TEAT ANATOMY

The development of the mammary gland starts early in the fetal life. Already in the second month of gestation teat formation starts and the development continues up to the sixth month of gestation. When the calf fetus is six months, the udder is almost fully developed with four separate glands and a medial ligament, teat and gland cisterns.

The development of milk ducts and the milk secreting tissue take place between puberty and parturition. The udder continues to increase in cell size and cell numbers throughout the first five lactations of the cow, and the milk production capacity increases correspondingly.

The only exit for the secretion from the mammary gland and the only means for the calf to receive milk are the teats. Teat size and shape are independent of the size, shape or milk production of the udder. Average size for the fore teats is about 6.6 cm long and 2.9 cm (in diameter, and for the rear teats is 5.2 cm long and 2.6 cm in diameter (Figure 1).

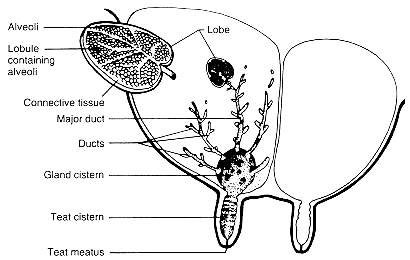


Figure 1 - Diagram of the duct system in one quarter of the mammary gland of the cow with a single lobe illustrated. Four quarters are fused into a single gland complex.

About 50% of all cows have supernumerary teats (extra teats). Some of these extra teats open into a "normal" gland, but many do not. Generally, they are removed before one year old. A pseudo-teat has no streak canal, and therefore, no connection to the internal structures of the gland.

The only orifice of the gland between internal milk secretory system and the external environment is called streak canal or teat meatus. The teat meatus is made up of three to five convex epithelial projections that lie close together to make a star-shaped slit. The projections are held closed by involuntary sphincter muscles around the orifice. The teat meatus prevents the escape of milk between two milkings and is the main physic protection against bacteria and foreign material, preventing intramammary infection. When a cow is milked, the sphincter muscles relax allowing the orifice to open. The teat meatus remains open for an hour or more after milking. This provides ready access of bacteria to the inside of the mammary gland. Post-milking germicidal teat dips are designed to help minimize the chance of bacteria gaining access to the mammary gland after milking. Keeping cows standing for a time after milking, such as providing access to fresh feed, also helps minimize teat end contamination before the teat meatus closes again. The rate of milking of a cow is partially dependent on the size of the teat meatus. Faster-milking cows usually have a teat meatus of larger diameter.

During the dry period (nonlactating period), the epidermal tissue lining the teat meatus forms a keratin plug that has antibacterial properties, this is an effective seal off the orifice.

**Secreting tissue and connective tissue**

The mammary gland consists of secreting tissue and connective tissue. The amount of secreting tissue, or the number of secreting cells, is the limiting factor for the milk producing capacity of the udder. It is a common belief that a big udder is related to a high milk production capacity. This is, however, not true in general, since a big udder might include a lot of connective and adipose tissue. The milk is synthesized in the secretory cells, which are arranged as a single layer on a basal membrane in a spherical structure called alveolus (Figure 1). An alveolus is the discrete milk producing unit and the diameter of each alveolus is about 50-250 mm. The lumen of the alveolus is lined by a single layer of secretory epithelial cells. Several alveoli together form a lobule, and each lobule contains 150-220 microscopic alveoli. Groups of lobules are surrounded by a connective tissue sheath and form a structure called lobe. The anatomy of this area is very similar to the anatomy of the lung. The milk, which is continuously synthesized in the alveolar area, is stored in the alveoli, milk ducts, udder and teat cistern between two milking. The most part of the milk (60-80%) is stored in the alveoli and small milk ducts, while the cistern contains 20-40%. However, there are relatively big differences between dairy cows when it comes to the cistern capacity.

A large proportion of ducts that are the tubing are presents in the mammary gland. These ducts allow the milk moves from the alveoli to the teat for milk removal. In addition, between the teat and the large ducts are open areas called teat cisterns. A teat cistern is a cavity where milk can collect between two milkings.

The gland cisterns or sinus lactiferous, also called the udder cistern, opens directly into the teat cistern. The gland cistern and teat cistern are separated by the annular fold. The gland cistern function for milk storage (holds 100-400 ml). The gland cistern varies greatly in size and shape. There are often pockets formed in the cistern at the end of the larger ducts.