# GLANDERS and MELIOIDOSIS

1. **Agent**: A non-motile gram-negative bacilli, *Burkholderia mallei* (glanders) and *Burholderia pseudomallei* (melioidosis)

   Both *B. mallei* and *B. pseudomallei* could be used in a biological attack, thus ANY case of glanders/melioidosis should be investigated promptly. If the bacteria were used as a weapon, it would be most effective as an aerosol and thus would present primarily in the pulmonic or systemic forms.

2. **Identification**:

   a. **Symptoms**:

   **Pulmonary Infection**
   Symptoms may present as acute febrile, necrotizing pneumonia with or without sepsis, with necrosis of tracheobronchial tree.

   **Glanders –** often manifests itself as pulmonary infection; pneumonia, pulmonary abscesses, and pleural effusion can occur. Chest X-rays will show localized infection in the lobes of the lungs.

   **Melioidosis –** often manifests as a mild bronchitis to severe pneumonia. The onset usually presents with cough, high fever, headache, anorexia, and general muscle soreness. Chest pain is also common. A characteristic of pulmonary infection is a nonproductive or productive cough with normal sputum. Cavitary lesions may be seen on chest X-ray, similar to those in pulmonary tuberculosis.

   **Localized-Cutaneous Infections**
   **Glanders –** most often presents as a localized infection and ulceration developing at the site where the bacteria entered the body through a cut or scratch in the skin. Swollen lymph nodes may also be apparent. Infections involving the mucous membranes in the eyes, nose, and respiratory tract will cause increased mucus production from the affected sites. Dissemination to other locations in the body may occur 1-4 weeks after infection. Cutaneous infection can lead to systemic or septicemic infection if untreated.

   **Melioidosis –** most often presents as an ulcer, nodule, skin abscess, pain and swelling at the site of introduction. Fever and muscle aches may also occur. Infection may remain local or spread rapidly through the bloodstream.

   **Septicemia (Glanders and Melioidosis)**
   Fever, headache, respiratory distress, abdominal discomfort, joint pain, and disorientation may occur. These symptoms can occur without pneumonia and can affect multiple organ systems including liver, spleen, prostate, and kidney, Mortality rate is 90%.

   **Chronic (Glanders)**
   Can present with re-activation pneumonia or multiple abscesses within the muscles and skin of the arms and legs or in the lungs, spleen, and/or liver.

   **Disseminated Infection (Melioidosis)**
   Fever, weight loss, stomach or chest pain, muscle or joint pain, headache, central nervous system/brain infection, and seizures.

   b. **Differential Diagnosis**:
   **Pulmonary glanders and melioidosis** – include mycoplasma pneumonia, Legionnaire's disease, psittacosis, plague, tularemia, invasive group A streptococcal pneumonia, Q fever, histoplasmosis, coccidiomycosis, and anthrax.
   **Cutaneous glanders and melioidosis** – include insect bite, brown recluse spider bite, ulceroglandular tularemia, scrub typhus, rickettsial spotted fevers, ecthyma gangrenosum, plague, Orf, staphylococcal lymphadenopathy, cutaneous leishmaniasis, cat scratch fever.

   c. **Diagnosis**: Isolation of organism from blood, urine, sputum, skin lesions, or abscesses; or by detection of antibody

response to the bacteria. Blood cultures are usually negative for B. mallei (glanders) but often positive for B. pseudomallei (melioidosis).

d. **Case Definition**: Refer to Council of State and Territorial Epidemiologists (CSTE)

https://ndc.services.cdc.gov/case-definitions/melioidosis-burkholderia-pseudomallei-2023/

**Glanders**: No current CSTE case definition

**Melioidosis:**

- **Suspect**:
  - Meets clinical criteria[1] **AND** supportive laboratory evidence **AND** epidemiologic linkage
  - Meets vital records criteria[2] **AND** supportive laboratory evidence **AND** epidemiologic linkage
  - Meets other criteria[3] **AND** supportive laboratory evidence **AND** epidemiologic linkage
- **Probable**:
  - Meets clinical criteria[1] **AND** presumptive laboratory evidence **AND** epidemiologic linkage
  - Meets vital records criteria[2] **AND** presumptive laboratory evidence **AND** epidemiologic linkage
  - Meets other criteria[3] **AND** presumptive laboratory evidence **AND** epidemiologic linkage
- **Confirmed**:
  - Meets confirmatory laboratory evidence.

