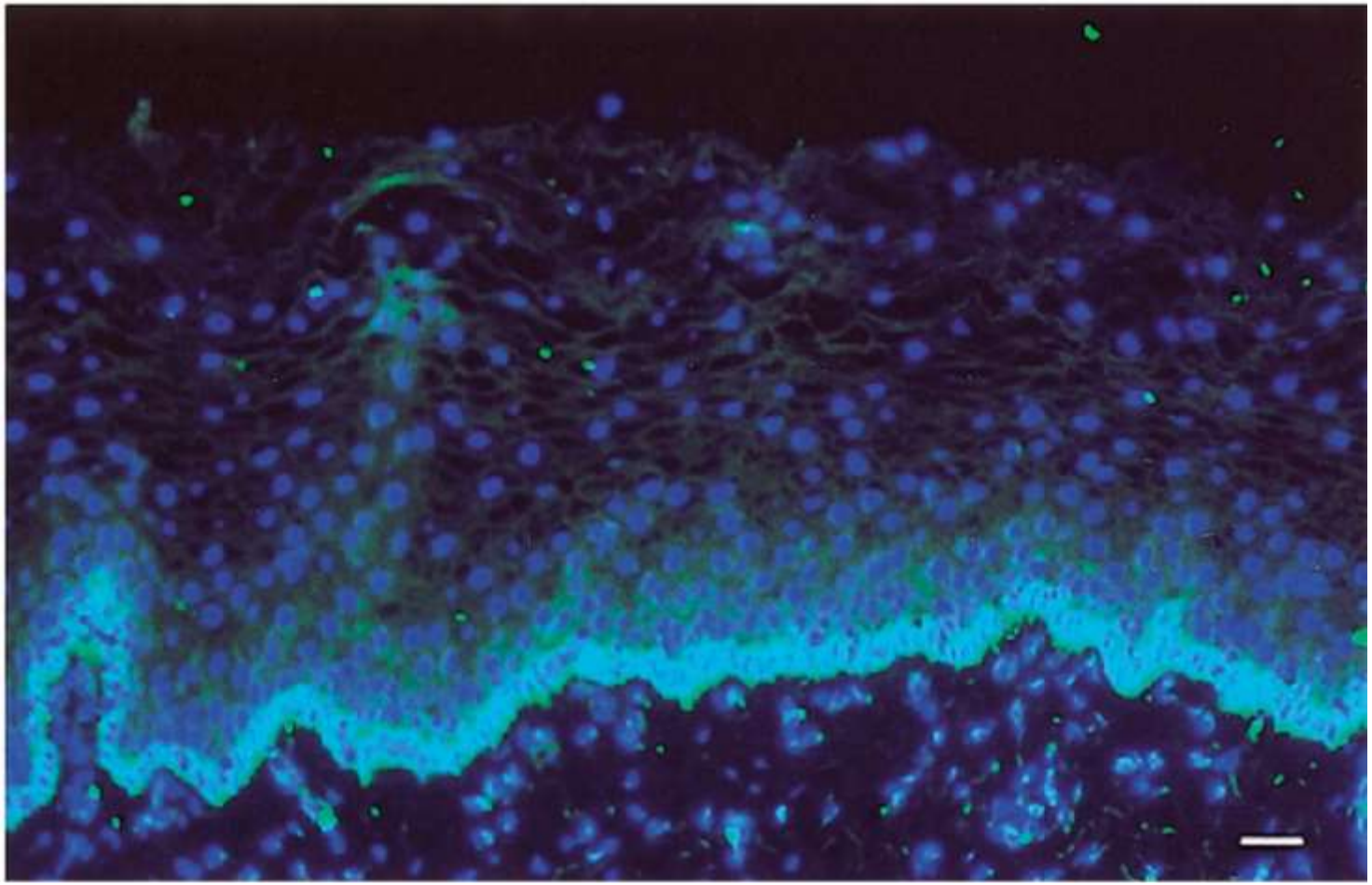
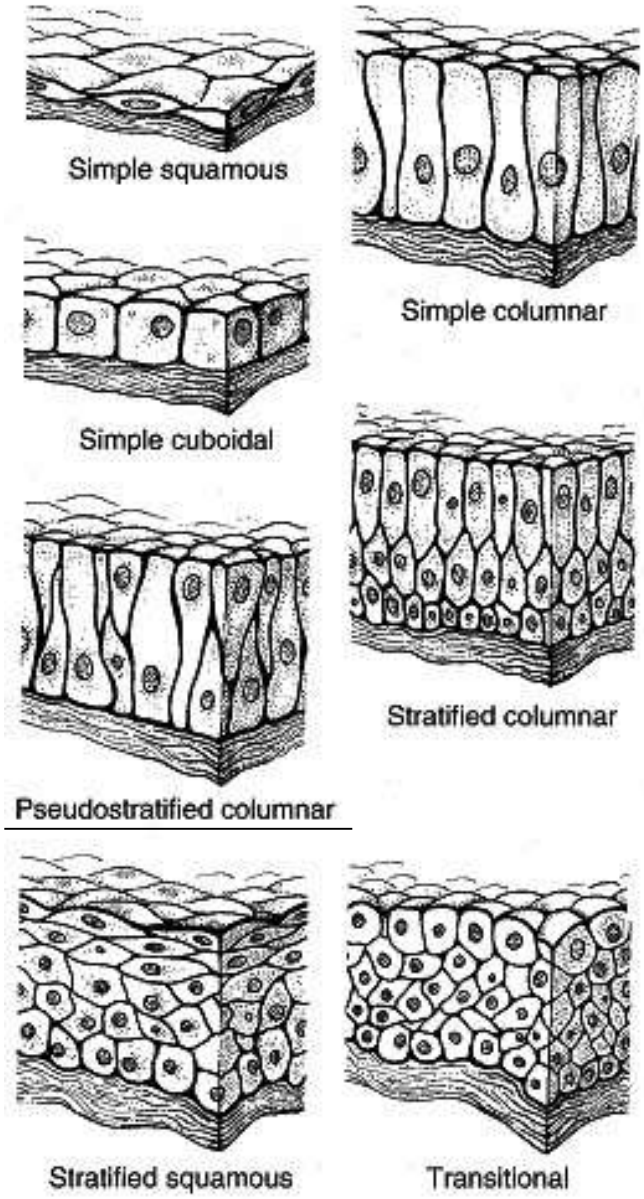
Stratified epithelium



Dr. Zita Puskár

EDI. 21/09/2018

Stratified epithelium



Stratified squamous → **Nonkeratinized**

Stratified squamous → **Keratinized**

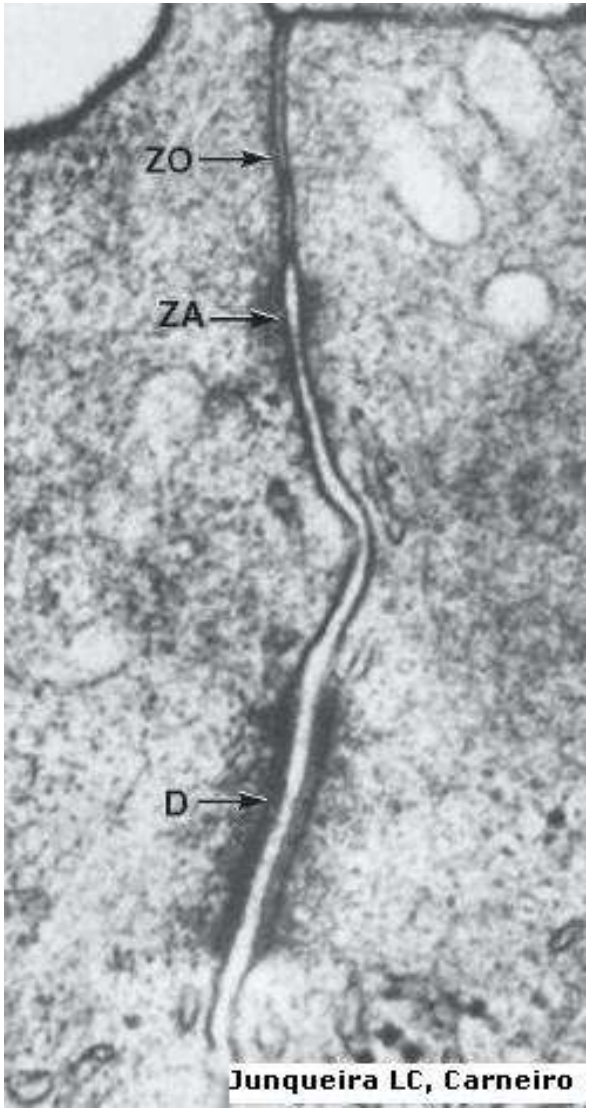
Stratified cuboidal

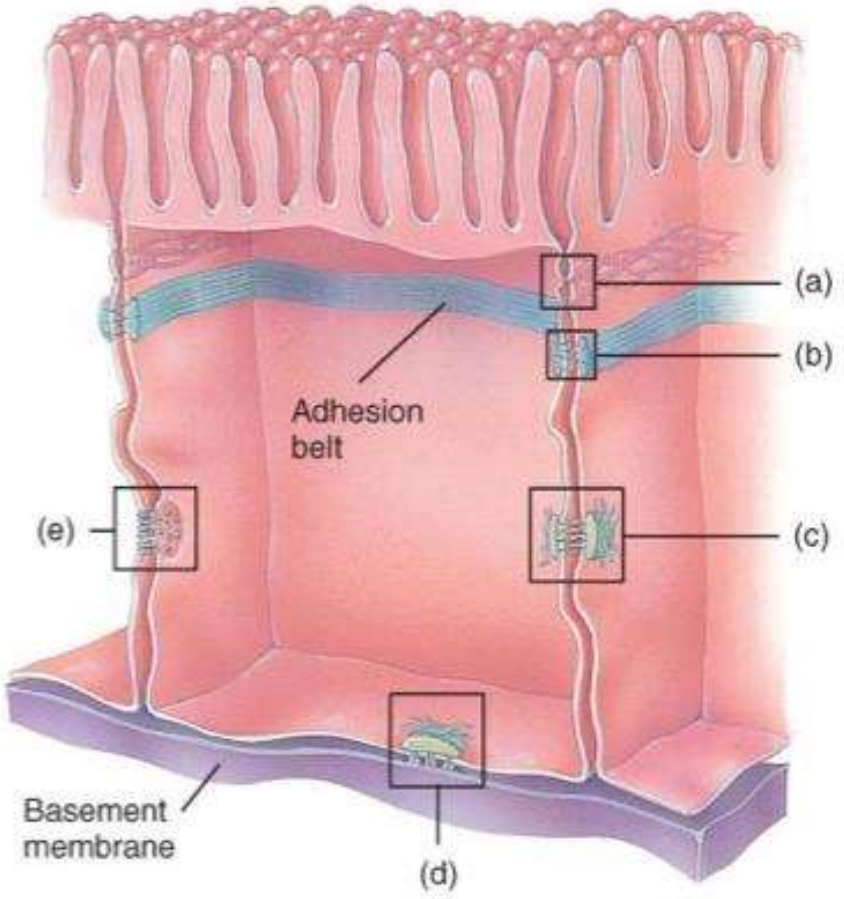
Stratified columnar

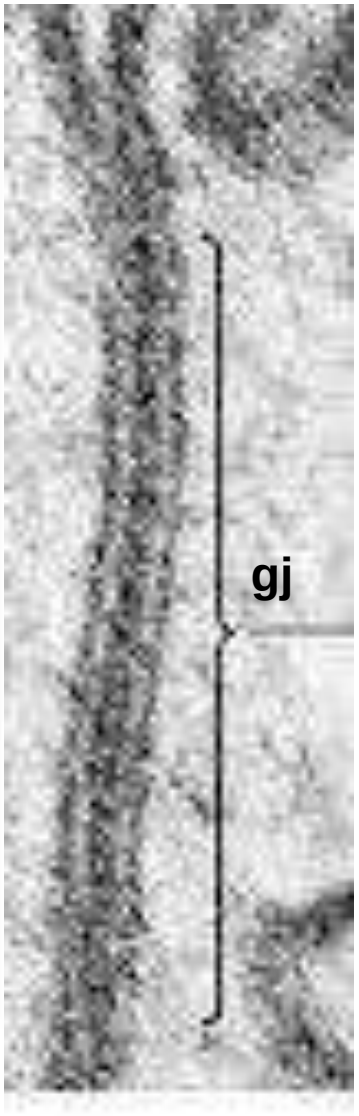
Transitional epithelium (urothelium)

Classification is based on the cell shape of the superficial layer.

Junctional complexes

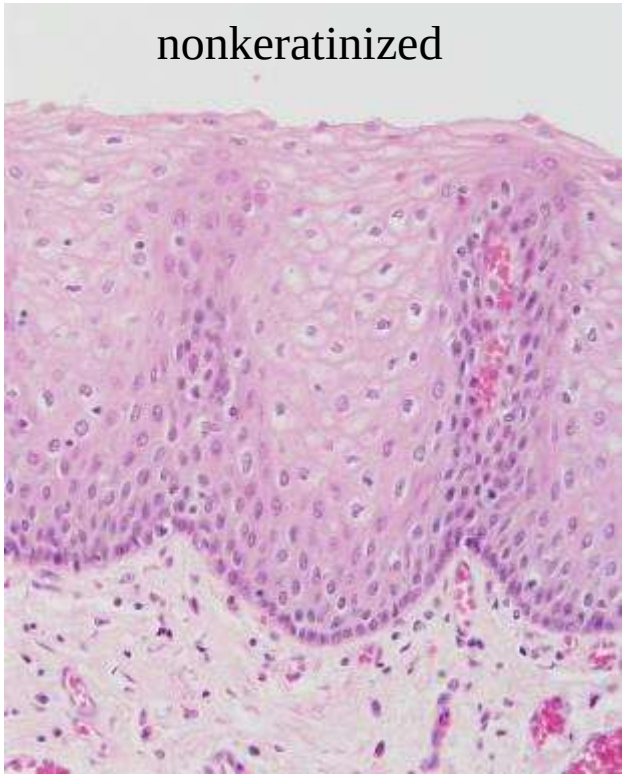


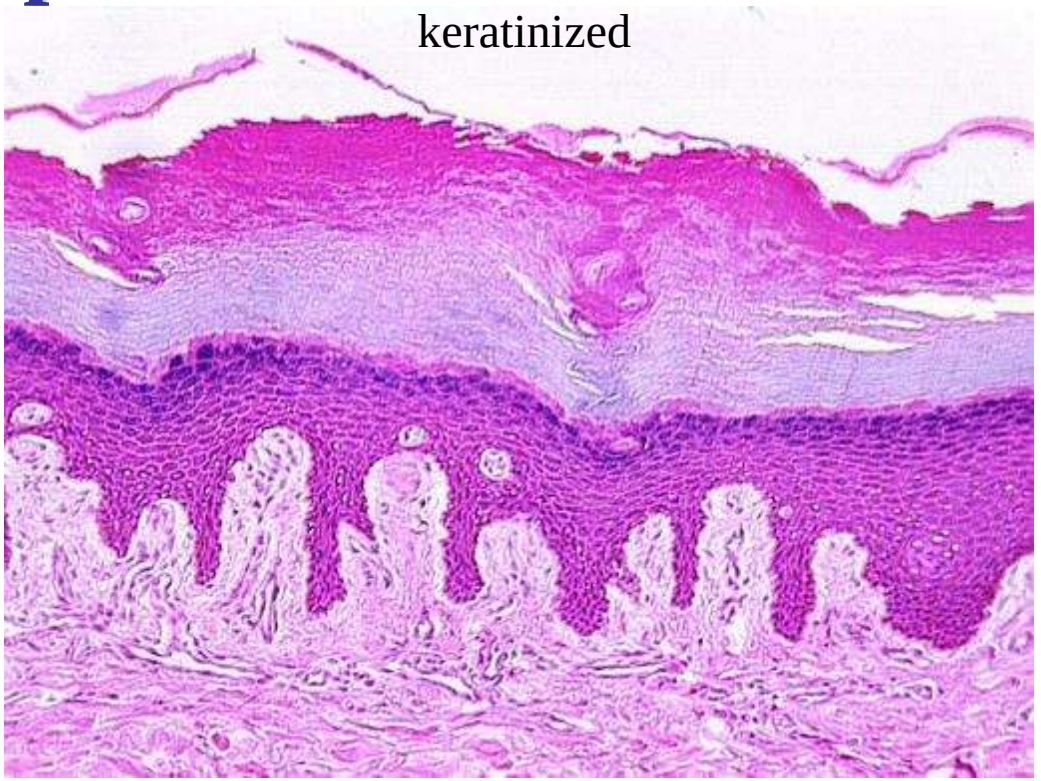




(a) **Occluding junction**, **zonula occludens** (tight junction) (b) **adhesive junction**, **zonula adherens** (c) **macula adherens** (desmosome) (d) **hemidesmosome** (e) **gap junction**

