**MELIOIDOSIS**

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<th>Animal Group(s) Affected</th>
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<td>Mammals, Humans</td>
<td>Most common routes of infection are: contamination of wounds, ingestion of contaminated soil, water or carcasses and inhalation.</td>
<td>Skin lesions, pneumonia, internal organ miliary abscesses. Mimics many other diseases.</td>
<td>Can vary widely depending on the site of infection.</td>
<td>Antibiotic therapy; multiple drugs for septicemic cases; pulmonary resection may be considered for chronic cases.</td>
<td>Chlorinate or filter water. Minimize exposure to diseased animals.</td>
<td>Yes - rare</td>
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**Fact Sheet Reviewed by:** Ronald Mitchell Bush, Rasana Wongratanachewin

**Susceptible animal groups:** Infection with *B. pseudomallei* is seen most often in many species of domestic animals especially goats and sheep. While cattle, pig, dog and cat have higher resistance to melioidosis. Although incidences of melioidosis in wildlife are rarely reported, cases have been documented in marine mammals, camels, alpacas, mules, zebra, deer, kangaroos, bear and various non-human primates. Reptiles such as crocodiles, snakes, soft-shelled turtles; birds, including parrots, penguin, and tropical fish can also become infected with the bacteria. Hamsters and guinea pigs can be infected in the laboratory.

**Causative organism:** Gram negative, flagellated, bipolar-shaped saprophytic bacteria called *Burkholderia pseudomallei*.

**Zoonotic potential:** Humans can be infected by ingesting contaminated food, inhalation, or direct contact of the contaminant with open wound. Intrauterine and mammary transmissions have also been observed. Arthropod borne transmission has also been described. Horizontal transmission between human to human or animal to human by aerosol is unclear.

**Distribution:** The organism is ubiquitous throughout southeast Asia, northern Australia, and the South Pacific. Its distribution is predominantly tropical and subtropical with “hyperendemicity” in the top end of the Northern Territory of Australia and northeast Thailand. The true boundaries of its endemicity are ambiguous due to movement of the organism and its ability to travel to and exist in temperate regions (southwest Australia and France), where it may cause sporadic disease and outbreaks. Reports of possible autochthonous melioidosis have also come from India, Pacific islands, Central and South America, the Caribbean, Africa, and the Middle East.

**Incubation period:** In natural infections, the incubation period in humans can vary from days to months or years. The medical onset time of the disease is usually in the range of 1-21 days (means 9 days). Abscesses may be carried without clinical signs which can be found in some resistant animal species such as pigs and cattle. The incubation period in animal particularly in wildlife is uncertain due to lack of clinical history.

**Clinical signs:** Called "The Great Mimicker", melioidosis has a wide range of clinical presentation, including...
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fulminating septicemia, and chronic and local suppurative infections. Moreover, relapsing melioidosis can also cause the fulminating sepsis in patient who underwent insufficient eradication phase of treatment. The most common site of infection is acute respiratory form and sepsis through hematogenous dissemination. The chronic septicemia can present as intermittent febricula with chronic respiratory infection. Local infection can be seen as lameness, osteomyelitis, mastitis, orchitis, aortic aneurysms which may possibly induce fulminating septicemia or chronic infection. Subclinical infections are common in animals. The animals mostly undergo chronic illness. Abscesses may be found in asymptomatic animals at slaughter or died shortly after show the clinical signs. The clinical presentation also varies by species. In goat and sheep, a severe febrile reaction accompanied by anorexia, lameness and yellow thick exudate from the nose and eyes. Mastitis is sometimes seen in goats and the superficial lymph nodes and udder may contain palpable abscesses. In horses, neurologic disease, respiratory symptoms, or colic and diarrhea have been described. Neurological signs include walking in circles, nystagmus, blindness, hyperaesthesia and mild tetanic convulsions have been reported in cows, goats, camels and horses. Septicemia or extensive involvement of the vital organs can be fatal. Camels are highly susceptible and can present symptoms of pyrexia, severe depression, septic arthritis, anorexia, mucopurulent nasal discharge with nervous signs. Non-human primates mostly show generalized lethargy, progressive cachexia and respiratory distress with nasal purulent discharge. Most cases in captive marine mammals have been characterized by acute septicemia with anorexia and lethargy followed by death. Pyrexia was often recorded in the last few days preceding death, but respiratory distress was noticed only in a few animals immediately before death. Although birds may be relatively resistant to melioidosis, fatal cases with lethargy, anorexia and diarrhea have been reported in various avian species in Australia.

