LACTATION (SEM IV)

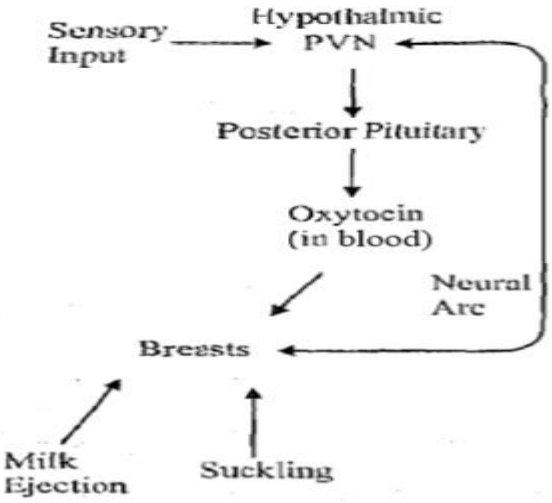
Lactation is a physiologic process which has profound relevance for both the mother and the newborn. It is the period following pregnancy when the woman nourishes a fully developed and a rapidly growing baby with breast milk.

A lactating woman secretes about 500 ml /day in the first month which increases to about 850 ml/day by the fifth month. On an average, a well-nourished lactating woman secretes about 850 ml/day.

A] Physiology of Lactation

Lactogenesis is the onset of copious milk secretion around parturition, triggered by a fall in plasma progesterone levels. Although colostrum is secreted after delivery (2-3 days), full lactation begins later. The first 2-3 days after delivery is a period of rapid lactation initiation, followed by the longer period of maintenance of lactation. This complex neuroendocrine process is facilitated by interplay of various hormones. Oxytocin and prolactin instigate the lactation process. Prolactin is responsible for milk production and oxytocin is involved in milk ejection from the breast.

A cyclic process of secretory activity, luminal distention and expulsion of milk into the duct system continues throughout lactation as directed by the suckling of the infant and the let-down reflex. Regular sucking stimulates the continuation of milk secretion. Milk removal from the breast is a product of coordinated interaction between suckling of the infant and let-down reflex of the mother, as depicted in the following figure:



[PVN= periventricular nucleus]

As the infant commences suckling, afferent iinpulses generated in the receptors in the areola travel to the brain where they stimulate the release of oxytocin from the posterior pituitary. Oxytocin travels through the blood stream to the breast where it combines with specific receptors on the myoepithelial cells, stimulating them to contract and force milk from the alveoli into the mammary ducts and sinuses.

B] Malnutrition - Effects on Milk and Effects on Mothers

1..Effect on milk

Milk is the sole source of nourishment for infants for upto 6 months or a year or even more. Therefore, the relationship between maternal nutritional status and lactation performance is important. Let us look into the effects of maternal undernutrition.

- **Volume**: A large healthy baby who can vigorously suck will induce and obtain much more milk from its mother than a small, sickly or preterm infant. These differences in yield may not be indicative of a in other's capacity for lactation. Milk production is a function of infant demand.
- Energy: In case of chronic undernutrition, association between postpartum weight loss and lower energy transfer may occur.
- Protein: Some studies show that the protein content of nlilk may be affected by chronic protein undernutrition. In some cases, the tyrosine content of milk was significantly lower. In lndian women, it was seen that the milk of malnourished mothers had more casein and less whey. By giving a high protein diet supplement, the whey:curd ratio could be increased.
- Fat: Fat content of inilk appears to be subject to variability as compared to other constituents. The average fat content in milk from well-nourished mothers tends to be higher than milk from less well-nourished mothers. This may have implications for the caloric intake of the infant. Supplementing the mother with adequate intake of energy, protein and fat helped to increase the fat concentration . When lactating women were fed a diet rich in PUFA, their milk also had a higher PUFA content. Providing mothers with fish oil supplements increased the n-3 fatty acid in milk. When caloric intake is severely restricted, fatty acid composition resembles that of the depot fat.
- Minerals: There appears to be no relationship between dietary intake and concentrations in milk for copper, iron or zinc.
- Vitamins: Although there are inter-individual variations in vitamin concentrations, diet and drug use by individual women influences vitamin composition in human milk. Vitamin D activity of human milk is influenced by maternal vitamin D intakeThe levels of water-soluble vitamins are more likely to reflect maternal dietary or supplement intake than most other ingested compounds.

2..Effects on Mother

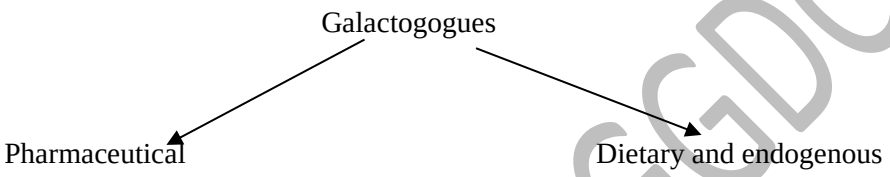
Successful breastfeeding requires adequate nutrition and rest. For adequate lactation, substrates must be available in sufficient quantities from the mother's diet or body stores laid down during pregnancy. I€ these are insufficient, some degree of subsidy from maternal body tissue can be expected. Among well-nourished women, weight loss can occur after childbirth, although this depends on their caloric intake and their physical activity. It is possible that changes in tissue composition may mask the changes in body weight.

C]Short note: Galactogogue

galactagogue, or galactogogue (from Greek: lacto: milk, + gogue;stimulation/ leading), is a substance that promotes lactation in humans and other animals. It may be synthetic, plant-derived, or endogenous.

Lactation is initiated with parturition, expulsion of the placenta, and falling progesterone levels in the presence of very high prolactin levels. Systemic endocrine control of other supporting hormones (estrogen, progesterone, oxytocin, growth hormone, glucocorticoids, and insulin) is also important. These hormonal changes trigger secretory activation (lactogenesis) of the mammary secretory epithelial cells, also called lactocytes. Prolactin secretion functions in a feedback system in which dopamine serves as a modulator. When dopamine concentration decreases, prolactin secretion from the anterior pituitary increases. Hence, galactogogues potentially decrease the dopamine levels and increase lactogenesis.

Types:



Pharmaceutical: Domperidone and metoclopramide are the most commonly used pharmaceutical galactogogues . Both are dopamine antagonists that increase prolactin secretion.

Dietary and endogenous galactogogue: These galactogogues include fenugreek, goat's rue, milk thistle (Silybum marianum), oats, dandelion, millet, seaweed, anise, basil, blessed thistle, fennel seeds, marshmallow, moringa leaf, shatavari, and torbangun among others. It is believed that, in general animal protein containing food stimulate lactogenesis. The bio active component of some food are held responsible for their lactogogue effect. A brief on their mode of action is given below:

Lead compound	Mechanism of action
Alkaloids	Help in letting down of milk.
Isoflavones	Increases milk yield as well as fat, protein and lactose percentage of milk.
Polyphenols	Improve milk yield, concentration of milk protein and ovulation rate.

Hormones such as Prolactin, somatotropin, cortisol, insulin, Thyrotropin Releasing Hormone(TRH) also play important role as endogenous galactogogues. Sucking reflex plays an important role in stimulating these endogenous factors, hence it is said that " sucking is the best galactogogue".