Brucella spp. (*B. abortus*, *B. melitensis*, *B. suis*)

**Basic agent information**

**Section I- Infectious Agent**

**Risk Group:**
- RG3

**Synonym or Cross reference:**
- Brucellosis, Undulant fever, Bang's disease, Malta fever, Mediterranean fever

**Characteristics:**
- SELECT AGENT
- Gram negative cocci or small rods, aerobic, non-motile, urease +

**Section II- Dissemination**

**Reservoir:**
- Cattle (*B. abortus* most common) and other animals

**Zoonosis:**
- Yes, especially from cattle

**Vectors:**
- None

**Research use considerations**

**Section III- Laboratory Hazards**

**Laboratory-Acquired Infections:**
- Most commonly reported laboratory-acquired infection; 423 cases up to 1976 with 5 deaths

**Sources/Specimens:**
- Cultures, blood, tissues, placentas, fetuses, urine, uterine discharges

**Primary hazards:**
- Exposure to aerosols; direct skin contact with cultures of infectious specimens from animals; ingestion (mouth pipetting); accidental inoculation; sprays into eyes, nose and mouth

**Special Hazards:**
- Most cases have involved exposure to *Brucella* organisms being grown in large quantities

**Section IV- Stability and Viability**

**Susceptibility to Disinfectants:**
- Susceptible to many disinfectants - 5% bleach, 70% ethanol, iodine/alcohol solutions, glutaraldehyde, formaldehyde
Physical Inactivation:
- Susceptible to moist heat (121°C for at least 15 min) and dry heat (160-170°C for at least 1 hour)

Survival Outside Host:
- Carcasses and organs - up to 135 days; paper - 32 days; soil - 125 days; blood 4°C - 180 days

Section V- Recommended Precautions

Containment Requirements:
- Biosafety level 2 practices for activities involving clinical materials of human or animal origin
- Biosafety level 3 containment, practices and facilities for all manipulations of cultures and for experimental animal studies

Protective Clothing:
- Laboratory coat; gloves when direct contact with infectious materials is unavoidable
- Gloves and gown (tight wrists and tie in back) for work with infectious material in biosafety cabinet

Other Precautions:
- All procedures likely to generate aerosols should be carried out in a biosafety cabinet

Health and Medical

Section VI- Health Hazard

Pathogenicity:
- All Brucella isolates are potentially pathogenic to humans; systemic bacterial disease with acute or insidious onset; intermittent fever, headache, weakness, profuse sweating, chills, arthralgia; localized suppurative infections; subclinical infections are frequent; <2% case fatality rate for untreated cases; may have long recovery period

Epidemiology:
- Worldwide, especially in Mediterranean countries of Europe and Africa; Middle East, India, central Asia, Mexico, Central and South America; common in those who eat raw caribou; occurrence often depends on extent of animal Brucellosis; predominantly an occupational disease of those who work with infected animals or their tissues

Host Range:
- Humans, cattle, swine, goats, sheep, deer, caribou, elk, dogs, coyotes

Infectious Dose:
- Unknown

Natural Mode of Transmission:
- Through ingestion, direct contact via skin abrasions and mucous membranes, and inhalation; risk factors include contact with infected tissues, blood, urine, vaginal discharge, aborted fetuses; ingestion of raw milk or cheese from infected animals; contact in abattoirs
- Laboratory-acquired (generally through aerosolization)

Incubation Period:
- Highly variable; 5-60 days; occasionally several months
Communicability:
- No evidence of person-to-person transmission

Section VII- Medical

Surveillance:
- Monitor for symptoms: Specifically, any person working with Brucella spp. who develops a fever with or without other complaints, should report to Needle-Stick hot line to coordinate with Occupational Health or the Emergency Department. *B. abortus* tends to cause mild disease with rare suppurative complications unlike other species such as *B. melitensis*. Nonetheless, all Brucella spp. may cause serious, life-threatening disease
- The most common presentation of brucellosis is a febrile illness, acute, subacute, or chronic, with the fever being intermittent in untreated patients, i.e., undulant fever. Other symptoms include chills, sweats, fatigue, malaise, anorexia, weight loss, depression, myalgias, arthralgias, and non-productive cough. Patients with advanced disease can have gastrointestinal symptoms, bone or joint disease, or other symptoms depending on the organ(s) involved

Immunization:
- There is no vaccine for humans available in the USA

Drug Susceptibility:
- Susceptible to tetracyclines and streptomycin or TMP-Sx; therapy usually consists of a combination of doxycycline and streptomycin

Prophylaxis:
- CDC does recommend antibiotic prophylaxis for workers who have direct skin contact or inoculation injury, a mucosal splash, or are present during generation of aerosols. Even being within 5 feet of an open culture plate on an open bench is considered an exposure

Clinical Monitoring, including fever watch:
- Employees should declare that they work with *Brucella* in a research lab. A focused history and physical will be performed. If there is a fever of >101.5°F or a history of fever, a diagnostic work up will be performed.
- Diagnostic testing for all patients will include:
  1. CBC and diff,
  2. Blood cultures X 2 (the culture lab should be informed that the worker is being evaluated for brucellosis; blood cultures will be held for 3 weeks if brucellosis is suspected)
  3. Serology for *Brucella*
    a. Sent to Mayo Clinic
    b. Ab screen is done (max labtime 3 days)
    c. If Ab screen is positive, a serum agglutination titer (SAT) will be performed
    d. Convalescent sera may need to be collected at 3 weeks
    e. Titers may be followed to monitor response to treatment
  4. Cultures of bone marrow or infected tissues may be helpful.
- ADMISSION: Admission is not necessary for patients presenting fever alone. Patients would be admitted if they have nausea/vomiting and are unable to take oral med, or if they have other signs of sepsis.
Treatment:
- Recommended antibiotic course following an exposure:
  Doxycycline 100 mg PO bid + rifampin 600 mg PO q day for 21 days
  If unable to take doxy, substitute TMP/Sx 1 DS PO four times a day
  Pregnant women should discuss post-exposure prophylaxis with their physician
- ANTIBIOTIC THERAPY: Doxycycline is the agent of choice, but relapse may occur
  unless combined with RIF or an aminoglycoside antibiotic (IV gent or IV streptomycin). If
  the patient is pregnant, TMP/Sx is substituted for doxycycline and aminoglycosides are
  avoided. All patients should receive therapy for at least 6 weeks to avoid relapse
  Doxy 100 mg PO bid x 6 weeks + gent IV for 7 days (or SM 1g IM for 23 weeks)
  OR
  Doxy 100 PO bid + RIF 600-900 mg PO q day, both for 6 weeks
  OR
  TMP/Sx 1 DS PO qid + RIF 600-900 mg PO q day
  Pregnant women should discuss PEP with their physician

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