



Colostrum for Lambs

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Most lamb mortalities occur within the first two weeks of life. Assuming a healthy birth, the major causes of death are often hypothermia, starvation, or respiratory diseases. Colostrum is one vital factor that can help reduce these mortalities by enhancing a lamb's immune system and overcoming environmental challenges.

Colostrum is important in developing antibodies (immunity) in lambs. Lambs essentially do not have an immune system at birth nor the exposure to pathogens or bacteria to produce their own antibodies or immunoglobulins (Agenbag et al., 2021). These antibodies are key to recognize and fight pathogens protecting lambs from illnesses. Although antibodies are not transferred across the placenta during pregnancy, antibodies can be acquired through exposure (e.g., vaccines, getting sick). This exposure is important, but too much all at once can be overwhelming leading to poor performance and increased mortality. Fortunately, antibodies are transferred through colostrum. Colostrum also known as the first milk after parturition is rich in immunoglobulins, and nutrients containing proteins, lactose, fats, minerals and other components like hormones, antimicrobials, anti-inflammatories, and growth factors that help lambs get off to a great start.

Lambs are born with a limited reserve of energy. Colostrum provides quick energy and nutrients increasing blood glucose levels and body temperatures (Agenbag et al., 2021). This allows lambs to thermoregulate, increasing ability to survive and overcome environmental challenges.

The process of suckling nurtures a strong ewe-lamb bond also enhancing survival rates. Weak, lethargic lambs, poor and limited ewe-lamb interactions, stressful lambing environments or difficult births can delay bonding increasing rejection and lamb mortality (Pollard and Littlejohn, 1999, Nowak and Poindron, 2006, Jacobson et al., 2020) while having a negative effect on colostrum consumption.

Lastly, colostrum develops both local and systemic immunity. This enables lambs' ability to fight infections such as intestinal or respiratory diseases (Nash et al., 1997) and improve future productivity. Colostrum can promote gastrointestinal maturation and increase reproductive efficiency (Agenbag et al., 2021).

Factors affecting colostrum production and composition

Several factors can affect colostrum production and composition including body condition score, litter size, and nutrition. Many of these factors can be linked to the hormone progesterone and the blood supply of glucose (Banchemo et al., 2015).

Progesterone is important for maintaining pregnancy and is mainly supplied by the placenta(s) during the last half of pregnancy. A week before birth, levels naturally decline signaling the start of parturition and initiation of lactogenesis or milk let down after birth. This signal however can be delayed or affected. Ewes pregnant with multiple lambs (and placentas) naturally have more progesterone compare with single bearing ewes.

Furthermore, overly fat ewes and underfed ewes can have delayed or slowed clearance of progesterone. Fat ewes store progesterone in fat slowing clearance, and pregnant, multi-bearing and underfed ewes are often in a negative energy balance. Energy levels or glucose in part, is important in declining the level of progesterone to signal the start of parturition and lactogenesis (Banchero et al., 2015, Agenbag et al., 2021).

Energy (glucose) levels in addition to affecting progesterone and milk let down, can affect the amount of colostrum and milk produced. Glucose is an important component of milk synthesis and decreased amounts can have a negative effect on lamb survival. When the volume of colostrum is decreased the amount of total solids or viscosity of colostrum is increased, meaning lambs have to work harder; suck more frequently and for longer to get the needed nutrients (Banchero et al., 2015).

Feed provided during late gestation can impact colostrum production. Proper nutrition in late gestation is important for increasing energy and glucose levels which can in part impact progesterone levels that initiate parturition and lactogenesis. Especially in multi-bearing ewes readily digestible, dense, high-energy feeds (i.e., grain) are important, as the space in the rumen is impacted by the number of lambs. The source of the dense, high-energy feeds may be important as colostrum production can be impacted by the source of grain fed. In ruminants, as feed is digested products called volatile fatty acids (VFA) are produced and specifically the VFA propionate is vital for colostrum production. Different feedstuffs produce different VFAs. Propionate is the key precursor for glucose production. It is most often produced from metabolizing starchy grains (e.g., corn).

Feeding Lamb(s) Colostrum

Research in colostrum is limited and to date most of the research has been based off cattle and applied to sheep. Despite this limited research certain principles still apply to ensure newborn lambs receive the vital colostrum they need. When considering colostrum for lambs the 3 Qs; quickly, quality, and quantity should be kept in mind.

Quickly - How quickly should colostrum be given?

Lambs should be fed colostrum within 30 minutes to 6 hours after birth to optimize absorption of

immunoglobulins. Immunoglobulins are large molecules normally unable to pass in the gastrointestinal tract of lambs. The exception being newborn lambs which have a 'leaky gut' allowing these molecules to pass and provide that passive immunity to lambs. However, this leaky gut is time sensitive and becomes less leaky as the lambs age to prevent harmful absorption of other large molecules such as bacteria. Additionally, ewe immunoglobulins are transferred to milk during the last week of pregnancy and are quickly reabsorbed following the birth of the lamb. By 12-hours postpartum colostrum IgG concentrations are decreased by over 25% and 75-100% by 24-hours (Alves et al., 2015). The time sensitive combination of decreasing IgG levels in ewes' colostrum and lambs gut closure makes it essential that colostrum is fed as soon as possible.

Quantity - How much colostrum is enough?

Lambs should be fed a general requirement of 10% of their birth body weight. For a 10-pound lamb this means they need 1 pound or 16 ounces of colostrum which should be spread out over multiple feedings. Specifically, this quantity is dependent on the amount of energy needed for heat production and thermoregulation. Meaning the amount depends on the current environment conditions lambs are born into with colder conditions increasing the amount needed. Although, again research is limited, remembering 10% of birth body weight as a general guideline will ensure lambs receive the colostrum they need.

