Postpartum Anestrus: Importance and Evaluation

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Abstract: The duration of postpartum anestrus is important to consider when evaluating reproductive performance and efficiency in cow-calf operations. The percent of cows calving in the first 21 days of the calving season and is higher for herds with shorter (average 50 days) rather than longer (average 80 days) length of postpartum anestrus. Earlier calving cows produce heavier calves at weaning as demonstrated by a model that calculated weaning weights that averaged 65 lbs. heavier for herds with 50 day average duration of postpartum anestrus compared to herds with 80 day average duration of postpartum anestrus. Some cattle production experts believe that cow-calf producers should breed replacement heifers before mature cows, sometimes referred to as providing a heifer lead time. While having a 42 day heifer lead time resulted in greater pregnancy success and average weaning weight, approximately two-thirds of the improvement in outcomes was realized when with a heifer lead time of only 21 days. Determining the length of postpartum anestrus following the first as well as subsequent pregnancies can assist veterinarians and producers develop optimal herd management strategies.

Keywords: cow-calf, postpartum

Postpartum Period

The postpartum period is the time from calving until a cow resumes her estrous cycles and can become pregnant again. There are two significant events that must take place during the postpartum period, the uterus must return to a pre-pregnancy state and the hormones that control the estrous cycle must resume normal function and signal the ovaries to resume fertile ovulations. During the postpartum period, the cow has the highest nutritional demand of the year because she starts lactating and reaches peak lactation at about 60 days postpartum, the uterus undergoes involution, and she resumes cycling and becomes pregnant for the subsequent calving season.

The uterus decreases in weight from 20-25 pounds at parturition to less than one pound by 25 days postpartum. During the first few days after parturition the uterus is normally thick-walled and tonic, but if infection is present, it may have a thinner wall and be atonic. Uterine involution is not affected by suckling and is similar in beef and dairy cattle. In the normal process, the upper two thirds of the caruncle undergoes necrosis due to loss of blood supply – the necrotic tissue is sloughed and expelled as part of the uterine locia. The uterus usually is near the nonpregnant size by three to four weeks postpartum, with the previously pregnant horn still slightly larger.¹ Parturition is followed by an approximately three-week long period when conception is not possible. Estrus and ovulation seldom occur together during this period and, if fertilization

occurred and the embryo reached the uterus, placentation would be virtually impossible. Kiracofe reports that the period of no fertility is followed by two to three weeks when fertility is possible, but not optimal. Uterine involution appears not to be a barrier to fertility after five to six weeks postpartum in cows unless delayed by inflammation or infection.¹

Anestrus (lack of estrous- or heat-cycles) is the major component of postpartum infertility and is affected by several minor factors: season, breed, parity, dystocia, presence of a bull, and carryover effects from the previous pregnancy as well as two major factors: suckling and nutrition.² In the non-suckled cow, the first ovulation can occur as early as seven to ten days post-calving. In suckled cows, the first ovulation is delayed to 30 days or more postpartum. Conception success is lower up to 40 days after parturition because the function of the first CL as measured by serum progesterone level is less than subsequent cycle, and signs of estrus are reduced.² Normal CL function during an early postpartum estrous cycle can be obtained by pre-treating with a progestin.³

Major factors affecting postpartum anestrus:

- Suckling has the most dramatic effect on postpartum interval. Cows that have their calves weaned at birth have shorter postpartum interval than do cows that are suckled. If calves are weaned at some time after birth but before estrous cycles begin (usually between 20 and 40 d after calving), cows will return to estrus in a few days.
- Postpartum intervals can be decreased by complete weaning, short-term weaning (48 h), or partial weaning (restricting suckling to short periods of time each day).
- A cow's nutritional demand is the highest of the year during the postpartum period primarily due to the demands of lactation, which peaks at about 60 days after calving. Quantity and quality of feed intake, nutrient reserves stored in the body, and competition for nutrients from other body functions besides reproduction (lactation, growth, etc.) are all factors that impact the length of time required to resume cycling. Body weight and condition score, are good indicators of energy status and rebreeding performance after calving. Inadequate pre-calving and/or post-calving energy or protein nutrition lowers pregnancy rates and extends the length of postpartum anestrus.

Minor factors affecting postpartum anestrus:

- Cows calving from late spring to early fall have shorter postpartum interval than cows calving from late fall to early spring.
- Breed effects on postpartum interval exist they may be confounded with amount of milk produced or appetite and feed intake.
- Post-partum anestrus lasts an average of 55-65 days for mature cows in good body condition (longer if low body condition).⁴⁻⁸ But, average postpartum length means that about 50% of cows in good BCS have not resumed fertile cycles by 55-65 days (add about 20 days to achieve 90% cycling)
- Post-partum anestrus lasts an average of 80 to 100 days for first-calf heifers in good body condition (100 to 140 days for 90% of first-calf heifers to resume fertile cycles).^{9,10}

- Dystocia will increase the length of postpartum anestrus. The adverse effects of dystocia can be overcome at least partially by providing early obstetrical assistance.
- Presence of a bull decreases the length of postpartum anestrus.
- Cows that produce fast-growing, larger calves (or calves consuming more milk) will have a longer period of postpartum anestrus.

Reproduction: What do we want?

What do we want from reproduction? Basically, we should expect 95% of cows to become pregnant in a controlled breeding season that is 65 to 90 days long. And, the herd should be "front-end loaded", in that well over half of the cows should get pregnant in the first 21 days and almost all of them in the first two cycles. And finally, I want every year to be good - I want to get reproductive momentum working in the producer's favor.

Reproduction: What are the constraints?

