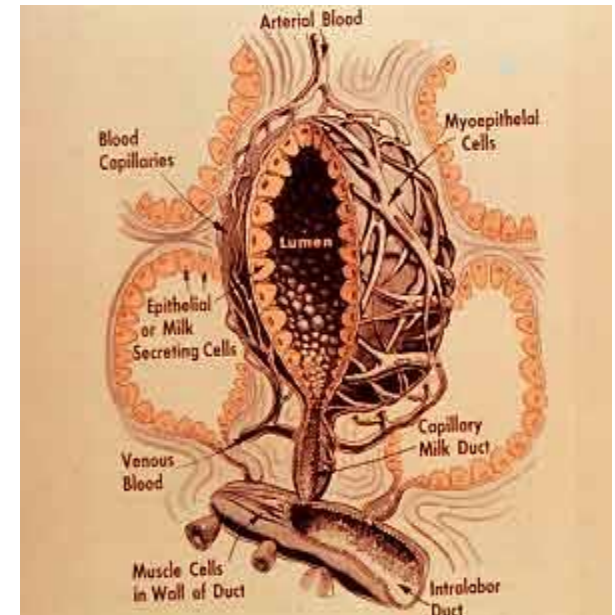


AF 1201

The Mammary System



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Mammary Gland

- Skin and Exocrine gland, common to all mammals
- Produce milk for the nourishment of young ones
- Located within the legs

Anatomy of Mammary Gland

- Located either side of legs
- Paired gland

Goat, sheep - one pair

Cattle, Buffalo - two pairs

Swine -12-14 pairs

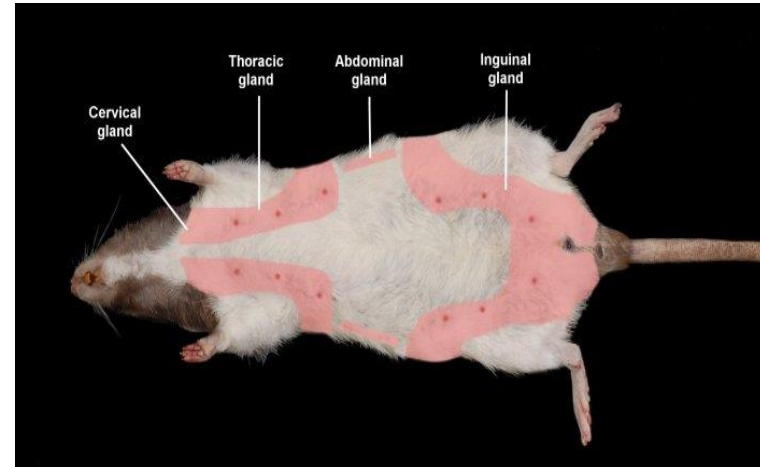


- **Has pendulous /flatten structure**

Rats - flat

Swine - tight

Cattle/Goat - pendulous



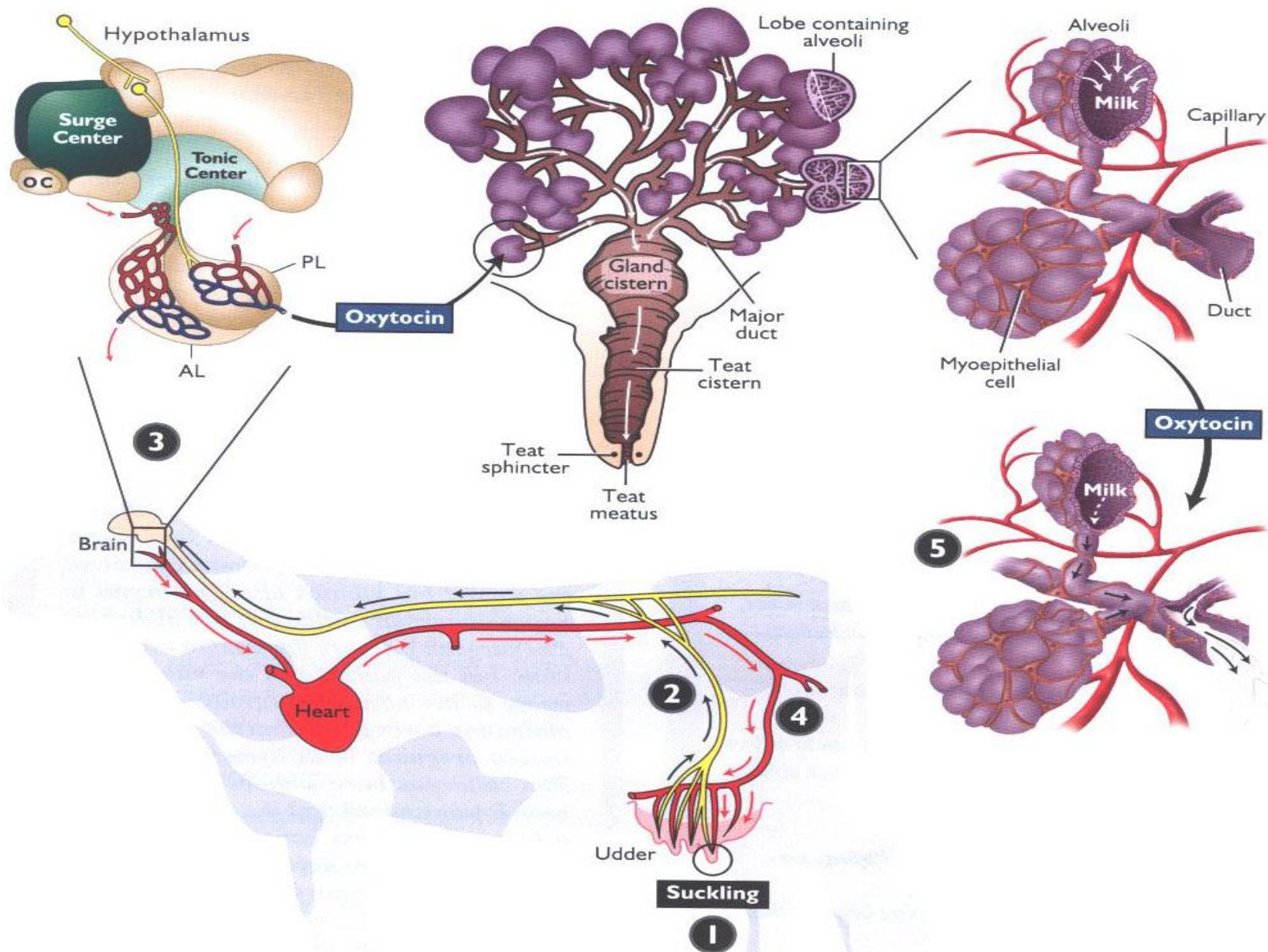
- Flatten mammary gland has simple structure

