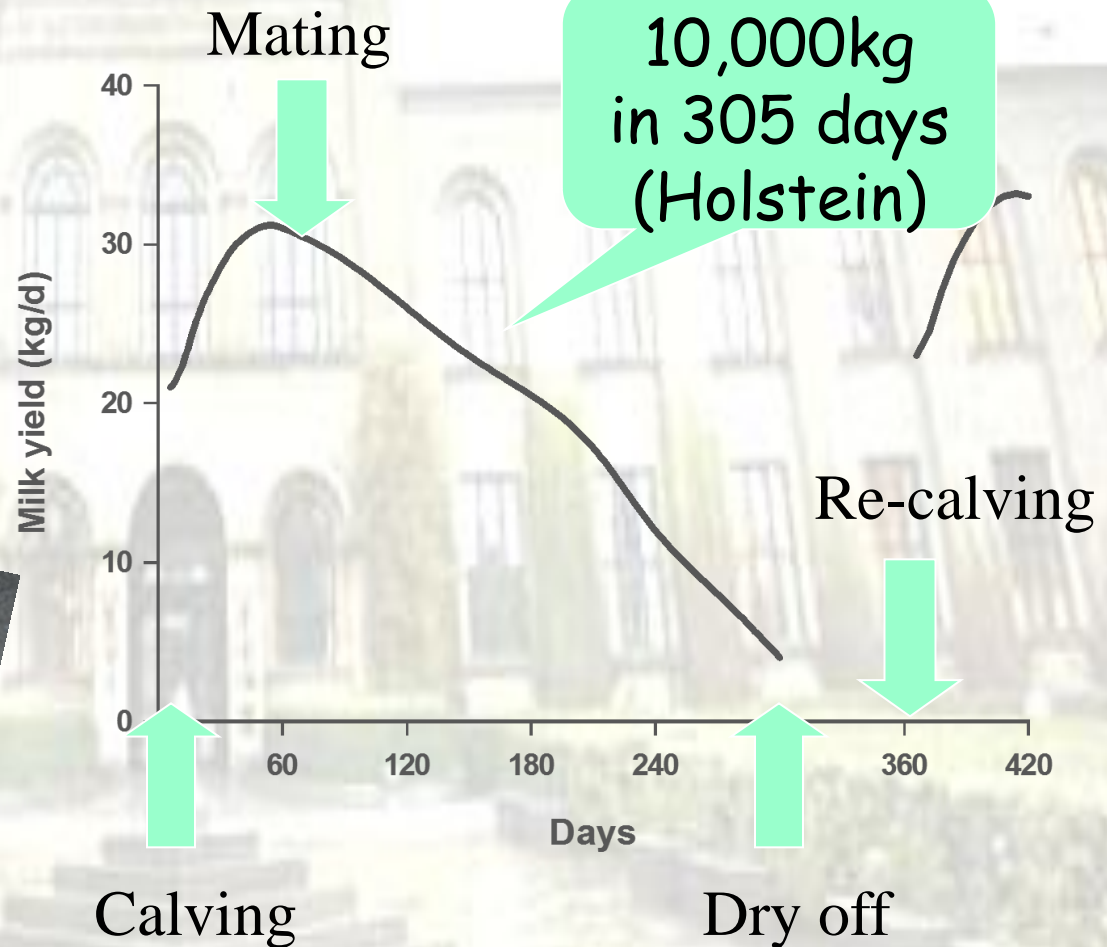
