

What Is “Shaker Foal” Syndrome?

- ▶ Shaker foal syndrome is a very serious disease. It is actually a **form of botulism**.
 - Botulism is caused by a toxin produced by the bacterium *Clostridium botulinum*. In shaker foals, both the toxin and the bacteria producing it are present, so this condition is more specifically called toxicoinfectious botulism.
- ▶ **Fast-growing foals 1-2 months of age** are most commonly affected, but the disease can affect foals as young as one week of age or as old as six months of age.
- ▶ Shaker foal syndrome is **more common in certain regions**. In North America, it is most common in Kentucky and the mid-Atlantic region.



What Causes Shaker Foal Syndrome?

- ▶ Shaker foal syndrome is caused by **botulinum toxin**, which is produced by the bacterium *Clostridium botulinum*. Botulinum toxin is **one of the most potent toxins known**. *Clostridium botulinum* can be found in the soil and in manure of some healthy horses.
- ▶ There are **several different strains** (types) of *C. botulinum*, and different strains may be more common in different regions. They all cause the same type of disease, but it is important to know what strains are involved when it comes to vaccinating animals or providing specific treatment (i.e. antitoxin).

What Happens When A Horse Swallows *Clostridium botulinum*?



- ▶ Swallowing *C. botulinum* would be extremely unlikely to cause any problems in an **adult horse**, because the normal bacterial population in the horse's intestinal tract prevents *C. botulinum* from growing and producing toxins. (*Adult horses can get botulism, but this is usually from swallowing the botulinum toxin itself.*)
- ▶ **Foals** do not have the same degree of protection from their developing intestinal bacterial population as adult horses do. In some cases, when a foal swallows *C. botulinum*, **the organism will start to grow** in the intestine **and produce botulinum toxin**. The toxin is then absorbed from the intestinal tract and travels through the body in the bloodstream.

What Are The Signs Of Shaker Foal Syndrome?

- ▶ Botulinum toxin is a **neuromuscular toxin**, meaning it interferes with the interaction between nerves and the muscles they control. The effects of the toxin cause muscle weakness and paralysis.
- ▶ At first most affected foals appear **weak**. They may not want to stand, or they may have **difficulty standing and walking**. They often develop **muscle tremors**, which is why they are called “shaker foals.”
- ▶ As the condition progresses, foals may have **problems eating and drinking**, because they lose the ability to suckle, chew and swallow.
 - Complications such as **dehydration** and **hypoglycemia** (low blood sugar level) can occur in foals that cannot eat or drink. **Severe pneumonia** can develop if a foal accidentally inhales (aspirates) food or water while it is trying to eat because its swallowing muscles are not working properly.
- ▶ If the muscles that control breathing become affected, the foal may have a great deal of **trouble breathing**. Foals with this disease commonly die from respiratory failure (inability to breathe).
- ▶ The signs of weakness and paralysis may **progress rapidly** in affected foals.

How Is Shaker Foal Syndrome Diagnosed?

- ▶ Shaker foal syndrome is usually diagnosed based on the **clinical signs** of the foal, but only after other possible causes of the foal's signs have been ruled out.
 - Confirming the presence of botulinum toxin in a foal (or a horse of any age) can be difficult. Samples of blood, manure, intestinal contents or liver can be tested for the toxin, but negative results do not necessarily indicate that botulism is not involved. This is because **horses are exquisitely sensitive to botulinum toxin**, and they can be affected by very low levels of toxin that may not be detectable by laboratory tests.





How Is Shaker Foal Syndrome Treated?

- ▶ Shaker foals need to be treated **immediately** and **aggressively** if they are to survive.
- ▶ **Botulism antitoxin** must be given intravenously as soon as possible. The antitoxin will neutralize any toxin that is still in the foal's bloodstream, but it neutralize the toxin that is already bound to the nerves. Therefore, treating with antitoxin can only help **stop the progression** of the disease, it will not improve the foal's clinical signs. In order for the foal to improve, its body must replace the parts of the nerves where the toxin is already bound. This can take several weeks, and there is no way to speed up the process.

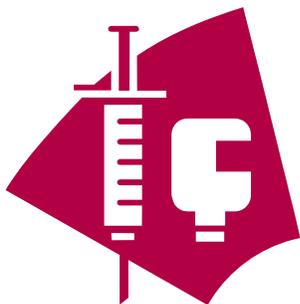


- **Antitoxins are specific for the different strains** of *C. botulinum*. Some product contain antitoxin against only one strain of *C. botulinum*, usually Type B. Other products contain antitoxin against more than one strain, usually Types B and C. If the type of antitoxin does not match the type of *C. botulinum* that is affecting the foal, then the treatment will not be effective, so it is important to know what strains are present your area.
 - Antitoxin is **very expensive**, but it can be a life-saving treatment and should be given if possible.
- ▶ Other than antitoxin, shaker foals usually require a great deal of **supportive care** to make up for the things they cannot do until their bodies have time to recover. The type of supportive care needed depends on specific signs in the affected foal. Treatment may include administration of intravenous (IV) fluids or nutrient solutions, force-feeding through a nasogastric tube, nursing care to prevent bedsores and other problems from being unable to stand, antibiotics to prevent or treat secondary infections, and other measures. Treatment can be difficult, and often requires a lot of time, effort and money.
 - Severely affected foals that are having a hard time breathing may need to be put on a **ventilator** until their respiratory muscles are stronger. This must be done at a **referral hospital** where there are specialized staff and equipment. Keeping a foal on a ventilator is very expensive, but is critical for survival in severe cases.



How Can I Prevent Shaker Foal Syndrome In My Foals?

- ▶ **Avoiding exposure to *C. botulinum*** is **difficult** because it can be found in the soil in many regions. Testing the soil is not useful. In some areas the risk of exposure is always present and unavoidable.
- ▶ **Vaccination of mares against botulism** in higher-risk areas is critical to disease prevention. Vaccination should be considered mares living in areas where botulism is endemic *and* in mares that may be transported to endemic areas with their foals for breeding.



- Initially, three doses of vaccine should be administered to mares at monthly intervals. A booster should then be given every year approximately 30 days prior to foaling.
- Vaccination will not prevent all cases of shaker foal syndrome. The vaccines available in North America only produce immunity against *C. botulinum* Type B toxin (this is the most common type in North America). Vaccination against one type does not confer any immunity against other types.
- Considering the **severity of disease**, the **difficulties and cost** involved in treatment, the constant **risk of exposure** in some areas, and the **effectiveness of vaccination**, **vaccination against botulism is highly recommended in areas where this disease is known to occur.**

What Is The Prognosis For Shaker Foals?

- ▶ The prognosis depends a great deal on the severity of signs in the individual animal and the type of treatment provided.
- ▶ With **prompt diagnosis** and **appropriate care**, the **prognosis is actually very good**. One study reported that 88% of affected foals treated at a referral hospital survived. These would have been seriously ill foals, but also foals that received aggressive and expensive treatment. The cost of treatment is often a limiting factor.
- ▶ **Without appropriate care, death rates are very high**. Most untreated foals die within 1-3 days of the onset of the disease.