- Pendulous mammary gland has complex structure

Swine, Rabbit - Single MG

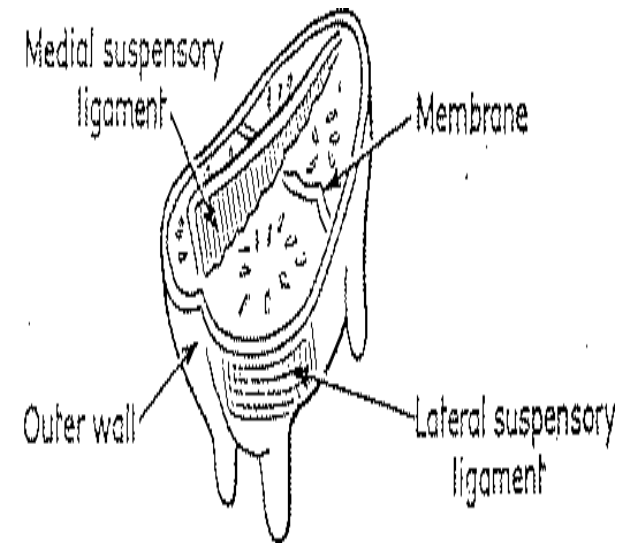
Cattle, Buffalo, Sheep, Goat - Udders

Figure 15-13. The Anatomy and Physiology of Milk Ejection



External features of the udder

- Has 4 quarters, divided into two parts by intra-mammary groove
- **Fore quarters** - contain 40% of udder
- **Hind quarters** - contain 60%
- Covered with hairs except teats
- Size & capacity varied based on
 - Age and lactation



