

# Leptospira hardjo infection in cattle

## Technical Note

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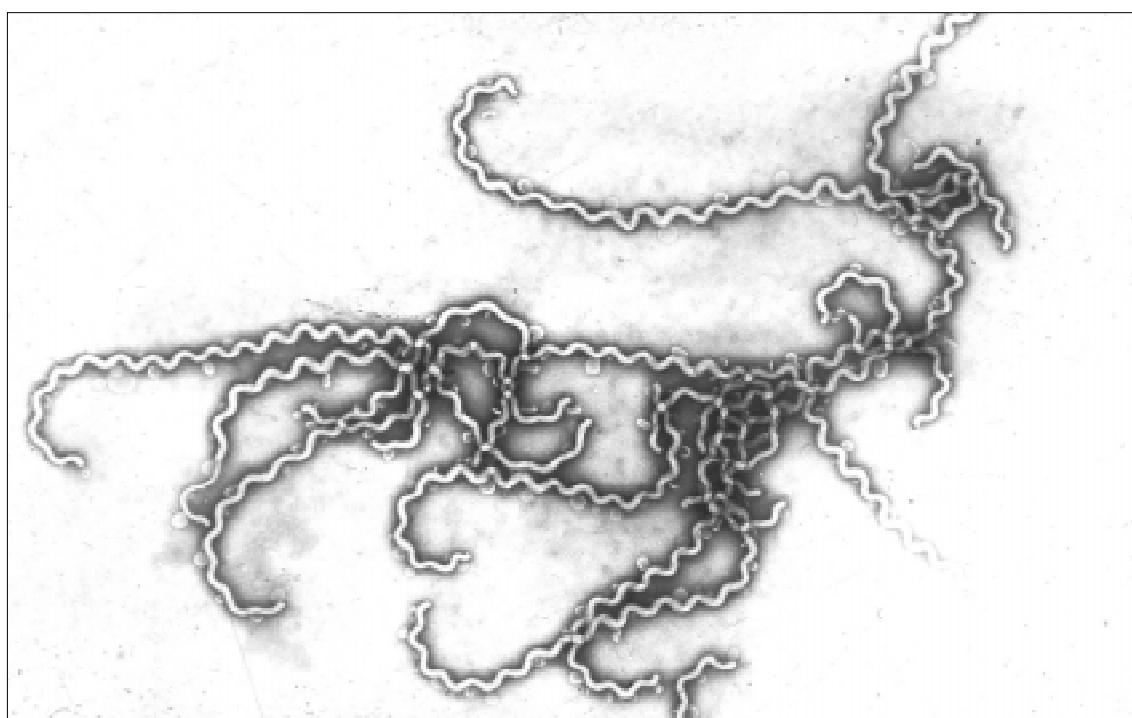
- *Leptospira hardjo* infection is associated with **infertility** and **abortion** and the **weak calf syndrome**.
- Infection is nearly always introduced into a herd by the **purchase of infected cattle**.
- Once infected, cattle may shed the organisms intermittently or continuously for a period that may extend to life.
- *L. hardjo* infection is **transmissible to man**; infection causes flu-like symptoms, severe headaches and rarely death.

### The disease

Leptospirosis is a disease caused by bacteria of the genus *Leptospira*. Leptospirosis in cattle is caused by the organisms collectively referred to as *Leptospira hardjo* (*Leptospira borgpetersenii* serovar *hardjo* and *Leptospira interrogans* serovar *hardjo*).

*L. hardjo* causes milk drop in cattle and has been associated with infertility and abortion. Milk drop syndrome is characterised by a sudden precipitous drop in milk yield (or cessation in milk production)

and occurs soon after infection enters a herd or the individual cow contacts infection (2-7 days). The udder is often soft and flabby; all four quarters are affected. The milk is often colostrum-like, has a high cell count, but is apparently sterile. Affected animals may have a high temperature. After 5-6 days the milk production will be resumed, but cows affected in late lactation may dry off altogether. If milk drop occurs before the peak of lactation then that peak will never be achieved. In a 6-8 week period 30-50 % of the herd may be infected.



