericarditis [37] [38] , focal neurological abnormalities, brainstem encephalitis [39] , hyponatremia and hepatitis [40] [41]

Signs and symptoms of Human Metapneumovirus (hMPV) infection are similar to those of Respiratory syncytial virus infection [42-44] , and coinfection by these two agents may be particularly severe. [45-49] Children with hMPV infection are likely to be older than those with RSV, and more likely to present with pneumonia and less likely to present with bronchiolitis. [50]
• Clinical signs of Rhinovirus infection [51] and of Human Bocavirus infection are also similar to those of Respiratory syncytial virus infection; however, hypoxia, and neutrophilia may be more common in Human Bocavirus infection. [52]
• Superinfection of RSV by *Staphylococcus aureus* [53] , *Bordetella pertussis* [54] and other bacteria is not unusual. [55]

Respiratory syncytial virus infection in Zambia

Prevalence surveys:

16.3% of children with acute respiratory infection (Lusaka - March to November, 1996). [56]
15.2% of hospitalized children with severe non-influenza acute respiratory illness (Lusaka, 2011 to 2012) [57] [58]

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Respiratory viruses - miscellaneous

Agent	VIRUS - RNA and DNA Paramyxoviridae: Mononegavirales Human Metapneumovirus Coronaviridae: New Haven Coronavirus, HKU1 Parvovirinae: Human Bocavirus
Reservoir	Human
Vector	None
Vehicle	Droplet Infected secretions (on hands)
Incubation Period	Unknown
Diagnostic Tests	Viral culture. Serology. Nucleic acid amplification.
Typical Adult Therapy	NA
Typical Pediatric Therapy	NA
Clinical Hints	Rhinorrhea, cough, wheezing, bronchiolitis and respiratory distress; encountered primarily in infancy.
Synonyms	Acanthamoeba polyphaga mimivirus, Bat reovirus, Bocavirus, Bradford coccus, Cardiovirus, Coronavirus HKU1, Coronavirus NL63, Encephalomyocarditis Virus, HCoV-HKU1, HCoV-NL63, HK23629/07, HKU1, HRV-A, HRV-B, HRV-C, Human Bocavirus, Human Coronavirus NL63, Human CoV 229E, Human CoV OC43, Human metapneumovirus, Human rhinovirus, Kampar, Karolinska Institutet virus, KI virus, Melaka, Metapneumovirus, Mimivirus, New Haven coronavirus, Pulau, Rhinovirus, Small Anellovirus, Tioman virus, Torque tenovirus, Torquetenovirus, Washington University virus, WU polyomavirus, WU virus. ICD9: 079.89 ICD10: B34.2,J12.8

Clinical

For a comprehensive review of newer respiratory viral infections, see [1]

Human Metapneumovirus:
Signs and symptoms of Human Metapneumovirus (hMPV) infection are similar to those of Respiratory syncytial virus infection [2-4], and coinfection by these two agents may be relatively severe and / or prolonged. [5-10] Children with hMPV infection are likely to be older than those with RSV, and more likely to present with pneumonia and less likely to present with bronchiolitis. [11]

- Findings include either lower respiratory tract disease (pneumonia, bronchiolitis, tracheobronchitis) or upper respiratory tract illness, often accompanied by fever and otitis media. [12] [13]
- Asymptomatic infection is reported. [14] [15]
- Wheezing, rhonchi, rales, and pulmonary infiltrates are encountered with bronchiolitis, hyperaeration and pneumonia. [16] Severe and potentially-fatal infections are reported. [17]
- Apnea has been reported in newborn infants. [18]
- hMPV has been recovered from the middle ear in patients with otitis media. [19] and is associated with 6% of otitis media cases in children. [20]
- Central nervous system disease has been reported, ranging from febrile seizures [21] to severe encephalopathy / encephalitis. [22-26]
- Myocarditis associated with hMPV has been reported. [27]
- Reinfection is common. [28-30]
- Although infection in adults is usually mild or asymptomatic [31], severe disease is reported in elderly adults with underlying disease. [32-35]

New Haven coronavirus:
New Haven coronavirus infection is characterized by fever, cough and rhinorrhea. [36] [37]

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• Tachypnea, hypoxia and pulmonary infiltrates may be present.
• The agent has also been identified as a common cause for croup. [38]

Coronavirus infections:
HKU1 (HCoV-HKU1), a human coronavirus, was isolated in Hong Kong in 2005, from two adult patients with pneumonia. [39]
• An additional 6 cases in Hong Kong were characterized by gastroenteritis, fever, otitis and febrile seizures.
• Human Coronavirus OC43 infection is associated with fever, rhinitis, pharyngitis, laryngitis, otitis, bronchitis, bronchiolitis or pneumonia. [40]
• Rare instances of acute flaccid paralysis have been associated with infection by Human Coronaviruses 229E and OC43. [41]

Human Bocavirus:
Human Bocavirus is a common cause of lower respiratory tract infection in children. [42] [43]
• Bocavirus infections, including cases of severe pneumonia, have also been reported in adults. [44]
• Patients are often co-infected by Respiratory syncytial virus, Adenovirus, Influenza virus, Human metapneumovirus or other pathogens. [45]
• Clinical presentation may include fever, cough, rhinorrhea, conjunctivitis, wheezing, respiratory distress, pneumonia or pleural effusion. [46]
• Rarely, severe and life-threatening infection is encountered. [47]
• Severe HBoV-bronchiolitis in infancy is associated with the later development of asthma. [48]
• Human Bocavirus infection may mimic the symptoms of pertussis [49]
• Rare instances of Human Bocavirus myocarditis [50] , spontaneous pneumomediastinum [51] , and encephalitis have been reported. [52-54]
• Clinical signs are also similar to those of Respiratory syncytial virus infection; however, hypoxia, and neutrophilia may be more common in Human Bocavirus infection. [55]
• Disseminated Bocavirus infection, including diarrhea and viremia, has been reported in a stem cell transplant patient. [56]

Other viruses:
Although Rhinovirus infection is usually associated with the common cold, infection may be associated with severe lower respiratory tract infections [57] , and outbreaks of major and even fatal disease have been reported in chronic care facilities. [58-61]

Melaka virus, a bat-associated Reovirus, has been identified as a cause of fever and acute respiratory tract infection in Malaysia. [62]

Saffold Cardiovirus, a member of the *Picornaviridae*, has been associated with cases of upper respiratory tract infection in children. [63] [64]
• Human infection by an additional Cardiovirus, Encephalomyocarditis Virus, have been characterized by fever, headache, nausea and dyspnea. (2009 publication) [65] One such patient also experienced weight loss, arthralgia, photophobia, myalgia, chills, vomiting, and abdominal pain.

Sosuga virus (tentative name) infection was reported in a single patient. The illness consisted of fever, malaise, headache, generalized myalgia and arthralgia, neck stiffness, and a sore throat. [66]

Respiratory viruses - miscellaneous in Zambia

Prevalence surveys:
Viruses were identified in 61.9% of hospitalized children with severe non-influenza acute respiratory illness: Rhinovirus 19.2%, Adenovirus 16.8% and RSV 15.2% (Lusaka, 2011 to 2012) [67] [68]

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Reye's syndrome

Agent	UNKNOWN
Reservoir	Unknown
Vector	None
Vehicle	Unknown
Incubation Period	Unknown
Diagnostic Tests	Clinical diagnosis.
Typical Adult Therapy	Electrolyte & glucose management, ? enemas, ? dialysis
Typical Pediatric Therapy	As for adult
Clinical Hints	Vomiting, lethargy, coma, seizures, hepatomegaly, hypoglycemia and elevated blood ammonia concentration; usually anicteric; follows viral infection; aspirin ingestion is often implicated.
Synonyms	Reye syndrome. ICD9: 331.81 ICD10: G93.7

Clinical

Signs and symptoms of Reye's syndrome include protracted vomiting and encephalopathy, in the absence of fever or jaundice. [1] [2]
• Hepatomegaly is present in 50% of cases.
• Twelve hours to 3 weeks following an antecedent viral illness, the patient develops vomiting and lethargy, followed by restlessness, irritability, combativeness, disorientation, delirium, tachycardia, hyperventilation, dilated pupils with sluggish response, hyperreflexia, positive Babinski sign, and appropriate response to noxious stimuli.

Diarrhea and hyperventilation are often the first signs in children below age 2 years.
• Later, obtundation, coma and decorticate rigidity are associated with inappropriate response to noxious stimuli.
• Coma deepens, and the patient is found to have fixed and dilated pupils, loss of oculovestibular reflexes and dysconjugate gaze with caloric stimulation.
• Seizures ensue, with flaccid paralysis, absent deep tendon reflexes, lack of pupillary response and respiratory arrest.

Similar disease (Reye-like syndrome) is caused by inborn errors of metabolism, hypoglycemia, hypoketonemia, elevated ammonia, and organic aciduria. [3]
• A case of encephalopathy and hepatic failure • similar to Reye's syndrome • was related to *Bacillus cereus* food poisoning. [4]

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Rheumatic fever

Agent	BACTERIUM. Streptococcus pyogenes A facultative gram-positive coccus
Reservoir	Human
Vector	None
Vehicle	Droplet
Incubation Period	1w - 5w
Diagnostic Tests	Clinical diagnosis.
Typical Adult Therapy	Supportive; salicylates
Typical Pediatric Therapy	As for adult
Clinical Hints	Migratory arthritis, fever, carditis, chorea, subcutaneous nodules, erythema marginatum and leukocytosis; follows overt pharyngitis after 1 to 5 weeks in most cases; acute attack persists for approximately 3 months.
Synonyms	Febbre reumatica. ICD9: 390,391 ICD10: I00,I01,I02

Clinical

Case definition for surveillance: [1]
The CDC (The United States Centers for Disease Control) case definition for surveillance requires evidence for preceding group A streptococcal infection (culture, serology) in addition to two major clinical criteria; or one major and two minor criteria, as follows:

Major clinical criteria:
- carditis (may include evidence limited to Doppler echocardiography findings [2])
- polyarthritis
- chorea [3] [4]
- subcutaneous nodules
- erythema marginatum. [5]

Minor criteria:
- previous rheumatic fever or rheumatic heart disease
- arthralgia
- fever
- elevation of erythrocyte sedimentation rate [ESR]
- positive C-reactive protein
- leucocytosis
- prolongation of the P-R interval on electrocardiogram.

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Rhinoscleroma and ozena

Agent	BACTERIUM. Klebsiella pneumoniae ssp ozaenae and Klebsiella pneumoniae ssp rhinoscleromatis Facultative gram-negative bacilli
Reservoir	Human
Vector	None
Vehicle	Infected secretions Contact
Incubation Period	Unknown
Diagnostic Tests	Culture. Biopsy. Nucleic acid amplification. Advise laboratory when this diagnosis is suspected.
Typical Adult Therapy	Rhinoscleroma: Streptomycin, often with systemic or topical Rifampin - for 3 to 6 weeks; fluoroquinolones also appear to be effective. Ozena: Ciprofloxacin or Sulfamethoxazole/trimethoprim for 3 months
Typical Pediatric Therapy	As for adult
Clinical Hints	Rhinorrhea associated with a painless intranasal mass; may extend to sinuses or ears.
Synonyms	Klebsiella pneumoniae ssp ozaenae, Ozena, Rhinoscleroma. ICD9: 040.1 ICD10: J31.0

Clinical

Rhinoscleroma

The nose is involved in over 90% of cases of rhinoscleroma.

- Findings include fetid discharge, a crusting granulomatous mass and cicatrization. [1] [2]
- The pharynx is involved in 15% to 40%, the larynx in 2% to 2%, the tracheobronchial tree in 15% [3] and the paranasal sinuses in 2% to 25%. [4]
- Rare instances of extension into the oral cavity [5] and laryngeal / tracheal stenosis have been reported. [6] [7]
- Standard therapy consists of streptomycin in combination with topical or systemic rifampicin, for at least 3 to 6 weeks.
- Recent studies suggest that fluoroquinolones are also effective.

Ozena:

Ozena (primary atrophic rhinitis) is characterized by progressive atrophy of the nasal mucosa and underlying bone.

- Findings include foul-smelling, thick, dry crusts and greatly enlarged nasal cavities. [8]
- Laryngeal involvement has been reported. [9]
- Ozena may be associated with tracheobronchopathia osteochondroplastica [10]
- Rare instances of disseminated systemic infection are reported. [11] [12]

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Rhinosporidiosis

Agent	PROTOCTISTA Rhinosporidium seeberi (may in fact be Microcystis, a cyanobacterium)
Reservoir	Water Soil Vegetation
Vector	None
Vehicle	Aerosol from soil or water
Incubation Period	2w - 6m
Diagnostic Tests	Histology of resected material (organism does not grow in-vitro).
Typical Adult Therapy	Excision Dapsone has been used in cases of disseminated disease, in some cases combined with cycloserine and ketoconazole
Typical Pediatric Therapy	As for adult
Clinical Hints	Friable, painless vascular masses of nose, conjunctivae and larynx; recurrence is common.
Synonyms	Rhinosporidium seeberi. ICD9: 117.0 ICD10: B48.1

Clinical

Clinical forms of rhinosporidiosis include:
• nasal (chronic, painless unilateral obstruction, mucoid discharge) [1] [2]
• conjunctival (usually palpebral) [3] [4] , corneal [5] or lacrimal lesion. [6-8]
• ENT (mucous membrane mass of the epiglottis, tongue, palate, tonsils [9] , uvula, pharynx [10] , larynx [11] [12] , trachea [13] [14] , orbits [15] or paranasal sinuses. [16]
• urethral (predominantly male), presenting as a painless, friable polyp of the fossa navicularis. [17]

Multiple painless dermal or subcutaneous nodules may be present. [18-26]
• Rarely, skin lesions may be polymorphic [27]
• Additional manifestations have included primary cutaneous lesions [28] , osteomyelitis [29-35] , facial swelling [36] , bronchial mass lesions [37] [38] , obstructive tracheitis [39] , a vaginal mass [40] and infection of the parotid duct. [41-46]

Relapse occurs in approximately 10% of cases following excision.

Signs of mucosal chromomycosis may mimic those of rhinosporidiosis. [47]

Signs of subcutaneous rhinosporidiosis may mimic those of soft tissue tumor. [48]

Rhinosporidiosis in Zambia

Sporadic cases of rhinosporidiosis are reported. [49]

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Rhodococcus equi infection

Agent	BACTERIUM. Rhodococcus equi An aerobic gram-positive coccobacillus
Reservoir	Farm animal Farm soil
Vector	None
Vehicle	? Inhalation Contact Ingestion
Incubation Period	Unknown
Diagnostic Tests	Culture of blood, body fluids and secretions. Advise laboratory when these organisms are suspected.
Typical Adult Therapy	Two drugs from the following, administered for two months: Levofloxacin, Rifampin, Azithromycin, Ciprofloxacin, Imipenem, Vancomycin
Typical Pediatric Therapy	Two drugs from the following, administered for two months: Levofloxacin, Rifampin, Azithromycin, Imipenem, Vancomycin
Clinical Hints	Most often encountered as pleuropulmonary infection in an immune-suppressed patient; history of contact with farm or farm animals in 40% of cases.
Synonyms	Rhodococcus. ICD9: 027.9 ICD10: A92.8

Clinical

The clinical features of *Rhodococcus equi* disease are largely determined by the site of infection and clinical substrate in which it occurs. [1] [2]

- 49% of patients are HIV-positive.
- Pulmonary infection predominates among HIV-positive patients [3]
- Extrapulmonary disease (abscesses. septicemia, eye or wound infection, etc) is most common in immunocompetent individuals. [4]

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Rift Valley fever

Agent	VIRUS - RNA. Bunyaviridae, Phlebovirus: Rift Valley fever virus
Reservoir	Sheep Ruminant
Vector	Mosquito (Culex, Aedes, Anopheles, Eretmapodites, Mansonia, Culicoides, Coquillettidia spp.)
Vehicle	None
Incubation Period	3d - 5d (range 2d - 7d)
Diagnostic Tests	Viral culture (blood, CSF). Serology. Nucleic acid amplification. Biosafety level 3.
Typical Adult Therapy	Supportive. Animal studies suggest a possible role for Ribavirin.
Typical Pediatric Therapy	As for adult
Vaccine	Rift Valley fever vaccine
Clinical Hints	Headache, myalgia, photophobia, arthralgia and a maculopapular rash; occasional jaundice and retinitis; history of contact with sheep or cattle during the preceding week may be elicited; case fatality rate = 0.1%.
Synonyms	Arumowot, Enzootic hepatitis, Gabek Forest, Gordil, Riftvalleykoorts, Zinga. ICD9: 066.3 ICD10: A92.4

Clinical

Disease is heralded by a "flu-like" illness with sudden onset of fever, headache, myalgia and back pain. [1] [2]
• Following an incubation period of 2 to 6 days, the patient may develop a mild, flu-like illness which may mimic dengue fever or viral meningitis.
• A characteristic syndrome consists of fever, large-joint arthralgia, and gastrointestinal complaints followed by jaundice, right upper-quadrant pain, and delirium, often coinciding with hemorrhagic manifestations. [3]
• Nuchal rigidity, arthralgia, myalgia and photophobia may be present.
• Retinitis occurs in 15% of patients, and is characterized by macular, paramacular, and/or extramacular lesions, often occurring bilaterally. Hemorrhage and edema are often present, and vasculitis, vascular occlusion and optic atrophy are also observed. [4-6]

Complications include hemorrhagic fever [7] on the second to fourth day of illness; or retinal hemorrhage or meningoencephalitis appearing after the first week. [8-10]
• Hemorrhagic phenomena and fatal encephalitis have been observed in approximately 1% to 2% of patients during epidemics and account for much of the mortality.
• Renal dysfunction is encountered in 60% of cases. [11]
• The case-fatality rate in epidemics is usually below 1%.

Rift Valley fever in Zambia

Seropositive cattle were identified during 1974 to 1978. [12]
- An epizootic was reported in 1985. [13]

Seroprevalence surveys:

10.5% of cattle representing 88.9% of herds from all nine districts, with highest rates in flood plains (1997 publication) [14]

14% of cattle in Kafue Flats (1991 publication) [15]

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Rotavirus infection

Agent	VIRUS - RNA. Reoviridae: Rotavirus
Reservoir	Human Pig
Vector	None
Vehicle	Fecal-oral Water
Incubation Period	2.0 d (range 12h - 3d)
Diagnostic Tests	Stool assay for viral antigen. Serology. Nucleic acid amplification.
Typical Adult Therapy	Stool precautions; supportive
Typical Pediatric Therapy	As for adult
Vaccine	Rotavirus vaccine
Clinical Hints	Vomiting, diarrhea and mild fever: the illness lasts approximately 1 week, and is most severe in infancy; fatal cases are associated with dehydration and electrolyte imbalance.
Synonyms	Rotavirus. ICD9: 008.61 ICD10: A08.0

Clinical

The median incubation period for Rotavirus gastroenteritis is 2.0 days. [1]

Infants and young children present with fever, vomiting, diarrhea, and occasionally dehydration. [2]
• Most hospitalized patients had experienced fever and vomiting for 2 to 3 days, and diarrhea for 4 to 5 days.
• The diarrhea is watery without blood or mucus.
• Leukocytes are detected in the stool in a small percentage of patients.
• Approximately 36% of episodes are characterized by "dehydrating diarrhea."
• Viremia is present in over 50% of patients with Rotavirus diarrhea. [3] [4]
• Asymptomatic infection is common. [5]

Infection in immunodeficient children may persist for weeks to months.

Rotavirus infection is not unusual in adults. [6]

Complications:
• Rotavirus infection increases the risk of bacteremia in children with nontyphoid *Salmonella* gastroenteritis [7]
• Rare instances of toxic megacolon [8] and duodenal perforation have been reported. [9]
• Although intestinal intussusception may occur in some cases [10], a causal role for Rotavirus infection (ie, as opposed to Rotavirus vaccine [11]) is not established. [12]
• Central nervous system dysfunction may complicate Rotavirus infection, in the form of seizures [13-17] (even in the absence of fever [18]), cerebellitis [19-22], encephalopathy [23-27], acute flaccid paralysis [28] and death. [29]
• Some reports have linked Rotavirus infections with instances of aseptic meningitis [30] [31], necrotizing enterocolitis, myositis, liver abscess, pancreatitis [32-34], pneumonia, Kawasaki's disease, acute hemorrhagic edema [35], sudden infant death syndrome and Crohn's disease.

Rotavirus infection in Zambia

Vaccine Schedule:

BCG - birth
DTwPHibHepB - 6, 10, 14 weeks
Measles - 9, 18 months

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OPV - 6, 10, 14 weeks
Pneumo conj - 6, 10, 14 weeks
Rotavirus - 6, 10 weeks
Td - 1st contact pregnancy; +1, +1, +6 months; +1, +1 year

Rotavirus - WHO-UNICEF est. % (Rota1) vaccine coverage was 80 in 2014.

Prevalence surveys:

24% of children below age 5 hospitalized for gastroenteritis (1992) [36]
25% of HIV-positive children hospitalized for diarrhea (1994 publication) [37]

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Rubella

Agent	VIRUS - RNA. Togaviridae: Rubivirus, Rubella virus
Reservoir	Human
Vector	None
Vehicle	Contact Air Transplacental Breastfeeding
Incubation Period	16d - 18d (range 14d - 23d)
Diagnostic Tests	Viral culture (throat, urine). Serology. Nucleic acid amplification.
Typical Adult Therapy	Respiratory precautions. Supportive
Typical Pediatric Therapy	As for adult
Vaccines	Rubella vaccine Rubella - Mumps vaccine Measles-Mumps-Rubella vaccine Measles-Rubella vaccine
Clinical Hints	Maculopapular rash following a one-day prodrome of coryza and headache; post auricular lymphadenopathy; arthralgia and arthritis encountered in adults; severe thrombocytopenia or encephalitis may follow acute infection.
Synonyms	Epidemic roseola, German measles, Roda hund, Rode hond, Rode hunder, Rodehond, Rosolia, Roteln, Rubeola [Spanish], Three-day measles. ICD9: 056 ICD10: B06

Clinical

CDC (The United States Centers for Disease Control) case definition for surveillance:
For surveillance purposes, the CDC (The United States Centers for Disease Control) case definition of rubella requires, "An illness that has all of the following characteristics:
• acute onset of generalized maculopapular rash
• temperature >37.2 C if measured
• arthralgia/arthritis, lymphadenopathy, or conjunctivitis" [1] Arthropathy may occur in as many as 41% of cases [2]

A "confirmed" case requires either laboratory confirmation or epidemiological link to a laboratory-confirmed case.
• Atypical features may be seen in adults with rubella; ie, hepatitis, conjunctival hemorrhage [3], uveitis [4], retinitis [5] and a high incidence of polyarthritis.
• Rare instances of acute hepatic failure [6] and hemophagocytic syndrome [7] are reported.

Congenital rubella should be suspected if any of the following is present in a newborn infant [8] [9] :
• cataracts (45% of cases), congenital glaucoma, pigmentary retinopathy
• congenital heart disease (70%, most commonly patent ductus arteriosus or pulmonary artery stenosis) Both anomalies may appear concurrently in up to 50% of cases [10]
• hearing loss (35% to 60%)
• purpura
• splenomegaly
• jaundice
• microcephaly, mental retardation [11], meningoencephalitis
• radiolucent bone disease
• duodenal stenosis [12]

The chance of fetal defects from a viremic mother is 40% to 90% during the first trimester. [13]
• Infection also increases the risk for spontaneous abortion and miscarriage by 50%. [14]
• The rate of congenital rubella syndrome during epidemics is 0.5 to 2.2 per 1,000 live births.
• 60% of children with CRS have hearing impairment, 45% congenital heart disease, 27% microcephaly, 25% cataracts, 23%

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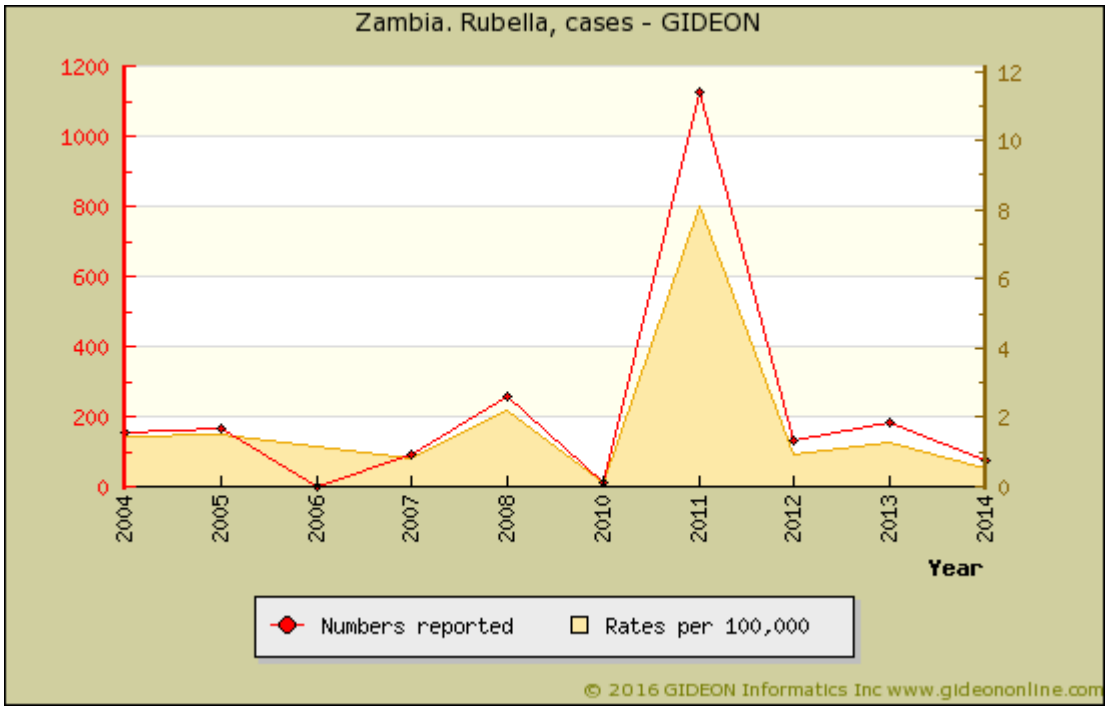
low birth weight (< 2,500 grams), 17% purpura, 19% hepatosplenomegaly, 13% mental retardation and 10% meningoencephalitis.
• Infants born with CRS continue to excrete Rubella virus for up to twelve months. [15]

Anterior uveitis • differential diagnosis:
Anterior uveitis due to Rubella virus is characterized by younger age at onset and a chronic course, typically associated with cataract at presentation. [16]
• Rubella virus has been implicated in the etiology of Fuchs heterochromic iridocyclitis. [17]
• Anterior uveitis due to Herpes simplex and Varicella-Zoster viruses is more common in adults, and often follows an acute course.
• Herpes simplex anterior uveitis presents with conjunctival redness, corneal edema, a history of keratitis, and the presence of posterior synechiae. Anterior chamber inflammation is common with Herpes simplex virus, while vitritis is more common with Rubella and Varicella-Zoster virus.
• Rubella, Herpes simplex and Varicella-zoster viruses are associated with intraocular pressure of more than 30 mmHg and development of glaucoma (18%-30%; P = 0.686).
• Focal chorioretinal scars were present in 22% of Rubella cases, 0% of HSV and in 11% of VZV uveitis cases.

Rubella in Zambia



Graph: Zambia. Rubella, cases

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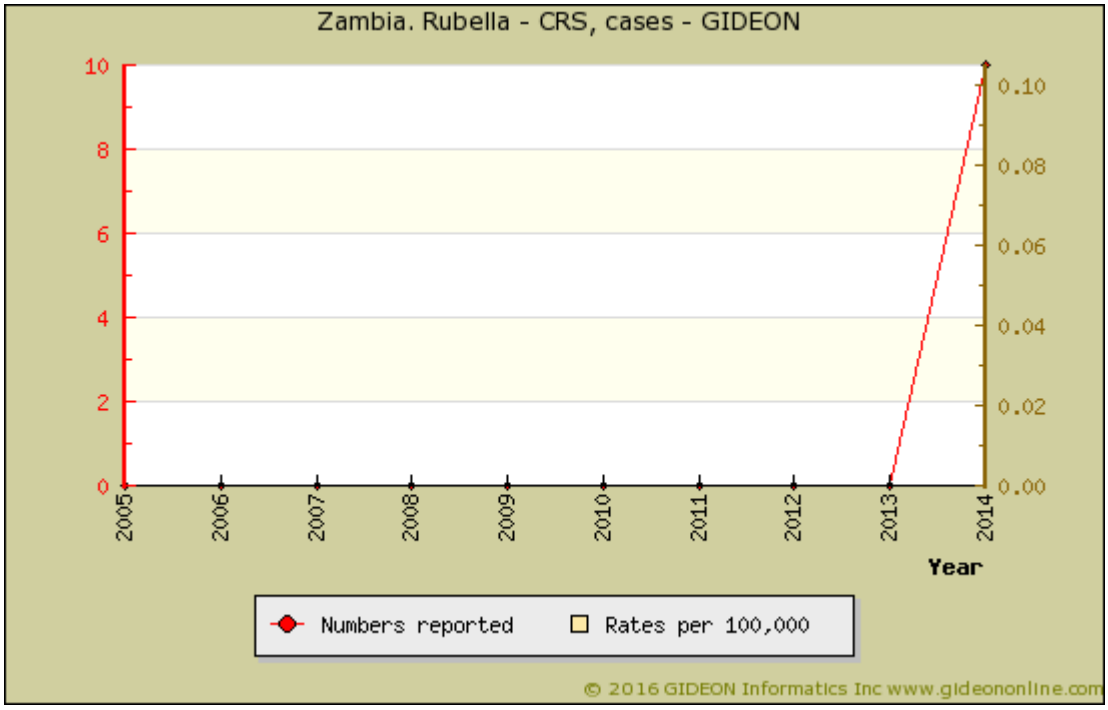

Graph: Zambia. Rubella - CRS, cases

Seroprevalence surveys:

91.9% of female blood donors (2015 publication) [18]

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Salmonellosis

Agent	BACTERIUM. Salmonella A facultative gram-negative bacillus
Reservoir	Mammal Bird Reptile
Vector	None
Vehicle	Food Milk Eggs Poultry Shellfish Meat Vegetables Fruit Fecal-oral Breastfeeding Fly
Incubation Period	12h - 36h (range 6h - 5d)
Diagnostic Tests	Culture (stool, blood, infected tissue). Serology.
Typical Adult Therapy	Stool precautions. Therapy not indicated for uncomplicated diarrhea; if necessary, treat per antibiogram
Typical Pediatric Therapy	As for adult
Clinical Hints	Fever, chills & watery diarrhea 12 to 24 hours after ingestion of eggs, meat, poultry; fecal leucocytes present; fever resolves in 2 days; but diarrhea persists for up to 7 days (occasionally weeks).
Synonyms	Salmonellosen, Salmonellosi. ICD9: 003 ICD10: A02

Clinical

WHO Case definition for surveillance:
• An illness with the following symptoms: diarrhea, abdominal cramps, fever, vomiting and malaise.
Laboratory criteria for confirmation
• Isolation of *Salmonella* spp. from the stool or blood of a patient.
Case classification
• Suspected: An individual showing one or more of the clinical features.
• Confirmed: A suspected case with laboratory confirmation.