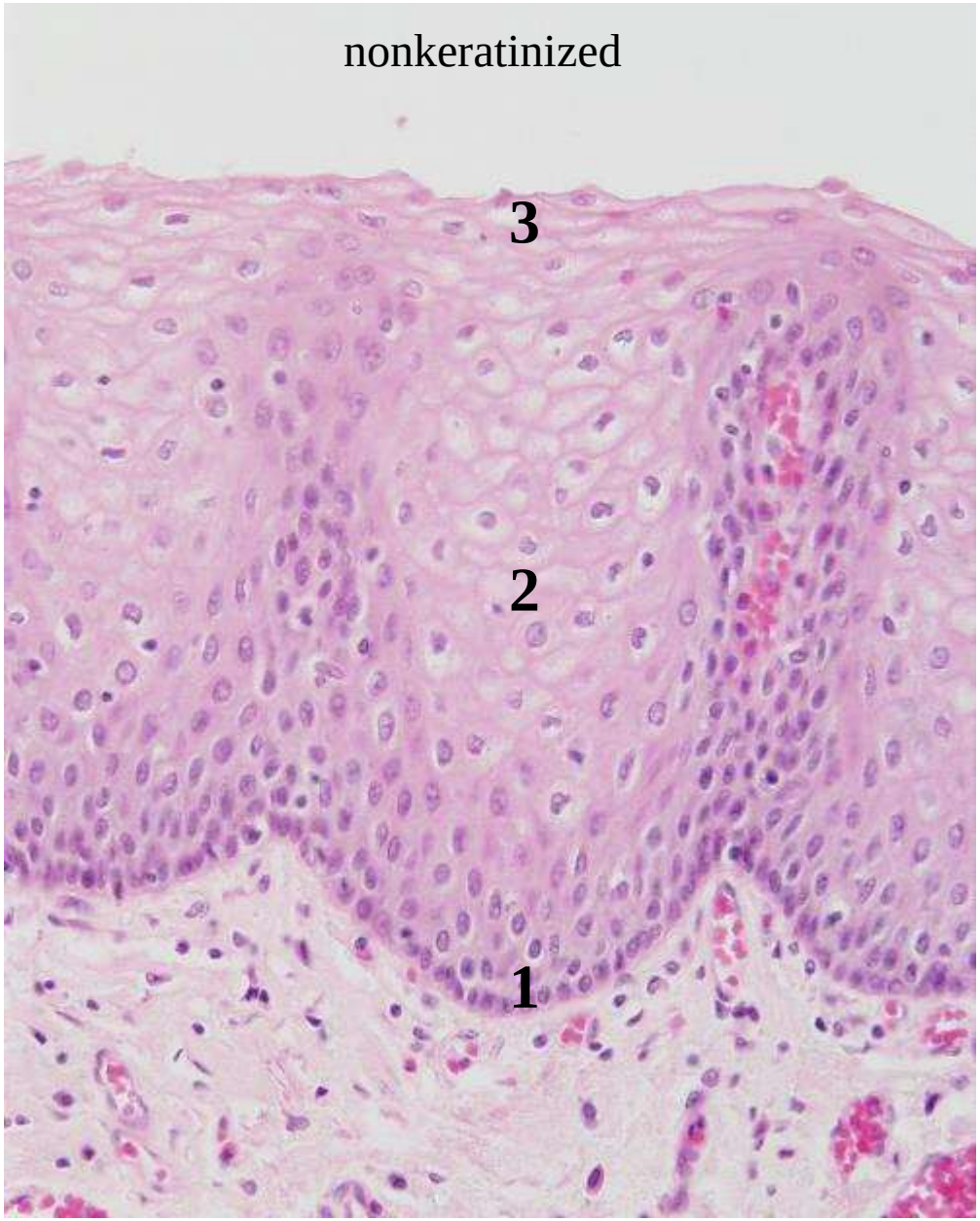
General features of stratified squamous epithelia





Flattened cells in the superficial layer
Appear in areas where mechanical insults are frequent
Fastness: stratification
projections of the connective tissue (papillae)
firm cytoskeleton (keratin filaments)
firm intercellular junctions (connections) – desmosomes
hemidesmosomes at the border of epithelium and connective tissue
Avascular and nourished by diffusion of nutrients from capillaries in the connective tissue

Stratified squamous nonkeratinized epithelia



1. **Basal layer (stratum basale/germinativum)**

Basophil columnar cells with mitotoic activity, (epithelial stem cells are among them) → production of dividing and differentiating cells

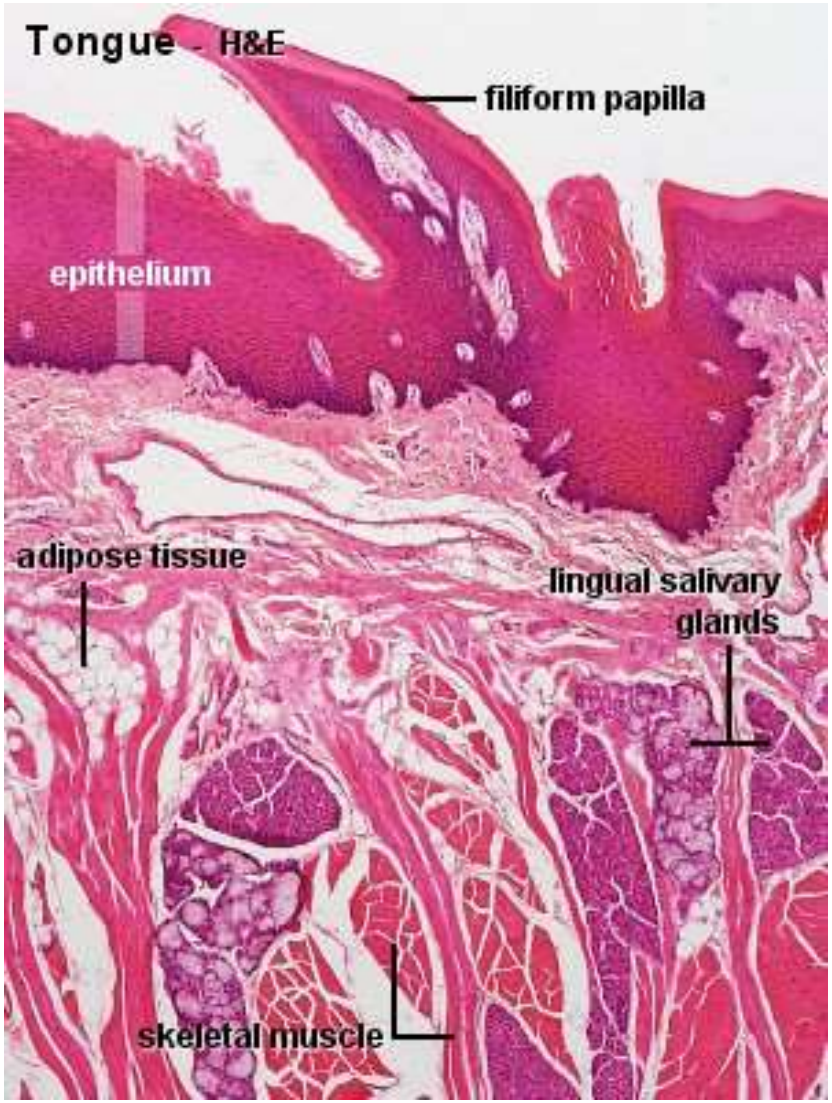
2. **Spinous layer (stratum spinosum/poligonale)**

Polyhedral cells with desmosomes (intermedier filaments: keratin filaments - bundles tonofilaments) During histological preparation the cells shrink but the desmosomal connections remain intact → spinous appearance

3. **stratum planocellulare/superficiale**

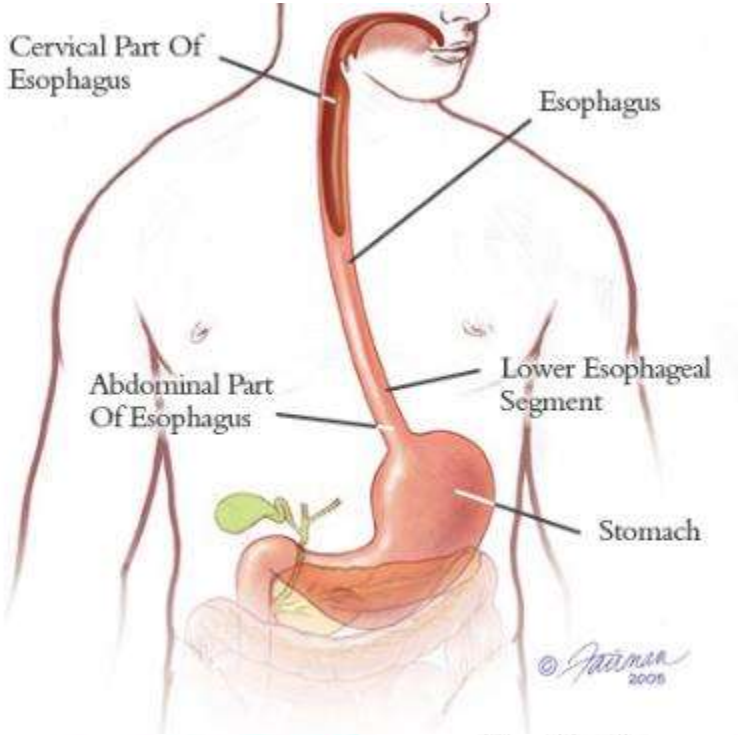
The top layers consist of living flattened cells with elongated nuclei.

