

# CANINE BRUCELLOSIS

## Cornell Research Laboratory

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### WHAT IS BRUCELLOSIS?

Brucellosis is the general name given infectious systemic bacterial diseases affecting a number of different species. Until recently, it was recognized principally as a disease of cattle, goats, and swine but in 1966 a bacterium isolated in our Laboratory from aborted canine fetal tissues was found. By contact, brucellosis in various species is transmissible to human beings and to a number of wild and domestic animals. Vaccination with a living, weakened strain ("strain 19") now has made its control and even its eradication possible. In the past the disease has been called by a variety of names including Malta fever or undulant fever in man and contagious abortion or Bang's disease in cattle, but now the disease in all species generally is called brucellosis.

Typically, all brucella organisms are found growing within certain cells of the body, but they are especially prevalent in tissues such as the spleen, lymph nodes, the placenta, the bone marrow, the testes, and in certain types of white blood cells called macrophages.

The disease in dogs caused by these alien species is self-limiting and the organisms do not persist. However, occasional human infections acquired from infected dogs have been reported.

Characteristic signs are abortion of pregnant females, very low mortality, relatively low-grade or clinically nonapparent illness and infertility. In the male, infection of the testes and epididymides frequently occurs along with scrotal swelling. Painful and swollen joints may occur in both sexes.

Following an abortion caused by a brucella organism, a vaginal discharge generally occurs that lasts for days or weeks. Nervous manifestations are common, as are lymph node swelling, splenitis, and, sometimes, kidney involvement. Much is yet to be learned about the reasons for the variability in the

type and extent of disease caused by various *Brucella* species.

Brucellosis in dogs is remarkably variable in its clinical manifestations, ranging from frank abortions and male genital disease to inapparent infection. It was first recognized as a cause of abortions, whelping failures and male infertility in large breeding colonies of beagles used for commercial and field trial purposes. Subsequent study, however, has clearly shown that there is no breed preference. Clinically, the disease signs are abortions, reproductive failures in both sexes, and generalized enlargement of lymph nodes, especially those in the region of the site of infection (e.g., either under the jaw or in the inguinal region). Animals also may show fatigue, poor condition, or behavioral abnormalities, e.g., loss of alertness and failure to perform tasks for which they have been trained.

Abortions in dogs occur most frequently between the forty-fifth and fifty-fifth day of gestation; however, they may occur earlier. Occasional litters may be born with some pups alive and some dead. Pups artificially infected at birth have shown few signs of illness. Presently, it is not known whether pups infected at birth recover before reaching sexual maturity.

*Brucella canis* may circulate in the blood of infected animals for 2 years or longer, a notable feature of the canine disease. After several months' infection, the bacteremia may be intermittent. An important aspect of the disease in males is infertility, with abnormal sperm and a severe reduction in motility. This suggests that a semen examination is an essential portion of the diagnostic procedure for male animals.

### HOW IS THE DISEASE TRANSMITTED?

By far the most common mode of

transmission is by ingestion of placental tissue and vaginal excretions that are discharged following abortion. The vaginal discharge following an abortion may contain several billions of organisms per milliliter. The vaginal discharge which generally lasts from 1 to 6 weeks serves as the main source of spread of this infection. Males and females are affected with equal ease. In one experiment it required nearly 2 million brucella organisms to establish infection by the oral route. Thus, transmission via urine or other body secretions seems unlikely since the number of organisms shed is very low. Once the disease becomes established in the male, brucella may be transmitted at the time of breeding as a true venereal disease. Transmission by the infected male is unpredictable since organisms may be isolated in abundance from ejaculated semen only during the first to second month after infection; however, the number of organisms generally decreases very rapidly after this time. Shedding then becomes sporadic; however, brucellae have been recovered from the semen of infected dogs for as long as 60 weeks where the prostate gland seems a principal source of bacteria. This poses a difficult treatment problem for, by its nature, the prostate gland is difficult to treat. Antibiotics effective in other tissue sites do not adequately penetrate into the prostate gland.

