

PLACENTAL HORMONE

The placenta secretes several hormones either identical to, or with biologic activity similar to, hormones of mammalian reproduction.

1. Equine Chorionic Gonadotropin (eCG),
2. Human Chorionic Gonadotropin (hCG),
3. Placental Lactogen (PL) and
4. Protein B.

EQUINE CHORIONIC GONADOTROPIN:

1. The hormone eCG (PMSG) was discovered when blood from pregnant mares produced sexual maturity in immature rats.
2. eCG is a glycoprotein with alpha and beta subunits similar to LH and FSH but with a higher carbohydrate content, especially sialic acid.
3. The higher sialic acid content appears to account for the long half life of several days for eCG.
4. Thus a single injection of eCG has biologic effects on the target gland for more than a week.

EQUINE CHORIONIC GONADOTROPIN

5. The equine uterus secretes this placental gonadotropin.

6. The endometrial cups are the source for the eCG.

7. The cups that are formed at about day 40 of pregnancy persist until day 85 of pregnancy.

8. eCG has both FSH and LH biological actions, with the FSH action being dominant.

9. eCG circulates in the blood of pregnant mares and is not excreted in urine.

10. The secretion of eCG stimulates development of ovarian follicles.

11. Some follicles ovulate, but most become luteinized follicles, due to the LH like action of eCG.

12. These accessory corpora lutea produce progesterone, which maintain pregnancy in the mare.

13. eCG was one of the first commercially available gonadotropins used to induce superovulation in farm animals.

Human Chorionic Gonadotropin

1. The glycoprotein hCG consists of alpha and beta subunits with a molecular weight of 40,000 daltons.
2. The alpha subunit has 92 amino acids and two carbohydrate chains.
3. The alpha subunit of hCG is similar to the alpha subunits of human, porcine, ovine and bovine LH.
4. The beta subunit has 145 amino acids and five carbohydrates chains.
5. hCG is primarily luteinizing and luteotrophic and has little FSH activity.
6. The syncytiotrophoblastic cells in the primate placenta synthesize hCG of the placenta of primates.
7. hCG is found in both blood and urine.
8. Its presence in the urine in early pregnancy is the basis of the various laboratory tests for human pregnancy.
9. It is detected in the urine 8 days after conception by sensitive immunoassays.

PLACENTAL LACTOGEN:

1. Placental lactogen is a protein with chemical properties similar to prolactin and growth hormone.

2. Its molecular weight is 22,000 to 23,000 daltons in the ovine with 132 amino acids.

3. Placental lactogen is isolated from placental tissue but cannot be detected in the serum of the pregnant animal until the last trimester of pregnancy.

4. Placental lactogen is more important for its growth hormone properties than its prolactin properties.
5. It is important in regulating material nutrients to the fetus and possibly is important for fetal growth.
6. Placental lactogen may play a role in milk production because the level is higher in dairy cows (high milk producers) than in beef cows (low milk producers).

PROTEIN B

1. The bovine conceptus produces numerous signals during early pregnancy.
2. Currently only one protein from placental tissue has been partially purified- pregnancy-specific Protein B (bPSPB).
3. The physiologic action of protein B may be involved in preventing destruction of the corpus luteum in early pregnancy of the cow or ewe.
4. This placental hormone has the potential to be the first reliable hormonal pregnancy test for cattle.

PROSTAGLANDINS:

1. Prostaglandins first isolated from accessory sex gland fluids, were termed prostaglandins because of their association with the prostate gland.
2. Almost all body tissues secrete them.
3. All prostaglandins are 20-Carbon unsaturated hydroxy fatty acids with a cyclopentene ring.
4. Arachidonic acid, an essential fatty acid, is the precursor for prostaglandins most closely associated with reproduction, mainly PGF₂α and prostaglandin E₂ (PGE₂).
5. Most prostaglandins act locally at the site of their production on a cell to cell interaction and therefore do not conform exactly to the classic definition of a hormone.

PROSTAGLANDINS

6. Unlike other humoral agents, prostaglandins are not localized in any particular tissue.
7. They are transported in the blood to act on a target tissue away from the site of production.
8. Some forms never appear in the blood, whereas others are degraded after they circulate throughout the liver and lungs.
9. PGF₂α is the natural luteolytic agent that ends the luteal phase (Corpus luteum) of the estrous cycle and allows for the initiation of a new estrous cycle in the absence of fertilization.
10. It is particularly potent in ending early pregnancy.

11. Prostaglandin may be considered hormones, which regulate several physiologic and pharmacodynamic phenomena, such as contraction of smooth muscles in the reproductive and gastro intestinal tracts, erection, ejaculation, sperm transport, ovulation, formation of the corpus luteum, parturition and milk ejection.
12. An increase in estrogen, which promotes myometrium growth in the uterus stimulates PGF₂α synthesis and release.
13. In pregnant animals, the developing embryo sends a signal to the uterus (maternal recognition of pregnancy), preventing luteolytic effects of PGF₂α.
14. The capacity of PGF₂α to induce luteolysis has been exploited for manipulating the estrous cycle and the induction of parturition.