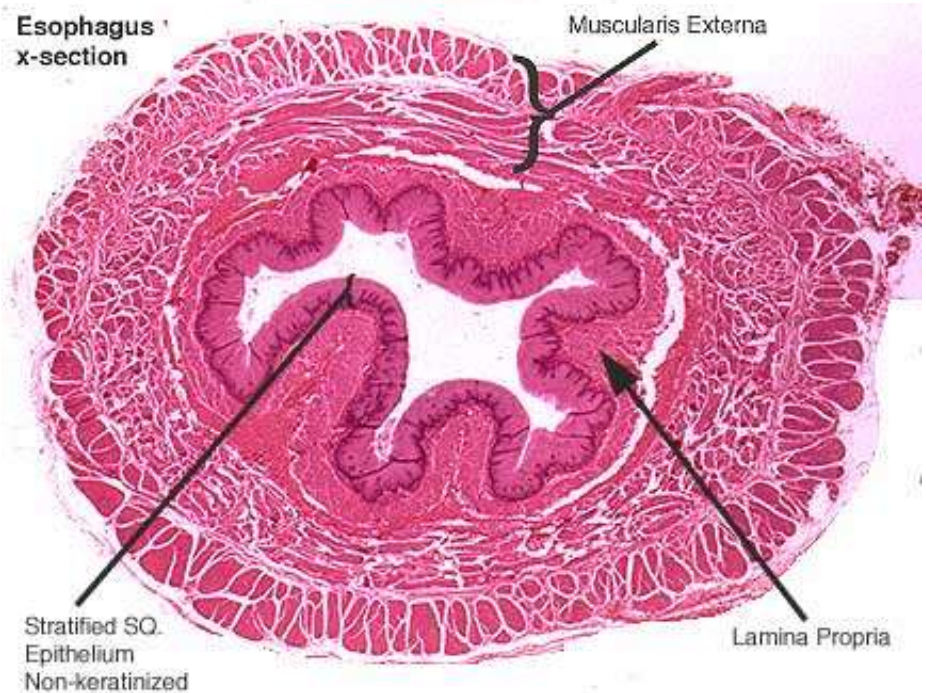
Oral cavity

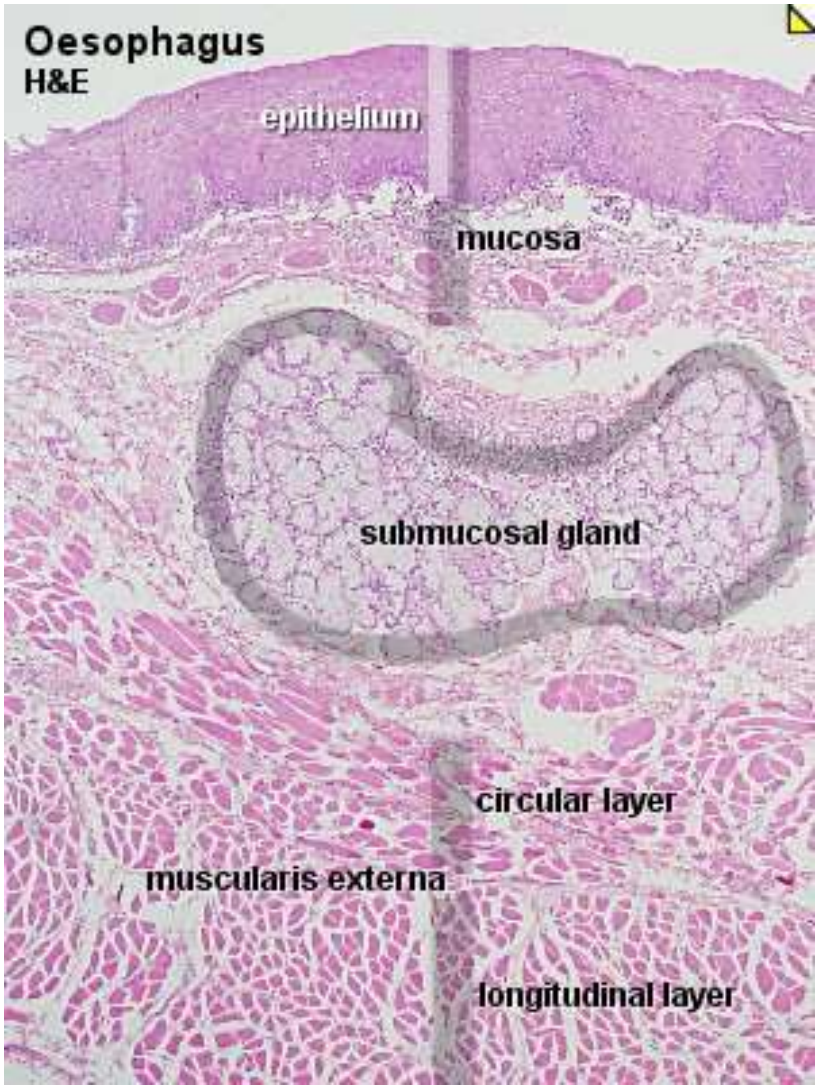


tongue

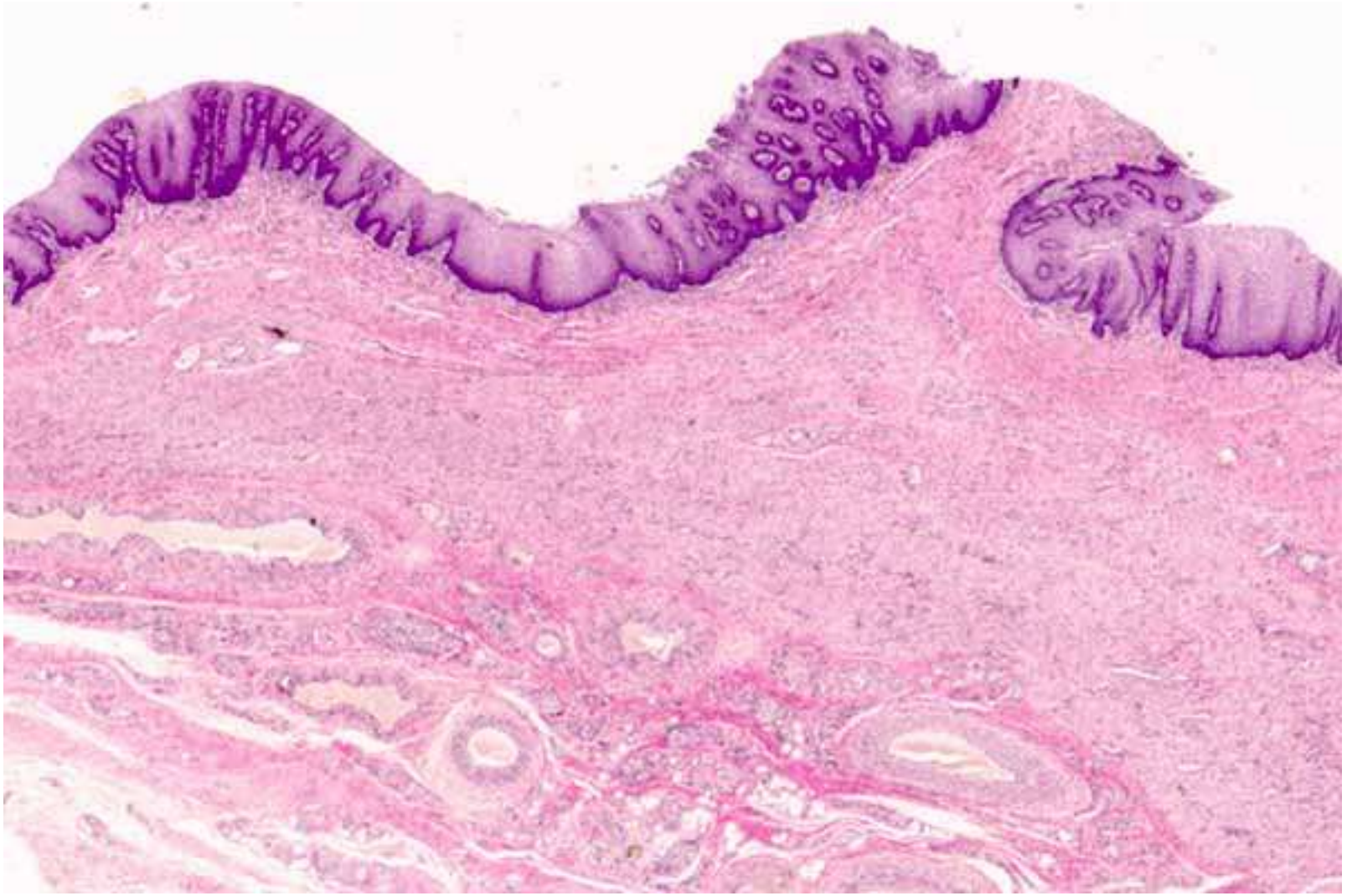
Esophagus


Cervical Part Of Esophagus
Esophagus
Abdominal Part Of Esophagus
Lower Esophageal Segment
Stomach

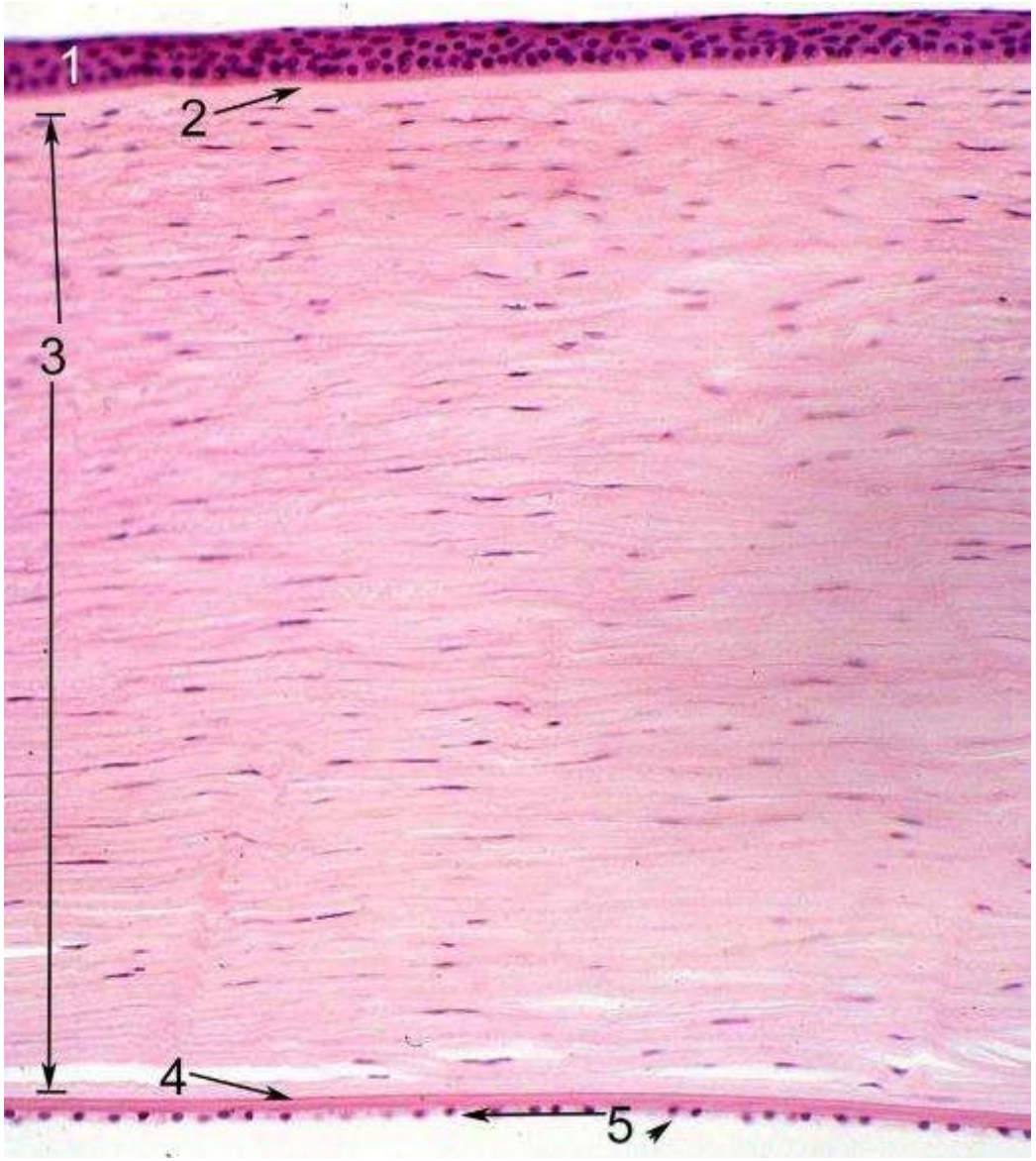

Esophagus x-section
Muscularis Externa
Stratified SQ. Epithelium Non-keratinized
Lamina Propria

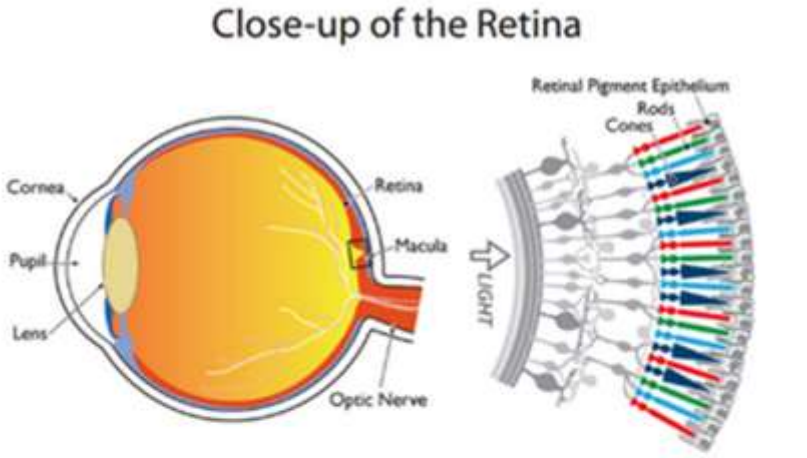

Oesophagus
H&E
epithelium
mucosa
submucosal gland
circular layer
muscularis externa
longitudinal layer

Vagina



Cornea

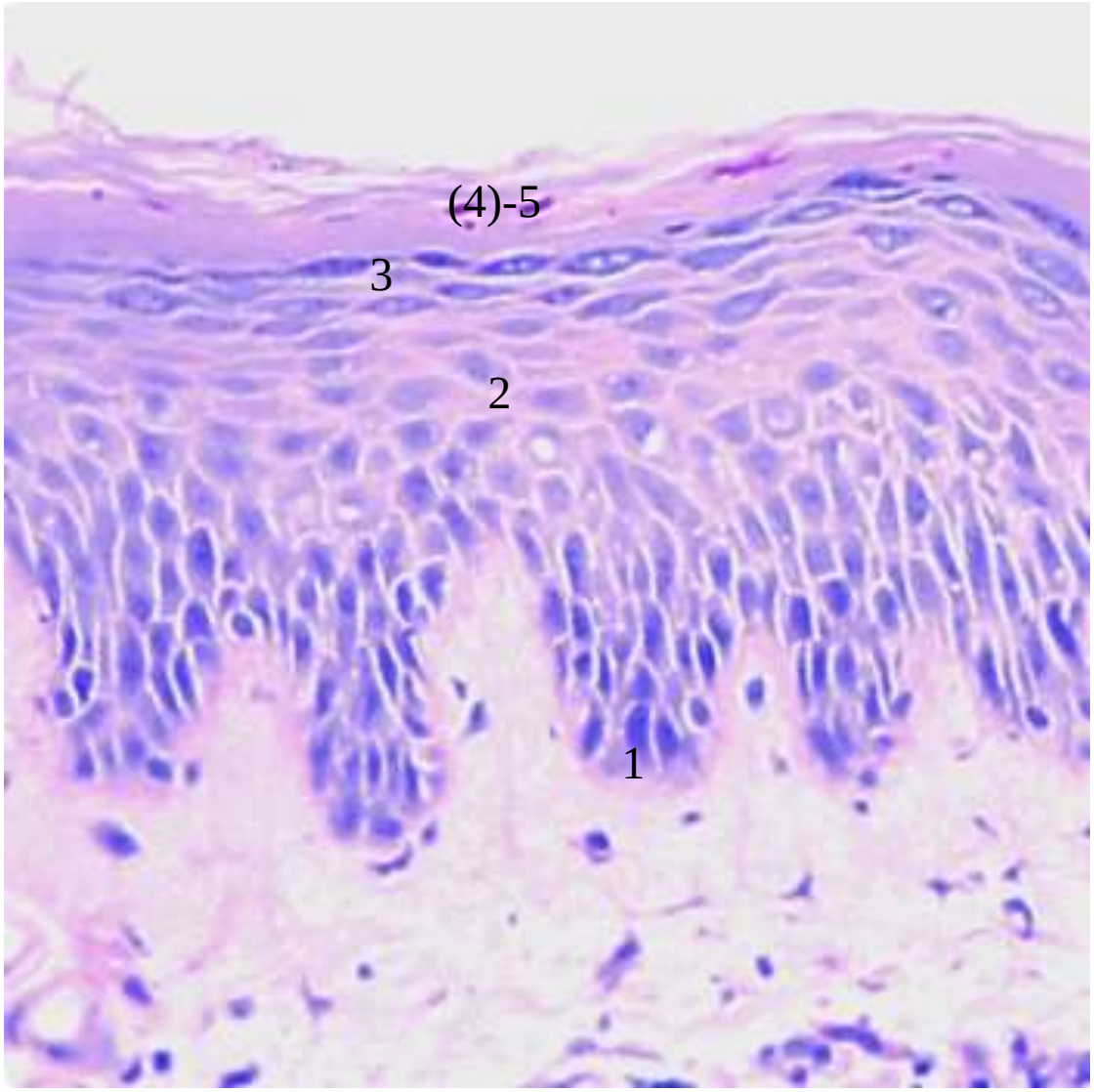




No connective tissue papillae!!!

