

Management of Postpartum Anestrus in Beef Cows¹

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Introduction

The U.S. Department of Agriculture (USDA) reported that in July 2011 there were 31.4 million beef cows in the United States (USDA 2011). These cows are found in a wide range of environmental conditions and receive varying degrees of management, but one thing that they all have in common is the need to overcome postpartum anestrus (the time period following calving when the cow does not experience estrous cycles) to remain a viable contributor to a producer's herd. Cattle must attain normal and fertile estrous cycles following calving, and they must do it in a limited time to maintain a 365-day calving interval to maximize their ability to generate income over their life span.

To maintain a yearly calving interval, beef females must be managed so that they overcome their postpartum interval (PPI), the time from calving to conception, within 80–85 days of calving to allow for a 280–285 day gestation. Failure to successfully manage the cow herd through the PPI is one of the major causes of infertility. It is estimated that in Florida alone the cost of infertility of beef cows exceeds \$86 million annually (Lamb et al. 2011). Infertility occurs when cows 1) become pregnant but fail to calve; 2) become pregnant late in the breeding season and fall out of the annual production cycle; or 3) fail to become pregnant during the breeding season. The latter two causes of infertility are a direct result of the length of the PPI. Even though this publication focuses on PPI, successful completion of this phase depends on properly managing cows throughout the year.

Understanding Postpartum Anestrus

After giving birth, all females go through a period in which they do not experience estrous cycles; this is known as postpartum anestrus. This period of temporary infertility cannot be avoided, but it can be managed to ensure that the cows return to a fertile state in a timely and economically efficient way. Postpartum anestrus is a result of several factors related to pregnancy and calving. A variety of factors influence the length of the PPI, and the two primary factors are the suckling effect and nutritional status. In addition, cows must complete uterine involution and may experience short estrous cycles during their PPI. While many factors influence the length of the postpartum period, this publication addresses four specific areas: 1) uterine involution, 2) short estrous cycles, 3) effects of suckling, and 4) nutrition.

1) Uterine Involution

Following calving, uterine involution must take place before estrous cycles resume. Uterine involution can be defined as the structural and functional regression of the uterus to a status that is capable of supporting another pregnancy. This includes returning to a non-pregnant size, shape and position, shedding of all fetal membranes, and repair of uterine tissues. This process is completed in approximately 20–40 days following calving if no complications arise. Although uterine involution is a barrier to conception in the early postpartum cow, researchers have found that after uterine

1. This document is AN277, one of a series of the Animal Sciences Department, UF/IFAS Extension. Original publication date March 2012. Reviewed July 2018. Visit the EDIS website at <http://edis.ifas.ufl.edu>.

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involution is completed it has no relationship to a cow's ability to successfully overcome the PPI (Kiracofe 1980).

2) Short Estrous Cycles

A majority of beef cattle normally experience abnormal luteal function following their first ovulation postpartum. This often occurs without visual signs of estrus being expressed. In addition to the first postpartum ovulation, inducing ovulation with exogenous gonadotropin-releasing hormone (GnRH) or calf weaning (temporary or permanent) often results in a short estrous cycle. In a short estrous cycle, the life span of the corpus luteum (CL), known as the luteal phase, is often 10 days or less. A typical luteal phase usually comprises 14–18 days of a normal 21-day estrus cycle. This phenomenon is referred to as a short estrous cycle and is common in females overcoming postpartum anestrus.

This first postpartum ovulation results in a fully functional CL (producing adequate levels of progesterone to support pregnancy); however, the uterus is producing and metabolizing higher than normal quantities of prostaglandin (PGF), which is a result of the involution of the uterus. Prostaglandin is the hormone responsible for the regression of the CL. The high concentrations of PGF result in the premature regression and death of the CL. If fertilization of the ova from this ovulation were to occur, CL regression would take place before maternal recognition of the pregnancy (usually occurring ~days 16 to 18 of pregnancy), which results in loss of the embryo and failure to maintain the pregnancy (day 18; Smith et al. 1987).

Exogenous progesterone sources, such as a controlled intravaginal release device (CIDR) or melengestrol acetate (MGA), can be useful tools in managing short estrous cycles. A lack of progesterone in the anestrus cow limits luteinizing hormone (LH), which drives follicle development and ultimately causes ovulation. Through progesterone exposure, this inhibition is lessened, increasing LH secretions. Treatment with MGA before the first postpartum ovulation could reduce the occurrence of short estrus, and cows that ovulate following a CIDR treatment have a reduced incidence of short estrous cycles. Some tools that help producers successfully overcome anestrus and the incidence of short estrous cycles during the PPI include the implementation of estrous synchronization protocols and fixed-time artificial insemination, along with administration of exogenous progesterone through a CIDR or MGA. It is important to note that these tools should not be used unless the days postpartum are known. Uterine contractions are an important component of uterine involution;

administration of any progestin or progesterone within 21 days of calving could hinder this process.