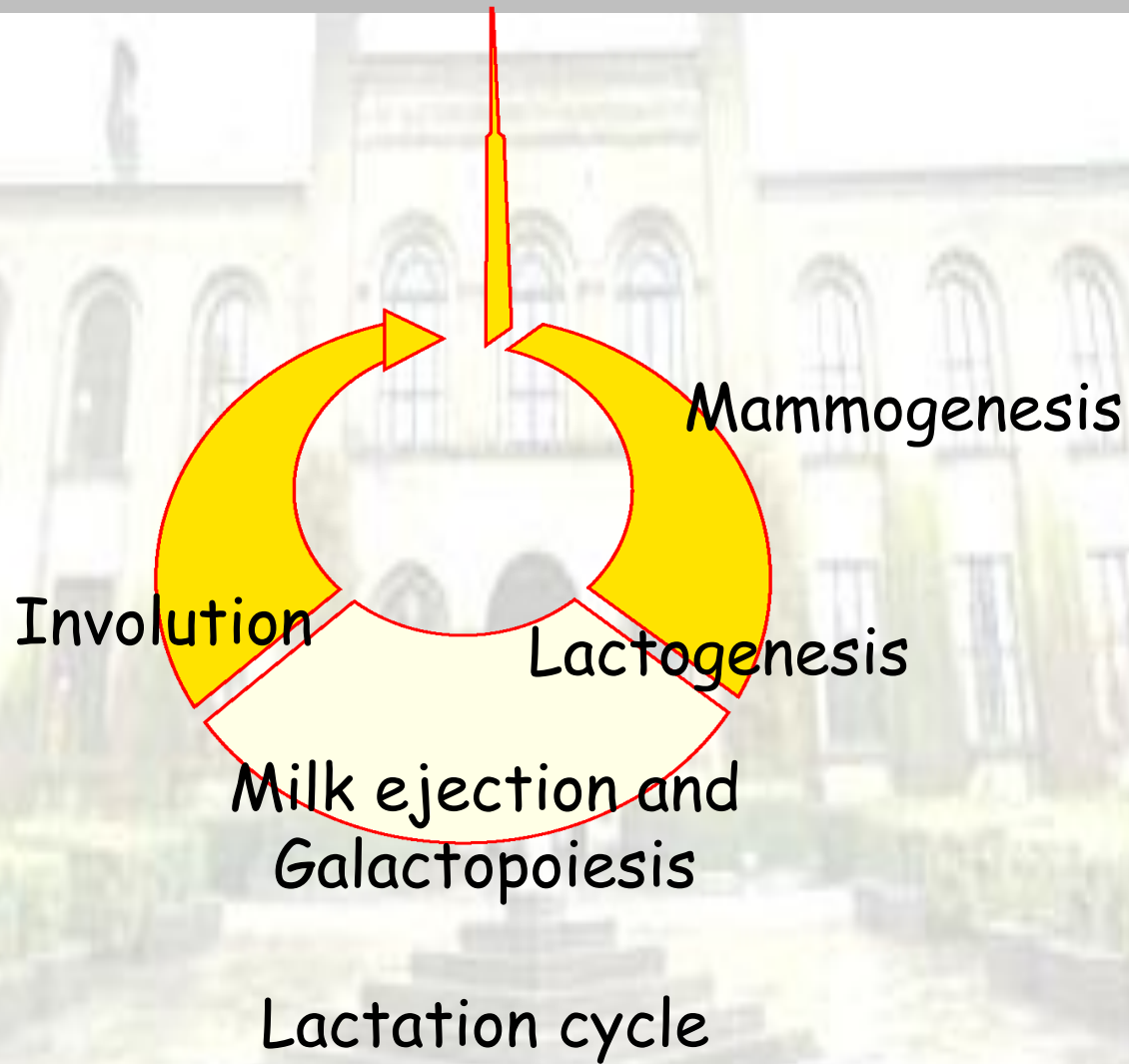