Stratified squamous keratinized epithelium

New differentiated cells (pushed upward) → keratinization (keratin-tonofibrill), lamellar granules → squames cornified cells (continuously shed)



thin skin

Layers:

1.Basal layer (Str. basale / germinativum)

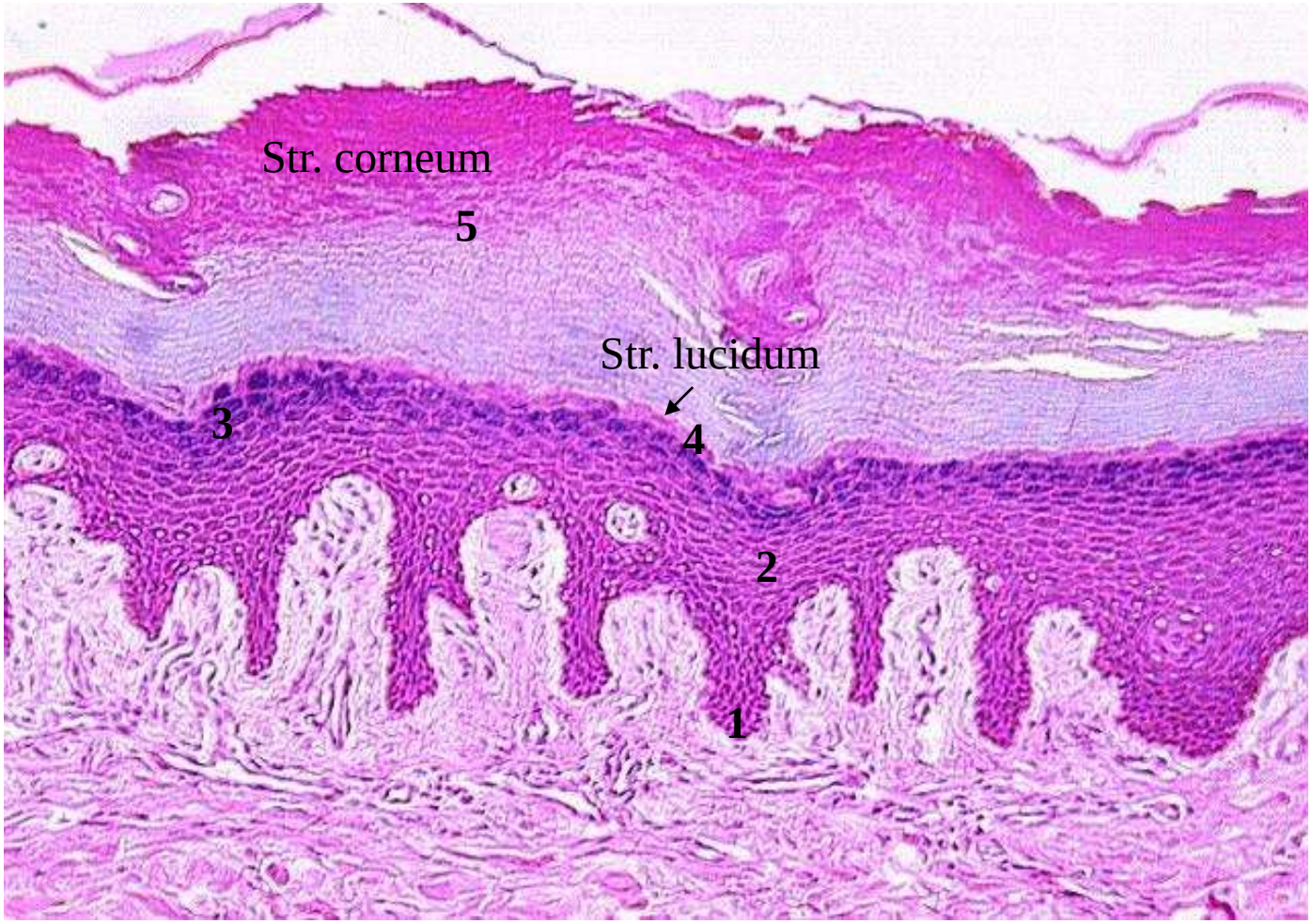
2. Spinous layer (Stratum spinosum / poligonale)

3. Granular layer (Stratum granulosum)
3-5 cell layers, flattened poligonal cells
Keratohyaline granules in the cytoplasm → basophil staining
Lamellar granules (membrane coated lipids) → exocytosis → lipid envelope (barrier against water loss)

4.Stratum lucidum (seen only in thick skin***)*** thin homogenous translucent eosinophilic layer. Nuclei and organelles are lost.

5.Stratum corneum
Cells contain only fibrillar and amorphous proteins with thickened plasma membrane

Thick skin (palms and soles)



1.Str. basale / germinativum

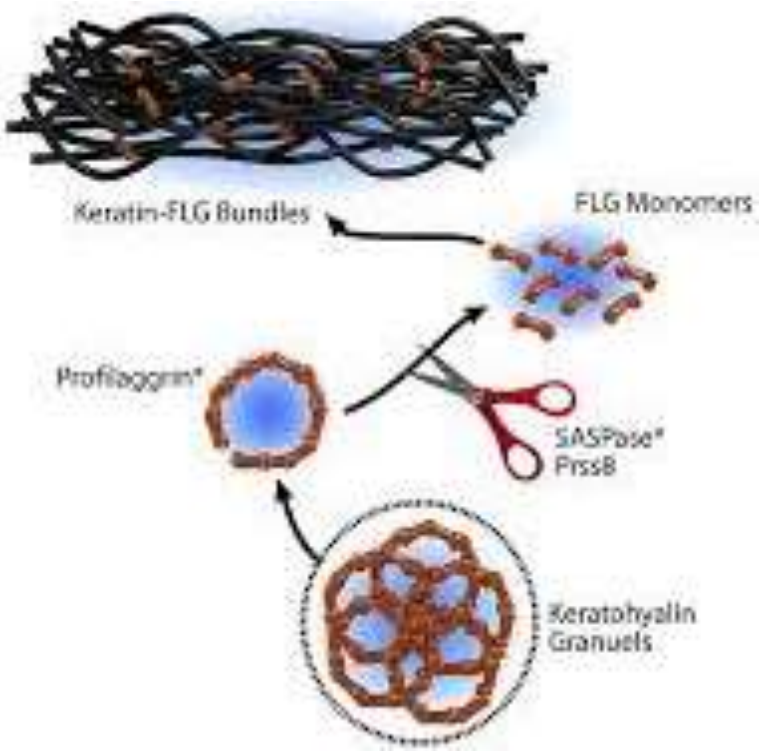
2.Stratum spinosum / poligonale

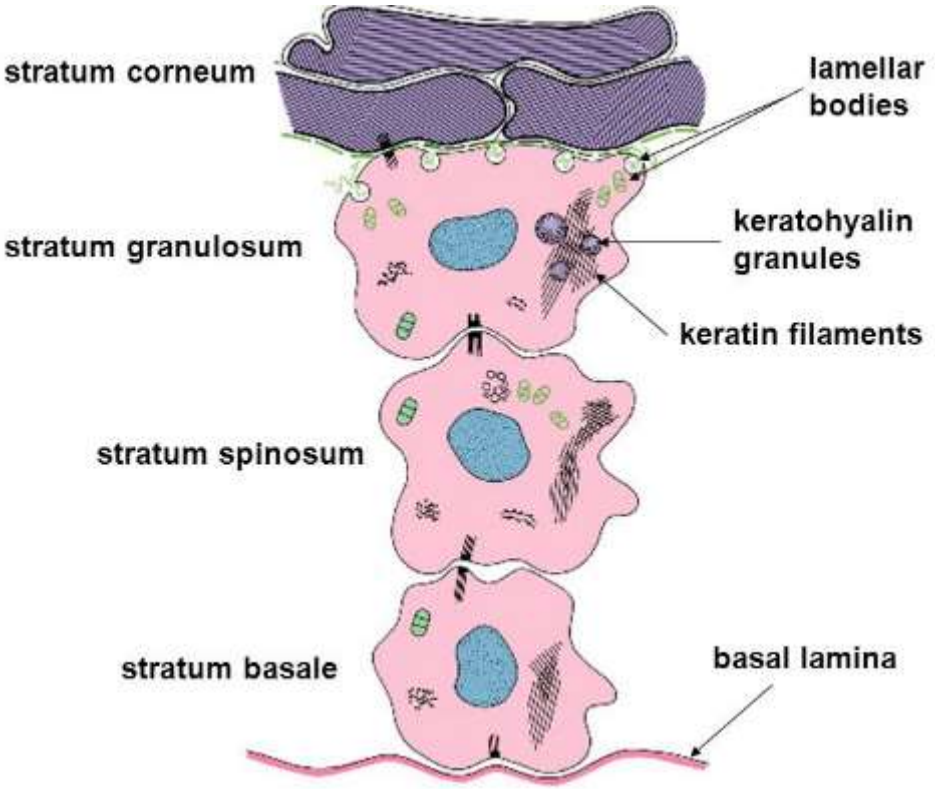
3.Stratum granulosum

4.Stratum lucidum

5.Stratum corneum (continuously shed)

Keratinization

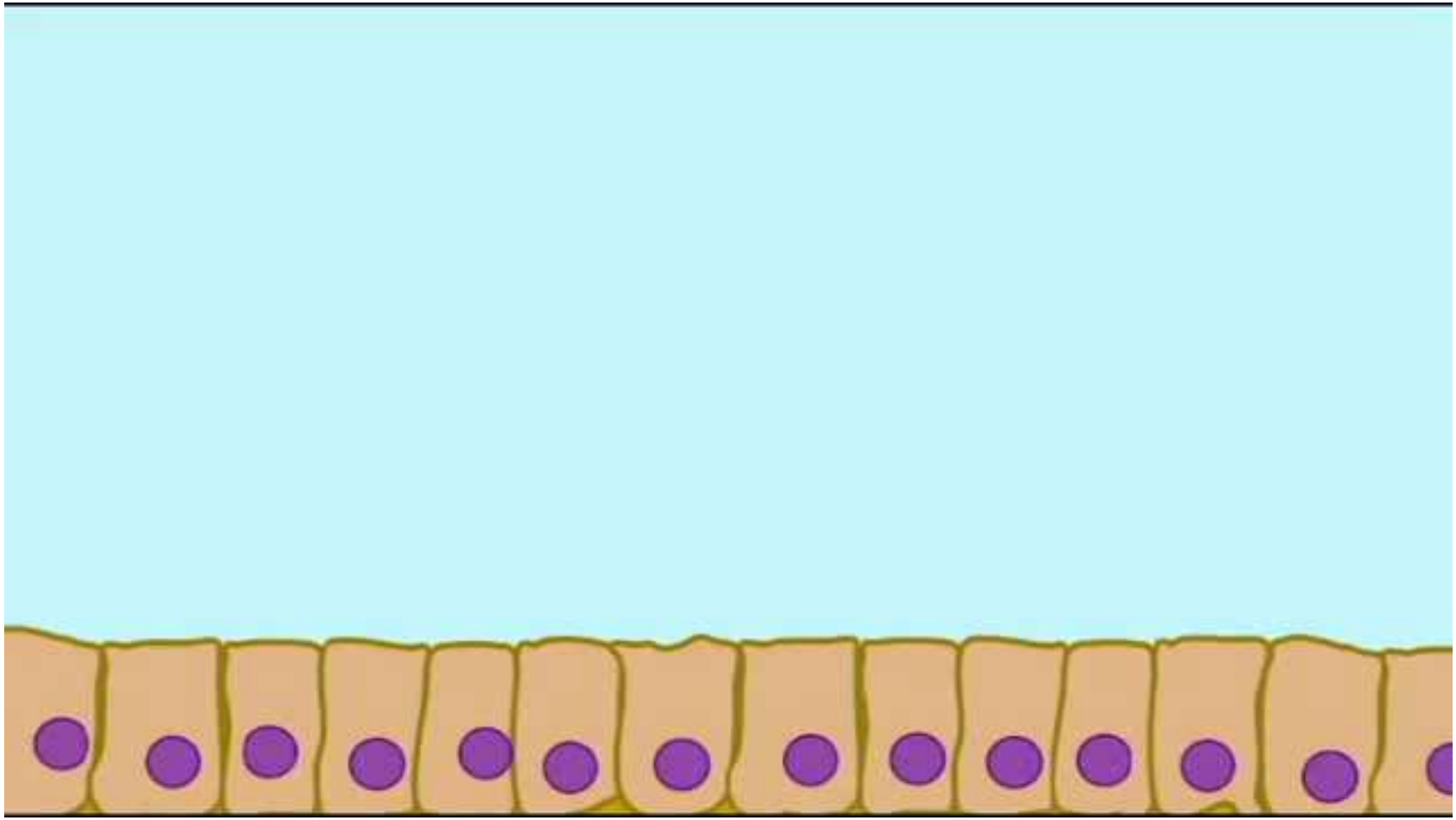




By Jennifer Carbrey, Duke

Gyohei Egawa, and Kenji Kabashima:Multifactorial skin barrier deficiency and atopic dermatitis: Essential topics to prevent the atopic March, 2016, *J Allergy Clin immunol*,Volume 138, Number 2

Keratinization

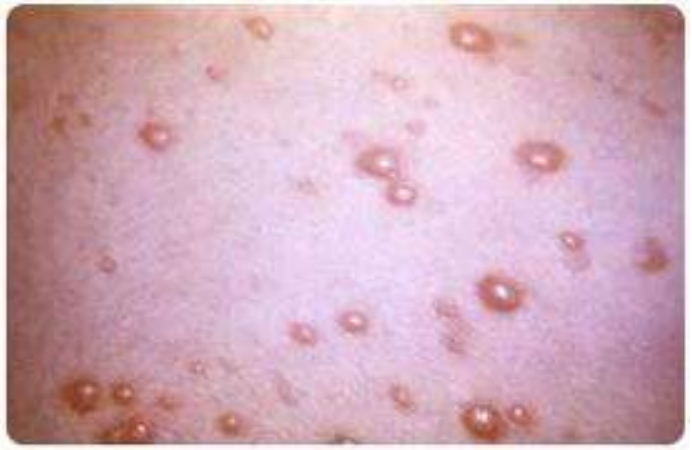


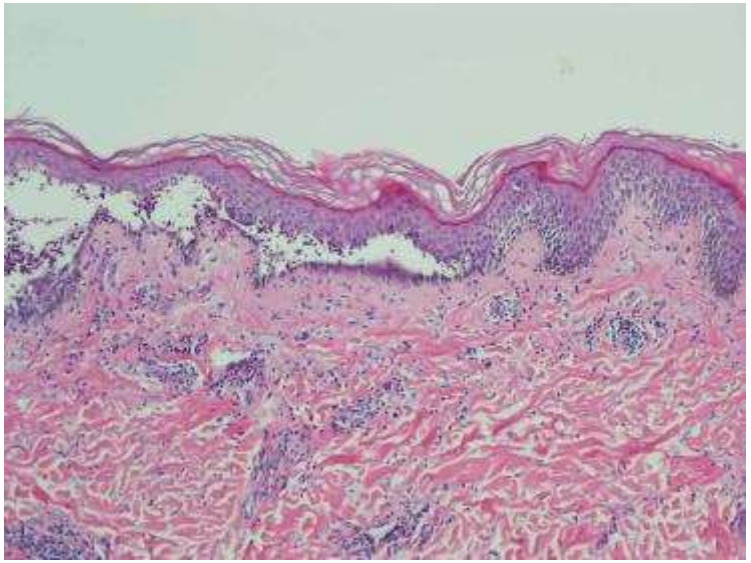
https://www.youtube.com/watch?v=OKosGSm7Ps4 by Walter Jahn

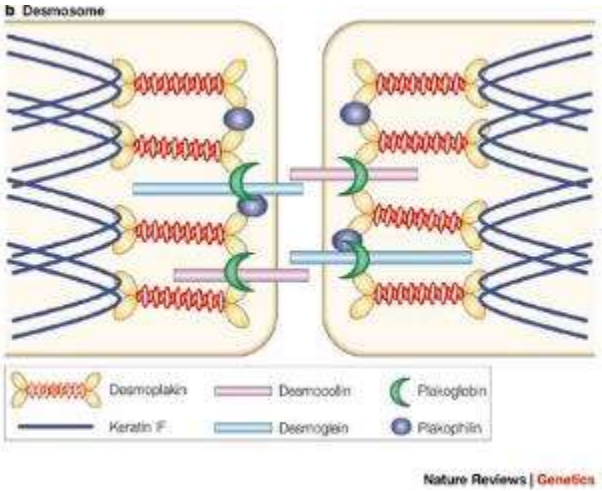
Disorders of cornification

Figure 1. Clinical features of lamellar ichthyosis. A, Brownish lamellar desquamation. B, Marked plantar hyperkeratosis. C, Scarring alopecia of the scalp. L.Rodríguez-Pazos és mtsai:https://doi.org/10.1016/j.adengl.2011.11.021