**Laboratory Criteria**:
*Confirmatory laboratory evidence:*

- Isolation of *B. pseudomallei* from a clinical specimen

*Presumptive laboratory evidence:*

- Evidence of a fourfold or greater rise in *B. pseudomallei* antibody titer by indirect hemagglutination assay (IHA) between acute- and convalescent-phase serum specimens obtained at least two weeks apart, **OR**
- Evidence of *B. pseudomallei* deoxyribonucleic acid *(*DNA) (for example, by Laboratory Response Network [LRN]-validated nucleic acid amplification test) in a clinical specimen.

*Supportive laboratory evidence:*

- Single *B. pseudomallei* total antibody titer of greater than or equal to 1:40 by serology in one or more serum specimens.

**Epidemiologic Link**:
A person with at least one of the following findings:

- History of travel to or residence in a region endemic for melioidosis, **OR**
- Known exposure to *B. pseudomallei* as a result of intentional release or known product/source exposure (outside of laboratory), **OR**
- Known exposure to *B. pseudomallei* as a result of an occupational risk (i.e., laboratory exposure)

[1]Clinical Criteria:

- In the absence of a more likely diagnosis, at least one of the following signs or symptoms:
  - Fever (temperature > 38.0°C [100.4°F])
  - Muscle aches
  - Ulcer
  - Nodule
  - Skin abscess
  - Pneumonia
  - Headache
  - Chest pain
  - Anorexia
  - Respiratory distress
  - Abdominal discomfort
  - Joint pain
  - Disorientation
  - Weight loss
  - Seizure
  - Organ abscess (liver, lung, spleen, prostate, or brain)

- Encephalomyelitis/meningitis/ extra-meningeal disease

[2] A person whose death certificate lists melioidosis as a cause of death or a significant condition contributing to death.

[3] A person whose healthcare record contains a recent diagnosis of melioidosis.

3. **Incubation**:
**Pulmonary Infection**:
Glanders: 10-14 days
Melioidosis: more difficult to determine, 1-21 days or could be extended months to years

**Localized-Cutaneous Infections:**
Glanders: 1-14 days
Melioidosis: difficult to determine

4. **Reservoir**:
Glanders: Zoonotic disease that primarily affects horses, mules, donkeys, goats, cats and dogs.
Melioidosis: Soil and water in the tropics, endemic in Southeast Asia and northern Australia. Recently identified in the environment in the U.S. (the Gulf Coast area of the state of Mississippi, Puerto Rico, and the U.S. Virgin Islands).

5. **Source**:
Glanders: Bodily fluids or tissues of infected animals.

6. **Transmission**:

Glanders – contact with tissues or body fluids of infected animals through skin cuts or abrasions and through mucosal surfaces such as the eyes and nose. Inhalation via infected aerosols or dust contaminated by infected animals. Sporadic cases have been documented in veterinarians, horse caretakers, and laboratorians.

Melioidosis – inhalation of dust, ingestion of contaminated water, and contact with contaminated soil especially through skin abrasions.

7. **Communicability**:
Glanders: Person-to-person transmission not reported in U.S.
Melioidosis: Rare person to person transmission.

Both are highly infectious organisms and have caused laboratory-acquired infections in humans. If *B. mallei* or *B. pseudomallei* are suspected, it requires precautions by microbiologists and is usually referred to a BSL-3 lab.

8. **Specific treatment**:

Glanders – Human cases of glanders are rare, and there is limited information about antibiotic treatment in humans. Sulfadiazine has been found to be effective in experimental animals and in humans. Also, the bacterium that causes glanders is usually susceptible to: tetracyclines, ciprofloxacin, streptomycin, novobiocin, gentamicin, imipenem, ceftazidime, and sulfonamides.

Melioidosis – treatment generally starts with intravenous antimicrobial therapy (ceftazidime or meropenem) and oral antibiotics (trimethoprim-sulfamethoxazole, or amoxicillin/clavulanic acid, or doxycycline, for patients with non-pulmonary focal sites of infection) for 2-8+ weeks, followed by 3-6 months of oral antimicrobial therapy (trimethoprim-sulfamethoxazole, or amoxicillin/clavulanic acid, or doxycycline).

For most up-to-date treatment recommendations, refer to CDC: https://www.cdc.gov/melioidosis/hcp/clinical-overview/index.html

## REPORTING PROCEDURES

1. **Report any case or suspect cases by telephone immediately** (Title 17, Section 2500. *California Code of Regulations*).