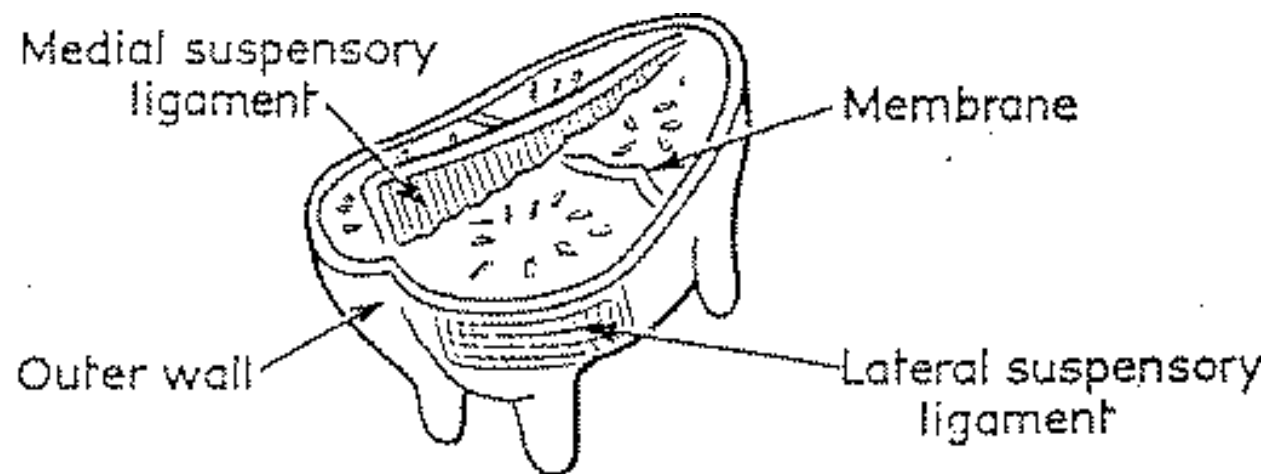
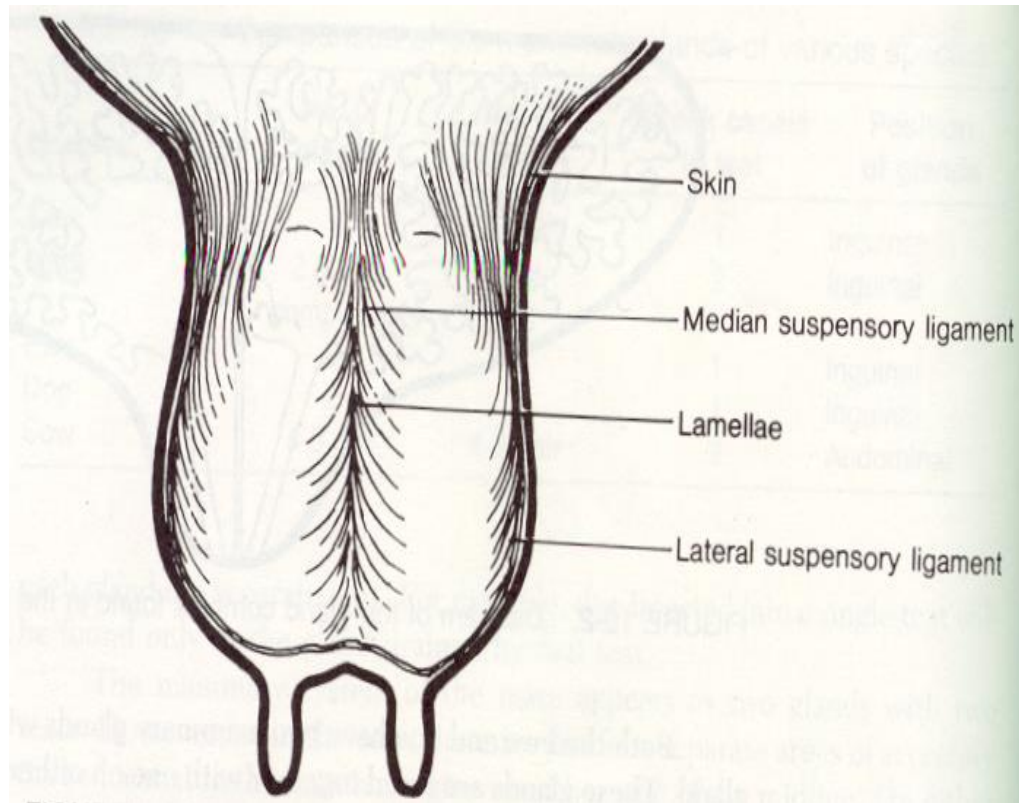
Internal Structure of the Udder

- **Medial Suspensory Ligament (MSL)**

- Separates udder into left & right
- Important for expansion of udder when it fills with milk

