

Secret killer

Horses are strong, powerful animals, but a colony of botulism bacteria the size of a pinhead can literally bring them to their knees. Vet Tom Righton from Hook Norton Vets explains more about this little-known disease

Rare but usually lethal, botulism is a neurological disease that causes extreme weakness and paralysis throughout the horse's body. You may have heard of the condition affecting humans, causing gastrointestinal upset and neurological problems, but few people are aware that botulism can affect horses, too.

It is caused by a toxin that is produced by the bacteria *Clostridium botulinum*, which is from the same family as

Clostridium tetani – the bacteria that causes tetanus. The spores of *C. botulinum* are found in soil and organic material, and when these spores germinate they produce the toxins that cause disease.

While botulism isn't contagious and can't be spread between horses, outbreaks on yards affecting multiple horses can occur if they've all had access to a source of the toxin, such as a batch of contaminated feed. *C. botulinum* is not selective – it can affect any breed, age or sex of horse that has been exposed to the toxins. ➤

Our expert



Tom Righton BVSc MRCVS qualified from Liverpool University in 2011 and joined the team at Hook Norton Veterinary Group, a member of XLEquine, in 2014. He has a special interest in orthopaedic work, as well as lameness work-ups and wound management.

How do horses get botulism?

Horses can contract botulism via three main routes...



Ingestion of preformed botulinum toxins within feed,

sometimes known as forage poisoning. This can occur when poor-quality forage or spoiled hard feed has been fed, particularly if it has been contaminated with soil or faeces, or when a dead animal carcass is accidentally baled with forage. The decomposition of this organic material in an anaerobic environment with high moisture content and alkaline pH, such as silage or haylage, provides the ideal conditions for the bacteria to produce toxins.

Via contaminated wounds.

This occurs when *C. botulinum* bacteria contaminate a wound and multiply. For this to happen, there needs to be anaerobic conditions, such as in deep puncture wounds or injection sites, and in abscesses.



Ingestion of *C. botulinum* bacteria,

which is seen most commonly in foals (shaker foal syndrome). However, there have not been any reported cases of botulism in foals in the UK, it is more of a problem in other countries. It occurs when foals start grazing, usually from about two weeks of age. The foal ingests *C. botulinum* spores from the soil, then the bacteria develops and multiplies within the gut, and begins producing toxins that are absorbed by the foal. This was previously thought not to occur in adult horses because the normal gut bacteria inhibit the botulinum spores from germinating. However, recent research into the underlying cause of grass sickness has brought this into question.

How the toxin works

The botulinum toxin is a neurotoxin. It binds to nerve endings where they join the muscle and blocks the release of neurotransmitter chemicals that would normally pass on impulses to the muscle. This prevents nerve impulses reaching the muscles, causing flaccid paralysis of muscles throughout the body.

Signs of sickness

Symptoms can occur a few hours after acquiring the toxin, but may take up to a week depending on the amount of toxin present.

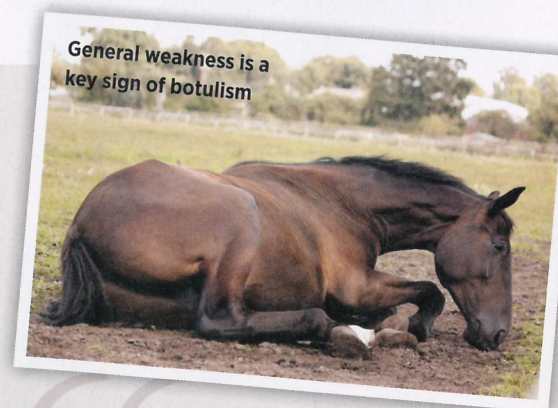
- **In the early stages**, a horse with botulism will have...
 - generalised muscle weakness
 - a dull demeanour
 - difficulty eating feed and swallowing caused by reduced tongue muscle tone
 - dilated pupils
 - muscle trembling
- **Botulism in foals** most typically presents with...
 - muscle tremors
 - weakness
 - drooling of milk or milk running from the nose due to dysphagia (inability to swallow correctly)

In both foals and adults, the symptoms will progress to include an elevated heart and respiratory rate, difficulty standing

and difficulty urinating. They may become so weak that they are unable to stand and lie on their side. Death occurs due to respiratory failure caused by paralysis of the diaphragm muscle, which leads to suffocation, or cardiac paralysis, which results in cardiac arrest. The speed of progression of the disease is dependant upon the amount of toxin present, but can be very rapid.

It is important to remember that botulism is uncommon and that there are other more common causes of some of the symptoms displayed, so if your horse is showing some of the symptoms, don't panic. For example...

- **dullness** is a very general symptom seen with a wide variety of conditions
- **difficulty in eating and swallowing** is commonly seen with dental problems and choke (an obstruction within the oesophagus)
- **weakness and recumbency** are more commonly seen in horses following trauma, colic and myopathies (muscle disorders)
- **regurgitation and nasal flow of milk** in foals can be caused by a cleft palate



Botulism is uncommon and there are other more common causes of some of the symptoms

When to call your vet

Same day appointment

- Dull demeanour
- Difficulty eating or swallowing
- Muscle trembling

Emergency appointment

- Difficulty passing urine
- Weakness and struggling to stand
- Recumbent (unable to stand)

Reaching a diagnosis

Your vet is likely to make a presumptive clinical diagnosis based upon a detailed history, and symptoms of difficulty eating and reduced tongue tone that progresses to muscle weakness and finally recumbency. A variety of diagnostic tests are likely to be performed to rule out other possible diagnoses.