# KeyPoint Lactation Physiology



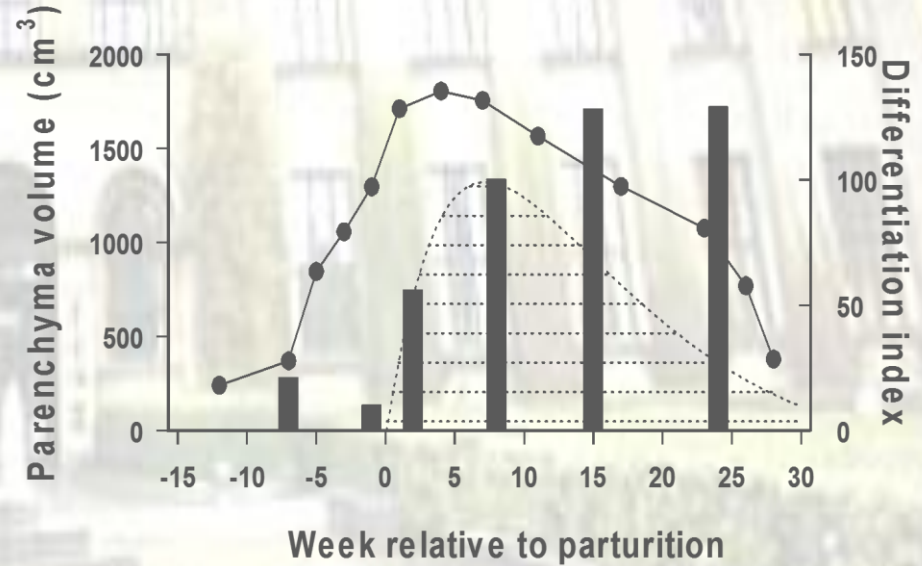
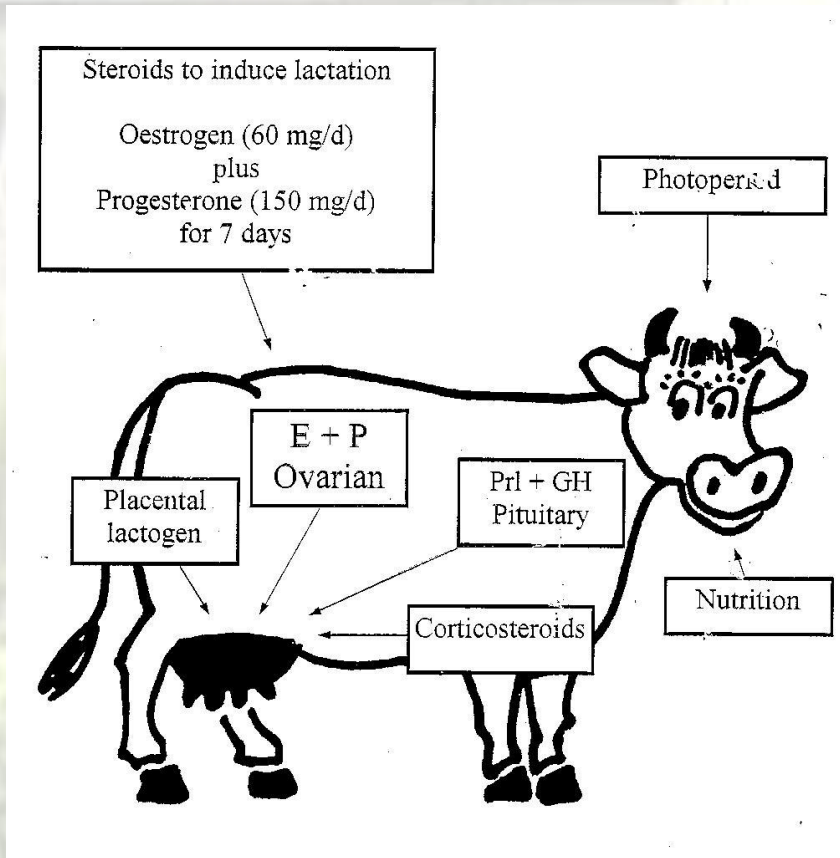
# Overview



