

The Lurking Monster in Calf Care

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We have come a long way in the past ten years. On most farms, calves are now regarded at or close to the same level as the lactating herd. This has been nothing short of a revolution in common calf care practices. Nowadays it is more common to see a pre-weaned calf with a coat on than not, milk feeding rate has doubled (20% of body weight versus 10%, or even better, ad libitum), sufficient quantity and quality of colostrum is delivered in a timely manner. We also provide clean dry, ample bedding and keep records of treatments. For all of this investment, our return is a lower age at first calving and more milk in the first lactation. These seem like basic necessities, and they are, but a mere ten years ago this was not the case. The future of the calves in our care looks bright.

Well, it may not be as bright as we think. There is a disease on our door step that is so pervasive and demoralizing it is causing long time calf care employees to quit their jobs for their own mental health. These employees do everything right, follow the book and still the pre-weaned calf mortality can be upwards of 50%. Yes, 1 out of every 2 calves will die despite excellent care because of this disease. Even better, this disease can also present in the lactating and dry cows as abortion storms. Not only will at least every other calf likely die before weaning, but some will never even hit the ground alive. But wait, there is more good news! It is also zoonotic and is resistant to 17 of the 20 antibiotics currently available. This means if you, your family or an employee contract this disease not only is there an almost certain chance that you will be hospitalized, but there may not be an antibiotic that can cure you. Meaning, there is a real chance of death to people too. Are the alarms bells ringing yet?

The disease is Salmonella Dublin. It is not like other diarrhea causing Salmonella infections we typically see. The main manifestation in North America is chronic, untreatable respiratory disease in pre-weaned calves. In Europe, Salmonella Dublin infections more commonly show up as abortions in the cow herd. In this area, abortion occurs at a much lower frequency. S Dublin is endemic in the western USA, it is commonly found on more than 50% of farms. This is likely also true for our western provinces. In the East, it is estimated to be present on 3% of farms in 2012, however a 2017 study shows the number of positive farms is exponentially increasing. In the words of the Salmonella Dublin expert Dr. Belinda Thompson of Cornell, it is solidly entrenched in New York State. There are also numerous reported cases in Quebec. In Ontario, there have been a handful of confirmed cases. It is just a matter of time before S Dublin begins appearing with greater frequency on our farms.

Clinical Signs

The typical presentation of S Dublin is a sudden onset of pneumonia in calves. It usually occurs at the age at which animals are first grouped housed. Previously it was mostly seen in weaned calves however with the popularity of robotic and mob feeders in milk fed

calves, outbreaks are now often seen in pre-weaned calves. It can also occur in individually housed milk fed calves. The age of outbreak can vary from 1 week of age to 8 months old. The range of clinical signs can be infection with no clinical signs to a very sick, moribund calf that may recover but most die. Calves will have very high rectal temperatures (106⁰F/41⁰C) and signs consistent with pneumonia. Some may die before clinical signs are seen. Diarrhea is occasionally seen just prior to death.

Adult animals do not typically show signs, though abortion is possible. When clinical signs are seen, the animal often appears similar to cows experiencing watery mastitis. S Dublin can also be cultured from milk from infected cattle. For this reason, raw milk consumption should be avoided if there is even a minute possibility that S Dublin may be on your farm. Apparently healthy cows can be infected (carriers) and are able to pass infection to the calf in utero, colostrum, and in bodily fluids. Newborn calves can also pick up the infection from the maternity pen.

The most alarming aspect of Salmonella Dublin infection is the bacteria's ability to exist in a carrier animal. These are infected cattle that do not show clinical signs but shed the bacteria into the environment by manure and milk (similar to Johnes). Any infected animal that survives infection has the potential to become a carrier. The likelihood of becoming a carrier animal is greater the younger the animal is at initial infection and if the animal was treated with antibiotics. Yes, treating animals for this bacterial infection will select for carriers and further spread the disease through out your farm.

Economics

If the above information hasn't got your attention yet, consider the economic impact. In a well managed 200 cow herd the loss per stall is an estimated \$77 in the first year of infection and \$13 per stall over the next 10 years. In a poorly managed herd of the same size the loss is \$508 per stall in the first year and \$293 over the next 10 years. The losses are mostly represented in heifer and abortion losses. Milk yield loss is estimated anywhere from 200kg in well managed herds to 1200kg of ECM per cow in poorly managed herds during the first year of infection. This represents anywhere from an approximate \$28,000 to \$168,000 loss just due to reduced milk yield alone on these herds.