*Leptospira* are flexible, helicoidal, motile organisms

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Abortion may occur in the more chronic stage of the disease, 4-12 weeks after infection. It can occur at any stage of pregnancy but mostly in the last 4 months. It can occur at any time of the year but there is a marked seasonal incidence in late summer. Abortion may be followed by retention of the foetal membranes (afterbirth) and can lead to infertility.

After infection, *L. hardjo* localises in the reproductive tract of the cow as well as in the kidneys, hence the suggestion that it may cause infertility in infected cattle. Once cattle have been infected subsequent pregnancies are unlikely to be aborted, although calves may have a poor survival rate. Where infection occurs close to calving, the resulting placentitis may lead to the birth of small weakly infected calves rather than abortions. Furthermore poor growth rates are a feature of infected calves.

The role of *L. hardjo* in infertility is open to much debate. There are many reports of infection associated with reduced conception rates and regular (or irregular) returns to service. It has been suggested that the infection has an effect on embryo-maternal signalling or that the presence of leptospires in the uterus stimulates an inflammatory response resulting in early embryonic death.

Subfertility in beef cattle which have antibody to *L. hardjo* has been associated with a high incidence of inflammation of the cervix and fallopian tubes.

Many herds are infected without apparent clinical disease. In beef herds with home reared replacements transmission of infection may occur in calves before weaning and cause no significant disease. However in those beef herds where replacement heifers are purchased and have no contact with the cows until they enter the herd, new infections in these replacements occur at a critical period in their reproductive lives. This is the usual situation for dairy herds where replacement heifers are reared with minimal contact with the adult herd. Transmission occurs from the adult herd to the uninfected susceptible heifers resulting in the rapid spread of infection that may be associated with reproductive losses or milk drop.

## How is *L. hardjo* spread?

Because *L. hardjo* localises in the kidneys, the organism can be shed in the urine. Infected urine is the major vehicle but direct transmission also occurs

via the post-abortion discharge, via the infected placenta and by sexual contact. (*Leptospira* can be detected in semen of infected animals). *In vitro* fertilised embryos derived from oocytes recovered from infected donors which have been processed in the absence of antibiotics can be associated with leptospira. Transmission may occur to the foetus *in utero*; foetuses may be infected at birth and harbour infection in the kidneys.

Some animals excrete *L. hardjo* continually for a short time and then stop, others shed continuously or intermittently for life. Infection due to *L. hardjo* can arise from contact with infected urine, or indirectly from water or pasture contaminated with urine. Transmission is greatest in grazing cattle with a peak in June to October. Carriers often stop or reduce excretion when fed silage. The organism can persist in the environment for up to 4 months. However leptospira do not tolerate drying, exposure to sunlight or extremes of pH or temperature. Spread of the organism occurs more rapidly in wet seasons in low-lying areas.

The organism has not been identified in wildlife in the UK, and cattle are the recognised reservoir of infection. Disease is therefore usually introduced into a herd by the purchase of infected cattle. *L. hardjo* has been recovered from the urine of sheep, and one study has shown that cattle herds are more likely to be infected with *L. hardjo* if sheep are present on the farm. It is recommended that contact between cattle and sheep is reduced. As leptospira do not tolerate drying or exposure to sunlight, a rest period of two months after grazing by sheep or infected animals should make pasture safe for uninfected animals.

## Routine diagnosis of *L. hardjo* infection

Confirmation of infection in premature or still-born calves is difficult because the diagnostic tests for foetal infection with *L. hardjo* are poor. Maternal antibody production occurs before foetal death in most abortions, but evidence of infection in a herd can be obtained by blood sampling the cows. Diagnosis of endemic infection depends on blood testing a statistical proportion of the herd. It should be noted that *L. saxkoebing* (a serovar found in some wildlife) may infect cattle and result in an inconclusive blood test while causing little or no disease.

