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Brucella canis – an almost forgotten pathogen?

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Brucella (B.) canis is the causative agent of canine brucellosis. It was first isolated in the USA in 1966 and associated with abortions and reproductive disorders in a beagle colony, but is now detected worldwide.

Distribution

In Europe, *B. canis* is mainly endemic in Southeastern Europe (Romania, Hungary, Moldova, Macedonia). Positive findings have also been confirmed in numerous other European countries, both by PCR (Spain, Italy and France) as well as by increased antibody titres (e.g. Sweden, Belgium, Switzerland, Austria and Germany).

Unfortunately, as there are neither standardised studies on the prevalence of the pathogen nor any government surveillance programmes, and many countries around the world do not publish anything about the occurrence of *B. canis*, data on the spread of the pathogen are incomplete.

The prevalence of *B. canis* is higher in countries with a large population of stray dogs whose reproduction is largely uncontrolled. There is also an increased risk of infection in dog breeding facilities with poor veterinary surveillance.

Clinical presentation

Typical clinical signs associated with brucellosis manifest in the reproductive system.

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In female dogs, the disease causes abortion in late pregnancy, stillbirths or the birth of weak puppies. In males, it manifests as orchitis, epididymitis and scrotal dermatitis. A lot of animals only show non-specific signs such as lethargy, performance intolerance and weight loss and are afebrile throughout the infection.

Canine brucellosis also manifests outside the genital tract, most often as discospondylitis. Here, canine brucellosis is an important differential diagnosis. Especially if young dogs present with lameness or pain in the spinal region and possibly come from Southern or Southeastern Europe, *B. canis* should always be borne in mind.

Other less common manifestations of canine brucellosis are uveitis, osteomyelitis and dermatitis.

Transmission and shedding

B. canis is mainly transmitted through semen and vaginal fluid during mating. Abortion material contains particularly high bacterial counts of *B. canis*. Transmission usually takes place via the oronasal route. Puppies can already become infected in utero and during birth. The bacterial load in urine is usually lower, but it can still be contagious and infect other animals.

This pathogen has a particularly long excretion time: High bacterial counts of *B. canis* can still be detected in semen 6 – 8 weeks after infection. Female dogs, too, shed high concentrations of the bacterium for up to 6 weeks after abortion. Moreover, the pathogen is shed intermittently and can still be detected at least 2 years after infection.

The onset of bacteraemia is about 2 – 4 weeks post infectionem (p. i.). Experimentally infected dogs were positive in blood culture for up to 5 ½ years p. i.

Pathogen

The genus *Brucella* are gram-negative, small, coccoid, facultative intracellular bacilli which can be cultured on cell-free agar media such as blood agar or Brucella selective agar under aerobic to microaerophilic conditions. Due to their slow growth, the incubation period can be several days to weeks.

The genus *Brucella* comprises several species that are mostly host-specific but also have zoonotic potential. In recent years, new Brucella species have been described in an increasing number of animal species. While brucellosis in cattle, pigs, sheep and goats is subject to legal regulations in the European Union and in Germany (listed transmissible animal disease according to Annex 2, Directive (EU) 2016/429 (AHL) and the associated Delegated Regulation (EU) 2018/1629, Regulation on notifiable transmissible animal diseases), it does not apply to *B. canis*.

Diagnosis and pathogen detection

B. canis and antibodies against *B. canis* can be detected by several methods.

The pathogen can either be detected by culture or by molecular biology using PCR. Suitable sample materials are semen, vaginal swabs or abortion material. Urine can be used as well, although *B. canis* may quickly be overgrown in culture by the other pathogens (mostly enterobacteria such as *E. coli*). Fine needle aspirates or aqueous humour can also be tested.

