27.8A: Physiology of Lactation

Lactation is the secretion of milk from specialized glands (mammary glands) to provide nourishment to offspring.

Learning Objectives

• Outline the process of lactation

Key Points

• Lactation is a hallmark feature of female mammals.
• Lactation is under endocrine control. The two main hormones involved are prolactin and oxytocin.
• Lactogenesis, or the process of changes to the mammary glands to begin producing milk, begins during the late stages of pregnancy. The delivery of the placenta and the resulting dramatic reduction in progesterone, estrogen, and human placental lactogen levels stimulate milk production.
• Colostrum is the first milk a breastfed baby receives. It contains higher amounts of white blood cells and antibodies than mature milk and is especially high in immunoglobulin A. This immunoglobulin coats the lining of the baby’s immature intestines, helping to prevent pathogens from invading the baby’s system.

Key Terms

• witch’s milk: Witch’s milk or neonatal milk is milk secreted from the breasts of some newborn human infants of either sex. Neonatal milk secretion is considered a normal physiological occurrence and no treatment or testing is necessary.
• mammary gland: A gland that secretes milk for suckling an infant or offspring.
• **lactation**: 1. The secretion of milk from the mammary gland of a female mammal. 2. The process of providing the milk to the young, such as breastfeeding. 3. The period of time that a mother lactates to feed her young; the lactation period.

• **human placental lactogen**: A hormone closely associated with prolactin that is instrumental in breast, nipple, and areola growth before birth.

• **colostrum**: A form of milk produced by the mammary glands in late pregnancy and the few days after giving birth. Human and bovine colostrum is thick and yellowish. In humans, it has high concentrations of nutrients and antibodies, but it is small in quantity.

---

### Overview of Lactation

Lactation describes the secretion of milk from the mammary glands and the period of time that a mother lactates to feed her young. The process occurs in all female mammals, although it predates the origin of mammals.

In humans the process of feeding milk is called breastfeeding or nursing. The chief function of lactation is to provide nutrition and immune protection to the young after birth. In almost all mammals, lactation induces a period of infertility, which serves to provide the optimal birth spacing for survival of the offspring.

In most species, milk comes out of the mother’s nipples; however, the platypus (a non-placental mammal) releases milk through ducts in its abdomen. In only one species of mammal, the dayak fruit bat, is milk production a normal male function.

In some other mammals, the male may produce milk as the result of a hormone imbalance. This phenomenon may also be observed in newborn infants as well (for instance, witch’s milk).

Galactopoiesis is the maintenance of milk production. This stage requires prolactin and oxytocin.

### Preparation for Lactation

By the fifth or sixth month of pregnancy, the breasts are ready to produce milk. During the latter part of pregnancy, the woman’s breasts enter into the lactogenesis I stage. This is when the breasts make colostrum, a thick, sometimes yellowish fluid.

At this stage, high levels of progesterone inhibit most milk production. It is not a medical concern if a pregnant woman leaks any colostrum before her baby’s birth, nor is it an indication of future milk production.

At birth, prolactin levels remain high, while the delivery of the placenta results in a sudden drop in progesterone, estrogen, and human placental lactogen levels. This abrupt withdrawal of progesterone in the presence of high prolactin levels stimulates the copious milk production of the lactogenesis II stage.

When the breast is stimulated, prolactin levels in the blood rise and peak in about 45 minutes, then return to the pre-breastfeeding state about three hours later. The release of prolactin triggers the cells in the alveoli to make milk.
Colostrum

Colostrum is the first milk a breastfed baby receives. It contains higher amounts of white blood cells and antibodies than mature milk, and is especially high in immunoglobulin A (IgA), which coats the lining of the baby’s immature intestines, and helps to prevent pathogens from invading the baby’s system. Secretory IgA also helps prevent food allergies. Over the first two weeks after the birth, colostrum production slowly gives way to mature breast milk.

Lactation: A positive feedback loop ensures continued milk production as long as the infant continues to breastfeed.

LICENSES AND ATTRIBUTIONS

CC LICENSED CONTENT, SHARED PREVIOUSLY


CC LICENSED CONTENT, SPECIFIC ATTRIBUTION