ORIGINAL RESEARCH PAPER

Veterinary Science

BRUCELLOSIS: ITS ZOONOTIC AND PUBLIC HEALTH SIGNIFICANCE

KEY WORDS: Brucellosis, Humans, Animals, Prevention

Sujata Bhave* Senior Research Fellow, Department of Veterinary Public Health, Bombay Veterinary College, Parel, Mumbai – 400012. *Corresponding Author

Rajpal S. Khillare Ph.D. Scholar, Department of Veterinary Public Health, Bombay Veterinary College, Parel, Mumbai-400012.

ABSTRACT

Brucellosis is an important re-emerging zoonosis with a worldwide distribution with important veterinary and public health Significance. It remains one of the most common zoonotic diseases that can seriously affect the wellbeing of animals and humans. The disease is caused by diverse *Brucella* species of which *Brucella* abortus, *B. melitensis* and *B. suis* are highly pathogenic for humans. The possible sources of infections include all infected tissues, aborted fetuses, fetal fluids, vaginal discharges and potentially contaminated materials. The diseases can be transmitted from infected host to susceptible animals in direct and indirect contacts. Various methods are employed for the diagnosis of brucellosis including microscopic examination, culture methods, serological and molecular biology. The most rational approach for preventing human brucellosis is the control and elimination of the diseases in animal reservoir and health education of the public working at high risk area.

1. Introduction

Zoonotic diseases are of major concern worldwide. Brucellosis is an infectious, contagious, disease of domestic and wild animals with serious zoonotic implication in humans. The disease is caused by members of the genus Brucella, a facultative and gram negative bacteria. The disease primarily affects cattle, sheep, goats, swine, and dogs. Different Brucella species can infect humans and the most pathogenic and invasive species for human is *Brucella melitensis* followed in descending order by *Brucella suis, Brucella abortus and Brucella canis*. The importance of this highly contagious disease is due both to its economic impact on the animal industry and to the severe hazard it represents to human health. (Cadmus *et al*., 2006, Pal, 2007).

2. Etiology

Brucellosis is caused by a Gram negative, non-motile, facultative intracellular, coccobacillus or short rod in the family *Brucellaceae*. Six major species have been classically characterized: *Brucella abortus, Brucella melitensis, Brucella suis, Brucella canis*, Brucella ovis, and Brucella neotomae (Pal, 2007). Brucella species have a strong host preference. For *B. abortus,* the host preference is cattle; for *B. melitensis*, sheep and goats; for *B. suis*, swine; for B. canis, dogs; for *B. ovis*, sheep. *B. ceti*, which primarily circulates in cetaceans (whales, porpoises and dolphins), and *B. pinnipedialis*, which mainly infects pinnipeds (seals, sea lions and walruses) (Refai, 2002).

3. Transmission

Brucellosis is transmitted to humans by direct contact with tissues, blood, urine, vaginal discharges, aborted foetuses and especially the placenta of infected animals via breaks in skin. Brucella organisms are present in the reproductive tissues and products of parturition at extremely high concentrations. The organisms also concentrate in the udders of animals that produce milk used for human consumption. In places where brucellosis is endemic, humans can be infected through contact with infected animals or consumption of their milk and products mostly dairy products made from unpasteurized milk. Other routes, including in utero transmission, person-to-person transmission, (Poulou *et al.*, 2006). The mode of transmission of the bacteria varies with the epidemiological area, the animal reservoir and the occupational exposed groups (Seleem *et al*., 2010). Infection is transmitted by inoculation through cuts and abrasions in the skin, by inhalation of contaminated aerosols, by contact with the conjunctival mucosa, or by oral ingestion.

4. Disease in animals

Brucellosis is a sub-acute or chronic disease which may affect many species of animals. In cattle, sheep, goats, other ruminants and pigs the initial phase following infection is often not apparent. In sexually mature animals, the infection localizes in the reproductive system and typically produces placentitis followed by abortion in the pregnant female, usually during the last third stage of pregnancy, and epididymitis and orchitis in the male.

5. Disease in humans

Brucellosis in human known as "undulant fever", "Mediterranean fever" or "Malta fever", affects people of all age groups and of both sexes. The annual occurrence of human brucellosis in the world is over 500,000 cases (Donev *et al*., 2010). In humans, the incubation period for brucellosis is typically 2 to 3 weeks, but can vary from 5 days to more than 5 months. Acute infection can be unrecognized and can result in chronic infection with symptoms recurring years later. Most common symptoms include cyclically recurring (undulant) fever, night sweats, and neuropsychiatric symptoms such as headache. Common symptoms also include malaise, sleeplessness, and arthralgias (Pal, 2007). Human disease presents with lymph node swelling, enlargement of the spleen, fever, testicular swelling, influenza-like symptoms, and lethargy, nausea and weight loss. Spontaneous abortions can occur among pregnant women (Khan *et al.*, 2001).

6. Diagnosis

Herd history may be helpful in diagnosis. Confirmatory diagnosis of Brucella infections can be made only by the isolation and identification of Brucella but in situations where bacteriological examination is not practicable, diagnosis must be based on serological methods. The serological tests include Rose Bengal Plate Test (RBPT), Complement Fixation Test (CFT), Serum Agglutination Test (SAT), Milk Ring Test (MRT), Enzyme Linked Immunosorbent Assay (ELISA) (OIE, 2009).

