THE UNIVERSITY OF GEORGIA®
College of Veterinary Medicine

Salmonella enterica

Salmonella enterica are Gram negative rod-shaped facultative anaerobic bacteria. Over 2,000 different serotypes exist, but a handful of serotypes most commonly cause disease in animals and humans. S*almonella* can cause disease in many mammals, birds, reptiles, and amphibians. Of domestic species, horses, cattle, swine, and poultry are most commonly affected.

Clinical Signs

Salmonella infections may be asymptomatic in many animals, but others may exhibit fever, abnormalities in the leukogram, diarrhea, or other gastrointestinal symptoms. Stressful factors such as recent travel, hospitalization, transportation, diet changes, and colic episodes (in horses) may increase the likelihood of a patient shedding *Salmonella*.

Transmission

Salmonella is transmitted via fecal-oral contamination, either directly, such as when an animal consumes feed or water contaminated with manure from an animal shedding *Salmonella*, or indirectly, such as when materials that have contacted contaminated feces (such as shovels or feed pans) come into contact with feed or water that is then consumed by an animal.

Ecology

Salmonella can colonize the gastrointestinal tract of a variety of animal and bird species (including humans), and these individuals may appear completely normal, but they may shed *Salmonella* in their feces. Alternatively, individuals with gastrointestinal illness due to *Salmonella* will also shed the organism. *Salmonella* prefers moist and dark environments, such as manure pits or piles. It can live for weeks to months if it is not exposed to wind and sunlight. However, spreading feces or material contaminated with feces out in the sun can hasten the killing of *Salmonella* since UV radiation has a bactericidal effect. *Salmonella* can become endemic on operations where animals are housed, leading to recurrent disease and decreased growth and health in animals on the operation.

Prevention of salmonellosis

Colonization and disease due to Salmonella is prevented by preventing ingestion of manure from animals shedding Salmonella. Mice, rats, and birds commonly shed *Salmonella*; thus, animal feed and water should be stored so as to prevent contamination by feces of rodents and birds.

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UGA VTH Protocol for Large Animal Patients Suspected or Confirmed to be Shedding *Salmonella*

Handling patients that may be shedding *Salmonella:* Patients that may be shedding *Salmonella* must be placed into isolation and tested to confirm or rule out *Salmonella* shedding. This includes the following patients:

- patients presenting with acute or chronic diarrhea
- patient from a farm known to have a history of endemic salmonellosis
- patients originating from a farm where one or more animals have diarrhea, whether or not this patient has diarrhea
- horses with colic and a temperature of ≥ 101.4° F and total WBC of < 4,000
- horses with colic and a temperature of ≥ 101.4° F and neutropenia

Horses presented for colic which also have a temperature of ≥ 101.4° F and a WBC of 4,001 – 5,699:

- must have a CBC run as soon as the Clinical Pathology lab is open
- if the horse is neutropenic on this CBC it must be handled as a suspect Salmonella shedder

Patients that develop diarrhea in the hospital:

- must be immediately restricted to their stall
- gloves and a footbath are placed outside the stall and a "Wear Gloves and Dip Feet" sign is placed on the stall
- one fecal sample is submitted for *Salmonella* PCR testing
- If diarrhea resolves in 24 hours (or 48 hours for postoperative colics): animal is restricted to stall until results of the first *Salmonella* PCR test are returned
- If the first fecal PCR is negative, the restrictions can be lifted.
- If diarrhea continues for more than 24 hours (or more than 48 hours for a postop colic): the patient must be moved to isolation and a full series of *Salmonella* testing must be completed (see below).

If a patient must be moved from its stall for mandatory diagnostic testing or therapy:

- the feet must be picked free of manure and scrubbed with 2.4% chlorhexidine solution
- if the patient defecates outside it stall the feces must be cleaned up immediately and the floor disinfected with Virkon (10 minute contact time).

Equine postoperative colic patients that develop fever in the first 24 hours after surgery:

- require no special testing if the fever resolves within 24 hours
- if fever persists more than 24 hours, a CBC must be run
- if the horse is neutropenic on the CBC, it must be placed into isolation and tested for Salmonella (see below)

Equine patients with fever of unknown origin lasting more than 24 hours:

- must have a CBC run and must be tested for *Salmonella* as well as equine herpesvirus-1 and -4 and equine influenza (see IDO for details)

Confirming the diagnosis:

1) submit a fecal sample for *Salmonella* PCR testing.
2) 3 samples collected at least at 24 hour intervals must be negative before patient can be considered not to be shedding *Salmonella.*
3) **However,** patients can occasionally be found to be positive on additional samples, which may be run when there is a high suspicion of *Salmonella* infection in a patient with 3 negative samples.

If a patient placed in isolation is found to be negative for *Salmonella* and other contagious diseases and you wish to move the patient out of isolation, contact the IDO to discuss this. Do not move the patient without speaking with the IDO. If you cannot reach the IDO, speak to the Large Animal Internal Medicine faculty member on duty.

Informing the State Veterinarian: Salmonellosis is a reportable disease in Georgia, thus if a patient is found to be shedding *Salmonella*, the attending UGA VTH clinician must contact the State Veterinarian's office and report the diagnosis. It is prudent to inform the owner that you have made this report, as they may be contacted by a representative from the State Veterinarian's office.

Biosecurity screening in LA VTH: All equine patients hospitalized due to colic are tested at admission and then twice weekly for *Salmonella* shedding by fecal PCR. If a patient is found to be shedding *Salmonella* by biosecurity screening the patient must be moved immediately to isolation.

Disinfection of materials contaminated with *Salmonella*: Several disinfectants are effective against *Salmonella* when used appropriately, and when organic material is first cleaned off the surface to be disinfected. In the UGA VTH, inanimate objects that come into contact with patient skin (such as stethoscopes, ultrasound probes, or ECG leads) should be cleaned with soap and water if needed and then disinfected with either 2.4% (v/v) chlorhexidine solution (15 minute contact time) or 70% ethanol (leave on until it evaporates). Inanimate objects that do not come into contact with a patient's skin should be cleaned with soap and water if needed and then disinfected with Virkon (10 minute contact time), followed by rinsing with water.

For more information: 1) UGA VTH Biosecurity Standard Operating Procedures (approved April 2012); 2) Spickler, Anna Rovid. "Salmonellosis (Nontyphoidal)." May 2005. At: http://www.cfsph.iastate.edu/DiseaseInfo/factsheets.php