



# NEWS TO EWES

## Managing the Seasonal Effects on Ewe Reproduction

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### Introduction

Reproduction is the beginning of a series of events involved in the production of milk-fed slaughter lambs. Generally, the higher the reproductive rate of ewes, the greater the chances of achieving maximum profit. To illustrate, with a 100% lamb crop sold from a January/February lambing, the labor requirement is 3.5 hours per ewe that yields 28 lb of lamb sold per hour of labor (assuming the lamb is marketed at 100 lb). On the other hand, with a 200% lamb crop sold, the labor requirement is only 4.4 hours per ewe or 45 lb of lamb sold per hour of labor (assuming two lambs weigh 100 lb each). A knowledge of the effects of season, and how to manage it, can improve the chances for higher reproductive rates, marketing more pounds of lamb per ewe, increasing the efficiency of labor use, and ultimately increasing the chances of more profit.

### The Ewe

Ewe lambs reach puberty at 5 to 8 months of age, if they reach this age in the fall of the year. **Estrogen** secretion, from the ovaries, will be high enough to stimulate these lambs to receive the ram. However, they are too young to become pregnant. They should be at least 7 to 8 months old before even given the chance to become pregnant.

The 20-to 42-hour period (average = 30 to 35 hours) length of time when ewes will accept rams is the **estrous period** (heat). Ovulation occurs in the last 6 to 10 hours of this period. If ewes are not allowed to mate with rams, or fail to conceive, it will be 16 to 17 days before they will exhibit another estrous period (heat). This 16- to 17-day period from the end of one estrous period to the beginning of the next is the **estrous cycle**.

### Biological Hormone Relationships

The traditional breeding season for ewes in the farm flock states (eastern half of the U.S.) extends from August 15 to October 7 each year. The hormonal relationships for an estrous cycle during this time of year are shown in Figure 1. Day 1 is the start of 30-hour heats that occur every 16 to 17 days if ewes do not become pregnant. Let us assume that conception did not occur anytime during a 30-hour heat around August 16. The corpus luteum on the ovary produces **progesterone**, which suppresses **follicle stimulating hormone** (FSH) and **luteinizing hormone** (LH) production. The corpus luteum then atrophies and **progesterone** production decreases to Day 1 of the next estrous period (heat) on September 1 or 2. On about Day 14, **FSH** production begins to increase, which stimulates growth of a follicle that holds a developing egg (ovum) until it reaches maturity on the ovary. **LH** production begins to increase on September 1 or 2, which causes the follicle to rupture

(ovulation) and allows the ovum to fall into the infundibulum. **Estrogen** production also increases on September 1 or 2 to stimulate ewes to receive rams near the time of ovulation so fertilization can occur. Ovulation of two or more ova (eggs) during the estrous period is the way twin and triplet lambs are born. After fertilization, the corpus luteum, instead of atrophying, begins to produce **progesterone** again. It performs the following functions during pregnancy: (1) keeps other ova from being released [keeps ewes from having estrous periods (heats)]; (2) decreases LH production; (3) keeps ewes pregnant (prevents abortion); and (4) stimulates mammary development.

### Seasonal Breeders

Most ewes are **seasonally polyestrous**. That is, they exhibit recurring estrous cycles, if they don't become pregnant, but only in certain seasons of the year. Figure 2 shows the estrous activity of seasonal breeders during each month of the year. The "normal breeding (mating) season" for ewes in the northern hemisphere is in the fall of the year (October/November). This "normal breeding season" for all ewes of all breeds has been expanded from August 15 to January 15 of each year, after coming out of varying degrees of **anestrus** from January 15 to August 15. Therefore, breeding seasons for ewes are described as Long (6 to 8+ months), Medium (4 to 6 months), or Short (less than 4 months) around the October/November "normal breeding sea-

son". Table 1 shows the theoretical breeding seasons for some sheep breeds.

Ewes with Long breeding seasons will typically breed at times other than the August 15 to January 15 period. Some of these ewes may breed throughout the year. They may be further described as **out-of-season** breeders. Three of the most popular breeds that contain the highest percentage of out-of-season characteristics are Merino, Rambouillet, and Dorset. Other ewes with Long breeding seasons may be in **anestrus** during the spring, begin to show some estrous activity in July, and continue to exhibit regular estrous cycles until becoming pregnant or going into another **anestrus** 6 to 8 months later.

