Parturition

It is essential for the veterinarian to be perfectly familiar with the normal course of parturition in domestic species in order to be able to differentiate between physiological and pathological birth.

Parturition is the process of delivery of the fully grown fetus on the completion of the normal pregnancy period.

Initiation of parturition

Parturition is one of the most fascinating of biological Processes .**The uterine musculature is the key component of labour, and the essential physiological change between gestation and birth is liberation of the contractile potential of the myometrium;** the factors involved in this transformation are neural, humoral and mechanical.

The humoral factors are most important is the reversal of those mechanisms which are necessary for the maintenance of pregnancy, in particular the removal of the progesterone block, which ensures that, during this phase of the animal's reproductive life, the myometrium is largely quiescent.

Parturition occurs as result of activation of the fetal hypothalamus–pituitary–adrenal axis.

There is still uncertainty about the mechanisms responsible for the activation of the fetal hypothalamus.

A number of theories have been proposed. These are:

- maturation of the fetal hypothalamus which might result in the development of critical synapses in the para ventricular nucleus, allowing an increase in fetal neuroendocrine function.
- ability of the hypothalamus to respond to the effects of placental hormones
- fetal stressors such as hypoxia, hyper-capnia, changes in blood pressure and blood glucose

During the last 20–25days of gestation, there is a dramatic rise in fetal cortisol concentrations, which reach a peak 2–3days before birth, thereafter declining 7–10 days postpartum. The source of the increase in fetal cortisol is the fetal adrenal, which is due to both an increase in the size of the organ in relation to total body weight, and an increase in its sensitivity to adrenocorticotrophic hormone (ACTH) , The raise an increase in corticotrophin-releasing hormone (CRH) in the fetal hypothalamus during the last10 days of gestation.

The rise in fetal cortisol stimulates the conversion of placental-derived progesterone to oestrogen by activating the placental enzyme 17α hydroxylase; this hydroxylates progesterone via androstenedione to oestrogen .

The consequences of the rise in oestrogens in the peripheral circulation are three fold :

Firstly: oestrogens have a direct effect upon the myometrium, increasing its responsiveness to oxytocin.

Secondly: they produce softening of the cervix by altering the structure of collagen fibers.

Thirdly : they act upon the cotyledon–caruncle complex to stimulate the production and release of prostaglandin F2α(PGF2α). The latter change is induced by the activation of the enzyme phospholipaseA2 stimulated by the decline in progesterone and rise in oestrogen. This enzyme stimulates the release of arachidonic acid from phospholipids, so that under the influence of the enzyme prostaglandin synthetase, PGF2α is formed.

Prostaglandins play a key role in initiating parturition; because of their molecular structure they are soluble in fat and water so that they readily pass from cell to cell via cell membranes or between cells in the extracellular fluid.

Prostaglandins have a wide range of actions which are :

