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INVOLUTION OF THE UTERUS OF DAIRY CATTLE

E.P. Call

Summary

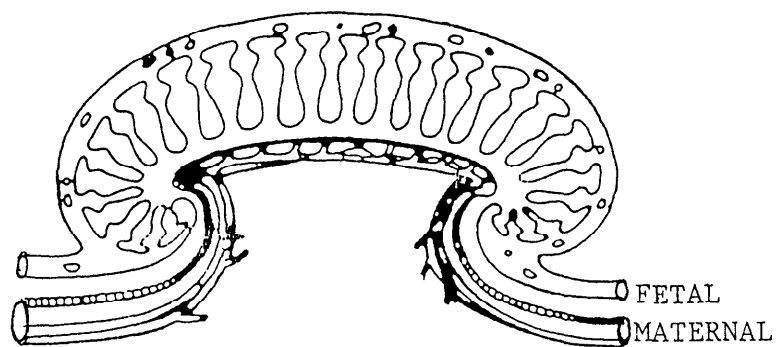
The rate of involution of the bovine uterus is remarkable. By 20 days after calving, tissue sloughing and hemorrhaging have ceased, and the size of the uterus has been reduced by more than 80%. By 40 days, the uterus has completely involuted except for isolated pockets of leukocytes. Any reproductive or metabolic disorders around calving will delay involution. A preventive herd health program (PHHP) including a reproductive examination of cows within a month after calving will pay dividends in improved reproductive performance. With a sound PHHP, servicing cows on the first heat after 42 days fresh is recommended.

Introduction

Few feats of nature are more phenomenal than the return to normalcy of the cow's uterus after calving. Even though the uterus is an internal organ, managers have an appreciation for the traumatic changes that occur during birth and the necessary sloughing and tissue repair required during the postpartum period. Since reproductive goals of the dairy suggest a 12-mo calving interval, the next pregnancy must be established by 85 days postpartum.

The Pregnancy

The fetal membranes or placenta—an outgrowth of the embryo—is detectable by 15 days after conception using ultrasonography and completely fills both horns of the uterus by 30 days, when it may be palpated per rectum. Between 30 and 40 days, the membranes commence to attach to the small raised structures known as caruncles. About 120 caruncles line the uterus, and 45 to 70 become functional during pregnancy.



THE BOVINE PLACENTOME

Figure 1. The bovine placentome is composed of an interlocking mass of maternal (caruncle) and fetal (cotyledon) tissue. Adapted from Bearden and Fuquay.

As the fetal membranes grow over the caruncles, fetal blood vessels (villi, referred to as cotyledons) penetrate into the caruncle and come into close contact with maternal blood vessels (Figure 1). As pregnancy progresses, these structures, known as placentomes, are stimulated to grow rapidly, and those nearest the fetus become 4 to 5 in. in diameter.

During the first month of gestation, the embryo is nourished by secretions from the uterine glands, known as uterine milk. As placentomes are established, nourishment is by diffusion of nutrients across the tissue barrier between maternal and fetal blood vessels. The exchange of blood per se does not occur. As gestation progresses, the fetal-maternal components of the placentome become tightly interlocked.

Parturition or Calving

At the moment of birth, the umbilical cord ruptures, and blood pressure within the placenta drops, allowing the fetal blood vessels to collapse. The cotyledonary villi loosen, allowing the placenta to be delivered, except in cases when it is retained. As the placenta detaches, maternal blood vessels are exposed, resulting in hemorrhage that may persist for several days.

Involution and Repair

An understanding of the task of regression or involution may be realized simply by viewing the cotyledons on the delivered placenta. The enlarged caruncles of the uterus remain intact and must undergo tremendous sloughing and reestablishment of the epithelial layer. Evidence for this repair is noted for about 2 wk by discharges that range from bloody to yellowish and purulent. During this period, the vaginal discharge or "lochia" is sometimes mistaken for uterine infection.