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Two blood tests are available. The microagglutination test (MAT) detects the animal's immediate response (immunoglobulin M) to infection with *L. hardjo*, but animals may test negative by the time abortion occurs. The enzyme-linked immunosorbent assay (ELISA), which is now used for routine testing and in SAC's Premium Cattle Health Scheme Leptospirosis Programme, measures the longer term response (immunoglobulin G), to infection, and animals may test positive years after contact with the organism. Unlike the MAT, the ELISA does not require the propagation of live leptospires with the risk to laboratory personnel. ELISA samples with optical density percentage values equal to or greater than 45% are positive for *L. hardjo* antibody. After infection animals are likely to have detectable antibody in approximately 3 weeks. Vaccination is an effective means of control but the blood tests do not differentiate between vaccinated animals and those that are naturally infected. Thus for leptospirosis where infection with *L. hardjo* may be chronic, but recovery and elimination of infection is common, a positive result only shows evidence of previous infection or vaccination. Animals that test positive may constitute a risk of introducing infection to a herd, but their actual infective status cannot be determined.

## Control of *L. hardjo*

Where animals test positive in the course of the herd test, careful analysis of the results is required. A small number of antibody positives may be due to exposure to non-pathogenic leptospires (e.g. serovar *saxkoebing*); infection with *L. interrogans* serovar *hardjo* which is excreted at lower levels in the urine and may not spread so rapidly as *L. borgpetersenii* serovar *hardjo*; or the early stage of infection before high immunoglobulin G levels are detectable. If the proportion of antibody positives is high, vaccination is the only practical method of control but has its limitations. The effect of vaccination is to limit replication of the organism. Vaccination prevents or markedly reduces clinical disease in previously unexposed animals, but does not affect disease established before vaccination. Vaccination will not eradicate infection from a herd. Vaccinated cattle that subsequently become infected, may not produce antibody (but leptospires may be present in the urine). Alternatively, when challenged, vaccinated antibody negative animals may produce antibody, but such an event is not indicative of

clinical disease. Furthermore, vaccinated pregnant animals challenged by a natural route may develop leptospira infection of the fetus.

Where a smaller number of antibody positives are detected, and these are confined to older animals, and these animals have mixed freely in the herd, there is the option to treat with antibiotic as advised by your vet. Antibiotic treatment will markedly reduce the number of organisms an animal is shedding but will not necessarily eliminate all leptospires, and so in-contact animals should be monitored for evidence of antibody production. Where the objective for the herd is to achieve freedom from infection, antibody positive stock can be removed from the herd and follow-up blood sampling can then be used to monitor the success of the strategy.

Where testing shows no evidence of the disease, breeding stock from such a herd can be considered to be free of infection and sold and purchased safely. Accreditation of freedom from *L. hardjo* infection is a useful tool in safeguarding the health and breeding performance of cattle, and preventing the infection in people working with cattle.

## Public Health Implications

*L. hardjo* infection is a zoonosis; the infection is transmissible to man. Sources of infection for humans include urine, uterine discharges and abortion material. Antibiotic therapy of infected animals with streptomycin helps reduce the human health risk rapidly. Although infection is present in the milk it quickly dies off once taken from the udder as the fats present in milk are toxic to leptospira. Pasteurisation of milk will eliminate the organism, so milk from herds undergoing milk drop does not pose a health hazard to man if it is pasteurised.



An aborted fetus

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Infection in man may result in a flu-like illness. Signs include fever, headaches and muscle pain. Death is rare and results from liver and kidney failure. Occupations most at risk include dairy workers, abattoir workers, meat inspectors, veterinary surgeons and butchers who do their own slaughtering. The herringbone parlour is the greatest risk of infection through repeated splashing of urine from infected cows. Herd owners must therefore be

aware of their responsibilities under the COSHH regulations. In the USA and New Zealand vaccination has resulted in a dramatic fall in the incidence of human *hardjo* infections. In the Netherlands control programmes have resulted in the virtual eradication of *L. hardjo* from the national herd and a dramatic reduction in the number of humans exposed to this infection.

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