

The Importance of Colostrum to Foals

Colostrum and Passive Transfer Assessment

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Colostrum is the sticky, yellowish, first milk produced by the mare during the last few weeks of gestation (pregnancy). It is stored in the udder until the foal suckles. Dripping of colostrum may occur 24 to 48 hours before foaling. Excessive loss of colostrum from the udder prior to foaling may result in an inadequate supply for the newborn foal. Colostrum is comprised of cellular components and non-cellular components. The cellular components include white blood cells (lymphocytes, macrophages, neutrophils) and epithelial cells that lined the milk-producing ducts of the mammary gland¹. The non-cellular or soluble components of colostrum include immunoglobulins, hormones, growth factors, enzymes, carbohydrates, fat and a variety of other substances². Colostrum ingestion is vital for the survival of your foal. Ingestion of colostrum should occur within two to four hours of birth. Foals without adequate colostrum intake, and therefore inadequate immunoglobulin levels, are very susceptible to often-fatal diseases such as infected joints (joint-ill), navel-ill, pneumonia and diarrhea³.

IMMUNOGLOBULIN

Foals are born with no immunity or are born naïve to the normal bacteria, viruses and pathogens that they will encounter in their daily lives. Foals must obtain immunity passively by absorbing various immunoglobulins (Ig) from their mother. This is called passive immunity. Immunoglobulins are immune proteins. They are the most important part of colostrum because the newborn foal's immune system doesn't know what immunoglobulins to make yet. Fortunately for the foal, horses have developed a mechanism whereby immunoglobulins produced by the dam's immune system in response to exposure to antigens are in her blood circulation and are picked up by specialized mammary gland cells and put into the colostrum. Vaccinating a mare a month prior to foaling maximizes the vaccine-related



Figure 1. Dripping of colostrum may occur 24 to 48 hours before foaling.

immunoglobulins produced by the mare. These immunoglobulins are available in the colostrum for the foal to absorb. In the dam, and other mature horses, Ig is an important part of the immune system. Ig is crucial in fighting infections. It takes a couple of weeks to months for a foal to develop a primary immune response to an antigen. The naïve foal (without the benefit of passive transfer of immunity) would otherwise be at risk to infection for a few weeks until it can mount an immune response. Getting Ig from mom gets the foal's immune system up to speed until it can start making its own Ig.

PASSIVE TRANSFER OF IMMUNOGLOBULIN (Ig) FROM COLOSTRUM INGESTION AND ABSORPTION

Assuming that a mare is fully vaccinated and protected to the common horse pathogens, Ig will be present in her colostrum. Now, all that has to happen is to get the colostrum into the foal. One of a foal's first jobs is to find that udder and begin emptying it. Mother Nature has that well programmed. The next job is to have a good sleep, for five or ten minutes, before going right back at that udder. In this way, a foal quickly consumes



Figure 2. One of the foal's first jobs is to find the mare's udder and begin emptying the colostrum from it.

the one to three litres of colostrum produced by mom.

The ingested Ig proteins are very large in size and are absorbed across specialized intestinal cells and deposited into the foal's lymph system, which quickly runs into the blood circulation system. Colostrum Ig consumed within two hours of birth will show up in the foal's blood in four to six hours⁴. Once the Ig is in the blood, its concentration in the foal can be accurately measured. Immunoglobulin intestinal-absorption is at 100% efficiency just after birth but rapidly decreases to about 20% efficiency by three hours of age and 1% efficiency by 20 hours of age⁵. Good quality colostrum contains a huge amount of Ig. Consumption of relatively small volumes within the first few hours of life will provide sufficient Ig. The entire process of consumption of colostrum Ig by the foal and getting the Ig into the foal's circulation is termed passive transfer. Any problem along the way, which results in inadequate Ig in the newborn foal, is termed failure of passive transfer.

COLOSTRUM QUALITY

Colostrum 'strength' (quality = Ig content) is measured by its 'thickness' or how much dissolved solids are within the colostrum.