A disease of desmosomes: pemphigus

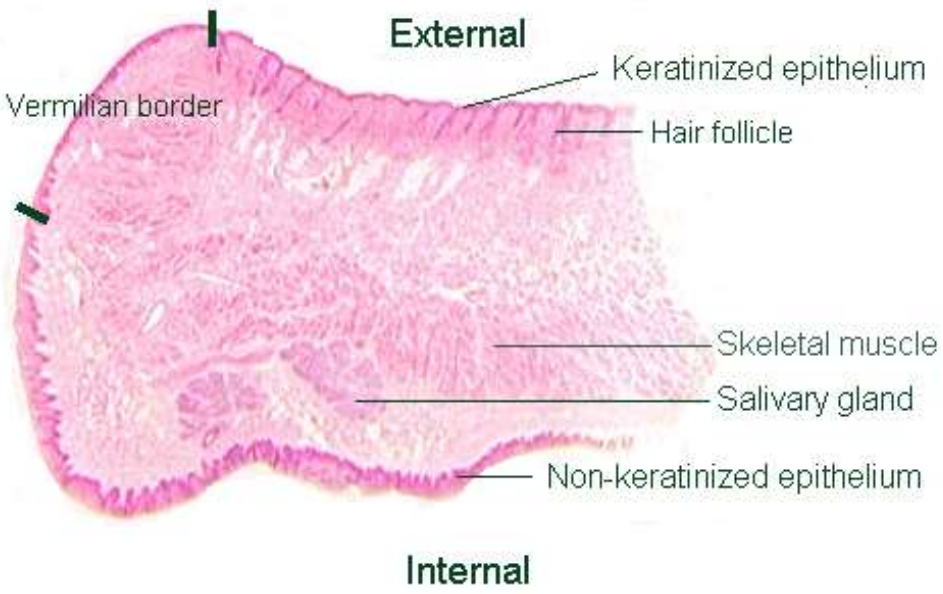


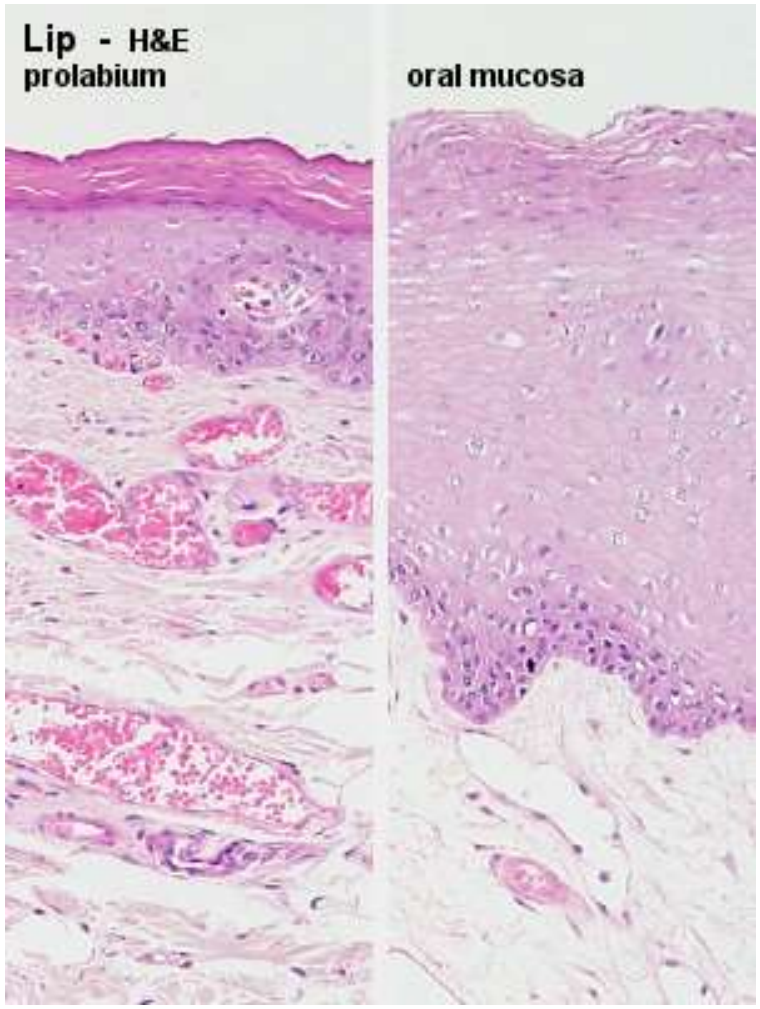




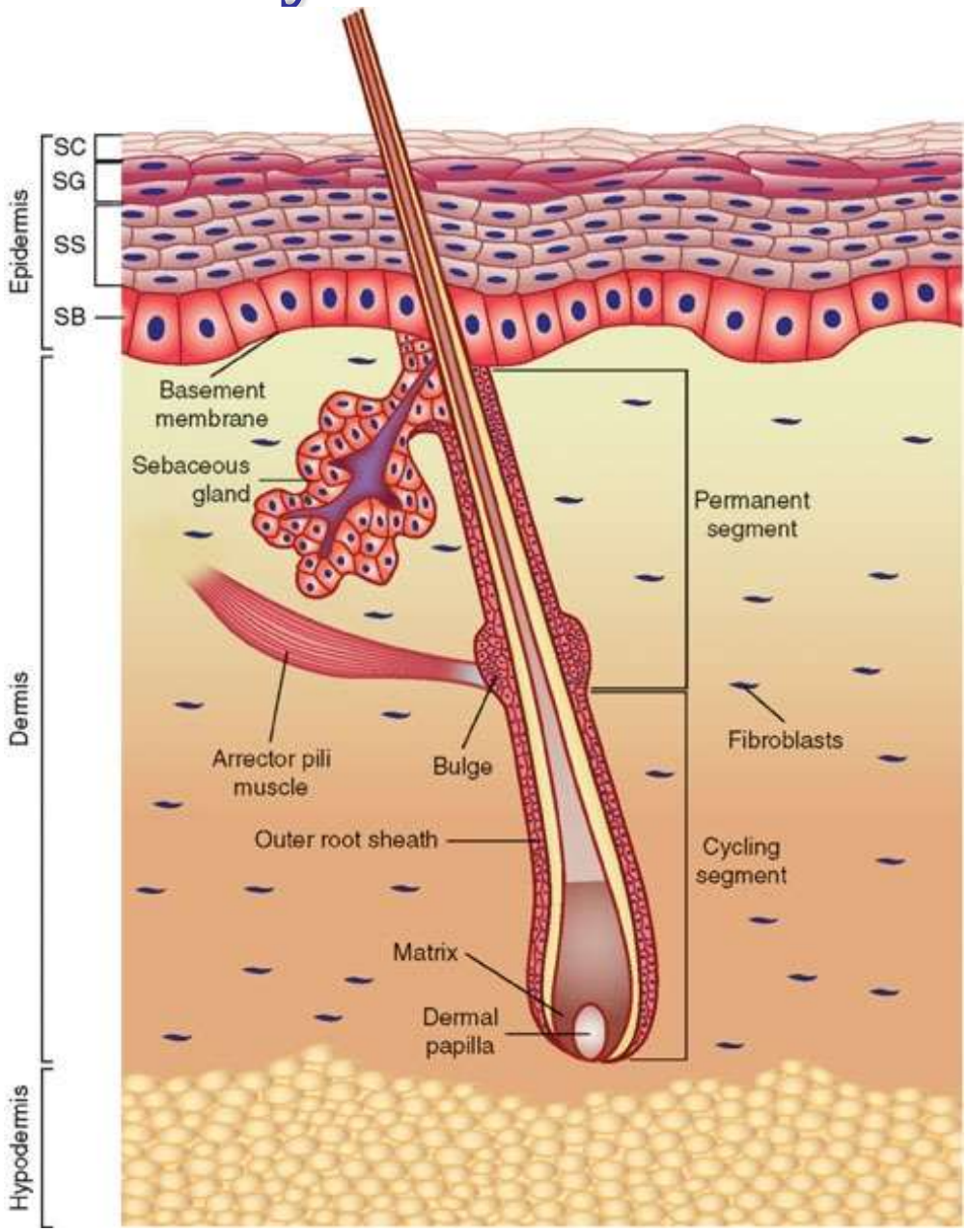
Blistering autoimmune disease in which antibodies form against **desmoglein** (the transmembrane desmosomal cadherin) and the cells of stratum spinosum are separated from each other (unglued). (Blisters→sores)

Lip

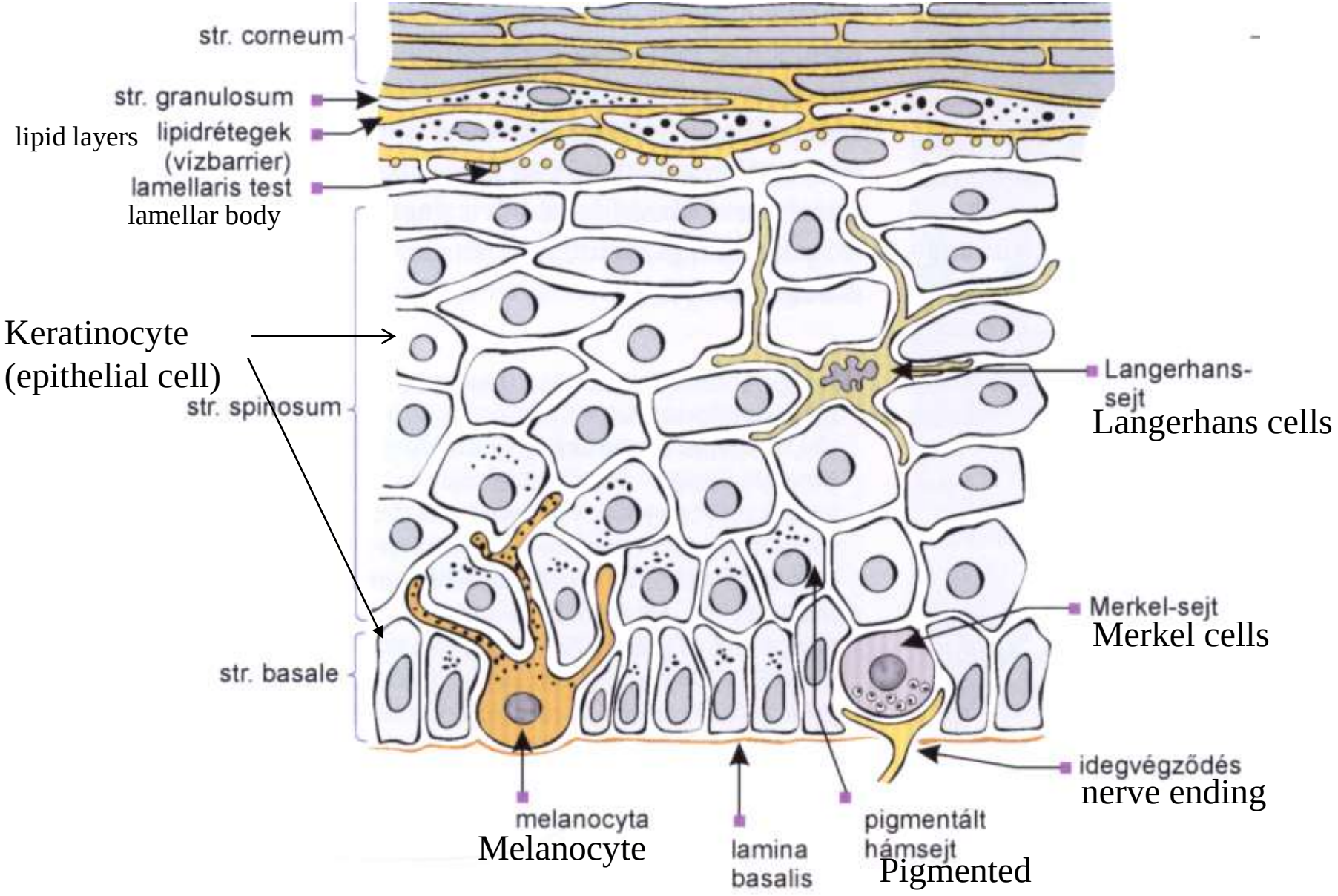

External
Keratinized epithelium
Vermilian border
Hair follicle
Skeletal muscle
Salivary gland
Non-keratinized epithelium
Internal


