

LECTURE 36 Epithelial Stem Cells

From Chapt. 22 (Histology: the lives & deaths of cells in tissues). p. 1259-1267
Figs. 22-1 to 22-9.

THE SKIN

- Comprised of 3 regions:
 - **epidermis:** ectoderm-derived, protective outer layers
 - **dermis:** mesoderm-derived, tough collagen-rich connective tissue (ECM) secreted by fibroblasts, richly supplied w/ blood vessels, nerves
 - **hypodermis:** underlying (subcutaneous) fatty layer

Epidermis:

- good example of cell renewal in adult tissues; similar processes/genetic pathways as used during embryogenesis
- multilayered epithelium (cells adherent in sheet via lateral adhesion complexes)
- Cells in lower layers have nuclei; upper most layers are anuclear
- Bottom layer of epidermis contains stem cells ("basal cells")

Keratinocytes:

- major cell type in epidermis
- synthesize keratin intermediate filaments (make epid. "tough")
- **basal cells:** stem cells for k's, in deepest layer, where mitosis occurs
- as k's differentiate, displaced ever upward, first into
 - prickle layer (several layers, many desmosomes)
 - then into granular layer (start to lose nucleus & organelles via partial activation of apoptosis machinery); g.l. forms waterproof barrier to H₂O & solutes, betw metabolically active & inactive (outer) parts of epid
 - finally, into outer, squamous layers (squames: cytoskeletons of dead cells, densely packed w/ keratin)
 - Time from birth of k. in basal layer to sloughing off from outer layer of epidermis: **1 month**
- **Deep layers** of epidermis also include:
 - melanocytes (pigment cells from neural crest (NC))
 - Langerhans cells (aka dendritic cells: immune cell type)
 - Merkel cells (assoc'd w/ nerve endings, may also be NC derived)

Epidermal stem cells

- **Fig. 22-4:** Definition of a stem cell
 - 1) not terminally differentiated
 - 2) can divide w/out limit (not *necessarily* frequently!)
 - 3) its daughters have 2 choices:
 - remain stem cell like mom
 - commit to differentiation pathway
- **Fig. 22-5:** Two ways stem cells produce unequal daughters:
 - unequal environment (1 daughter gets signal/cue not available to other)
 - asymmetric division (as covered previously)

- **Fig. 22-6:** human epidermal stem cells & pattern of epidermal cell production
 - **stem cells** at tips of dermal papillae; divide infreq'tly to generate:
 - **transit amplifying cells (Fig. 22-6):** divide rapidly for limited nr. divisions, then begin to differentiate, move out of basal layer.

MAMMARY GLAND (Fig. 22-8)

- glands that develop as in-growths of epidermal ectoderm (related to sweat glands, tear ducts, salivary glands)
- defining feature of mammals
- resting adult m.g. : branching ducts embedded in fatty connective tissue
- ducts lined w/ mam. epith. cells, including stem cells for d. epith. & myoepith. cells
- stem cells proliferate 10-20X during pregnancy
 - prolifer. dept. on horm. induct'n & signals betw/ epith cells & from **stromal cells**; integrins imp't
 - term. portion of ducts grow, branch, form alveoli w/ secretory cells
 - post-partum horms. induce milk secr'n
- weaning/ post-lactation:
 - secr. cells apoptose
 - macrophages remove dead cells
 - triggered by obstruct'n by milk in ducts, TGF β involved (**Fig. 22-9**)
- defects in mam. epith. prolifer. inducing factors common in breast CANCER