Acute infection:

Salmonella gastroenteritis is usually indistinguishable from that caused by other bacterial and viral pathogens. [1]
• Nausea, vomiting, and diarrhea begin 6 to 48 hours following ingestion of contaminated food or water.
• Incubation periods as long as 8 days have been reported. [2]
• Abdominal cramps and fever as high as 39 C are common.
• The diarrhea is usually characterized as loose, non-bloody stools of moderate volume.
• Voluminous diarrhea, bloody stools, and tenesmus may also occur.

The infection is usually self-limited.
• Fever resolves within 3 days, and diarrhea resolves within 3 to 7 days.
• Stool cultures may remain positive for 4 to 5 weeks after infection, and carriage may persist for as long as one year in fewer than 1% of cases. [3]
• Antibiotic treatment is reserved for unusual and complicated infections: septicemia, neonates, immunosuppressed patients, etc.

Complications:

The spectrum of extraintestinal salmonellosis is similar to that of other gram-negative bacterial infections: osteomyelitis [4-8], meningitis [9-11], myocarditis [12], endocarditis [13-16], etc.
• Endovascular infections are particularly common, and may result in aneurysms of the aorta and other large vessels. [17] [18]
• *Salmonella* osteomyelitis is common in children with underlying hemoglobinopathies. Pyomyositis has also been reported in such cases. [19]
• Septicemia is often described in patients with schistosomiasis [20-24], lymphoma, lupus erythematosus [25] [26], bartonellosis, malaria [27] and hepatic cirrhosis.
• Rotavirus infection increases the risk of bacteremia in children with nontyphoid *Salmonella* gastroenteritis [28]
• Elderly patients are at risk for complicated or fatal infection. [29]
• Reactive arthritis has been reported in as many as 16.8% of cases [30-32]

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- The risk for reactive arthritis following *Salmonella* infection [33] was 1.4/100,000 cases (United States, 2002 to 2004) [34]
- There is evidence that salmonellosis may increase the risk for later development of inflammatory bowel disease. [35]

Salmonellosis in Zambia

Prevalence surveys:

18% of malnourished children with diarrhea (2001 publication) [36]

Notable outbreaks:

1982 - An outbreak (102 cases) of *Salmonella* tuebingen infection among student nurses was associated with a contaminated chicken dish. [37]

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Sarcocystosis

Agent	PARASITE - Protozoa. Coccidea, Eimeriida: Sarcocystis bovihominis or S. suihominis
Reservoir	Cattle Pig
Vector	None
Vehicle	Meat Water
Incubation Period	9d - 39d
Diagnostic Tests	Identification of cysts in stool.
Typical Adult Therapy	Supportive
Typical Pediatric Therapy	As for adult
Clinical Hints	Diarrhea and abdominal pain of varying severity; muscle pain and eosinophilia occasionally encountered.
Synonyms	Isospora hominis, Kudoa, Sarcocystiasis, Sarcocystis, Sarcosporidiosis. ICD9: 136.5 ICD10: A07.8

Clinical

Human infection follows ingestion of undercooked beef or pork.
• Clinical features are limited to abdominal pain, vomiting, moderate diarrhea or asymptomatic infection of muscle. [1] [2]
• Recent outbreaks associated with *Sarcocystis nesbitti* infection have been characterized by a high incidence of headache, arthralgia and myalgia. [3] [4]
• Myositis is common [5-7] , and eosinophilia has been reported.

Symptoms associated with infection from beef appear to be more severe than those associated with pork. [8]

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Scabies

Agent	PARASITE - Arthropod. Arachnid, Acarina (Mite), Sarcoptiae: Sarcoptes (Acarus) scabiei
Reservoir	Human
Vector	mite
Vehicle	Contact, including Sexual contact
Incubation Period	3d - 42d
Diagnostic Tests	Identification of mites in skin scrapings.
Typical Adult Therapy	Permethrin 5%. OR Lindane. OR Crotamiton 10% OR Ivermectin 150 to 200 ug/kg PO as single dose
Typical Pediatric Therapy	Permethrin 5%. OR Lindane. OR Crotamiton 10% OR Ivermectin 200 mcg/kg PO (> 15 kg body weight)
Clinical Hints	Intensely pruritic papules, vesicles and burrows - interdigital webs, wrists, elbows, axillae, perineal region, buttocks, penis; pruritus most intense at night; severe psoriaform infestation (Norwegian scabies) noted in debilitated patients.
Synonyms	Cheyletiella, Cheyletiella infestation, Escabiose, Escabiosis, Histiostomatid mites, Kratze, Mange, Ornithonyssus, Pyemotes, Sarcoptes scabiei, Sarna, Scabbia, Skabies, Tropical rat mite. ICD9: 133 ICD10: B86

Clinical

The lesions of scabies are usually symmetrical.
• Typical sites include the interdigital webs, buttocks, penis, scrotum, breasts and nipples, axillae and flexor surfaces of the wrists. [1]
• Pruritis is often worse at night.
• Skin lesions consist of burrows, papules or vesicles. [2]
• Exaggerated eczematous patches ("crusted", or Norwegian scabies) [3] [4] may be encountered • notably in institutions for Down's syndrome and leprosy. [5] Crusted scabies may also suggest the presence of underlying HTLV-I infection. [6-11]
• Lesions in children are atypical and tend to involve the buttocks and perineum. [12]
• Complications include secondary infection and acute glomerulonephritis.

Otoacariasis due to Histiostomatid mites has been reported in Saudi Arabia. [13]

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Scarlet fever

Agent	BACTERIUM. Streptococcus pyogenes A facultative gram-positive coccus
Reservoir	Human
Vector	None
Vehicle	Infected secretions Occasionally food
Incubation Period	1d - 4d
Diagnostic Tests	Typical clinical features associated with group A streptococcal pharyngitis.
Typical Adult Therapy	Benzathine Penicillin G 1.2 million units IM as single dose
Typical Pediatric Therapy	Benzathine Penicillin G : Weight <14kg: 300,000 units IM Weight 14 to 28kg: 600,000 units IM Weight >28kg: 1.2 million units IM
Clinical Hints	Overt pharyngitis followed within 24 to 48 hrs by florid erythematous rash.
Synonyms	Escarlatina, Lanhousha, Scarlattina, Scharlach. ICD9: 034.1 ICD10: A38

Clinical

Signs of streptococcal pharyngitis (fever, pharyngeal exudate and pain) are followed by the appearance of a rash within 12 to 24 hours.
• The exanthem appears initially on the trunk and spreads rapidly over the body to finally involve the extremities. [1]
• The exanthem has the texture of sandpaper, and blanches with pressure.
• Pruritis may be present.
• Facial flushing and circumoral pallor are characteristic.

The patient appears ill, with fever, tachycardia, pharyngitis, tender adenopathy and palatal petechiae.
• Within a few days, the rash becomes more intense along skin folds, producing lines of confluent petechiae (Pastia sign).
• The rash begins to fade within 3 to 4 days, with desquamation evident over the face, palms and fingers.
• Skin peeling may persist for as long as a month.

During the first 2 days of illness, the tongue has a white coat through which the red and edematous papillae project ("white strawberry tongue").
• The tongue later desquamates and becomes markedly reddened ("red strawberry tongue").

Complications are those associated with the streptococcal infection itself • spread to regional, retropharyngeal tissues, middle ears, and sinuses; acute rheumatic fever or post-streptococcal glomerulonephritis.
• Septic complications such as meningitis, pyogenic arthritis, and endocarditis, are occasionally encountered.

Outbreaks of *Y. pseudotuberculosis* infection in Russia and Japan have been associated with a more severe generalized febrile illness known as Far East scarlet-like fever (FESLF) [2] [3] Clinical features include rash and desquamation, hyperemic tongue, and a toxic shock syndrome. [4]

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Schistosomiasis - haematobium

Agent	PARASITE - Platyhelminthes, Trematoda. Strigeida, Schistosomatidae: Schistosoma haematobium
Reservoir	Snail (Bulinus, Planorbarius, Ferrissia) Rarely baboon or monkey
Vector	None
Vehicle	Water (skin contact)
Incubation Period	2w - 6w
Diagnostic Tests	Identification of ova in urine or stool. Serology. Antigen detection.
Typical Adult Therapy	Praziquantel 20 mg/kg PO BID X 1 day
Typical Pediatric Therapy	As for adult
Clinical Hints	Early urticaria, fever and eosinophilia; later, dysuria, hematuria and obstructive nephropathy; often complicated by bladder cancer in advanced cases; parasite may survive for decades in human host.
Synonyms	Bilharziasis, urinary, Egyptian hematuria, Katayama fever [1], Schistosoma guineensis, Schistosoma haematobium, Schistosomal hematuria, Schistosomiasis, Vesicle bilharziasis. ICD9: 120.0 ICD10: B65.0

Clinical

WHO Case definition for surveillance:
Endemic areas (moderate or high prevalence)
• Suspected: Not applicable.
• Probable: Not applicable.
• Confirmed: A person with visible hematuria or with positive reagent strip for hematuria or with eggs of *S. haematobium* in urine (microscope).
Non-endemic areas and areas of low prevalence
• Suspected: A person with visible hematuria or with positive reagent strip for hematuria.
• Probable: Not applicable.
• Confirmed: A person with eggs of *S. haematobium* in urine (microscope).

The clinical features associated with various *Schistosoma* species infecting man are similar [1] , and will be discussed together.

Acute infection:
Within 24 hours of penetration by cercariae, the patient develops a pruritic papular skin rash known as swimmer's itch. [The more overt form of Cercarial dermatitis associated with avian schistosomes is discussed elsewhere in this module.]
• One to two months after exposure, an overt systemic illness known as Katayama fever (named for Katayama district, Hiroshima, Japan) begins, heralded by acute onset of fever, chills, diaphoresis, headache, and cough. [2]
• The liver, spleen, and lymph nodes are enlarged, and eosinophilia is present.
• Rare instances of myocarditis have been reported during acute schistosomiasis. [3] [4]
• Although deaths have been described at this point (notably in *S. japonicum* infection) these findings subside within a few weeks in most cases.

Chronic schistosomiasis:
The likelihood of progression to chronic schistosomiasis is related to the extent of infestation.
• Chronic schistosomiasis caused by *S. mansoni*, *S. japonicum*, or *S. mekongi* is characterized by fatigue, abdominal pain and intermittent diarrhea or dysentery.
• Blood loss from intestinal ulcerations may lead to moderate anemia.
• In *S. mansoni*, *S. japonicum*, and *S. mekongi* infections, ova remain in the venous portal circulation and are carried to the liver where they produce granulomata and fibrosis [5] , and block portal blood flow.
• Colonic polyposis is has been associated with infection by *S. mansoni*, *S. japonicum*, and *S. intercalatum*. [6] Retroperitoneal fibrosis has been reported with *S. japonicum* infection. [7]
• Portal hypertension and portosystemic collateral circulation result.
• Although liver function tests remain normal for a long time, hepatosplenomegaly and variceal hemorrhage develop.
• The spleen is firm and may reach massive size.

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• Fatal hematemesis is unusual.
• Laboratory tests reveal moderate eosinophilia and anemia related to blood loss and hypersplenism.
• Eventually, hepatic function deteriorates, with late ascites and jaundice.

In *S. haematobium* infection, ova are located in the bladder and ureters, leading to granuloma formation, inflammation, hematuria, ureteral obstruction, secondary infection and often carcinoma of the bladder. [8-11] Ova are also commonly present in the seminal vesicles and prostate [12] [13], and rare instances of prostatic adenocarcinoma have been reported in such patients. [14]
• Areas of chronic inflammation, fibrous tissue and calcifications ("sandy patches") in the genital mucosa and bladder contain ova, and are considered pathognomonic for *S. haematobium* infection. [15] [16]
• Genital lesions may present a risk factor for acquisition of HIV infection [17]; and schistosomal co-infection may accelerate HIV disease progression and facilitate viral transmission to sexual partners. [18]
• Terminal hematuria and dysuria are common symptoms.
• Although best known for damage to the urinary bladder and ureters, the female genitalia are involved in 50% to 70% of women with *S. haematobium* infection • resulting in vaginal deformities and fistulae [19], hypogonadism, ectopic pregnancy [20-31], miscarriage and malignancy. [32-35] *Schistosoma mansoni* is implicated in the etiology of appendicitis [36] [37], and membranoproliferative glomerulonephritis and amyloidosis [38]; and may also involve the fallopian tubes [39] [40] and uterine cervix [41], or cause ovarian [42] or testicular granulomata with infertility [43-45] and acute abdomen associated with granulomatous peritonitis [46] or panniculitis. [47] In rare instances, the skin may be involved in *Schistosoma mansoni* infection [48], and the prostate in *Schistosoma japonicum* infection. [49] Sporadic cases of bladder cancer associated with *Schistosoma mansoni* infection have been reported. [50]
• Reinfection or inadequately treated infection may lead to extra-anogenital bilharziasis cutanea tarda. Lesion may typically complicate pre-existing skin conditions. [51]
• Proctitis is occasionally encountered. [52]

S. intercalatum infection is characterized by abdominal pain and bloody diarrhea.

S. mekongi is an important cause of hepatomegaly in endemic areas.

Complications:
The following are some of the many complications described in chronic schistosomiasis.
• Pulmonary schistosomiasis is manifested by symptoms and signs of right ventricular congestion related to blockage of pulmonary capillaries by ova in the course of hepatosplenic schistosomiasis. [53-56]
• Central nervous system schistosomiasis is manifested as delirium, coma, seizures, dysphasia, visual impairment, ataxia, a cerebal mass, generalized encephalopathy, cerebral vasculitis with stroke, or focal epilepsy (notably in *S. japonicum* infection). [57-70]
• Granulomata of *S. haematobium* and *S. mansoni* may involve the spinal cord (most commonly the cauda equina or conus medularis) , producing transverse myelitis. [71-84] Rare instances of cerebral infection by *S. haematobium* have been reported. [85] *Schistosoma mansoni* infection may occasionally involve the bladder, mimicking *S. haematobium* infection or malignancy. [86] *S. mansoni* infection has been implicated in cases of colo-rectal cancer. [87]
• *Salmonella* bacteremia is often reported among persons with hepato-splenic schistosomiasis. [88-92]
• Concurrent chronic Hepatitis B infection enhances the deleterious effect of schistosomiasis on the liver. [93]

Schistosomiasis - haematobium in Zambia

An estimated 2 million individuals in Zambia are infested by *Schistosoma* species. [94]

Prevalence surveys:
7.7% to 37.5% of schoolchildren in Lusaka (1995 publication) [95]
20.72% of schoolchildren in peri-urban Lusaka (2009 publication) [96]
59.1% of schoolchildren in Southern Province (2005 publication) [97]
18% of rural primary school children (1991 publication) [98]
9.0% of schoolchildren, 7.3% of subsistence fishermen and 0% of commercial fishermen in the Lake Kariba region (2003 publication) [99]

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Schistosomiasis - mansoni

Agent	PARASITE - Platyhelminthes, Trematoda. Strigeida, Schistosomatidae: Schistosoma mansoni
Reservoir	Snail (Biomphalaria) Dog Cat Pig Cattle Rodent Horse Non-human primate
Vector	None
Vehicle	Water (skin contact)
Incubation Period	2w - 6w
Diagnostic Tests	Identification of ova in stool or biopsy specimens. Serology. Antigen detection.
Typical Adult Therapy	Praziquantel 20 mg/kg PO BID X one day OR Oxamniquine 15 mg PO X one dose
Typical Pediatric Therapy	Praziquantel 20 mg/kg PO BID X one day OR Oxamniquine 10 mg PO BID X one day
Clinical Hints	Early urticaria, fever and eosinophilia; later, hepatosplenomegaly and portal hypertension; parasite may survive for decades in human host.
Synonyms	Bilharziasis, intestinal, Katayama fever [3], Schistosoma mansoni. ICD9: 120.1 ICD10: B65.1

Clinical

WHO Case definition for surveillance (all forms of intestinal schistosomiasis):
Endemic areas (moderate or high prevalence)
• Suspected: A person with chronic or recurrent intestinal symptoms (blood in stool, bloody diarrhea, diarrhea, abdominal pains) or, at a later stage, hepatosplenomegaly.
• Probable: A person who meets the criteria for presumptive treatment, according to the locally applicable diagnostic algorithms.
• Confirmed: A person with eggs of *S. mansoni*, or *S. japonicum/mekongi* in stools (microscope).
Non-endemic areas and areas of low prevalence
• Suspected: A person with chronic or recurrent intestinal symptoms (blood in stool, bloody diarrhea, diarrhea, abdominal pains) or, at a later stage, hepatosplenomegaly.
• Probable: Not applicable.
• Confirmed: A person with eggs of *S. mansoni* or *S. japonicum* in stools (microscope). A person with positive reaction to immunoblot test.

The clinical features associated with various *Schistosoma* species infecting man are similar [1] , and will be discussed together.

Acute infection:
Within 24 hours of penetration by cercariae, the patient develops a pruritic papular skin rash known as swimmer's itch. [The more overt form of Cercarial dermatitis associated with avian schistosomes is discussed elsewhere in this module.]
• One to two months after exposure, an overt systemic illness known as Katayama fever (named for Katayama district, Hiroshima, Japan) begins, heralded by acute onset of fever, chills, diaphoresis, headache, and cough. [2]
• The liver, spleen, and lymph nodes are enlarged, and eosinophilia is present.
• Although deaths have been described at this point (notably in *S. japonicum* infection) these findings subside within a few weeks in most cases.

Chronic schistosomiasis:
The likelihood of progression to chronic schistosomiasis is related to the extent of infestation.
• Chronic schistosomiasis caused by *S. mansoni*, *S. japonicum*, or *S. mekongi* is characterized by fatigue, abdominal pain and intermittent diarrhea or dysentery.
• Colonic polyposis is has been associated with infection by *S. mansoni*, *S. japonicum*, and *S. intercalatum*. [3] Retroperitoneal fibrosis has been reported with *S. japonicum* infection. [4]
• Blood loss from intestinal ulcerations may lead to moderate anemia.
• In *S. mansoni*, *S. japonicum*, and *S. mekongi* infections, ova remain in the venous portal circulation and are carried to the

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liver where they produce granulomata and fibrosis [5] , and block portal blood flow.
• Portal hypertension and portosystemic collateral circulation result.
• Although liver function tests remain normal for a long time, hepatosplenomegaly and variceal hemorrhage develop.
• The spleen is firm and may reach massive size.
• Fatal hematemesis is unusual.
• Laboratory tests reveal moderate eosinophilia and anemia related to blood loss and hypersplenism.
• Eventually, hepatic function deteriorates, with late ascites and jaundice.

In *S. haematobium* infection, ova are located in the bladder and ureters, leading to granuloma formation, inflammation, hematuria, ureteral obstruction, secondary infection and often carcinoma of the bladder. [6-9] Ova are also commonly present in the seminal vesicles and prostate [10] [11] , and rare instances of prostatic adenocarcinoma have been reported in such patients. [12]
• Areas of chronic inflammation, fibrous tissue and calcifications ("sandy patches") in the genital mucosa and bladder contain ova, and are considered pathognomonic for *S. haematobium* infection. [13] [14]
• Genital lesions may present a risk factor for acquisition of HIV infection [15] ; and schistosomal co-infection may accelerate HIV disease progression and facilitate viral transmission to sexual partners. [16]
• Terminal hematuria and dysuria are common symptoms.

S. intercalatum infection is characterized by abdominal pain and bloody diarrhea.

S. mekongi is an important cause of hepatomegaly in endemic areas.

Complications:
The following are some of the many complications described in chronic schistosomiasis.
• Pulmonary schistosomiasis is manifested by symptoms and signs of right ventricular congestion related to blockage of pulmonary capillaries by ova in the course of hepatosplenic schistosomiasis. [17-20]
• Central nervous system schistosomiasis is manifested as delirium, coma, seizures, dysphasia, visual impairment, ataxia, a cerebal mass, generalized encephalopathy, cerebral vasculitis with stroke, or focal epilepsy (notably in *S. japonicum* infection). [21-34]
• Granulomata of *S. haematobium* and *S. mansoni* may involve the spinal cord (most commonly the cauda equina or conus medularis) , producing transverse myelitis. [35-48] Rare instances of cerebral infection by *S. haematobium* have been reported. [49] *Schistosoma mansoni* infection may occasionally involve the bladder, mimicking *S. haematobium* infection or malignancy. [50] *S. mansoni* infection has been implicated in cases of colo-rectal cancer. [51]
• Although best known for damage to the urinary bladder and ureters, the female genitalia are involved in 50% to 70% of women with *S. haematobium* infection • resulting in vaginal deformities and fistulae [52] , hypogonadism, ectopic pregnancy [53-64] , miscarriage and malignancy. [65-68] *Schistosoma mansoni* is implicated in the etiology of appendicitis [69] [70] , and membranoproliferative glomerulonephritis and amyloidosis [71] ; and may also involve the fallopian tubes [72] [73] and uterine cervix [74] , or cause ovarian [75] or testicular granulomata with infertility [76-78] and acute abdomen associated with granulomatous peritonitis [79] or panniculitis. [80] In rare instances, the skin may be involved in *Schistosoma mansoni* infection [81] , and the prostate in *Schistosoma japonicum* infection. [82] Sporadic cases of bladder cancer associated with *Schistosoma mansoni* infection have been reported. [83]
• *Salmonella* bacteremia is often reported among persons with hepato-splenic schistosomiasis. [84-88]
• Concurrent chronic Hepatitis B infection enhances the deleterious effect of schistosomiasis on the liver. [89]

Schistosomiasis - mansoni in Zambia

Schistosoma mansoni is found throughout the country, including urban areas.

An estimated 2 million individuals in Zambia are infested by *Schistosoma* species. [90]

Prevalence surveys:
9.4% of HIV-positive patients (2005 publication) [91]
42.4% of rural inhabitants in Kaoma District, western Zambia (2014 publication) [92]
2.5% of schoolchildren, 12.5% of subsistence fishermen and 26.3% of commercial fishermen in the Lake Kariba region (2003 publication) [93]
1.5% of schoolchildren in Chitokoloki district, North Western Province (2012 publication) [94]
0.4% of schoolchildren in Lusaka (1988 to 1989) [95]
0.5% of schoolchildren in Chawama, Lusaka (2001) [96]
0.3% of pre-schoolchildren in Kafue District (2007) [97]

Seroprevalence surveys:
88% of outpatients in Kaoma, Western Province (2013 publication) [98]

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Schistosomiasis - mattheei

Agent	PARASITE - Platyhelminthes, Trematoda. Strigeida, Schistosomatidae: Schistosoma mattheei
Reservoir	Snail (Bulinus globosus) Sheep Goat Cattle Horse Wild mammal
Vector	None
Vehicle	Water (skin contact)
Incubation Period	2w - 6w
Diagnostic Tests	Identification of ova in stool or biopsy specimens. Serology. Antigen detection.
Typical Adult Therapy	Praziquantel 20 mg/kg PO BID X 1 day
Typical Pediatric Therapy	As for adult
Clinical Hints	Diarrhea (often bloody), abdominal pain, eosinophilia and hepatosplenomegaly; significant disease of liver, lung or central nervous system is rare.
Synonyms	Schistosoma bovis, Schistosoma mattheei. ICD9: 120.8 ICD10: B65.8

Clinical

WHO Case definition for surveillance (all forms of intestinal schistosomiasis):
Endemic areas (moderate or high prevalence)
• Suspected: A person with chronic or recurrent intestinal symptoms (blood in stool, bloody diarrhea, diarrhea, abdominal pains) or, at a later stage, hepatosplenomegaly.
• Probable: A person who meets the criteria for presumptive treatment, according to the locally applicable diagnostic algorithms.
• Confirmed: A person with eggs of *S. mansoni*, or *S. japonicum/mekongi* in stools (microscope).
Non-endemic areas and areas of low prevalence
• Suspected: A person with chronic or recurrent intestinal symptoms (blood in stool, bloody diarrhea, diarrhea, abdominal pains) or, at a later stage, hepatosplenomegaly.
• Probable: Not applicable.
• Confirmed: A person with eggs of *S. mansoni* or *S. japonicum* in stools (microscope). A person with positive reaction to immunoblot test.

The clinical features associated with various *Schistosoma* species infecting man are similar [1] , and will be discussed together.

Acute infection:
Within 24 hours of penetration by cercariae, the patient develops a pruritic papular skin rash known as swimmer's itch. [The more overt form of Cercarial dermatitis associated with avian schistosomes is discussed elsewhere in this module.]
• One to two months after exposure, an overt systemic illness known as Katayama fever (named for Katayama district, Hiroshima, Japan) begins, heralded by acute onset of fever, chills, diaphoresis, headache, and cough. [2]
• The liver, spleen, and lymph nodes are enlarged, and eosinophilia is present.
• Although deaths have been described at this point (notably in *S. japonicum* infection) these findings subside within a few weeks in most cases.

Chronic schistosomiasis:
The likelihood of progression to chronic schistosomiasis is related to the extent of infestation.
• Chronic schistosomiasis caused by *S. mansoni*, *S. japonicum*, or *S. mekongi* is characterized by fatigue, abdominal pain and intermittent diarrhea or dysentery.
• Colonic polyposis is has been associated with infection by *S. mansoni*, *S. japonicum*, and *S. intercalatum*. [3] Retroperitoneal fibrosis has been reported with *S. japonicum* infection. [4]
• Blood loss from intestinal ulcerations may lead to moderate anemia.
• In *S. mansoni*, *S. japonicum*, and *S. mekongi* infections, ova remain in the venous portal circulation and are carried to the liver where they produce granulomata and fibrosis [5] , and block portal blood flow.
• Portal hypertension and portosystemic collateral circulation result.

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• Although liver function tests remain normal for a long time, hepatosplenomegaly and variceal hemorrhage develop.
• The spleen is firm and may reach massive size.
• Fatal hematemesis is unusual.
• Laboratory tests reveal moderate eosinophilia and anemia related to blood loss and hypersplenism.
• Eventually, hepatic function deteriorates, with late ascites and jaundice.

In *S. haematobium* infection, ova are located in the bladder and ureters, leading to granuloma formation, inflammation, hematuria, ureteral obstruction, secondary infection and often carcinoma of the bladder. [6-9] Ova are also commonly present in the seminal vesicles and prostate [10] [11] , and rare instances of prostatic adenocarcinoma have been reported in such patients. [12]
• Areas of chronic inflammation, fibrous tissue and calcifications ("sandy patches") in the genital mucosa and bladder contain ova, and are considered pathognomonic for *S. haematobium* infection. [13] [14]
• Genital lesions may present a risk factor for acquisition of HIV infection [15] ; and schistosomal co-infection may accelerate HIV disease progression and facilitate viral transmission to sexual partners. [16]
• Terminal hematuria and dysuria are common symptoms.

