

Rotavirus: General Information and a Research Update on Equine Rotavirus A and Rotavirus B (new variant) Research at the Gluck Equine Research Center

Rotavirus in foals

About Rotavirus.

Rotavirus diarrhea is a very serious, life threatening disease in foals that causes profuse watery diarrhea. Until recently, it was considered that only Rotavirus Group A viruses infected horses. However, in 2021 The University of Kentucky's Gluck Equine Research Center and Veterinary Diagnostic Lab identified a novel rotavirus in diarrhea samples from neonatal foal diarrhea outbreaks. This virus is of the group B family and termed Equine Rotavirus Group B (ERVB) and is very similar to ruminant Group B rotaviruses.

Equine rotaviruses typically affect foals under 6 months of age, where typically, the younger the foal the more severe the disease, although this is affected by immune status, and dose of virus among other factors. Adult horses are not typically affected.

Rotaviruses are highly contagious between susceptible animals. Vast numbers of virus particles are shed in the diarrhea of affected animals, but only small numbers of virus particles are needed to cause disease via fecal-oral transmission.

Typically, different rotavirus groups and strains infect specific species, however, it has been documented that strains can 'jump' species, making it possible for strains not typically associated with humans to infect people. As such biosecurity precautions should always be taken when working with animals with diarrhea.

Many farms employ the Zoetis Rotavirus Group A strain G3 vaccine. This vaccine, given to mares during the 8th, 9th, and 10th months of each pregnancy, generates passive immunity via the foal nursing colostrum. The advent of this vaccine, generated in the early 1990's, has made equine rotavirus A (ERVA-G3) associated neonatal diarrhea uncommon. However, we do still see ERVA-associated diarrhea in foals 75-150 days of age born to vaccinated dams. In these foals we see both ERVA-G3 and ERVA strain G14 positive samples. Foals at this age typically, but not always, respond well to swift veterinary treatment and generally do not get as sick as younger foals. We do not observe any cross protection generated by the ERVA vaccination in the case of protection from ERVB. This clearly indicates the need for a directed vaccine.

Rotavirus: effects on the gut

The virus damages the mature cells of the small intestine at the tips of the villi (microscopic fingerlike projections that increase gut surface area for digestion and absorption). This massively reduces the foal's ability to digest milk, especially the milk sugar, lactose, leading to maldigestion and malabsorption. It can also create an environment in the gut that can allow pathogenic bacteria to overgrow, possibly creating other problems. The severity of disease depends on the foal's age, immune status, and the number and virulence of rotavirus particles ingested. Typically, younger foals are more severely affected.

Clostridium perfringens: *Clostridium perfringens* type A is an infectious bacterial agent that can be associated with neonatal foal diarrhea and can be detected in foals with ERV-associated diarrhea. Foals suffering from *Clostridium perfringens* infection commonly present with low volume, bloody diarrhea with cardiovascular compromise. The disease, when identified, does not typically cause illness in a succession of multiple foals on the same farm. In contrast, rotavirus, a highly contagious infectious agent, can affect every foal on farms where there is an outbreak among susceptible foals.

The finding of *Clostridium perfringens* in the fecal samples from diarrheic foals remains an area of interest. A study we performed last year, with the help of six farms, largely corroborated a study published in 2002 on this subject¹. That publication demonstrated that >90% of normal, healthy foals will have detectable *Clostridium perfringens* in their feces at three days of age.

As such our understanding of the roles *Clostridium perfringens* and the various types of this bacterial group, may play in the normal gut microbiome, neonatal diarrhea, and /or interaction with other pathogens requires further study.

Clinical Signs of rotavirus infection

Rotavirus diarrhea in susceptible, neonatal foals causes profuse watery diarrhea, anorexia as the foal stops nursing, abdominal distention due to gut inflammation, transient gut stasis, and often colic. Massive fluid and electrolyte loss through diarrhea, as well as not nursing, causes rapid and severe dehydration and electrolyte derangements that can be fatal if left untreated in a timely manner. Susceptible, infected foals will show signs of disease as young as 24-48 hours of age.

¹ Tillotson *et al.* Am Vet Med Assoc 2002;220:342-348

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Diagnosis of rotavirus infection

Fecal samples can be tested for ERVA-G3, ERVA-G14 and ERVB using PCR techniques in laboratories that are set up for this testing. Testing can be performed at the University of Kentucky's Veterinary Diagnostic Lab (<http://vdl.uky.edu/>). Additionally, we have assisted professional laboratories across the globe in setting up and validating this test for their use.