Definitive diagnosis using laboratory testing is difficult because there are limited laboratory tests available. Feed can be tested for *C. botulinum* spores or toxin and if they are found in the feed of a patient with symptoms of botulism, it can help confirm a diagnosis. Unfortunately, only a tiny amount of contaminated feed is required to produce the disease and the rest of the feed may be completely normal, making it very difficult to find the spores or toxin.

Faecal culture of the *C. botulinum* bacteria is most useful in foals, detecting 80% of cases. However, in adult horses only 20% of cases can be diagnosed this way and *C. botulinum* can be found in up to 3% of normal, healthy horses' faeces.

Supportive therapy

Unfortunately, treatment for botulism is time-consuming and expensive, as affected horses are likely to require a lengthy period of hospitalisation with intensive nursing to stand a chance of survival. In severe, rapidly progressing cases where the horse has been recumbent for more than 24 hours, the prognosis for survival is extremely poor. For horses still standing with more slowly progressing clinical signs, the prognosis is slightly better, but still potentially fatal.

Within the UK, there is no available antitoxin, but antitoxin can be imported from the United States under a special license. Unfortunately, this takes too long to be helpful in most cases because it needs to be administered as early as possible. The antitoxin does not reverse the clinical signs. Instead, it binds any toxin that has not yet blocked a nerve ending. Once the toxin has blocked a nerve ending receptor, that receptor is irreversibly blocked.

The horse recovers by regenerating new receptors at its nerve endings to allow the passage of nerve impulses from the nerve to the muscle again. This takes 4–10 days, during which time the horse may get worse before improvement is seen.

Recovery can take months and requires a diligent and dedicated owner. Despite the high mortality rate, some horses do make a full recovery. During the recovery period, he will require intensive supportive therapy, including...

- **a deep bed and turning the horse regularly** to prevent sores. Slings can be used if the horse requires assistance standing.
- **nutritional and fluid support** given via a nasogastric tube to help keep his strength up while he cannot eat or drink for himself.
- **laxatives and manual evacuation of faeces** from the rectum and **catheterisation of the bladder** is required if the horse is not able to urinate and defecate by himself.
- **antibiotics** in cases with secondary pneumonia. This can occur if food is inhaled while trying to eat and in cases of wound botulism.



Don't allow your horse to eat spoiled forage

Reducing the risk

Fortunately, botulism is uncommon in the UK, but cases do occur sporadically in certain areas where the bacterium is present in the environment. Several simple management strategies can help to reduce the risk, most of which will already be in place on well-run yards...

- **Feed only good-quality roughage.** If any hay or haylage has spoiled, or is grossly contaminated with soil or a carcass, then that section should be disposed of
- **Mouldy or spoiled hard feeds** should always be disposed of
- **Feeding big bale silage should be avoided** because it poses a higher risk of carrying *C. botulinum* spores. If large bales are used, then they should be spread out before being fed – the toxins break down within a couple of hours of being exposed to UV light
- **Deep, contaminated wounds** should be swiftly referred to a vet for appropriate treatment to reduce the chance of wound infection

A vaccine is licensed for prevention of the *C. botulinum* type B strain in the USA and it is used primarily in areas where high rates of shaker foal syndrome are diagnosed. Pregnant mares are given monthly vaccinations during the last three months of gestation to ensure high levels of antibodies against *C. botulinum* are passed to their foals via the mares' colostrum. Horses in the UK are not vaccinated, however they may be vaccinated prior to being exported to areas of the USA where high levels of botulism occur.

Several simple management strategies can help reduce the risk

A link with equine grass sickness

Grass sickness is a disease in which damage to the nerves supplying the gastrointestinal system occurs, leading to paralysis of the gut. High incidences of grass sickness have been seen in specific geographical areas and in the UK it is seen most in the east of the country, although cases have been reported throughout the UK.

The cause of grass sickness has not been determined, but one area currently under investigation is the link between *C. botulinum* type C and grass sickness. In 1918, a team in Aberdeen who were researching high rates of grass sickness in eastern Scotland noted that there were similarities between botulism and grass sickness, even going as far as a vaccine trial. Unfortunately, this area of research lost traction after the research proved inconclusive.

Recent research has been once more directed towards the role of *C. botulinum*. The theory is that some normal, healthy horses carry the bacterium, which is kept in check by the rest of the gut bacteria and immune system. Grass sickness is thought to be triggered when there is a recent change in diet, causing a disruption to the balance of gut bacteria and a massive proliferation of *C. botulinum*, which then produces toxin that causes the paralysis of the gastrointestinal system.

Research has shown high levels of the bacterium in grass sickness cases compared to a normal population of horses. A vaccination trial is now in place to try to establish whether vaccination causes a reduction of grass sickness in high risk areas, but it will be some time before we know the results of this trial. ■