Quality – What is good quality colostrum?

Colostrum quality is a combination of cleanliness and concentration of immunoglobulins. Typically, colostrum quality is defined by amount of IgG or immunoglobulin G. Although research on IgG levels is limited in sheep, studies suggest "quality" sheep colostrum ranges from 15 mg/mL to 50 mg/mL IgG (Alves et al., 2015, Agenbag et al., 2021, Kessler et al., 2021). Higher concentrations of IgGs in colostrum means higher quality and more benefit to lambs. Lambs have an apparent IgG absorption of less than 33% at birth. Meaning a lamb drinking colostrum with 15 mg/mL IgG will absorb approximately 5 mg versus absorbing 16 mg IgG drinking colostrum with 50 mg/mL IgG. Furthermore, it has been suggested that Santa Inês lambs need to consume a minimum of 30 g of total IgG in 24 hours to gain adequate immunity (serum IgG concentration of ≥ 15 mg/mL, Alves et al., 2015). Using this recommendation, a lamb will need to consume

approximately 20 ounces of ewe's colostrum that has 50 mg/mL IgG (Figure 1). As the ewe's colostrum quality decreases the amount of colostrum needed to obtain 30 g of IgG increases to a point where a lamb will not be able to consume enough to meet IgG requirements. Although good absorption of IgGs is a function of consuming high-quality and adequate quantities of colostrum potential variabilities in sheep breeds may dictate how much colostrum lambs will need. From farm data, Dwyer et al. (2015) suggested that 22% of ewes produce less than 50 mg/mL of IgG. Ensuring ewes are appropriately fed and have adequate nutrition for their stage of production should help promote the quality and quantity of colostrum available. Despite the typical way of defining colostrum by concentration of IgGs, cleanliness is also vitally important. The 'leaky gut' that allows immunoglobulins to pass can also allow harmful absorption of other molecules such as bacteria. Bottling a lamb with improperly stored colostrum or lambs nursing ewes who are kept in a dirty environment will increase the likelihood of weak, ill, or dead lambs. Good management practices such as properly ventilating barns, shearing/crutching ewes prior to lambing will help promote quality colostrum.

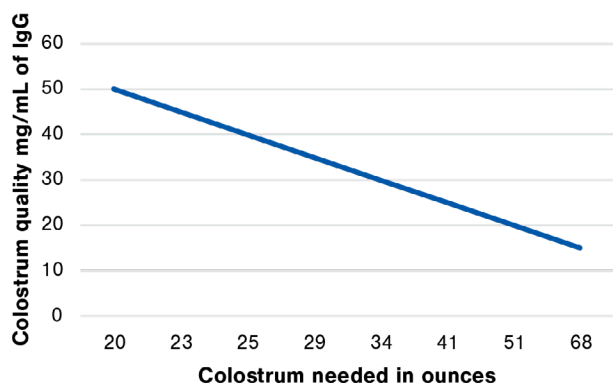


Figure 1. Research using Santa Inês lambs determined a minimum of 30 g of total IgG is needed in 24 hours to gain adequate immunity (Alves et al., 2015). This graph depicts the amount of colostrum a lamb would need in 24 hours based on the quality or concentration of IgG's in ewe's milk. This shows as colostrum quality (IgGs) decreases amount needed increases and becomes unrealistic for a lamb to consume.

Colostrum Storage and Handling

Bacteria loves milk and colostrum and can multiply easily in only a short period of time. It is important to remember if colostrum is milked out, use it, refrigerate, or freeze. General rules of thumb for storage times are 30 minutes at room/barn temperature, 3 days in the fridge, or 1 year in the freezer. Freezing colostrum in

small bags (4-6 ounces), or ice cube trays transferred to a bag (1 standard ice cube = 1 ounce) is ideal compared with large quantities. Smaller sizes will make thawing and using colostrum easier but also ensure IgGs remain intact. Repeated freezing and thawing can be detrimental to sensitive IgGs. Lastly, whenever stored colostrum or milk replacer is used it is important to be clean. It is good practice to clean and disinfect equipment between each lamb and feedings.



Figure 2. Freezing colostrum in small bags (4-6 ounces) is one way to store colostrum in a way that will make thawing and using colostrum easier.

Key Summary Points

Insufficient or little colostrum intake is a root cause of many lamb mortality issues and is one vital factor that can improve lamb survival. As a producer several steps can be taken to ensure adequate colostrum intake and include the following general guidelines.

Colostrum sourced from the ewe to the lambs

- Maintain proper ewe body condition score (<https://extension.sdstate.edu/managing-sheep-body-condition-score-throughout-year>) and provide adequate levels of energy to ewes in late gestation to increase quality and production of colostrum
- Maintain adequate ventilation and environmental cleanliness to minimize bacteria and maximize absorption of IgGs to lambs
- Limit handling to ensure lambs and ewes properly bond

Commercial or stored colostrum for bum lambs

- Minimize bacterial contamination to maximize IgG absorption
- It is best practice to thaw saved colostrum in hot water baths (~120°F) versus microwaves to keep IgG molecules intact.

- Administer colostrum as quickly as possible; ensure lambs are warm (102°F) before feeding.
- If using a commercial colostrum product in replacement of ewe colostrum, ensure a colostrum replacer not a colostrum supplement is used. Colostrum supplements by itself will not provide the necessary amounts of IgGs needed for lambs.

To learn more about newborn lamb management visit <https://extension.sdstate.edu/newborn-lamb-care-management>

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