Typical treatment of rotavirus diarrhea

Treatment is supportive with the mainstay of treatment being intravenous fluid therapy. This allows foals to maintain hydration and electrolyte balance, and are administered by or under the guidance of your veterinarian. In very young foals your veterinarian may also place the foal on prophylactic antibiotics to help prevent bacteria in the gut translocating across the inflamed gut wall and causing a joint infection, for example. Since rotavirus is a viral infection antibiotic therapy does not treat the viral infection directly. Your veterinarian may also place the foal on gastric protectants to reduce the chance of gastric ulcer development.

In some cases, not allowing or strictly limiting nursing can be beneficial but must only be done in conjunction with your veterinarian or at a veterinary hospital because young foals are so dependent on nursing for their hydration and energy needs.

Prevention of rotaviral infection

Rotavirus is spread via a fecal-oral route. It is estimated that a teaspoon of rotaviral diarrhea can contain up to half a trillion infective virus particles. It is also estimated that as few as 100 – 1000 particles can cause disease in a susceptible neonate.

Strict hygiene and biosecurity are essential to prevent the spread of rotavirus among foals. No 'one size fits all' biosecurity protocol exists and as such designing one for your farm is a team effort between you and your veterinary team.

Common basic hygiene which includes wearing gloves and clean protective clothing to handle foals, using foot dips with an appropriate disinfection outside stalls, dedicated footwear for foaling barns, reducing animal, human and vehicular traffic in barns and between barns, not using leaf blowers or power washers in barns with horses in them, are just a few items among many to consider in a protocol. Foaling mares outside with little to no contact with the newborn foals has been part of successful efforts to break the cycle of infection on farms experiencing the problem or to prevent the problem. The use of bio-thermal microchips placed on day 1 of life during the "foal check" procedure where bloodwork, IgG evaluation, a physical exam etc are performed enables hands free temperature monitoring further reducing contact

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related virus transmission. For more information: <https://gluck.ca.uky.edu/2021-rotavirus-workshop>

Disinfectants

Bleach is not an appropriate product to use in a farm/barn situation. Its activity is too easily destroyed by organic material to be in any way shape or form effective. Peroxygen compound or phenolic compound disinfectants are recommended with adequate contact time as rotavirus is difficult to inactivate. A list of such compounds may be found here

<https://www.cfsph.iastate.edu/Disinfection/Assets/CharacteristicsSelectedDisinfectants.pdf>

but it is important to read the instructions. Examples of such disinfectants include Rescue[®], Oxy-Sept 333[®], Virkon-S[®], One Stroke Environs[®], Pheno-Tek II and TekTrol. (The University of Kentucky does not endorse or promote any commercial products. These names are for informational purposes only.) Additional resources relating to biosecurity measures may be found on the Equine Disease Communication Center website here:

<https://equinediseasecc.org/biosecurity/disinfection>.

When thinking about disinfection please remember:

- to clean surfaces of grease and organic debris
- replace foot dip container disinfection solution frequently to prevent inactivation by organic debris
- to mix the correct dilution of disinfectant solution carefully – stronger is not always better!
- to allow sufficient contact time for disinfection.

Vaccination

The Gluck Equine Research Center was pivotal in the development of the monovalent Rotavirus Group A [G3 strain] vaccine in the late 1980s and early 1990s. This vaccine is now offered by Zoetis[®] for administration to pregnant mares on three occasions during each and every pregnancy. One dose of vaccine should be administered to pregnant mares during their 8th, 9th and 10th month of gestation. This vaccine has been immensely helpful in preventing neonatal Rotavirus Group A diarrhea in foals. However, we do see Rotavirus Group A (G3 and G14 strains) as a cause of diarrhea in older foals, aged 75-150 days of age. At this age the disease is typically mild and self-limiting with timely veterinary intervention. Foals typically recover completely from rotavirus infections with timely veterinary care and supervision. This vaccine does not appear to confer any protections against Equine Rotavirus B.

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Equine Rotavirus B – the urgent need for a vaccine

All of this points to the dire need for a vaccine to control this problem and prevent outbreaks every few years. The University of Kentucky’s Gluck Equine Research Center continues to work on your behalf with this goal in mind.

Our industry is one that must help itself with its problems because we are a small industry compared to the pet, poultry, and food-producing animal industries. *We appreciate your help and support in our continued efforts to address our industry’s research needs, respond to emergent issues and collaborate in to continue help our research to support the wellbeing of our industry stay strong and healthy.*

For further resources please visit: <https://gluck.ca.uky.edu/rotavirus>

If you would like to help us achieve our vaccine goal by donating, please visit:
<http://gluck.ca.uky.edu/content/gifting-opportunities>

Thank you