



Salmonellosis Outbreak Investigation and Monitoring by Diagnostic Methods:

Pat McDonough and Sue Stehman
Cornell Diagnostic Laboratory

Clinical animals shed large numbers of organisms and quickly contaminate an environment. In order to attempt to find the source of infection in an outbreak, samples must be collected as soon as possible after the first case is identified.

- Depending on the risk assessment gleaned from the herd history questionnaire, you may want to perform a combination of targeted animal and environmental culturing as outlined below- Please contact the Lab. prior to submitting samples.

Main limitations of testing in surveillance, outbreak assessment and monitoring:

- In longitudinal studies, *Salmonella* species can be isolated in herds for years after clinical disease is eliminated. Multiple serotypes can infect a herd over time without clinical expression. Environmental isolates may or may not correlate with animal isolates from clinical cases or surveillance animals. Additional typing of *Salmonella* isolates must be completed to determine the clinical relevance of isolates from animals and the environment.
 - Serotyping and phage typing are expensive and must be referred to specialty laboratories. Serogrouping alone may not be sensitive to changes in infecting strain of *Salmonella*.
 - Sampling at one point in time or with a single sample source will not capture the dynamics of the salmonella cycle of infection in a herd. Sampling pools of high risk groups (calves, fresh cows) with typing may give a more accurate picture of salmonella cycles on a farm but would be expensive especially if done with enough frequency to be valid. Question – what frequency is valid? and.....
 - What is the cost/benefit of surveillance or environmental sampling? More research is needed to answer these questions.
- **In the final analysis** we need more studies that look at the whole ecology of Salmonella on the farm, that is the farm ecosystem. These studies must be extensive and longitudinal in order to determine the significance of seasonal occurrence of salmonellae and also to evaluate such things as frequency of shedding over time.

Outbreak Sampling – Suggested Approaches

Clinically ill animals or high risk groups:

1. **Targeted sampling** of calves, milking animals, dry cows, recently fresh cows, any animals with diarrhea, and recovered but recently ill suspect animals in order to determine the extent of salmonella shedding in the herd; these specimens may be composites of samples (representing 5-10 animals) from these groups. Incoming animals can likewise be screened by pooled fecal samples.

2. For **bacterial culture, the following specimens may be requested:** *note isolates from the subclinical at risk animals may or may not correlate with isolates from clinical animals. Complete typing is required to evaluate significance of isolates from surveillance animals.*

Feces (in Amies transport medium w/ charcoal or 4 oz specimen container). Pooled feces from 5-10 animals are acceptable and best for subclinical high risk groups.

For clinical cases include:

- **Blood** (in conventional blood culture bottles)
 - **Milk** (sent in on ice packs)
 - **CSF, joint tap** (in Amies medium, usually from a calf)
 - **Aborted fetuses** (using our Bovine Abortion Kit)
 - **Necropsy material** from calf or adult cases (heart blood, bone marrow, CSF/brain, mesenteric lymph nodes, tied-off loop of bowel (jejunum or ileo-cecal area), lung, joint (swabs) or submission of entire animal to our necropsy service at the College of Veterinary Medicine with a full history.

2. **Environmental Samples:** *note isolates from the environment may or may not correlate with isolates from clinical animals. Complete typing is required to evaluate significance of environmental isolates.*

- **feedstuffs:** protein supplements, forages/ silage/ haylage (40 grams in a whirl pack bag)
- **water** (3-4 liters) from different sources
- **birds/rodent droppings** on the farm (usually found in the feed bunks/ silos/ rafters)
- A Moore swab of the **drains or manure storage areas** to ascertain extent of salmonella in the environment (Contact the Laboratory for complete protocol);
- A poultry "drag swab" of the **environment**. Use the drag swab technique to **culture fresh cow pens, sick cow pens, dust on blades of barn fans** (submit in double strength skim milk on ice packs. - Contact the Laboratory for complete protocol and supplies).
- **Milk sock** culture from 3 consecutive milkings (submit on ice packs in zip lock bag).

How to deal with prolonged, propagating outbreaks with same serotype? Testing options are limited (see above comments).

- Use standard hygiene BMP's as outlined in the core and preventive Salmonella modules.
- Effectiveness of vaccine is very controversial. Vaccination may decrease clinical signs due to endotoxemia but will not eliminate fecal shedding.

What is the usefulness of serology for diagnosing Salmonellosis in cattle herds?

1. *S. Dublin* specific serology (ELISA) has been developed and is offered by referral laboratories for identification of chronic carriers.
2. Use of ELISA systems for detecting other serogroups or serotypes appears to be useful for suggesting exposure but not for identifying chronic cases.
3. Few laboratories offer these assays for cattle.