**PUERPERIUM**

**puerperium** is that period after the completion of parturition, including the third stage of labour, when the genital system is returning to its normal non-pregnant state. In the polyoestrous species (the cow, mare and sow) it is important that there should be a normal puerperium since it is the practice under most systems of husbandry to breed from individuals of these species fairly soon after they have given birth. Thus any extension of the puerperium may have a detrimental effect on the reproductive performance of the individual animal concerned.

**There are four main areas of activity in this period:**

1- The tubular genital tract, especially the uterus, is shrinking and atrophying due to tissue loss, thus reversing the hypertrophy that occurs in response to the stimulus of pregnancy. Myometrial contractions, which continue for several days after parturition, aid this process and help in the voiding of fluids and tissue debris; this is normally referred to as **involution**.

2- The endometrium and deeper layers of the uterine wall is restored.

3- There is a resumption of ovarian function in polyestrous species and a return to cyclical activity.

4- Bacterial contamination of the uterine lumen is eliminated.

**Involution**

The reduction in the size of the genital tract is called involution; it occurs in a decreasing logarithmic scale, the greatest change occurring during the first few days after calving. Uterine contractions continue for several days, although decreasing in regularity, frequency, amplitude and duration. The atrophy of the myofibrils is shown by their reduction in size from 750 to 400 μm on the first day to less than 200 μm over the next few days. The diameter of the previously gravid horn was halved by 5 days and its length halved by 15 days.

There is some dispute about when uterine involution is complete; the differences are probably only subjective. In six studies reported in dairy cattle the time taken for complete involution ranged from 26.0 to 52.0 days, whilst in three studies in beef cattle it was 37.7–56.0 days. The changes after 20–25 days are generally almost imperceptible.

The cervix constricts rapidly postpartum; within 10–12 hours of a normal calving it becomes impossible to insert a hand through it into the uterus, and by 96 hours it will admit just two fingers. The cervix also undergoes atrophy and shrinkage due to the elimination of fluid and the reduction in collagen and smooth muscle.

 **Factors influence the uterine involution.**

Many of the methods used to measure the rate of involution have been largely subjective and thus inaccurate; however, with the advent of transrectal ultrasound imaging, accurate measurements of uterine and cervical dimensions are now possible and there are some factors which influencing the Uterine involution:

1. *Age*. Most observers have found that involution is more rapid in primipara than pluripara.

2. *Season of year*. If there is any influence, involution is probably most rapid in spring and summer.

3. *Suckling vs. milking*; it may be a breed influence on the effect of time to return of cyclical ovarian activity.

4. *Climate*. There is evidence that heat stress can accelerate and inhibit the speed of involution.

5. *Periparturient abnormalities*. Dystocia, retained placenta, hypocalcaemia, ketosis, twin calves and metritis delay involution. Periparturient problems cause an overall delay in the completion of this process of 5–8 days.

6. *Delayed return to cyclical ovarian activity*. This inhibits involution.

**Restoration of the endometrium:** : Although placentation in the cow is considered to be of a non-deciduous type it is well recognized that during the first 7–10 days after calving there is usually a noticeable loss of fluid and tissue debris (**lochia)** which is usually yellowish brown or reddish brown; the volume voided varies greatly from individual to individual. Pluripara can void up to a total of 2000 ml.

* The greatest flow of **lochia** occurs during the first 2–3 days; by 8 days it is reduced, and by 14–18 days postpartum it has virtually disappeared.
* Normal **lochial discharge** does not have an unpleasant odour.
* The **lochia** are derived from the remains of fetal fluids, blood from the ruptured umbilical vessels and shreds of fetal membranes, but mainly from the sloughed surfaces of the uterine caruncles.
* Regeneration of the epithelium of the endometrium occurs immediately after parturition in those areas which were not seriously damaged and is complete in the intercaruncular areas by 8 days.
* Complete re-epithelialisation of the caruncle, which is largely derived from centripetal growth of cells from the surrounding uterine glands, is complete from 25 days onwards, although the stage at which complete healing occurs is variable.

**Return of cyclical activity (ovarian rebound)**

* An ovulatory follicular wave occurs periodically during pregnancy, with the emergence of follicles of up to a maximum of 6 mm in diameter. However, because of the prolonged period of inhibition during pregnancy, due to the continuous negative feedback effect of progesterone secreted by the corpus luteum and placenta, the pituitary is refractory postpartum, as demonstrated by a lack of response to the administration of gonadotrophin releasing hormone (GnRH) .This eventually recovers with time.
* As a result of the absence or low output of gonadotrophins the ovary is relatively quiescent and the cow is in the anoestrous phase, which may be prolonged in suckler and high-yielding cows.

In the immediate postpartum period both oestradiol and progesterone are low. The anterior pituitary is capable of releasing FSH during the first few days postpartum, so that with the sporadic release of endogenous GnRH there is a gradual and sustained rise in plasma FSH. After about 7–10 days, this is sufficient to result in the emergence of the first follicular wave; this occurs at about 4 days in dairy cattle, and 10 days in beef cattle.

* The ability of the pituitary to release luteinising hormone (LH) is much slower, for although the early release of GnRH causes some rise in LH, it quickly returns to basal levels.
* A dominant follicle may emerge from the first follicular wave, but ovulation will occur only if the dominant follicle produces enough oestradiol to stimulate adequate LH secretion in the form of one pulse per hour; if this occurs, then there is a first ovulation at 21 days in dairy and 31 days in beef cattle.

**Elimination of bacterial contamination**

* At calving, and immediately postpartum, the vulva is relaxed and the cervix is dilated thus allowing bacteria to gain entry into the vagina,and thereafter the uterus.
* Blood, cell debris and sloughed caruncular tissue provide an ideal medium for bacterial growth; however, **in most cases the bacteria do not colonise the uterus to produce a metritis/endometritis** (why?).
* The main mechanism involved in the elimination of the bacteria is phagocytosis by migrating leucocytes; however, persistence of uterine contractions, sloughing of caruncular tissue and uterine secretions all assist in the physical expulsion of the bacteria.
* Early return to cyclical activity is probably important since the oestrogen dominated uterus is more resistant to infection.