



New York State Cattle Health Assurance Program
Salmonellosis Module
*Salmonellosis – Background, Management
and Control*

What is Salmonellosis?

Salmonellosis is an infection of the digestive tract caused by the bacterium, *Salmonella enterica*. *Salmonella enterica* has over 2,000 strains. Fortunately cattle are usually clinically infected by less than 10 of them. The majority of *Salmonella* that infect cattle are in groups B (species example - *S. Typhimurium*), C (example - *S. Montevideo*), D (example - *S. Dublin*), or E (example - *S. Anatum*). The type that most commonly infects cattle in the Northeast is *Salmonella Typhimurium*.

Salmonella is widespread and can be found on a large number of dairy farms and in many species of animals, including mammals, birds, insects, reptiles and humans. It is often an opportunistic bacterium, meaning it infects an animal when its immune system is suppressed, when other competing gut bacteria are absent (common after antibiotic therapy), or when the animal is very young. It also infects healthy animals when they are exposed to high doses.

The National Animal Health Monitoring System Dairy '96 study showed that 5.4% of milk cows shed *Salmonella*, while 18% of cows to be culled within one week were shedding the organism. Overall, 28% of dairy farms and 67% of cattle markets had animals that shed *Salmonella*. More recent survey data suggest that the incidence of *Salmonella* infection is on the rise. Unfortunately, when salmonellosis occurs on a farm, large numbers of animals can become very sick in a short period of time. Consequently, this disease can be extremely costly.

Infection can range from apparently “healthy” carrier animals to those that show acute signs of the infection. A spectrum of symptoms occur with *Salmonella* infection, from inapparent or subclinical infections to obvious or clinical

disease. In calves, the disease most commonly affects colostrum- deprived or deficient calves, and may cause a fever (105°-107° F), diarrhea (yellow with or without flecks of blood and mucus), rapid dehydration and death within 24-48 hours.

In adult cattle, severe intestinal disease is often brought on by some stress factor(s). Clinical signs include: fever (104° -106° F), followed by going off feed, depression, and foul-smelling diarrhea with varying amounts of blood, mucus, and shreds of intestinal lining. In milking animals, milk production severely drops. Abortions may occur in infected cattle. Dehydration varies with the severity of disease. Temperatures typically rise 12 to 24 hours before other signs and may drop off again with the onset of diarrhea. Death rates vary depending on the serotype of *Salmonella* involved.

Clinical illness usually lasts 7-10 days, with recovery in 2 to 3 weeks. Some animals, however, never resume full production. Sick cows that recover may become carriers that shed *Salmonella* for varying periods of time (e.g., *Salmonella Typhimurium* is shed from 3 to 6+ months while *Salmonella Dublin* is shed for life).

In chronic cases, following an acute episode, fever (103° -104° F) is intermittent and watery diarrhea persists, resulting in progressive dehydration and weight loss. Recovery may be slow and death rates are difficult to predict because cattle are often culled due to unthriftiness and poor condition.

Supportive therapy, such as oral or intravenous electrolytes and fluids, are used to treat sick cows. While antibiotics are often used, they alone are seldom effective, especially if the disease has progressed to the diarrheal stage. One type of *Salmonella*, called *Salmonella*

Typhimurium DT104, is often seen in sick cattle and is of particular concern to public health officials. *Salmonella* Typhimurium DT104 is highly virulent, and causes severe symptoms in animals and people. Outbreaks due to this type have resulted in cattle deaths and severe illness in farm families, because it is resistant to a wide range of antibiotics and is quite difficult to treat.

What is the economic impact of *Salmonella*?

Both clinical outbreaks and subclinical infections of *Salmonella* can drain profit from the dairy operation. *Salmonella* infection in a dairy herd can lead to losses from:

- milk production decline
- death in any age group of livestock
- abortions
- treatment costs
- losses from antibiotic contaminated milk
- increased culling
- increased cost due to delayed culling while antibiotic residues clear
- increased labor for management of sick animals
- reduced feed efficiency
- the inability to sell animals originating from an "infected" herd

Salmonella infection in a herd is also a significant public health risk to farm families, employees and visitors. This disease has serious economic, animal health and public health implications. Your veterinarian should become involved as soon as *Salmonella* is suspected.

