PHS 204

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Pharmacology

Gestation is the period of development during the carrying of an embryo or fetus inside viviparous animals.It is typical for mammals, but also occurs for some non-mammals. Mammals during pregnancy can have one or more gestations at the same time, for example in a multiple birth.

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

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. Since lactation ensues after a premature birth, it would appear that milk production is held back during pregnancy. The mechanism by which this inhibitory effect is brought about, or by which lactation is initiated at delivery, has long been the subject of an argument that revolves around the opposing actions of estrogen, progesterone, and prolactin, as studied in laboratory animals, goats, and cattle. 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.

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. To some degree, the role of the pituitary hormones adrenocorticotropin, thyrotropin, and growth hormone in supporting lactation in women is inferred from the results of studies done on animals and from clinical observations that are in agreement with the results of animal studies. Adrenal corticoids also appear to play an essential role in maintaining lactation.

The stimulus of nursing or suckling supports continued lactation. It acts in two ways: it promotes the secretion of prolactin (and possibly other pituitary hormones of value in milk formation), and it triggers the release of yet another hormone from the pituitary gland—oxytocin, which causes the contraction of special muscle 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, for 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 nonpregnant 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. Rarely, lactation has been reported to set in after operations on the chest; in such instances it is attributed to injury or irritation of the nerves in this region.

**Pregnancy and lactation**

A woman’s nutritional status before and during pregnancy affects not only her own health but also the health and development of her baby. If a woman is underweight before becoming pregnant or fails to gain sufficient weight during pregnancy, her chance of having a premature or low-birth-weight infant is increased. Overweight women, on the other hand, have a high risk of complications during pregnancy, such as high blood pressure (hypertension) and gestational diabetes, and of having a poorly developed infant or one with birth defects. Weight loss during pregnancy is never recommended. Recommended weight gain during pregnancy is 11.5 to 16 kg (25 to 35 pounds) for a woman of normal weight—slightly more for an underweight woman and slightly less for an overweight woman.

At critical periods in the development of specific organs and tissues, there is increased vulnerability to nutrient deficiencies, nutrient excesses, or toxins. For example, excess vitamin A taken early in pregnancy can cause brain malformations in the fetus. One important medical advance of the late 20th century was the recognition that a generous intake of folic acid (also called folate or folacin) in early pregnancy reduces the risk of birth defects, specifically neural tube defects such as spina bifida and anencephaly (partial or complete absence of the brain), which involve spinal cord damage and varying degrees of paralysis, if not death. For this reason, supplementation with 400 micrograms (0.4 milligram) of folic acid is recommended for all women who have a chance of becoming pregnant. Good food sources of folic acid include green leafy vegetables, citrus fruit and juice, beans and other legumes, whole grains, fortified breakfast cereals, and liver.