An Equine Colostrometer, marketed by Jorgenson Laboratories (www.jorvet.com) requires 15 mL of colostrum and, within minutes, will provide an estimate of quality (poor, good or great). An Equine Refractometer, marketed by Animal Reproduction Systems (www.arssales.com) requires a maximum of three drops of colostrum and will also provide a very accurate indication of the quality of the colostrum. In-

structions are provided with each instrument and questions can be directed to the supplier or your veterinarian. The cost for either instrument is reasonable, considering they can be used repeatedly and without supplies. Splitting the purchase between a few broodmare owners may also be practical.

Excessive dripping of colostrum prior to foaling may result in a small amount of poor quality colostrum available to the foal. Some mares produce only an average volume of average quality colostrum while others may produce a small volume of good quality colostrum. The stall-side tests described previously will provide some indication of quality but the volume of colostrum is difficult to assess.

If the quality is poor, it is time to find a supplemental source of colostrum, such as colostrum from another mare foaling at the same time or frozen banked colostrum that you can obtain and get into the foal quickly. Remember, colostrum absorption efficiency at three hours of age is only 1/5 of what it was at birth.

PASSIVE TRANSFER ASSESSMENT

Assessment of the concentration of passively derived Ig (from the mare's colostrum) is a useful tool in foal management. It can be used in conjunction with the stall-side test to assess colostrum quality or alone. For the first 20 hours of life, provide a good quality colostrum, even though colostrum absorption efficiency is poor the older the foal (in hours). Provision of colostrum 10 hours post birth will not likely raise the Ig level a huge amount because it just won't be appreciably absorbed into the blood in a foal of that age. Because there is a lag of a few hours between colostrum ingestion by a foal and Ig showing up in the blood, an assessment of passive transfer is best first used at about 20 hours of age. Running a blood test at 10 hours of age will provide an artificially low level because the Ig hasn't been absorbed from the intestines into the blood yet. By 20 hours of age or older, the Ig blood level will much more accurately reflect the Ig status of the foal.

Your veterinarian can easily draw a small amount of blood from the foal and either perform a convenient stall-side test or send the blood to a laboratory for Ig-level analysis. Stall-side tests are readily available and can provide results in minutes. Laboratories in Ontario can return results back to veterinarians within hours of the sample's arrival at the lab. There are a few different subtypes of immunoglobulins and the most important

one to check for passive transfer is immunoglobulin G (IgG). The test is typically called an IgG test. An IgG-level test is the cheapest insurance available to help ensure a healthy foal. The entire cost of the test is miniscule when compared to the cost of breeding a mare, keeping her through pregnancy and foaling her out. There is also the incalculable emotional input that goes along with getting a foal on the ground.

Laboratories and veterinarians refer to IgG levels as being 'less than 400', '400 to 800', and 'greater than 800'. Levels less than 400 are low and definitely need to be fixed in your foal. Levels greater than 800 are typically protective against infections⁶. The grey zone of 400-800 is where the art of veterinary medicine comes into play. Some foals need supplementation and others may do well without. Your veterinarian is the best guide through this problem.

Foals with IgG levels of less than 400 require intravenous infusion of Ig-rich plasma. This method of passive Ig transfer bypasses the intestinal absorption and puts Ig from donor horses directly into the foal. The greatest reason to avoid this treatment is the cost, as the plasma and infusion process is expensive, when compared to frozen colostrum if it is available.

SUMMARY

For foals to survive, they require immunity to the pathogens that they will encounter on a daily basis. Foals are born naïve, without any immunity, and are incapable of generating their own immunity for weeks to months. Initially their immunity comes passively from their

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mother's colostrum by way of Ig transfer across the intestinal lining. The higher the quality of the colostrum and the sooner they drink it, the more protection they will have from pathogens in their environment. The quality of colostrum can be measured by you at the stall. If the colostrum quality is poor, then colostrum (fresh or frozen) can be obtained and must be given to the foal immediately. Your veterinarian can draw a blood sample and assess the foal's IgG concentration. This is the least expensive insurance.

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