

COLOSTRUM AND MILK REPLACERS



BASICS

OVERVIEW

- The ruminant syndesmochorial placentation separates the blood supply of the dam and neonate, resulting in the birth of agammaglobulinemic neonates.
- Ruminant neonates rely on ingestion of colostrum within a narrow time period following birth to achieve passive immunity.
- Failure to achieve passive immunity can result in bacterial septicemia with a high likelihood of mortality
- Colostrum contains nutrients, immunoglobulins, immunologically active mediators and cells.
- Colostrum replacers provide nutrients (fat, protein, vitamins and minerals) and immunoglobulin G (IgG) to the neonate, and are designed to completely replace the first feeding of colostrum.
- Colostrum supplements provide less IgG than colostrum replacers (usually < 100 g) and are designed to help increase serum IgG in calves fed low or medium quality colostrum.
- Colostrum replacers and supplements are derived from bovine colostrum or serum or chicken eggs.
 - Colostrum derived replacer provides superior passive immunity than serum derived replacer.
 - Immunoglobulin Y from chickens is poorly absorbed in the calf.
- Milk replacers provide nutritional requirements for maintenance and growth of neonatal ruminants.

INCIDENCE/PREVALENCE

- The prevalence of failure of passive transfer can range from 10 to 30% in beef calves in some operations, and up to 40% in dairy calves.
- Failure of passive transfer is also common in neonatal lambs, kids and crias

SYSTEMS AFFECTED

- Digestive
- Hemolymphatic

PATHOPHYSIOLOGY

- Colostral antibodies are absorbed by enterocytes via pinocytosis and transferred into circulation.
- In neonatal domestic ruminants and crias, antibody absorption is optimal in the first 2-4 hours after birth, then declines until cessation at approximately 24 to 36 hours of age.
- Continued colostrum feeding may confer the benefit of local immunity within the GI tract after antibody transfer has ceased.

CAUSES AND RISK FACTORS

- Inadequate volume of colostrum ingested or administered

- Colostrum intake delayed, typically for longer than four hours after birth
- Production of poor quality colostrum by the dam



DIAGNOSIS

- Observation of the neonate after birth, if continuous, can determine if suckling behavior has been deficient
- Obvious anomalies with the dam or the parturition process, such as premature lactation, premature birth, disease of the dam, dystocia and other issues can indicate that colostrum replacement will likely be required regardless of neonate suckling activity
- Direct and indirect measures to quantify serum IgG can be utilized, but are most appropriately applied at between 24 to 36 hours of life. Ideally the need for colostrum replacement is identified at an earlier stage while the neonate is still capable of antibody absorption.
- Calves with serum IgG concentrations < 10 g/L are considered as having failure of passive transfer
- Crias with adequate passive transfer are expected to achieve serum IgG concentrations > 1000 mg/dl

COLOSTRUM REPLACER/SUPPLEMENTATION

- Calves should ideally receive 150-200 grams of IgG in the first feeding.
- Bovine colostrum replacers contain between 100 - 150 g of IgG per dose, therefore, two doses of colostrum replacer are recommended for calves.
- Colostrum supplements alone are insufficient to achieve adequate passive immunity.
- Colostrum supplements should not be mixed with colostrum, since this can impede antibody absorption, but may be fed after colostrum.
- Colostrum feedings can be divided within the first 24 hours of life especially in smaller calves.
- Bovine or egg based colostrum replacers are commercially available for lambs and kids.
- Small ruminants and exotic hoofstock can be fed colostrum based on weight, with recommendations ranging from 5-8grams of IgG per kg bodyweight, or 10-15 % of body weight in colostrum during the first 24 hours.

MILK REPLACER

- Milk replacer is routinely fed to dairy calves. Advantages over nursing the dam include decreased cost relative to loss of salable milk, biosecurity, standardization and monitoring of calf feeding.
- Milk replacer is fed at 15-20% of body weight to meet daily nutritional requirements for maintenance and growth. Requirements vary with ambient conditions and disease.
- Milk replacers contain less fat, and thus less metabolizable energy than whole milk.
- Protein, fat and ash content should be assessed when selecting a milk replacer.
- Calf formulations typically contain between 18-24% crude protein, and the source (milk or non-milk) is extremely important. Milk proteins are more digestible than non-milk proteins.
- Protein and energy content of replacer should be matched to expected weight gain.
- Pre-ruminant calves readily digest lactose and milk proteins while non-milk polysaccharides or proteins are poorly digested.
- Milk replacer formulations for lambs and kids contain higher protein and fat percentages and a lower lactose percentage compared to calf formulations.

- Specialty formulations for alpacas or exotic hoofstock can be challenging to access; often milk from the commercially available species most similar to the species in need is used. Goat or sheep milk is often used as a substitute in camelids.
- Medicated milk replacers may contain antimicrobials (oxytetracycline, chlortetracycline, neomycin), and coccidiostats.

PRECAUTIONS

- Poorly digestible ingredients or improper mixing in milk replacer products may result in bloat, diarrhea and colic.
- Lambs fed bovine milk replacer may develop diarrhea due to the higher lactose content.
- Overfeeding of milk can result in bloat or other gastrointestinal complications.



FOLLOW-UP

- Serum IgG can be assessed 24-48 hours after colostrum or colostrum replacer feeding.
- Direct measures (RID, ELISA) or indirect estimates (refractometry, turbidity tests) can be used to quantify or approximate serum IgG concentrations.
 - Species specific testing for the species of colostrum replacer origin are required when using direct measures of IgG
- IgG testing can be used to monitor herd colostrum management

POSSIBLE COMPLICATIONS

Failure of passive transfer can lead to a variety of complications in neonates including:

- Septicemia
- Septic arthritis
- Pneumonia
- Diarrhea
- Omphalophlebitis
- Nutritional diarrhea can occur with mixing errors in milk replacers

PREVENTION

Failure of passive transfer or the need for colostrum replacers or supplements can be reduced by effective management efforts

- Vaccination and appropriate nutritional management of pregnant dams
- Careful observation of parturition and neonatal suckling behavior
- Providing high quality colostrum (in cows, colostrum IgG content > 50 g/L) with appropriate volume (typically 4 quarts soon after birth to calves > 100 lb bodyweight) and by an appropriate route (such as esophageal feeder)
- The earlier after birth colostrum is fed, the higher the final peak serum IgG values are likely to be i.e. feeding in the first or second hour is superior to the fourth hour.

BIOSECURITY

- Bacterial proliferation can occur rapidly in colostrum. To avoid this:
 - Colostrum should be refrigerated (33 to 35°F) within an hour of collection and for no longer than 24 hours
 - Colostrum can be frozen (-5°F) for up to one year (avoid frost free freezers)

- Colostrum should be pasteurized



MISCELLANEOUS

SEE ALSO

Failure of Passive Transfer

ABBREVIATIONS

- IgG = Immunoglobulin G
- GI = Gastrointestinal

SUGGESTED READING

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Author Sarah Depenbrock

Consulting Editor Erica C. McKenzie

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