# Mammogenesis: growth of the MG

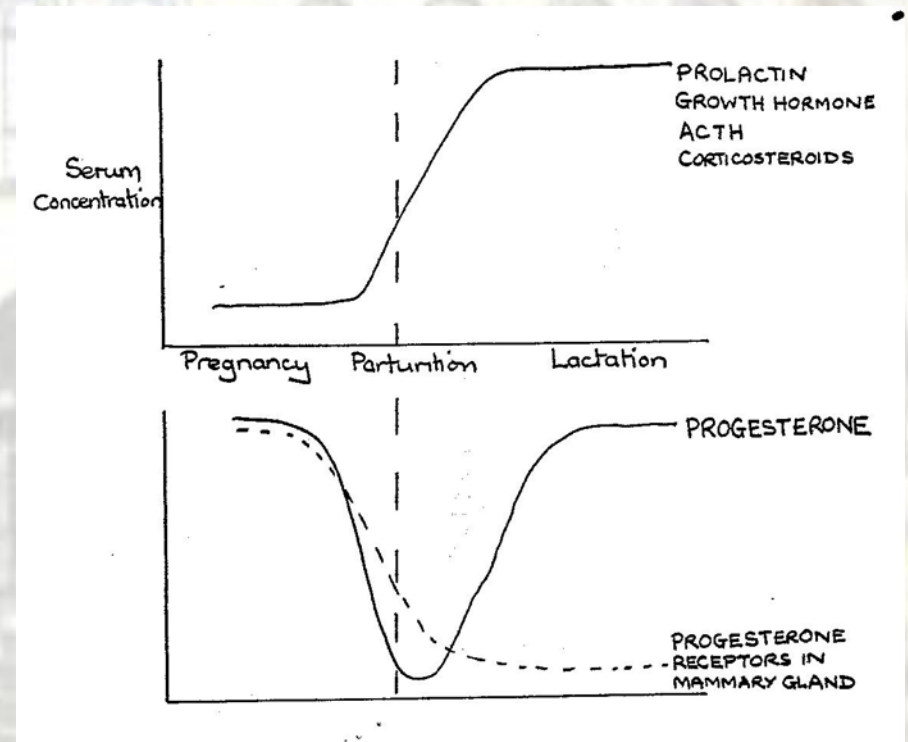
- Relatively little development prior to conception, although...
- ...period around puberty is important
- Exponential proliferation during pregnancy
- Stimulated by mammogenic complex of oestrogen, progesterone and prolactin, although...
- ...placental lactogen is important
- At around parturition proliferation comes to an end, differentiation continues
- Declining milk yield after peak is a consequence of apoptosis

# Mammogenesis

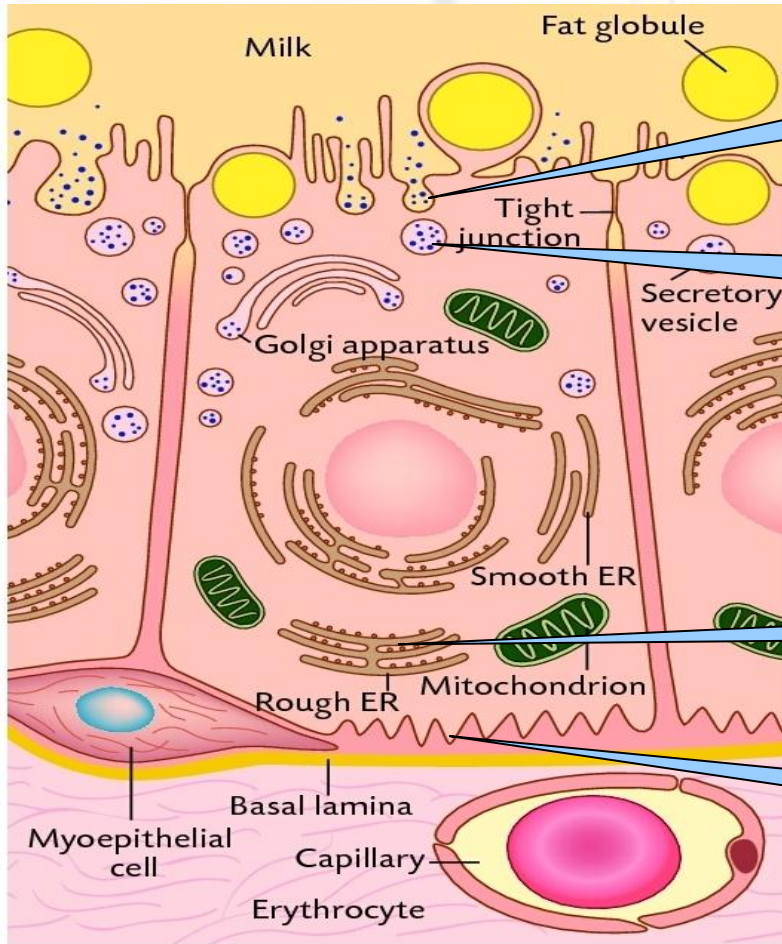


# Lactogenesis: initiation of milk secretion

- Stage 1: development of secretory capability during last trimester.
- Stage 2: onset of copious secretion at term, triggered by decrease in progesterone
- (Stage 3: Angiogenesis *post partum* ?? )



