



Premium Cattle Health Scheme

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JOHNE'S DISEASE FREQUENTLY ASKED QUESTIONS

Question 1 - Why do the diagnostic tests for Johne's disease appear to give such variable results?

The blood test currently used to diagnose Johne's disease is similar in accuracy to those that we use for both brucellosis and TB. However, the difficulty in the diagnosis of Johne's disease lies in the biology of the disease itself. There are several disease facts that complicate diagnosis including the long disease incubation period, the lack of a specific early response by the animal's immune system and the difficulty and time taken to grow the bacteria in the laboratory environment.

The Johne's disease bacterium is very slow growing and stays within the animal's own cells in the intestine lining. It takes several years before there is significant damage to the intestine. When this occurs, the immune system is exposed to the Johne's disease organism and only then is an antibody response stimulated. Following this, enough bacteria are shed in the faeces to be detected by the faecal culture test.

Question 2 - Why is it that a cow that has tested negative for the disease on 3 consecutive herd tests can suddenly test positive at the fourth test?

The blood test relies on detecting antibodies in the blood. However, as mentioned above, an animal with Johne's disease usually only starts to form these protective antibodies long after infection has been established. Some may never develop this immune response and so can remain completely undetected, although this is unusual. A cow can test negative for several consecutive tests and it is only when she gets to a stage in the disease that her body mounts an immune response to the bacteria that we can detect her as positive. The up side of this is that she usually turns positive when she is shedding few bacteria into the environment to infect others - so we can still facilitate control of the disease by concentrating on hygiene measures.

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In contrast, other diseases such as Leptospirosis and IBR cause the development of disease-specific antibodies within a few days of becoming infected so are much quicker and easier to diagnose.

Question 3 - Why do you get animals positive for Johne's disease on the blood test but then negative on the faecal test?

There are 3 possible reasons for this:

1. False positive blood result:

When an animal tests positive for the disease but in fact is not infected, it is termed a "false positive". This may happen because antibody produced by the animal to other organisms may cross-react to the test. These cross-reactions can be temporary, in which case they may subside and the animal will be negative if tested several weeks or months later. This phenomenon affects all diagnostic tests to some degree and is the reason for the use of a second test. For Johne's disease we use the faecal culture as the second test to confirm positives in some cases where there may be doubt about the herd status. In herds known to be infected there is little need for a second test.

2. Incorrect faecal culture result:

The dung test is considered by some to be the best diagnostic test for Johne's disease. It is almost 100% specific, meaning that if a positive result is obtained the bacteria is present in the faeces and the animal is almost certain to be infected with the disease. This means that we don't really get false positives with the dung test. However a false negative is more likely. The bacteria is slow-growing in the laboratory environment and so other fast-growing bacteria and fungi can compete and prevent growth of the Johne's disease bacteria resulting in a negative faecal culture.

3. Intermittent shedding of the bacteria:

Animals have been found to shed the bacteria only intermittently. This means that on a certain day there may be no or very few bacteria in the faeces to grow in culture, even though the animal is infected - hence giving a negative result on the faecal test that is actually false.

The best way to approach these problems is to retest such animals which is done on a regular basis when participating in the control scheme.

Question 4 - Why not always use the faecal test instead of the blood test?

Although, as above, it is suggested that the faecal test is a more accurate test, it takes many weeks to grow the bacteria and in most cases, is too expensive to use to test all the animals in a herd. It has also been shown in scientific studies that the use of the blood test and the confirmatory faecal culture test together is the most efficient (time-wise and in accuracy to detect the disease) and economical approach. As positive animals can be missed in the earlier

stages of the disease they need repeated testing to confirm that the disease is not present - hence the control program is a long process with regular testing.

Question 5 - Why do some animals get inconclusive positive and suspicious negative results?

In several diagnostic tests the graduation from positive to negative is not clear-cut. Inconclusive results exist also in the Leptospirosis antibody and BVD antigen test. The purpose of re-testing inconclusive positives is to prevent animals with false positive results due to transient cross-reactions from incorrectly being identified as true positives. The purpose of retesting suspicious animals is not to let these animals that may be in the early stages of transition from negative to positive to go untested for a whole year before the next whole herd test

Question 6 - Do adult animals pick up the disease or is it only calves that can be infected? Why?

Studies have shown that cattle are generally infected as calves up to 6 months of age. The younger the calf, the more susceptible it is to infection, with the first month of life being the greatest risk period. Younger animals have more lymphoid tissue in their intestines than adult animals and their intestines are also more "open" to infections. This susceptibility can be considered in the same light as susceptibility to other calf-hood diseases like E. Coli and Salmonella -the defences of the gut are not as good as in the adult animal. In the case of the Johne's disease bacterium, which is more slow growing, we only see symptoms much later in life.

Studies are not conclusive but it is thought that adult animals can become infected in environments that are very contaminated with the bacteria, as the sheer numbers of bacteria taken in may then be capable of crossing the "stronger" adult gut wall. But again, because the bacteria is usually so slow-growing, unless the animal has consumed large amounts of the bacteria, in most cases we would expect these adult-hood infections to result in clinical disease several years later.

Question 7 - How is the disease transmitted?

Johne's disease usually enters the herd when an infected animal, often a purchased or hire bull, not yet showing clinical signs of the disease, is bought into the herd. The bacterium is passed from animal to animal primarily by the accidental ingestion of dung. Infected animals shed billions of bacteria daily in their faeces, which contaminate the general environment. The

calf's dam, herd mates and hire or share bulls shedding bacteria in their dung contaminate the food and water sources, acting as possible transmitters for the bacteria.

