

# Failure of Passive Transfer

*A newborn foal needs antibodies to protect him from serious infectious diseases*

## Overview

There is no doubt that foaling is an exciting time, but one that is wrought with potential problems. One of the most important complications in neonatal foals is failure of passive transfer: the inadequate absorption of antibodies from the mare's colostrum or "first milk." Approximately 10-25% of newborn foals are diagnosed with failure of passive transfer (FPT) and are at risk for developing serious medical conditions such as pneumonia, diarrhea, and joint infections.<sup>1,2</sup>



When foals don't get enough of the necessary antibodies from their dams, it is called failure of passive transfer.

## The Importance of Colostrum

Unlike other species, the mare's antibodies (specialized infection-fighting proteins that circulate in her blood) do not cross the placenta and reach the fetus. As a result, newborn foals have virtually no antibodies in their blood to fight infections.<sup>3</sup>

While foals are able to start producing antibodies at birth, they are immunologically naïve and will not have significant levels of antibodies until they are about two months old. Instead, foals obtain life-saving antibodies (immunoglobulins) from their dam's colostrum—the special milk produced during the last two weeks of pregnancy and available to the newborn foal immediately after birth. How mares pass antibodies to their foals via colostrum is referred to as passive transfer of immunity.<sup>1,2</sup>

Not only is colostrum rich in antibodies (primarily immunoglobulin G, also called IgG), but it also contains growth factors, pro- and anti-inflammatory molecules, fats, and other proteins. Colostrum is calorie dense and also functions as a laxative.

## Time is of the Essence

The gastrointestinal tract of neonatal foals is lined with a special type of cell capable of absorbing large molecules

(such as antibodies). By 18-24 hours after birth, however, these cells are replaced by more mature cells that are not capable of absorbing immunoglobulins.<sup>1,3</sup>

Studies have shown absorption of maternal antibodies from colostrum is greatest within 6-8 hours of birth. Since the average foal has a suckling reflex within 2-20 minutes of birth, can stand within one hour, and typically nurses from its mother within two hours, this time constraint is not normally a concern.

## Failure of Passive Transfer Causes

Some of the most common causes of failure of passive transfer include:

- Insufficient quantity of immunoglobulins in the milk due to prelactation. This occurs if mares drip or run milk for several hours prior to parturition.
- Premature foaling.
- Orphaned or rejected foals and foals unable to rise and suckle (due to dysmaturity, prematurity, postmaturity, weakness, or limb deformities).
- Production of poor-quality colostrum that does not contain the type or amount of antibodies required to protect the foal. This can occur if a mare is not properly vaccinated or is moved to a new envi-

ronment too close to the time of foaling; in mares greater than 15 years old; and in mares that foal early in the year.

- Inability of the foal to absorb the antibodies from the colostrum despite suckling adequate quantities of good quality colostrum.<sup>1-3</sup>

## Diagnosis

The only way to diagnose failure of passive transfer is to measure the foal's IgG levels in a blood sample. Normal foals generally have IgG levels between 1,000 and 2,000 mg/dl. Foals with IgG levels less than 200 mg/dl are diagnosed with complete failure of passive transfer, whereas IgG levels between 200 and 800 mg/dl is considered a partial failure of passive transfer.<sup>1,2</sup> Routine determination of IgG levels is recommended for all foals in the first 18-24 hours of life.<sup>1</sup>

To obtain an exact measurement of the foal's IgG levels the blood sample needs to be sent to a laboratory for analysis, which takes approximately 24 hours. In cases where failure of passive transfer is suspected, this is not an ideal timeframe. Instead, there are several test kits that can be used on the farm to measure foal IgG levels. These tests provide relatively reliable results in approximately 10 minutes. Results are not quantitative (i.e., the test do not give the exact mg/dl of IgG), but simply indicate if the foal's IgG levels are above or below a certain cut-off value.

## Treatment

Foals diagnosed with either complete or partial failure of passive transfer require administration of immunoglobulins. The main sources of IgG are fresh or frozen colostrum, commercial IgG products, and plasma.<sup>1-3</sup>

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If the mare is leaking colostrum prior to foaling, it can be stripped from the mare and frozen until the foal is born. The frozen colostrum is then thawed at room temperature or in warm water (**not** in a microwave!) and immediately bottle fed to the foal. If another mare on the farm lost her foal during parturition, the colostrum from that mare can be stripped and frozen for future use. If another mare's colostrum is given to a foal, it should be tested for the absence of anti-red blood cell antibodies (in order to avoid neonatal isoerythrolysis or jaundiced foal) and the donor mare should have a negative Coggins test.

One gathers colostrum by milking the mare. This is easy, only takes a few minutes, and can be done by anyone. Grasp the teat between the thumb and forefinger and gently squeeze and force the milk downward within the cavity inside the teat. No special equipment is required other than clean hands and a clean container in which to collect the colostrum.

Colostrum can be stored in any freezer for a year (when frozen at -4° Fahrenheit/-20° Celsius). Frozen immunoglobins are stable for much longer, but the quality of

the colostrum deteriorates over time.


Alternatively, dried IgG products are available that can be mixed with water and bottle-fed to colostrum-deprived foals. These products are stable at room temperature and have a longer shelf-life than fresh or frozen colostrum, but they can be expensive and have variable absorption.

Finally, equine plasma high in IgG can be administered intravenously. This option is good for foals with very low IgG levels (less than 200 mg/dl), are too old to absorb orally administered immunoglobulins, or have abnormal gastrointestinal function that precludes the absorption of the immunoglobulins. IgG levels should be re-measured post-treatment.

### Prognosis

Not all foals with this problem become sick, and not all foals that achieved passive transfer of immunity are guaranteed to be healthy. Nonetheless, almost all foals that develop life-threatening infections early in life have at least partial failure of passive transfer. It is therefore imperative that foals with failure of passive transfer are diagnosed and treated as soon as possible.

### Prevention

FTP is most effectively avoided by ensuring the foal stands and nurses shortly after birth. This necessitates witnessing the birth and assisting the mare and foal when necessary. Ensure the mare is properly vaccinated (e.g., according to the AAEP vaccination guidelines)<sup>4</sup>, and do not move the mare to a new environment in the last month of gestation. This allows the mare to develop antibodies specific to the types of microorganisms are present in the newborn foal's environment. 

### REFERENCES

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