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Paper: IV, Group – A

Topic: The Hormonal Control of Lactation

THE HORMONAL CONTROL OF LACTATION

Lactation:

Lactation is the secretion and yielding of milk by females after giving birth to the baby. The milk is produced by the mammary glands, which are contained within the breasts.

In humans the process of feeding milk is also called *breast feeding* or *nursing*. Newborn infants often produce some milk from their own breast tissue, known colloquially as witch's milk.

Galactopoiesis is the maintenance of milk production. This stage requires prolactin. Oxytocin is critical for the *milk let-down reflex* in response to suckling. Galactorrhea is milk production unrelated to nursing. It can occur in males and females of many mammal species as result of hormonal imbalances such as hyperprolactinaemia.

The changes that the mammary glands undergo during pregnancy whereby they become adapted to the physiological function of lactation.

Fig; Breast-feeding; lactation A mother holding and breast-feeding her newborn baby.

Pregnancy and lactation:

The breasts, unlike most of the other organs, continue to increase in size after childbirth. Although mammary growth begins during pregnancy under the influence of ovarian and placental hormones, and some milk is formed, copious milk secretion sets in only after delivery.

During pregnancy the combination of estrogen and progesterone circulating in the blood appears to inhibit milk secretion by blocking the release

of prolactin from the pituitary gland and by making the mammary gland cells unresponsive to this pituitary hormone.

The blockade is removed at the end of pregnancy by the expulsion of the placenta and the loss of its supply of hormones, as well as by the decline in hormone production by the ovaries, while sufficient estrogen remains in circulation to promote the secretion of prolactin by the pituitary gland and so favour lactation.

For lactation to continue necessary patterns of hormone secretion must be maintained; disturbances of the equilibrium by the experimental removal of the pituitary gland in animals or by comparable diseased conditions in humans quickly arrest milk production.

Several pituitary hormones seem to be involved in the formation of milk, so that it is customary to speak of a lactogenic ("milk-producing") complex of hormones.

The stimulus of nursing or suckling supports continued lactation. It acts in two ways:

(i) It promotes the secretion of prolactin and

(ii) It triggers the release of another hormone from the pituitary gland—oxytocin, which causes the contraction of special muscle cells (myoepithelial cells) around the alveoli in the breast and ensures the expulsion of milk.

It is in this way that a baby's sucking at one breast may cause an increase in milk flow from both, so that milk may drip from the unsuckled nipple. About 30 seconds elapse between the beginning of active suckling and the initiation of milk flow.

The nerve supply to the mammary glands is not of great significance in lactation. Milk production is normal after the experimental severing of nerves to the normal mammary glands in animals or in an udder transplanted to the neck of a goat.

Milk ejection, or “the draught,” in women is readily conditioned and can be precipitated by the preparations for nursing.

Conversely, embarrassment or fright can inhibit milk ejection by interfering with the release of oxytocin; alcohol, also, is known to block milk ejection in women, again by an action on the brain.

Beyond its action on the mammary glands, oxytocin affects uterine muscle, so that suckling can cause contractions of the uterus and may sometimes result in cramp.

Since oxytocin release occurs during sexual intercourse, milk ejection in lactating women has been observed on such occasions.

Disturbance of oxytocin secretion or of the milk-ejection reflex, stops lactation just as readily as a lack of the hormones necessary for milk production, for the milk in the breast is then not extractable by the infant.

Many instances of nursing failure are due to a lack of milk ejection in stressful circumstances; fortunately, treatment with oxytocin, coupled with the reassurance gained from a successful nursing, is ordinarily successful in overcoming the difficulty.

Suckling can initiate lactation in non-pregnant women. This has been seen most often in women of childbearing age but also has been observed in older persons.

A baby who had lost his mother was suckled by his 60-year-old grandmother, who had borne her last child 18 years before. The grandmother produced milk after a few days and continued to nurse the baby until he was a year old and could walk.

Composition and Properties of Milk:

Milk can be regarded as an emulsion of fat globules in a colloidal solution of protein together with other substances in true solution.

Two constituents of milk—the protein casein and milk sugar, or lactose—are not found elsewhere in the body. Breastfeeding is particularly advantageous because of the nutritional, immunologic, and psychological benefits. Human breast milk is superior to modified cow's milk formulas, which may lack essential and beneficial components and are not absorbed as easily or as quickly by the infant.

Maternal breast milk provides vitamins, minerals, protein, and anti-infectious factors; antibodies that protect the infant's gastrointestinal tract are supplied, resulting in a lower rate of enteric infection in breast-fed than in bottle-fed babies. The bonding that is established through breast-feeding is advantageous to building the parent-child relationship.

The nutritional status of the mother is important throughout this period. The mother's daily caloric intake must increase significantly in order to replenish the mother's nutrient and energy stores.

The milk released from the breast when lactation starts differs in composition from the mature milk produced when lactation is well established.

The early milk, or colostrum, is rich in essential amino acids, the protein building blocks essential for growth; it also contains the proteins that convey immunity to some infections from mother to young, although not in such quantity as among domestic animals.

The human infant gains this type of immunity largely within the uterus by the transfer of these antibody proteins through the placenta; the young baby seldom falls victim to mumps, measles, diphtheria, or scarlet fever.

The growth of harmful viruses and bacteria in the intestines is probably inhibited by immune factors in human milk. After childbirth the composition of milk gradually changes; within four or five days the colostrum has become transitional milk, and mature milk is secreted 14 days after delivery.