



## SALMONELLOSIS

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<b>Definition</b>	<p>Contagious and zoonotic bacterial infection caused by <i>Salmonella</i> spp, of which there are &gt;2500 serotypes.</p> <p>Clinically normal horses can transiently shed <i>Salmonella</i>, with shedding more common during:</p> <ul style="list-style-type: none"> <li>• Concurrent illness: antibacterial usage, physiological disturbance</li> <li>• Stress: transportation, social, nutritional</li> <li>• Gastrointestinal disturbance: motility (especially colic), feed change</li> </ul>
<b>Clinical Signs</b>	<ul style="list-style-type: none"> <li>• Diarrhea (soft feces to projectile, watery diarrhea) is most common, however, horses may have normal feces</li> <li>• Fever (patient may have normal temperature, especially if treated with NSAIDs)</li> <li>• Lethargy</li> <li>• Anorexia</li> <li>• Colic</li> <li>• Localized infection (e.g. joint or bone infection)</li> <li>• Sepsis/septic shock</li> <li>• Laminitis is a common sequel to enterocolitis</li> <li>• Abortion with infection by <i>Salmonella</i> serovar abortus-equi (does not occur in the United States of America)</li> </ul> <p>Foals are commonly more seriously affected when compared to older horses, with profound systemic illness including</p> <ul style="list-style-type: none"> <li>• Hemorrhagic diarrhea</li> <li>• Pneumonia</li> <li>• Meningitis</li> <li>• Phylitis</li> <li>• Septic arthritis</li> </ul>
<b>Incubation Period</b>	<p>&gt;12 hours; varies 1–5 days.</p> <p>Variation in onset affected by:</p> <ul style="list-style-type: none"> <li>• Amount and virulence of organism ingested</li> <li>• Immunocompetence of host</li> </ul>



<b>Risk Factors</b>	<ul style="list-style-type: none"><li>• Presence of other variables potentially disturbing resistance to intestinal colonization</li><li>• Antibacterial administration</li><li>• Feed change</li><li>• Concurrent illness</li><li>• Increased horse density: overcrowding, overgrazing, poor pasture management (fecal build-up), hospitalization</li><li>• Gastrointestinal disturbance, colic, or other illness</li><li>• Recent surgery: anesthesia may disturb gastrointestinal motility</li><li>• Transportation</li><li>• Environmental stressors: hot weather</li><li>• Wet barn floors</li><li>• Proton pump inhibitor usage for gastric ulcer treatment and prophylaxis may be associated with onset</li></ul>
<b>Transmission</b>	<ul style="list-style-type: none"><li>• Fecal-oral spread</li><li>• Ingestion of contaminated material (pasture, roughage, feed or water)</li><li>• Fomites are a significant means of indirect transmission of infection</li><li>• Intermittent shedding by subclinically infected horses</li><li>• Aerosol transmission has been suspected in other species; evidence of this route in horses is lacking</li></ul>
<b>Diagnostic Sampling, Testing, and Handling</b>	<p><b>Fecal culture</b></p> <ul style="list-style-type: none"><li>• Request <i>Salmonella</i> specifically, along with serotyping and antibiotic susceptibility testing of isolated organism(s)</li><li>• A definitive sampling protocol has not been established. A practical schedule for an individual case would be collecting up to 5 samples at 12- to 24-hour intervals due to intermittent shedding</li><li>• If several animals are affected, submit samples from as many animals as possible</li><li>• Very watery fecal material may be less likely to yield positive cultures due to decreased organism concentration</li></ul> <p><b>PCR testing</b></p> <ul style="list-style-type: none"><li>• Testing in conjunction with microbiological culture may provide more rapid identification of the presence of <i>Salmonella</i> spp</li></ul> <p><b>Sample Submission</b></p> <ul style="list-style-type: none"><li>• Feces in a leak proof container for PCR or aerobic culture</li><li>• Feces in bacterial transport or specialized enteric transport media (contact diagnostic laboratory for requirements)</li></ul>
<b>Post-Mortem</b>	<p>Biosecurity guidelines should be observed when selecting where and how to conduct the necropsy as contents of the GI tract and potentially other tissues can be considered to contain pathogenic organisms.</p>