# Milk secretion: casein



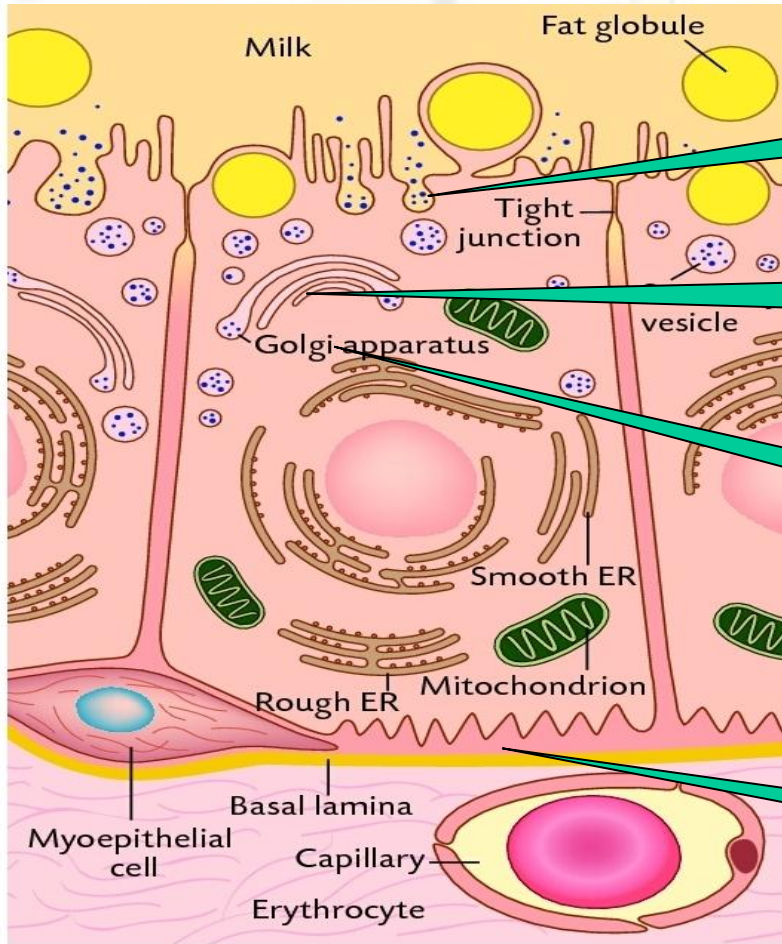
Exocytosis of golgi apparatus/secretory vesicles

