

The threat of Q fever in dairy cattle and human health: how to control it?

Q fever is an infectious disease caused by a small intracellular bacterium, *Coxiella burnetii*. The disease affects many mammalian species. Small ruminants, especially goats, are among the species with the strongest clinical signs, including abortions. However, cattle are also affected by the disease.

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In this species, abortion is the most dominant clinical expression, but in many cases the disease has a sub-clinical impact, affecting fertility of the cows.

Moreover, Q fever is a zoonosis that is expressed in humans in two ways. Typically, it manifests as an acute flu-like syndrome that usually recovers spontaneously within a few days. However, in 4% of cases, complications such as hepatitis, pneumonia, meningitis or encephalitis may occur, requiring the patient to be hospitalised.

But the disease can develop chronically (about 2% of patients) and lead to cardiac complications or chronic fatigue. In pregnant women, this can lead to abortion, foetal death or premature delivery.

Q fever is present worldwide. It has been reported that 20% of animals may be seropositive and 37.7% of herds infected. In addition to the public health risk, this high prevalence can certainly explain a number of fertility problems found in cattle farming.

Clinical signs

Q fever is a major cause of bovine abortions. Abortions can occur at any stage of gestation, but they are more obvious when they occur during late pregnancy. Besides abortion, there are more insidious reproductive problems that undermine the economic performance of the farm.

Several studies have shown that seroprevalence is higher in herds with poor reproductive performance compared with reference herds. Indeed, *Coxiella burnetii* has been shown to be directly responsible for



chronic endometritis, and the incidence of retained placenta was found to be twice as high in seropositive cows.

Furthermore, cows that have experienced early pregnancy loss (resulting in irregular return to heat) are more likely to be seropositive.

It has also been shown that there is a correlation between the presence of *Coxiella burnetii* in milk and chronic subclinical mastitis. This suggests that the disease may also be responsible for an increase in the Somatic Cell Count (SCC). Furthermore, in goats, a study clearly identified that infected animals produced less milk than uninfected females.

Disease transmission

Within a herd, the disease is transmitted from one animal to another by contaminated material. The main sources of contamination are the aborted foetus, placenta, foetal membranes and vaginal discharge.

Due to that, the period around the time of parturition or abortion is very risky. However, infected animals also shed the bacteria in milk and faeces. On farms where Q fever is present, the environment is contaminated, and it is also a source of infection.

Transmission of Q fever from an infected herd to a healthy herd can also occur.

Indeed, as the bacterium is small in size, it can easily be carried by the wind. It has been shown that *Coxiella burnetii* can be transferred up to 18km in the air.

Diagnosis

The diagnosis of Q fever can be made by direct testing (usually by PCR) for the bacterium in contaminated material. In cases of abortion, the placenta or a vaginal swab from the aborted female is the sample of choice. A positive result will be evidence of *Coxiella burnetii* involvement in the abortion. If there is no abortion, or if sampling of the aborted female is not possible, a diagnosis at herd level is possible.

This can be done on faeces or on vaginal swabs taken from several cows. However, in dairy cows, bulk tank milk is the sample of choice. A single analysis provides information on the excretion of the bacteria in milk and, thus, on the presence of the disease in the herd. In addition, bulk tank milk has the advantage of being easy to collect.

It is also possible to make an indirect diagnosis of the disease by serology assay (searching for antibodies). This can be done on blood or milk, including bulk tank milk. Unlike direct testing, a positive result will not indicate that *Coxiella burnetii* is currently present in the herd, but only that

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the cows are in contact with the bacterium either now or in the past.

Disease control

As this is an infectious disease, it may be thought that antibiotic treatment could be used to cure the animals or to at least limit clinical expression, such as abortion. However, many studies have shown that anti-infective treatments are not effective against Q fever in ruminants. Prevention is the only effective method for protecting herds. It is based on two pillars: non-medical measures and vaccination.

Non-medical measures are fairly simple to implement and can be easily deduced from the epidemiology of the disease. As the bacteria are excreted in large numbers during abortion and parturition, the aborted animals and the products of parturition should be removed as quickly as possible to avoid contamination of healthy cows and heifers. Because of the faecal shedding and the ability of the bacteria to be easily carried by the wind, manure should not be spread close to animals, especially in windy conditions.

In addition to these non-medical measures, vaccination is the most effective way to protect the herd against Q fever. All animals in the herd over three months of age can be

RUMINANTS	HUMANS
Abortions, pregnancy losses	Flu-like syndrome
Endometritis	Hepatitis
Retained placenta	Pneumonia
Chronic sub-clinical mastitis	Encephalitis
	Meningitis
	Cardiac disease
	Chronic fatigue
	Abortion, foetal death or premature delivery

Table 1. Comparative clinical signs in humans and ruminants. In ruminants, Q fever is primarily a reproductive disease, whereas in humans it is a systemic disease.

vaccinated. Preventive herd vaccination is the best way to protect animals in case of introduction of the disease.

Unfortunately, in practice, the decision to vaccinate is often taken after the presence of Q fever has been detected on the farm. In this case, vaccination is also effective but full control of the disease will take at least 2-3 years.

Naïve animals, that is, those that have never been infected, will be more effectively protected than animals that are already infected and therefore shedding the bacteria. Nevertheless, it is useful to vaccinate these animals as well, as this will reduce the spread of the bacteria in the long

term and lead more quickly to the eradication of the disease.

Conclusion

In cattle, Q fever is a disease that is often subclinical but responsible for many fertility problems that may seriously affect the profitability of the farm. Moreover, it is a zoonosis that can have serious consequences for human health. Control of the disease through implementation of vaccination and hygiene measures is important to protect the health of both people and animals. ■