Normal males have been bred repeatedly to infected females without acquiring the infection, suggesting that males most commonly acquire the disease by ingestion. There is no fever. Since infected dogs of the same sex have been maintained in isolation units with susceptible dogs in close quarters for several months without spread of the infection, transmission by means of other than those noted above seems very rare, even unlikely. Experimentally, infection of the dog can occur via all mucous membrane surfaces, such as the eye, nose, mouth, and vagina. It also is possible for transmission to occur via contaminated needles used to draw blood or by transfused blood from an infected to a susceptible animal.

#### WHAT IS THE INCIDENCE OF THE DISEASE IN DOGS WITHIN THE UNITED STATES?

The principal test indicates that the incidence varies from area to area, and even from locale to locale within a state. Although precise information is not available, the incidence appears relatively low among both stray and household pets. An "average

incidence" appears to be about 1% to 1.5%; however, rates of 5% to 6% have been reported in some southern states.

#### HOW IS THE DISEASE DIAGNOSED?

Until very recently, canine brucellosis could be presumptively diagnosed only by tests requiring reagents available in a very few qualified laboratories. When a dog is infected it responds to the infecting organisms in a variety of ways, one being the production of antibodies in the blood. Antibodies can be detected by adding a known amount of killed *B. canis* organisms (called "antigen") to a sample of clear serum which has been separated from the clotted blood. If *B. canis* antibody is present in the serum it will cause the added organisms to clump together. It is well known that canine red cells are very fragile. The tube agglutination test also requires meticulously prepared antigen. The dilutions of serum from a dog suspected of having this disease are mixed with antigen in the laboratory, and allowed to incubate at an elevated temperature (for one type of test). At present dogs which have titers by the tube agglutination method of 1:200 or greater are considered infected. A positive or "suspicious" serological test always should be followed up by attempts to isolate the organisms from the blood, a simple procedure where facilities are available for bacterial culture.

In 1973 a rapid slide agglutination test for canine brucellosis was developed. The plate test can be performed on a smooth surface such as a glass microscope slide. Agglutinating antibodies usually can be detected shortly before or at the onset of bacteremia and they persist until the animal completely recovers. Elimination of organisms from the body sometimes takes 2 to 3 years. Successfully treated animals also have marked and rapid declines in antibody titers.

Unlike brucellosis in cattle, or other domestic animals, individual dogs are most frequently involved and "herd status" information is not available. The need for careful clinical and laboratory studies, including cultures of blood, are therefore even more important.

In cases of abortion, fetal pup tissues, placental tissue, and vaginal discharges are appropriate materials for bacteriologic examination. These, naturally, should be sent in leak-proof containers.

In the male, an analysis of semen quality is important since infected male dogs' semen usually will have infected abnormal sperm

severe reduction in sperm motility, and inflammatory cells in the ejaculate.

### **CAN THE DISEASE BE TREATED?**

In order for effective treatment, *B. canis* must be completely eliminated from the body, a recognized difficulty with all brucella infections. At the present time there is no certain treatment; however, some successes have been achieved. While treatment generally has resulted in periods of remission of the bacteremia, relapses usually have occurred within a month or two after treatment was stopped. Only intensive and prolonged (lasting 2-3 weeks or longer) treatment schedules have proved successful.

Dogs do eventually recover with time and have been found immune to reinfection for at least 3 years.

Control in breeding kennels is an especially perplexing problem. Subsequently, all dogs introduced into a kennel should be tested at least 1 month prior to such introduction. Naturally, all infected animals should be kept separated from noninfected dogs and not allowed to breed.

The bacterium does not survive long on kennel floors, or outside the host. Disinfection

with common household ("strong") detergents, or commercial disinfectants rapidly inactivates *B. canis*.

### **CAN THE DISEASE BE PREVENTED BY IMMUNIZATION?**

Although effective immunizing agents are not currently available to prevent the disease, various methods now are under study. The fact that dogs do recover, often after 1 or more years, and then develop immunity to reinfection offers hope. Conventional vaccination procedures have not proven sufficiently reliable or safe to be optimistic at this time.

### **HOW SERIOUS IS THE THREAT OF HUMAN INFECTIONS?**

Although *B. canis* is infectious for humans, a relatively massive dose of organisms seems required. It appears that human infection by *B. canis* is a trivial public health problem. Nevertheless, dog owners should be informed of the potential public health risk of maintaining infected dogs, especially if the animals are bred and live in intimate contact with the family.