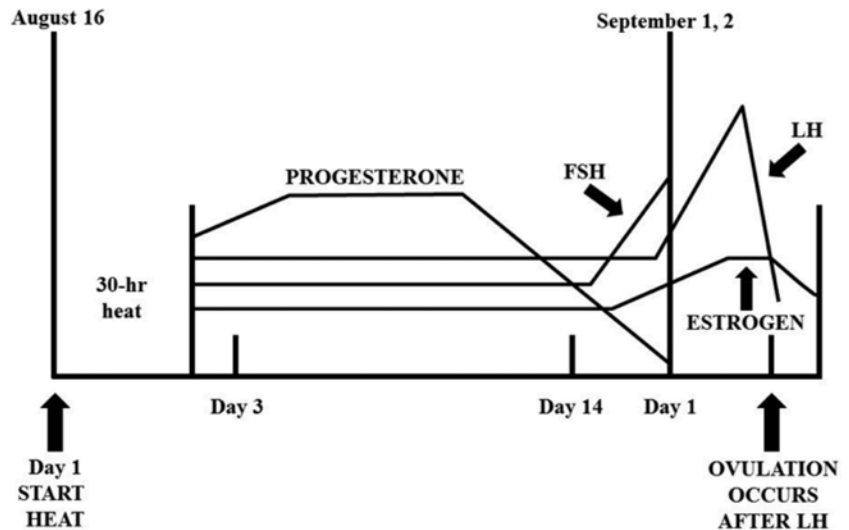
Crossbred ewes (Long x Medium), like Rambouillet x Suffolk, Dorset x Suffolk, can be successfully bred in June and July if the breeding season extends through September. However, about one of every three of these ewes and probably only one of every five Medium breeding season ewes will conceive in March, April, or May without using exogenous means of inducing estrus. Medium length breeders may begin to show estrous activity in August and continue to do so for 4 to 6 months around the October/November center. Short breeding seasons are the most restrictive. Ewes in this group usually begin cycling in September and continue until January 15. They are usually in **anestrus** for the rest of the calendar year.

When Medium and Short breeding season ewes (seasonal breeders) are in **anestrus** during spring and summer, they will not even "cycle". Other types of anestrus are pregnancy, post partum, and lactation. As noted earlier, progesterone prevents a return to estrus during pregnancy. After lambing, at least 17 to 21 days are required before the reproductive tract will return to normal so ewes can begin to show estrous activity if the season of the year will allow it. So, all ewes (seasonal and out-of-season) will be in anestrus for 17 to 21 days after lambing, regardless of the season. Even if season does not prevent heat for 17 to 21 days after lambing, lactation probably will. It is generally assumed that ewes do not exhibit heat during lactation.

### Factors Affecting Sexual Activity in Ewes

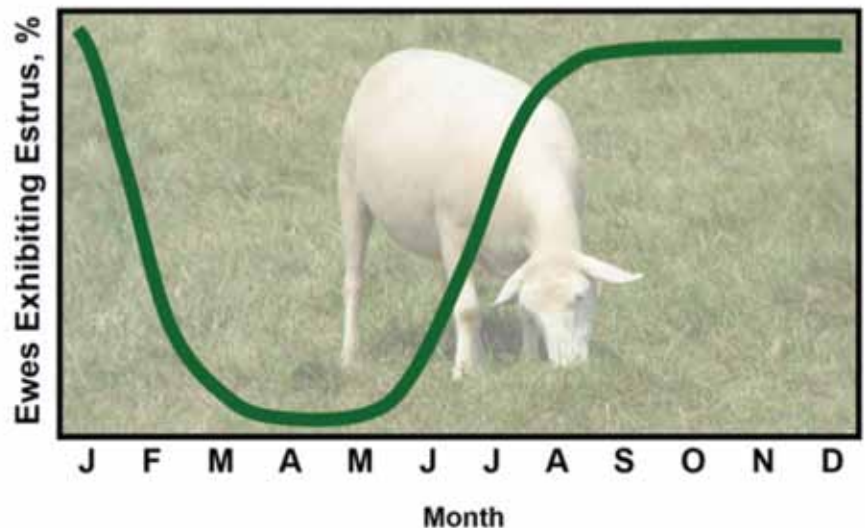
Three main factors govern sexual activities in ewes. **Daylight** hours is the primary one. If the number of daylight hours

**Figure 1.**  
**HORMONAL RELATIONSHIPS IN THE ESTROUS CYCLE OF THE EWES**



**Figure 2.**

## Monthly Estrous Activity of the Ewe



**Table 1.** Breeding Seasons for Ewes of Different Breeds

Long <sup>a</sup>	Medium <sup>a</sup>	Short <sup>a</sup>
Barbados Blackbelly	Columbia	Blue-faced Lincoln
Dorper (White Dorper)	Corriedale	Border Leicester
Finnsheep <sup>b</sup>	Hampshire	Cheviot
Katahdin	Montadale	Cotswold
Merino	Shropshire	East Friesian
Navajo-Churro	Southdown	Icelandic
Polypay	Suffolk	Jacob
Rambouillet	Texel	Lincoln
Romanov	Tunis	Oxford
St. Croix		Romney
Targhee		Shetland

<sup>a</sup>Long = 6 to 8+ months; Medium = 4 to 6 months; Short = less than 4 months.