How Does the Disease Spread?

Salmonella is a highly contagious bacteria that spreads primarily when animals consume contaminated feed or water. *Salmonella* can infect birds and mammals, including humans. As a result, manure from infected birds, rodents and other wild animals is a common source for contamination of the environment, water and feed. Feed contamination can occur either in storage on the farm or on the premises of a feed vendor.

Large numbers of *Salmonella* are shed by clinically infected animals. Infected animals readily contaminate their surroundings, including feed, water troughs, barnyards, feeding equipment, and people who work around them. Most bacteria are shed in manure, but when systemic illness develops, the bacteria is also shed in saliva, nasal secretions, urine and milk.

Some animals, upon recovery, become carriers and continue to shed organisms for many months. They may not show outward signs of the disease, but are a continual, intermittent source of environmental contamination.

Outbreaks of this disease are often seen after episodes of flooding or runoff, when cattle feed or equipment is contaminated with flood waters carrying the organism. *Salmonella* bacteria love wet, dark environments. They have the remarkable ability to survive under adverse conditions, such as pH's between 4 and 8+, and temperatures between 46° and 113° F. *Salmonella* can survive in low oxygen environments, such as in manure lagoons and are known to survive for up to 4 - 7 months in water and soil.

Survival of *Salmonella* in slurry is temperature, oxygen, and pH dependent. Aerobic storage, low pH and high temperatures in the summer all decrease salmonella survival. *Salmonella* spread onto fields in manure may survive for weeks to months. Manure should be spread onto flat land, where it is exposed to the drying effects of wind and to the bactericidal effect of UV irradiation from the sun. Incorporate manure into soil in areas where runoff could be a problem. Manure should be spread onto cropland rather than onto pastures used for grazing. Recent investigations demonstrate manure disposal by composting and anaerobic digestion reduce organism numbers.

Salmonella are no more or less sensitive to the effects of commonly used disinfectants than are other fecal bacteria. Chlorine solutions, iodine, quaternary ammoniums and phenolic compounds are very good at killing *Salmonella* on surfaces. However, it is very important to get rid of organic matter and bedding first, followed by wet cleaning with high pressure hot water/steam and then disinfection. Because *Salmonella* can "bloom" within a few hours in a warm, wet environment, disinfection should immediately follow cleaning.

How Contagious is *Salmonella*?

Keep in mind that *Salmonella* is an opportunist. Consequently, the organism is extremely contagious to newborn calves and animals with suppressed immune systems. The latter is often the result of herd stresses, such as hot weather, acidosis or poor nutrition, or the result of individual cow stressors, such as parturition, milk

fever, ketosis and diseases, such as BVD. The organism is also very contagious to healthy adult cattle if they are exposed to large doses. Infections may cause:

- many calves to become sick at the same time, due to common exposure to the organism.
- sporadic clinical signs. These signs often occur in the post fresh period, since this is when a cow's immune system is most likely to be depressed. Depending on the management situation, a sporadic clinical case may result in an outbreak, depending on the degree of environmental contamination and exposure to susceptible animals.
- an outbreak in the adult herd. This typically happens when the entire herd is stressed at one time, such as during a hot spell, or when exposed to an overwhelming common source of the organism, such as heavily contaminated feed or a flooded barnyard.

Is *Salmonella* Contagious to People?

Yes, especially in young children and the elderly. Most often, salmonellosis is characterized by nausea and vomiting within 8-48 hours of ingestion. Shortly thereafter, the patient will experience abdominal pain, cramps or diarrhea. The diarrhea may vary from a few loose stools to profuse watery stools or, rarely, dysentery (bloody stools). Patients may have moderate fevers (up to 102° F) and occasional chills.

More severe symptoms may occur in higher risk groups of people, such as the very old or young, those with impaired immune systems (AIDS, arthritis, transplant or cancer patients), those who already have a gastrointestinal disorder, or those receiving antibiotics. In higher risk groups of people, *Salmonella* may invade beyond the gastrointestinal tract and cause severe systemic illness. These syndromes cause more severe symptoms, such as more extreme nausea, prolonged fever, chronic diarrhea, overall lethargic feeling and in some cases, death. Consequently, people with these conditions should take special precautions, especially when working around calves or other high-risk animals.