- **Lateral Suspensory Ligament (LSL)**

- Important to hold the udder to the body
- Not help in expansion of the udder

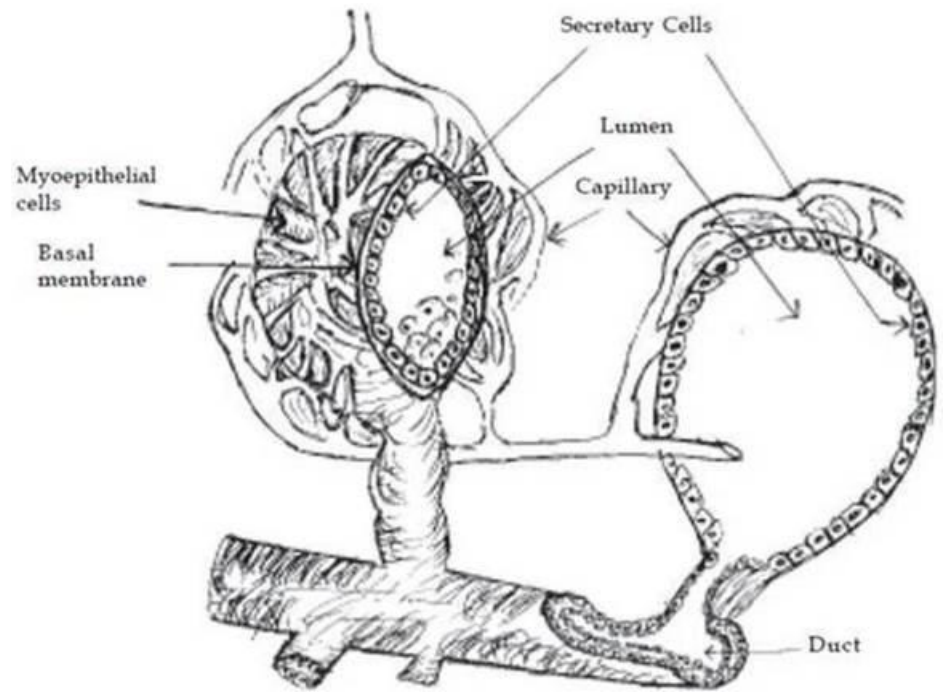


Udder

- Secretory tissue
- Duct System
- Supporting Structure (connective tissue)
- Blood, Nerves & lymph nodes

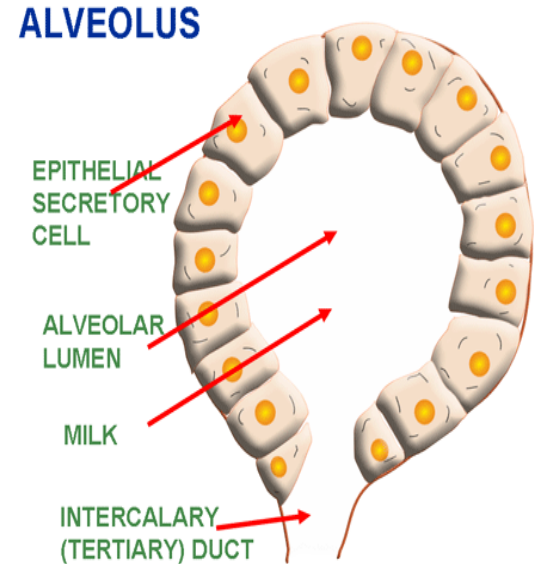
Structure of the MG

- **Secretory tissue (Paranchyma)**
 - Surrounded by connective tissue
 - Basic functional unit - **Alveolus**
 - Surrounded by one layer of cells called **alveolar epithelial cells**



