VDH VIRGINIA DEPARTMENT OF HEALTH

Virginia Department of Health
Brucellosis: Overview for Healthcare Providers

Organism	• *Brucella* spp. that infect humans: *B. abortus, B. canis*, *B. ceti*¸ *B. inopinata*, *B. neotomae*, *B. melitensis, B. pinnipedialis*, and *B. suis* • *Brucella* spp. are small, non-spore-forming, slow-growing, non-motile, gram-negative coccobacilli
Reporting to Public Health	• Suspected or confirmed cases require immediate notification to the local health department (LHD). See https://www.vdh.virginia.gov/health-department-locator/
Infectious Dose	• 10 to 100 organisms
Occurrence	• Worldwide, especially in Mediterranean Basin (Portugal, Spain, Southern France, Italy, Greece, Turkey, North Africa), Mexico, South and Central America, Eastern Europe, Asia, Africa, Caribbean and Middle East • 143 cases in the United States and 0–5 cases in Virginia were reported annually during 2016–2019
Natural Reservoir	• *B. abortus* (cattle), *B. canis* (dogs), *B. ceti* (dolphins, porpoises, whales), *B. neotomae* (wild rodents), *B. melitensis* (sheep, goats, camels), *B. pinnipedialis* (seals, sea lions, walruses), and *B. suis* (pigs) • Infection might occur in other animals (e.g., bison, elk, coyotes, and some deer)
Route of Infection	• Multiple routes of infection, including ingestion of unpasteurized dairy products or undercooked meat from infected animals; inhalation of aerosols; contact through broken skin or mucous membranes with tissues, blood, urine, vaginal discharges, aborted fetuses and especially placentas of infected animals; inoculation with animal vaccine (injection or spraying into wounds or eyes); person-to-person transmission is rare, but can occur (see Communicability)
Communicability	• Person-to-person transmission is rare, but has been reported with perinatal transmission, breastfeeding, blood transfusion or tissue transplantation, and sexual contact
Risk Factors	• Consuming unpasteurized dairy products or undercooked meat, especially those from endemic areas; handling infected animals, tissues, or specimens during work (slaughterhouse workers, meat-packing workers, veterinarians, laboratory workers) or recreation (hunters of feral swine or game animals)
Case-fatality Rate	• Low (< 2%), usually from endocarditis or an infection affecting the brain
Incubation Period	• Highly variable, ranging from 5 days to 5 months (average is 2–4 weeks)
Clinical Description	• Fever (constant or intermittent), chills, sweats, malaise, anorexia, headache, arthralgia, myalgia, back pain, fatigue, weakness, weight loss, depression, and pregnancy complications (spontaneous abortion, preterm delivery, miscarriage or intrauterine infection with fetal death) • Musculoskeletal and genitourinary systems are commonly affected • Illness might last a few weeks to several months or longer, with intermittent relapses
Differential Diagnosis	• Numerous because of nonspecific clinical presentation and varied complications
Radiography	• Chest x-ray is often normal, but might show lung abscesses, single or miliary nodules, bronchopneumonia, enlarged hilar lymph nodes, or pleural effusions
Specimen Collection and Laboratory Testing	• Alert lab if brucellosis is suspected so that appropriate precautions are taken during testing • Tests: culture of blood, bone marrow or tissue; serology (EIA and agglutination tests); PCR • *Brucella* spp. are slow-growing bacteria. Culture might require extended incubation times (e.g., up to 21 days for non-automated broth blood culture and up to 10 days for automated systems). • False-positive results with IgM EIA test can occur; further testing by agglutination test or testing paired sera to detect 4-fold change in titer is recommended • If brucellosis is suspected, notify LHD immediately to discuss the case. If VDH approves public health testing based on clinical presentation and exposure history, specimens may be sent to the Division of Consolidated Laboratory Services (DCLS). For questions about specimen collection, contact the DCLS Emergency Officer available 24/7 at 804-335-4617.