Furthermore, a number of studies show extensive *Salmonella* contamination of farm households. Therefore, take care to keep soiled barn clothes, boots and equipment out of the house. Also, drink only pasteurized milk,

because *Salmonella* can also be excreted in milk.

How is Salmonellosis Prevented?

The goals of *Salmonella* prevention are to minimize exposure and maximize cow resistance. All employees with access to animals need to understand and support these goals.

Minimize exposure to *Salmonella*

- Practice strict biosecurity to prevent introduction of *Salmonella* into the herd. Place new arrivals in isolation for at least two weeks.
- Maintain a constant watch for newly sick animals and isolate any such animals immediately. Personnel should handle sick animals separately/last and maintain strict sanitation as described below.
- Do not allow rendering trucks near the barn, feed, or animals, to prevent spread of potentially infectious material.
- Provide clean, dry calving pens. Avoid group calving areas. Remove calves from their dams as soon as possible after birth and place them in a clean, dry, well ventilated environment, such as a hutch, and prevent contact with other calves.
- Do not feed waste milk to calves.
- Minimize the use of common equipment between groups.
- Sanitize and disinfect equipment used between animals, including water or milk pails, feeders, nipple bottles and oral medication equipment. Maintain clean, dry pens and alleys.
- Farm personnel should practice good personal hygiene. Avoid walking across feed with manure contaminated boots. Wash hands and boots when moving between groups of animals. Change coveralls if they become contaminated with manure.
- Prevent contamination of feeds and water sources by feces (cattle, birds, rodents, pets, and wild animals) and runoff. Restrict animal access to surface water sources.
- Control rodents and birds on the premises to protect feeds from contamination. Use feeds from dealers that have excellent rodent and bird control programs in place.
- Clean manure from tires before driving in feedbunks or feed storage areas. Do not use the same equipment for handling manure or dead animals and feed.

- Prevent opportunities for flooding of manure laden areas. Maintain clean, dry barnyards.
- If possible, store manure at least 60 days in the summer, and 90 days in the winter.
- Incorporate or spread manure on crop rather than grazing land. Spread onto flat rather than hilly areas to minimize runoff and maximize drying and exposure to UV radiation.
 - o Avoid spreading at times when soils are saturated and in areas with high runoff potential.
 - o If spread on pasture, delay grazing for 30 days, and then only graze adults or non-susceptible groups.

Maximize animal resistance to Salmonella

- Prevent herd stresses, such as excessive heat and overcrowding.
- Aggressively monitor and treat fresh and sick animals.
- Provide good cow comfort.
- Prevent sudden feed changes.
- Maximize feed intake in the periparturient period.
 - o Maintain adequate fiber intake.
 - o Minimize milk fever, ketosis, displaced abomasum and retained placenta.
 - o Prevent overconditioning in the dry period.
- Implement a sound general herd vaccination program.

The NYSCHAP Salmonella Module

NYSCHAP can help identify the risks for the introduction of *Salmonella* and its spread on NY dairy farms. Working with the herd veterinarian and farm managers, the Agriculture and Markets Field Veterinarian will help develop a herd plan to address and prevent these risks. By writing out the farm plan and assigning responsibility for the specific practices to farm personnel, the program increases the likelihood that the preventative practices will be implemented and progress will be made toward the farm's *Salmonella* control goals.

How to Enroll in NYSCHAP

To enroll in NYSCHAP, contact your herd veterinarian. They will then make arrangements with the regional field veterinarian from the Department of Agriculture and Markets. For additional information, contact one of the sources below:

Enrolling or contacting a state field veterinarian, call NYS Division of Animal Industry at 518-457-3502.

Diagnostic testing services or information, call the Diagnostic Lab at Cornell University, 607-253-3900.

Mastitis testing or information, call Quality Milk Promotion Services at 607-255-8202.

Additional NYSCHAP information, contact the NYSCHAP coordinator at 607-255-8202.

Visit the NYSCHAP website at: <http://nyschap.vet.cornell.edu> or email us at nyschap@cornell.edu.