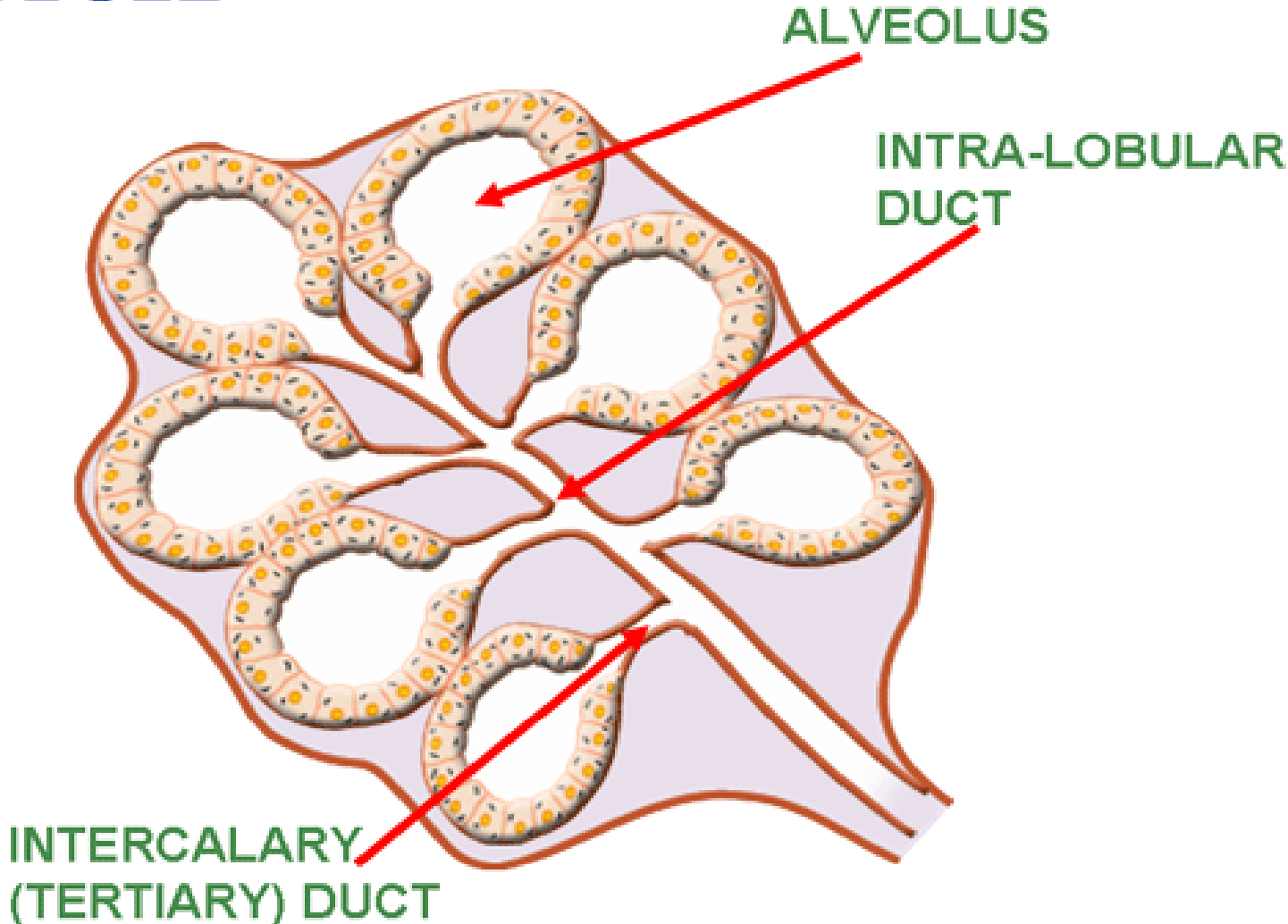
- **Alveolus**

- Basic secretory unit
- Lined by epithelial cells
- which synthesize and/or secrete



- Lipids - triglycerides & free fatty acids (FFA)
- Protein
- Lactose
- Minerals & Vitamins - Ca, P, K; Vits. A, B, C, D
- Water

LOBULE

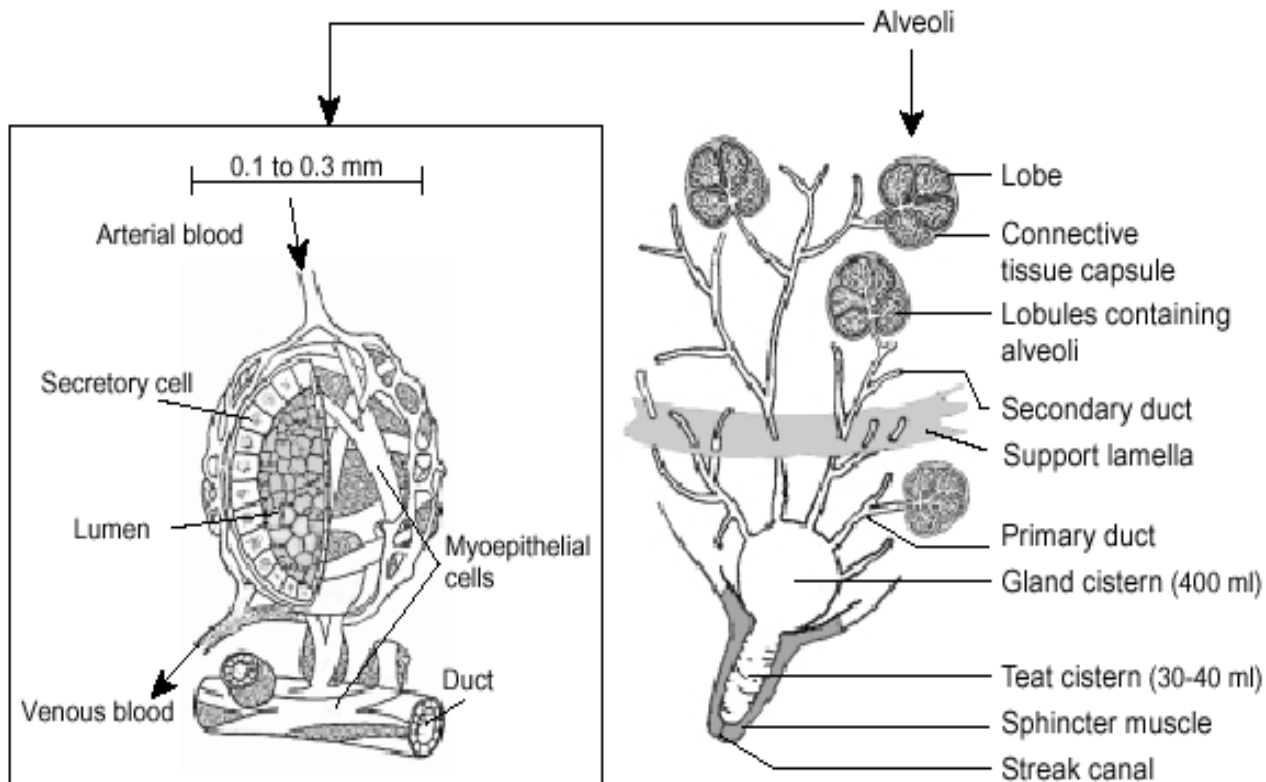


Alveolar Epithelial Cells

- Alveolar epithelial cells covered by myoepithelial (basket) cells
 - which attach to a basement membrane
 - that surrounded by arteries & nerves
- Enclose a cavity called **alveolus lumen**
- Secrete milk droplets into this lumen