Lip - H&E
prolabium
oral mucosa

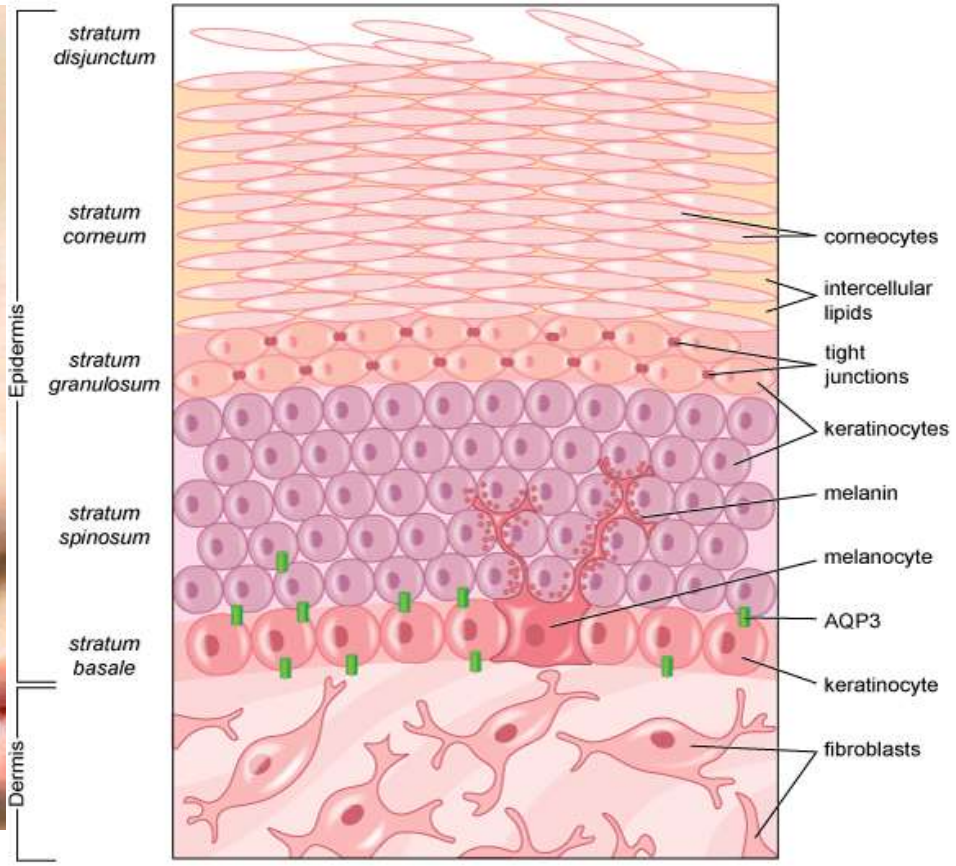
Layers of the skin



Cells of epidermis

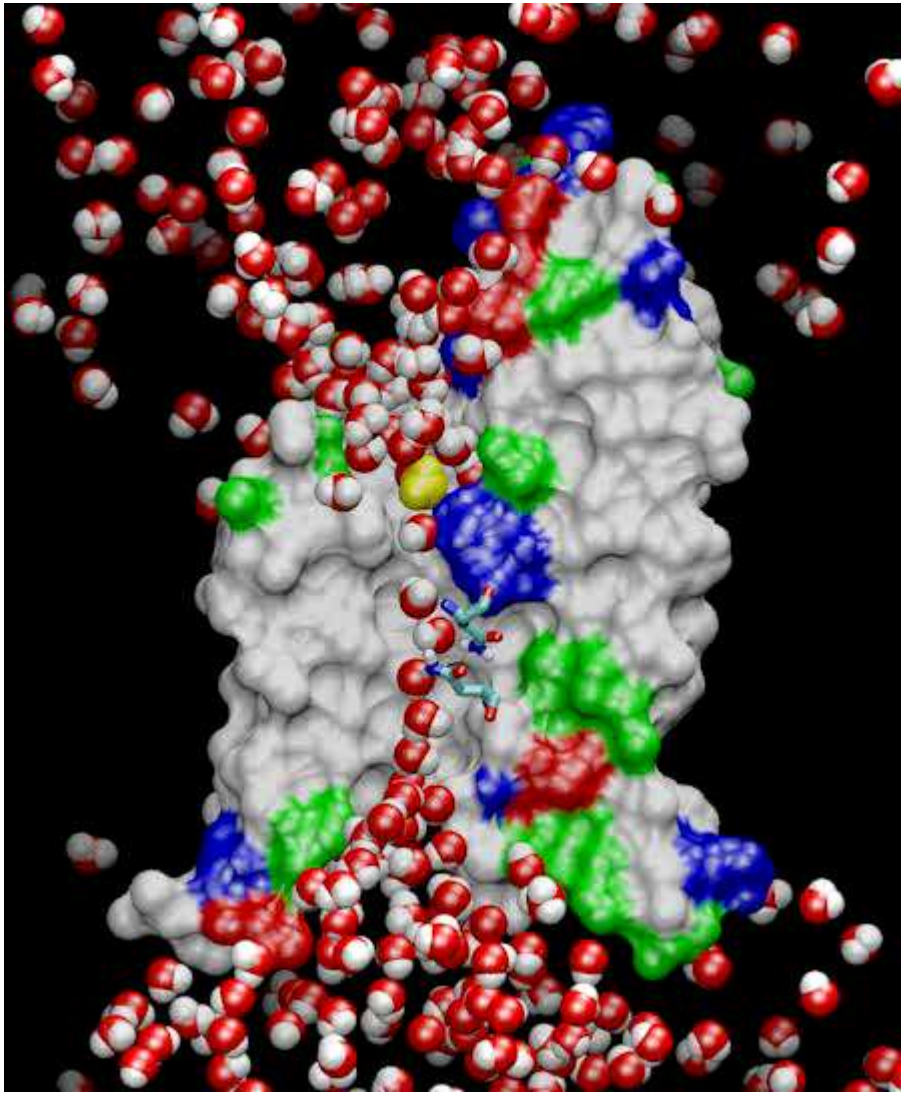


Aquaporins


stratum disjunctum
stratum corneum
stratum granulosum
stratum spinosum
stratum basale
Epidermis
Dermis
corneocytes
intercellular lipids
tight junctions
keratinocytes
melanin
melanocyte
AQP3
keratinocyte
fibroblasts

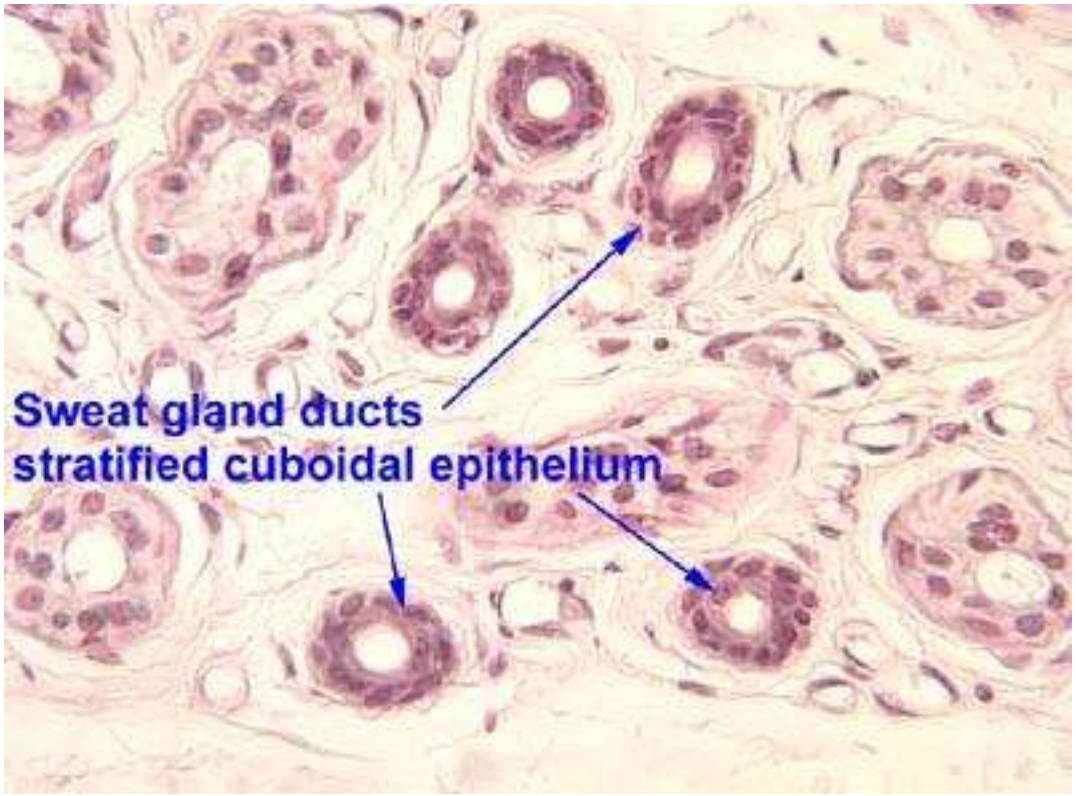
Nobel-prize in Chemistry 2003

P. Agre and R. MacKinnon: water and ion channels



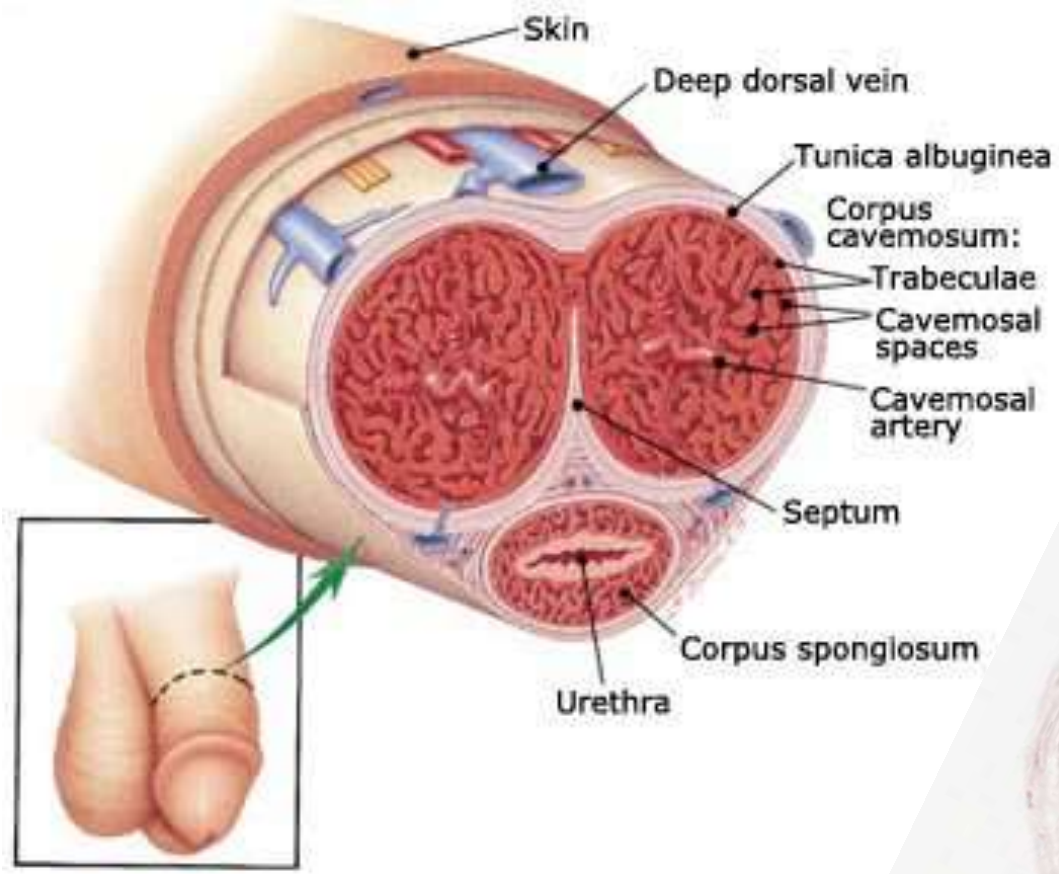
Stratified cuboidal epithelium

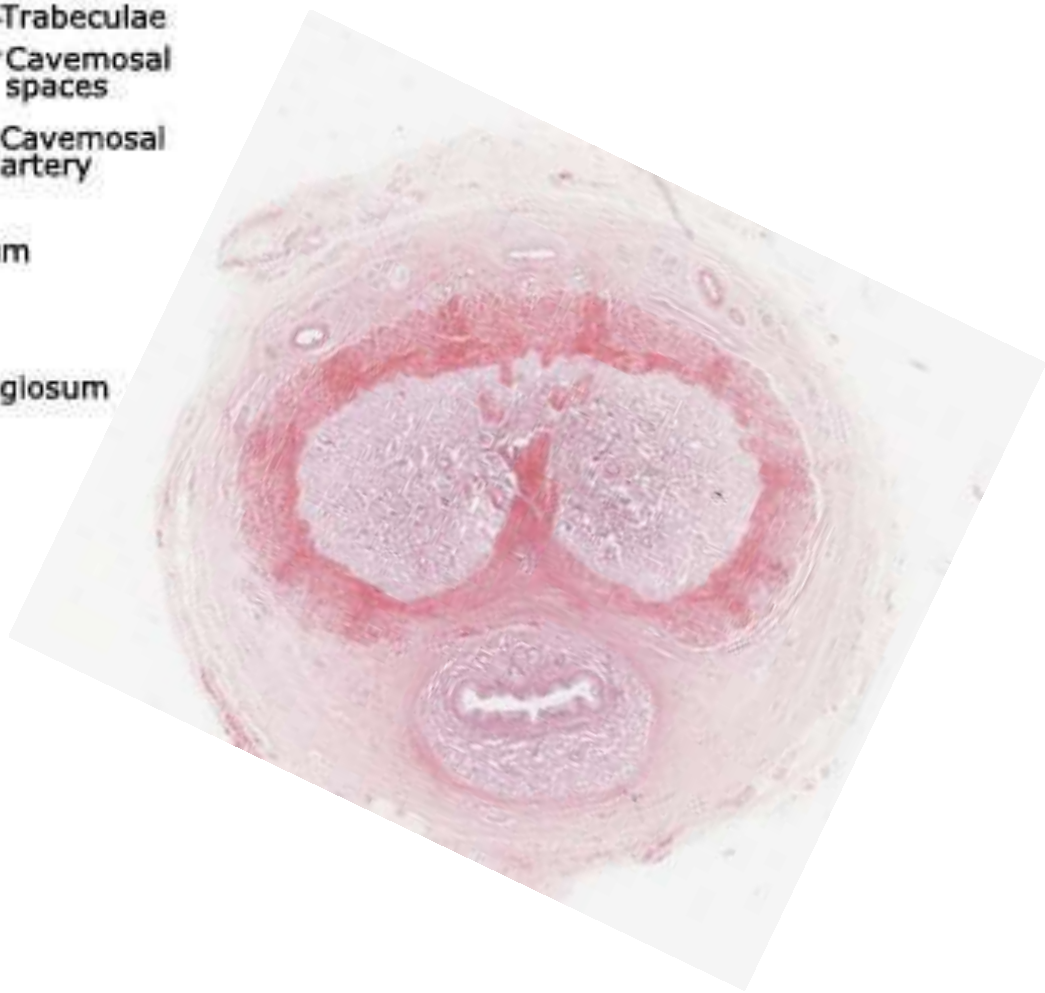
Sweat gland



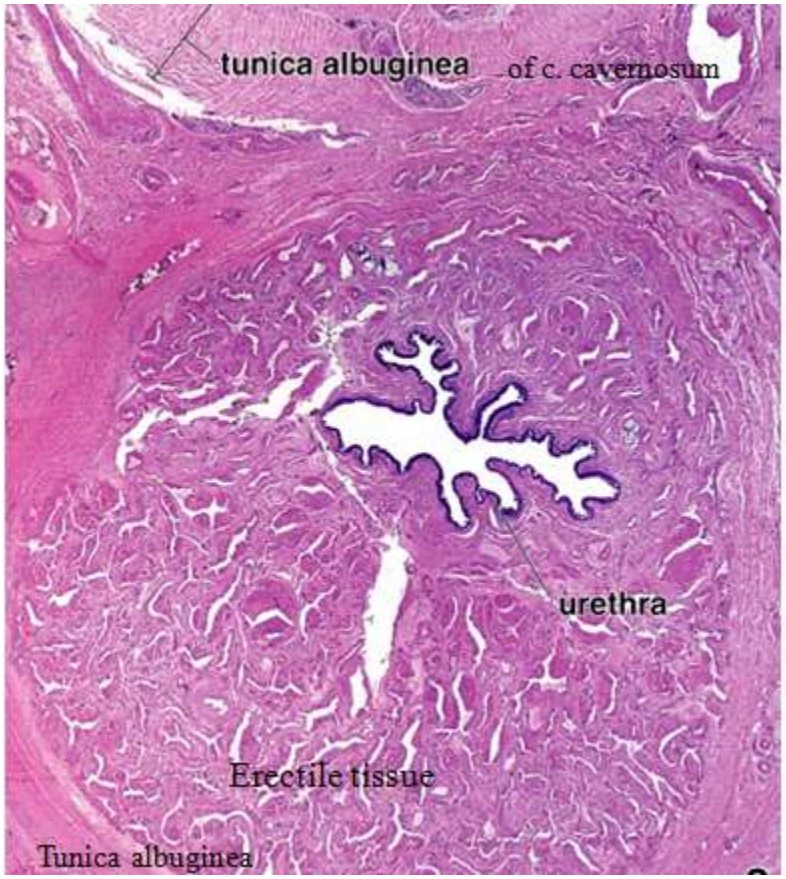
Gland ducts

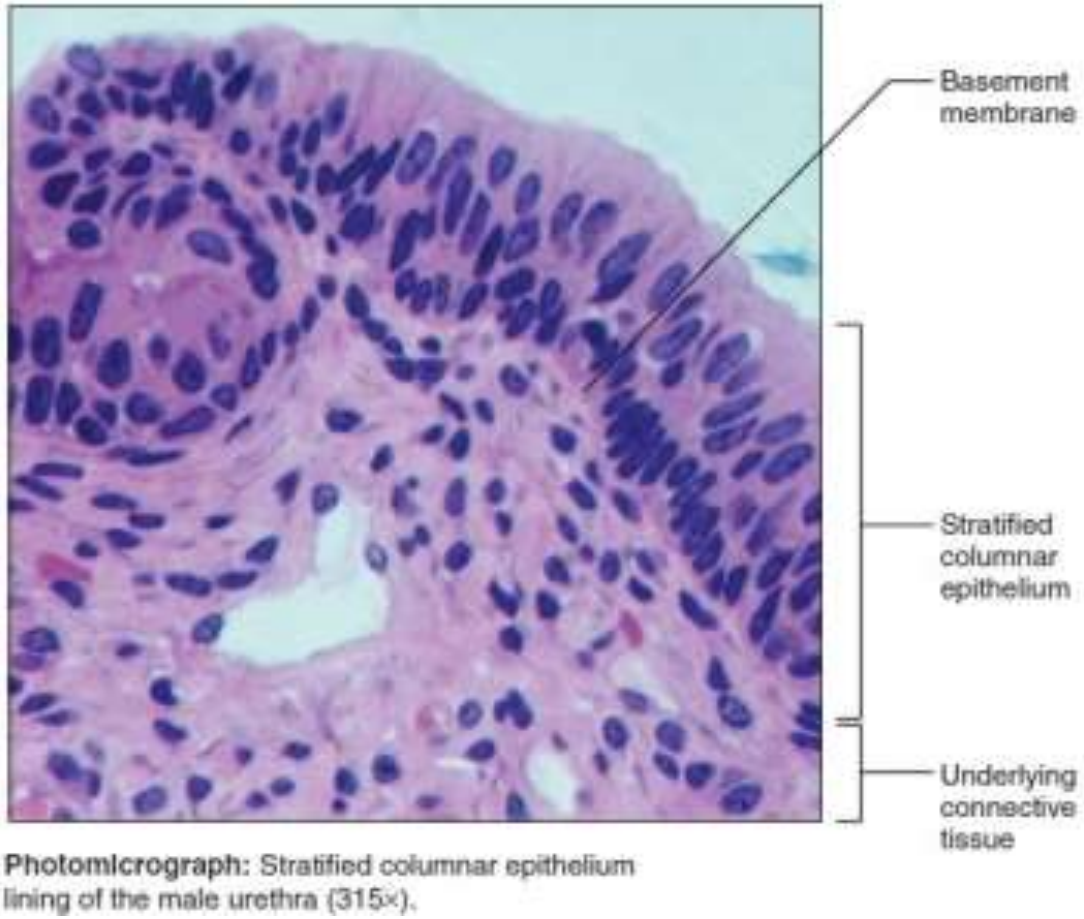
Urethra


Skin
Deep dorsal vein
Tunica albuginea
Corpus cavemosum:
Trabeculae
Cavemosal spaces
Cavemosal artery
Septum
Corpus spongiosum
Urethra