Protein trafficking through golgi and packaging into secretory vesicles

Protein synthesis in RER

Uptake of amino acids. Specific transporters

# Milk secretion: lactose (and water)



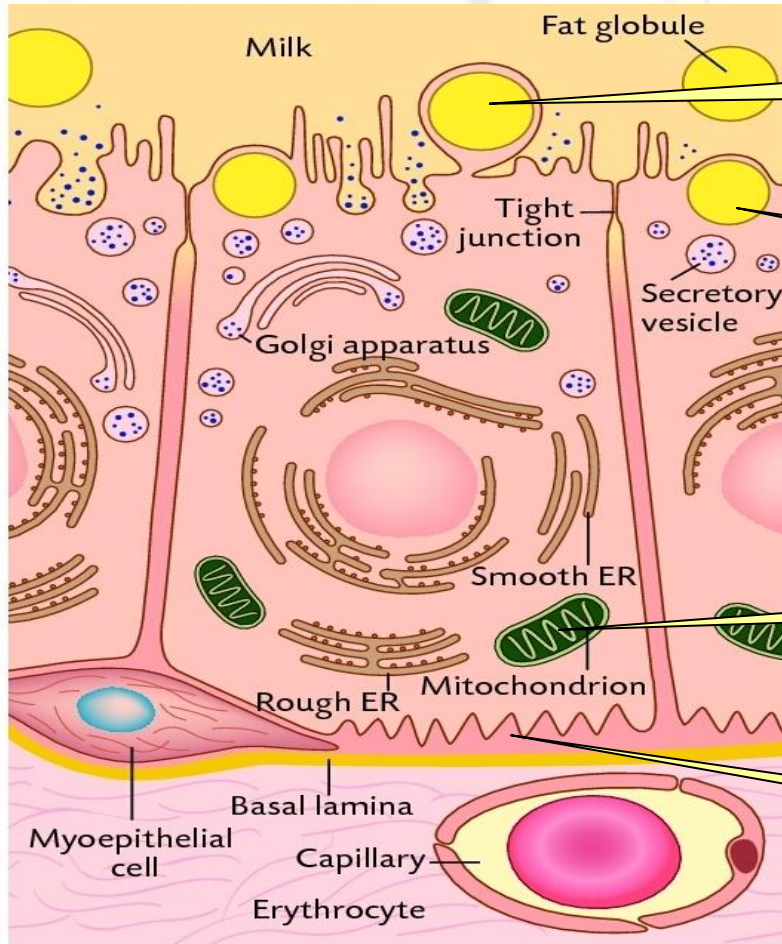
Exocytosis of golgi apparatus/secretory granules

Accumulation of glucose and galactose, lactose synthesis. Osmotic drive for water.

Trafficking of intact glucose to Golgi

Insulin-insensitive uptake of glucose. GLUT1?