S. intercalatum infection is characterized by abdominal pain and bloody diarrhea.

S. mekongi is an important cause of hepatomegaly in endemic areas.

Complications:
The following are some of the many complications described in chronic schistosomiasis.
• Pulmonary schistosomiasis is manifested by symptoms and signs of right ventricular congestion related to blockage of pulmonary capillaries by ova in the course of hepatosplenic schistosomiasis. [17-20]
• Central nervous system schistosomiasis is manifested as a cerebal mass, generalized encephalopathy, cerebral vasculitis with stroke, or focal epilepsy (notably in *S. japonicum* infection).
• Granulomata of *S. haematobium* and *S. mansoni* may involve the spinal cord (most commonly the cauda equina or conus medularis) , producing transverse myelitis. [21-34] Rare instances of cerebral infection by *S. haematobium* have been reported. [35] *Schistosoma mansoni* infection may occasionally involve the bladder, mimicking *S. haematobium* infection or malignancy. [36] *S. mansoni* infection has been implicated in cases of colo-rectal cancer. [37]
• Although best known for damage to the urinary bladder and ureters, the female genitalia are involved in 50% to 70% of women with *S. haematobium* infection • resulting in vaginal deformities and fistulae [38] , hypogonadism, ectopic pregnancy [39-50] , miscarriage and malignancy. [51-54] *Schistosoma mansoni* is implicated in the etiology of appendicitis [55] [56] , and membranoproliferative glomerulonephritis and amyloidosis [57] ; and may also involve the fallopian tubes [58] [59] and uterine cervix [60] , or cause ovarian [61] or testicular granulomata with infertility [62-64] and acute abdomen associated with granulomatous peritonitis [65] or panniculitis. [66] In rare instances, the skin may be involved in *Schistosoma mansoni* infection [67] , and the prostate in *Schistosoma japonicum* infection. [68] Sporadic cases of bladder cancer associated with *Schistosoma mansoni* infection have been reported. [69]
• *Salmonella* bacteremia is often reported among persons with hepato-splenic schistosomiasis. [70-74]
• Concurrent chronic Hepatitis B infection enhances the deleterious effect of schistosomiasis on the liver. [75]

Schistosomiasis - mattheei in Zambia

Both human and cattle infections are documented. [76-78]

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Septic arthritis

Agent	BACTERIUM or FUNGUS. Gram positive cocci most common; gram negative bacilli, gonococci, mycobacteria, fungi, et al
Reservoir	Human
Vector	None
Vehicle	Endogenous
Incubation Period	Variable
Diagnostic Tests	Smear and culture of joint fluid. Cytological and chemical analysis of joint fluid also useful.
Typical Adult Therapy	Antimicrobial agent(s) directed at known or likely pathogen
Typical Pediatric Therapy	As for adult
Clinical Hints	Fever (60% to 80%) associated with swelling, erythema and tenderness (usually single joint, most commonly a knee; elbow or ankle in child); mean fluid leukocyte count in acute bacterial forms = 50,000 / cu mm.
Synonyms	

Clinical

Most cases present with fever, malaise and local findings of warmth, swelling and decreased range of motion. [1] [2]
- Lack of erythema and local warmth are not uncommon.
- The most commonly involved joints are the knee and hip, followed by the shoulder and ankle. [3]
- Non-gonococcal arthritis is mono-articular in 80% to 90% of cases.
- Infection of the costochondral, sternoclavicular and sacroiliac joints is common in intravenous drug users.

Synovial fluid demonstrates low viscosity and turbidity.
- Leucocyte counts usually exceed 50,000 per cu mm.
- Note that leucocytosis, low glucose and high lactate levels are also encountered in some non-infectious forms of arthritis.
- Gram stains are positive in 50% of cases, and cultures in 90%.
- Unlike Lyme disease, septic arthritis is usually associated with leukocytosis and an erythrocyte sedimentation rate >= 40 mm / hour. [4]

Etiological associations:
- Adult below age 30: *Neisseria gonorrhoeae* (often monoarticular involving knee)
- Associated rash: Lyme disease, gonococcemia (often monoarticular, involving knee)
- Child below age 5 years: *Haemophilus influenzae*, *Staphylococcus aureus*, *Streptococcus* spp.
- Chronic arthritis: Tuberculosis, Mycobacteria • nontuberculous, Sporotrichosis and other fungi
- Hematogenous infection: *Staphylococcus aureus*, *Streptococcus pyogenes*
- Injecting drug user: *Pseudomonas aeruginosa* (often sternoclavicular or sacroiliac)
- Traumatic injury to joint: *Staphylococcus aureus*, Enterobacteriaceae, *Pseudomonas aeruginosa*

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Septicemia - bacterial

Agent	BACTERIUM. Escherichia coli, Staphylococcus aureus, facultative gram negative bacilli, et al
Reservoir	Human
Vector	None
Vehicle	Endogenous
Incubation Period	Variable
Diagnostic Tests	Culture of blood and sepsis source.
Typical Adult Therapy	Antimicrobial agent(s) directed at known or likely pathogen
Typical Pediatric Therapy	As for adult
Clinical Hints	Fever, rigors, leukocytosis, tachypnea, mental changes; hypotension, acidosis and bleeding diathesis herald septic shock; further signs (eg, urinary infection, phlebitis, etc) may point to the source of infection .
Synonyms	Sepsis, Septicaemia, Septicemia, Septicemie, Septikemie, Setticemia. ICD9: 036.2,036.3,038 ICD10: A40,A41

Clinical

Bacterial septicemia is defined as the presence of signs and symptoms related to bacteremia. [1]
• The clinical spectrum and severity of disease are largely determined by the infecting species, underlying diseases and source of infection.
• Most patients present with fever, tachycardia and leucocytosis, in addition to signs and symptoms referable to a primary infectious focus (eg, urinary tract, abdominal infection, endocarditis, etc).

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Shigellosis

Agent	BACTERIUM. Shigella sonnei, Shigella flexneri, Shigella boydii or Shigella dysenteriae A facultative gram-negative bacillus
Reservoir	Human Non-human primate
Vector	None
Vehicle	Fecal-oral Water Dairy products Fomite Fly Vegetables
Incubation Period	48h - 72h (range 7h - 1w)
Diagnostic Tests	Stool culture.
Typical Adult Therapy	Stool precautions. Choice of antimicrobial agent based on regional susceptibility patterns. Continue treatment for five days
Typical Pediatric Therapy	As for adult
Clinical Hints	Watery or bloody diarrhea, tenesmus, abdominal pain and headache; colonic hyperemia and abundant fecal leucocytes are present; usually resolves in 3 days (may persist for up to 14); case fatality rate = 1%.
Synonyms	Bacillaire dysenterie, Bacillary dysentery, Dissenteria batterica, Dysenteria bacillaris, Leptospirenerkrankung, Ruhr, Shigella, Shigellose, Shigelose, Ubertragbare Ruhr. ICD9: 004 ICD10: A03

Clinical

Acute infection:
Approximately 50% of infections are limited to transient fever or self-limited diarrhea.
• 50% of patients progress to bloody diarrhea and dysentery. [1]
• Fever may rise rapidly to 40 C, and febrile seizures are common in children.
• Seizures rarely recur or result in neurological sequelae.
• Dysentery is characterized by passage of 10 to 30 small-volume stools consisting of blood, mucus, and pus.
• Abdominal cramps and tenesmus are noted, and straining may lead to rectal prolapse, notably in young children. [2]
• On endoscopy, the colonic mucosa is hemorrhagic, with mucous discharge and focal ulcerations. Most lesions are in the distal colon.

Dysentery:
Dysentery may be simply defined as diarrhea containing blood.
• Although several organisms can cause dysentery, *Shigella* are the most important. *Shigella dysenteriae* type 1 (Sd1) [the Shiga bacillus], is the most virulent of the four serogroups of *Shigella*.
• Sd1 is the only cause of epidemic dysentery. In addition to bloody diarrhea,
• Sd1 infection is often associated with abdominal cramps, fever and proctalgia.
• Less frequent complications include sepsis, seizures, renal failure and the hemolytic uremic syndrome. [3]
• Approximately 5-15% of Sd1 cases are fatal.

Complications:
Patients with mild disease generally recover without specific therapy in two to seven days.
• Severe shigellosis can progress to toxic dilatation or perforation of the colon, which may be fatal.
• Mild dehydration is common, and protein-losing enteropathy can occur with severe disease.
• Complications are most commonly described in developing countries and are related both to the relative prevalence of *S. dysenteriae* type 1 and *S. flexneri*, and the poor nutritional state of the local populations.
• *Shigella* bacteremia is not uncommon, and is associated with increased mortality, particularly among infants below one year of age and persons with protein-energy malnutrition. [4-9]
• Hemolytic-uremic syndrome (HUS) may complicate shigellosis due to *S. dysenteriae* type 1, and usually develops toward the end of the first week of shigellosis. [10-12] The case-fatality rate in these cases is 36%. [13]
• Profound hyponatremia and hypoglycemia may occur.
• Other complications include encephalopathy [14], seizures, altered consciousness, and bizarre posturing, pneumonia [15], meningitis, vaginitis, keratoconjunctivitis [16], pneumonia and "rose spots."

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- Reiter's syndrome is seen in patients having histocompatibility antigen HLA-B27. [17] [18]
- Reactive arthritis follows 7% to 10% of *Shigella* infections. [19-22]

Shigellosis in Zambia

Prevalence surveys:

10.2% of diarrhea among children below age 5 years (Lusaka, 1992 to 1993) [23]

Notable outbreaks:

1995 - An outbreak of *Shigella dysenteriae* infection was reported. [24] [25]

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Sindbis

Agent	VIRUS - RNA. Togaviridae, Alphavirus: Sindbis virus
Reservoir	Wild bird
Vector	Mosquito (Culex univittatus and Cx. tritaeniorhyncus)
Vehicle	None
Incubation Period	3d - 6d
Diagnostic Tests	Viral culture (blood, vesicle fluid). Serology. Nucleic acid amplification. Biosafety level 2.
Typical Adult Therapy	Supportive
Typical Pediatric Therapy	As for adult
Clinical Hints	Fever, myalgia, arthritis and a papular-to-vesicular rash; arthralgias may persist for more than three years; fatality not reported.
Synonyms	Babanki, Whataroa. ICD9: 078.89 ICD10: A92.8

Clinical

Sindbis virus infection is a self-limited febrile illness associated with myalgia and diffuse papular or vesicular rash (typically of the plantar region). [1]
• Arthralgia is common, and may be severe.
• Fever and rash persist for 2 to 3 weeks; and arthralgias for months, or even years.
• No deaths have been reported.

Infection by a related agent, Babanki virus, is characterized by fever, rash and arthralgia.
Although Sindbis is not endemic to Zambia, imported, expatriate or other presentations of the disease have been associated with this country.

Sindbis in Zambia

Seroprevalence surveys:

0.1% of German aid workers returning from Zambia (a single worker, 1999 publication) [2]

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Sinusitis

Agent	BACTERIUM. Various (Haemophilus influenzae & Streptococcus pneumoniae in most acute cases)
Reservoir	Human
Vector	None
Vehicle	None
Incubation Period	Variable
Diagnostic Tests	Imaging techniques. Culture of sinus drainage.
Typical Adult Therapy	Amoxicillin/clavulanate 2000/125 mg BID X 7 days Drainage as indicated Alternatives: Levofloxacin, Cllindamycin, Cefuroxime, Cefdinir
Typical Pediatric Therapy	Amoxicillin/clavulanate 90/6.4 mg/kg BID X 7 days Drainage as indicated Alternatives: Cllindamycin, Cefuroxime, Cefdinir
Clinical Hints	Sinusitis often follows upper respiration infections; headache, fever and local tenderness are common, however the precise presentation varies with patient age and anatomic localization.
Synonyms	Acute sinusitis, Mastoidite, Mastoiditis, Rhinosinusitis, Sinusite. ICD9: 473.9,383.0,461 ICD10: H70,J01

Clinical

Acute community-acquired bacterial sinusitis is usually superimposed on preexisting viral sinusitis.
• In most cases, it is not possible to distinguish between viral and bacterial infections.
• Sneezing, nasal discharge and obstruction, facial pressure and headache are common in both conditions. [1]
• Fever of 38C or more, facial pain, and erythema occur may occasionally herald bacterial infections.
• The nasal discharge may be colored in both viral and bacterial sinusitis.
• Cough and hyposmia may also be present.

Sinusitis following dental infection is associated with molar pain and a foul breath odor.
• Sphenoid sinusitis is associated with severe frontal, temporal, or retroorbital headache that radiates to the occipital region; and hypesthesia or hyperesthesia of the ophthalmic or maxillary dermatomes of the fifth cranial nerve.
• Lethargy and findings suggestive of cavernous sinus or cortical vein thrombosis, orbital cellulitis or orbital abscess may also be present.
• In severe cases of frontal sinusitis, pus may collect under the periosteum of the frontal bone resulting in a "Pott puffy tumor."

Rare instances of toxic shock syndrome have followed sinusitis. [2]

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Smallpox

Agent	VIRUS - DNA. Poxviridae, Orthopoxvirus: Variola virus
Reservoir	Human
Vector	None
Vehicle	Contact Infected secretions Fomite
Incubation Period	7d - 17d
Diagnostic Tests	Culture and electron microscopy of skin lesions. Serology. Nucleic acid amplification. Biosafety level 3.
Typical Adult Therapy	Isolation Tecovirimat 400 to 600 mg PO once daily X 14 days Cidofovir is effective in vitro
Typical Pediatric Therapy	Isolation Pediatric dosage of Tecovirimat not established
Vaccine	Smallpox vaccine
Clinical Hints	Fever, myalgia, headache, pustular or hemorrhagic rash; disease resolves in 2 to 3 weeks; case-fatality rate = 25% for severe form (variola major) and 1% for minor form; last naturally-acquired case reported in Somalia in 1977.
Synonyms	Alastrim, Eczema vaccinatum, Kopper, Smallpox, Vailo, Variola, Variola minor, Varioloid. ICD9: 050 ICD10: B03

Clinical

Acute infection: [1] [2]
12 to 14 days after exposure (range 7 to 17 days), the patient experiences a 2 to 3 day prodrome of high fever, malaise, prostration and severe headache and backache.
• This "preeruptive stage" is followed by the appearance of a maculopapular rash (i.e., eruptive stage) that progresses to papules within one to two days.
• Vesicles appear on the fourth or fifth day; pustules by the seventh day; and scab lesions on the fourteenth day.
• The rash first appears on the oral mucosa, face, and forearms; and then spreads to the trunk and legs. [3]
• The palms and soles may also be involved.
• Skin lesions are deeply embedded in the dermis and feel like firm round objects in the skin.
• As the lesions heal, the scabs separate and pitted scarring gradually develops.
• Patients are most infectious during the first week of the rash when the oral mucosa lesions ulcerate and release large amounts of virus into the saliva.
• A patient is no longer infectious after all scabs have separated (3 to 4 weeks after the onset of the rash).
• Rare instances of bone involvement (osteomyelitis variolosa) are described. [4-6]
• During the smallpox era, overall mortality rates were approximately 30%.

Other less common but more severe forms of smallpox include
• a) flat-type smallpox (mortality rate over 96%) characterized by severe toxemia and flat, velvety, confluent lesions that did not progress to the pustular stage or scaring
• b) hemorrhagic smallpox, characterized by severe prodromal symptoms, toxemia, and a hemorrhagic rash.

Hemorrhagic smallpox is uniformly fatal and occur among all ages and in both sexes, but pregnant women appear to be unusually susceptible. [7] [8]
• Illness usually begins with a somewhat shorter incubation period and is characterized by high fever and pain in the head, back, and abdomen.
• Soon thereafter, a dusky erythema develops, followed by petechiae and frank hemorrhages into the skin and mucous membranes.
• Death usually occurs by the fifth or sixth day after onset of rash.

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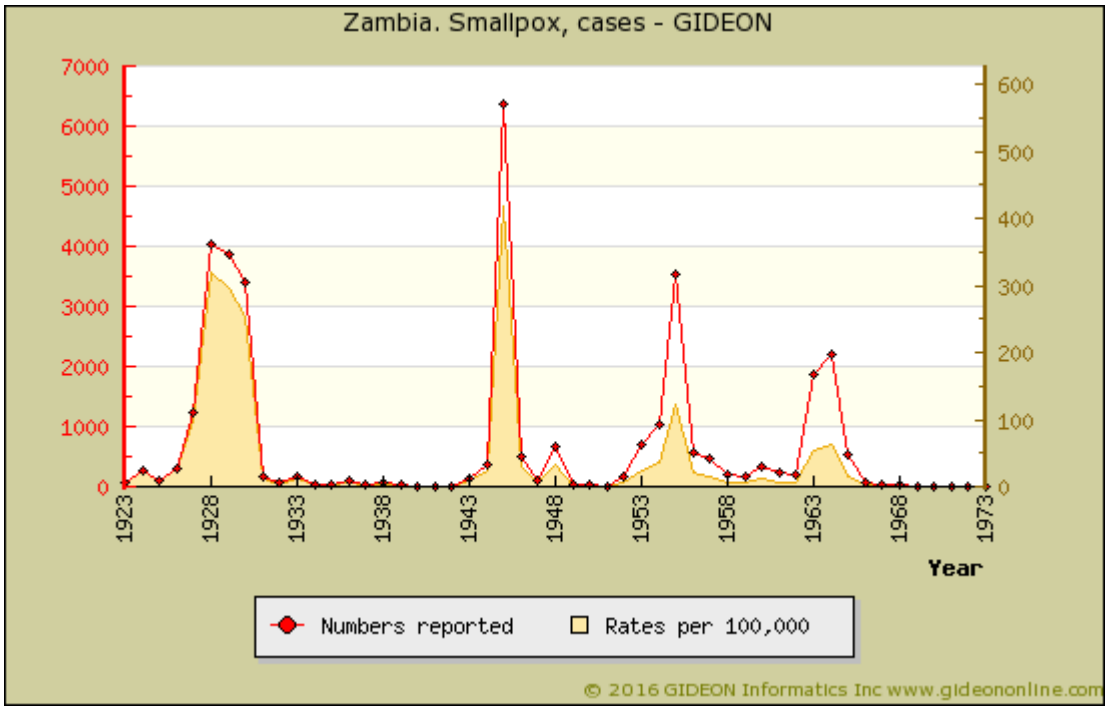
Variola minor is generally less severe, with fewer constitutional symptoms and a more sparse rash.
• A milder form of disease is also seen among those who have residual immunity from previous vaccination.
• In partially immune persons, the rash tends to be atypical and more scant and the evolution of the lesions more rapid.

Disseminated herpes simplex in patients with eczema (Eczema herpeticum) may resemble smallpox. [9]

Not currently endemic to any country. Although Smallpox is not endemic to Zambia, imported, expatriate or other presentations of the disease have been associated with this country.

Smallpox in Zambia



Graph: Zambia. Smallpox, cases

Notes:
1. Cases reported in 1970 were imported from Zaire

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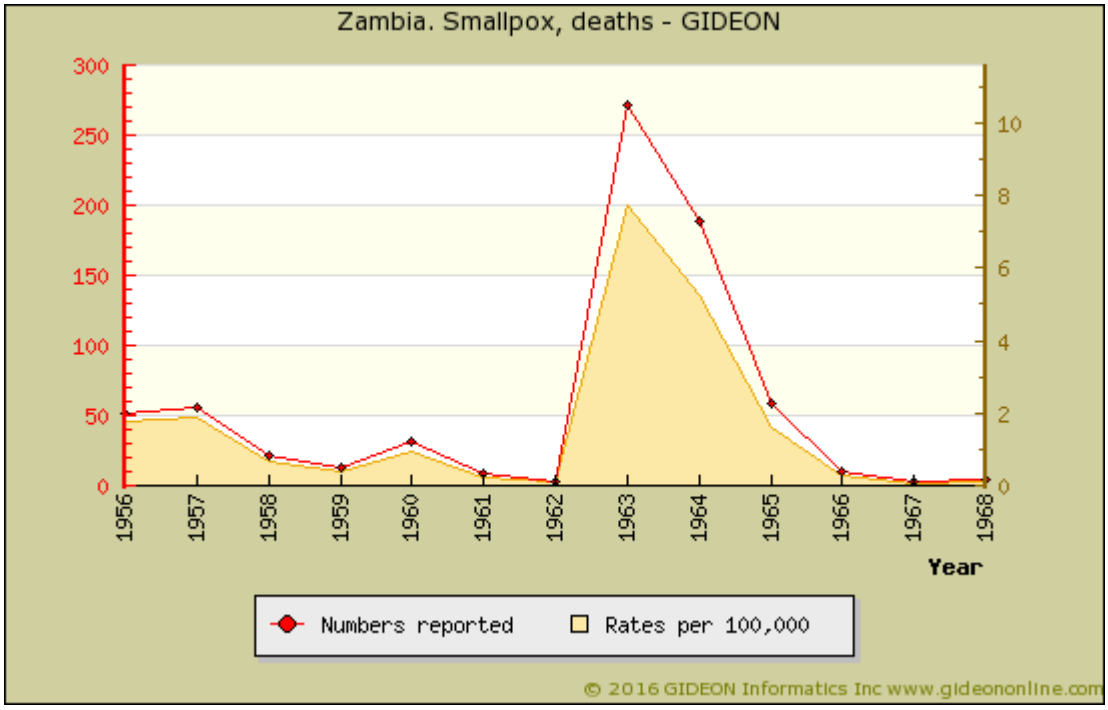

Graph: Zambia. Smallpox, deaths

Notes:
1. 321 fatal cases were reported during 1930 to 1933.

Indigenous transmission ended in 1968.

Importations from Zaire were reported in 1970.

Notable outbreaks:

1964 (publication year) - An outbreak of smallpox was reported in Mpulungu. [10]

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Sporotrichosis

Agent	FUNGUS. Ascomycota, Euascomycetes, Ophiostomatales: Sporothrix schenckii, S. brasiliensis and S. globosa A dimorphic dematiaceous fungus
Reservoir	Soil Vegetation Wood
Vector	None
Vehicle	Trauma Contact Air (rare)
Incubation Period	1w - 3m
Diagnostic Tests	Fungal culture. Serologic tests available in some centers.
Typical Adult Therapy	Itraconazole 100 to 200 mg PO daily X 3 to 6 months. OR Fluconazole 400 mg PO daily X 6 months. OR Potassium iodide 1 to 5 ml PO TID X 3 to 6 months
Typical Pediatric Therapy	Itraconazole 2 mg/kg PO daily X 3 to 6 months. OR Fluconazole 3 mg/kg PO daily X 6 months.
Clinical Hints	Draining nodules which follow lymphatics; acquired from contact with flowers, thorns, trees or other plant material; eye, brain, testis, bone and other tissues may be involved.
Synonyms	Schenck's disease, Sporothrix brasiliensis, Sporothrix chiensis, Sporothrix globosa, Sporothrix mexicana, Sporothrix schenckii, Sporotrichose. ICD9: 117.1 ICD10: B42

Clinical

Clinical forms of sporotrichosis:

Cutaneous sporotrichosis begins as a painless erythematous papule which enlarges and suppurates, without systemic symptoms. [1] [2]
- Multiple lesions may spread along lymphatic channels. [3]
- Occasionally only a single lesion appears, which may persist for decades.
- Bilateral infection may occur. [4]
- Hematogenous infection of multiple skin sites has also been described, notably among immuno-suppressed patients. [5-7]
- In some cases, ulcers appear on multiple body sites. [8]

Infection associated by *Sporothrix brasiliensis* may be associated with disseminated cutaneous infection without underlying disease, hypersensitivity reactions, and mucosal involvement. [9]

Nodular lymphadenitis is also seen in *Nocardia brasiliensis* infection, tularemia, *Mycobacterium marinum* infection, chromomycosis [10] and infections caused by *Leishmania panamensis/guyanensis* [11] [12]
- Lesions of sporotrichosis may rarely mimic those of pyoderma gangrenosum [13], melanoma [14] or keratoacanthoma. [15-17]

Pulmonary sporotrichosis characteristically presents as a single upper lobe cavity associated with cough and low-grade fever. [18]
- Multifocal lung lesions have also been reported. [19]
- 86 cases of pulmonary sporotrichosis were reported in the world's literature during 1960 to 2010. [20] Extrapulmonary multifocal disease involved the joints in 45.4%.

Osteoarticular sporotrichosis is characterized by infection of a single bone or large peripheral joint [21] [22] • hip and shoulder involvement is not encountered. [23-27]
- Most patients are afebrile when first seen.
- Occasionally, the infection presents as tenosynovitis, usually of the wrist or ankle.

Other forms include infection of the eyelids [28] or conjunctivae [29] [30], dacryocystitis [31-34], hematogenous endophthalmitis, brain abscess, soft tissue mass [35], meningitis [36], orchitis, etc. [37]

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Spotted fevers - Old World

Agent	BACTERIUM. Rickettsia conorii subsp. Conorii, R. aeschlimannii, R. helvetica, R. massiliae, R. monacensis, R. slovaka
Reservoir	Dog Rodent Tick
Vector	Tick (Rhipicephalus sanguineus)
Vehicle	None
Incubation Period	6d - 7d (range 3d - 18d)
Diagnostic Tests	Serology. Demonstration of rickettsiae by immunofluorescence or culture. Nucleic acid amplification.
Typical Adult Therapy	Doxycycline 100 mg PO BID X 3 to 5d. OR Chloramphenicol 500 mg PO QID X 3 to 5d
Typical Pediatric Therapy	Doxycycline 2 mg/kg PO BID X 3 to 5d (maximum 200 mg/day). OR Chloramphenicol 10 mg/kg PO QID X 3 to 5d
Clinical Hints	Headache, myalgia, maculopapular rash; an eschar may be identifiable; patient may recall tick bite or dog contact during the preceding 1 to 3 weeks; untreated disease resolves within two weeks; case-fatality rates of 2% to 3% are reported.
Synonyms	Boutonneuse fever, Candidatus Rickettsia kellyi, DEBONEL, Febre escaro-nodular, Febre escaronodular, Indian tick typhus, Kenya tick typhus, Marseilles fever, Mediterranean spotted fever, R. aeschlimannii, Rickettsia aeschlimannii, Rickettsia conorii subsp conorii, Rickettsia conorii subsp indica, Rickettsia helvetica, Rickettsia massiliae, Rickettsia monacensis, Rickettsia raoultii, Rickettsia slovaca, Thai spotted fever, TIBOLA, Tick-borne lymphadenopathy. ICD9: 082.1 ICD10: A77.1

Clinical

The clinical features of Mediterranean spotted fever (MSM) are similar to those of Rocky Mountain spotted fever (q.v.); however, an eschar ("tache noire") and diffuse distribution of the rash characterize MSM. [1] [2]
• Hepatomegaly, elevation of serum transaminase levels and splenomegaly are common. [3]
• Complications may include meningitis with CSF pleocytosis (either lymphocytic or polymorphonuclear) [4] , encephalitis [5-7] , hearing loss [8] , renal failure [9] , myocarditis [10] , coronary artery ectasia [11] , severe respiratory distress syndrome [12] , acute pancreatitis [13] , bleeding diatheses, splenic rupture [14] , acral gangrene [15] , hemophagocytic syndrome [16] [17] , rhabdomyolysis [18] and retinitis. [19] [20]
• There is evidence that Israeli spotted fever is more virulent than Mediterranean spotted fever. [21]

Spotted fever in India differs from the Mediterranean form in that the rash is often purpuric, and an inoculation eschar at the bite site is rarely found. [22]
• The clinical course is mild to moderately severe.
• Hepatitis has been reported in cases of Indian tick typhus. [23]
• A case of Indian tick typhus with gangrene of all toes has been reported. [24]

A syndrome of Dermacentor-borne necrosis with erythema and painful lymphadenopathy (DEBONEL) described in Spain has been ascribed to possible infection by *Rickettsia slovaca*. [25] [26]
• This syndrome appears to be identical to Tick-borne lymphadenopathy (TIBOLA), reported in Hungary. [27]
• Clinical features may include fever, dermal eschar, lymphadenopathy, facial edema, rash, headache, asthenia and alopecia. Acute myopericarditis has also been reported. [28]
• Rarely, tularemia presenting with scalp eschar and cervical lymphadenopathy may suggest infection by *Rickettsia slovaca*, *Rickettsia raoultii* or *Bartonella henselae* [29]

Rickettsia helvetica has been implicated in cases of mild flu-like illness (myalgia, arthralgia, headache, conjunctivitis) without rash, in Denmark, Italy, France and Thailand; and in myocarditis reported from Sweden. [30]

Rickettsia massiliae infection may present with dermal eschar and regional lymphadenopathy. [31]

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Rickettsia monacensis infection has been associated with headache, joint pain, a nonpruritic, disseminated maculopapular rash of the trunk and lower extremities, including palms and soles.
• An inoculation site eschar is not reported.

Spotted fevers - Old World in Zambia

A British tourist developed spotted fever (type not established) after returning from a trip to Kenya and Zambia (2008 publication). [32]

Seroprevalence surveys:

16.7% of the population - 23.1% in the East and 3.0% in the North (1989) [33]

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Staphylococcal food poisoning

Agent	BACTERIUM. Staphylococcus aureus exotoxins
Reservoir	Human (nares, hands) Occasionally cattle (udder), dog/cat (nasopharyngeal)
Vector	None
Vehicle	Food (creams, gravies, sauces)
Incubation Period	2h - 4h (range 30 min - 9h)
Diagnostic Tests	Identification of bacterium in food.
Typical Adult Therapy	Supportive
Typical Pediatric Therapy	As for adult
Clinical Hints	'Explosive" diarrhea and vomiting; usually no fever; no fecal leucocytes; onset 1 to 6 hours after food; resolves within 1 to 2 days; fatality is rare.
Synonyms	Staphylococcus aureus food poisoning. ICD9: 005.0 ICD10: A05.0

Clinical

Usually symptoms start within several hours of ingestion of potentially contaminated foods
• Illness is heralded by nausea, vomiting and intestinal cramping, followed by urgency and profuse watery non-bloody diarrhea.
• Symptoms resolve within 12 to 24 hours.
• Multiple family members or patrons of the same eating establishment may be affected.
• The presence of both explosive diarrhea and vomiting, lack of fever and short incubation period are helpful in distinguishing this entity from other forms of food poisoning.

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Staphylococcal scalded skin syndrome

Agent	BACTERIUM. Staphylococcus aureus phage group 2 A facultative gram-positive coccus
Reservoir	Human
Vector	None
Vehicle	Direct contact; infected secretions
Incubation Period	1d - 4d
Diagnostic Tests	Typical clinical features; Recovery of S. aureus from localized wound or blood ; skin biopsy may be helpful
Typical Adult Therapy	Fluid replacement (as for burn) ; Intravenous Nafcillin or Oxacillin, in addition to application of anti-staphylococcal drug to local source infection; Vancomycin if MRSA
Typical Pediatric Therapy	Fluid replacement (as for thermal burn) ; Intravenous Nafcillin or Oxacillin, in addition to application of anti-staphylococcal drug to local source infection; Vancomycin if MRSA
Clinical Hints	Acute, generalized exfoliative dermatitis which occurs primarily in infants and young children; a pre-existing localized skin infection is present in most - but not all - cases.
Synonyms	Lyell disease, Ritter disease, Ritter von Ritterschein disease, Scalded skin syndrome, SSSS. ICD9: 695.81 ICD10: L00

Clinical

Staphylococcal scalded skin syndrome (SSSS) is characterized by diffuse erythematous cellulitis followed by extensive skin exfoliation. [1] [2]

- Generalized erythema and then bulla formation with separation of the skin at the granular cell layer. [3] [4]
- A warm, "sandpaper" erythema with accentuation in the flexor creases may mimic scarlet fever; while the presence of flaccid bullae and Nikolsky sign may suggest pemphigus. [5]
- Skin biopsy can be used to differential SSSS from Toxic epidermal necrolysis. [6]
- Facial edema and perioral crusting are often present.

