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Brucella abortus Exposure during an Orthopedic Surgical Procedure—New Mexico, 2010

Megin Nichols, DVM, MPH,
New Mexico Department of Health, Epidemiology and Response Division, Santa Fe, New Mexico, USA

Deborah Thompson, MD, MSPH,
New Mexico Department of Health, Epidemiology and Response Division, Santa Fe, New Mexico, USA

Joshua T. Carothers, MD,
New Mexico Orthopedics, Albuquerque, New Mexico, USA

Judy Klauber, BS,
New Mexico Department of Health, Scientific Laboratory Division, Albuquerque, New Mexico, USA

Robyn A. Stoddard, DVM, PhD,
Centers for Disease Control and Prevention, Division of High-Consequence Pathogens and Pathology, National Center for Emerging and Zoonotic Infections, Atlanta, Georgia, USA

Marta A. Guerra, DVM, MPH, PhD,
Centers for Disease Control and Prevention, Division of High-Consequence Pathogens and Pathology, National Center for Emerging and Zoonotic Infections, Atlanta, Georgia, USA

Tina J. Benoit, MPH, and
Centers for Disease Control and Prevention, Division of High-Consequence Pathogens and Pathology, National Center for Emerging and Zoonotic Infections, Atlanta, Georgia, USA

Rita M. Traxler, MHS
Centers for Disease Control and Prevention, Division of High-Consequence Pathogens and Pathology, National Center for Emerging and Zoonotic Infections, Atlanta, Georgia, USA

Abstract

We describe a periprosthetic *Brucella abortus* infection in a case-patient undergoing hip replacement revision surgery, and the subsequent investigation of laboratory and surgical staff exposures. Although exposures are rare, it is important to have infection prevention recommendations for surgical procedures among patients with suspected or unidentified *Brucella* spp. infection.

Corresponding Author: Megin Nichols, DVM, MPH, New Mexico Department of Health, 1190 St. Francis Drive, Ste. N-1350, Santa Fe, NM 87505, Phone 505-476-3563, Fax 505-827-0013, megin.nichols@state.nm.us.

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Brucellosis, a zoonotic disease transmitted through inhalation of infectious aerosolized particles, is endemic in many areas, including Mexico.[1, 2, 3, 4] Manifestations of disease can range from subclinical illness to osteoarticular disease and chronic sequelae.[4] It is a potential occupational hazard among laboratory workers.[3] Although *Brucella* infection is not usually a risk to medical staff, prosthetic joint infections have been encountered during surgery.[5–9] We report a case of periprosthetic *Brucella* infection and the subsequent investigation into possible transmission to operating room and laboratory staff. Objectives of the investigation included infection prevention, case-finding and examination into potential routes of *Brucella* spp. transmission.

Methods

The New Mexico Department of Health (NMDOH), in consultation with the Centers for Disease Control and Prevention (CDC) initiated an investigation of operating room and laboratory staff exposures. Among operating room staff, high risk exposures were defined as presence in the operating room during aerosol-generating procedures, including joint irrigation and cleaning after the procedure. NMDOH Scientific Laboratory Division and reference laboratory staff involved in testing the patient's isolate were contacted to evaluate laboratory exposures. Serial serologic testing and antibiotic post-exposure prophylaxis (PEP) (100 mg doxycycline orally twice daily and rifampin 600 mg once daily for 21 days, for those without contraindications) was recommended for individuals with high risk exposures.[10] The CDC performed serological testing for anti-*Brucella* antibodies by microagglutination.

Results

The 67 year-old female patient, was born, raised in, and frequently traveled to Mexico. Her first hip replacement occurred in Mexico two years prior to presenting for revision. During the revision, implant component loosening, bone loss, and cloudy synovial fluid were noted. Synovial fluid was cultured, the joint debrided and copiously irrigated, and hip replacement was deferred; an articulating vancomycin- and tobramycin-impregnated cement spacer was placed. Synovial fluid was sent to a reference laboratory for bacterial culture where growth suggestive of *Brucella* spp. was recognized. The NMDOH Scientific Laboratory Division conducted confirmatory nucleic acid amplification testing and subsequently, the CDC performed speciation; *Brucella abortus* was identified.