Stratified columnar epithelium

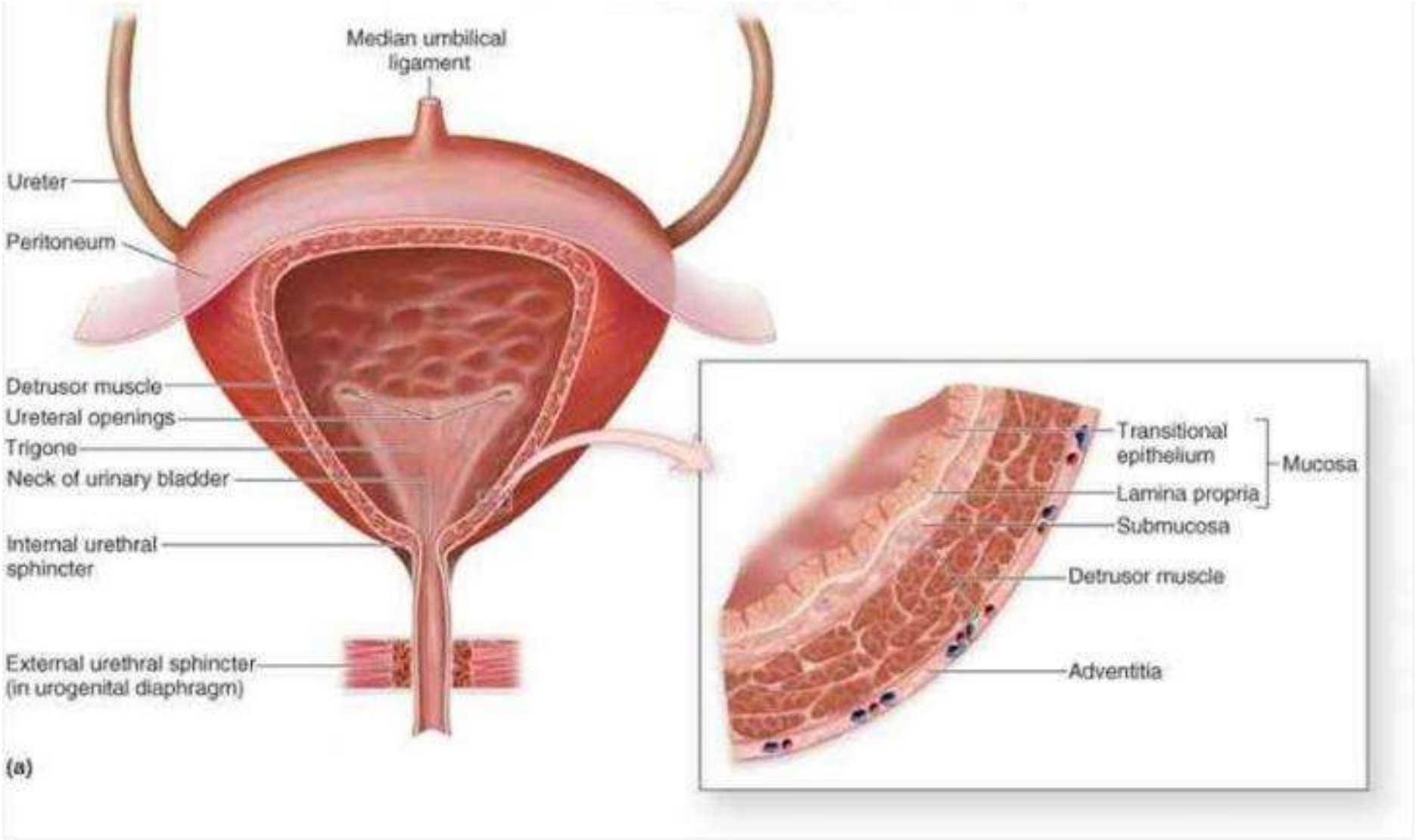




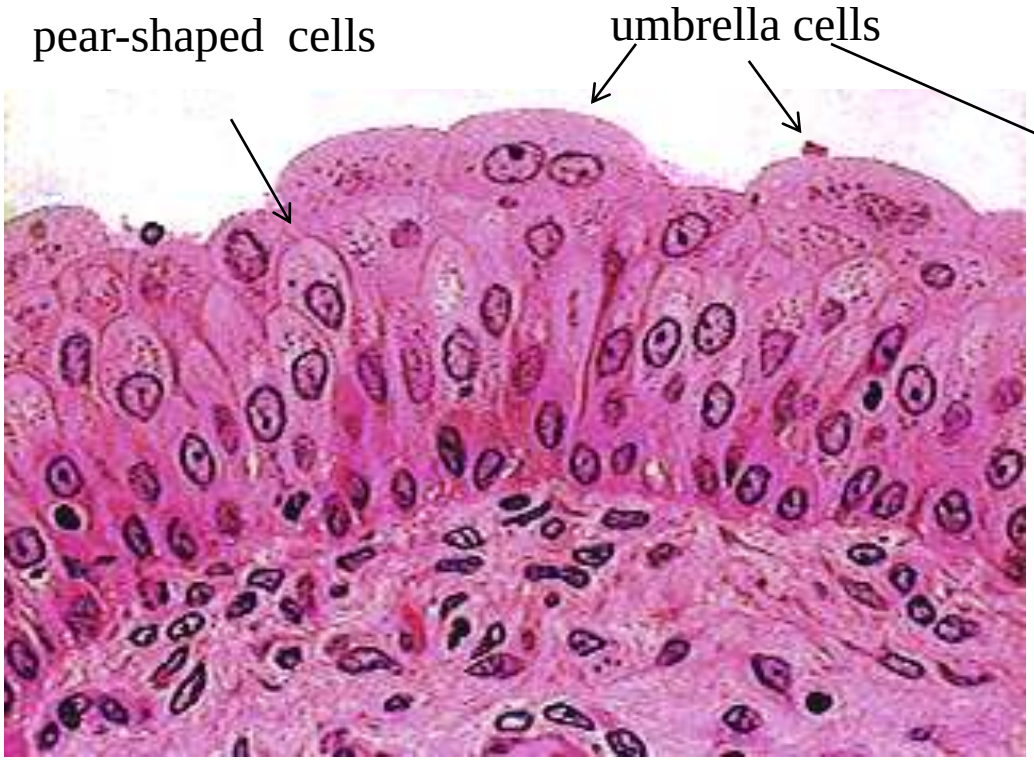
Photomicrograph: Stratified columnar epithelium lining of the male urethra (315×).

Basal and superficial cells are columnar, poligonal cells in between.
Large ducts of exocrine glands, spongy part of male urethra, fornix of conjunctiva

Urinary bladder



Transitional epithelium - urothelium



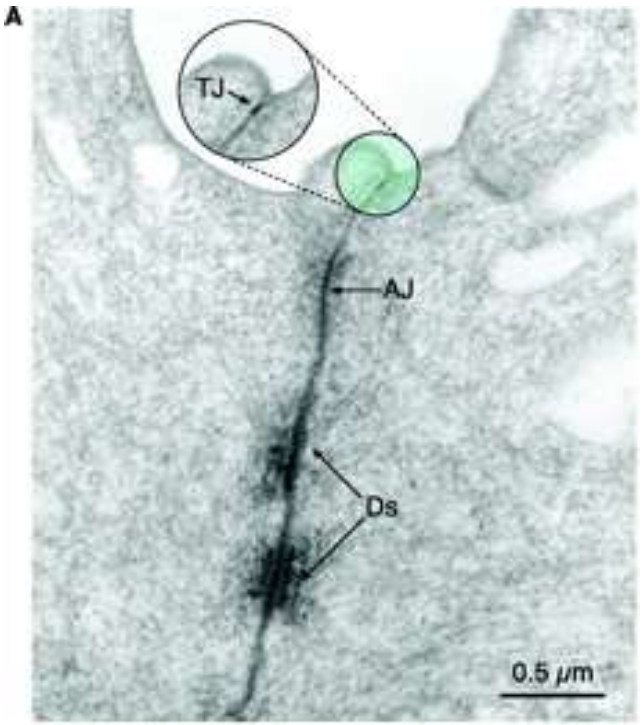
Characteristic epithelium of urinary system. Transitional: distended bladder compress the cells into squamous cells, empty bladder results in thickening of the epithelium. Protections from hypertonic and cytotoxic effect of urine.

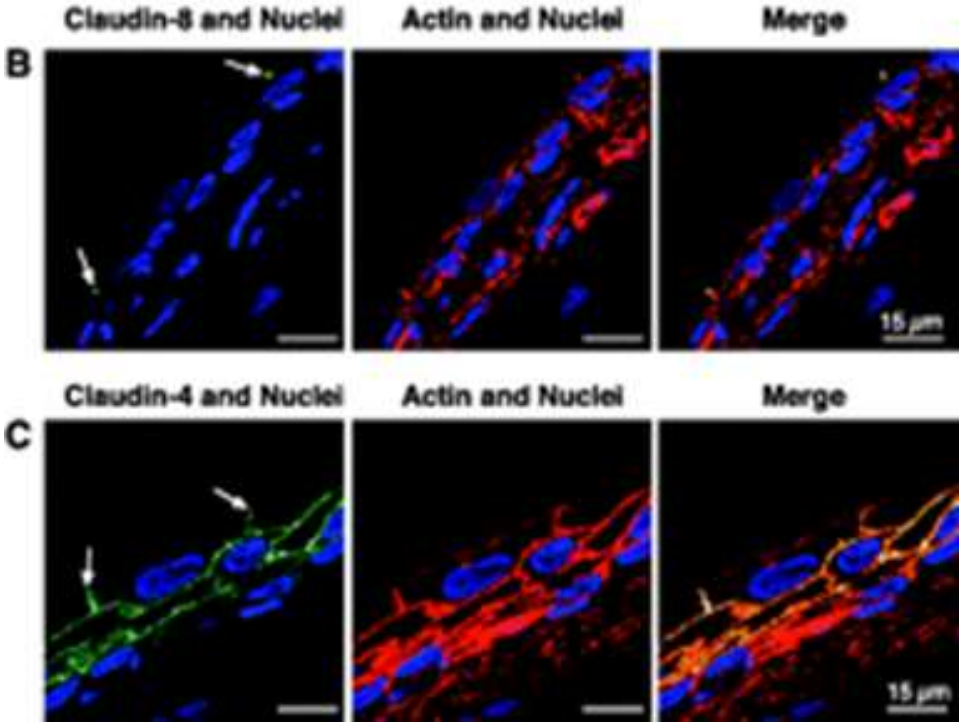
Layers

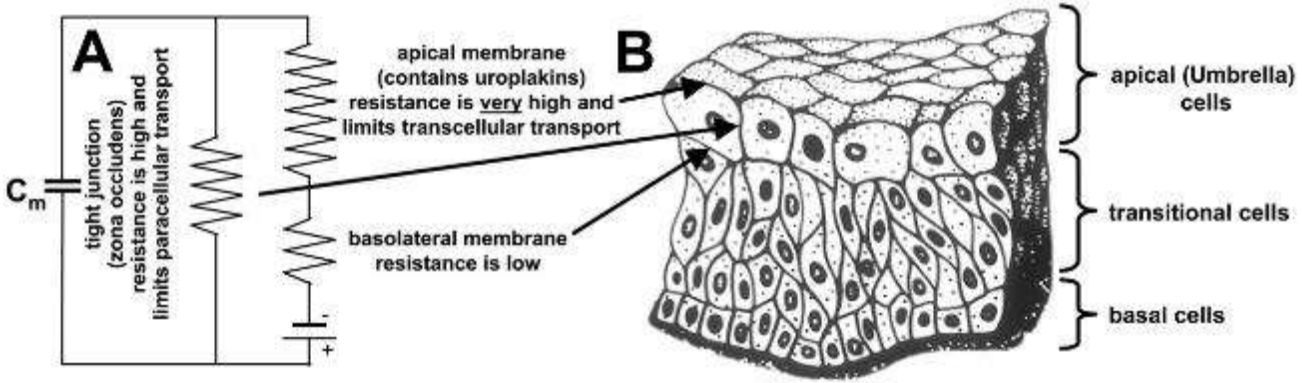
1. basal layer: cuboidal or columnar epithelial cells with mitotic activity
2. piriform layer: poligonal parabasal cells – pear shaped cells
3. dome shaped-umbrella cell layer often binucleated cells.