Treatment: Adults, Children ≥8 years*†	Combination therapy to decrease the incidence of relapse: • Oral doxycycline (2–4 mg/kg per day, maximum 200 mg/day, in 2 divided doses) or oral tetracycline (30–40 mg/kg per day, maximum 2 g/day, in 4 divided doses) -**and**- • Rifampin (15–20 mg/kg per day, maximum 600–900 mg/day, in 1 or 2 divided doses) • Recommended for a **minimum** of 6 weeks • Notes: Combination therapy with trimethoprim-sulfamethoxazole (TMP-SMZ) can be used if tetracyclines are contraindicated. Red Book® (2021) lists dose for oral doxycycline as 2.2–4.4 mg/kg per day, maximum 200 mg/day, in 2 divided doses
Treatment: Children <8 years*	• Oral TMP-SMZ (trimethoprim, 10 mg/kg per day, maximum 480 mg/day; and sulfamethoxazole, 50 mg/kg per day, maximum 2.4 g/day) divided in 2 doses for 4 to 6 weeks • Notes: For combination therapy, Red Book recommends adding rifampin. Consult physician for dosing or if rifampin is contraindicated. Tetracyclines (such as doxycycline) should be avoided in children less than 8 years of age. Red Book® (2018) lists dose for rifampin as 15–20 mg/kg per day, maximum 600 mg/day, in 1 or 2 divided doses.
Treatment: Pregnancy*	• Tetracyclines are contraindicated for pregnant patients • Consult obstetrician regarding specific antimicrobial therapy instructions
Treatment: Complicated Cases (Endocarditis, Meningitis, Osteomyelitis, etc.)*	• Streptomycin or gentamicin for the first 14 days of therapy in addition to a tetracycline for 6 weeks (or TMP-SMZ if tetracyclines are contraindicated). Streptomycin might not be readily available in the United States. • Rifampin can be used in combination with this regimen to decrease the rate of relapse • For life-threatening complications, such as meningitis or endocarditis, duration of therapy often is extended for 4 to 6 months • Notes: Case-fatality rate is < 1%. Surgical intervention should be considered in patients with complications, such as deep tissue abscesses. Red Book® recommends a 3-drug regimen: gentamicin included for the first 7 to 14 days of therapy, in addition to doxycycline (or trimethoprim-sulfamethoxazole, if doxycycline is not used) and rifampin for a minimum of 6 weeks.
Postexposure Prophylaxis (PEP)*	• PEP is recommended for high-risk exposures; PEP is generally not recommended for low-risk exposures, but can be considered , especially if pregnant or immunocompromised • Doxycycline (100 mg twice daily for 3 weeks) plus rifampin (600 mg once daily for 3 weeks) • For patients with contraindications to doxycycline or rifampin, TMP-SMZ, in addition to another appropriate antimicrobial, should be considered. Pregnant women should consult their obstetrician. • For those with low- or high-risk exposures, regular symptom watch (e.g., weekly) and daily self-fever checks through 24 weeks post-exposure is recommended; sequential serological monitoring at 0 (baseline), 6-, 12-, 18- and 24-weeks post-exposure is recommended. Serologic monitoring is not currently available for *B. abortus* RB51 vaccine or *B. canis* exposures.
Vaccine*	• In the United States, a modified live vaccine (*B. abortus* RB51 vaccine) is licensed only for animals • Self-inoculation with vaccine has occurred in veterinarians. Vaccine exposures typically occur through direct contact and individuals exposed to RB51 vaccine should be considered as having a high-risk exposure. • PEP regimens for exposure to RB51 vaccine should include doxycycline in addition to TMP-SMZ or another suitable antimicrobial, if not contraindicated. Note that rifampin should not be used for RB51 vaccine exposures. In addition, regular symptom watch (e.g., weekly) and daily self-fever checks through 24 weeks post-exposure are recommended. Serological monitoring is not available for *B. abortus* RB51 vaccine, but a baseline serum sample can be collected to rule out infection with other *Brucella* spp. if needed.
Infection Control	• Use standard precautions for all patients; isolation rooms not necessary

*Adapted from CDC Brucellosis Reference Guide: Exposures, Testing, and Prevention (February 2017) and Red Book: 2021-2024 Report of the Committee on Infectious Diseases. 32nd ed. Elk Grove Village, IL: American Academy of Pediatrics; 2021. (Accessed May 22, 2023). Note that the *B. abortus* strain used in the RB51 vaccine was derived by selection in rifampin-enriched media and is resistant to rifampin in vitro. This strain is also resistant to penicillin. If the infection or exposure is due to this vaccine strain, treatment or PEP should be determined accordingly (for example, doxycycline and TMP-SMZ in place of rifampin). Specifics on the treatment or PEP regimen and dose should be established in consultation with the person's healthcare provider in case of contraindications to the aforementioned. For additional information on dosing, please consult with the package inserts.

† VDH modified this category to include children aged 8 years or older based on communication with CDC.