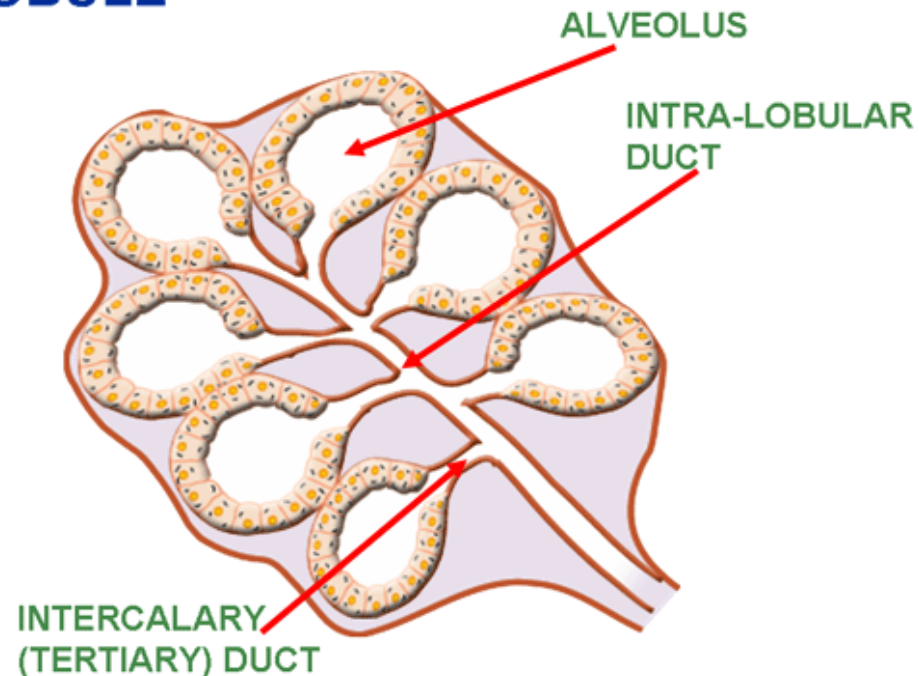
Myoepithelium

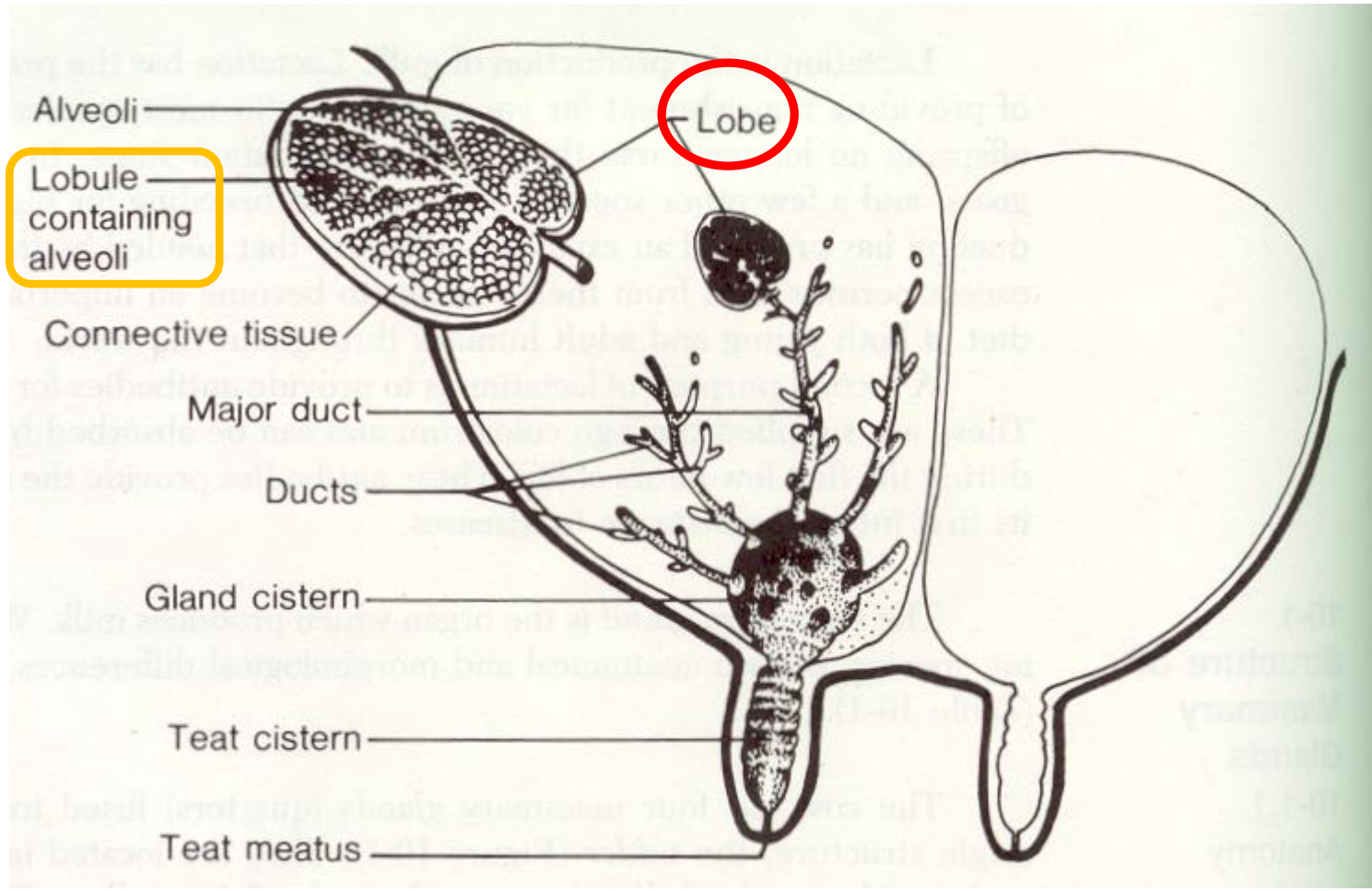
- Specialized cells
- Have oxytocin receptors
- Can contract which squeeze the alveolus



