I. Statement of the Problem:
Brucellosis is a zoonotic disease causing 100-200 human cases reported annually in the USA. CSTE position statement 09-ID-14 standardized the brucellosis case definition and justified the need to maintain national surveillance for this disease. The majority of reported cases are caused by *Brucella abortus*, *B. melitensis*, and *B. suis*, all of which are relatively well-defined with regards to their human health implications, diagnosis, and treatment. In contrast, the clinical and epidemiologic aspects of human brucellosis caused by *B. canis* infection are poorly defined, mostly due to the lack of available diagnostic tests and under-recognition by clinicians. As a result, the true public health impact of *B. canis* infections is unknown, as is the magnitude of risk for humans exposed to dogs with canine brucellosis.

Background and Justification:
The genus *Brucella* consists of six classically recognized species based on antigenic/biochemical characteristics and primary host species: *B. abortus* (cattle), *B. melitensis* (sheep and goats), *B. suis* (swine, cattle, rodents, wild ungulates), *B. ovis* (sheep), *B. canis* (dogs), and *B. neotomae* (rodents). More recently, other species have been recognized: *B. ceti* (cetaceans), *B. pinnipedialis* (seals), *B. microti* (voles, also isolated from soil), and *B. inopinata* (single isolate from a human). Public health officials typically are called upon to investigate human infection with *B. abortus*, *B. melitensis*, and *B. suis*. The epidemiology and public health ramifications of these infections are all relatively well-defined, primarily because serologic and PCR assays for these agents are readily available. However, much less is known about *B. canis* infections.

*Brucella canis*, first identified in 1966, is a gram-negative nonmotile aerobic intracellular coccobacillus with rough colony morphology when grown on artificial medium. Dogs and wild Canidae are the only non-human species susceptible to *B. canis* infection under natural conditions. Canine brucellosis is not uncommon in domestic dogs. Prevalence in the USA is estimated to be 1-8%, with a higher prevalence in southern states compared with the rest of the country, and a higher prevalence in stray dogs compared with owned animals.

In general, the reported signs and symptoms of *B. canis* infections in humans are similar to those of brucellosis caused by *B. abortus* and *B. melitensis*. Non-specific manifestations such as fever (often periodic and nocturnal), fatigue, headache, weakness, malaise, chills, sweats, weight loss, hepatomegaly, splenomegaly, and lymphadenopathy can occur. More serious manifestations have been described, which include septic arthritis, aortic valve vegetations, calvarial osteomyelitis, epidural abscess, pleural effusion, oral lesions, lower extremity aneurysms, and culture negative endocarditis.

The diagnostic gold standard for all *Brucella* infections is the isolation of the organism from a clinical specimen. However, *Brucella* spp. are relatively fastidious and grow slowly in vitro, which may result in a culture being prematurely discarded and considered negative due to insufficient length of incubation. Additionally, bacteremia is typically intermittent and of a low level which may result in negative culture results even in patients who have brucellosis. Empiric treatment with antibiotics will also adversely affect the ability to culture the organism.

Because of the difficulties inherent in culture, the diagnosis of brucellosis frequently relies on serologic assays which are problematic for detecting *B. canis* infections. In contrast to other *Brucella* species (*B. abortus*, *B. melitensis*, *B. suis*) which are pathogenic for humans and grow in smooth colonies, *B. canis* naturally forms rough phase (mucoid) colonies in culture. Serologic tests that use suspensions of smooth phase *Brucellae* as antigen substrates are useless in diagnosing *B. canis* infections. To our knowledge, all commercially available
human serologic assays in the USA utilize smooth phase Brucella species as their antigen substrates, and therefore do not detect antibodies against the rough phased B. canis. Besides making clinical diagnosis difficult, the inability to detect antibody to B. canis renders human serosurveys problematic. The few serosurveys in the literature are dated and contradictory.

In summary, the diagnosis of human B. canis infection is challenging due to the nonspecific clinical presentation, the organism’s fastidiousness in culture, and the lack of available serologic and PCR assays. Routine laboratory tests are generally not revealing, with patient WBC counts usually being normal or low.

Since 1973, the CDC has identified B. canis in approximately 50 human specimens. A recent literature review identified 43 documented human cases in the USA and approximately 14 more internationally since 1967 (Rita Traxler, CDC, personal communication, 2012). These low numbers seem to indicate that human illness due to B. canis is probably not a significant public health concern. However, it seems likely that B. canis infections in humans are significantly under-diagnosed and under-reported, primarily due to the nonspecific presentation of the disease and the lack of validated, readily available laboratory testing. Additionally, surveillance for brucellosis has been limited by the fact that the etiologic species of Brucella is not captured in case reports transmitted to the CDC by state health departments.

For all these reasons, it is clear that the true public health significance of human B. canis infections is still unknown, and will remain so unless deliberate attempts are made to address the issue. Of particular interest is whether a significant proportion of “culture negative” endocarditis, osteomyelitis, and septic arthritis are actually caused by B. canis. Brucella infection is already recognized as one of the causes of culture negative endocarditis and septic arthritis.

II. Statement of the desired action(s) to be taken:

1. CSTE recommends that the etiologic species of Brucella be reported to CDC whenever a case of brucellosis is reported, and that CDC ensure that the National Electronic Telecommunications System for Surveillance has the ability to accept this new variable. Additionally, these data should be included in published summaries of brucellosis morbidity.

2. CSTE additionally recommends that CDC, NIH, FDA, and other potential partners develop or facilitate the development of a reliable assay to detect antibodies to B. canis in human serum.

3. CSTE also recommends sharing of information about diagnoses of B. canis infections in humans and animals between state health departments and their respective departments of agriculture.

III. Public health Impact:

Implementation of the above recommended actions would greatly improve the ability to diagnose B. canis infections in humans, clarify the currently ill-defined epidemiology and public health burden of this infection, and ultimately inform the public health response when human exposures to B. canis occur.

IV. References


V. Coordination

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