Dehydration may indicate fluid loss (as in thermal burns)

- Complete recovery occurs in most cases, within one to two weeks. [7]
- The case-fatality rate in uncomplicated SSSS is less than 2%.
- Rare instances of recurrence have been reported [8]
- Staphylococcal septicemia complicates SSSS in a minority of cases.

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Streptococcus suis infection

Agent	BACTERIUM. Streptococcus suis I and Streptococcus suis II A facultative gram-positive coccus
Reservoir	Pig
Vector	None
Vehicle	Air Secretions Meat Local wounds Contact
Incubation Period	Unknown. Probably hours to few days
Diagnostic Tests	Culture of blood, tissue, body fluids
Typical Adult Therapy	Systemic antibiotic. Usually susceptible in vitro to Penicillin, Amoxicillin, Chloramphenicol and Gentamicin
Typical Pediatric Therapy	Systemic antibiotic
Clinical Hints	Severe multisystem disease, hemorrhagic diatheses, deafness or meningitis appearing hours to a few days after contact with pigs or pig products.
Synonyms	Streptococcus suis. ICD9: 027.8 ICD10: A48.8

Clinical

Demography:
Virtually all patients have been farmers and butchers, of whom 80 percent were men.
• Most had been involved in butchering sick pigs or selling the pork.
• Over 40 percent of the patients were in the age group 50 to 60 years, and none were children. [1]

Signs and symptoms:

• Clinical features of *Streptococcus suis* II infection include high fever, malaise, nausea and vomiting • followed by meningitis, subcutaneous hemorrhage, multi-organ failure (hepatic, renal, pulmonary, cardiac) and coma in severe cases. [2] [3]
• Toxic shock syndrome is common. [4-9]
• Sensorineural hearing loss is often present. [10-12]
• Peritonitis [13], endocarditis [14-16], mycotic aortic aneurysm [17], rhabdomyolysis [18], spondylodiscitis [19], salcroiliitis [20], monoarthritis [21-24], prosthetic joint infection [25], endophthalmitis [26] and cranial nerve palsy [27] have been reported. [28]
• Persons with occupational exposure may exhibit asymptomatic seropositivity toward *S. suis*. [29]
• Relapses of meningitis may occur. [30]

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Strongyloidiasis

Agent	PARASITE - Nematoda. Secernentea: Strongyloides stercoralis (Strongyloides fulleborni is occasionally implicated in systemic disease)
Reservoir	Human ? Dog Monkey (for Strongyloides fulleborni)
Vector	None
Vehicle	Skin contact Soil Feces Autoinfection Sexual contact (rare)
Incubation Period	14d - 30d
Diagnostic Tests	Identification of larvae (or ova, for Strongyloides fulleborni) in stool or duodenal aspirate. Serology.
Typical Adult Therapy	Ivermectin 200 micrograms/kg/d PO daily X 2d OR Thiabendazole 25 mg/kg BID (max 3g) X 2d OR Albendazole 400 mg/d X 3d (7 days for hyperinfection syndrome)
Typical Pediatric Therapy	Ivermectin 200 micrograms/kg/d PO daily X 2d OR Thiabendazole 25 mg/kg BID (max 3g) X 2d. OR Albendazole 200 mg/d X 3d (7 days for hyperinfection syndrome)
Clinical Hints	Diarrhea, gluteal or perineal pruritus and rash; eosinophilia often present; widespread dissemination encountered among immune-suppressed patients because of uncontrolled autoinfection (case-fatality rate for this complication = 80%).
Synonyms	Anguilluliasis, Anguillulosis, Cochin China gastroenteritis, Diploscapter, Halicephalobus, Larva currens, Leptodera intestinals, Leptodera stercoralis, Micronema, Pseudo-rhabdis stercoralis, Rhabditis stercoralis, Rhabdonema intestinale, Rhabdonema stercoralis, Strongyloides fulleborni, Strongyloides stercoralis, Strongyloidose, Threadworm, Turbatrix. ICD9: 127.2 ICD10: B78

Clinical

Strongyloidiasis may present as long as 75 years following initial acquisition of the parasite. [1]

Gastrointestinal strongyloidiasis:
The symptoms of strongyloidiasis reflect invasion of the skin, larval migration of larvae intestinal penetration.
• Approximately one third of patients are asymptomatic.
• Dermal and pulmonary symptoms resemble those of hookworm [2] , pruritic papular or linear urticarial rash (larva currens [3] [4]) and a Loeffler-like syndrome.
• Intestinal penetration is characterized by abdominal pain, mucous diarrhea and eosinophilia. [5]
• Vomiting, weight loss, protein-losing enteropathy and inappropriate ADH excretion [6] are occasionally encountered.
• Rare instances of hematemesis [7] and intestinal obstruction have been reported. [8] [9]
• Yellowish mucosal nodules are seen on colonoscopy, predominantly in the ascending colon. [10]
• Findings in colonic infection may mimic those of ulcerative colitis. [11]

Generalized strongyloidiasis:
5 to 22% of patients develop a generalized or localized urticarial rash beginning in the anal region and extending to the buttocks, abdomen, and thighs.
• Extraintestinal infection may involve a wide variety of organs. [12-18]
• Autoinfection is characterized by massive larval invasion of the lungs and other organs.
• Massive systemic strongyloidiasis occurs in patients with lymphoma, leukemia and AIDS; and during high-dose therapy with corticosteroids. [19] Rare instances of disseminated disease are reported in immune-competent individuals. [20-22]
• Findings include generalized abdominal pain, concurrent gram-negative bacillary septicemia (55% of cases) [23] , bilateral diffuse pulmonary infiltrates and ileus.
• Patients with HTLV-1 infection are at risk for recurrent meningitis associated with chronic strongyloidiasis. [24]
• Cases of fulminant gastrointestinal hemorrhage [25] and inappropriate ADH secretion have been reported. [26]
• Hyperinfection may mimic acute exacerbation of COPD [27]
• Eosinophilia may be present or absent at this stage; and rare instances of eosinophilic endocarditis [28] , eosinophilic ascites [29] and eosinophilic meningitis have been reported. [30]

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• An outbreak of hyperinfection strongyloidiasis has been reported among immune-suppressed renal transplant recipients. [31]
• *Strongyloides stercoralis* is the only helminth responsible for disseminated infection in immunocompromised patients. [32]

Strongyloides fulleborni infection is usually asymptomatic.

Strongyloides fulleborni kellyi infection [33] is most common among infants, and consist of abdominal distention, mild diarrhea and protein-losing enteropathy.
• Respiratory distress may occur, and is associated with a characteristic high-pitched cry.

Halicephalobus (Micronema) deletrix has been associated with five human infections • all fatal • and characterized by meningoencephalitis, with or without visceral involvement. [34] [35]

Strongyloidiasis in Zambia

Prevalence surveys:

1.1% of schoolchildren in Southern Province (2005 publication) [36]
2.2% of AIDS patients with diarrhea (1992 publication) [37]
6.8% of HIV-positive patients (2005 publication) [38]

Strongyloides fulleborni infection is also reported. [39] [40]

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Subdural empyema

Agent	BACTERIUM. Haemophilus influenzae, oral anaerobes, streptococci, et al
Reservoir	Human
Vector	None
Vehicle	Endogenous
Incubation Period	Variable
Diagnostic Tests	Imaging techniques (CT scan, etc).
Typical Adult Therapy	Antimicrobial agent(s) directed at known or likely pathogen
Typical Pediatric Therapy	As for adult
Clinical Hints	Fever, severe headache, vomiting, and signs of meningeal irritation and increased cerebrospinal fluid pressure; may follow head trauma, meningitis, otitis or sinusitis; case-fatality rate 15% (alert) to 60% (comatose).
Synonyms	

Clinical

Most patients present with headache, meningismus, decreased mental status and hemiparesis. [1]
• 32 cases of suppurative parotitis in neonates were reported during 1970 to 2004. [2]
• In 60 to 90% of cases, sinusitis or otitis is present.
• Extension of the infection into the subdural space is heralded by fever, focal and later generalized headache, vomiting, and meningismus. [3]
• 50% of patients exhibit altered mental function.
• Focal neurological signs appear within 24 to 48 hours, and rapidly progress to hemispheric dysfunction with hemiparesis and hemisensory deficit.
• Seizures, usually focal, occur in 50% of cases, and papilledema in less than 50%.
• Signs of increased intracranial pressure appear, leading to cerebral herniation and death.
• Chronic and even sterile subdural collections are also encountered, often following antibiotic therapy.

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Suppurative parotitis

Agent	BACTERIUM. Most commonly Staphylococcus aureus
Reservoir	Human
Vector	None
Vehicle	Endogenous
Incubation Period	Unknown
Diagnostic Tests	Clinical features (local swelling and purulent discharge from salivary ducts). Stain and culture of discharge.
Typical Adult Therapy	Surgical drainage and aggressive parenteral antistaphylococcal therapy
Typical Pediatric Therapy	As for adult
Clinical Hints	Consider when confronted by unexplained fever in the setting of malnutrition, dehydration and obtundation; local swelling and discharge of pus from salivary duct are diagnostic.
Synonyms	Parotitis, bacterial. ICD9: 527.2 ICD10: K11.3

Clinical

Suppurative parotitis is characterized by the sudden onset of firm, erythematous swelling of the pre• and post auricular areas, extending to the angle of the mandible. [1]
• Marked pain and tenderness is accompanied by high fever, chills and marked toxicity.
• Pus may be seen exiting from the parotid duct.
• Progression of the disease can result in massive swelling of the neck, respiratory obstruction, septicemia, facial nerve palsy [2], fistula formation [3] [4] and osteomyelitis of the adjacent facial bones.
• The condition should be suspected in any patient with unexplained or prolonged fever.

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Syphilis

Agent	BACTERIUM. Treponema pallidum subsp. pallidum A microaerophilic gram-negative spirochete
Reservoir	Human
Vector	None
Vehicle	Sexual contact Infected secretions
Incubation Period	2w - 4w (range 10d - >8w)
Diagnostic Tests	Dark field microscopy (chancre). VDRL confirmed by antitreponemal test (FTA, MHTP). Nucleic acid amplification.
Typical Adult Therapy	Primary, secondary or early (< 1 year) latent: Benzathine Penicillin G 2.4 million units IM Other stages: Repeat dosage at one and two weeks Alternatives: Tetracycline, Ceftriaxone
Typical Pediatric Therapy	Primary, secondary or early (< 1 year) latent: Benzathine Penicillin G : Weight <14 kg: 600,000u IM Weight 14 to 28 kg: 1,200,000u IM Other stages: Repeat dosage at one and two weeks
Clinical Hints	Firm, painless chancre (primary syphilis); later fever, papulosquamous rash and multisystem infection (secondary syphilis); late lesions of brain, aorta, bone or other organs (tertiary syphilis).
Synonyms	Canton rash, Chinese ulcer, Christian disease, French disease, German sickness, Harde sjanker, Lues, Neopolitan itch, Polish sickness, Sifilide, Sifilis, Spanish pockes, Syfilis, Treponema pallidum. ICD9: 090,091,092,093,094,095,096,097 ICD10: A50,A51,A52,A53

Clinical

WHO Case definition for surveillance:
The signs and symptoms of syphilis are multiple.
• The primary stage usually, but not necessarily, involves ulceration of the external genital organs and local lymphadenopathy; secondary and tertiary syphilis show mainly dermatological and systemic manifestations. For surveillance purposes, only confirmed cases will be considered.
Confirmed case
• A person with a confirmed positive serology for syphilis (Rapid Plasma Reagin (RPR) or VDRL confirmed by TPHA (*Treponema pallidum* hemagglutination antibodies) or FTA (fluorescent treponemal antibody absorption).
Case classification
• Congenital syphilis: An infant with a positive serology, whether or not the mother had a positive serology during pregnancy.
• Acquired syphilis: All others.
Additional notes:
• The prevalence rate among pregnant women in developing countries varies between 3% and 19%. Maternal syphilis is associated with congenital syphilis (one third of births from such pregnancies), and with spontaneous abortion and stillbirth. [1]
• Because the primary lesion is often painless and secondary syphilis is usually not diagnosed, women are mainly identified through serological screening.

Syphilis is a chronic disease with a waxing and waning course; and is reported from all countries.
• Transmission is mainly by sexual contact.
• Primary, secondary, and early latent syphilis are potentially infectious.
• *Treponema pallidum* has been identified in the blood of 34.5% of patients with early syphilis. [2]

Stages of syphilis:
• Primary syphilis is characterized by a painless chancre at the site of inoculation. [3] Penile swelling without an overt chancre

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has also been reported. [4]
• The secondary stage is characterized by a generalized (rarely localized [5] non-pruritic polymorphic [6-8], pustular [9] or papulonecrotic [10] rash , lymphadenopathy, and systemic manifestations. [11-16] Moist flat genital or mucosal lesions (condyloma lata) [17] [18] or granulomatous dermatitis [19] may be evident.
• An asymptomatic latent period follows, which for epidemiological purposes is divided into early (<1 year) and late (>1 year) stages.
• The tertiary stage is the most destructive and is marked by cardiovascular [20] and neurological sequelae [21-26], and gummatous involvement of any organ system. [27-32]
• As of 2009, the world's literature contained 165 reports of cerebral syphilitic gummata • 64% in men and 66% located on the cerebral convexities. [33]
• Syphilitic uveitis may present in the absence or other clinical manifestations of syphilis. [34-36] Acute posterior placoid chorioretinitis is also encountered. [37-39] 143 cases of syphilitic uveitis were reported in the English Language literature during 1984 to 2008. [40]

The clinical features of congenital infection are similar to those of secondary syphilis, and may be associated with deformation of teeth, bones and other structures. [41]

Acquired syphilis in patients with HIV infection is characterized by severe and accelerated infection, often with overt meningitis, hepatitis [42], lues maligna (a florid papulopustular rash) [43] and other forms of systemic involvement. [44-56]
• The presence of concurrent syphilis does not affect the progression of AIDS. [57]

Syphilis in Zambia

Prevalence surveys:

11.5% of genital ulcers (2012 publication) [58]

Seroprevalence surveys:

12.8% of pregnant women (1985 to 1987) [59]
14.3% of pregnant women (1982 publication) [60]
2.7% of pregnant women in Kalomo District (2015 publication) [61]
2.8% of pregnant women in Kalomo District (2014 publication) [62]
54% of mothers of still-born babies and 29% of mothers of live-born babies (1979 to 1980) [63]
9.8% of urban / 2.8% of rural pregnant women ages 15 to 49 years, in 1994; 7.5% / 3.2% in 2008 [64]
4.1% of baseline and 9.2% of intervention-program pregnant women (2012 publication) [65]

The rate of disease among at risk women in South Africa (Durban and Hlabisa), Tanzania (Moshi) and Zambia (Lusaka) was estimated at 7.5 per 100 person-years at risk (2003 to 2004). [66]

An estimated 9,072 pregnant women with active syphilis were living in Zambia in 2012. [67]

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Taeniasis

Agent	PARASITE - Platyhelminthes, Cestoda. Cyclophyllidea, Taeniidae: Taenia solium & T. saginata (other species occasionally encountered)
Reservoir	Cattle Pig
Vector	None
Vehicle	Meat
Incubation Period	6w - 14w
Diagnostic Tests	Identification of ova or proglottids in feces.
Typical Adult Therapy	Praziquantel 10 mg/kg PO as single dose OR Niclosamide 2 g PO once
Typical Pediatric Therapy	Praziquantel 10 mg/kg PO as single dose OR Niclosamide 50 mg/kg PO once
Clinical Hints	Vomiting and weight loss; often symptomatic or first appreciated due to passage of proglottids or "tape" segments; parasite may survive for over 25 years in the human intestine.
Synonyms	Bandwurmer [Taenia], Drepanidotaenia, Gordiid worm, Hair snake, Mesocestoides, Raillietina, Taenia asiatica, Taenia longihamatus, Taenia saginata, Taenia saginata asiatica, Taenia solium, Taenia taeniaformis, Taeniarhynchiasis, Tapeworm (pork or beef), Tenia. ICD9: 123.0,123.2 ICD10: B68

Clinical

Most cases of *Taenia* infestation are subclinical.

Symptomatic taeniasis may be associated with nausea, vomiting, epigastric fullness, weight loss or diarrhea. [1]
• *Taenia saginata* often becomes apparent when motile proglottids are passed through the anus; however, this is uncommon with *T. solium* infestations.
• Eosinophilia is not a prominent finding.
• Rare complications include appendicitis [2] [3], cholangitis [4], cholecystitis [5], pancreatitis or intestinal obstruction. [6]
• The major complication of *T. solium* infection, Cysticercosis, is discussed separately in this module.

Taeniasis in Zambia

Prevalence surveys:

6.3% of individuals in eastern Zambia (2012 publication) [7]
11.9% of individuals in Eastern Province (antigenemia, 2013 publication) [8]
14.8% of persons with epilepsy, in Eastern Province (antigenemia, 2015 publication) [9]
1.6% of schoolchildren in Chawama, Lusaka (2001) [10]
0.9% of pre-schoolchildren in Kafue District (2007) [11]
1.4% of HIV-positive patients (2005 publication) [12]

6.1% of adult cattle were seropositive for *T. saginata* cysticercosis. [13]
- 13.5% of pigs in Katete District were seropositive for *T. solium* cysticercosis (2015 publication) [14]
- 20.6% to 56.6% of pigs in slaughterhouses were infested. [15] [16]
- 10.8% of free-range pigs (on tongue examination) in selected districts of Eastern, Southern and Western Zambia; 23.3% were seropositive for *Taenia solium*. (2007 publication) [17]

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Tetanus

Agent	BACTERIUM. Clostridium tetani An anaerobic gram-positive bacillus
Reservoir	Animal feces Soil
Vector	None
Vehicle	Injury
Incubation Period	6d - 8d (range 1d - 90d)
Diagnostic Tests	Isolation of C. tetani from wound is rarely helpful. Serology (specimen taken before administration of antitoxin).
Typical Adult Therapy	Human antitoxin (see Vaccine module). Metronidazole (2 g daily) or Penicillin G (24 million u daily) or Doxycycline (200 mg daily). Diazepam (30 to 240 mg daily). Tracheostomy, hyperalimentation
Typical Pediatric Therapy	Human antitoxin (see Vaccine module). Metronidazole (30 mg/kg daily); or Penicillin G (300,000 units/kilo daily). Diazepam. Tracheostomy, hyperalimentation
Vaccines	DT vaccine DTaP vaccine DTP vaccine Td vaccine Tetanus immune globulin Tetanus vaccine
Clinical Hints	Trismus, facial spasm, opisthotonus, tachycardia and recurrent tonic spasms of skeletal muscle; sensorium is clear; disease may persist for 4 to 6 weeks; case fatality rate = 10% to 40%.
Synonyms	Lockjaw, Starrkrampf, Stelkramp, Tetano, Tetanos. ICD9: 037,771.3 ICD10: A33,A34,A35

Clinical

Tetanus may present in any of four clinical forms: generalized, localized, cephalic, and neonatal. [1]
• In general, shorter incubation periods are associated with a worse prognosis.
• Certain portals of entry (compound fractures) and underlying conditions (heroin addiction) are also associated with poorer prognoses.
• A series of 11 cases of tetanus related to tungiasis (25% of all tetanus cases) was reported by a single hospital in Congo over an 11-month period (1989 publication). [2]
• An outbreak of 12 cases of tetanus in Argentina was reported among elderly women treated with sheep cell therapy (1996). [3]
• In some cases, tetanus was associated with chronic otitis media or injudicious attempts to remove foreign objects ("otogenic tetanus"). [4] [5]
• Tetanus has been reported in a child who bit her own tongue during a convulsion [6] and following a snake bite (2007 publication) [7]
• Two cases of tetanus in Brazil were associated with freshwater stingray injuries. [8]
• An attack of tetanus does not result in immunity. Therefore, recurrent tetanus is possible, unless the patient is given a series of toxoid following recovery. [9-16]

Generalized tetanus, the most common form, begins with trismus ("lockjaw") and risus sardonicus (increased tone in the orbicularis oris).
• Abdominal wall rigidity may be present.
• The generalized spasm consists of opisthotonic posturing with flexion of the arms and extension of the legs. [17]
• The patient does not lose consciousness, and experiences severe pain during these spasms.
• Spasms often are triggered by sensory stimuli.
• Respiration may be compromised by upper airway obstruction, or by participation of the diaphragm in the general muscular contraction.

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- Autonomic dysfunction, usually occurring after several days of symptoms, is currently the leading cause of death in tetanus.
- Complications of tetanus include rhabdomyolysis and renal failure [18] [19]
- The illness can progress for two weeks, while the severity of illness may be decreased by partial immunity.
- Recovery takes an additional month, but is complete unless complications supervene.
- Lower motor neuron dysfunction may appear after the spasms remit, and persist for several additional weeks.
- A case of *Clostridium tetani* bacteremia has been reported. [20]
- Case-fatality rates of 10% to 50% are reported, but may be as high as 70% in Africa. [21]
- The differential diagnosis of tetanus includes strychnine poisoning and neuromyotonia (Isaac's syndrome). [22]

Localized tetanus presents as rigidity of the muscles associated with the site of inoculation.
- Initial symptomatology may be limited to back pain [23]
- The illness may be mild and persistent, and tends to resolve spontaneously.
- Weakness and diminished muscle tone are often present in the most involved muscle.
- Localized tetanus is often a prodrome of generalized tetanus.

Cephalic tetanus is a form of localized disease affecting the cranial nerve musculature
- Facial nerve weakness, is often apparent, and extraocular muscle involvement is occasionally noted.

Neonatal tetanus follows infection of the umbilical stump, most commonly as a result of a failure of aseptic technique following delivery of non-immune mothers.
- The condition usually manifests with generalized weakness and failure to nurse; followed by rigidity and spasms.
- The mortality rate exceeds 90%, and psychomotor retardation is common among survivors.
- Poor prognostic factors include age younger than 10 days, symptoms present for fewer than 5 days before presentation to hospital, fever, and the presence of risus sardonicus. [24]
- Apnea is the leading cause of death in the first week of disease, and sepsis in the second week.
- Bacterial infection of the umbilical stump leads to sepsis in almost half of babies with neonatal tetanus.

The WHO Case definition for surveillance of neonatal tetanus is as follows:
- Suspected case: Any neonatal death between 3-28 days of age in which the cause of death is unknown; or any neonate reported as having suffered from neonatal tetanus between 3-28 days of age and not investigated.
- Confirmed case: Any neonate with a normal ability to suck and cry during the first two days of life, and who between 3 and 28 days of age cannot suck normally, and becomes stiff or has convulsions (i.e. jerking of the muscles) or both.
- Hospital-reported cases of neonatal tetanus are considered confirmed.
- The diagnosis is purely clinical and does not depend upon laboratory or bacteriological confirmation.

Tetanus in Zambia

Vaccine Schedule:

BCG - birth
DTwPHibHepB - 6, 10, 14 weeks
Measles - 9, 18 months
OPV - 6, 10, 14 weeks
Pneumo conj - 6, 10, 14 weeks
Rotavirus - 6, 10 weeks
Td - 1st contact pregnancy; +1, +1, +6 months; +1, +1 year

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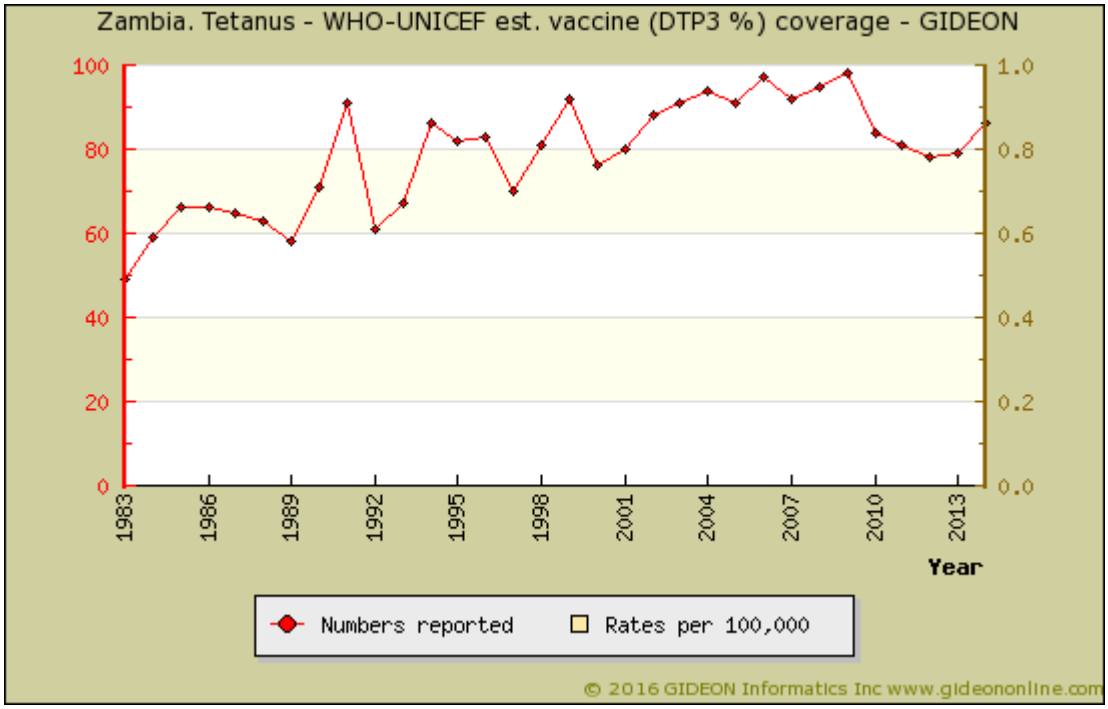
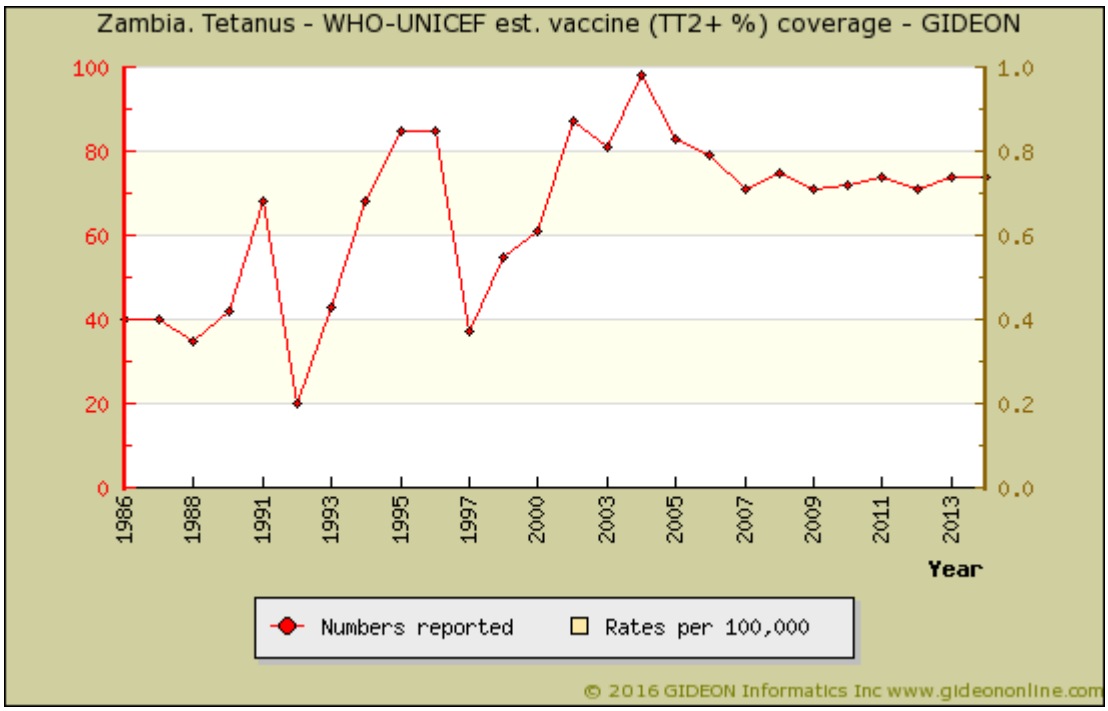


Graph: Zambia. Tetanus - WHO-UNICEF est. vaccine (DTP3 %) coverage



Graph: Zambia. Tetanus - WHO-UNICEF est. vaccine (TT2+ %) coverage

Notes:

