HISTOLOGY & CYTOLOGY
OF
THE MAMMARY GLAND
Histology = Study of the microscopic structure of tissues
CELL LAYERS

Epithelium

- All glands are made up of epithelial cells
- Functions include secretion, selective absorption, protection, transcellular transport, and sensing

Alveoli

- Single layered epithelium

Everything else down to the teat orifice

- Double layered epithelium

Secretory vs. non-secretory
SKIN VS TEAT CANAL

s – epidermis of the skin

k – keratin

e – epithelial lining of the streak canal

cc – corpus cavernosum

k – keratin
STRAFIFIED SQUAMOUS EPITHELUM

Skin and streak canal

Stratum corneum (horny layer)
  - Outermost layer
  - Tough cells
  - Sloughs off

Stratum granulosum
  - Transitional layer

Stratum germinativum
  - Innermost layer
  - Rapid mitosis to supply skin cells
A – epidermis of the skin
k – keratin
m – stratum germinativum

B – epithelial lining of the streak canal
g – stratum granulosum
c – stratum corneum
Fig. 6.3. Light micrograph of a cross section of the teat canal showing muscle tissue, keratin, and epithelial lining. ×4,000 magnification. (Provided by M.P. Comalli and R.J. Eberhart)
Fig. 6.11. Micrograph demonstrating the sealing of the teat canal 16 days after involution. ×4,000 magnification. (Provided by M.P. Comalli and R.J. Eberhart)
STREAK CANAL — LACTATING
STREAK CANAL — NON-LACTATING
FURSTENBURG’S ROSETTE

Area of transition from stratified squamous epithelium to double layered epithelium
TEAT SINUS
TEAT SINUS
TEAT SINUS
ALVEOLI - FULL
ALVEOLI - EMPTY
LOBES
ALVEOLAR STRUCTURE
ALVEOLUS - CROSS SECTION
ALVEOLUS
APICAL SURFACE OF ALVEOLUS
EXTERNAL ALVEOLAR SURFACE
MYOEPITHELIAL CELLS
LIPID SECRETION (RED)
CYTOLOGY = BRANCH OF BIOLOGY CONCERNED WITH THE STRUCTURE AND FUNCTION OF PLANT AND ANIMAL CELLS

Fig. 4.6. Diagrammatic representation of a secretory cell in the alveolar epithelium of the lactating mammary gland. AM = apical plasma membrane; BM = basal plasma membrane; BaM = basement membrane; CAP = capillary; CR = chromosomes; GA = Golgi apparatus; GJ = gap junction; JC = junctional complex; L = lysosome; LD = lipid droplet (globule); M = mitochondrion; MCP = myoepithelial cell process; MV = microvilli; N = nucleus; NU = nucleolus; P = protein (casein micelle); R = ribosomes (free and bound); RER = rough endoplasmic reticulum; SER = smooth endoplasmic reticulum; SV = secretory vesicle. Precursors from the blood stream (CAP) enter the cell and exit into the lumen as milk constituents. (Drawn by C. Andersen)
SECRETORY MECHANISMS
SECRETORY MECHANISMS
FAT SECRETION
FAT SECRETION
PROTEIN SECRETION

Diagram showing various cellular structures labeled with abbreviations such as GV and CV. The diagram is labeled with subscripts a, b, c, and d.
PROTEIN SECRETION
EXOCYTOSIS

VESICLE

PLASMA MEMBRANE
TIGHT JUNCTIONS

Specialized connection of two adjacent cell membranes such that the space usually lying between them is absent

Form the closest contact between adjacent cells known in nature

Found in the apical region around cell's circumference
TIGHT JUNCTIONS
**CELLULAR STRUCTURES**

**Nucleus**
- Controls cell activities
- Contains the hereditary material

**Mitochondria**
- Breaks down sugar molecules to release energy

**Golgi apparatus**
- Modifies proteins made by the cells
- Packages & exports proteins

**Endoplasmic reticulum (rough and smooth)**
- Carries materials through cell
- Aids in making proteins
CELLULAR STRUCTURES

Cytoplasm
- Supports and protects cell organelles

Ribosome
- Synthesizes proteins

Lysosome
- Contains enzymes for use in the hydrolytic breakdown of macromolecules
-Digests old cell parts

Plasma membrane
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PLASMA Membrane

- Alpha-helix protein
- Oligosaccharide side chain
- Glycolipid
- Phospholipid
- Globular protein
- Hydrophobic segment of alpha-helix protein
- Cholesterol
PLASMA MEMBRANE

- Phospholipid bilayer
- Cholesterol
- Carbohydrate attached to lipid
- Intrinsic proteins
- Extrinsic proteins
- Filaments of cytoskeleton
- Inside of cell (cytoplasm)
CELLULAR STRUCTURES

Cytoskeleton
- Modify proteins made by the cells
- Package & export proteins
- Flexible tubular scaffold of microfilaments
- Maintains cell shape and provides support
- Anchors organelles & enzymes to specific regions of the cell
- Allows for contractility and movement

Microtubules
- Helps cell maintain its shape
- Anchors organelles
- Helps with organelle movement

Microfilaments
- Solid protein (actin)
- Tough but flexible
- Helps the cell in movement
CYTOSKELETON

- Plasma Membrane
- Endoplasmic Reticulum
- Ribosomes
- Microtubule
- Mitochondrion
- Microfilaments and Intermediate Filaments