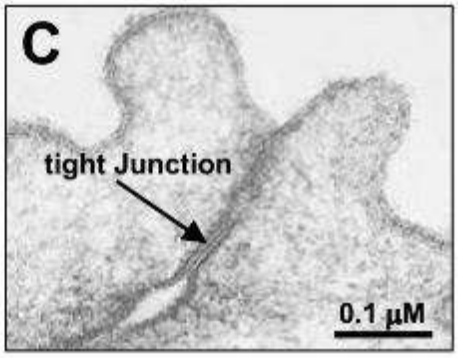
Appearance: renal pelvis, ureter, urinary bladder, upper part of urethra

Junctional complexes in umbrella cells



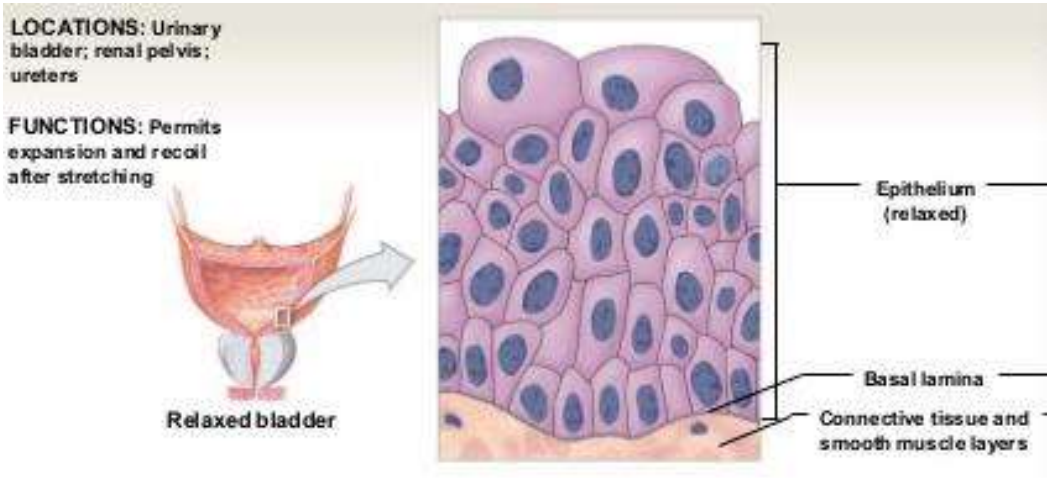


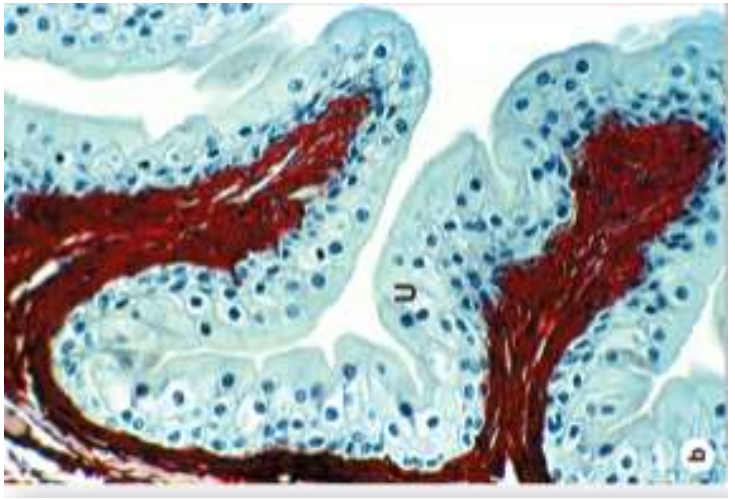




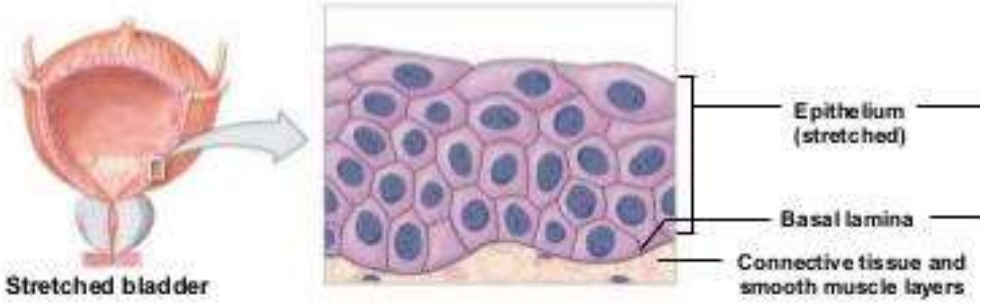
American Journal of Physiology - Renal Physiology Published 1 December 2009 Vol. 297 no. 6,

Empty bladder

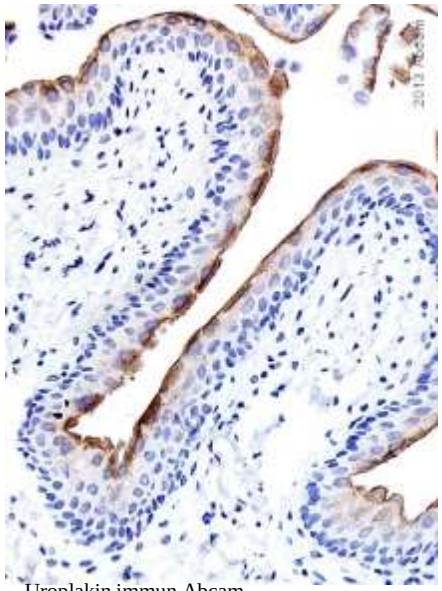




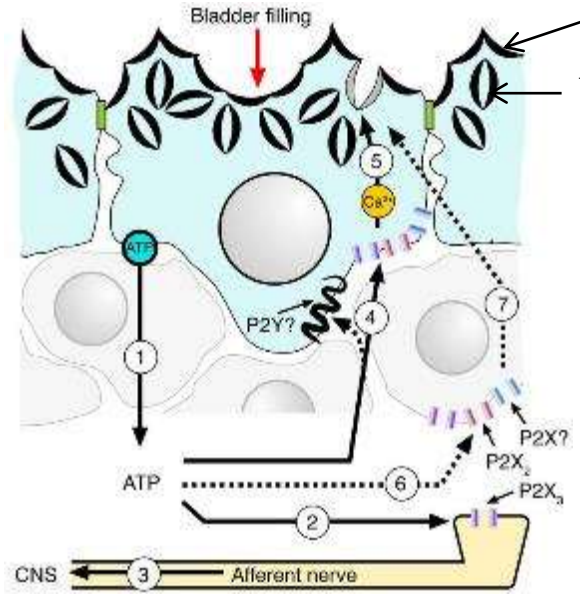
The bladder is full



Specific features of umbrella cells

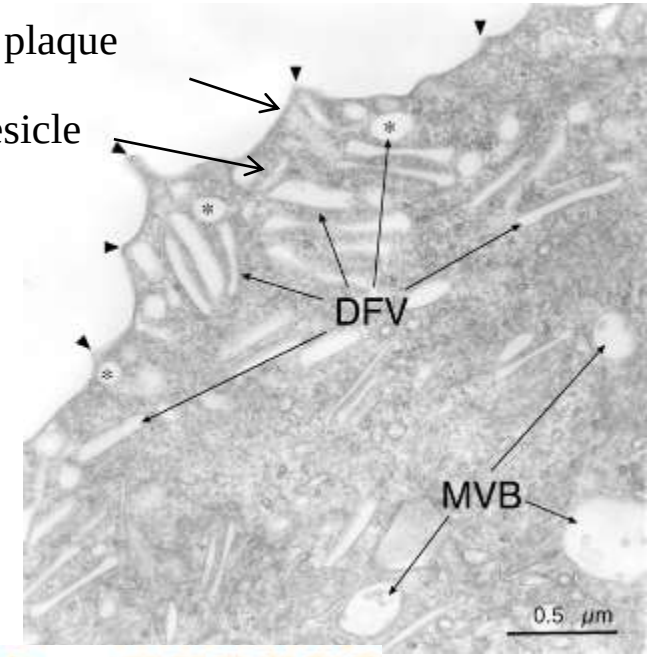


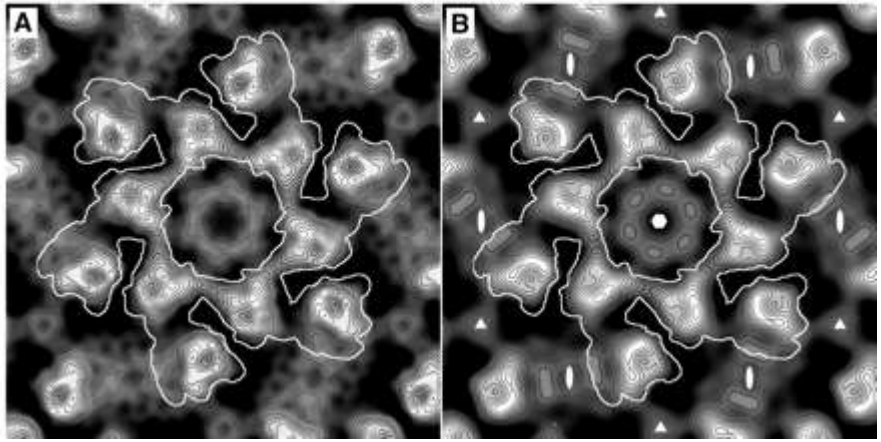
Uroplakin immun Abcam

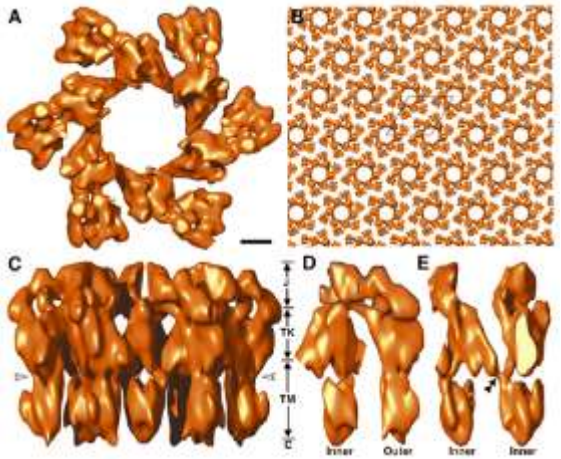


plaque

vesicle





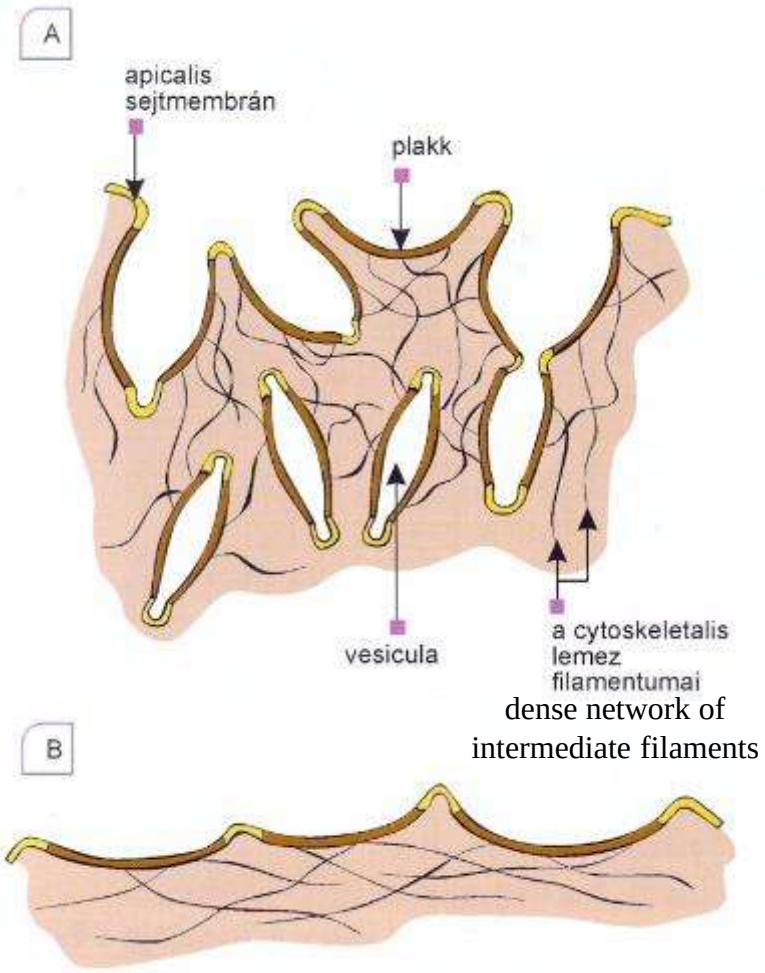


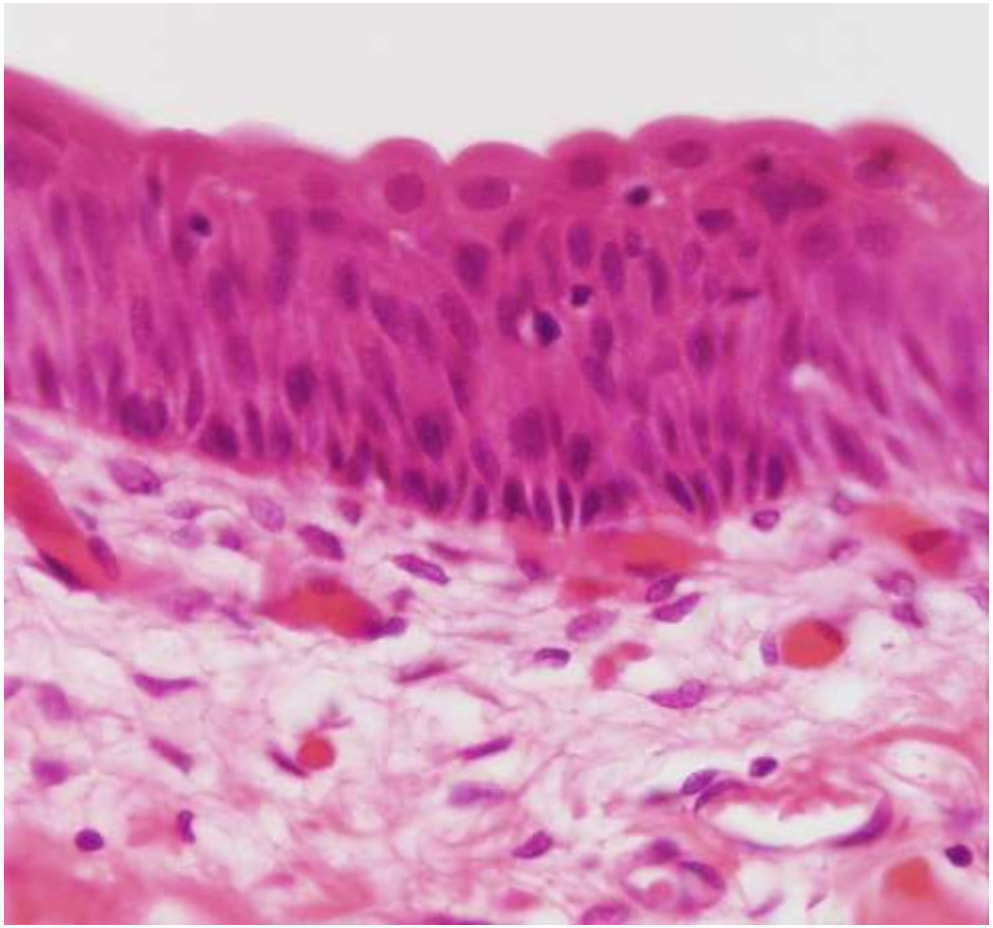
- Surface increment
- Barrier
- Receptor

Min és mtsai:Structural basis of urothelial permeability barrier function as revealed by Cryo-EM studies of the 16 nm uroplakin particle Journal of Cell Science 2003 116: 4087-4094; doi: 10.1242/jcs.00811

Membrane specialization: plaques (thicker and rigid membrane units - uroplakin protein), vesicles (reserve membrane parts), cytoskeletal plate (intermedier filaments) in the cytoplasmatic side of the membrane (crusta-light microscopic appearance). Increase/decrease the surface, barrier.

Crusta?





„..in subapical areas of umbrella cells (see below) a dense network of intermediate filaments was seen and represented part of the so-called crusta described by light microscopy (Teutsch, 1977).”

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