1. See reference [25]

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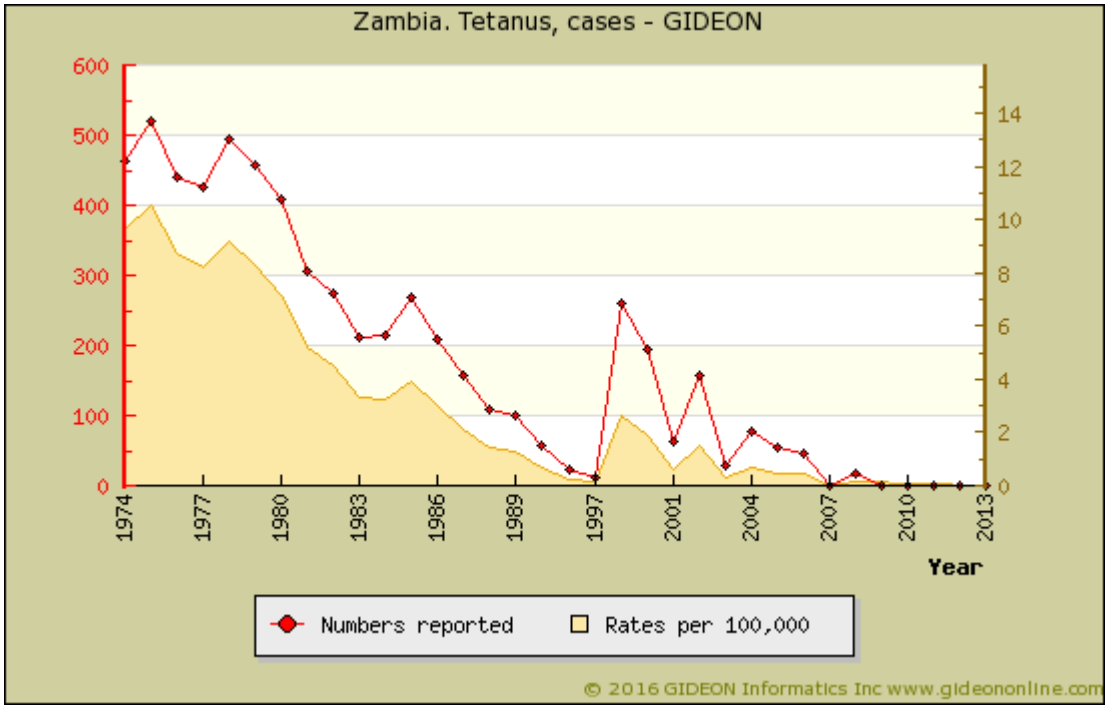
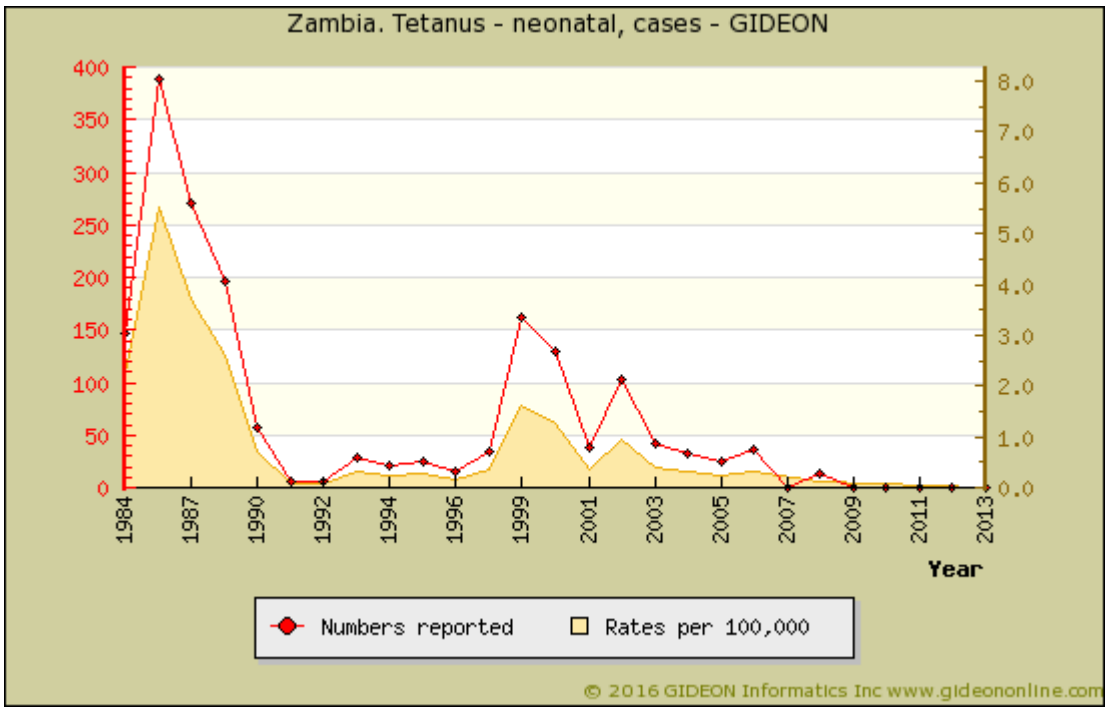


Graph: Zambia. Tetanus, cases



Graph: Zambia. Tetanus - neonatal, cases

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Thelaziasis

Agent	PARASITE - Nematoda. Secernentea: Thelazia callipaeda (rarely T. californiensis)
Reservoir	Dog Rabbit Deer Cat
Vector	Fly (? Musca and Fannia species)
Vehicle	None
Incubation Period	not known
Diagnostic Tests	Identification of parasite.
Typical Adult Therapy	Extraction of parasite
Typical Pediatric Therapy	As for adult
Clinical Hints	Conjunctivitis and lacrimation associated with the sensation of an ocular foreign body.
Synonyms	Conjunctival spirurosis, Oriental eye worm, Rictularia, Thelazia californiensis, Thelazia callipaeda. ICD9: 372.15 ICD10: B83.8

Clinical

The signs and symptoms of Thelaziasis are related to the presence of a worm in the conjunctival sac, and consist of pain, lacrimation and a foreign body sensation. [1] [2]

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Toxic shock syndrome

Agent	BACTERIUM. Staphylococcus aureus, Streptococcus pyogenes, et al - (toxins) Facultative gram-positive cocci
Reservoir	Human
Vector	None
Vehicle	Tampon (occasionally bandage, etc) which induces toxinosis
Incubation Period	Unknown
Diagnostic Tests	Isolation of toxigenic Staphylococcus aureus. Toxin assay available in specialized laboratories.
Typical Adult Therapy	The role of topical (eg, vaginal) and systemic antistaphylococcal antibiotics is unclear; however, most authorities suggest intravenous administration of an anti-staphylococcal (anti-MRSA, anti-streptococcal as indicated) antibiotic.
Typical Pediatric Therapy	As for adult
Clinical Hints	Fever (>38.9), hypotension (<90 mm Hg) and dermal erythema with desquamation; respiratory, cardiac or other disease present; most cases associated with "super absorbent" tampon use or staphylococcal wound infection; case-fatality rate = 5% to 10%.
Synonyms	Streptococcal toxic shock syndrome, TSS. ICD9: 040.82 ICD10: A48.3

Clinical

CDC (The United States Centers for Disease Control) case definition for surveillance:.
For surveillance purposes, the CDC (The United States Centers for Disease Control) case definition of toxic shock syndrome [1] requires an illness with the following clinical manifestations:
1. fever at least 38.9 C
2. diffuse macular erythema [2]
3. desquamation 1 to 2 weeks after onset of illness (particularly of the palms and soles)
4. hypotension (less than 90 mm Hg for adults, or less than fifth percentile if below age 16 years • or orthostatic hypotension)
5. multisystem involvement, consisting of three or more of the following: acute vomiting or diarrhea; myalgia and elevation of creatine phosphokinase levels; vaginal, oropharyngeal or conjunctival hyperemia; elevation of blood urea nitrogen or creatine to at least twice normal, or sterile pyuria; elevation of serum bilirubin or aminotransferase levels to at least twice normal; platelet count < 100,000/ cu mm; disorientation or alteration in consciousness unrelated to fever and hypotension
6. laboratory examination
• negative cultures of blood, throat or cerebrospinal fluid (however, *S. aureus* may be present in blood)
• negative tests for measles, leptospirosis or rickettsiosis

A probable case requires at least five of the above clinical findings. A confirmed case requires all six clinical findings (unless the patient dies before desquamation can occur).

The case definition for Streptococcal toxic shock syndrome [3] [4] includes isolation of *Streptococcus pyogenes* in addition to:
1. hypotension as above
2. multiorgan involvement characterized by at least two of the following (defined above)
• renal impairment
• coagulopathy
• hepatic dysfunction
• acute respiratory distress syndrome
• a generalized erythematous macular rash which may desquamate [5]
• soft tissue necrosis (fasciitis, myositis, gangrene).

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Toxocariasis

Agent	PARASITE - Nematoda. Secernentea: Toxocara cati and canis
Reservoir	Cat Dog Mouse
Vector	None
Vehicle	Soil ingestion
Incubation Period	1w - 2y
Diagnostic Tests	Identification of larvae in tissue. Serology.
Typical Adult Therapy	Albendazole 400 mg BID X 5d. OR Mebendazole 100 to 200 mg PO bid X 5 days Add corticosteroids if eye, brain, heart or lung involvement is present.
Typical Pediatric Therapy	As for adult
Clinical Hints	Cough, myalgia, seizures, urticaria, hepatomegaly, pulmonary infiltrates or retrobulbar lesion; marked eosinophilia often present; symptoms resolve after several weeks, but eosinophilia may persist for years.
Synonyms	Ascaris suum, Toxocara canis, Toxocara cati, Toxocarose, Toxocarosis, Visceral larva migrans. ICD9: 128.0 ICD10: B83.0

Clinical

Most infections present in children below the age of 5 years, and are asymptomatic or mild; however rare instances of infection are reported in adults. [1] [2]

Overt disease is characterized by fever, cough [3] , wheezing, eosinophilia, myalgia, tender hepatomegaly and abdominal pain. [4]

• A tender nodular rash may be present on the trunk and legs.

• Chronic urticaria, chronic pruritus, relapsing eosinophilic cellulitis [5] and eczema are also reported. [6]

• Myocarditis [7-9] , pericarditis [10] [11] , Loeffler's endocarditis [12] , nodular pulmonary infiltrates [13] [14] , acute respiratory distress syndrome [15] , seizures, nephritis, encephalopathy [16] , spinal involvement (usually cervical or thoracic) including transverse myelitis [17-20] , encephalomyelitis [21] , cerebral vasculitis [22] or infarct [23] , brain abscess [24] , Bell's palsy [25] , eosinophilic meningitis [26-28] , eosinophilic pneumonia [29] or pericardial [30] / pleural effusion [31-33] , eosinophilic ascites [34-37] , eosinophilic abscesses of the liver [38-40] , chronic polyarthritis [41] , cystitis [42] [43] and renal dysfunction have been described in heavy infections.

• Eye disease is rare in toxocariasis. [44] [45] Ocular toxocariasis usually presents in children ages 5 to 10 years, and is typically unilateral and characterized by formation of a retinal granuloma at or near the macula, resulting in strabismus, iridocyclitis, glaucoma, papillitis or visual loss. [46-53] Retinal vasculitis and neuroretinitis are also reported. [54]

• Toxocariasis has been identified as a cause of chronic cough in childhood [55] ; and of asthma [56] and diminished lung function (FEV-1) at any age. [57] [58]

• In some cases, pulmonary and hepatic nodular lesions could be mistaken for malignancy. [59] [60]

• Toxocariasis has been implicated in the etiology of epilepsy [61] and decreased cognitive function among children. [62]

Ascaris suum, a parasite of pigs, has been reported to cause rare cases of myelitis [63] , encephalopathy [64] , eosinophilic pneumonia [65-67] and focal liver lesions in humans. [68-72]

• *A. suum* has been implicated in cases of eosinophilic colitis [73] and intestinal obstruction. [74]

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Toxocariasis in Zambia

Prevalence surveys:

11.1% of rural dogs in Kateke and 11% in Lusaka (2011 publication) [75]

7.6% of domestic dogs in Lusaka, Katete, Petauke and Luangwa Districts (2005 to 2006) [76]

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Toxoplasmosis

Agent	PARASITE - Protozoa. Apicomplexa, Eimeriida: Toxoplasma gondii
Reservoir	Rodent Pig Cattle Sheep Chicken Bird Cat Marsupial (kangaroo)
Vector	None
Vehicle	Transplacental Meat ingestion Soil ingestion Water or milk (rare) Fly
Incubation Period	1w - 3w (range 5d - 21d)
Diagnostic Tests	Serology. Cultivation or identification of organisms per specialized laboratories. Nucleic acid amplification.
Typical Adult Therapy	Pyrimethamine 25 mg/d + Sulfonamides 100 mg/kg (max 6g)/d X 4w - give with folinic acid. Alternatives: Clindamycin, Azithromycin, Dapsone. Spiramycin (in pregnancy) 4g/d X 4w
Typical Pediatric Therapy	Pyrimethamine 2 mg/kg/d X 3d, then 1 mg/kg/d + Sulfonamides 100 mg/kg/d X 4w - give with folinic acid. Alternatives: Clindamycin, Azithromycin, Dapsone.
Clinical Hints	Fever, lymphadenopathy and hepatic dysfunction; chorioretinitis; cerebral cysts (patients with AIDS); congenital hydrocephalus, mental retardation or blindness.
Synonyms	Toxoplasma, Toxoplasmose, Toxoplasmosi. ICD9: 130 ICD10: B58

Clinical

Acquired toxoplasmosis:
The clinical features of acquired toxoplasmosis can range from subclinical infection to lymphadenopathy (the most common presentation) to fatal, fulminant disease.
• In healthy adults, infection is usually subclinical, or mimics infectious mononucleosis; however, pharyngitis, posterior and posterior cervical lymphadenopathy are unusual in toxoplasmosis.
• Most patients with acute *Toxoplasma* lymphadenitis experience fatigue, headache, difficulty concentrating and muscle aches. [1] [2]
• In immunocompromised hosts, toxoplasmosis may mimic other opportunistic infections, such as tuberculosis or infection with *P. jiroveci* (formerly *P. carinii*) [3] [4] , or extensive varicella. [5]
• In patients with AIDS, CNS involvement is the most common manifestation, followed by pulmonary disease. [6]

Congenital toxoplasmosis:
The rate and severity of congenital toxoplasmosis are largely related to gestational age at the time of infection. [7-9]
• Overt clinical signs appear to be more common among American infants vs. European infants with congenital toxoplasmosis. [10] [11]
• The brain and eyes are often affected, presenting as chorioretinitis, hydrocephalus, intracranial calcifications, and seizures. [12]
• 97% of children infected during the first trimester of pregnancy and having normal antenatal ultrasounds are asymptomatic or only slightly affected. [13]
• Rare instances of nephrotic syndrome complicating congenital toxoplasmosis have been reported. [14]

Ocular toxoplasmosis: [15] [16]
Ocular toxoplasmosis occurs from reactivation of cysts in the retina. [17]
• Focal necrotizing retinitis is characteristic lesion, and approximately 35% of all cases of retinochoroiditis can be attributed to toxoplasmosis. [18]
• Roth spots were identified in a patient with ocular toxoplasmosis. [19]
• Risk factors for early (first two years of life) retinochoroiditis include a delay of >8 weeks between maternal seroconversion and the beginning of treatment, female gender, and the presence of cerebral calcifications. [20]
• The incidence and severity of ocular toxoplasmosis varies from country to country. [21]

CNS toxoplasmosis:

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The manifestations of CNS toxoplasmosis in the immunocompromised patient range from an insidious process evolving over several weeks to acute onset of a confusional state.
• Signs may be focal or symmetrical.
• *T. gondii* has a predilection to localize in the basal ganglia and brain stem, producing extrapyramidal symptoms resembling those of Parkinson's disease.
• A normal CT scan does not rule out cerebral toxoplasmosis. MRI is the imaging modality of choice [22]
• Nonfocal evidence of neurological dysfunction may include generalized weakness, headache, confusion, lethargy, alteration of mental status, personality changes, and coma.
• Rare instances of acute disseminated encephalomyelitis have been associated with toxoplasmosis. [23]
• Infection in transplant recipients is often diffuse and disseminated.
• In patients with underlying malignancy (e.g. Hodgkin's disease), the presentation is evenly distributed between focal and nonfocal forms of encephalitis.

Toxoplasmosis and AIDS:
Patients with AIDS tend to present subacutely with nonspecific symptoms such as neuropsychiatric complaints, headache, fever, weight loss, disorientation, confusion, and lethargy evolving over 2 to 8 weeks.
• Later findings include evidence of focal CNS mass lesions, ataxia, aphasia, hemiparesis, visual field loss, vomiting, confusion, dementia, stupor and seizures. [24]
• Toxoplasmosis presenting as subcutaneous mass has been reported among HIV-positive patients. [25] [26]
• Primary cerebral lymphoma in AIDS patients may be mistaken for Toxoplasmosis. [27]

Toxoplasmosis in Zambia

Prevalence surveys:

0% of central nervous system infections among HIV-positive patients (2014 publication) [28]

Seroprevalence surveys:

4% of HIV-positive patients, and 11% of controls (1991 publication) [29]

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Trachoma

Agent	BACTERIUM. Chlamydia trachomatis, type A
Reservoir	Human
Vector	Fly
Vehicle	Infected secretions Contact Fly Fomite
Incubation Period	5d - 12d
Diagnostic Tests	Culture or direct immunofluorescence of secretions. Serology. Nucleic acid amplification.
Typical Adult Therapy	Azithromycin 1 g po as single dose. OR Doxycycline 100 mg/day PO X 21 days. Also administer topical Tetracycline
Typical Pediatric Therapy	Azithromycin 20 mg/kg as single dose. Also administer topical Tetracycline
Clinical Hints	Keratoconjunctivitis with palpebral scarring and pannus formation; 0.5% of infections result in blindness.
Synonyms	Egyptian ophthalmia, Granular conjunctivitis, Kornerkrankheit, Trachom, Tracoma. ICD9: 076 ICD10: A71

Clinical

Early symptoms include erythema and swelling of both bulbar and palpebral conjunctivae, associated with a watery or purulent discharge. [1] [2]

- Additional findings may include preauricular lymphadenopathy and rhinitis.
- Examination reveals follicular hypertrophy and conjunctival scarring.
- Corneal scars (Herbert's pits), punctate keratitis and pannus formation may also be present. [3]
- As scarring progresses, the eyelashes deviate (entropion) and may produce additional trauma and ulceration of the conjunctivae. [4]
- Reinfection and bacterial superinfection are common [5] and may contribute to the progression of follicular trachoma. [6]

Trachoma may be differentiated from inclusion conjunctivitis by the presence of corneal scarring and a preference of the latter for the upper tarsal conjunctivae

Trachoma in Zambia

230,240 cases of active trachoma were estimated in 2003.

Prevalence surveys:

17.6% of children below age 6 in the Luapula Valley (1992 publication) [7]

47% in Gwenbe District (southern region) in 2001; 7.6% in 2003, following intervention [8]

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Trichinosis

Agent	PARASITE - Nematoda. Trichinella spiralis (occasionally T. nativa, T. britovi, T. pseudospiralis, T. nelsoni, et al)
Reservoir	Wild carnivore Omnivore Marine mammal
Vector	None
Vehicle	Meat ingestion
Incubation Period	10d - 20d (range 1w - 10w)
Diagnostic Tests	Identification of larvae in tissue. Serology.
Typical Adult Therapy	Albendazole 400 mg PO BID X 14d. OR Mebendazole 200 to 400 mg PO tid X 3 days, then 400 to 500 mg PO. tid X 10 days. Give with prednisone 50 mg PO daily X 3 to 5 days (then 'taper' dosage)
Typical Pediatric Therapy	Albendazole 7 mg/kg BID X 14 d. OR Mebendazole 200 to 400 mg PO tid X 3 days, then 400 to 500 mg PO. tid X 10 days. Give with prednisone 50 mg PO daily X 3 to 5 days (then 'taper' dosage)
Clinical Hints	Early diarrhea and vomiting; subsequent myalgia, facial edema and eosinophilia; onset 1 to 4 weeks following ingestion of undercooked meat (usually pork); symptoms may persist for two months; case-fatality rate for symptomatic infection = 2%.
Synonyms	Trichinellose, Trichinellosis, Trichinose, Trikinose, Triquiniase, Triqunosis. ICD9: 124 ICD10: B75

Clinical

The great majority of infections are subclinical.
• The development of symptoms depends on the number of larvae ingested.

Signs and symptoms:
During the first week of illness, the patient may diarrhea, abdominal pain and vomiting. [1-3]
• Symptoms associated with larval invasion appear during the second week and include fever, periorbital edema, subconjunctival hemorrhages and chemosis. [4]
• Myositis is also common, and often appears in the extraocular muscles, progressing to involve the masseters, neck muscles, limb and lumbar muscles.
• Additional symptoms may include headache, cough, dyspnea, hoarseness and dysphagia.
• Occasionally, a macular or petechial rash, or retinal or subungual splinter hemorrhages are seen.
• Hepatomegaly is common. [5]
• Laboratory studies may reveal marked eosinophilia, hypoalbuminemia, decreased erythrocyte sedimentation rate, proteinuria or hematuria.
• Rare instances of renal dysfunction [6], encephalitis [7], heart failure [8], and eosinophilic meningitis have been reported. [9]

Clinical course:
• Systemic symptoms usually peak 2 to 3 weeks after infection and then slowly subside; however, weakness may persist for weeks.
• A number of clinical findings may persist for several months: hypocalcemia, hypomagnesemia, fatigue, myalgia (notably in the legs), cardiovascular disorders, neurological, psychiatric, and allergic illnesses. [10]
• Deaths are ascribed to myocarditis [11] [12], encephalitis or pneumonia.

Trichinosis in Zambia

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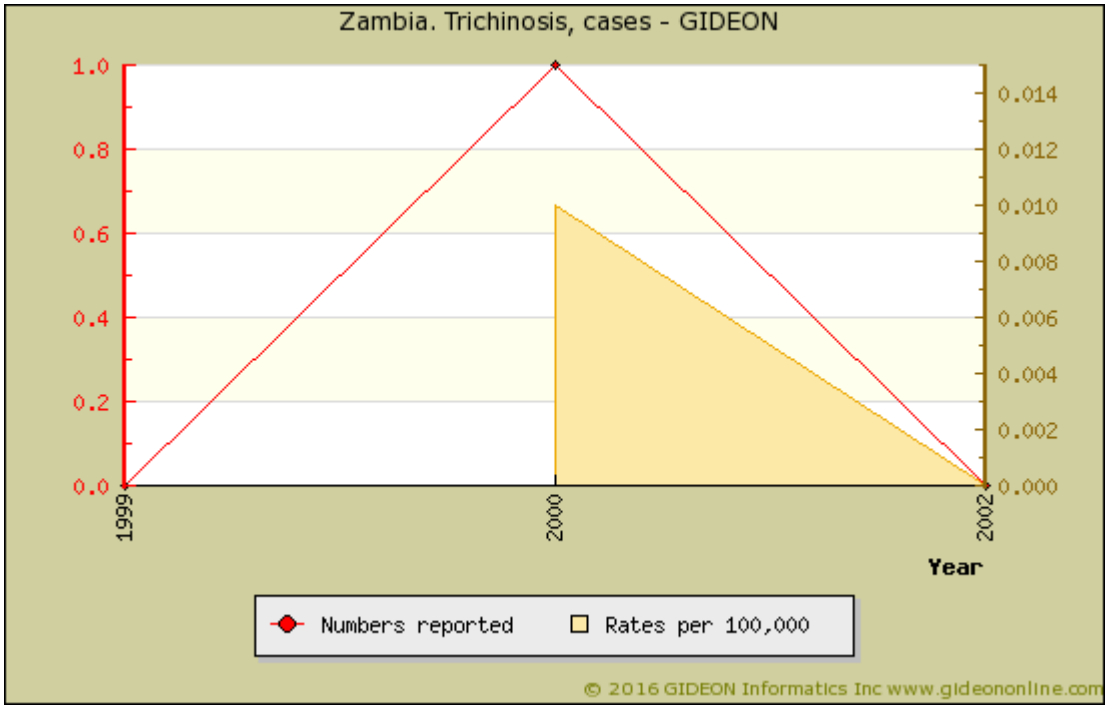

Graph: Zambia. Trichinosis, cases

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Trichomoniasis

Agent	PARASITE - Protozoa. Metamonada, Parabasala, Trichomonadea. Flagellate: Trichomonas vaginalis
Reservoir	Human
Vector	None
Vehicle	Sexual contact
Incubation Period	4d - 28d
Diagnostic Tests	Microscopy of vaginal discharge. ELISA, culture, antigen detection tests available. Nucleic acid amplification.
Typical Adult Therapy	Metronidazole or Tinidazole 2g PO as single dose to both sexual partners
Typical Pediatric Therapy	Metronidazole 5 mg/kg PO TID X 7d. OR Tinidazole 50 mg/kg PO X 1 (maximum 2 grams)
Clinical Hints	Vaginal pruritus, erythema and thin or frothy discharge; mild urethritis may be present in male or female.
Synonyms	Pentatrichomonas, Tetratrichomonas, Trichomonaden, Trichomonas, Trichomonas vaginalis, Tricomoniasis, Tritrichomonas. ICD9: 131 ICD10: A59

Clinical

10% to 50% of infections are asymptomatic.
• Symptoms often begin or worsen during the menstrual period.
• Infection is usually characterized by vaginal discharge and vulvovaginal irritation. [1]
• Dysuria may be present, and dyspareunia is common.
• As many as two thirds of infected women complain of a disagreeable odor.
• Abdominal discomfort is present in 5% to 12%.

Examination reveals a copious loose discharge that pools in the posterior vaginal fornix. [2]
• The discharge is yellow or green in 5% to 40%, and bubbles are observed in the discharge in 10% to 33%. [3]
• The material has a pH above 4.5 in 66% to 91% of cases.
• Endocervical disease is not caused by *T. vaginalis*.
• Punctate hemorrhages (colpitis macularis or "strawberry cervix") are seen on colposcopically in 45% of infected women, but in only 2% by visual inspection alone.
• Parasites can be recovered from the urethra and paraurethral glands in more than 95% of the women, and may explain the association of the infection with urinary frequency and dysuria.

Reported complications of trichomonal vaginitis include vulvar ulceration [4] , and vaginitis emphysematosa • the presence gas-filled blebs in the vaginal wall. [5]
• Gestational trichomoniasis may be associated with premature labor and low birth weight, postabortal infection or premature rupture of the membranes.
• Spread of trichomonads beyond the lower urogenital tract is extremely rare.
• Rare cases of *Trichomonas vaginalis* conjunctivitis have been reported in adults. [6-9]
• Sporadic cases of neonatal pneumonia due to *Trichomonas vaginalis* are reported. [10] [11]

Trichomoniasis has been associated with endometritis, adnexitis, pyosalpinx, infertility, preterm birth, low birth weight, bacterial vaginosis, and increased risk of cervical cancer, HPV, and HIV infection. [12]
• In men, its complications include urethritis, prostatitis, epididymitis, and infertility through interference with sperm function. [13]

Most men carrying trichomonads are asymptomatic; however, the organism is implicated in 5% to 15% of patients with nongonococcal urethritis.
• The discharge from trichomonal urethritis is usually milder than that seen with other infections.
• Epididymitis, superficial penile ulcerations (often beneath the prepuce) , urethral fistulas and prostatitis have also been

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reported. [14]

Tritrichomonas foetus pneumonia [15] and peritonitis have been reported in immunosuppressed patients. [16]
• *Trichomonas tenax* has been reported to cause pneumonia in an immunosuppressed patient. [17]

Trichomoniasis in Zambia

Prevalence surveys:

34.3% of women in Ndola (1997 to 1998) [18]

14% of married women attending STD clinics (Lusaka, 1997 publication) [19]

38.5% of pregnant women (1977 publication) [20]

18.8% of HIV-infected pregnant women in Blantyre and Lilongwe (Malawi), Dar es Salaam (Tanzania) and Lusaka (Zambia) (2008 publication) [21]

2.5% of HIV-negative women in Malawi, South Africa, United States, Zambia, and Zimbabwe (2014 publication) [22]

24.6% of adolescent females, 32.2% of pregnant women, and 33.2% of commercial sex workers (Ndola, 2010 publication) [23]

27.1% of adolescent females ages 13 to 16 years (Ndola, 2011 publication) [24]

The rate of disease among at risk women in South Africa (Durban and Hlabisa), Tanzania (Moshi) and Zambia (Lusaka) was estimated at 31.9 per 100 person-years at risk (2003 to 2004). [25]

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Trichuriasis

Agent	PARASITE - Nematoda. Trichuris trichiura
Reservoir	Human
Vector	None
Vehicle	Soil ingestion Sexual contact (rare) Fly
Incubation Period	2m - 2y
Diagnostic Tests	Stool microscopy or visualization of adult worms (adults are approximately 3 cm long).
Typical Adult Therapy	Mebendazole 100 mg PO BID X 3d. OR Albendazole 400 mg PO daily X 3 to 7 days OR Ivermectin 200 mg/kg PO daily X 3 days
Typical Pediatric Therapy	Albendazole 200 mg PO single dose OR Mebendazole 100 mg BID X 3 d (> age 2). OR Ivermectin 200 mg/kg PO daily X 3 days
Clinical Hints	Abdominal pain, bloody diarrhea, rectal prolapse or intestinal obstruction are occasionally encountered; the parasite may survive for as long as five years in the human host.
Synonyms	Trichocephaliasis, Trichuris trichiura, Tricuriasis, Whipworm. ICD9: 127.3 ICD10: B79

Clinical

The vast majority of infections are asymptomatic. [1]

- Symptoms are aggravated by concurrent shigellosis, balantidiasis or amebiasis.
- Heavy infestations are characterized by dysentery or rectal prolapse. [2] [3]
- Infants may develop hypoproteinemia, anemia, mental retardation and digital clubbing. [4-8]
- In some cases, chronic infection may result in edema of the ileocecal valve, suggestive of "malignancy" [9]

Trichuriasis in Zambia

Prevalence surveys:

0.8% of schoolchildren in Chawama, Lusaka (2001) [10]

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Tropical phagedenic ulcer

Agent	BACTERIUM Mixed infection by ? Fusobacterium species and Borrelia
Reservoir	Human
Vector	None
Vehicle	Direct inoculation ? via minor trauma
Incubation Period	Unknown
Diagnostic Tests	Wound smear suggestive of fusobacterial infection.
Typical Adult Therapy	Systemic Penicillin G . Excision/debridement as necessary
Typical Pediatric Therapy	As for adult
Clinical Hints	A deep, painful, foul-smelling ulcer (usually of the leg) with undermined edges; may be complicated by secondary infection.
Synonyms	Acute phagadenic ulcer, Aden ulcer, Delagoa sore, Malabar ulcer, Naga sore, Rhodesian sore, Tropical sloughing phagedaena. ICD9: 682.7 ICD10: A69.8,L97

Clinical

95% of ulcers involve the ankle or lower third of the leg.

