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Melioidosis
Pseudoglanders, Whitmore Disease

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Etiology
Melioidosis results from infection by *Burkholderia pseudomallei*, a motile Gram negative bacillus (family Pseudomonadaceae). This organism was formerly known as *Pseudomonas pseudomallei*.

Geographic Distribution
Melioidosis is endemic in Southeast Asia, Africa, Australia, the Middle East, India and China. This infection is mainly associated with tropical and subtropical regions; however, *B. pseudomallei* has also been isolated from the temperate regions of southwest Australia and France. Isolated cases have occurred in South America and in the states of Hawaii and Georgia in the United States. *B. pseudomallei* is generally found in water or moist soil.

Transmission
New infections are primarily acquired from organisms in the environment. Contaminated swamps, muddy water and rodents are important sources of infection. Soil-borne infections are generally associated with heavy rainfall or flooding in areas with high humidity or temperatures. Infection can occur by ingestion, inhalation, or through wounds and abrasions. The role of insect bites is uncertain. Direct human-to-human and animal-to-human transmission is rare but can occur after contact with blood or body fluids. Depending on the site of the infection, contaminated body fluids may include urine, nasal secretions and milk. Shed organisms can survive for months in soil and water.

Disinfection
*B. pseudomallei* can survive for months to years in soil and water, but can be readily destroyed by heat. Moist heat of 121°C for at least 15 min or dry heat of 160-170°C for at least 1 hour is recommended for disinfection. The organism is also susceptible to numerous disinfectants, including 1% sodium hypochlorite, 70% ethanol, glutaraldehyde and formaldehyde.

Infections in Humans

Incubation Period
In natural infections, the incubation period can vary from two days to months or years. Infections may remain latent for years. Infections from aerosolized forms in biological weapons are expected to have an incubation period of 10-14 days.

Clinical Signs
*B. pseudomallei* infections may be inapparent or can result in pulmonary infections, disseminated septicemia, acute nondisseminated septicemia or localized chronic suppurative infections.

The most serious form is disseminated septicemic infection. In natural infections, this form is most common in people with pre-existing debilitating diseases such as AIDS, cancer, diabetes and kidney failure. Its onset may be acute. The clinical signs may include severe headache, severe dyspnea, disorientation, pharyngitis, upper abdominal pain, diarrhea, pustular skin lesions and notable muscle tenderness. Pulmonary signs and symptoms of arthritis or meningitis are sometimes seen. This form is often accompanied by septic shock.

Pulmonary infections vary in severity, from mild bronchitis to severe necrotizing pneumonia. Symptoms can appear suddenly or gradually and may include fever, headache, cough, tachypnea, rales, blood-tinged sputum, anorexia, generalized myalgia and dull aching or pleuritic chest pain.

Localized chronic suppurative infections are characterized by abscesses in the skin, lymph nodes or other organs including the brain. Osteomyelitis is common with this form. Fever may or may not be present. Acute nondisseminated septicemic infection also occurs, involves a single organ and is relatively rare.
In cases with acute infection of the oral, nasal or conjunctival mucosa, the clinical signs may include mucopurulent, blood streaked nasal discharge from the nose, as well as nodules and ulcers in the septum and turbinates.

Communicability

Yes. Direct transmission between humans or from humans to animals is rare but can occur after contact with blood or body fluids. Depending on the site of the infection, contaminated body fluids may include urine, nasal secretions and milk. Human carriers have not been seen.

Diagnostic Tests

Melioidosis can be diagnosed by isolation and identification of *Burkholderia pseudomallei*. Bacteria may be found in blood, sputum, tissues and wound exudates. In the septicemic form, blood cultures may be negative until just before death.

The organism has a wrinkled colony form, which may be mixed with smooth colonies. A characteristic odor has been described. (Due to the risk of infection, directly sniffing the plates is not recommended.) Organisms are oval, Gram negative bacilli, with bipolar staining in young cultures. A polymerase chain reaction can differentiate *B. mallei* from that of *B. pseudomallei*.

Serologic tests on paired sera may be helpful. High single titers in the presence of clinical signs may also be used for diagnosis. Serologic tests include agglutination tests, indirect hemagglutination, complement fixation, immunofluorescence assays and enzyme immunosays. Cross-reactions may occur in serologic tests with *Burkholderia mallei*, the causative agent of glanders.

Treatment and Vaccination

*B. pseudomallei* is variably susceptible to antibiotics. Long-term treatment may be necessary and multiple drugs may be needed. Pulmonary resection or draining of abscesses is sometimes necessary for chronic cases. No vaccine is available.