3) Effects of Suckling

The primary factor associated with nursing that limits resumption of the normal estrous cycle is not the energy demand of lactation. Rather, it is the actual suckling and presence of the calf that have the greatest effect on the length of the PPI. Suckling triggers a complex system of neural responses and hormonal feedback loops that result in reduced LH pulse frequency and amplitude by altering GnRH release. This results in decreased or hindered follicular development and a lack of follicles eligible for ovulation. This effect is intensified by the number of calves suckling and the frequency of suckling. Suckling has the greatest impact on females in poor body condition or first calf heifers. In addition to the effect of suckling, the maternal bond with the calf also plays a critical role. It was demonstrated that twice daily milking does not impact the length of the postpartum period, but daily suckling of offspring does lengthen the PPI; thus, cows will have a lengthened PPI if the cow is being suckled by a calf that shares a maternal bond with the cow.

Early weaning of calves decreases the PPI and improves reproductive performance in beef cows. Although effective, this can be a costly tool to use if not properly managed. Either calves will have to be sold at lighter weights or a producer will have to supplement them. This is an option that needs to be evaluated if females are extremely thin or feed availability for the dam is insufficient. Early weaning should be considered only in extreme cases and thoroughly researched prior to implementation.

A less aggressive means to alter the negative effects of suckling on the PPI is temporary calf removal that does not exceed 48 hours. Removing calves for 48 hours eliminates the suckling effect, causing an increase in GnRH and LH secretion. In many cases, 48-hour calf removal improves overall pregnancy rates when used in conjunction with an estrous synchronization protocol.

4) Nutrition

Proper nutrition is essential for optimum performance in every aspect of beef cattle production, and overcoming postpartum anestrus is no exception. In practical production conditions, much of the variance in reproductive performance may be attributed to nutritional status or differences in energy intake and body condition.

Reviews of literature from the past 15 years conclude four basic observations of nutrition's role in reproductive success:

1. Prepartum (prior to calving) nutrition is more important than postpartum nutrition in determining the length of the PPI.
2. Inadequate dietary energy in late gestation will affect reproduction even when sufficient energy is supplied during lactation.
3. Body condition score (BCS) of at least a 5 or greater (on a 9-point scale) at calving ensures sufficient reserves to assist in overcoming negative nutritional balances associated with the PPI.
4. Further reductions in reproductive performance will occur if females remain in a negative energy balance during lactation.

Body condition scoring is a tool that can be used to estimate the energy reserves of cattle. In the beef industry a 9-point scale is used, with 1 being emaciated and 9 being obese (Kunkle, Sand, and Rae 1997). Using BCS, producers can estimate the energy balance of their herd, which is critical to reproductive efficiency. Reports have shown that by 80 days postpartum 62% of cows with a BCS of 4 or lower at calving were experiencing estrous cycles compared to 88%–98% that calved at a BCS of 5–6. Experiments have also demonstrated that cows with a BCS of 4 or lower had pregnancy rates of 61%, in contrast to 90% for those cows that calved with a BCS of 5 or greater (Selk et al. 1986).

Females with restricted intake of energy have decreased levels of LH secretion, which is the hormone that signals ovulation. Beef cows with inadequate energy reserves or poor BCS typically have several follicular waves before their first ovulation. Thus, energy reserves and intake affect the length of time until the initial ovulation during the PPI. Without ovulation, no CL can be formed and normal estrous cycles fail to initiate.

Body condition and nutritional status before calving are more influential on postpartum reproductive performance than supplementation following calving. In order to take advantage of this, the producer must be aware of the critical periods of time in which cows must attain the desired BCS before calving. Typically, this is during early gestation and after weaning. During this period the nutritional maintenance requirements of the beef cow (the amounts of nutrition needed to sustain healthy life) are at their

lowest compared to other phases of the production cycle. For example, a 1,200-pound cow in early gestation after weaning will have a reduction of 23% in energy and 36% in protein requirements compared to a lactating cow. With the decline in required protein and energy, this becomes the optimal time to increase BCS and improve energy reserves, both physiologically and economically. Ideally, a BCS of 5 or greater should be obtained prior to calving, which allows for weight loss following calving without dramatic effects on the animal's health and consequently fewer negative impacts on reproductive performance.

Postpartum nutrient intake can lessen the duration of postpartum anestrus, but it cannot compensate completely for low BCS and nutrient intake prior to calving. Even when thin cows gain body weight during the postpartum period they continue to ovulate later when compared to females with good (5 or greater) BCS at calving. Therefore, maintaining a BCS of 5 or greater assists in maintaining a 365-day calving interval. Managing BCS and nutrient intake before and after calving contributes to improved reproductive efficiency within a herd.

Conclusion

Using strategic management, producers can limit how much postpartum anestrus affects the productivity of a beef cow herd. With proper attention to BCS prior to calving, successful uterine involution, acknowledgment of the suckling interaction, and a reduction in short estrous cycles, the period of postpartum anestrus can be reduced for successful reproductive efficiency. Producers must understand the available tools, weigh all aspects of implementing those tools, and properly manage cattle through all phases of production to aid in initiating estrous cycles and maintain a PPI that will allow cows to calve annually. All of these steps together will help to optimize the profitability of cow-calf operations.

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