- Minor trauma is followed by a tender indurated area which evolves into a round or oval skin ulcer. [1] [2]
- Ulcers favor the lower extremities, and tend to be single, painful and foul-smelling.
- Ulcers spread rapidly, and result in exposure of underlying muscles and tendons.
- Fever and restlessness are common.
- After 4 or more weeks, ulcers may become painless and chronic, and persist for decades.
- Scar carcinomas develop in 2% of cases, and constitute a common form of malignancy in parts of Africa.

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Tropical pulmonary eosinophilia

Agent	UNKNOWN Possibly related to filarial infection
Reservoir	Unknown
Vector	Unknown
Vehicle	Unknown
Incubation Period	Unknown
Diagnostic Tests	Antifilarial antibodies may be present. Response to therapeutic trial.
Typical Adult Therapy	Diethylcarbamazine 2 mg/kg PO TID X 21d
Typical Pediatric Therapy	As for adult
Clinical Hints	Chronic cough, wheezing, dyspnea, reticular-nodular pulmonary infiltrates and eosinophilia (over 3,000/cu. mm.) acquired in countries known to be endemic for filariasis.
Synonyms	

Clinical

Tropical pulmonary eosinophilia is characterized by recurrent episodes of paroxysmal, dry cough, wheezing, and dyspnea. [1-3]
• Malaise, anorexia, and weight loss are common.
• Symptoms are worse and night.
• Physical examination reveals scattered wheezes and crackles.
• Some patients have fever, hepatomegaly and lymphadenopathy.
• Symptoms fluctuate in severity over many months.

Eosinophilia is present in the majority of patients, often at very high levels (as high as 60,000/cu mm) • however, the level of eosinophilia is not related to the severity of symptoms.
• Chest radiographs reveal scattered reticulonodular opacities [4] which may be mistaken for miliary tuberculosis. [5]
• Serum antibodies to filaria are present.
• A presumptive clinical diagnosis can usually be made through successful response to antifilarial therapy.
• A second course may be necessary in some cases.

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Trypanosomiasis - African

Agent	PARASITE - Protozoa. Euglenozoa, Kinetoplastidea. Flagellate: Trypanosoma (Trypanozoon) brucei gambiense and T. b. rhodesiense
Reservoir	Human Deer Wild carnivore Cattle
Vector	Fly (Glossina = tsetse fly)
Vehicle	None
Incubation Period	3d - 21d (acute illness)
Diagnostic Tests	Identification of protozoa in CSF, blood, lymph node aspirate. Serology. Nucleic acid amplification.
Typical Adult Therapy	Early: Pentamidine 4 mg/kg IM qod X 10 doses. OR Suramin 1g IV days 1, 3, 7, 14, 21 (after test dose 100 mg) OR Eflornithine (T. gambiense only) 100 mg q6h IV X 14 d; then 75 mg/kg PO X 21-30 d. Late + CNS disease: Melarsoprol
Typical Pediatric Therapy	Early: Pentamidine 4 mg/kg IM qod X 10 doses. OR Suramin 20 mg/kg IV days 1, 3, 7, 14, 21 (after test dose 20 mg) Late + CNS: Melarsoprol
Clinical Hints	Chancre, myalgia, arthralgia, lymphadenopathy and recurrent fever; later mental changes, sensory disorders and heart failure; disease due to *Trypanosoma brucei rhodesiense* is more rapid and virulent than that due to *T.b. gambiense*.
Synonyms	African sleeping sickness, African trypanosomiasis, Gambian fever, Schlafkrankheit, Trypanosoma brucei, Trypanosoma congolense, Trypanosoma evansi, Trypanosoma lewisi, Trypansomiasis, afrikanische, U.T.I., UTI. ICD9: 086.3,086.4,086.5 ICD10: B56

Clinical

WHO Case definition for surveillance:
• In the early stages, a painful chancre, which originates as a papule and evolves into a nodule may be found at the primary site of tsetse fly bite.
• There may be fever, intense headache, insomnia, painless lymphadenopathy, anemia, local edema and rash. In the later stage, there is cachexia, somnolence and signs of central nervous system involvement.
• The disease may run a protracted course of several years in the case of *Trypanosoma brucei gambiense*. In case of *T. b. rhodesiense*, the disease has a rapid and acute evolution.
• Both diseases are always fatal without treatment.
• The painful chancre is very rare in *T. b. gambiense* infection.
Laboratory criteria for diagnosis
• Presumptive: serological: card agglutination trypanosomiasis test (CATT) for *T. b. gambiense* only or immunofluorescent assay (IFA) for *T. b. rhodesiense* mainly and possibly for *T. b. gambiense*.
• Confirmative: parasitological: detection (microscopy) of trypanosomes in blood, lymph nodes aspirates or CSF.
Case classification
• Suspected: A case that is compatible with the clinical description and/or a history of exposure.
• Probable: A case with a positive serology with or without clinical symptoms in persons without previous history of trypanosomiasis diagnosis or treatment.
• Confirmed: A case with positive parasitology, with or without clinical symptoms.
Notes:
• In the early stage or even early in the late stage of the disease there are often no clinical signs or symptoms which can be associated with the disease.
• Suspicion is then based on local risk of contracting the disease and local disease historical background.
• Confirmed positive healthy carriers are a major public health risk. As a reservoir of parasites, they disseminate the disease, and must be treated as soon as possible.

Acute trypanosomiasis:
The initial sign of African trypanosomiasis in a chancre which develops at the site of inoculation, 1 to 2 weeks following the

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bite of a tsetse fly.
• The chancre may reach a diameter of several centimeters, and be associated with regional adenopathy, but resolves over several weeks.
• In most cases, the chancre is noted by neither the patient nor the clinician.
• Fever appears weeks to months following inoculation, and is characteristically intermittent.
• Lymphadenopathy is a fairly constant feature of west African trypanosomiasis.
• The nodes are discrete, movable, rubbery, and nontender.
• Supraclavicular and cervical nodes are often visibly discernible, and enlargement of the nodes of the posterior cervical triangle ("Winterbottom's sign") is common in the west African form.
• Additional findings at this point may include hepatosplenomegaly; edema of the face, hands and feet; pruritis; an irregular circinate, 5 to 10 cm rash on the trunk, shoulders, buttocks and thighs [1] ; headache, asthenia, weight loss, arthralgias, and tachycardia.
• In some cases, trypanosomiasis has been associated with cryoglobulinemic membranoproliferative glomerulonephritis. [2]

***Trypanosoma brucei gambiense* infection:**
In the West African form, the meningoencephalitic stage may develop months or even years after the initial infection. [3]
• Findings include irritability, personality changes, indifference, apathy, daytime somnolence (often with insomnia at night), slurred speech, choreiform movements of the trunk, neck, and extremities, tremors of the tongue and fingers, ataxia, and muscular fasciculations. [4]
• CSF cell counts above 5 per cu mm are considered indicative of brain involvement. [5] [6]
• The final phase of the CNS disease is progression to coma and death [7] ; however, survival without therapy is reported. [8]

***Trypanosoma brucei rhodesiense* infection:**
The East African form tends to follow a more acute course, with an incubation of a few weeks to several weeks.
• Intermittent fever, headache, myalgia, and rash develop early; while lymphadenitis is not a prominent feature.
• Persistent tachycardia is common, and some patients die of arrhythmias, congestive heart failure or pericarditis before the onset of neurological disease.
• If untreated, the East African form is fatal within weeks to months.

Trypanosomiasis - African in Zambia

Time and Place:
Trypanosomiasis is endemic to the northern region.
- As of 2004, cases are reported sporadically from Mpika and Petakua districts, in the Luangwa fly belt. [9] [10]
- An estimated 500,000 persons live in the endemic zone.

Prevalence surveys:
13.9% of animals in the Luangwa Valley - with highest rates among waterbuck (*Kobus ellipsiprymnus*) lion (*Panthera leo*), greater kudu (*Tragelaphus strepsiceros*) and bushbuck (*Tragelaphus scriptus*) (various species of *Trypanosoma*, 2005 to 2007) [11]
19.4% of goats in Sinazongwe and Kalomo districts, southern Zambia (*Trypanosoma brucei*, 2013 to 2014) [12]
18.3% of tsetse flies (*Glossina pallidipes*) in the Chiawa area of the Lower Zambezi (2008 publication) [13]

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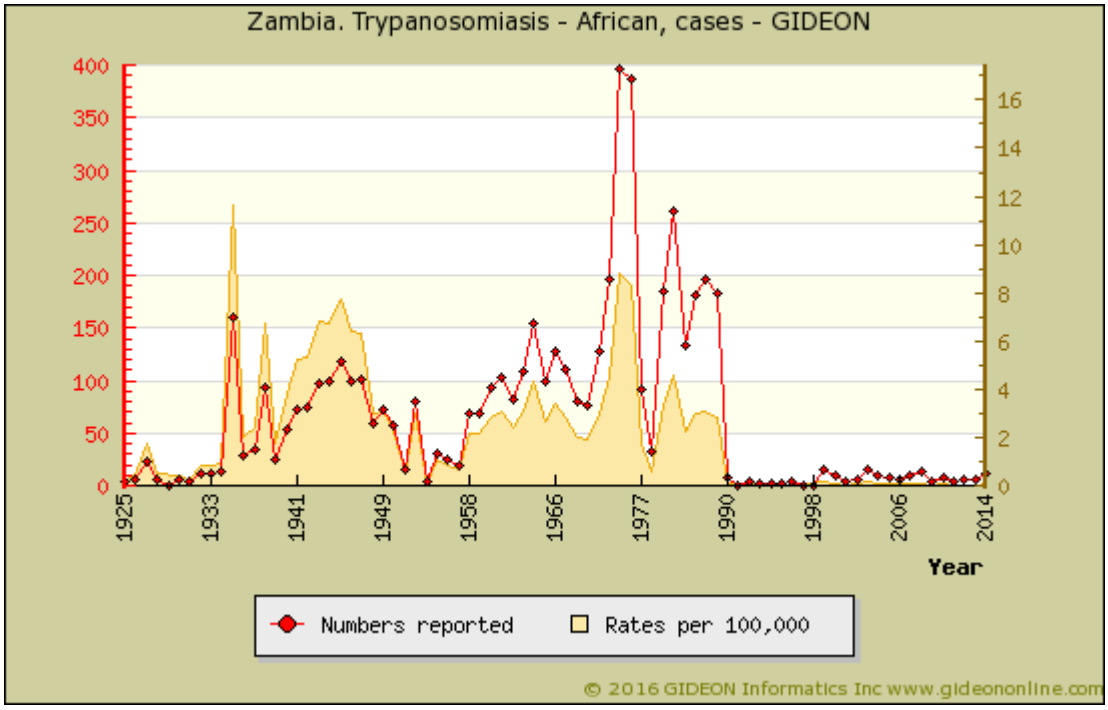

Graph: Zambia. Trypanosomiasis - African, cases

Exported cases:

1986 - An American tourist acquired trypanosomiasis in Zambia. [14]
2000 - A British tourist acquired trypanosomiasis (nonfatal) in Zambia. [15] [16]
2001 - A British national acquired trypanosomiasis in Zambia. [17]
2008 - A British tourist acquired trypanosomiasis in Zambia. [18]
2010 - An American tourist [19] and a South African Ranger acquired trypanosomiasis in Zambia. [20]
2010 - A British traveler developed trypanosomiasis following travel in Zambia and Zimbabwe. [21] [22]
2015 - A Canadian traveler acquired trypanosomiasis in Zambia. [23]

The endemic species is *Trypanosoma brucei rhodesiense*.

The local vectors are *Glossina morsitans* and *G. pallidipes*.

Infected kudus (*Tragelaphus strepsiceros*) were identified on a game ranch north east of Lusaka (2010 publication) [24] - Three infected dogs (Boerbel, Labrador and Jack Russel) were identified in the Luangwa and Zambezi Valleys (2010 to 2012). [25]

Notable outbreaks:

1974 (publication year) - An outbreak of human trypanosomiasis was reported in the lower Luangwa Valley, Eastern Province. [26] [27]

2014 - An outbreak (8 cases) was reported in Lusaka Province. [28]

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Tuberculosis

Agent	BACTERIUM. Actinomycetes, Mycobacterium tuberculosis An aerobic acid-fast bacillus
Reservoir	Human Cattle
Vector	None
Vehicle	Air Dairy products
Incubation Period	4w - 12w (primary infection)
Diagnostic Tests	Microscopy. Culture. Nucleic acid amplification. Inform laboratory when this diagnosis is suspected.
Typical Adult Therapy	Respiratory isolation. Typical pulmonary infection is treated with 6 months of Isoniazid, Rifampin & Pyrazinamide
Typical Pediatric Therapy	As for adult
Vaccine	BCG vaccine
Clinical Hints	Cough, "night sweats" and weight loss; often presents as prolonged fever (FUO) or infection of bone, meninges, kidneys or other organs; most infections represent reactivation of old foci in lungs, brain, bone, kidneys etc.
Synonyms	Consumption, Mycobacterium africanum, Mycobacterium bovis, Mycobacterium caprae, Mycobacterium orygis, Mycobacterium tuberculosis, Oryx bacillus, Phthisis, TB, TB meningitis, Tuberculose, Tuberculose miliar, Tuberculosi, Tuberculous meningitis, Tuberkulose, White plague. ICD9: 010,012,013,014,015,016,017,018 ICD10: A15,A16,A17,A18,A19

Clinical

WHO Case definition for surveillance:
Pulmonary tuberculosis, sputum smear positive (PTB+)
• Tuberculosis in a patient with at least two initial sputum smear examinations (direct smear microscopy) positive for Acid-Fast Bacilli (AFB), or
• Tuberculosis in a patient with one sputum examination positive for acid fast bacilli and radiographic abnormalities consistent with active pulmonary tuberculosis as determined by the treating medical officer, or
• Tuberculosis in a patient with one sputum specimen positive for acid-fast bacilli and at least one sputum that is culture positive for acid-fast bacilli.
Pulmonary tuberculosis, sputum smear negative (PTB-)
Tuberculosis in a patient with symptoms suggestive of tuberculosis and having one of the following:
• Three sputum specimens negative for acid-fast bacilli
• Radiographic abnormalities consistent with pulmonary tuberculosis and a lack of clinical response to one week of a broad-spectrum antibiotic
• Decision by a physician to treat with a full curative course of antituberculous chemotherapy
Pulmonary tuberculosis, sputum smear negative, culture positive
• Tuberculosis in a patient with symptoms suggestive of tuberculosis and having sputum smear negative for acid-fast bacilli and at least one sputum that is culture positive for *M. tuberculosis* complex
Extra-pulmonary tuberculosis
• Tuberculosis of organs other than lungs: pleura, lymph nodes, abdomen, genito-urinary tract, skin, joints and bones, tuberculous meningitis, etc.
• Diagnosis should be based on one culture positive specimen from an extra-pulmonary site, or histological or strong clinical evidence consistent with active extra-pulmonary tuberculosis, followed by a decision by a
medical officer to treat with a full course of anti-tuberculous therapy
• Any patient diagnosed with both pulmonary and extra-pulmonary tuberculosis should be classified as a case of pulmonary tuberculosis

The clinical features of tuberculosis are protean, and largely determined by the site of infection and clinical substrate.
• Most infections represent reactivation of a dormant focus in a lung, with resultant chronic fever, weight loss, nocturnal diaphoresis, productive cough and typical roentgenographic findings. [1]

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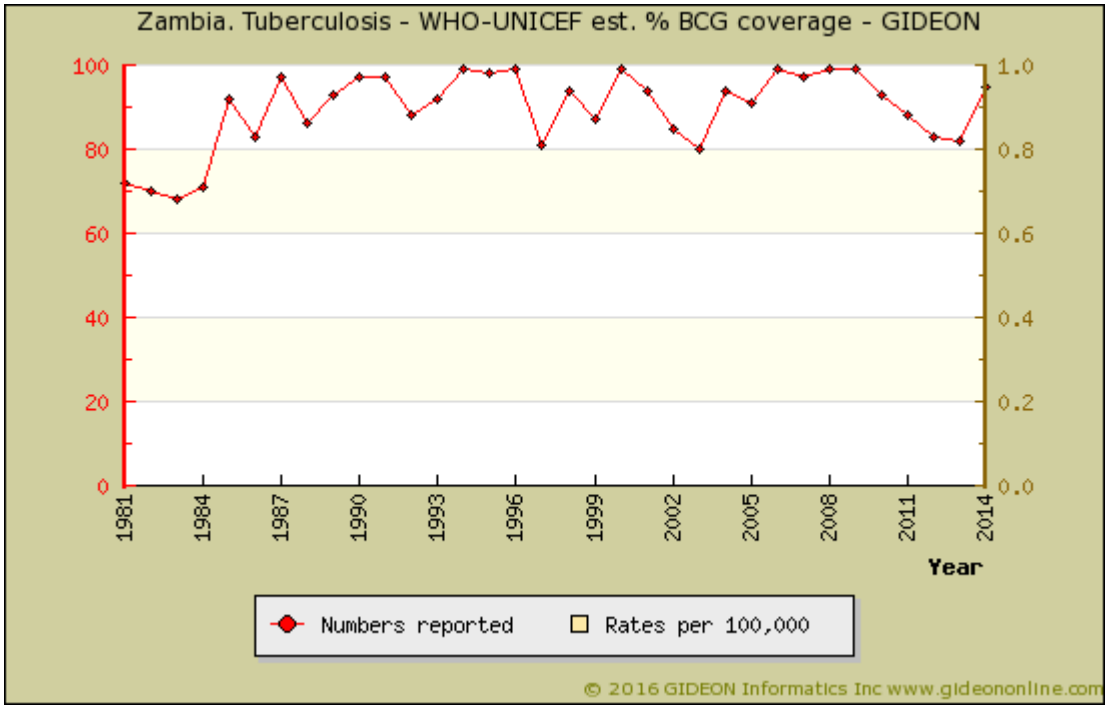
• Reactivation of an extrapulmonary focus (kidney, bone, central nervous system [2] [3], skin [4], gastrointestinal [5-10] and hepatobiliary system [11], eyes [12] [13], skeletal muscle [14-22], reproductive tract [23], breast [24-26], eye [27], etc) will result in signs referable to the infected organ.
• The extent and severity of disease are influenced by patient age, nutrition, immune function [28] [29], and many other factors which are beyond the scope of this module.
• Nocardiosis may mimic tuberculosis, particularly in the setting of HIV infection. [30]
• The appearance of a miliary infiltrates in tropical pulmonary eosinophilia [31] or *Chlamydophila pneumoniae* infection may suggest a diagnosis of tuberculosis. [32]
• Spinal histoplasmosis may mimic tuberculosis spondylodiscitis [33]; and gastrointestinal histoplasmosis may mimic abdominal tuberculosis. [34] Although spondylodiscitis is also encountered in brucellosis, tuberculosis is more likely than brucellosis to produce prevertebral, paravertebral, epidural, and psoas abscesses, with calcification and loss of vertebral body height. [35]
• Rare instances of tuberculous septic shock are reported. [36]
• The clinical features of melioidosis are similar to those of tuberculosis: prolonged fever, weight loss, latency with reactivation, upper-lobe infiltrates, etc. [37-42]
• The pulmonary and cerebral manifestations of paragonimiasis are similar to those of tuberculosis. [43]
• Tularemia [44] [45] and leprosy may manifest as lymphadenopathy mimicking tuberculosis [46]

Tuberculosis in Zambia

Vaccine Schedule:

BCG - birth
DTwPHibHepB - 6, 10, 14 weeks
Measles - 9, 18 months
OPV - 6, 10, 14 weeks
Pneumo conj - 6, 10, 14 weeks
Rotavirus - 6, 10 weeks
Td - 1st contact pregnancy; +1, +1, +6 months; +1, +1 year



Graph: Zambia. Tuberculosis - WHO-UNICEF est. % BCG coverage

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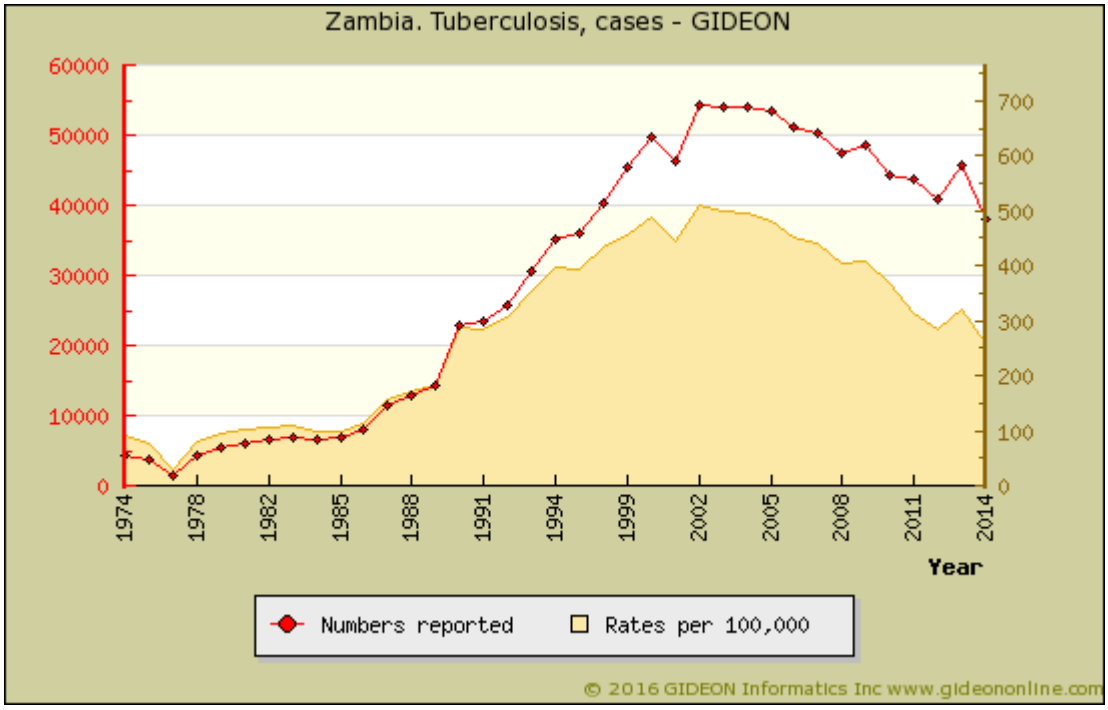
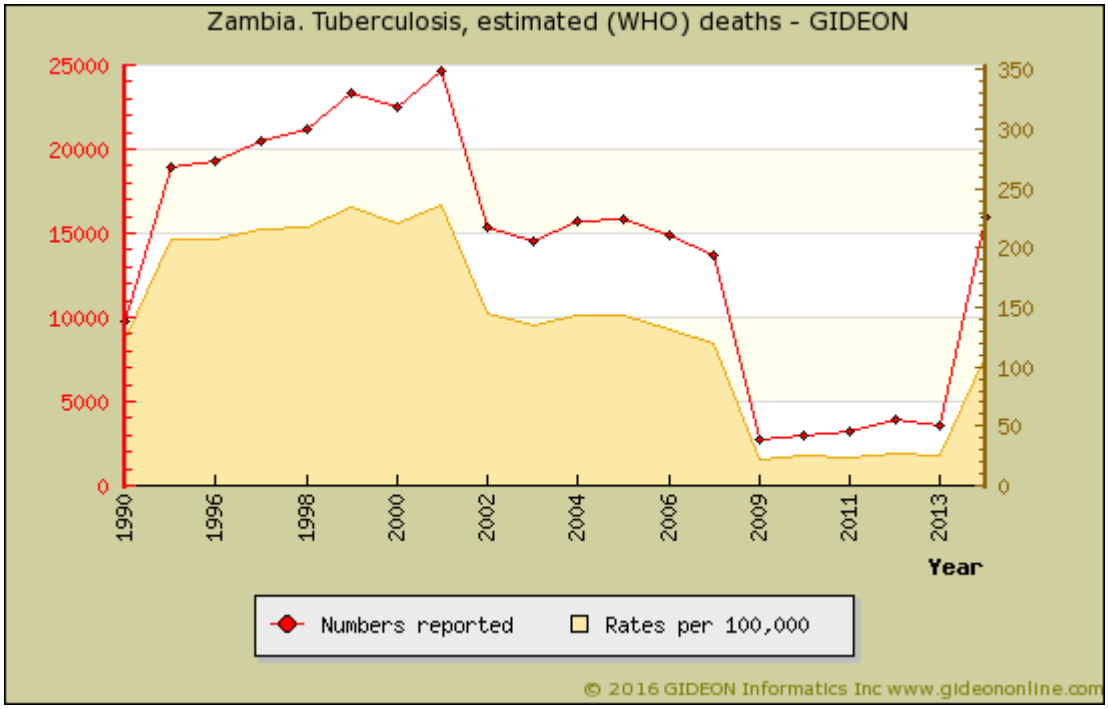


Graph: Zambia. Tuberculosis, cases

Notes:

1. 759,769 cases were reported during 1990 to 2010 [47]



Graph: Zambia. Tuberculosis, estimated (WHO) deaths

Prevalence surveys:

4.3% of the general population above age 15 years (sputum examination, 2013 to 2014) [48]
40% of hospitalized patients with chronic respiratory disease (Katete district, 2002 to 2003) [49]
15.5% of central nervous system infections among HIV-positive patients (2014 publication) [50]
6.4% of residents of prisons and adjacent encampments (2015 publication) [51]

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7.4% of cattle in the Kafue basin ecosystem (2012 publication) [52]
4.8% of traditionally-reared cattle in Southern Province (2013 publication) [53]

Tuberculosis and HIV infection:
- 70 percent of tuberculosis patients were found to be HIV-positive (2006 to 2010) [54]
- The incidence of tuberculosis among persons living with HIV is 4.9% per year (1998).
- 88% of patients with tuberculous lymphadenitis were found to be HIV-positive (Lusaka, 1981 to 1998) [55]

446 cases of MDR tuberculosis (49% of isolates) and 0 cases of XDR tuberculosis were identified during 2000 to 2011. [56]
- The prevalence of MDR tuberculosis was estimated at 1.8% in 2001; 1.1% to 1.6% in 2008. [57] |
- Primary / retreatment INH monoresistance was identified in 2.4% / 5.0% of isolates in 2008. [58]

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Tungiasis

Agent	PARASITE - Insecta Siphonaptera (Flea), Tungidae: Tunga penetrans and T. trimamillata ("sand fleas")
Reservoir	Pig Dog ? Various other mammals
Vector	None
Vehicle	Contact
Incubation Period	8d - 12d
Diagnostic Tests	Identification of parasite.
Typical Adult Therapy	Extraction of parasite Ivermectin has been advocated in some publications.
Typical Pediatric Therapy	As for adult
Clinical Hints	Painful papule or nodule, usually on the feet - may be multiple; begins 1 to 2 weeks after walking on dry soil; secondary infections and tetanus are described.
Synonyms	Bicho de pe, Chica, Chigger, Chigoe flea, Jigger, Nigua, Puce-chique, Tu, Tunga penetrans, Tunga trimamillata, Tungosis. ICD9: 134.1 ICD10: B88.1

Clinical

Virtually all infestations are limited to the foot, notably the interdigital and periungual regions. [1] [2]
• Ectopic infections are occasionally noted on the hands, elbows, thighs or gluteal region • and even the eyelids [3] and tongue. [4]
• Irritation begins 8 to 12 days following infection, and is manifested as a small "pit" which evolves into a circular ulcer associated with pain, edema, erythema and pruritis.
• On dermoscopy, circumferential rings may be evident surrounding a central black lesion • the "radial crown" sign. [5]
• Secondary bacterial infection, thrombophlebitis or even tetanus may follow.
• Most infestations are characterized by 2 to 3 fleas, although hundreds may occasionally be present. [6] [7]
• Severe disease may be characterized by deep ulcerations, necrosis leading to denudation of underlying bone, and auto-amputation of digits.
• Ectopic infection (hands, elbows, knees, neck [8] , anus and genitals) is encountered, often in small children.
• Studies in an endemic region of Brazil revealed 17 lesions (maximum 98) per patient, and almost all had nail deformation and edema.
• Nail loss (46%), pain and fissures (70%), digit deformation (25%), abscesses (42%), and walking difficulty (59%) were common. (Brazil, 2007 publication) [9]

A series of 11 cases of tetanus related to tungiasis (25% of all tetanus cases) was reported by a single hospital in Brazzaville over an 11-month period (1989 publication). [10]
• Tungiasis is implicated in the etiology of 10% of tetanus cases in Sao Paulo, Brazil (2001 publication). [11]

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Typhoid and enteric fever

Agent	BACTERIUM. Salmonella serotype Typhi (other Salmonella species cause 'paratyphoid' fever) A facultative gram-negative bacillus
Reservoir	Human
Vector	None
Vehicle	Fecal-oral Food, Fly Water
Incubation Period	15d - 21d (range 5d - 34d)
Diagnostic Tests	Culture (blood, urine, sputum culture). Stool usually negative unless late, untreated infection. Serology.
Typical Adult Therapy	Ceftriaxone 2 g IV q12h to q 24h X 5 to 7d. OR Azithromycin 1 gram PO on day 1; then 500 mg days 2 to 7. Fluoroquinolones resistance common - not recommended for empiric therapy. Add corticosteroids if evidence of shock or decreased mental status.
Typical Pediatric Therapy	Ceftriaxone 50 to 80 mg/kg IV daily X 5 to 7d. OR Azithromycin 15 mg/kg PO on day 1; then 7.5 mg/kg on days 2 to 7.
Vaccines	Typhoid - injectable vaccine Typhoid - oral vaccine
Clinical Hints	Transient diarrhea followed by fever, splenomegaly, obtundation, rose spots (during second week of illness); leukopenia and relative bradycardia often observed; case fatality rate = 0.8% (treated) to 15% (untreated).
Synonyms	Abdominal typhus, Abdominaltyphus, Buiktyphus, Enteric fever, Febbre tifoide, Febbre tifoidea, Fiebre tifoidea, Paratifoidea, Paratyfus, Paratyphoid, Salmonella serotype Typhi, Tyfoid, Typhoid, Typhoide. ICD9: 002 ICD10: A01

Clinical

Enteric fever is a defined syndrome of systemic illness associated with *Salmonella* infection.
• Enteric fever caused by *S. typhi* is referred to as "typhoid fever," and that caused by *S. paratyphi*, is referred to as "paratyphoid fever."
• Symptoms are often nonspecific and insidious in onset. [1] [2]
• The differential diagnosis of fever, abdominal pain with hepatosplenomegaly also includes malaria, amebic liver abscess, brucellosis [3], visceral leishmaniasis, and dengue fever.
• The clinical features of scrub typhus [4] and melioidosis may also mimic those of enteric fever. [5]

Acute illness:
Following an incubation period of 5 to 21 days, an initial enterocolitis may develops without associated fever.
• Constipation is present in 10 to 40% of patients; abdominal pain 20 to 40%; hepatosplenomegaly in 50%.
• Such symptoms as chills, diaphoresis, headache, anorexia, cough, sore throat, vertigo and myalgia often precede the onset of fever.
• Psychosis or confusion ("muttering delirium") occur in 5 to 10%, encephalopathy in 21% [6], and seizures and coma in less than 1%.
• Patients appear acutely ill.
• Cervical lymphadenopathy develops in some patients, and pulmonary disease is rare at this stage.
• 3% have signs and symptoms of cholecystitis, and jaundice is reported in as many as 12% of cases. [7]
• Instances of "typhoid hepatitis" appear to represent super-infection by hepatitis virus, rather than a complication of typhoid fever. [8]

Course of illness and complications:
Symptoms resolve by the fourth week of infection without antimicrobial therapy.
• Weight loss, and debilitation may persist for months, and 10% of patients will experience a relapse.

