



Salmonellosis Disease Guidelines

Definition

Salmonellosis is a clinical disease resulting from infection with *Salmonella enterica* ssp. *enterica*. *Salmonella* is a Gram-negative, facultative anaerobic bacteria with >2,500 serovars (aka serotypes).

Clinically normal horses can transiently shed *Salmonella*, with shedding more common at times of stress (e.g., long-distance transportation, severe systemic disease, parturition).

Prevalence

Shedding prevalence varies from <1% in the general horse population to upwards of 13% among horses with gastrointestinal disease.

Although serovar prevalence can vary by year and region, the most commonly reported *Salmonella* serovars in horses consistently include *S. enterica* serovars Typhimurium, Newport, Anatum, and Agona according to the USDA National Veterinary Services Laboratories (NVSL).

Risk factors for the development of salmonellosis in horses include poor environmental hygiene, immunosuppression, stress, commingling of horses, or antimicrobial administration.

Clinical Signs

Horses can be asymptomatic shedders or develop clinical disease, characterized by nonspecific signs including fever, diarrhea, leukopenia, and colic. Infections may result in endotoxemia and laminitis (a common sequel to enterocolitis).

Four generally recognized clinical syndromes of salmonellosis in horses are:

- 1) asymptomatic infection with intermittent shedding
- 2) enterocolitis (i.e., watery diarrhea)
- 3) fever without diarrhea (common in adult horses)
- 4) sepsis (common in neonatal foals)

Foals can have more severe disease with profound systemic illness, including hemorrhagic diarrhea, pneumonia, meningitis, physitis, and septic arthritis.

Incubation Period

Varies from hours to days depending on risk factors. Variation in speed of onset is affected by:

- Infectious dose and virulence of the strain
- Immunocompetence of host
- Presence of other variables potentially disturbing resistance to intestinal colonization



Risk Factors

- Management factors
 - Stocking density
 - Fecal build-up on pasture
 - Feed change
 - Long-distance transportation
 - Contact with feces of other species
- Concurrent illness and/or treatments
 - Severe illness (e.g., pleuropneumonia, colitis)
 - Gastrointestinal disturbance (e.g., colic, diarrhea)
 - Recent surgery (e.g., change in feed, anesthesia may disturb gastrointestinal motility, treatment with antibacterial medications may disturb microbiome)
 - Antimicrobial administration
 - Proton pump inhibitors may predispose to colonization
- Environmental stressors
 - Extreme environmental temperatures (e.g., hot weather)
 - Poor environmental hygiene

Transmission

- Direct transmission via fecal oral route
 - Clinically and subclinically infected horses shed *Salmonella* in their feces.
 - Fecal shedding can be intermittent.
- Indirect transmission
 - Environmental contamination of pasture, feed, or water
 - Fomites, including but not limited to human hands, clothing, shoes, and contaminated equipment
 - Human and animal movement
 - Mechanical vectors such as flies
- Aerosol transmission may occur with high-pressure washing

Diagnostic Sampling, Testing, and Handling

Culture of feces or gastric reflux:

- Request enriched *Salmonella* cultures, to allow characterization via serotyping and antimicrobial susceptibility of isolated organism(s).
 - This may assist with epidemiologic analysis in an outbreak setting.
 - Interpretation should be performed in consultation with an internal medicine specialist and/or microbiologist.
- As horses shed intermittently, it is recommended to collect 3 to 5 one-gram samples at 12- to 24-hour intervals.



- Very watery fecal material or testing a swab sample will have a lower sensitivity due to decreased organism concentration.
- Samples can be pooled for testing, but may reduce sensitivity of the testing strategy.
- Enrichment culture may take several days.

PCR testing:

- Testing of enriched feces and/or gastric reflux in conjunction with microbiological culture may provide more rapid identification of the presence of *Salmonella*.
- If *Salmonella* PCR alone is requested, it is unknown if living bacteria are present.
 - Antimicrobial susceptibility testing is only possible after a *Salmonella* isolate has been grown in culture.
 - Characterization of antimicrobial testing is encouraged to identify epidemiologic patterns. See above section “Culture of feces or gastric reflux.”

Sample submission:

- Contact laboratory for specific requirements
- General recommendations
 - Place sample in a leak-proof container for PCR and/or aerobic culture
 - Store in a refrigerator until shipped
 - Send overnight shipping with an icepack

Postmortem

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 contain pathogenic organisms.

