



Living With Bovine Leptospirosis

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What is bovine leptospirosis?

Bovine leptospirosis is an infectious disease of cattle which tends to affect whole herds. The clinical signs vary depending whether the disease has recently entered a herd or whether it is well established.

In a newly affected herd, the first indication of infection is usually abortions in the third trimester. The degree of loss is variable but can be as high as 20% of susceptible animals. In milking cows, there may be a sudden cessation of milk production that is not mastitis but a temporary agalactia known as 'flabby bag'. Non-milking cows and bulls can show a malaise characterised by a high temperature but little else in the way of clinical signs. Others in the herd will become infected without showing any clinical signs at all.

In a chronically infected herd, one can expect to experience sporadic abortions, the birth of weakly calves which fail to thrive and the odd case of flabby bag. However, the greatest penalty is reduced fertility with early embryo loss and difficulty in conception. Anecdotal reports also suggest a general reduction in herd health and vigour. It is estimated that at least 65% of all UK herds have been or are infected with leptospirosis.

What causes bovine leptospirosis?

Bovine leptospirosis is caused by a bacterium called *Leptospira harjo*, containing two serovars *L.hardjo prajitno* and *L.hardjo bovis*. However, this group of leptospires is in the process of being reclassified and it is likely in the near future that *L.hardjo bovis* will become *L. borgpeterseii* serovar *hardjo* and *L.hardjo prajitno* will become *L. interrogans* serovar *hardjo*.

Confused? To keep it simple as far as the practical day-to-day usage is concerned, the condition in cattle can be referred as being caused by *L.hardjo* as this is the collective name of both species. Irrespective of which is involved in a particular herd, the clinical results are virtually identical.

L.hardjo will grow in the laboratory but requires specialised techniques. It is capable of surviving outside the host for considerable periods so long as the environment is damp and warm. It is quickly killed in hot, arid conditions and if exposed to long periods of desiccation.

Which animals are most likely to catch the disease?

All breeds of cattle are susceptible to leptospirosis. The disease is probably more common in dairy herds than in suckler herds. But its transitory nature and the greater awareness of suboptimal fertility in dairy herds may only make it appear more prevalent in dairy herds. Clinical signs are most commonly observed in pregnant or milking females. In chronically infected herds, weakly calves and reduced fertility may be the only signs. Bulls may become symptomless carriers.

How do you know if an animal or herd is infected with leptospirosis?

The clinical signs seen in animals suffering from L.hardjo infection can easily be confused with other conditions. In cases of abortion, the bacterium can on occasions be found in kidney tissue taken at post mortem. In cases of abortion, weakly calves, flabby bag and reduced fertility, examination of serum can be subjected to a microscopic agglutination test (MAT). It is advisable to sample a number of individuals across all age ranges and not to rely on a single sample. The exception is in the case of flabby bag, when two samples should be taken a fortnight apart; firstly at the onset of disease and secondly as the animal recovers. A rising titre will confirm the cause to be L.hardjo. Serological interpretation is not always easy and some individuals may not respond as expected, hence the need to take a representative number of samples. Generally, titres disappear after 100 days or so, hence the difficulty in identifying symptomless carriers on an individual basis. Diagnosis should be aimed at establishing whether the herd is infected or not.

Recently, a bulk milk tank test has become available and this is a great step forward in monitoring the herd status on a regular basis. The interpretation of results is fairly straightforward and the test quickly identifies whether there are positive cattle present. Regular testing will also indicate whether the disease is spreading or has entered a previously clean herd. This test, like the conventional MAT, does not identify seronegative cows shedding leptospires. However, compared to blood testing, this test is inexpensive and only requires the collection of milk from the bulk tank and delivery to the nearest VI centre.

Can animals carry the infection without being obviously clinically infected?

This is one of the major problems with the disease. Once cattle are infected, the bacteria settle into the kidneys where they can remain for up to two years. During this time they are shed in the urine. If the animal was infected in the dry period and showed no sign of disease, she could still shed leptospires in her urine for the next two years. Unfortunately, these animals only retain measurable antibodies for about 100 days after infection, so a serological test after this time would fail to detect her as an infected animal.

Can animals other than cattle carry leptospirosis?