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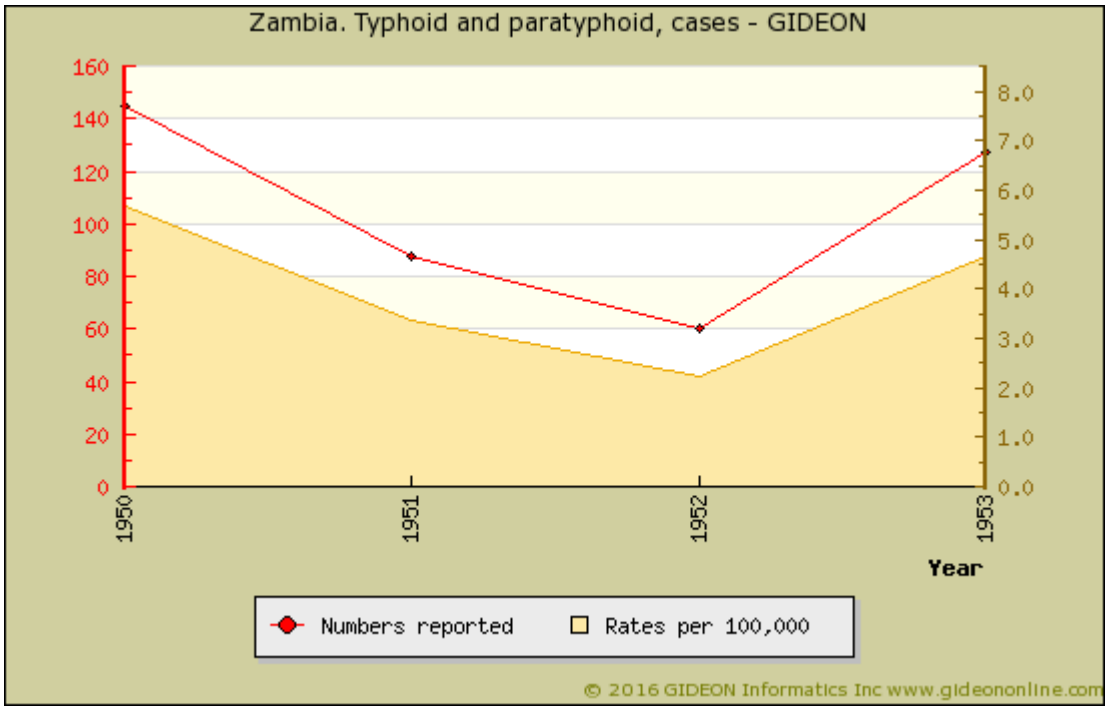
• Relapse is more common among antibiotic-treated than non-treated patients.
• Intestinal perforation is characterized by recurrent fever, abdominal pain, intestinal hemorrhage and tachycardia occurring in the 3rd to 4th week of illness. 65.7% of perforations are solitary and involved the anti-mesenteric border of the terminal ileum [9-13] There is a male predominance among patients with typhoidal perforation. [14] During a typhoid fever outbreak in Uganda, 43% of patients presented with intestinal perforation. [15] The case-fatality rate for typhoidal perforation in developing countries is 15.4% (meta-analysis, 1991 to 2011) [16]
• 70% of pregnancies will end in miscarriage when complicated by untreated typhoid. [17]
• Instances of acalculous cholecystitis [18-22], gall-bladder perforation [23] [24], pancreatitis, intestinal intussusception [25], endocarditis [26], rhabdomyolysis [27-33], renal failure [34], genital ulceration [35], spondylitis/spondylodiscitis [36], meningitis [37-39], transverse myelitis [40], cranial nerve palsy [41], Guillain-Barre syndrome [42], catatonia with parkinsonism [43], cerebral venous sinus thrombosis [44], myocarditis [45], endophthalmitis [46] and ectopic abscesses [47] [48] have been reported in typhoid patients.
• The case-fatality rate among untreated cases is 10% to 15%

Carrier state:
The carrier state is defined as persistent shedding of *Salmonella typhi* in stool and/or urine for >=12 months. [49]
• Approximately 5% of people who contract typhoid continue to carry the disease after they recover.
• Long-term carriage is associated with an increased incidence of cancers of the gallbladder [50-61], pancreas, colo-rectum and lung. [62-64]

Vertical transmission of *Salmonella typhi* to the fetus has been documented. [65]

Laboratory findings include leukopenia (albeit an initial leucocytosis is common), thrombocytopenia, coagulopathy and hepatic dysfunction.
• The most sensitive laboratory test for enteric fever is blood culture.
• Serum transaminase elevations appear to reflect myopathy rather than hepatic disease in most cases. [66]
• Rare instances of hemophagocytic lymphohistiocytosis have been reported. [67]

Typhoid and enteric fever in Zambia



Graph: Zambia. Typhoid and paratyphoid, cases

Notes:
1. During 1943 to 1949, the mean annual incidence was 119 cases [68]
   Individual years:
   1945 - 63 cases of typhoid were reported.

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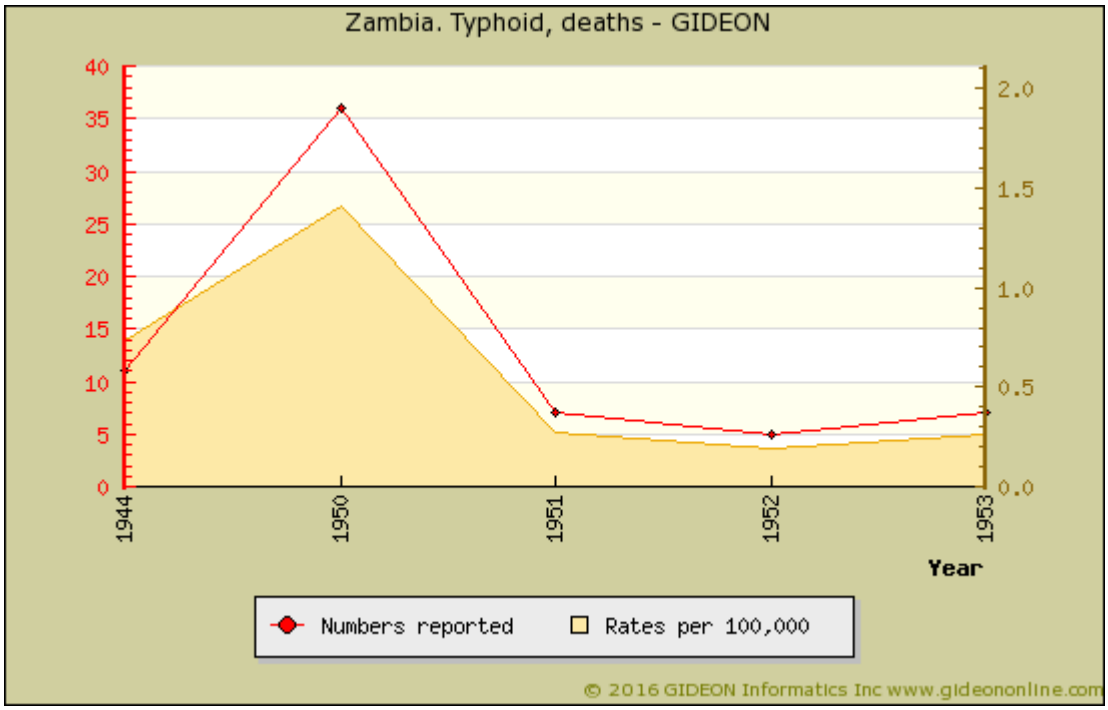

Graph: Zambia. Typhoid, deaths

Notable outbreaks:

1984 (publication year) - An outbreak was reported at a girls camp. [69]

2011 to 2012 - An outbreak (4,396 cases, 9 fatal) of typhoid was reported. [70] [71]

2013 - An outbreak (144 cases) was reported in Central Province. [72]

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Typhus - endemic

Agent	BACTERIUM. Rickettsia typhi
Reservoir	Rat
Vector	Flea (Xenopsylla or Nosopsyllus spp.)
Vehicle	None
Incubation Period	10d - 12d (range 4d - 18d)
Diagnostic Tests	Serology. Identification of rickettsiae in smear or culture of skin lesions. Nucleic acid amplification.
Typical Adult Therapy	Doxycycline 100 mg BID X 7d
Typical Pediatric Therapy	Doxycycline 2 mg/kg BID X 7d (maximum 200 mg/day); or Chloramphenicol 12.5 mg/kg QID X 7d
Clinical Hints	Fever, headache and myalgia; truncal maculopapular rash (present in 60%) appears on days 3 to 5 and persists for 4 to 8 days; fever resolves after 12 to 16 days; case fatality rate (untreated) = 2%.
Synonyms	Endemic typhus, Murine typhus, Rickettsia typhi, Ship typhus, Tifo murino, Tifus pulgas, Vlektyphus. ICD9: 081.0 ICD10: A75.2

Clinical

The features of endemic typhus are similar to those of epidemic typhus, but less severe. [1]
• Headache and myalgia predominate.
• The rash is nonspecific and may be lacking in 50% of patients. [2]
• Major complications are rare.
• The severity of infection has been associated with old age, delayed diagnosis, hepatic and renal dysfunction, central nervous system abnormalities, and pulmonary compromise.
• Ocular complications include uveitis, retinal hemorrhage, choroidal dots, papilledema and optic neuritis [3] [4]
• Rare instances of meningoencephalitis [5] [6], splenic infarction [7], myositis [8], Perinaud's oculoglandular syndrome [9], cranial nerve palsy [10], acute respiratory distress syndrome [11] and hemophagocytic syndrome have been reported. [12]
• As many as 4% of hospitalized cases are fatal.

Typhus - endemic in Zambia

Seroprevalence surveys:

5.0% of the population (1989) [13]

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Typhus - epidemic

Agent	BACTERIUM. Rickettsia prowazekii
Reservoir	Human ? Flying squirrel
Vector	Louse (Pediculus) ? Squirrel flea
Vehicle	None
Incubation Period	10d - 14d (range 5d - 23d)
Diagnostic Tests	Serology. Identification of rickettsiae in smear or culture of skin lesions. Nucleic acid amplification.
Typical Adult Therapy	Doxycycline 100 mg PO BID X 3 to 5d. OR Chloramphenicol 500 mg QID X 3 to 5d
Typical Pediatric Therapy	Doxycycline 2 mg/kg PO BID X 3 to 5d (maximum 200 mg/day). OR Chloramphenicol 10 mg/kg PO QID X 3 to 5d
Clinical Hints	Fever, headache and myalgia; truncal maculopapular rash appears on days 4 to 7; encephalopathy or myocarditis may ensue; fever resolves after 2 weeks, but convalescence is prolonged; case-fatality rate (untreated) = 10% to 20%.
Synonyms	Camp fever, Epidemic typhus, Jail fever, Red louse disease, Rickettsia prowazekii, Ship fever, Shop typhus, Sutama, Sylvatic epidemic typhus, Tifus piojos, Tobardillo. ICD9: 080 ICD10: A75.0

Clinical

Typhus is characterized by the sudden onset of headache, chills, prostration, vomiting, high fever, coughing, severe myalgia and shin pain. [1]
• Conjunctival suffusion, splenomegaly and cerebral obtundation are common.
• A macular eruption appears on the second to sixth day, initially on the upper trunk, with spread to the entire body except the face, palms and soles. [2]
• The rash may later become petechial or necrotic.
• No rash is noted in as many as 30% of cases.

Meningoencephalitis occurs in as many as 50% of severe cases.
• Other complications include secondary bacterial infection, peripheral gangrene and myocarditis.
• The case-fatality rate among untreated patients is 10% to 15%.

Important clinical features which distinguish epidemic typhus from malaria and typhoid are lack of splenomegaly, rigors and diarrhea.

Recrudescent typhus (Brill-Zinsser disease) may present years after the initial episode, and is characterized by classic features of epidemic typhus with a milder clinical course.
Although Typhus - epidemic is not endemic to Zambia, imported, expatriate or other presentations of the disease have been associated with this country.

Typhus - epidemic in Zambia

One case was reported in 1981; 0 in 1982.

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Urinary tract infection

Agent	BACTERIUM OR FUNGUS. Escherichia coli, other facultative gram negative bacilli, enterococci, et al
Reservoir	Human
Vector	None
Vehicle	Endogenous
Incubation Period	Variable
Diagnostic Tests	Urine culture and leucocyte count.
Typical Adult Therapy	Antimicrobial agent(s) directed at known or likely pathogen
Typical Pediatric Therapy	As for adult
Clinical Hints	Fever, dysuria, frequency, flank pain and vomiting; infection in children or men and infection which relapses in women may warrant radiological studies to rule out underlying obstruction or calculus.
Synonyms	Cistite, Cistitis, Cystite, Cystitis, Pielite, Pielitis, Pielonefrite, Pielonefritis, Prostatite, Pyelitis, Pyelonephrite, Pyelonephritis, Trigonitis, Tubulointerstitial nephritis, Urethritis, Uretrite, Zystitis. ICD9: 791.9,136.9,599.0,590,601.0 ICD10: N10,N30,N41

Clinical

Young children often exhibit nonspecific signs such as fever, poor feeding and vomiting.
• Abdominal pain may be present.
• After early childhood, dysuria, urgency, and frequency are generally present in UTI.
• Adult women with cystitis have frequent and urgency, often with lower abdominal or lower back pain.
• The urine may be foul smelling or turbid and is often bloody.
• Onset of symptoms is usually abrupt.
• Some infections progress to upper tract involvement, with fever, rigors, nausea, vomiting, abdominal and flank pain.
• Classical signs of "upper" vs. "lower" UTI are often misleading and do not necessarily point to the location of infection.

In the elderly, UTIs are often asymptomatic or manifest by nonspecific signs.
• Frequency, urgency, nocturia, and incontinence in this age group may also mimic other disorders in this age group.
• Infection associated with neurogenic bladders and indwelling catheters may not necessarily present with localizing symptoms.

Acute uncomplicated cystitis is most common in young women but may also be seen in men, children or the elderly. [1]
• Typical symptoms include dysuria, frequency, urgency, and suprapubic or pelvic pain. [2]
• Suprapubic tenderness is present in 10 to 20 percent, and gross hematuria in 20 to 30 percent.
• Approximately ten percent of patients with symptoms of acute cystitis will be found to have occult infection of the upper urinary tract.
• Bacterial vaginosis may predispose to urinary tract infection [3]

Acute pyelonephritis presents with flank, low back, or abdominal pain, in addition to fever, rigors, sweats, headache, nausea, vomiting, malaise, and prostration. [4]
• Antecedent or concomitant symptoms of cystitis may or may not be present.
• Fever and flank pain are relatively specific indicators of renal infection.
• A minority of patients with pyelonephritis develop septicemia, or necrotizing renal or perinephric abscesses.
• The latter are often associated with urinary tract obstruction or diabetes [see Perinephric abscess].

All urinary infections in males should be considered complicated until proven otherwise, and prompt a careful search for anatomical or functional abnormality of the urinary tract.

Comprehensive reviews of prostatitis. [5] [6]

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Vaccinia and cowpox

Agent	VIRUS - DNA. Poxviridae, Orthopoxvirus. Cowpox virus
Reservoir	Cattle Cat Rodent
Vector	None
Vehicle	Cattle Cat
Incubation Period	2d - 4d
Diagnostic Tests	Viral isolation from skin exudate or biopsy. Nucleic acid amplification. Biosafety level 3.
Typical Adult Therapy	Secretion precautions; supportive. In severe cases, Tecovirimat, 400 to 600 mg PO OD X 14 d.
Typical Pediatric Therapy	As for adult
Vaccine	Vaccinia immune globulin
Clinical Hints	Vesicles or pustules (usually on hand) progressing to crusts; painful regional lymphadenopathy; follows contact with infected animals or smallpox vaccination (largely abandoned); see Buffalopox (India note).
Synonyms	Akhmeta poxvirus, Aracatuba, Buffalopox, Camelpox, Cantagalo, Cowpox, Passatempo, Vaccinia, Vaiolo. ICD9: 051.0 ICD10: B08.0

Clinical

Cowpox is characterized by single or multiple vesicles of the hands or face, which evolve to pustules that may persist for two or more months. [1]
• The surrounding tissues are swollen and painful, and tender regional adenopathy is present.
• Most lesions occur on the thumbs, forefinger and first interdigital cleft.
• Secondary lesions may appear on the hands, forearms or face through self-inoculation.
• Facial cellulitis with necrotizing lymphadenitis has been reported. [2]
• Vaccinia infections caused by unintentional transfer from vaccination sites usually involve the face, nose, mouth, lips, genitalia, anus, or eye. [3]
• Poxviruses are known to remain infectious in the scabs of patients for months to years. [4]
• Infectious virus is present at the site of primary vaccination for at least 21 days. [5]

The rash evolves as follows:
• One to six days following inoculation), an inflamed macule appears at the site of contact.
• On days 7 to 12, the lesion becomes papular, then vesicular.
• On days 13 to 20, the vesicle becomes hemorrhagic and then pustular, and tends to ulcerate, with surrounding edema and induration. Secondary contiguous lesions may appear.
• After 3 to 6 weeks, the vesicopustule progresses to a hard, black eschar • often surrounded by edema, induration and erythema.
• At weeks 6 to 12, the eschar sloughs, and the lesion heals with scarring.
• Additional findings include lethargy, vomiting, sore throat, conjunctivitis, periorbital edema and keratitis during the early phase of infection.
• A generalized rash does not occur.

One case of post-cowpox encephalitis has been reported.
• During 2002 to 2010, cases of vulvar vaccinia in the United States were acquired through sexual exposure to recently-vaccinated military personnel. [6-9]

Previous smallpox vaccination may attenuate the severity of infection.

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The clinical features of buffalopox include fever, lymphadenopathy and pox lesions on the hands (acquired from contact with the udders of cattle [10]).

Camelpox virus infection in humans is characterized by papules, vesicles, ulceration and finally scabs over fingers and hands (eg, areas in contact with infected camels) [11]

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Varicella

Agent	VIRUS - DNA. Herpesviridae, Alphaherpesvirinae: Human Herpesvirus 3 (Varicella-zoster virus)
Reservoir	Human
Vector	None
Vehicle	Air Direct contact Breastfeeding
Incubation Period	2w - 3w
Diagnostic Tests	Viral culture (vesicles). Serology. Nucleic acid amplification.
Typical Adult Therapy	Respiratory isolation. Severe/complicated cases: Acyclovir 10 to 12 mg/kg IV q8h X 7d Adolescent / young adult: 800 mg PO X 5 per day X 7 d. Alternatives: Valacyclovir 1 g PO TID; or Famciclovir 500 mg PO TID
Typical Pediatric Therapy	Respiratory isolation. Acyclovir (severe/complicated cases) 150 mg/sq m IV q8h X 7d
Vaccines	Varicella vaccine Varicella-Zoster immune globulin
Clinical Hints	Cough and fever followed by a pruritic papulovesicular rash after 1 to 2 days; pneumonia is often encountered; case fatality rate = 4.3 per 100,000 cases (7% in immune-suppressed patients).
Synonyms	Chickenpox, Lechina, Skoldkopper, Vannkopper, Varicela, Varizellen, Vattenkoppor, Waterpokken, Windpocken. ICD9: 052 ICD10: B01

Clinical

Acute infection:
The predominant features of varicella are fever, cough, malaise, lymphadenopathy and a generalized pruritic vesicular rash typically consisting of 250 to 500 lesions.
• The rash generally begins on the scalp and proceeds to the trunk and extremities, with most lesions on the trunk.
• Skin lesions are initially maculopapular, progressing to vesicles on an erythematous base. [1]
• Atypical varicella, including lesions on palms and soles, may mimic monkeypox in endemic areas. [2]

Complications:
Complications include hepatitis [3] [4], encephalitis (10% of hospitalized cases; notably involving the cerebellum) [5-8], myelitis [9], arthritis [10], secondary bacterial infections, Reye's syndrome, disorders of the facial [11-13] and other cranial nerves [14], cerebellar mutism [15], meningitis [16], cerebral venous thrombosis [17] [18], transverse myelitis [19], Guillain-Barre syndrome [20] [21], sudden deafness [22], peripheral facial palsy [23], acute urinary retention [24], pancreatitis [25-27], appendicitis [28], pneumonia [29-31], empyema [32], acute respiratory distress syndrome (ARDS) [33-36], spontaneous pneumothorax [37], myocarditis [38], atrioventricular block [39], hemorrhagic pericarditis [40] [41], optic neuritis [42-44], uveitis [45], acute retinal necrosis [46] [47], necrotizing scleritis [48] [49], deep venous thrombosis or thromboembolism [50], purpura fulminans [51] [52], idiopathic thrombocytopenic purpura [53], marked thrombocytopenia [54] and hemophagocytic lymphohistiocytosis. [55]
• Pyomyositis [56], osteomyelitis [57], necrotizing fasciitis or Fournier's gangrene may occasionally complicate varicella [58]
• Post varicella cerebral infarction has been described in young, previously healthy children within a few months of VZV infection and is characterized by middle cerebral artery territory infarction and proximal MCA disease. [59] [60] A similar condition has been reported in immunocompromised patients following herpes zoster involving the ophthalmic branch of the trigeminal nerve as well as in the context of primary varicella complicated by granulomatous angiitis [61] Extra-cranial vascular thrombosis of large or small vessels has also been reported [62]
• VZ virus infection may be associated with facial nerve palsy [63] or Ramsay-Hunt syndrome (Bell palsy unilateral or bilateral, vesicular eruptions on the ears, ear pain, dizziness, preauricular swelling, tingling, tearing, loss of taste sensation, and nystagmus) [64]

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• Immunocompromised individuals, neonates, infants, adolescents and adults are at risk of severe illness and complications. [65-67]

• VZ virus infection can be a presenting symptom of hyperparathyroidism and occurs twice as often in persons with hypercalcemia than age-matched controls. [68]
• Use of nonsteroidal anti-inflammatory drugs during primary varicella, has been implicated as a risk factor for subsequent occurrence of streptococcal necrotizing fasciitis.

Anterior uveitis • differential diagnosis:
Anterior uveitis due to Rubella virus is characterized by younger age at onset and a chronic course, typically associated with cataract at presentation. [69]
• Rubella virus has been implicated in the etiology of Fuchs heterochromic iridocyclitis. [70]
• Anterior uveitis due to Herpes simplex and Varicella-Zoster viruses is more common in adults, and often follows an acute course.
• Herpes simplex anterior uveitis presents with conjunctival redness, corneal edema, a history of keratitis, and the presence of posterior synechiae. Anterior chamber inflammation is common with Herpes simplex virus, while vitritis is more common with Rubella and Varicella-Zoster virus.
• Rubella, Herpes simplex and Varicella-zoster viruses are associated with intraocular pressure of more than 30 mmHg and development of glaucoma (18%-30%; P = 0.686).
• Focal chorioretinal scars were present in 22% of Rubella cases, 0% of HSV and in 11% of VZV uveitis cases.

Perinatal infection: [71-73]
Newborn infants whose mothers had onset of varicella within 5 days before delivery or within the 48 hours after delivery are at risk for neonatal varicella. [74-79]
• Neonatal varicella carries a case-fatality rate as high as 30%.
• Maternal infection [80] during the first 20 weeks of pregnancy carries a risk (0.4% to 2.0%) of congenital varicella, characterized by low birth weight, hypoplasia of extremities, dermal scarring, focal muscular atrophy, encephalitis, cortical atrophy, chorioretinitis and microcephaly. [81-83]

Varicella in Zambia

Prevalence surveys:

3.9% of central nervous system infections among HIV-positive patients (2014 publication) [84]

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Vibrio parahaemolyticus infection

Agent	BACTERIUM Vibrio parahaemolyticus A facultative gram-negative bacillus
Reservoir	Marine water Seafood Fish
Vector	None
Vehicle	Seafood
Incubation Period	10h - 20h (range 2h - 4d)
Diagnostic Tests	Stool culture - alert laboratory when this organism is suspected.
Typical Adult Therapy	Supportive
Typical Pediatric Therapy	As for adult
Clinical Hints	Vomiting and explosive diarrhea, 4 to 24 hours following ingestion of seafood (often steamed crabs); diarrhea may persist for 7 to 10 days; case fatality rate = 0.1%.
Synonyms	Vibrio parahaemolyticus. ICD9: 005.4 ICD10: A05.3

Clinical

Symptoms usually begin within 10 to 20 hours after ingestion of seafood, and persist for 2 to 10 days.
- Illness is characterized by vomiting (50%), abdominal pain and watery or explosive diarrhea.
- Fever is noted in 25% of patients.
- Dysentery has been described in some cases. [1]

Rare instances of bacteremia and extra-intestinal infection are reported. [2-5]

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Wesselsbron

Agent	VIRUS - RNA. Flaviviridae, Flavivirus: Wesselsbron virus
Reservoir	Sheep Cattle
Vector	Mosquito (Aedes sp., Anopheles gambiae, An. pharoensis, Culex telesilla, Cu. univittatus, Mansonia uniformis)
Vehicle	None
Incubation Period	2d - 4d
Diagnostic Tests	Viral culture (blood, throat). Serology. Biosafety level 3.
Typical Adult Therapy	Supportive
Typical Pediatric Therapy	As for adult
Clinical Hints	Fever, myalgia, arthralgia, dermal hyperesthesia, maculopapular rash and leukopenia; illness lasts up to 10 days; no fatality reported.
Synonyms	

Clinical

Wesselsbron is characterized by abrupt onset of fever, myalgias, arthralgias, dermal hyperesthesia, leucopenia.
- A maculopapular rash which appears after 3 to 4 days. [1]
- Meningoencephalitis may follow.
- Although human infection may be severe, no fatalities have been reported.

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West Nile fever

Agent	VIRUS - RNA. Flaviviridae, Flavivirus: West Nile virus A subtype of West Nile virus, Kunjin virus, is associated with human disease in Oceania and Asia
Reservoir	Bird Horse Bat ? Tick
Vector	Mosquito (Culex univittatus. Cu. pipiens, Cu. vishnui, Cu. neavei, Coquillettidia, Aedes and Anopheles spp. Kunjin virus is transmitted by Culex annulirostris
Vehicle	Blood Breastfeeding
Incubation Period	3d - 6d (range 1d - 14d)
Diagnostic Tests	Viral culture (blood, CSF). Serology. Nucleic acid amplification. Biosafety level 3.
Typical Adult Therapy	Supportive
Typical Pediatric Therapy	As for adult
Clinical Hints	Myalgia, arthralgia, lymphadenopathy, headache, conjunctivitis and a macular rash; sporadic instances of encephalitis, meningitis and myocarditis are reported; Kunjin virus similar, but often associated with arthralgia, myalgia and rash; illness resolves within one week in most cases.
Synonyms	Bagaza, Fiebre del Oeste del Nilo, Kunjin, Lourdige, Near Eastern equine encephalitis, Ntaya, Usutu, WNF. ICD9: 066.4 ICD10: A92.3

Clinical

Acute infection:
It has been estimated that 25% of infected humans develop clinical illness, with neuroinvasive disease in less than 1%. 10% of the latter result in death. [1]
• West Nile fever in humans usually is a minor influenza-like illness, characterized by an abrupt onset of moderate to high fever lasting 3 to 5 days.
• Illness among children is generally mild, with relatively fewer complications. [2]
• The fever is occasionally biphasic, and may be accompanied by rigors.
• Additional findings include frontal headache, sore throat, backache, myalgia, arthralgia, fatigue, conjunctivitis and retrobulbar pain. [3]
• A maculopapular or roseolar rash [4] [5] appears in approximately 50% of cases, spreading from the trunk to the extremities and head.
• Lymphadenopathy, anorexia, nausea, abdominal pain, diarrhea, and respiratory symptoms are also encountered.