- Alveoli together form the cluster called **lobules**
- Each lobule has 150- 200 alveolus
- **Lobes** are made by gathering several lobules

LOBULE





Duct System

- Transportation of milk
- Begin at the level of alveolus called **terminal ductular**
- Combine all terminal ductular, it forms **lobular ductular** which drains milk from lobular
- **Lobar ducts** are formed from lobular ductular
- **Major ducts** are formed by lobar ducts which empty into a space located within gland called **gland cistern**

- Ducts are lined with myoepithelial cells
- Gland cistern is lined with two layer of myoepithelial cells
- Storage capacity = 100 - 400 mL of milk
- Gland cistern opens to the **teat cistern**
- b/w gland & teat cistern - annular fold
 - made up of circular muscles
 - Line with 2 layer of cells
 - Has several longitudinal & horizontal folds which create a very good environment for some pathogens

- Then, milk passes to a small passage called **teat/streak canal**
- Upper end of the teat canal, there are epithelial cells arranged to form a star like structure called **“Furstenberg Rosette”**
 - which secrete keratine for the prevention of MO to teat cistern
- At lower end, is a valve called **teat sphincter** which blocks the teat canal & prevents entering of pathogens into the teat canal

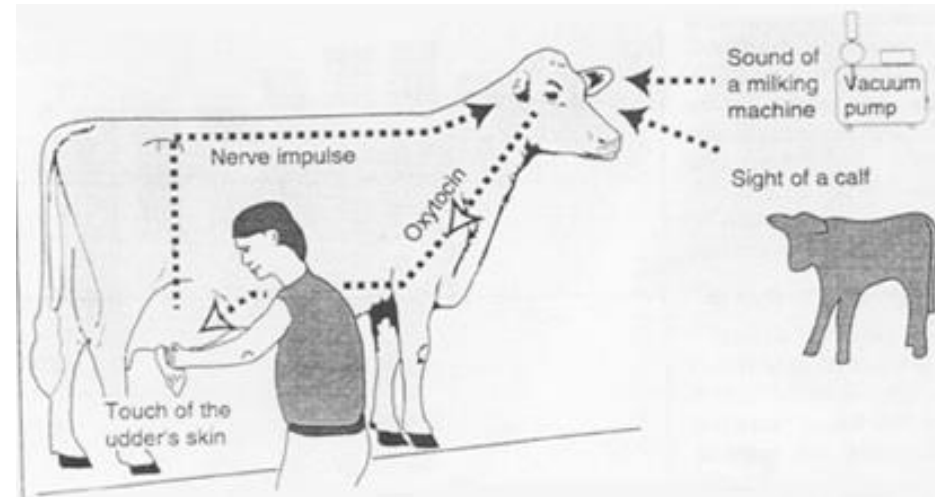
- Duct system
 - Store and transportation of milk
- Regular interval of milking
 - Important to prevent the back pressure (BP)
 - BP destroys the epithelium cells
 - Practice 12hr interval
 - Residual milk = 15-20%

Milk synthesis

- Milk synthesis depends on
 - no of secreting cells
 - supply of milk precursor
 - milking frequency
- No. secreting cells is dependent on
 - Genetics
 - Endocrine support for mammarigenesis