Sources of Infection to a Naïve Herd

S Dublin is brought onto farms by infected cattle. Sources include:

1. Purchased infected adults or youngstock
2. Animals returning from a heifer raiser (especially if there is contact with animals from other farms)
3. Animals returning from a show
4. ET recipient dams and Offspring from embryo recipient dams
5. Colostrum, milk and manure of infected animals

Surveillance

There are several antemortem tests available to confirm whether an animal or herd is infected with Salmonella Dublin. Each test is specific for the group and time of infection, so it is important to use the correct one at the correct time to confirm positive or negative status.

Once an animal is infected, it takes seven weeks to produce enough antibodies for the available (ELISA) tests to detect them. This means if you test an incoming animal and they result is negative, you must re-test again seven weeks later to ensure the animal was not infected the day before the first initial test. If the animal was positive on either of these tests, antibodies are present in the body for seven months. Therefore, she should be tested seven months later to determine if she is a carrier or has cleared the infection entirely.

If a diagnosis is needed quickly, for example a very sick calf, sterile blood culture using specialized blood vials can be done. The following is a summary of the appropriate tests. Please talk to your veterinarian if you require animals to be tested.

Test	Group	Confirmation of:	Retest/Timing
Antigen ELISA (Blood)	Suspected Carrier or Unknown animals	Exposure of an individual animal in the last 7 months	Yes / 7 weeks
Blood Culture	Sick animals	Cause of sickness/infection in that animal	No
Bulk Tank ELISA	Lactating Herd	Exposure in the lactating herd	Yes / Every 2-3 months

There are also tests available to confirm infection on post mortem. Whole dead calves and major organ samples can be taken for culture.

Treatment

As mentioned before there is a high level of antibiotic resistance already with S Dublin. Salmonella species have the ability to trade genes which can result in other more prevalent Salmonellas we see on most farms acquiring S Dublin's antibiotic resistance. In addition to this, further use of the antibiotics that it currently does not have resistance to will certainly select for resistance in the future. Remember, humans can contract this infection, we need to preserve medically important antibiotics for ourselves!

Treated calves that survive are often stunted and unproductive. These are also very likely carriers of S Dublin that shed the bacteria through the herd as they grow. Currently the best course of action for animals sick from S Dublin infections is immediate isolation from other animals. Initiation of supportive therapy including anti-inflammatories and fluids

until culture and susceptibility testing can be completed. Then the appropriate antimicrobial should be selected in consultation with your herd veterinarian.

Control – Prevent Entry

The ultimate treatment for S Dublin is to prevent it in the first place. Once this disease is in your herd it is virtually impossible to eradicate it. Get a history of any purchased animals and require the appropriate tests, and retests if necessary, before they enter the herd. Yes, this requires time, money and coordination with the seller, buyer, veterinarians and testing lab but the potential savings by preventing S Dublin infection in your herd is a good return on investment. Isolate animals coming into your herd and observe for clinical signs. Co-mingling these animals with a small group of cattle from the herd can help detect carriers as they infect other cattle causing clinical illness.

Control – Breaking the Cycle

Once the herd is infected, the best course of action is to institute exceptional calf care best management practices. Ensure the calving pen is well bedded, reduce stocking density, and remove the calf as soon as it hits the ground. Feed good quality colostrum at 10% of their body weight within 6 hours. Provide a good environment with adequate bedding, appropriate ventilation and optimum stocking density. Focus on good hygiene of colostrum collection equipment, feed/milk preparation and feeding equipment as well as penning and treatment equipment. As S Dublin is shed in milk, feeding of raw whole milk should be avoided. In herds that have Salmonella Dublin present, outbreaks often occur when there is a breakdown in management.

Environmental cleanup involves the removal of all organic material (bedding, contaminated feed, manure), thoroughly washing all surfaces including feed troughs, water buckets/tanks, and equipment with water and a detergent cleaner to remove remaining organic residues. Following this, apply a disinfectant for the proper contact time. Disinfectants used to combat *Salmonella* include halogens like dilute chlorine bleach, phenols, quaternary ammonium compounds, and oxidizing agents like Virkon-S. Scrapers, brooms, shovels and manure forks can spread the organism from contaminated areas to previously uncontaminated ones. Designate items such as these so that they do not travel from one areas of the farm to another. Cleaned areas should be dried quickly by using fans and exposing the area to sunlight. Pressure washers should be avoided, as *Salmonella* organisms can be transmitted by aerosolization and particularly love warm, moist environments. Environmental sampling may be employed to determine the effectiveness of cleaning a contaminated environment.

Salmonella Dublin is here and it is bad. It is time to get serious about it and be aware of the potential implications it has for our industry and human health. Please talk to your herd veterinarian if you think your herd may have been exposed.

More information can be found at <https://www.vet.cornell.edu/animal-health-diagnostic-center/news/multi-drug-resistant-salmonella-dublin-cattle>