<sup>b</sup>In most cases, Long breeding season implies early in the year onset; Finnsheep have a late onset (August/September), but a long season thereafter.



is too long, ewes may not “cycle”. Because June 21 is the longest day of the year (daylight-wise), seasonal breeders are normally in anestrus before and after this date. They typically begin cycling when the daylight hours become less than 14, after June 21, and reach maximum sexual activity when the daylight is 10 to 12 hours per day in October and November.

**Temperature** is closely related to daylight hours. Ewes in anestrus start to cycle when the average night temperature drops to 74°F. However, daylight hours may override this effect. Relative humidity is tied to temperature and can also affect sexual activity. For example, there is more sexual activity at 90°F when the humidity is less than 50% than when the temperature is 90°F, but the humidity is higher than 50%. Producers may assume that ewes don't cycle in hot weather because of the high temperature, high humidity, and/or long daylight hours, all of which may be true. On the other hand, unbeknown to the producers, their ewes may cycle in hot weather and may even conceive, but not lamb. Why? The newly formed embryo is quite fragile prior to implantation during the first 5 days after conception. Conception during hot weather can enhance this fragility and even enhance embryo death (embryo mortality). Therefore, when the “grass is good” in April, May, and June, ewes eat a lot and body temperature may go up. Ewes may even have a heat period, mate, and conceive, but not lamb because of embryo mortality. Shepherds, then, may erroneously conclude that long daylight hours and/or high temperatures prevent the occurrence of estrous periods (heats) when in actuality it may be embryo mortality that keeps ewes from lambing.

**Nutrition** can also affect sexual activity. That is, feeding ewes so their body condition is rising (gaining weight) at breeding time is recognized as a “nutritional flushing” period. Ewes typically ovulate 1 to 3 eggs per ovulation with an average of 1.5. Nutritional flushing can increase the average ovulation rate and this can be manifested through an increase of 15 to 20% more lambs born. However, ewes that are fat cannot be flushed effectively. Wise shepherds “limit feed” their ewes instead of letting them get too fat prior to breeding. This feat is accomplished by stocking pastures at heavy rates and/or allowing them to consume the poorest pasture possible. Then, about 2 weeks before turning rams in with ewes, begin to feed 0.5 to 1.0 lb of grain (shelled corn) per

head per day on the same pasture or move the ewes from a heavily grazed, low quality pasture to a lush, stockpiled one where they will remain for the duration of the breeding season.

### **Synchronizing Estrus**

Traditionally, highest prices for 100-to-120-lb slaughter lambs has been in the spring. This system requires that ewes be bred in August/September and lamb in January/February (winter lambing) so lambs can be sold in May/June. But, the landscape of the sheep industry is changing, especially in the farm flock states. Currently, 30% of the sheep marketings in the United States are non-traditional. Much of this system requires that ewes be bred in November/December and lamb in April (spring lambing) so lambs can be sold at 50 to 80 lb directly off ewes and grass during the summer and fall. The third system of lamb production in the farm flock states requires that ewes be bred in May and lamb in September/October (fall lambing) so 100-to-120-lb slaughter lambs can be marketed for relatively high prices in late February/early March.

Reproductive management of ewes in all of these systems is required before any can be successful. For example, an August/September breeding season is when the Medium and Short season breeders (seasonal breeders) in Table 1 are coming out of anestrus periods (Figure 2) on their way to highest estrous activities in October/November. Even though Long season breeders, theoretically, do not have the March/April/May anestrus (Figure 2), if their breeding season is in August/September they are still a month or two away from their maximum estrous activity in October/November, the same as Medium and Short season breeders (seasonal breeders). Breeding in late November/early December for spring lambing finds Long, Medium, and Short season breeders exhibiting near maximum estrous activity (Figure 2) whereas breeding in May for fall lambing shows just the opposite. Ewes in this system have to be Long season breeders (out-of-season). Any seasonal breeders used in this system will likely be in anestrus (Figure 2) and will likely require exogenous hormone treatment to initiate and synchronize estrus.

