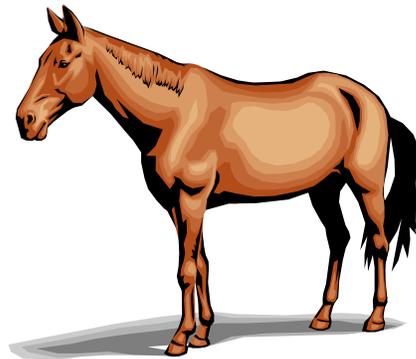




What is Clostridial Myonecrosis?

- Clostridial myonecrosis is an uncommon but very serious problem in horses. “Clostridial” means the condition is caused by bacteria from the genus *Clostridium*. “Myo” means muscle and “necrosis” means death of living tissue. So “clostridial myonecrosis” literally means death of muscle tissue caused by *Clostridium* bacteria.
 - Other names for this condition include clostridial myositis, gas gangrene and malignant edema.
- Several different species of *Clostridium* can cause myonecrosis. *Clostridium perfringens* is the most commonly identified species involved. Other species associated with this condition are *C. septicum*, *C. sordellii*, and *C. sporogenes*.
- All *Clostridium* species are able to form bacterial **spores**. The spores are very hardy, so the bacteria can survive in this form for long periods of time, even years, in the environment or in healthy muscle tissue.
- All *Clostridium* species are also **anaerobic**, which means they can only grow when there is no oxygen present. Therefore these bacteria do not grow in normal muscle that is well oxygenated by its blood supply. In the presence of oxygen, only the inactive spore form of the bacteria can survive.



How Do Horses Get Clostridial Myonecrosis?

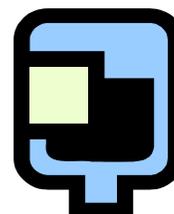
There are two main ways that clostridial myonecrosis is believed to develop:



- **Inoculation:** Sometimes clostridial spores may be deposited or inoculated into a horse's muscle. This can happen when an injection is given in the muscle with a needle (intramuscular injection), or if the horse has a wound that affects the muscle. In most cases injections and wounds do not result in clostridial myonecrosis because the tissue remains well oxygenated, so the *Clostridium* can't grow, even if it's there. However, if there is a lot of muscle damage or inflammation, the blood and oxygen supply to parts of the muscle may become very low, allowing the *Clostridium* to grow. This situation is usually associated with injection of very irritating substances or with severe wounds.
- **Growth of “resident” spores:** Clostridial spores are present in the muscles of some normal horses. These spores do not normally cause a problem because they are inactive and cannot grow as long as the muscle tissue is well oxygenated. If for some reason the oxygen supply to the muscle gets very low (e.g. after injection of an irritating substance or major trauma) the spores can start to grow.
- *Most cases of clostridial myonecrosis are associated with injections in the affected muscles.*

Are Intramuscular Injections of Certain Drugs Higher Risk Than Others?

- **Maybe.** Intramuscular injection of **flunixin meglumine** (Banamine™) is most commonly associated with clostridial myonecrosis, but it is unknown if this is because of the properties of the drug, or simply because this drug is more commonly injected intramuscularly than others.
- Intramuscular injections of some other substances have also been associated with clostridial myonecrosis, including ivermectin, antihistamines, phenylbutazone, dipyrone, B vitamins and synthetic prostaglandins.
- Intravenous injections do not cause clostridial myonecrosis *if they are done properly*.



What Happens When a Horse Has Clostridial Myonecrosis?

- Clostridial myonecrosis causes swelling of the affected muscle. It most commonly involves the neck, since that is where most intramuscular injections are given. Swelling can progress very rapidly and become very severe within just a few hours. In rare cases, affected horses may die before the swelling becomes obvious.
- The swelling of the muscle is usually hot and painful to the touch at first, and the horse is typically reluctant to move its neck. There is usually (but not always) crepitus in the tissues. Crepitus is a “crackling” feeling caused by gas pockets under the skin, which develop due to gas production by the *Clostridium*.
 - Affected horses often become systemically very sick as well, which may make them very depressed, put them off their feed and cause a fever. Complications such as laminitis (founder) are also common.





How Is Clostridial Myonecrosis Diagnosed?



- A tentative diagnosis is usually made based on the horse's clinical signs and the rapid swelling of the muscle, especially if the horse recently had a wound or injection in that area.
- In order to confirm the diagnosis, your veterinarian may use a needle and syringe to collect a sample of fluid from the affected area. This fluid can be examined with a microscope, and sometime bacteria that look like *Clostridium* can be seen.
- The fluid can also be cultured to see if *Clostridium* (and what species of *Clostridium*) can be grown from it, but this may take a few days. Fluorescent antibody tests can also be used to detect the presence of some *Clostridium* species in the fluid.

How Is Clostridial Myonecrosis Treated?

Horses with this condition require immediate, aggressive (and often expensive) treatment. Even a few hours could make a significant difference in the outcome.

- A key component of treatment is **opening the swollen tissues** to allow the trapped fluid and gas to escape, and to get oxygen to the infected site, which will effectively stop the growth of the *Clostridium*. This usually requires a veterinarian to make numerous large cuts deep into the infected muscle (see picture right). The result looks very dramatic but is necessary, and may save the horse's life. Proper care of the wounds afterwards is also important.
- Other important treatments that are usually required include:
 - High doses of intravenous antibiotics
 - Anti-inflammatories and other painkillers
 - Intravenous fluids, because the horse may be in shock and unwilling to drink
 - Close monitoring for complications such as laminitis



The prognosis for any horse that develops clostridial myonecrosis is guarded. The toxins produced by different *Clostridium* species are often very powerful, and if the bacterial growth is not stopped as soon as possible the effects of the toxins can rapidly lead to death. It is therefore critical that any horse suspected of having clostridial myonecrosis be examined by a veterinarian as soon as possible. However, with prompt and proper treatment, horses can survive and even return to performance.

How Can I Prevent My Horse From Getting Clostridial Myonecrosis?



- The best way to avoid this disease is to avoid giving intramuscular injections whenever possible, particularly injections of irritating substances like flunixin (Banamine™).
- There is no evidence that doing things like wiping the injection site with alcohol before inserting the needle are helpful (although there is no reason not to do it). Clostridial spores are resistant to alcohol.
- There is probably no way to prevent accumulation of some clostridial spores in healthy muscle, so there will always be some risk that the spores could start to grow if they are exposed to low oxygen levels.

What Should I Do If My Horse Has A Sore Neck After An Injection?

- **Contact your veterinarian** as soon as possible.
- If there is visible swelling of the neck, **measure the size of the affected area** or outline it with a marker when you first notice it. This makes it easier to determine if and how fast the affected area is expanding.
- **Cold hosing** the affected site can be helpful, *but is not a replacement for veterinary care.*