Milk let down

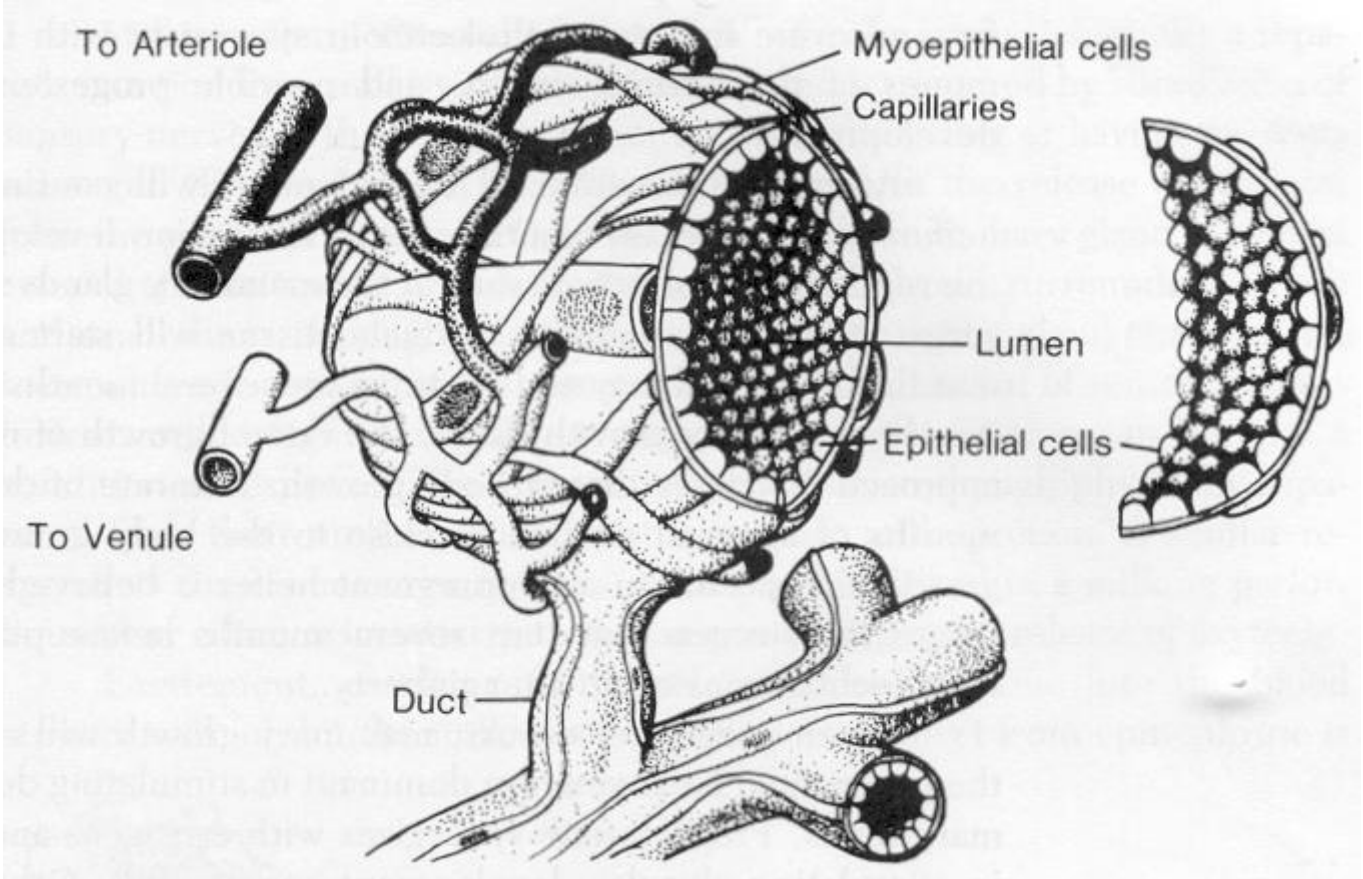
- Milk ejection stimulated by contractions of Myoepithelial cells controlled by **Oxytocin**
- Secretion of Oxytocin by neuro-hypophysis stimulated by
 - Sound of buckets
 - Washing of udder
 - Sight of calf
 - Providing concentrates before milking



- Oxytocin is transferred to the alveoli by blood circulatory System
- Oxytocin acts on m. cells which are contracted then milk ejection occur
- Life time of oxytocin is about 6-8 min in blood
- Milking should be done just after stimulation (within 5-6 min)

Posterior pituitary : **Oxytocin**

- Synthesized in the hypothalamus
- Transferred to posterior pituitary
- Secreted into blood and acts on myoepithelial cells
- Contraction of myoepithelial squeeze the milk let down



Species	Fat	Protein	Lactose	Ash
Horse	1.9	2.7	6.1	0.5
Sheep	7.5	7.0	3.5	0.9
Swine	7.5	5.4	4.7	0.9
Goat	4.1	3.3	4.1	0.9
Cattle				
Guernsey	4.7	3.6	4.8	0.7
Holstein	3.7	3.1	4.6	0.7
Jersey	4.9	3.7	4.8	0.7
Shorthorn	3.6	3.3	4.5	0.8