The primary risk to the new-born calf is the presence of infected dung in the environment, especially soiled teats and flanks of the calf's own dam. Therefore the key element of control is to minimise direct exposure of the young calf to faeces in the calf-rearing system. Secondary to this are measures to improve hygiene to limit faecal contamination of the environment by infected animals.

Infection can also be spread through colostrum and milk of cows that are in the more advanced stages of the disease and to the unborn calf in the uterus. For this reason it is advised that the calves of a positive cow are not kept in the herd for breeding. The highest risk is considered to involve the two most recently born calves.

Embryos and semen are also possible modes of transmission but are considered only very rarely involved compared to those mentioned above.

Question 8 - Why does there sometimes appear to be no link between the disease in a cow and her dam?

It may not necessarily be the calf's dam that is infected but another cow in the herd that is shedding the bacteria in her dung. If this infected dung contaminates the calving pens, yards or the dam's udder and flanks then the calf can be infected with the disease. This is why a link is not always seen between an infected animal and her dam - she may well have picked up the disease as a calf by exposure to another infected animal in the herd and so test positive while her mother is uninfected and repeatedly tests negative.

So, with current knowledge, we can make the assumption that if a 3 year old animal is detected as positive, there was an infected animal present in the herd, which may even have subsequently been sold or culled, or bacteria were present on the farm from an outside source 3 years ago when that animal was a calf. This led to her becoming infected by ingesting the bacteria.

Therefore part of the control of Johne's disease is based on detecting infected animals and removing them from the herd. However management measures are also important, especially not using the same equipment for removing dirty bedding and manure as for handling food. The flanks of the cow and especially the udder should be clean, as suckling on dirty dung-contaminated teats is a very efficient way for the bacterium to transmit itself to the calf. The cleaner the environment and the cows are kept, the more chance the calf has of not becoming infected in that critical time period when most susceptible. These preventative measures obviously also apply to many other calf-hood diseases as well.

Question 9 - How important are rabbits and other wildlife in the transmission of the disease?

Studies carried out by SAC researchers in Scotland have found that rabbits have the potential to harbour the disease in a situation that could be similar to that postulated for badgers and TB. However, rabbit control, as mentioned by so many of you, can be very difficult. The disease has also been detected in other animals (predators of rabbits such as foxes and stoats) but it is thought that these animals are not capable of transmitting the disease but are just end-stage hosts. The best advice to adhere to is to prevent young calves grazing on pastures where there are a lot of rabbits and rabbit faeces present. Rabbit control should be continuous to effect control of this aspect of disease transmission. We hope that further research into the subject will give us a better idea of the importance of rabbits in the transmission of the disease.

Question 10 - Are sheep important?

We know that where sheep co-graze with cattle infected with Johne's disease they can become infected. There is also a sheep specific strain of Johne's in the UK that does not infect cattle. Cattle specifically avoid sheep faeces when grazing. Also, because Johne's disease infected sheep shed fewer bacteria in their faeces and rarely develop diarrhoea, they cause less contamination of the environment and therefore are considered low risk for spreading the infection to cattle.

Question 11 - Is there any evidence of a link between Johne's disease and trace element deficiencies, especially selenium?

Certain factors may speed up the onset of clinical Johne's disease. These include an inadequate diet (the amount of food given and the nutritional quality of the food) as well as deficiencies in micro-nutrients like vitamins and minerals. Other infectious diseases, parasite burdens, parturition or peak lactation and following transport or introduction to new premises causing stress are thought to contribute. Immunosuppression, as a result of infection with bovine viral diarrhoea virus (BVD), may also trigger the clinical condition.

However, it is also true that Johne's disease reduces the ability of the intestinal tract to absorb nutrients and to cope with other problems, so it can be difficult to determine which came first - the "disease" or the apparent "trigger" factor. More research is required to determine the importance of these factors. However, as the health and nutritional status of any animal affects its immune system and susceptibility to disease, the best advice is to pay considerable attention to nutrition and control of other common diseases, as this can only be beneficial.

Question 12 - What are the most important points for control?

1. Prevent overcrowded calving areas - keep calving area stocking density low
2. Isolate any animal showing symptoms suspicious for Johne's disease such as diarrhoea and weight loss. Isolated animals must be kept well away from the rest of the herd until all tests have been performed and a diagnosis made.
3. Prevent weaned stock from contact with adult's manure as much as is possible. Avoid manure contamination of drinking water. Water troughs should be checked and cleaned regularly. Animals, especially young stock, should not have access to pools of stagnant or slow-moving water that may be contaminated. Clean, dry, well-bedded calving pens and lying areas for the cows and keep feed and feed equipment free from faecal contamination.
4. Change calving season to calve outside where improvement in hygiene in an indoor calving system is too difficult
5. Source breeding replacements from herds that have achieved Johne's disease monitored certification wherever possible
6. Don't retain calves from diseased or cows tested positive for Johne's disease in the herd for breeding.
7. Persist with the control program as it is a long process and make sure all the required testing is carried out on time and animals that are bought in are well isolated from the rest of the herd and tested according to the scheme rules
8. Keep in regular contact with your veterinary surgeon and read up as much as possible about the disease to keep abreast of the latest up to date knowledge regarding control of the disease