

Faculty Name: Dr. Kumari Sushma Saroj
Department: Zoology
College: Dr. L. K. V. D College, Tajpur, Samastipur
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Topic: Structure of Mammary gland

Structure of Mammary gland

A mammary gland is an exocrine gland in humans and other mammals that produces milk to feed young offspring. Mammals get their name from the Latin word *mamma*, "breast". The mammary glands are arranged in organs such as the breasts in primates (e.g, humans and chimpanzees), the udder in ruminants (e.g., cows, goats, and deer), and the dugs of other animals (e.g., dogs and cats).

The mammary gland is a gland located in the breasts of females that is responsible for lactation or the production of milk. Both males and females have glandular tissue within the breasts; however, in females the glandular tissue begins to develop after puberty in response to estrogen release.

Structure

The basic components of a mature mammary gland are the *alveoli* lined with milk-secreting cuboidal cells and surrounded by myoepithelial cells. These alveoli join to form groups known as *lobules*. Each lobule has a *lactiferous duct* that drains into openings in the nipple.

The myoepithelial cells contract under the stimulation of oxytocin, excreting the milk secreted by alveolar units into the lobule lumen toward the nipple. As the infant begins to suck, the oxytocin-mediated "let down reflex" ensues and the mother's milk is secreted.

All the milk-secreting tissue leading to a single lactiferous duct is called a "simple mammary gland". In a "complex mammary gland" the entire simple mammary glands serve one nipple. Humans normally have two complex mammary glands, one in each breast, and each complex mammary gland consists of 10–20 simple glands.

Mammary epithelial cells extracellular matrix (ECM) which, together with adipocytes, fibroblast, inflammatory cells, and others, constitute mammary stroma.

Mammary epithelial ECM mainly contains myoepithelial basement membrane and the connective tissue. They not only help to support mammary basic structure, but also serve as a communicating bridge between mammary epithelia and their local and global environment throughout this organ's development.

Histology

A mammary gland is a specific type of apocrine gland specialized for manufacture of colostrum when giving birth. Mammary glands can be identified as apocrine because they exhibit striking "decapitation" secretion. Mammary glands are modified sweat glands.

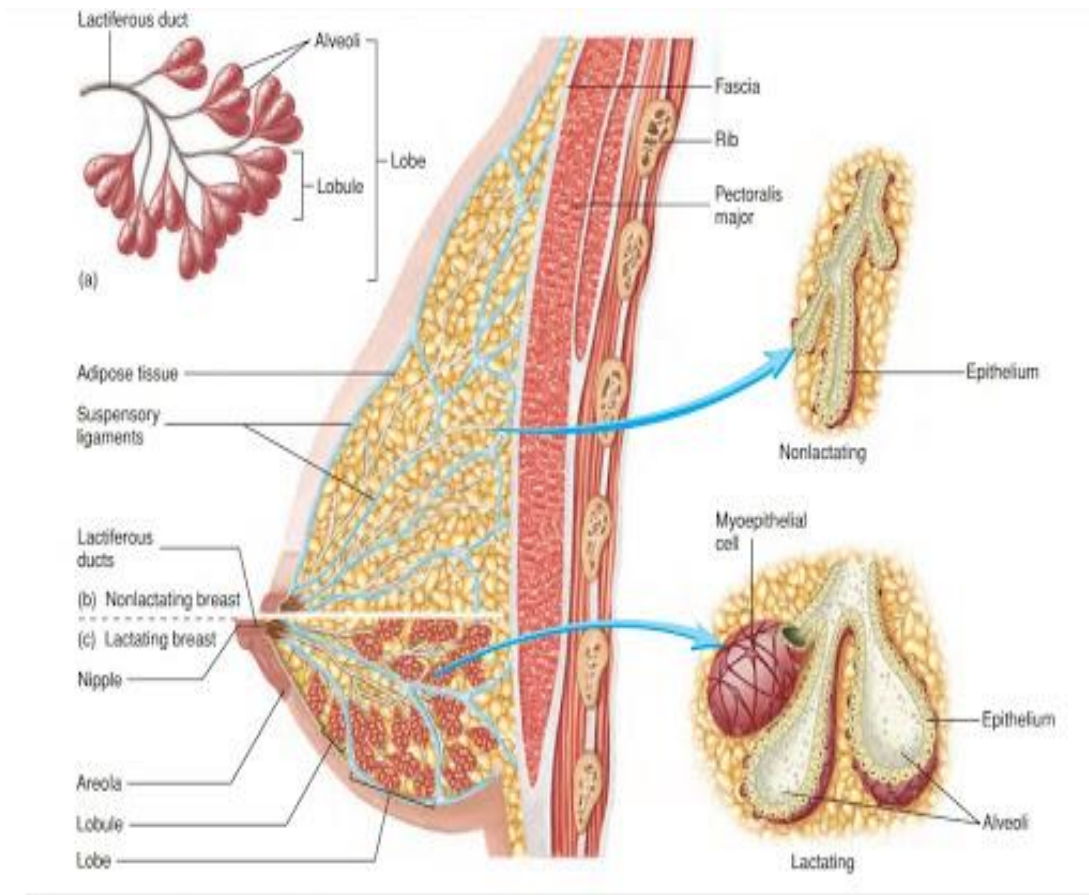


Fig. Anatomy of the Breast

Development

Mammary glands develop during different growth cycles. They exist in both sexes during embryonic stage, forming only a rudimentary duct tree at birth. In this stage, mammary gland development depends on systemic (and maternal) hormones, but is also under the (local) regulation of paracrine communication between neighboring epithelial and mesenchymal cells by parathyroid hormone-related protein (PTHrP).

This locally secreted factor gives rise to a series of outside-in and inside-out positive feedback between these two types of cells, so that mammary bud

epithelial cells can proliferate and sprout down into the mesenchymal layer until they reach the fat pad to begin the first round of branching.

At the same time, the embryonic mesenchymal cells around the epithelial bud receive secreting factors activated by PTHrP, such as BMP4. These mesenchymal cells can transform into a dense, mammary-specific mesenchyme, which later develop into connective tissue with fibrous threads, forming blood vessels and the lymph system.

Biochemistry

Estrogen and growth hormone (GH) are essential for the ductal component of mammary gland development, and act synergistically to mediate it. Neither estrogen nor GH is capable of inducing ductal development without the other.

The role of GH in ductal development has been found to be mostly mediated by its induction of the secretion of insulin-like growth factor 1 (IGF-1), which occurs both systemically (mainly originating from the liver) and locally in the mammary fat pad through activation of the growth hormone receptor (GHR).

In addition to IGF-1, other paracrine growth factors such as epidermal growth factor (EGF), transforming growth factor beta (TGF- β), amphiregulin, fibroblast growth factor (FGF), and hepatocyte growth factor (HGF) are involved in breast development as mediators downstream to sex hormones and GH/IGF-1.

During pregnancy, progesterone and prolactin are essential for mediating lobulo-alveolar development in estrogen-primed mammary gland tissue, which occurs in preparation of lactation and nursing.

Androgens such as testosterone inhibit estrogen-mediated mammary gland development (e.g., by reducing local ER expression) through activation

of androgen receptors expressed in mammary gland tissue and in conjunction with relatively low estrogen levels, are the cause of the lack of developed mammary glands in males.