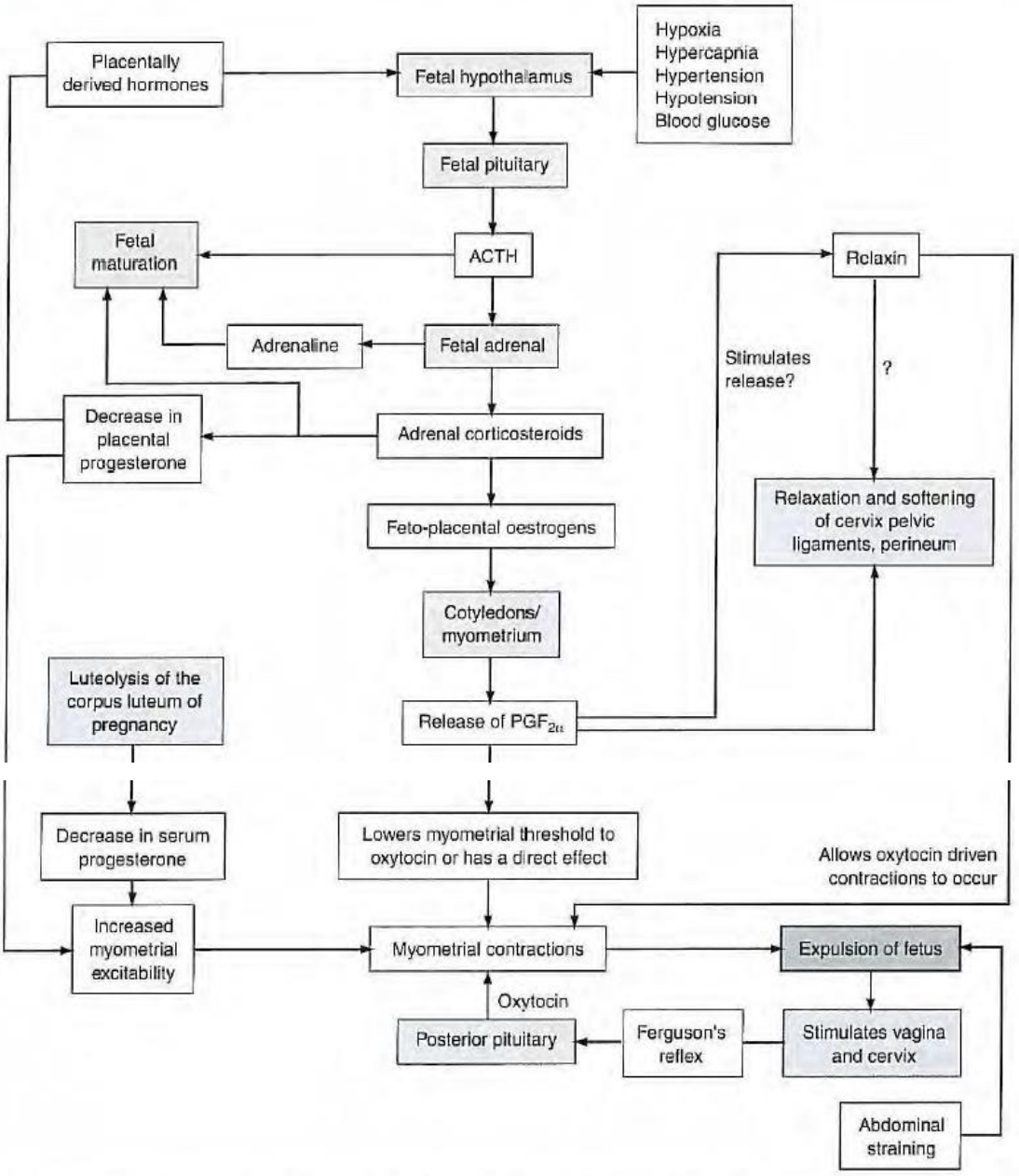
1- they cause smooth muscle contraction.
2- Luteolysis (regression of CL in ovary).
3- softening of cervical collagen .
4- Stimulating smooth muscle cells to develop special areas of contact called gap junctions, thereby allowing the passage of electrical pulses and ensuring coordinated contractions.

PGF2is considered to be the intrinsic stimulating factor of smooth muscle cells, and thus its release is important in initiating myometrial contractions.

The effect of these contractions is to force the fetal lamb towards the cervix and vagina where it will stimulate sensory receptors and initiate Ferguson’s reflex, with the release of large amounts of oxytocin from the posterior pituitary.

Oxytocin will stimulate further myometrial contractions and the release of PGF2 from the myometrium. Hence both these hormones, together with uterine contraction, seem to work as a positive feedback system of increasing magnitude, thus stimulating further uterine contractions and consequent expulsion of the fetus.

Other important changes which are brought about by the endocrine events of parturition have been observed. For instance, maturation of the fetal lamb's lungs, especially the production of alveolar surfactant, is stimulated by cortisol, as are many other changes in fetal function and structure that enable the lamb to survive after birth.



Fetal Hypothalamus (CRH) ⟹ fetal pituitary gland (ACTH) ⟹ fetal adrenal cortex (cortisol) ⟹ placenta (estrogen) ⟹ uterus (prostaglandin) ⟹ maternal pituitary gland (oxytocin).