Rams can help synchronize estrus in ewes, simply by their body odor. The “ram effect” occurs when non-cycling ewes are stimulated to ovulate by the **sudden intro-**

**duction** of a ram or teaser (vasectomized ram). Rams produce a substance called pheromone, the odor of which stimulates the onset of estrus. Theoretically, ewes that are not cycling when a rams (teasers) are introduced will ovulate in 3 to 4 days. This ovulation will be during a “silent” heat, which cannot be detected by either the rams or the ewes. Following this silent heat, there will be two normal estrous peaks, with some ewes coming into heat around day 18 and the remainder around day 25. This series of physiological activities point to the use of “teaser” rams to synchronize ewes. By turning teasers in two weeks before the planned breeding seasons and at the same time begin to “nutritionally flush” the ewes, fertile rams can be saved until the fertile heats occur on days 18 and 25. It should be expected that 60 to 70% of the ewes will conceive at the first normal estrus. Of the remaining ewes, 60 to 70% should conceive at the second estrus. Ewes that do not conceive at either of these times should return to heat 16 to 17 days later. Overall, a 95% conception rate is expected from the breeding season.

The “ram effect” works best for an August/September breeding season for Long, Medium, and Short season breeders. All of these are approaching maximum estrous activity in October/November when they will respond to the ram pheromone. Ewes in this breeding season also respond to nutritional flushing, which helps the synchrony and increase lambing rates.

The “ram effect” can also be used in the November/December breeding for April lambs, but the effect is not as pronounced as in August/September. Long, Medium, and Short season breeders may be on the other side of their maximum sexual activity in October/November, but are still very close. Consequently, only a 3-week breeding season should be required for a 95% conception rate. Ewes in this system tend to “synchronize themselves”. Even if the “ram effect” is used, these ewes do require nutritional flushing.

Ewes bred in May to lamb in the fall are typically Long season breeders (out-of-season). The “ram effect” and nutritional flushing are necessary for attaining an acceptable lambing rate in the fall because of the variable out-of-season breeding abilities between and within genetic types and breeds. Use of the “ram effect” to try and synchronize Medium and Short season breeders (seasonal) usually yields variable results because of variations in rainfall,

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cloudiness, temperature, forage availability, etc.. Many of these ewes are likely so deep in anestrus that the “ram effect” cannot pull them out. Consequently, conception rates from these breeding seasons will likely be only 30 to 50%. If higher rates are expected, exogenous hormone use may be the management program of choice.

Attempts have been made for more than 60 years to initiate and synchronize estrus in anestrus ewes with exogenous hormone treatment. The real problem comes when trying to initiate fertile estrus of ewes in seasonal anestrus. Approved for use in 2009, CIDRs (Controlled Intravaginal Drug Release) have become a component of some breeding protocols. These are used primarily for synchronization of seasonal breeders whose estrous activity is advancing towards maximum in October/November. Many of these ewes are cycling or are close to cycling. Thus, conception rates can be relatively high and highly synchronized. On the other hand, when ewes are in anestrus (March/April/May) and treated with CIDRs, only about 65% can be expected to lamb in the fall, an improvement of about 20% over the “ram effect” alone. An example procedure for use of CIDRs follows:

Day	Procedure
1	Insert CIDR into vagina.
6 to 12	Pull 3 to 5 CIDRs per day and give injection of PG600.
7 to 13	Introduce ram 24 hours after CIDR removal.
14	Ewes exhibit heat 1 to 3 days after CIDR removal.

PG600 is a combination of serum gonadotropin and chorionic gonadotropin to induce estrus (heat) by mimicking the naturally occurring hormones, FSH and LH.

The most important function of CIDRs is to prepare ewes to show estrus and ovulate in response to introduction of the ram. They are most effective in mature ewes in moderate condition that are not lactating and have been isolated from rams for at least a month before breeding. Ewe lambs and lactating ewes do not respond well to out-of-season breeding, even with the use of CIDRs.

### Summary

Management of ewe reproduction requires a knowledge of puberty, cyclicity, and breeding seasons. Ewes are short-day breeders and typically exhibit maximum sexual activity in October and November.

Seasonal breeders are in anestrus in March, April, and May. Hormonal stimulation of estrus, with CIDRs, during these months can result in a 65% conception rate, whereas the “ram effect” may produce only a 30 to 50% pregnancy rate. Although CIDRs can effectively synchronize estrus, combining the “ram effect” and nutritional flushing to synchronize estrus in August/September breeding can result in 60 to 70% of the ewes conceiving at the first normal estrus, with 60 to 70% of the remaining ewes conceiving at the second estrus. A 95% conception rate is normal from these synchronized matings. Although ewes bred in November/December tend to synchronize themselves, use of the “ram effect” and nutritional flushing may enhance this synchronization. In conclusion, the great value of the “ram effect” is the synchronization of estrous activity in cycling ewes which will result in large numbers of ewes ovulating, conceiving, and lambing in a relatively short period of time.

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