Morbidity and Mortality

In natural infections, the mortality rate is usually less than 10%, except in disseminated septicemic infections; mortality rates as high as 90% may be seen in this form. Localized lesions may be progressive or disseminate. Fatal infections are more common in patients who are immunosuppressed or have concurrent disease.

Exposure to biological weapons containing aerosolized forms is expected to result in septicemia or severe pulmonary infections, with high mortality rates in spite of treatment.

Infections in Animals

Species Affected

Infection with *B. pseudomallei* is seen most often in pigs, goats and sheep. It occurs less often in cattle, horses, dogs, rodents, birds, dolphins, tropical fish, primates and various wild animals. Hamsters, guinea pigs and rabbits can be infected in the laboratory.

Incubation Period

The incubation period can vary from days to months or years. Abscesses may be carried without symptoms.

Clinical Signs

*B. pseudomallei* infection results in suppurating or caseous lesions in lymph nodes or other organs. Infections may be asymptomatic and abscesses may be found in clinically normal goats, sheep and pigs. Symptomatic melioidosis mimics other diseases; the clinical signs vary with the site of the lesion. They may include fever, loss of appetite, and lymphadenopathy, often involving the submandibular nodes in pigs. Lameness or posterior paresis, nasal discharge, encephalitis, gastrointestinal symptoms or respiratory signs may also be seen in some species. Extensive abscesses and infections of vital organs can be fatal.

In sheep and goats, lung abscesses and pneumonia are common. Other common symptoms in sheep include high fever, coughing, ocular and nasal discharge, lameness with swollen joints, neurologic disease, and gradual emaciation. Some animals may display only weakness and fever. Mastitis is sometimes seen in goats and the superficial lymph nodes and udder may contain palpable abscesses. Pulmonary lesions in goats are usually less severe than in sheep and coughing is not prominent. In horses, neurologic disease, respiratory symptoms, or colic and diarrhea have been described. Infections in pigs are usually chronic and asymptomatic. Acute infections in this species may result in septicemia with fever, anorexia, coughing and nasal and ocular discharges. Abortions and stillbirths may occur but are rare, and orchitis may occur in boars. Cattle are rarely affected, but may develop pneumonia or neurologic signs.

Communicability

Yes. Direct transmission between animals or from animals to humans is rare but can occur after contact with blood or body fluids. Depending on the site of the infection, contaminated body fluids may include urine, nasal secretions and milk. Animals may become carriers.

Diagnostic Tests

Swabs of nasal discharges and samples collected from lesions should be submitted for culture. Organisms may be isolated from the sputum, blood, wound exudates or tissues.
In some species, serum may also be collected for serologic tests. Melioidosis is diagnosed by isolation and identification of *Burkholderia pseudomallei*. This organism has a wrinkled colony form, which may be mixed with smooth colonies. A characteristic odor has been described. (Due to the risk of infection, directly sniffing the plates is not recommended.) Organisms are oval, Gram negative bacilli, with bipolar staining in young cultures. A polymerase chain reaction can differentiate *B. mallei* DNA from that of *B. pseudomallei*.

In some species, agglutination tests, indirect hemagglutination, immunofluorescence, and enzyme immunoassays can be used for diagnosis. Cross-reactions may occur in serologic tests with *Burkholderia mallei*, the causative agent of glanders.

### Treatment and Vaccination

*B. pseudomallei* is susceptible to various antibiotics, but relapses can occur when treatment is stopped. Vaccines are available in some countries but are not effective against large challenge doses.

### Morbidity and Mortality

Mortality varies with the site of the lesions, but can be high in sheep. Extensive abscesses and infections of vital organs can be fatal. Disseminated septicemic infections have a high mortality rate, but are less common in animals than humans. Infections may be progressive.

### Post-Mortem Lesions

At necropsy, the major findings are multiple abscesses containing thick, caseous greenish-yellow or off-white material. These abscesses are generally not calcified. The regional lymph nodes, spleen, lung, liver and subcutaneous tissues are most often involved, but abscesses can occur in most organs. In acute cases, pneumatic changes in the lungs, meningoencephalitis and suppurative polyarthritis may be found. In cases with suppurative arthritis, the joints may contain fluid and large masses of greenish-yellow purulent material. In sheep, common findings include abscesses in the nasal mucosa (*Melioidosis*). Splenic abscesses are often found in pigs at slaughter.

### References