By 3 wk postpartum, the sloughing of necrotic tissue and hemorrhaging have ceased. The epithelial layer is being established by the outgrowth of cells from the uterine glands. As noted in Figure 2, both the weight of the uterus and diameter of the previously pregnant horn have decreased more than 80% during this 3-wk period. Rectal palpation at this time will detect the previous horn of pregnancy and any ovarian activity. In most dairy cows, a new corpus luteum has formed by 20 days. In the normal cow, the uterus will be void of accumulated fluids, even though the size of the uterus will continue to regress.

Grossly, both weight and size have become static by 40 days, as noted in Figure 2, with no discernible changes thereafter. The uterine epithelium has been completely repaired, and the environment appears healthy. Microscopically isolated pockets of white blood cells (leukocytes) may persist in the lining for indeterminant periods of time. The cause and effect of this condition remain obscure.

Factors Affecting Involution

Although season of calving has some effect on the rate of involution, the only significant delay is seen in cows calving when ambient temperature exceeds 90°F. Parity or

age at calving favors involution in first-calf heifers by 1 wk. As would be expected a retained placenta delays uterine involution by about 7 days, regardless of the age at calving.

Any reproductive or metabolic disorder around calving time will have a depressing effect on uterine involution and other reproductive measures, such as days to first heat, conception to first service, and services per conception. Prophylactic measures to reduce the probability of reproductive disorders and/or the early diagnosis and treatment of problems through a preventive herd health program (PHHP) will pay dividends in the overall health, productivity, and profitability of the dairy herd.

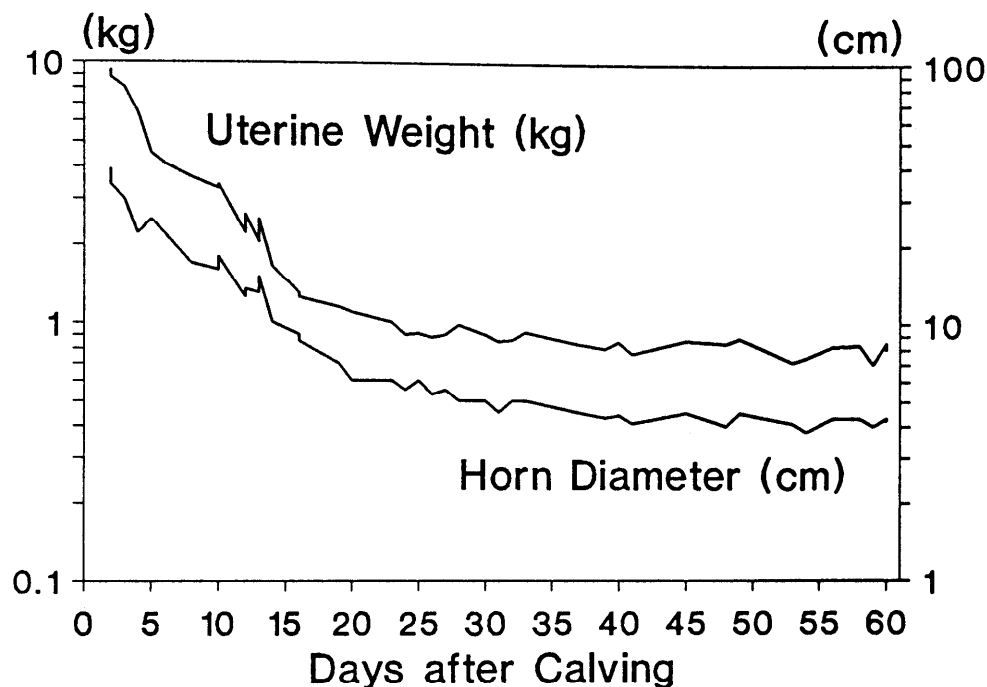


Figure 2. Rate of uterine involution as measured by weight (kg) and diameter of previously pregnant horn (cm). Adapted from Gier and Marion.

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