Neuroinvasive disease:
Occasionally (<15% of cases), acute aseptic meningitis or encephalitis occurs, associated with neck stiffness, vomiting, confusion, disturbed consciousness, somnolence, tremor of extremities, abnormal reflexes, convulsions, pareses, and coma. [6] [7]
• Such patients may then develop anterior myelitis and acute asymmetric flaccid paralysis, reminiscent of poliomyelitis or Guillain-Barre syndrome. [8-14] Rare instances of isolated bulbar palsy [15], progressive brachial plexitis and diplegia are reported. [16] [17]
• Focal encephalitis with seizures may mimic herpes simplex encephalitis. [18] [19] Opsoclonus myoclonus syndrome has also been encountered. [20]
• Cases of acute psychosis [21], diplopia [22] and stuttering (? lingual myoclonus) during the course of West Nile fever have been reported. [23]
• Risk factors for neuroinvasive disease include age >45 years, male sex, hypertension, immune-compromise (HIV infection, post-transplant) and diabetes mellitus. [24] [25]
• Multifocal chorioretinitis is common among patients with neuroinvasive disease. [26-31] A case of acute hemorrhagic conjunctivitis, bilateral subconjunctival hemorrhages, and nystagmus has been reported. [32]
• Most fatal cases occur in patients older than 50 years. [33]

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Hepatosplenomegaly, hepatitis, pancreatitis [34] , myocarditis [35] , purpura fulminans [36] and hemorrhagic fever have been reported. [37]

Prolonged convalescence (up to one year) may follow recovery from encephalitis; and myalgia, confusion and lightheadedness may persist beyond this period. [38-43]
• Recovery is complete (less rapid in adults than in children, often accompanied by long-term myalgias and weakness), and permanent sequelae have not been reported.
• Prolonged depression persists in as many as 31% of patients following recovery. [44] [45]
• Residual kidney disease is common following West Nile fever. [46]

Laboratory findings:
Laboratory findings consist of a slightly increased sedimentation rate and mild leukocytosis.
• Profound and prolonged lymphocytopenia is reported in some cases. [47]
• Cerebrospinal fluid in patients with central nervous system involvement is clear, with moderate pleocytosis and elevated protein.
• A distinctive CSF plasmacytosis may be present.
• The virus can be recovered from the blood for up to 10 days in immunocompetent febrile patients, and as late as 22 to 28 days after infection in immunocompromised patients.
• Peak viremia occurs 4 to 8 days postinfection.

Kunjin virus infection is often asymptomatic. Overt infection is clinically similar to Ross River disease • arthralgia, fever and rash. [48]
• Headache, nuchal rigidity and encephalitis have been reported in a minority of cases.

Usutu virus infection was reported in two immune-compromised humans in 2009 [49-51] and in three patients in 2013. [52]
• Clinical features included fever of 39.5 °C, headache, meningo-encephalitis, tremor and hyper-reflexia. One patient developed fulminant hepatitis.

Ntaya virus, a related flavivirus, has been associated with febrile illness and neurological findings. [53]
Although West Nile fever is not endemic to Zambia, imported, expatriate or other presentations of the disease have been associated with this country.

West Nile fever in Zambia

Antibody toward Ntaya virus has been demonstrated in travelers returning to Britain from Zambia. [54]

Seroprevalence surveys:
10.2% of individuals in Western and North-Western Provinces (2015 publication) [55]

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Whipple's disease

Agent	BACTERIUM. Actinomycetes, Tropheryma whipplei A gram positive bacillus
Reservoir	Unknown
Vector	None
Vehicle	None
Incubation Period	Unknown
Diagnostic Tests	Identification of inclusions in lamina propria (other tissues). Tissue culture. Nucleic acid amplification.
Typical Adult Therapy	Ceftriaxone 2.0 g IV daily X 14 days. OR Penicillin G 12 million u + Streptomycin 1 g daily X 14d. Then, Sulfamethoxazole/trimethoprim X 1 year OR: Doxycycline 100 mg PO BID + Hydroxychloroquine X 1 year, followed by Doxycycline for life
Typical Pediatric Therapy	Disease is rarely, if ever, encountered in children
Clinical Hints	A chronic multisystem disorder characterized by weight loss, diarrhea, abdominal and joint pain; dermal hyperpigmentation, fever and lymphadenopathy often present; PAS-positive macrophages present in intestinal biopsy material.
Synonyms	Intestinal lipodystrophy, Lipophagic granulomatosis, Mesenteric chyladenectasis, Steatorrhea arthropericarditica, Tropheryma whipplei. ICD9: 040.2 ICD10: K90.8

Clinical

The typical patient with Whipple's disease has a history of recurrent arthralgia or arthritis involving multiple joints for several years. [1]

- Joint complaints precede systemic and gastrointestinal disease in approximately one-third of patients [2], and may persist for years in the absence of diarrhea. [3] [4]
- Infection of prosthetic joints has been reported. [5]
- Diarrhea, low-grade fever and weight loss are characteristic, and hyperpigmentation is present in 50% of patients.
- Generalized lymphadenopathy is common.
- A syndrome of dementia and obesity or ataxia linked associated with *T. whipplei* infection has been recently described. [6]

As many as one third of the patients develop cardiac involvement characterized by the presence of systolic murmurs, a pericardial friction rub, congestive heart failure, and nonspecific electrocardiographic changes. [7]

- The most common pathological changes are endocarditis [8-12] with negative blood cultures, presenting with thickened and deformed mitral or aortic valves. [13]
- In one series, Whipple's disease was identified in 6.3% of patients with culture-negative endocarditis (2011 publication) [14]
- 30 to 40% of patients develop pleuritic chest pain, chronic nonproductive cough, and dyspnea.
- The chest X-ray may show a pleural effusion or pulmonary infiltrates.
- Isolated *T. whipplei* endocarditis may occur without other systemic features of Whipple's disease. [15-17]

Relapse of Whipple's disease has been reported following therapy. [18] [19]

- Recurrence of symptoms following therapy may represent an immune reconstitution syndrome. [20]

Tropheryma whipplei was isolated from 6.4% of blood specimens from febrile patients with cough (Senegal, 2008 to 2009) [21]

Other features of Whipple's disease may include personality changes or dementia [22-25], hypersomnia [26], amnesic syndrome [27], peripheral or cranial nerve neuropathy [28], encephalitis [29] [30], cerebral pseudotumor [31-33], ataxia [34], chronic headache [35], endocarditis [36-39], confusion, delirium [40], pericarditis [41] [42], pneumonia [43] [44], pulmonary hypertension

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[45] [46], hypothyroidism [47], subcutaneous nodules [48], anemia, myoclonus, chorioretinitis [49], vitritis [50], uveitis [51] [52], Parinaud syndrome [53], salcroiliitis [54] and spondylitis [55], recurrent monoarthritis [56], thrombocytopenia [57], pancytopenia [58], hypoalbuminemia and hypokalemia. [59]

The features of Whipple's disease may resemble those of lymphoma, celiac disease, Crohn's vasculitis, sepsis, an inflammatory process, liposarcoma, rheumatoid arthritis, seizure disorder, cerebrovascular accident, xanthoma, or central nervous system neoplasm. [60]

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Yaws

Agent	BACTERIUM. Treponema pallidum subsp. pertenue: microaerophilic gram-negative spirochete
Reservoir	Human ? Non-human primate
Vector	None
Vehicle	Contact ? Insect bite ? Fomite
Incubation Period	3w - 5w (range 10d - 12w)
Diagnostic Tests	VDRL and antitreponemal tests (FTA, MHTP) positive as in syphilis.
Typical Adult Therapy	Azithromycin 30 mg/kg p.o. as single dose OR Benzathine Penicillin G 1.2 million units IM as single dose.
Typical Pediatric Therapy	Azithromycin 30 mg/kg p.o. as single dose OR Benzathine Penicillin G : Weight <14kg: 300,000u IM Weight 14 to 28kg: 600,000u IM Weight >28kg - 1.2 million u IM
Clinical Hints	Dermal papillomata, periostitis and soft tissue suppuration; regional lymphadenopathy common; relapses often seen during initial 5 years of illness; gummas and hyperkeratotic plaques in later stages.
Synonyms	Anakhre, Bouba, Breda's disease, Charlouis' Disease, Frambesia, Gangosa, Goundou, Granuloma tropicum, Gundo, Henpue, Henpuye, Ogo Mutilans, Parangi, Patek, Pian, Treponema pallidum subsp pertenue. ICD9: 102 ICD10: A66

Clinical

Yaws has three clinical stages. [1] [2]
• Stage 1 is characterized by the a variety of flat and/or raised skin lesions.
• Stage 2 (Gangosa Syndrome, Ogo, or Rhinopharyngitis Mutilans) may involve the bones, joints, and/or skin.
• Stage 3 (Goundou Syndrome, Henpue, Henpuye, Gundo, or Anakhre) may also involve the bones, joints, and/or skin.

After an incubation period of approximately 3 weeks, a primary painless 2 to 5 cm pruritic papule ("mother yaw") appears at the site of inoculation. [3]
• The lesions may ulcerate, but generally heal completely after 3 to 6 months.
• Secondary lesions appear in crops from weeks to months later, measure 1 to 5 cm and tend to ulcerate or take the shape of raspberries (frambesoids), round or discoidal papillomas. [4]
• Osteoperiostitis may be evident at this stage [5] ; however systemic symptoms are usually not present
• The secondary stage may persist for up to 6 months, and relapse over periods as long as 10 years. [6]
• The third stage is characterized by destructive necrotic and gummatous lesions of skin, bone, nasopharynx and contiguous structures.

Although yaws and chancroid may co-exist in some regions, lesions of yaws tend to be more circular in shape, and are more likely to have central granulating tissue and indurated edges. [7]
Although Yaws is not endemic to Zambia, imported, expatriate or other presentations of the disease have been associated with this country.

Yaws in Zambia

Yaws was previously endemic to the Zambesi valley and in the northwestern region on the border with Democratic Republic of Congo. [8]

100 cases were reported in 1950.

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Yellow fever

Agent	VIRUS - RNA. Flaviviridae, Flavivirus: Yellow fever virus
Reservoir	Human Mosquito Monkey ? Marsupial
Vector	Mosquito - Stegomyia (Aedes), Haemagogus, Sabethes
Vehicle	None
Incubation Period	3d - 6d (range 2.5d - 14d)
Diagnostic Tests	Viral culture (blood, liver). Serology. Nucleic acid amplification. Biosafety level 3.
Typical Adult Therapy	Supportive
Typical Pediatric Therapy	As for adult
Vaccine	Yellow fever vaccine
Clinical Hints	Headache, backache, vomiting, myalgias, jaundice, hemorrhagic diathesis, relative bradycardia and leukopenia; illness is often biphasic; 10% to 60% die within 7 days of onset.
Synonyms	Bulan fever, Febbre gialla, Febre amarela, Fever of Fernando Po, Fever of the blight of Benin, Fiebre amarilla, Fievre jaune, Gelbfieber, Gele koorts, Gul feber, Gula febern, Inflammatory fever, Kendal's disease, Magdalena fever, Maladie de Siam, Pest of Havana, Stranger's fever. ICD9: 060 ICD10: A95

Clinical

WHO Case definition for surveillance: [1]
Clinical description
• Characterized by acute onset of fever followed by jaundice within 2 weeks of onset of first symptoms.
• Hemorrhagic manifestations and signs of renal failure may occur.
Laboratory criteria for diagnosis
• Isolation of yellow fever virus, or
• Presence of yellow fever specific IgM or a four-fold or greater rise in serum IgG levels in paired sera (acute and convalescent) or
• Positive post-mortem liver histopathology or detection of yellow fever antigen in tissues by immunohistochemistry or
• Detection of yellow fever virus genomic sequences in blood or organs by PCR
Case classification
• Suspected: A case that is compatible with the clinical description.
• Probable: A suspected case with presence of yellow fever IgM antibody (in the absence of vaccination within 30 days); or positive postmortem liver histopathology; or an epidemiological link to a confirmed case or outbreak.
• Confirmed: A probable case; and a fourfold or greater increased in antibody titers; or presence of yellow fever neutralization antibody; or detection of yellow fever virus, viral genome or antigen in blood or tissues.

The clinical presentation of yellow fever can range from a self-limited flu-like illness to overwhelming hemorrhagic fever, with a case-fatality rate of 50%. [2]
• 55% of yellow fever infections are asymptomatic, 33% mild and 12% severe. The case-fatality rate in severe illness is 47% (meta-analysis, 1969 to 2011). [3]

Infection is heralded by abrupt onset of fever, headache, and myalgias associated with conjunctival injection, facial flushing, relative bradycardia (Faget's sign) and leukopenia. [4]
• Although most cases do not progress beyond this stage, a remission of fever for a few hours to several days may be followed by high fever, headache, lumbosacral pain, nausea, vomiting, abdominal pain, and somnolence.
• At this stage, the patient exhibits icteric hepatitis and a hemorrhagic diathesis with prominent bleeding from the gastrointestinal tract, epistaxis, bleeding gums, and petechial and purpuric hemorrhages.
• Weakness, prostration, protracted vomiting and albuminuria are prominent.
• Deepening jaundice and elevations in serum transaminase levels continue for several days, accompanied by azotemia and progressive oliguria.

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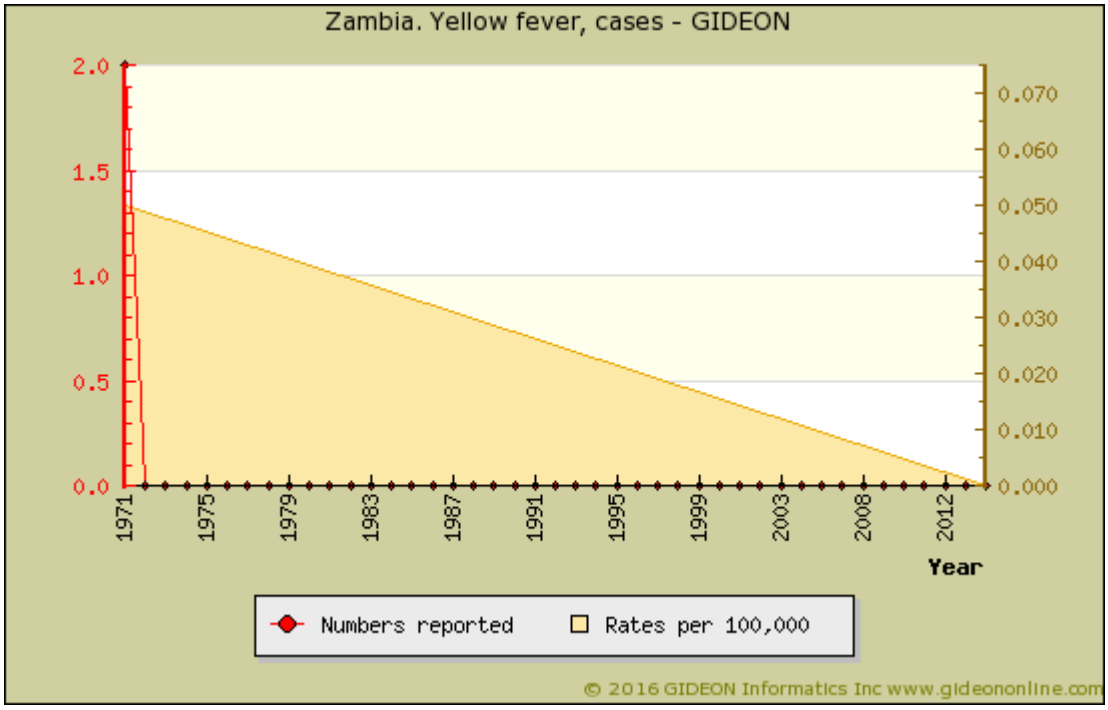
- Direct bilirubin levels rise to 5 to 10 mg/dl, while alkaline phosphatase levels are only slightly raised.
- Eventually, hypotension, shock, and metabolic acidosis develop, compounded by myocardial dysfunction and arrhythmias.
- Additional findings may include acute tubular necrosis, confusion, seizures, and coma.
- CSF examination reveals an elevated protein level without pleocytosis.
- Death usually occurs within 7 to 10 days after onset.

Yellow fever in Zambia

Zambia is designated a COUNTRY WITH ONLY AREAS OF LOW POTENTIAL FOR EXPOSURE TO YELLOW FEVER VIRUS.

As of 2015, Zambia is designated by WHO as a YELLOW FEVER FREE ZONE [5]
- The western forest region of Zambia had been previously designated an endemic area.



Graph: Zambia. Yellow fever, cases

Notes:
1. Three cases were reported in Northern Rhodesia (present-day Zambia) in 1953.

Seroprevalence surveys:

0.2% / 0.3% of non-vaccinated individuals in North-Western and Western Provinces (IgM / IgG, 2015 publication) [6]

Routine infant vaccine coverage in the local population was 8% in 1991.

The vectors for yellow fever in Zambia are *Aedes aegypti* and *Aedes africanus*. [7]

Proof of vaccination **IS** required if traveling from a country with risk of YFV transmission and >=9 months of age. Vaccine is also required if the traveler has been in transit for >12 hours in the airport of a country with risk of YFV transmission
- CDC (The United States Centers for Disease Control) generally does not recommended for travelers going to the North West and Western Provinces. Not recommended in all other areas.

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Yersiniosis

Agent	BACTERIUM. Yersinia enterocolitica and Yersinia pseudotuberculosis A facultative gram-negative bacillus
Reservoir	Pig Rodent Rabbit Sheep Goat Cattle Horse Dog Cat Bat
Vector	None
Vehicle	Food Water Meat Dairy products Vegetables Fecal-oral Blood
Incubation Period	4d - 7d (range 1d - 11d)
Diagnostic Tests	Culture stool, blood. Alert laboratory when these organisms are suspected.
Typical Adult Therapy	Stool precautions; diarrhea is self-limited. If severe disease - Ciprofloxacin 500 mg BID X 5 to 7d. OR Sulfamethoxazole/trimethoprim
Typical Pediatric Therapy	Stool precautions; diarrhea is self-limited. If severe disease - Sulfamethoxazole/trimethoprim 20 mg-4 mg/kg BID X 5 to 7d
Clinical Hints	Fever, diarrhea, right lower quadrant pain; fecal leucocytes present; may be associated with rheumatologic manifestations such as erythema multiforme, Reiter's syndrome and chronic arthritis.
Synonyms	Far East scarlet-like fever, FESLF, Yersinia enterocolitica, Yersinia pseudotuberculosis, Yersiniose. ICD9: 008.44 ICD10: A04.6,A28.2

Clinical

Yersinia enterocolitica infection typically presents as febrile diarrhea, and occasionally bloody diarrhea. [1]
• Lower abdominal pain without diarrhea occurs in over 15% of cases, and may mimic acute appendicitis. [2-7] Several instances of intestinal intussusception have been associated with *Yersinia enterocolitica* [8-18] and *Y. pseudotuberculosis* infections. [19]
• Pharyngitis [20] and tonsillitis [21] are encountered ; and metastatic infection of bone, joints [22] , soft tissues, spleen, meninges [23] or other organs may occur. [24-28]
• Chronic arthritis, erythema nodosum, Reiter's syndrome [29] , Sweet's syndrome [30] , glomerulonephritis [31-37] , hemophagocytic lymphohistiocytosis [38] , pneumonia [39] and endocarditis [40-53] have also been reported.
• Reactive arthritis has been reported in over 20% of cases [54] [55]
• *Yersinia enterocolitica* septicemia (associated with transfusion of contaminated red blood cell products) is fatal in over 50% of cases. [56]

Yersinia pseudotuberculosis is associated with cases of self-limited gastroenteritis.
• Outbreaks of *Y. pseudotuberculosis* infection in Russia and Japan have been associated with a more severe generalized febrile illness known as Far East scarlet-like fever (FESLF) [57] [58] Clinical features include rash and desquamation, hyperemic tongue, and a toxic shock syndrome. [59]

Yersinia enterocolitica and *Yersinia pseudotuberculosis* are two of at least a dozen *Yersinia* species encountered in humans. See the Microbiology module for further details.

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Zika

Agent	VIRUS - RNA. Flaviviridae, Flavivirus: Zika virus
Reservoir	Human Mosquito Monkey
Vector	Mosquito - Stegomyia (Aedes) species
Vehicle	Sexual transmission Blood transfusion
Incubation Period	5d - 8d (range 2d - 15d)
Diagnostic Tests	Viral isolation (blood). Serology. Nucleic acid amplification.
Typical Adult Therapy	Supportive
Typical Pediatric Therapy	As for adult
Clinical Hints	A mild dengue-like illness with conjunctivitis and a pruritic maculopapular rash that starts on the face and spreads to the rest of the body; joint pain is common; myalgia, retroorbital pain and leg edema may occur; may be associated with congenital neurological defect.
Synonyms	Zika fever. ICD9: 078.89 ICD10: A92.8

Clinical

Zika virus infection is characterized by a mild illness which lasts for 4 to 7 days. [1]
• The female/male ratio of patients is 2/1.
• Signs and symptoms include fever, headache (40%) conjunctivitis (65%) and a maculopapular rash (80%) that starts on the face and spreads to the rest of the body.
• Lack of fever and subclinical infections are reported. [2]
• Pruritis is common
• Patients may experience arthralgia (35%) or arthritis (25%), mostly affecting the smaller joints of the hands and feet. Larger joints may also be involved
• Additional findings have included myalgias (25%) retro-orbital pain (30%) , lower extremity edema (20%), cough, diarrhea, [3] , lymphadenopathy, and abdominal pain (8%).
• Neurological signs, including Guillain-Barre syndrome, are common. [4-8]
• There is evidence that Zika virus infection during pregnancy results in microcephaly of the newborn [9-17] and abnormalities of the retina and optic nerve. [18] [19]
• Clinical features tend to be relatively mild in children.
• Symptoms resolve within 4 to 7 days.

Note that Zika and Dengue are clinically similar, and may coexist in a given country.
• Dengue-Zika [20] co-infections may occur in regions which are endemic for both diseases.
Although Zika is not endemic to Zambia, imported, expatriate or other presentations of the disease have been associated with this country.

Zika in Zambia

Seroprevalence surveys:

6.0% of individuals in Western and North-Western Provinces (2015 publication) [21]

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Zygomycosis

Agent	FUNGUS. Zygomycota, Zygomycetes, Mucorales: Mucor spp., Rhizopus spp., Lichtheimia (formerly Absidia) spp, Saksenaea spp, et al
Reservoir	Saprophytes
Vector	None
Vehicle	Air Bandages Contact
Incubation Period	Variable
Diagnostic Tests	Fungal smear and culture.
Typical Adult Therapy	Amphotericin B to maximum dose 0.8 mg/kg/d; and to total dose of 3g. Excision as indicated
Typical Pediatric Therapy	Amphotericin B max dose 0.8 mg/kg/d; and to total dose of 40 mg/kg. Excision as indicated
Clinical Hints	Periorbital pain, sinusitis, and palatal, nasal or cerebral infarcts; occurs in the setting of preexisting acidosis (diabetes, uremia); pulmonary infection may complicate leukemia.
Synonyms	Absidia, Actinomucor, Apophysomyces, Cokeromyces, Cunninghamella, Hormographiella, Lichtheimia, Lichtheimia, Mucor, Mucormycosis, Mycocladus, Phycomycosis, Rhizomucor, Rhizopus, Saksenaea, Syncephalastrum. ICD9: 117.7 ICD10: B46

Clinical

Infection is most commonly associated with hyperglycemia, metabolic (diabetic, uremic) acidosis, corticosteroid therapy and neutropenia [1] , transplantation, heroin injection or administration of desferoxamine. [2]
• Major risk factors identified in children are neutropenia, diabetes mellitus, and prematurity. [3]
• Virtually any organ can be involved [4-7] ; however, most infections involve the paranasal sinuses and contiguous structures (orbit, cavernous sinus, cranial nerves, cerebral arteries), lungs, skin [8] [9] and gastrointestinal tract. [10]

Disease manifestations reflect the mode of transmission, with rhinocerebral and pulmonary diseases being most common. [11]
• Cutaneous [12] , gastrointestinal, and allergic diseases are also seen.
• The Mucorales are associated with blood vessel invasion, often leading to thrombosis, infarction and tissue destruction.
• Rare cases of sinusitis have been ascribed to *Actinomucor elegans*.
• Dissemination is common.
• Therapy must be started early and consists of antifungal drugs, surgical intervention, and reversal

Rhinocerebral zygomycosis initially manifests with headache (often unilateral), fever, facial pain, diplopia, lacrimation, and nasal stuffiness.
• As the infection spreads, necrotic lesions appear in the turbinates, nose, paranasal skin or hard palate. [13]
• Rare cases of mycotic mandibular osteomyelitis have been reported.
• Chemosis, proptosis, and external ophthalmoplegia may occur.
• Cranial nerve abnormalities are common (nerves II through VII, IX, and X) [14] , and blindness may ensue following invasion of the cavernous sinus, ophthalmic artery, and orbit.
• Hemiparesis, seizures, or monocular blindness suggest advanced disease.
• Invasion of the internal carotid artery in the cavernous sinus can occur, with metastatic lesions in the frontoparietal cortex and deepening coma.

Pulmonary zygomycosis presents with nonspecific symptoms such as fever, cough and dyspnea. [15]
• Hemoptysis may occur with vascular invasion.
• Radiological findings include segmental consolidation which progresses to contiguous areas of the lung and may cavitate.
• In 74% of pulmonary zygomycosis cases, the infection is limited to the lung. [16]
• Complications may include bronchial perforation and mediastintis. [17]

Gastrointestinal zygomycosis usually affects patients with severe malnutrition, and may involve the stomach [18] [19] , ileum, colon [20] or peritoneum. [21]

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- Clinical findings mimic intra-abdominal abscess.
- The diagnosis is often made at autopsy.

Cutaneous zygomycosis may present as primary infection, characterized by necrotic lesions following trauma; or secondary extension from a focus of rhinocerebral infection. [22-24]

Renal zygomycosis may mimic malignancy [25-28]

Zygomycetes peritonitis may complicate peritoneal dialysis. [29]

59 case reports (38 fatal) of neonatal zygomycosis had been published to July 2007 • 77% premature infants, 54% gastrointestinal and 36% dermal. [30]

Zygomycosis has a poor prognosis, with a mortality rate of 44%. [31]

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Vaccine Schedule for Zambia

BCG - birth
DTwPHibHepB - 6, 10, 14 weeks
Measles - 9, 18 months
OPV - 6, 10, 14 weeks
Pneumo conj - 6, 10, 14 weeks
Rotavirus - 6, 10 weeks
Td - 1st contact pregnancy; +1, +1, +6 months; +1, +1 year

A given generic vaccine may have multiple designations in this list due to variations in terminology used by individual countries. Vaccination policies evolve rapidly in response to changes in disease occurrence and the introduction of new vaccines. Every effort has been made to update these lists accordingly.

Vaccine Abbreviations

aP - Attenuated pertussis
ap - Attenuated pertussis
BCG - Bacillus Calmette Guerin
CBAW - Childbearing age women
D - Diphtheria
HCW - Health-care workers
Hep - Hepatitis B
HEP - Hepatitis B
HepA - Hepatitis A
HepB - Hepatitis B
Hib - Haemophilus influenzae type B
HPV - Human papillomavirus
IPV - Injectable polio vaccine
MenACWY - Meningococcus types A,C,Y and W
MenC-conj - Meningococcus type C conjugate
MR - Measles, Rubella
MMR - Measles, Mumps, Rubella
MMRV - Measles, Mumps, Rubella, Varicella
OPV - Oral polio vaccine
P - Pertussis
Pneumo - Pneumococcal vaccine
Pneumo conj - Pneumococcal conjugate
Pneumo ps - Pneumococcal polysaccharide
T - Tetanus
TBE - Tick-borne encephalitis
Td - Tetanus lower dose diphtheria
TT - Tetanus toxoid
wP - Whole-cell pertussis
YF - Yellow fever

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About GIDEON

GIDEON Informatics produces the GIDEON web application and the GIDEON ebooks series.

GIDEON online

GIDEON online is the world's premier global infectious disease knowledge management tool. GIDEON (Global Infectious Diseases and Epidemiology Online Network) is an easy to use, interactive and comprehensive web based tool that helps overcome information overload, save time and access a vast knowledge database. GIDEON is used for diagnosis and reference in the fields of Tropical and Infectious Diseases, Epidemiology, Microbiology and Antimicrobial Therapy.

Content

GIDEON is made up of two modules, which are updated continually: Infectious Diseases and Microbiology. The Infectious Diseases module encompasses 347 diseases, 231 countries, and 500+ anti-infective drugs and vaccines. Microbiology includes over 1,500 microbial taxa. GIDEON's worldwide data sources access the entire world's literature and adhere to the standards of Evidence Based Medicine. Over 20,000 notes outline the status of specific infections within each country. Also featured are over 35,000 images, graphs, and interactive maps and more than 400,000 linked references.

Users

GIDEON is used in hospitals, universities (colleges and medical schools), private practice, Public Health departments and Military installations - by physicians (emergency room, infectious diseases, pediatrics and hospitalists), teachers, clinical microbiologists and health professionals. It is an ideal teaching tool for health care and microbiology students, residents and fellows.

Accuracy

The Infectious Diseases Diagnosis module has been tested in a blinded multi-center field trial of 495 patients. The correct diagnosis was displayed in over 94% of cases, and was listed first in over 75%. GIDEON has been reviewed in numerous journals and is continually updated daily to maintain content and accuracy.

GIDEON ebooks

GIDEON ebooks complement the GIDEON web application by expanding easy access to the GIDEON's vast content without a subscription or continual internet access. Ebooks can be downloaded to a variety of devices and can be read anywhere. These ebooks summarize the status of individual infectious diseases, drugs, vaccines and pathogens, in every country of the world.

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