Sheep are well documented as carriers of *L. hardjo*. In fact, they can suffer similar symptoms such as post lambing agalactia and, on rare occasions, abortions have been reported. Reports of disease in sheep are more frequent from Ireland than from the UK. As with cattle, the bacteria settle in the kidneys and are then excreted in the urine. The extent of infection in the UK national flock has never been investigated, but excretion is thought to be of a shorter duration than in cattle.

Exotic ruminants such as water buffalo and bison are probably at risk. The position of goats is unknown in the UK but reports from USA, Canada and New Zealand have demonstrated the experimental establishment of infection and shedding. The position of deer has not been investigated in the UK. However, surveys in the USA and Australia failed to demonstrate any positive cases of infection.

L. hardjo is but one of many leptospires to infect animals but most are fairly host specific and, in the UK at least, no other leptospire has yet been incriminated in disease afflicting cattle.

How do cattle catch leptospirosis?

Cattle acquire leptospirosis from environmental sources or by direct infection from infected urine. Infection appears to peak during the summer months when cattle are at pasture. Housed cattle seem less likely to be infected, presumably because then they are drinking from troughs. In addition, the leptospires do not survive well in other than neutral pH and the pH of yards and loafing areas is usually below neutral.

The ingestion of contaminated water from streams or ponds is one of the commonest sources. How often have cattle been seen standing in a stream either urinating or drinking? *L. hardjo* can penetrate intact mucous membrane, so if infected urine from a carrier cow reaches the eye or muzzle, the infection can be established. There is evidence to suggest that a steady low level of exposure to contaminated water is more likely to succeed in establishing infection than a single, massive dose. Contamination of the conjunctiva is the easiest way to establish infection and this route is used in experimental studies.

Can you treat the disease successfully in sick animals?

Treatment of infected animals is by the use of high doses of antibiotics. The real problem is to prevent the establishment of the leptospires in the kidneys. Traditionally a 'streptomycin' and 'dihydrostreptomycin' mixture has been used in a single dose of 25mg/kg to ensure clearance of the kidneys. In addition 'ampicillin' at 10 mg /kg and repeated in 24 hours and 'amoxycillin' at 7mg/kg are indicated. However it is likely that several animals with no symptoms have been infected and so herd treatment should always be considered.

Does treatment eradicate the infection?

In individual animals treated correctly, treatment is often successful. However, one can never guarantee 100% success. It must be remembered that, unless recently bought in, the animal has acquired the infection from a source still present on the premises and can become re-infected. There is a wealth of evidence that excellent results are achievable if the disease is treated on a herd basis.

Does an understanding of the infective process help to construct control programmes?

Infection is acquired either from a contaminated environment or by direct transmission cow to cow. Four risk factors have been identified which will lead to the introduction of the disease to a herd:

- 1) The introduction of a carrier (shedding) animal and this includes hired bulls.
- 2) Co-grazing with infected carrier sheep.
- 3) Access to streams and waterways contaminated up-stream by a herd already infected.
- 4) Rearing heifers away from the main holding on a contaminated farm or pasture.

Measures to overcome these risks include -

- 1) Any purchased animals must be isolated and undergo a course of appropriate antibiotic therapy prior to introduction to the main herd, including hired bulls.
- 2) Cattle should not be co-grazed with sheep. Where sheep are wintered on cattle pastures, a three-week period between their removal and the introduction of cattle should be observed.
- 3) Grazing animals should be denied access to streams and ponds. These should be fenced off and water troughs supplied.
- 4) If heifers are reared away, ensure that the conditions above apply and also ensure they have received a full course of vaccination before departure to be sure they do not return as infected carriers.

If these risk factors are appreciated and strict precautions taken to reduce them totally, which is quite feasible, then it should be possible to keep leptospirosis at bay. However, it is sometimes exceedingly difficult to ensure 100% compliance. In these circumstances alternative measures need to be adopted.

Is vaccination an appropriate part of control?

Control of leptospirosis in cattle is best achieved by vaccination. So often it is difficult to counter all the risk factors all the time. Herds into which cattle are regularly introduced are at high risk as are herds using hired or borrowed bulls. In addition, herds where heifers are reared away run the risk of them introducing the disease on their return, or leaving in the early stages of disease and failing to breed as well as could be expected.

All three vaccines available in the UK provide protection against both *L.interrogans* serovar hardjo and *L.borgpetersenii* serovar hardjo. They are all inactivated which means it is essential to administer a full

primary course of two doses 4-6 weeks apart at the start of any programme, as it is to any subsequent groups being vaccinated for the first time.