There are several reproductive constraints that cannot be changed. The first is that when a fertile cow and a fertile bull mate, about 60-70% of the time a viable calf will be born 9 months later.¹¹ About 30% of the time following a fertile mating, even though fertilization takes place and an early embryo is formed, because of the complexity of mammalian reproduction, the embryo is imperfect and will die within the first 14 days. When an embryo is lost before 14 days, the cow will cycle back in heat about 21 days after her last heat and she will ovulate a fertile egg and have another 60-70% chance of becoming and maintaining a pregnancy.11

Recognizing that there are 283 days of gestation and 365 days in a year, that means there is 82 days from the time a cow calves to the time she needs to become pregnant again if she is going to calve on the same date next year.

Reproduction: What is possible/optimal?

The very best herd reproductive performance I can expect would be depicted with a histogram where 65% of the herd becomes pregnant in the first 21 days. This would indicate that nearly every cow is cycling at the start of the breeding season and the bulls are able to successfully mate



the cows. Of those cows that are actually fertile but failed to maintain a pregnancy from the first mating, they will usually come around and cycle again and we will get 65% of them the next estrus – that results in another 23% of the herd becoming pregnant in the second 21 days of the breeding season. And finally, if fertile cows have not settled after two matings, I will pick up 65% of the remaining cows in the third 21 days of the breeding season, leaving the herd with 5% open cows after a 65 day breeding season.

In addition to the benefit a selling older (and thereby heavier) calves at weaning because of excellent herd reproductive performance, a front end-loaded herd is likely to have the same calving distribution next year because of the effect of momentum in beef herd reproduction. The way I think about creating reproductive momentum in beef herds is to develop the heifers so that all replacements calve early so that they have plenty of time post-partum before the start of their next breeding season. This results in the first-calf heifers all cycling early so they have three chances to get pregnant for their second calf – and the momentum just starts going. If you can get the scenario of positive momentum going and then protect it, it will be a self-fulfilling, positive feedback loop to make it easier to have a successful breeding season each year.

Modeling the effects of postpartum anestrus length

The percent of cows calving in the first 21 days of the calving season is higher for herds with shorter (average 50 days) rather than longer (average 80 days) length of postpartum anestrus.¹² Earlier calving cows produce heavier calves at weaning as demonstrated by a model that calculated weaning weights that averaged 65 lbs. heavier for herds with 50 day average duration of postpartum anestrus compared to herds with 80 day average duration of postpartum anestrus.¹²



Importance of Heifer Fertility at First Breeding on Herd Reproductive Momentum

Because post-partum anestrus lasts 80 to 100 days for first-calf heifers (or longer if thin), heifers must calve before the cows to be cycling at the start of their second breeding season. Some cattle production experts believe that cow-calf producers should breed replacement heifers before mature cows, sometimes referred to as providing a heifer lead time. While having a 42 day heifer lead time resulted in greater pregnancy success and average weaning weight, approximately two-thirds of the improvement in outcomes was realized when with a heifer lead time of only 21 days.¹³



Conclusions from model (Assumption of mature herd PPA \leq 60d): If first-calf heifer PPA is:

- 60 days: 7-14 day lead-time is sufficient
- 70 days: 21 day lead-time is sufficient
- 80 days: 28-35 day lead-time is sufficient
- 90 days: 42 day lead-time is sufficient
- 100 days or longer: 42 day lead-time is needed to moderate negative effect on re-breeding

Font-End Loaded Herds Are More Resilient When "Bad Things" Happen

- If cows calve in thin body condition, and PPI is prolonged by 10 days to 65-75 days cows that calved in the first 21 days will still be cycling at bull turn-out
- I am most confident in the breeding ability of the bull battery at the time of bull turn-out. If a bull(s) goes bad after two to three weeks in the breeding pasture only 30-40% of the cows still need to be bred and the rest of the bulls can easily cover the number of cycling cows

What Kills Momentum?

- Heifers that don't calve ahead of cow herd
- First calf heifers that calve in thin body condition (PPI can be longer than 100 days)
- Cows that calve in thin body condition (PPI can be longer than 55-65 days)
- Bulls (yearlings or mature) that fail to successfully breed cows in heat
- Disease that ends pregnancy

Methods to Determine Duration of PPA

- KAMAR[®] ESTROTECTTM or other heat detection aid
- Chin-ball marker on gomer-bull
- Remote behavior monitoring (new tech)
- Evaluate all cows or sub-sets of first-calf heifers and mature cows

Summary: Duration of Postpartum Anestrus (PPA)

- Duration of PPA is important to herd reproductive efficiency and age (weight) of calves at weaning
- Mature cow herds with average PPA of 50 days (few cows with PPA >70 days) are positioned for positive momentum (little benefit for lower PPA)
- Mature cow herds with average PPA of 60 days have some cows with PPA >70 days potential for some improvement
- Mature cow herds with average PPA of 70 days or longer will not maintain momentum and will have fewer cows pregnant in a 65-70 day breeding season
- Individual cows with more than a 70 day PPA are more likely to be open
- First-calf heifer cohorts with average PPA of 60 days or less (assuming they calved early) are positioned to contribute to positive momentum for the herd
- First-calf heifer cohorts with average PPA of 70 should be bred to calve ahead of cows or they will contribute to negative momentum and an unacceptable % will be open after 65-70 days of breeding
- Determining duration of PPA between herds and over time in the same herd are potential veterinary services
- Determining duration of PPA for first-calf heifers has additional value
- Extended duration of PPA should be a rule-out when investigating lower-than-desired reproductive efficiency

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