

Infection, a major cause of foal mortality

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Infection is caused by the establishment of pathogens, such as bacteria, viruses, fungi, protozoa or parasites, in or on the body.

For this to occur, the pathogen must first be able to evade the host's defence mechanisms.

The development and severity of an infection are determined by the numbers and nature of the pathogen as well as the host's immune status. Depending on the balance of these factors, it may remain localised or spread via the blood stream (septicaemia) and involve multiple organs.

In foals the majority of infections are bacterial in nature.

The number one factor that predisposes new born foals to infection is a lack of passive immunity due to inadequate colostrum intake. Foals need 1-2l of good colostrum in the first 24 hrs to get sufficient antibodies.

The quality of the colostrum can easily be measured using a "Brix" refractometer, which can be purchased for around \$40.



For the foal, a blood test in the first 12-18 hrs, can detect poor intake, so that additional colostrum can be supplemented or tube fed if need be.

Other factors that increase the risk of disease include a dirty environment, prematurity at birth, poor health and condition of the dam, a difficult birth, and the presence of disease-causing agents in the environment that the mare has no antibodies against.

A healthy foal should meet the following time lines.

Time to sternal recumbency	By 5 minutes
Suck reflex present	By 5-10 minutes
Time to stand	By 1-2 hours
Time to suck	By 1-3 hours

Immediately after birth, the highest risk of infection is via the umbilical cord, leading to navel ill and if it enters the blood stream, septicaemia and ultimately joint ill (infectious arthritis)

Due to the poor blood supply, joint infections are difficult to treat and often result in permanent damage, so it's best to take preventative measures.

Foaling the mare in a clean well grassed paddock away from other horses and immediate disinfection with iodine or chlorhexidine of the umbilical stump after birth and at least twice daily until it's sealed, can greatly reduce the risk.

The stump should be clean and dry. Any swelling or pain when touched, could be the result of an infection or hernia. A persistently wet, raw navel may indicate a patent urachus (urine leaking from the navel).



Normal umbilical remnant



Infected umbilical stump



Patent urachus

New born foals, are also at risk of bacterial gut infections (enteritis). Clumsy attempts to nurse can result in ingesting harmful bacteria before the consumption of protective colostrum.

Assisting a foal to consume adequate colostrum as quickly as possible greatly reduces this risk.

Common signs of enteritis include fever, lethargy, diarrhoea and bloating.

Lack of fluid intake, coupled with the marked loss through diarrhoea, rapidly leads to severe, potentially life threatening, dehydration. Initially, oral re-hydration by stomach tubing electrolytes may be sufficient, but once the foal is recumbent and has lost its suckling reflex, aggressive intravenous fluid therapy is required to try and save it.

“Foal heat diarrhoea”, is a normal physiological event, believed to occur when the foal is changing its gut flora, as a result of ingesting faeces (coprophagia). It is not, as often suggested, the result of a change in milk composition, as orphan foals get it as well. It doesn't cause systemic illness and antibiotic therapy is neither indicated nor required.



However, by ingesting faeces, these young foals are likely to pick up worm eggs and develop a worm burden at an early age. Worming the mare before foaling does reduce the risk, but worm eggs may well be present in old manure as they can survive for several years. Foals are extremely susceptible to parasites, therefore an effective worming protocol is imperative. Worming should start at 2 months of age, and repeated every 2 months until 12 months old. Alternatively, a faecal worm egg count can be used to quantify the worm load and tailor the frequency of treatments.

Pneumonia is a relatively common and potentially fatal infection of foals. It is usually bacterial and rarely viral in nature.

Most foal pneumonias are caused by bacteria from an existing infection, entering the blood stream (septicaemia and spreading to the lungs).

Other causes are inhalation of milk or dust. Aspiration of milk, is a common complication of bottle feeding or tubing foals with unsuitable equipment.

Prompt recognition and early veterinary intervention with appropriate antibiotics is crucial for a good outcome. Knowledge of normal foal behaviour and vital signs is important for early detection of an infection.

Checking the mare's udder is also a good indicator of the foal's well-being. A tight udder, dripping milk is a sure sign of trouble.

AGE	Heart Rate Beats minute	per	Respiratory Rate Breaths minute	per	Rectal Temperature °C/°F
Birth	60-80		Gasping		37-39/99-102
0-2 hours	120-150		40-60		37-39/99-102
12 hours	80-120		30-40		37-39/99-102
24 hours	80-100		30-35		37-39/99-102

Tetanus is usually a fatal bacterial infection, which becomes established when spores commonly found in the soil, gain access through an open or more commonly puncture wound.

They quickly proliferate and produce a neurotoxin that causes muscle spasms and the classic symptoms of tetanus, i.e. stiff gait, erect tail, lockjaw. Horses are very susceptible.

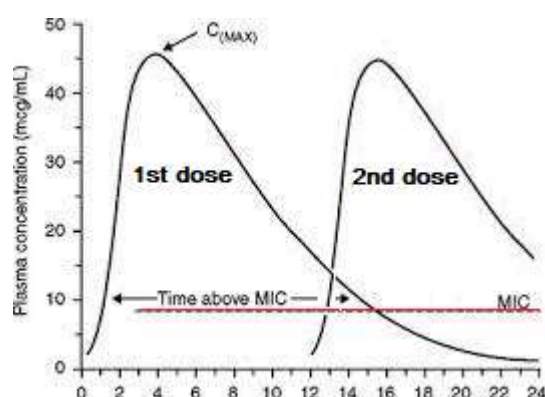
Tetanus is totally preventable with vaccination. For all young stock and horses with lapsed or unknown vaccination history, the recommended program is: 2 doses, 4 weeks apart, a third vaccination no more than 12 months later and a booster every 3-5 years.

Broodmares should be vaccinated 4-6 weeks before foaling to ensure good antibodies in the colostrum. Foals can be vaccinated from 3 months of age.

Fortunately, most bacterial infections have a good prognosis if treated early with the right choice of antibiotic, the correct dose and course duration.

Apart from enteritis, the majority of infections are caused by gram positive bacteria and respond well to Procain penicillin when dosed at 1ml/ 12kg intramuscularly, every 12 hours, which translates to about 5-6mls for an average size new born Clydesdale foal.

Twice daily injections are required to maintain the Minimum Inhibitory Concentration (MIC, red line on graph) and kill the pathogens. This is clearly depicted in the graph below, showing plasma antibiotic concentrations falling below MIC at 14hrs, but maintained well above, with an additional injection at 12hrs.



The duration of treatment should continue for an additional 3 days after clinical sign and fever have abated, which means a course should be 5-7 days. Stopping treatment too early not only promotes bacterial resistance, but also often leads to a relapse, which will be much more difficult to treat the second time around.

It is crucial to administer the antibiotic intramuscularly, to achieve rapid absorption and adequate blood levels (Cmax). This also minimizes the risk of injection site reactions.

However, administering twice daily i/m injections in foals is a challenge because of the poorly developed musculature, especially in the neck area. Any injection distends and tears the muscle tissue and causes pain (imagine injecting 8mls of water into the middle of your steak)

Therefore it is important to alternate injection sites. In the horse the recommended sites are: Base of the neck, rump, pectoral and hamstring muscles. The last two are not recommended as they pose a significant safety risk to the administrator.



Injections in the rump can be given safely by putting the horse in a crush or race.

With the greatest foal mortality occurring in the first 12 months, frequent monitoring of the foal for signs of abnormal behaviour or obvious signs of illness allows early intervention and increases the chances of survival.

So, hopefully this year's crop of foals all survive and grow into the mighty Clydesdale, we have all love.