	<p>Gross pathologic findings are typical of enteritis or enterocolitis.</p> <ul style="list-style-type: none"> <li>• Predominant necropsy lesion is fibrinous or hemorrhagic inflammation of the cecum and colon. The mucosa may show superficial necrosis and grayish pseudomembranes adhered to the mucosa. Ulceration may develop in more chronic cases</li> <li>• Mesenteric lymphadenopathy with hemorrhages and edema</li> <li>• Gastric hyperemia with edema and focal hemorrhages</li> <li>• Small intestinal lesions vary from simple congestion to mucoid or hemorrhagic exudate</li> </ul>
<p><b>Shedding of Organism Following Resolution of Clinical Signs</b></p>	<p>Highly variable, from several days to extended periods (&gt;30 days).</p> <p>Chronic intermittent shedding is uncommon but can occur.</p>
<p><b>Environmental Persistence</b></p>	<ul style="list-style-type: none"> <li>• Withstands freezing temperatures and can potentially survive <u>for years</u> under adverse environmental conditions</li> <li>• Multiplies in temperatures ranging from 44.6–111° F (7–45° C)</li> <li>• Viable organisms have been recovered from soil after 300 days, water after 9 months, and dried feces up to 30 months</li> <li>• Susceptible to <a href="#">chemical disinfection</a> on <u>thoroughly cleaned surfaces</u>, however the organism can persist on porous surfaces and difficult to clean areas (e.g. drains, corners, beneath rubber matting) where it can act as a persistent reservoir of infection.</li> </ul>
<p><b>Specific Control Measures</b></p>	<p><a href="#">Biosecurity Guidelines</a></p> <ul style="list-style-type: none"> <li>• Quarantine horses that develop diarrhea and/or fever. If a separate stall or paddock is not available, establish barrier precautions at their current location</li> <li>• Isolate horses following significant colic episodes, impactions (notably small colon), or colic surgery to reduce environmental contamination and potential exposure of other horses should <i>Salmonella</i> subsequently be recovered on fecal culture</li> <li>• Prevent horses that have come in contact with known infected or clinical cases from mixing with the general population</li> <li>• Contaminated stall and equipment should have all organic material removed. Dispose of organic matter in a manner which prevents contamination of the facility (do not spread on pastures). Disinfection can be performed after all organic matter has been removed and the surfaces cleaned. Pressure washers or hoses should not be used as they can aerosolize <i>Salmonella</i>, potentially contaminating other parts of the facility or infecting a susceptible horse or human</li> <li>• No commercially available validated vaccine is currently marketed</li> </ul>



**Release of Animals from Isolation**

For animals with positive cultures while clinically ill:

- Before removing restrictions, following resolution of clinical signs, conduct a series of fecal cultures (see Diagnostic Sampling, Testing and Handling) to determine if all negative
- Where culture is not performed, isolation up to 30 days may be required to minimize risk of exposure of other horses from convalescent shedding of previously infected horses following the cessation of clinical signs (fever, diarrhea)

**Note:** Five (5) consecutive negative samples do not guarantee a horse is 'free' of *Salmonella* spp. Rather, it demonstrates that the horse likely was not shedding the bacteria at the time of the sample collections and is therefore suggestive that it is no longer shedding.

**Biosecurity Issues for Receipt of Previously Infected Animals**

[Biosecurity Guidelines](#)

- Isolate horse for 30 days from resident horses
- Obtain 5 consecutive negative fecal cultures prior to releasing horse into the general population
- Prior to entry into the general population the horse should be housed in an environment that can be thoroughly cleaned and disinfected
- If the horse is turned out in a paddock, manure should be promptly removed and appropriately disposed of in a manner that avoids potential contamination of other areas of the facility. Caretakers should wear personal protective equipment. After the horse is released, the paddock should be harrowed to encourage drying and kept unused for 30 days

**Zoonotic Potential**

All *Salmonella* serotypes which cause disease in horses are potentially contagious to people and can cause serious disease or death.

Immuno-compromised individuals and children should be kept away from any animal with clinical disease, suspected or confirmed to be caused by *Salmonella* spp. and from any clinically normal animals suspected or confirmed to be shedding the bacterium.

[Resource Information - A Review of Equine Zoonotic Diseases: Risks in Veterinary Medicine](#)