| **Post mortem, gross, or histologic findings:** 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, lungs, spleen, liver and subcutaneous tissues are most often involved, but abscesses can occur in most organs. In animals with respiratory disease, fibrinous pleuritis and exudative bronchopneumonia, consolidation and/or abscesses may be found in the lungs. Suppurative lesions including nodules and ulcers may also be found on the nasal mucosa and septum, as well as on the turbinate bones. These nodules may coalesce to form irregular plaques. Meningoencephalitis, severe enteritis, suppurative polyarthritis and other syndromes have also been reported. Aortic aneurysms and mastitis are common in goats. Splenic abscesses are often found in asymptomatic pigs at slaughter. |

| **Diagnosis:** The gold standard method is isolation and identification of the organism from lesions and discharges. The organism is readily cultured on routine diagnostic media such as MacConkey’s agar and blood agar. The selective media, Ashdown’s agar, can help increase the sensitivity and specificity of this technique. The unique characteristic of *Burkholderia pseudomallei* colony is earth odor. Effective serologic screening tests include complement fixation and indirect hemagglutination. In some species, agglutination tests, indirect hemagglutination, immunofluorescence, and enzyme immunoassays can be used for diagnosis. However, serological end points are not available for each wildlife species. Cross-reactions may occur in serologic tests with avirulent strain, *Burkholderia thailandensis*, which causes a false positive outcome in exposed animals. Although antibody titers cannot be detected in chronically infected animals, new tests using DNA probes and PCR have recently been developed. The specific primers that are designed for conserved regions to 16s rRNA, 16S-23S rRNA intergenic spacer, flagellin and lipopolysaccharide can differentiate between *B. pseudomallei*, *B. mallei* and *B. thailandensis*. |

| **Material required for laboratory analysis:** Culture swab from lesions or exudates, infected tissue or organs, serum for serologic testing. |

| **Relevant diagnostic laboratories:** Any lab is capable of culturing the organism. Currently, there is no reference lab in the world for Melioidosis listed with the Office International des Epizootics (OIE). This list can be checked at: |
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http://www.test.oie.int/our-scientific-expertise/reference-laboratories/list-of-laboratories/

**Treatment:** The medical treatment which will take at least 4 months, can be divided into 3 phases including post exposure prophylaxis, induction and eradication phases. Treatment of septicemic melioidosis in wildlife is difficult and challenging due to the need for extended, continuous intravenous antibiotics and extra-label use of medicine. Moreover, pharmaceutical treatment can lose their effectiveness after prolonged treatment, often resulting in an unsuccessful cure, with risks of recrudescence once treatment is discontinued in animals.

**Prevention and control:** In endemic or contaminated areas, contact between the animal and soil should be minimized. Providing safe drinking water is important in endemic areas. Chlorine (1ppm) in the water for 30 minutes is effective in inhibiting bacterial activity in the water supply. Carnivores and omnivores should not be allowed to eat contaminated carcasses. Although there is no effective vaccine, promising vaccine candidates are currently being researched and developed. A routine environment collection for bacteriology will help in the disease surveillance and control.

**Suggested disinfectant for housing:** *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.

**SPILLS:** Allow aerosols to settle; wear protective clothing; gently cover spill with paper towels and apply 1% sodium hypochlorite, starting at perimeter and working towards the centre; allow sufficient contact time (30 min) and clean the area. 40% W/W calcium oxide is proved to be effective in preventing bacterial activity in the environment for 1 year.

**Notification:** Public health officials and state veterinarians will need to be notified if zoonotic transmission occurs.

**Measures required under the Animal Disease Surveillance Plan:** Melioidosis is not listed under this plan.

**Measures required for introducing animals to infected animal:** An infected animal should be maintained in a quarantine situation until the wound has healed. Do not introduce infected animal to an animal with a compromised immune system.

**Conditions for restoring disease-free status after an outbreak:** Follow the suggestions above for disinfection of facilities and maintaining uncontaminated water sources. Decontaminate waste before disposal; steam sterilization, incineration, chemical disinfection. Quarantine any affected individuals until lesions resolved.

**Experts who may be consulted:** There are no listed OIE experts for *Burkholderia pseudomallei*. That said, the following people deal with Melioidosis routinely and would be willing to respond to questions from professionals dealing with confirmed or suspect cases:

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References