2. **Report Form:**
**GLANDERS AND MELIOIDOSIS CASE REPORT FORM**

3. Epidemiological Data:
   a. Travel history to endemic area during lifetime and during previous 21 days.
   b. Places visited locally in the previous 21 days.
   c. Contact with animals:
      i. Occupational
      ii. Imported pets

d. Acquisition of pets or commercial products from international sources in last 21 days.
e. Known exposure as result of occupational risk (laboratory worker).
f. Potential BT exposure:
    i. Other persons with similar symptoms
    ii. Common activities/events attended.

**CONTROL OF CASE, CONTACTS & CARRIERS**

**CASE**:

1. Provide necessary antibiotic treatment as soon as disease is confirmed. Standard precautions indicated.

2. **For Laboratory Exposure**: See Management of Laboratory Exposed to *B. mallei* and *B. pseudomallei.*

3. **ANIMAL**: Los Angeles County Department of Public Health (LAC DPH)'s Veterinary Public Health Program will investigate potential animal sources.

**CONTACTS**:
Avoid contact with blood or body fluids of an infected person.

Identify any persons who participated with the case in any risk activities or who may have been exposed to contaminated products or other sources. Inform ill persons identified of possible exposure.

Provide post-exposure prophylaxis as recommended by CDC.

**Management of Laboratory Exposure to *B. mallei* and *B. pseudomallei:***

Laboratory workers that have worked with cultures of the organism are at risk of developing disease. Laboratories that have handled the specimen should conduct an exposure risk assessment on their lab employee.

If there are any potential laboratory exposures (high or low), the worker should be evaluated by the lab facility's occupational health physician as part of the laboratory health and safety plan.

CDC recommends symptom watch for 21 days as well as baseline and follow-up serology on employees with lab exposure (regardless of high or low risk).

The following Emerging Infectious Disease article by Peacock et al., can be used as guidance on the Management of Accidental Laboratory Exposure to *B. pseudomallei* and *B. mallei*:

http://wwwnc.cdc.gov/eid/article/14/7/07-1501_article.htm

**PREVENTION-EDUCATION**

Glanders:

1. No vaccine available

2. Identification and elimination of infection in the animal population in countries where glanders is endemic in animals.

3. Use of standard and airborne precautions in Health Care Settings.

Laboratory personnel handling specimens from persons who might have glanders must wear appropriate Personal Protection Equipment.

Melioidosis:

1. Currently, no vaccine available

2. Decrease risk of exposure in areas where the disease is endemic (Southeast Asia and northern Australia):

    a. Avoid contact with contaminated soil or water, especially persons with open wounds, cuts, or scrapes and persons with immunocompromised conditions (e.g., diabetes or chronic renal disease).
    b. Agricultural workers should wear boots to prevent infection through feet or lower legs
    c. Health care workers should use standard contact precaution.

**DIAGNOSTIC PROCEDURES**

**Notify and consult PHL if *B. mallei* or *B. pseudomallei* is suspected and obtain prior approval for submission of samples for testing at 562-658-1360. After hours,**

**weekends, or holidays contact the County Operator and ask for the Public Health Laboratory Director at 213-974-1234. Do not send specimens using regular courier.**

PHL may perform molecular, culture, or conventional biochemical testing depending on the specimen type submitted.

Required Specimen Type(s) for Testing:

- Bone marrow: collect directly into an appropriate blood culture bottle.
- Whole Blood: collect in EDTA or Sodium Citrate tubes (not heparin).
- Sputum: collect expectorated specimen into sterile transport cup or collect during bronchoscopy procedure.
- Tissue specimens (biopsies, abscess aspirates): tissue pieces (at least the size of a pea) should be collected and kept moist in a sterile transport cup
- Wound Swab: a swab from a tissue sample can be submitted in a transport tube with medium to stabilize specimen (e. g. Amies charcoal).
- Urine: collect more than 1 mL

If Specimen Already Cultured by a laboratory:

- Culture - Pure culture/isolated colony should be transported in a tubed agar slant medium with a secured screw cap at 2-8°C.

Standard labeling of specimens with a minimum of two patient identifiers (patient full name and date of birth) and collection date should be followed. If a medical record number is available, please also include Forms required for Lassa fever diagnostic testing at the LAC DPH Public Health Laboratory include:

1) Public Health Laboratory Test Request Form
2) MDL Bacterial Culture for Identification Form