5. Treatment

As a general rule, treatment of Brucella infected animal is not recommended because of the high treatment failure rate, cost, and potential problems related to maintaining infected animals in the ongoing eradication program. As a result, treatment is unlikely to be undertaken in animals and no economically feasible drugs. Tetracycline (500 mg every six hours orally) administered for at least six weeks has long been the standard treatment of human brucellosis. The treatment recommended by the World Health Organization for acute brucellosis in adults is rifampicin 600 to 900 mg and doxycycline100 mg twice daily for a minimum of six weeks (FAO/WHO 1986). A combination of Quinolones and rifampcin also have given good results (Radostits *et al*., 2000).

6. Public Health significance

Brucellosis is one of the major anthropozoonosis of public health importance worldwide. The most pathogenic and invasivespecies for human are, *B. melitensis, B. abortus,* and *B. canis.* The disease is usually transmitted from infected animals to human by direct contact or by consumption of raw milk infected with *Brucella*

organisms. Brucellosis is primarily a disease of animals and is transmitted directly and indirectly to humans. It is an occupational hazard with those particularly at risk such as laboratory workers, veterinarians, abattoir workers, farmers and animal keepers either living in close proximity with animals or handling aborted fetus and animal products that contaminated by Brucella agents (Radostits *et al*., 2000). According to OIE, it is the second most important zoonotic disease in the world after rabies, causing extensive economic losses. It constitutes an uncontrolled public health problem in many developing countries (Young, 1995). The zoonotic pathogens *B. abortus, B. melitensis,* and *B. suis* have been identified as Category B bioterrorism agents because they are easily capable of causing considerable morbidity and low numbers of deaths if used in a mass event and due to the highly infectious nature of three species, as they can be aerosolized (Rotz *et al.*, 2002).

9.Prevention and control

Approaches used to control brucellosis are immunization, test and slaughter of confirmed animals (Dwight, 1999). Vaccination reduces the number of infected animals and permits disease control (Radostits *et al.*, 2000). Human brucellosis is usually prevented by controlling the infection in animals. Pasteurization of dairy products is an important safety measure where this disease is endemic. Unpasteurized dairy products and raw or undercooked animal products should not be consumed. Good hygiene and protective equipment are very important in preventing occupational exposure. Precautions should be taken to avoid contamination of the skin, as well as inhalation or accidental ingestion of organisms when assisting at a birth, performing a necropsy, or butchering an animal for consumption (CFSPH, 2007).

10. Conclusion

Brucellosis is an infectious disease of domestic and wild animals with serious zoonotic implications in humans. The disease in animals causes tremendous economic losses. Brucellosis is prevalent worldwide but has been controlled in most developed countries. The disease is usually transmitted from the infected animals to humans; and it is also an occupational hazard to the livestock handlers. Since brucellosis is primarily an animal disease, emphasis should be given to control the disease in animal populations by adopting well organized control strategies to protect the public from the risks of acquiring this zoonosis.

References

1. Cadmus SIB., Ijagbone IF, Oputa HE, Adesokan HK, Stack JA (2006). "Serological survey of brucellosis in livestock animals and workers in Ibadan, Nigeria." African J. Biomed Res., Vol. 9, pp. 163-168.
2. CFSPH (2007). "Brucellosis in human." Center for Food Security and Public Health, College of Veterinary Medicine, Iowa State University, Ames, Iowa., pp. 1-13.
3. Donev D, Karadzovski Z, Kasapinov B, Lazarevik V (2010). "Epidemiological and public health aspects of brucellosis in the Republic of Mecedonia." Biol. Med. Sci., Vol. 1, pp. 33-54.
4. Dwight H (1999). "Brucella: Bacteriology." Veterinary Microbiology, 1st ed. Blackwell Science Ltd, Blackwell Publishing Company. pp. 196-203.
5. Khan MY, Mah MW, Memish ZA (2001). "Brucellosis in pregnant women." Clin. Infect. Dis., Vol. 32, pp. 1172–1177.
6. OIE (2009). Bovine brucellosis: Terrestrial Manual, Chapter 2.4.3. Version adopted by the World Assembly of Delegates of the OIE in May, pp. 1-35.
7. Pal M (2007). "Zoonoses." 2nd ed. Satyan Publishers, Jaipur, India. pp. 98-99.
8. Poulou A, Markou F, Xipolitos I (2006). A rare case of Brucella melitensis infection in an obstetrician during the delivery of a transplacentally infected infant. J. Infect., Vol. 53, pp. 39-41.
9. Radostits D, Gay C, Inchcliff W (2000). "Veterinary Medicine." Textbook of the diseases of cattle, sheep, pigs, goats and horses. 9th ed, W.B. Saunders Company Ltd. New York., pp. 867-882.
10. Refai M (2002). Incidence and control of brucellosis in the near east region. Vet. Microbiol., Vol. 90, pp. 81–110.
11. Rotz LD., Khan AS, Lillibridge SR (2002). "Public health assessment of potential biological terrorism agents." Emerg. Infect. Dis., Vol. 8, pp. 225-230.
12. Seleem MN, Boyle SM, Sriranganathan N (2010). "Brucellosis: A re- emerging zoonosis." Vet. Microbiol., Vol. 140, pp. 392-398.
13. Young EJ (1995). "An overview of human brucellosis." Clin. Infect. Dis., Vol. 21, pp. 283-289.