Gross pathologic findings are typical of enteritis or enterocolitis:

- 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.
- Mesenteric lymphadenopathy with hemorrhages and edema.
- Gastric hyperemia with edema and focal hemorrhages.
- Small intestinal lesions vary from simple congestion to mucoid or hemorrhagic exudate.

Foals may have evidence of sepsis, including septic arthritis of multiple joints, osteomyelitis, meningitis, uveitis, and/or pneumonia due to hematogenous spread of the organism.

Shedding of Organism Following Resolution of Clinical Signs

Shedding duration can be highly variable, from several days to extended periods (30 to 60+ days).



Chronic intermittent subclinical shedding may occur in a small subset of horses.

Environmental Persistence

- Susceptible to commonly used [chemical disinfectant\(s\)](#). (See also [AAEP Biosecurity Guidelines Disinfectant Table](#).)
- Surfaces should be clean of visible debris, scrubbed with a detergent, rinsed, and dried before disinfectant application at an appropriate concentration and contact time.
- Organisms can persist in damp, dark places (e.g., under mats, drains, hard-to-clean corners) creating potential reservoirs for infection.
- Viable organisms have been recovered from soil after 300 days, water after 9 months, and dried feces up to 30 months.
- Optimal temperature for growth is 35–37°C, with lower environmental temperatures prolonging its survival in the environment.

Specific Control Measures (See [AAEP General Biosecurity Guidelines](#))

- Quarantine – Isolate horses under the following circumstances:
 - When presenting with diarrhea and/or fever of unknown origin.
 - If a separate stall or paddock is not available, establish barrier precautions at their current location.
 - Following significant colic episodes, impactions (notably small colon), or colic surgery to reduce environmental contamination should *Salmonella* shedding be detected.
- Prevent horses in contact with known infected or clinical cases from mixing with the general population.
- Contaminated stalls and equipment should be properly cleaned and disinfected prior to use with other horses. Surfaces should be clean of visible debris, scrubbed with a detergent, rinsed, and allowed to dry before disinfectant application.
- Use separate cleaning tools for quarantined horses, and clothing/boots should be changed or thoroughly cleaned between animals.
- Do not spread feces or bedding from infected horses on pastures.
- Avoid pressure washing as this can lead to aerosolization of *Salmonella*.
- No vaccine for *Salmonella* in horses is currently available.

Biosecurity Guidelines for Salmonellosis Cases

- Segregate or isolate new horses from resident horses for 30 to 60 days, ideally in an environment that can be effectively cleaned and disinfected (i.e., sealed concrete, sealed wood).
- 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. After the horse is released from quarantine, the paddock should be harrowed to encourage drying, grass clipped to 4-inches to promote UV light penetration and kept unused for at least 30 days.

- Obtain 3 to 5 consecutive negative fecal cultures prior to releasing a horse into the general population.
- Caretakers should wear personal protective equipment, use dedicated equipment or appropriately clean and disinfect tools between horses, and work from healthy/clean areas to ill/dirty areas to reduce transmission risk.
- Non-equine domestic species may act as a source or fomite in the spread of *Salmonella* and should be kept away from horses.

Release of Animals from Quarantine (See [AAEP General Biosecurity Guidelines](#))

For animals with positive cultures:

- Check state regulations for reporting requirements.
 - After clinical signs have resolved and before removing restrictions, obtain 3 to 5 negative *Salmonella* fecal culture or PCR results to assess the risk of continued shedding.
 - When culture or PCR is not performed, transmission risk from subclinical shedding can be reduced via segregation of affected horses away from the healthy horse population for a minimum of 30 days, or up to 60 days when possible.
 - Horses that test positive after 30 to 60 days are uncommon. If this occurs, it is recommended to consult with an internal medicine specialist.

Note: 3 to 5 consecutive negative samples do not guarantee a horse is “free” of *Salmonella*. Rather, it demonstrates that the horse is less likely to be shedding the organism at the time of sample collection.

Zoonotic Potential

All *Salmonella* serovars which cause disease in horses are potentially contagious to people and other animals (e.g., livestock, dogs, cats) and can cause serious disease or death. For this reason, PPE (eye protection, dedicated coveralls, disposable gloves and boots) must be worn and handwashing is imperative.

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

Further Reading

[AAEP Biosecurity Guidelines: Disinfectant Table](#)

Burgess B. *Salmonella* in Horses. Veterinary Clinics: Equine Practice, 2023; 39, 25-35



AAEP Infectious Disease Guidelines: Salmonellosis

The Center for Food Security & Public Health. [Characteristics of Select Disinfectant Classes \(2023\)](#)

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