# Milk secretion: fat



Apocrine secretion of fat droplets

Synthesis of triglyceride,  
formation of fat droplets

De novo FA synthesis

Diffusion of FFA and substrates



# Milk ejection: removal of milk

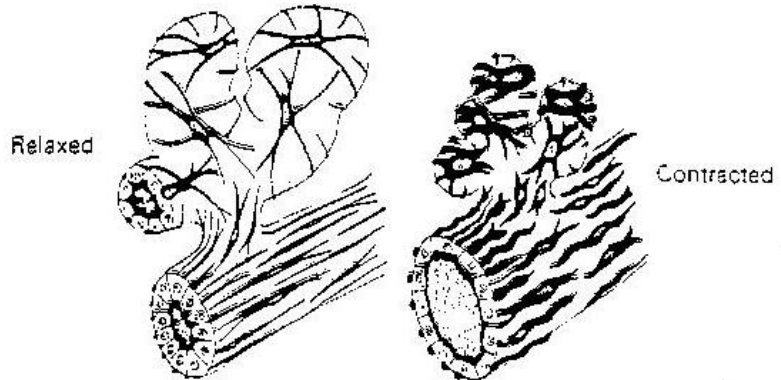


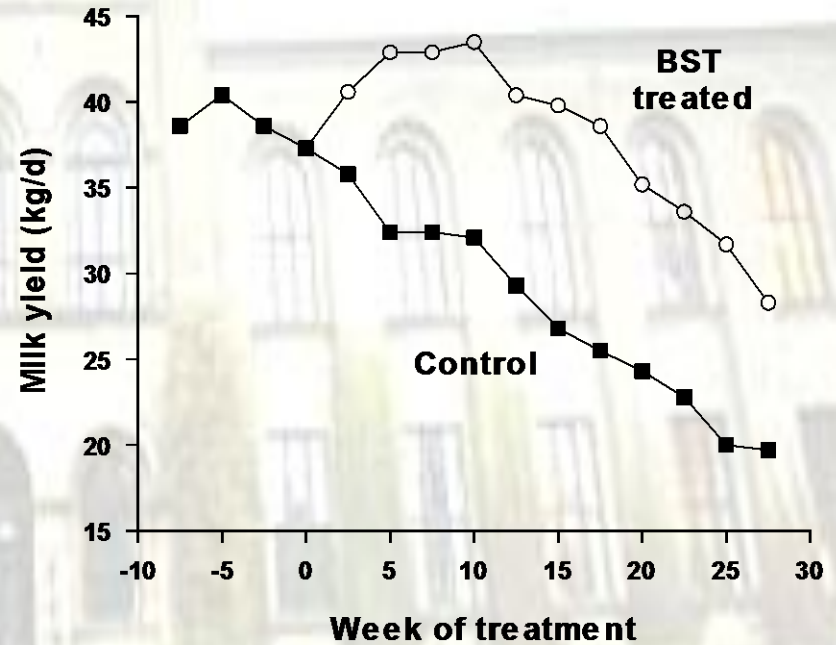
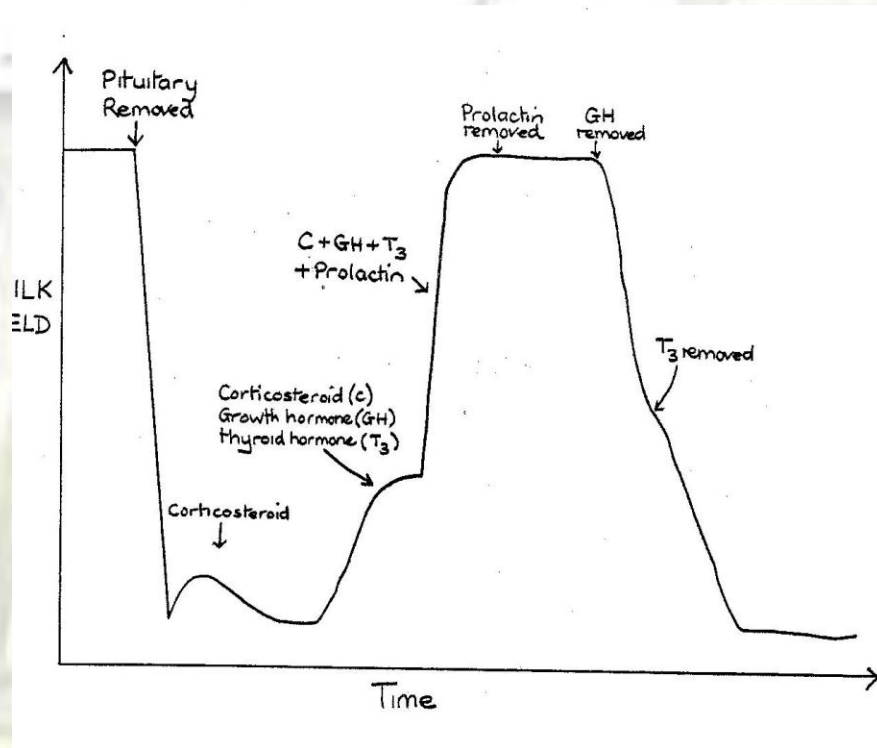
Figure 8.4. The action of myoepithelial cells in contracting mammary alveoli and dilating ducts.  
(Drawing by the late Dr. J. L. Linzell.)

- Oxytocin:
  - Constricts the alveoli
  - Opens the small ducts

# Galactopoiesis: maintenance of established milk secretion

- Milking is essential
- Milking does two things:
  - Stimulates the release of galactopoietic hormones
  - Prevents milk stasis
- Galactopoietic hormones stimulate milk secretion
- Milk stasis inhibits secretion in two ways:
  - By feedback inhibition (within hours)
  - By physical disruption (within days)

# Galactopoietic hormones



Prolactin



GH

# Cessation of milk secretion

- Removal of milk maintains milk secretion
- Accumulation of milk leads to cessation
  - Through lack of galactopoietic hormones
  - Feedback inhibition
  - Pressure and physical disruption
- Accompanied by a large increase in cell death (apoptosis)

# Questions to think about

Sudden very large increase in blood flow and nutrient use.

How? Where does glucose come from?  
Why does it suddenly go to the mammary gland?