Seventeen high-risk exposures and one low-risk exposure were investigated; fifteen high-risk exposures occurred in the operating room. Personal protective equipment (PPE) varied from body exhaust suits (surgeon, first assistant, and scrub technician) to gloves only (cleaning staff); none wore N-95 respiratory protection. Since the joint was copiously irrigated, hospital staff who cleaned the operating room were also considered exposed. One low- and two high-risk exposures of reference laboratory staff occurred during isolate processing outside of the biosafety cabinet on an open bench; the low risk exposure occurred outside the five foot (1.5 m) radius qualifying as a high risk. No exposures occurred at the NMDOH Scientific Laboratory Division as the isolate was handled inside a biosafety cabinet.

Fifteen exposed operating room staff underwent serial serologic testing and prophylaxis. Reference laboratory employees with high-risk exposures agreed to serologic testing but declined PEP. All who elected prophylaxis completed the PEP regimen. None of those exposed met criteria for seroconversion (i.e., fourfold increase in anti-*Brucella* antibody titer). Two individuals whose total antibody titers were indeterminate (between 1:20–1:40, potentially resulting from test run variation and assay cross-reaction with other antibodies) were referred for infectious disease consultation; no evidence of acute *Brucella* infection was detected. Exposed individuals self-monitored and were observed by personal healthcare or occupational medicine providers for six months; none developed symptoms of brucellosis.

The surgical patient was treated for three months with combination therapy (doxycycline and rifampin) to address osteomyelitis and prevent *Brucella* infection relapse. A preoperative aspirate, prior to re-implantation of the hip replacement, yielded a negative culture result. The NMDOH recommended anyone involved in re-implantation use N-95 masks and goggles, minimize aerosol-generating procedures, and handle biological specimens with care. The patient's recovery was uneventful without evidence of infection recurrence at the two-year follow-up.

Discussion

This case report demonstrates the need to consider evaluation for *Brucella* spp. infection and risk factors among patients with prostheses failure or osteoarticular prosthetic infections. Although there are not any documented instances of *Brucella* transmission during surgery, repeated instances of laboratory transmission support a precautionary approach. During prosthetic joint arthroplasty procedures, surgical staff may wear orthopedic space suits, or a mask and face shield, to protect themselves from bloodborne pathogen transmission through droplet sprays; further respiratory protection may be needed to protect staff from airborne transmission of aerosolized pathogens. As in this case, post-operative brucellosis diagnosis following surgery of an infected joint, warrants an evaluation of PPE appropriateness and potential breaches. Personnel who did not wear, or experienced a breach in PPE should be serologically monitored for six months and report new symptoms consistent with brucellosis. PEP may be considered if the procedure aerosolized the *Brucella* organism.

If preoperative patient evaluation identifies *Brucella* spp. infection, appropriate antibiotic therapy can be initiated to decrease bacterial load in surrounding tissues, and precautions taken to limit surgical *Brucella* spp. exposure. Surgeons and operating room staff should wear appropriate respiratory PPE (i.e. N95 mask), minimize aerosol-generating procedures, and only essential operating room personnel should be present. Regardless of PPE worn, personnel present during the procedure should be considered for six months of symptom monitoring, because of potential unrecognized aerosol exposures and PPE breaches.

Although rare in those countries where it is nonendemic, brucellosis osteoarticular infections occur and pose a potential risk to surgeons and other operating room staff. Therefore, recommendations similar to the guidelines for accidental *Brucella* spp. laboratory are needed to standardize PPE usage, prevent transmission of brucellosis during surgical

procedures, and provide follow-up regarding symptom and serologic monitoring, and administration of PEP.

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