Generally, while the animal responds well to the vaccine, protection from a primary course lasts no longer than 17 months or so. It is therefore essential that booster doses be administered on an annual basis. The best time to give these booster doses is at turnout in the spring, as this maintains the highest level of protection at the time of greatest risk. If a booster dose is missed and 17 months has elapsed, then a full primary course of two doses is required to re-establish a satisfactory degree of protection. In all cases, the vaccine is administered under the skin (subcutaneous) and the dose is 2ml. As leptospirosis is a herd problem, vaccination should be used to protect the whole herd. Experience has shown that if only part of the herd is vaccinated then breakdowns frequently occur. The only exception is if the herd at home is leptospirosis-secure. Heifers reared away can be vaccinated to prevent them becoming infected and thus safeguard the resident herd on their return.

There is evidence that the vaccination of a herd in the face of a disease outbreak will substantially reduce both the numbers of cows, which will shed and also decrease the time for which the leptospires are shed in the urine. However shedding will not be totally eliminated.

Leptospirosis vaccines have been available in the UK since 1985. Herds that have used them conscientiously and maintained their booster programmes have reported good results in lack of clinical disease as well as enhanced fertility.

Some herds have ceased to vaccinate because of the lack of disease, where an appreciation of the risk factors are taken into account and eliminated disease has remained at bay. Sadly, this is the exception rather than the rule and there are regular reports of breakdowns in such herds. These breakdowns are due almost entirely to complacency or desire to make a cost saving short term. Longer term, the cost can be substantial.

The best advice must be that once in a vaccination programme, do not stop. The benefits of ceasing to vaccinate, unless you are positive you can totally eliminate the risk factors, are minimal and could turn into a costly disaster.

Vaccination can be expected to give a rapid resolution in the case of milk drop. In the case of abortions, these may still continue for several weeks after vaccination since the incubation period is as long as 12 weeks. Additionally, on rare occasions, an apparent abortion storm may follow vaccination in heavily infected herds. This storm is probably due to the added stress of handling for vaccination and these animals would probably have aborted anyway but over a longer time scale.

It is important to keep unused vaccine at a constant temperature of +2°C to +8°C (warmest part of a domestic refrigerator). It should not be frozen and must be protected from light. Vaccines are not cheap, they are also comparatively 'high tech' and to obtain the best results, correct storage and handling is important.

Is eradication of the disease from a herd, a region, or a country achievable?

The widespread distribution of leptospirosis within the national herd makes it very unlikely that eradication from a region or the country is possible. In addition, the presence of symptomless, undetectable carriers makes diagnosis difficult on an individual basis. On a herd basis, there is no reason why with good security as far as the risk factors are concerned, the disease cannot be both eliminated and the herd subsequently kept free. Elite herds in the UK are leptospirosis free, as are many other herds who have made a positive effort to manage the risk factors.

What is the risk of re-introducing the disease into a clean herd?

Experience has shown that re-introduction is not uncommon, particularly when herds have ceased to vaccinate. Ignoring the risk factors and the purchase of animals that are immediately added to the resident herd pose the greatest risk. The hiring or purchase of a bull is also one of the major breakdown points, even young bulls can be infected and they can excrete leptospires for two years!

Does the disease have any human implications?

Leptospira hardjo is a recognised zoonotic agent causing disease in man. The main source of infection is cow's urine contaminated with *L. hardjo*; those mainly at risk are dairymen, veterinary surgeons, inseminators, slaughtermen and anyone coming into contact with infected urine. Infection usually gains entrance by way of the mucous membranes of the eye and or the mouth. This accounts for the New Zealand practice of tail docking as they have problems with *L. pomona* that causes serious disease in man.

In addition, those pursuing leisure pursuits on rivers heavily contaminated with cow's urine are at risk just as cows themselves are at risk.

In man, the disease usually presents as a high fever with some joint pains and, often, severe headaches. Untreated, in most cases the disease can cause serious problems, and even deaths have been reported. Thus anyone in contact with cattle who suffers severe 'flu-like symptoms should seek medical assistance without delay. The attending doctor should be made aware that the sufferer has been exposed to cow's urine. Early treatment in man with either amoxycillin or ampicillin results in rapid recovery.

It is important that the risk of leptospirosis is appreciated by employers and due note is taken when carrying out risk assessment under COSHH legislation.