As *B. canis* can cause bacteraemia, detection in blood culture is possible. For this, whole blood is collected (since the pathogen can partly be found in the leukocytes). Under sterile conditions in the practice, it is immediately filled into blood culture bottles. Bacteria in the blood usually have only a low bacterial count. This is why the following points need to be observed to avoid false negative results: Heparin or sodium citrate tubes are more suitable, as EDTA can inhibit bacterial growth. The dogs should not have been pre-treated with antibiotics at the time of blood collection. Blood culture bottles should be at room temperature when samples are taken and remain unrefrigerated even after filling. Transport to the laboratory should take place as soon as possible.

Blood culture bottles are sent out as a set for aerobic and anaerobic culture (see Figure 1).

Fig. 1: Set of blood culture bottles (aerobic and anaerobic)

Picture credits: Laboklin

Ideally, a rather large amount of blood is required for this (7 – 10 ml per bottle). However, since it is not always possible to collect such an amount of blood, there are special blood culture bottles from paediatrics (Peds Plus bottles, see Figure 2). They only need to be filled with 2 ml of blood.

Fig. 2: Blood culture bottle Peds Plus™

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B. canis can be detected by molecular biology using PCR. An advantage of this test method is that it takes significantly less time to perform the test. Additionally, PCR does not depend on the viability of the pathogen and is not influenced by other contaminating bacterial pathogens.

Serologically, antibody titres against *B. canis* can, for example, be determined by IFAT (indirect immunofluorescence antibody test). Positive sample dilutions are indicated by green fluorescent structures as shown in Figure 3.

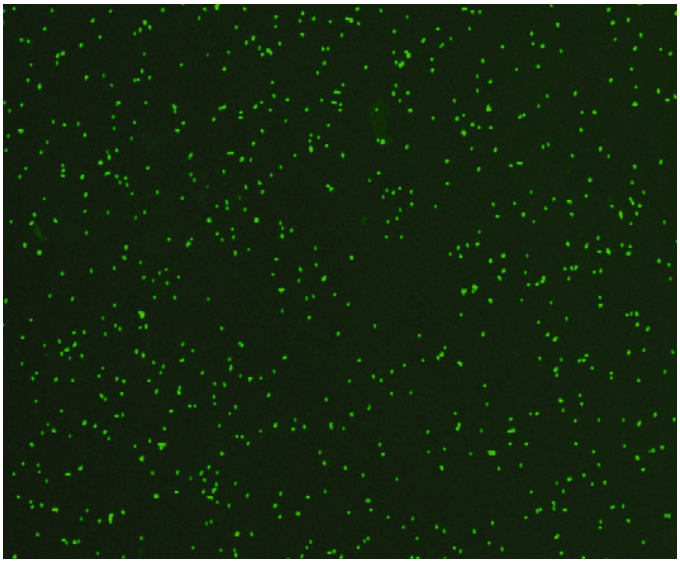

Fig. 3: Positive antibody detection (IFAT) of *B. canis*

Picture credits: Laboklin

When using serological methods, it should be noted that false positive results may occur as a result of cross-reactions. Testing for antibodies should not be done until 3 to 4 weeks after infection and, if negative, the test should be repeated after 4 weeks to rule out a false negative result.

Treatment and prevention

Complete elimination of the pathogen is often not possible even with extensive antibiotic treatment, as brucella are found within the leukocytes and cannot be completely eliminated even with agents that are able to penetrate the prostate.
B. canis isolates from dogs are usually sensitive to doxycycline and tetracycline. Enrofloxacin can also be used. However, even with these prostate-penetrating agents, brucella cannot be safely eliminated. Infected male dogs should therefore always be castrated to prevent the spread of the pathogen.

There is no vaccine against *B. canis*, so the main focus is on preventive measures such as reproductive fitness, diagnosis and castration of stray dogs in order to limit the spread of the pathogen.

Zoonosis

B. canis is a zoonotic agent. Although its zoonotic potential is considered to be low, human infections with *B. canis* have been reported. In humans, the course of the disease is usually mild with non-specific symptoms and does not resemble that of classical brucellosis as caused by *B. melitensis, B. abortus or B. suis* in humans. However, affected animal owners must be informed about the zoonotic potential and the possible shedding of the pathogen.

Dr Marianne Schneider

Further reading

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