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Johne's disease is a disease of cattle, sheep and goats caused by infection with a bacterium, *Mycobacterium avium* subsp *paratuberculosis* [formerly *Mycobacterium paratuberculosis*]. Goats are usually infected by bacteria excreted in faeces by clinically ill or symptomless carrier goats. The bacteria can persist in the environment for at least 1 year. Some animals may be intermittent excretors.

It is believed that the vast majority of *M. avium* subsp. *paratuberculosis* infections in goats occur while they are kids. Most infections probably occur within the first 30 days of life. Animals older than 9 months of age are much less likely to be infected because, as goats mature, their resistance to becoming infected increases, although complete resistance is unlikely and adult goats, if given a sufficiently large dose of bacteria at a period of immune insufficiency [eg during pregnancy], can become infected.

Infected adults serve as a source of infection for kids as they shed the organism in faeces, milk and colostrum. Introduction of Johne's disease to a `clean' herd should result in the next year's crop of kids becoming infected but, because of the long incubation period, not becoming clinically ill until some years later. The minimum time from infection to signs of clinical disease in goats is not known but is usually between 2 and 4 years. The minimum time reported in calves is 16 months. Older animals would only become infected in the face of very heavy contamination of pasture or buildings and many or most of the existing animals in the herd would be expected to be immune to infection.

Because of the long incubation period, only adult goats are affected, with the disease rarely occuring in goats younger than 2 to 3 years of age. Progressive weight loss occurs over weeks or months, leading to dramatic emaciation. Initially the goat's appetite is maintained but later decreases as the goat becomes increasingly lethargic and depressed. Diarrhoea only occurs in the terminal stages. **There is no treatment for Johne's disease**.

Diagnosis is very difficult in the living animal and the disease is generally considered to be grossly underdiagnosed. **No single bacteriological or serological test is sufficiently accurate to identify all clinical and subclinical cases or has sufficient specificity to avoid false positives.** This means that in herds where clinical cases of Johne's Disease have not been identified using blood tests to try to establish freedom from disease is fraught with difficulty. **A single blood test is not sufficient to guarantee freedom from disease**. Similarly, in the absence of clinical disease, **a single `positive' test should be treated with caution until further confirmatory tets are carried out**.

In England, the Veterinary Laboratory Agency centres use the *Agar Gel ImmunoDiffusion test [AGID]* as the basic serological screening test. In Scotland, the Scottish Agricultural Colleges use an *Enzyme-Linked Immunosorbent Assay [ELISA]* . These tests take a relatively short time to produce results and several samples can be processed each day. However, the earlier the stage of infection, the lower the sensitivity will be and it is not until the later stages that serum changes become adequate enough for these tests to gain sufficient sensitivity to detect the disease. AGID and ELISA tests correlate reasonably well with faecal culture and are useful for detecting profuse excretors.

AGID is considered highly specific [100%] and positive test results correlate well with clinical signs but the sensitivity is low, so that if the animal is not showing clinical signs, the likelihood of a positive test result is low [less than 50%]. A positve test is indicative of developing disease and if the goat is not already showing signs of disease, it would be expected to deteriorate with time [possibly months]. Some tests are reported as `weak positives' ie inconclusive. AGID is considered better for diagnosing infection in animals that are already showing clinical signs, whereas ELISA is better for detecting infection in animals without clinical signs, where animals have localised infections and low level bacterial burdens.

A further test, *Polymerase Chain Reaction [PCR]* is used to detect *Mycobacterium paratuberculosis* in the faeces of infected animals. It is highly specific and can pick up low levels of infection, but depends on active shedding of organisms in the faeces and may miss subclinical infections. Care needs to be taken to avoid cross contamination of samples. *Faecal culture* is a fairly reliable test with high sensitivity, but requires 8 to 12 weeks and will not detect less than 100 organisms/g, thereby missing some carriers. *Identification of acid fast organisms in ileocaecal or mesenteric lymph nodes* is the best diagnostic test either at postmortem or by biopsy.

If you are worried that a goat or goats in your herd may have been infected with Johne's Disease:

Don't panic or take precipitate action without confirming the diagnosis, then carefully consider your options before acting.

Isolate the goat[s] and all other members of the herd that may have been exposed to infection. Remember that the disease is transmitted to young kids through faeces, milk and colostrum and to older kids by faeces. Goats over 9 months of age when first exposed to the organism should be fairly immune, unless exposed to high levels of contamination and with a compromised immune system [pregnancy or movement stress]. As with CAE, the more infected animals there are in a herd, the higher the challenge to the kids and the more likely clinical cases will occur in a few years time.
Blood test the whole herd, rather than one or two goats [if financially feasible] using an AGID or ELISA test.

- If the whole herd is negative, retest in 3 or 6 months depending on your degree of concern and financial constraints.
- If positive goats are detected, confirm the diagnosis by a PCR test on faeces from individual goats or by faecal culture.

Do not make rush decisions to cull animals before the result is confirmed.
Remember that, as with CAE, snatching kids at birth [before suckling and becoming contaminated with faeces] and then rearing the kids separate from the rest of the herd will enable blood lines to be preserved. Housing kids in clean buildings away from older goats until they are goatlings should prevent them from becoming infected
Remember that the organism is very persistent in the environment - up to 2 years or more on pasture - but removal of faeces and thorough cleaning of pens and yards will reduce the risk of contamination. .

Control of Johne's disease in known infected herds

Establish a diagnosis:

- Isolate goats that are losing weight and establish a diagnosis by post mortem examination.

Reduce the level of infection in the herd:

- Identify and remove infected animals from the herd as soon as possible.
- Remove the offspring of infected goats from the herd
- Cull goats with progressive weight loss before they kid
- Breed replacements from older animals in the herd

Improve hygiene:

- Prevent faecal contamination of water and feed troughs.
- Use generous amounts of clean straw bedding.
- Prevent overcrowding.
- Clean pens regularly.
- Burn the straw litter from infected herds or allow long term manuring [greater than 1 year] to occur before spreading it onto land used to produce food for animal consumption

Test regularly:

- Test the herd routinely for Johne's disease every 6 months - by faecal culture + blood tests [AGID or ELISA] - if financially practical.
- Testing is expensive and will not detect infected animals which are not shedding bacteria.

At kidding:

- Isolate goats at kidding into clean kidding pens in an area separate from the main herd.
- Clean and disinfect kidding pens between goats and use generous amounts of straw bedding.
- If practical consider snatching kids immediately they are born. Otherwise remove kids from their dams as soon after birth as possible.

Kid rearing:

- Pasteurise the colostrum and milk fed to young kids.
- Do not feed pooled colostrum or milk.
- Provide young kids with access to good quality hay and clean straw to discourage them from eating the straw bedding.
- Rear kids in small groups for the first 9 months in an area isolated from the adults.
- Record the identity of the kids in each rearing group.
- Vaccinate the kids between 2 and 4 weeks of age. When all the goats on the unit have been vaccinated, continue for a further 2 years.Vaccination will reduce the incidence of clinical disease, but animals may still become infected and shed bacteria without ever developing the disease. Vaccinated animals cannot be exported and present a possible risk to other herds, eg at shows. .

There is an excellent website www.johnes.org which covers Johne's in goats extremely well