

Structure & Functions of Skin

Dermatology

- Dermatology – defined as ‘the branch of medicine concerned with the diagnosis & treatment of skin disorders’
- However, dermatologists do not confine themselves purely to a study of intrinsic disorders of the skin
- Must also study internal medicine & the many environmental & occupational factors that so frequently cause skin problems

Dermatology

- Probably at least 2000 different skin conditions might present to the dermatologist; vary enormously in severity
- Range from cosmetic problems, e.g., dry skin or wrinkles, through a huge variety of acute or chronic diseases - disfiguring, itchy or painful, less commonly fatal to life-threatening conditions
- Certain diseases, if untreated, may prove fatal within days (e.g., toxic epidermal necrolysis), weeks (e.g., pemphigus), months (e.g., malignant melanoma) or years (e.g., mycosis fungoides)

Dermatology

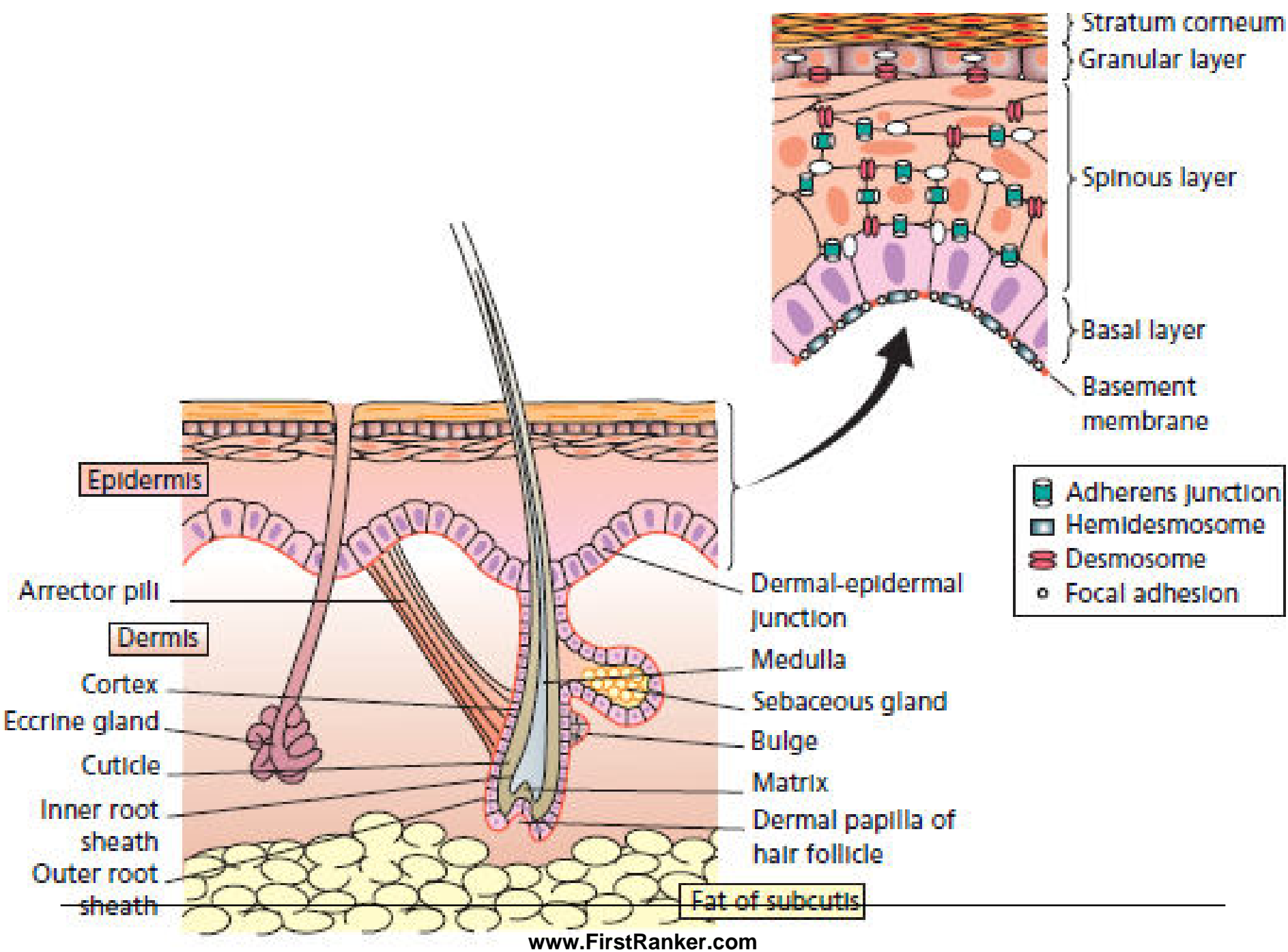
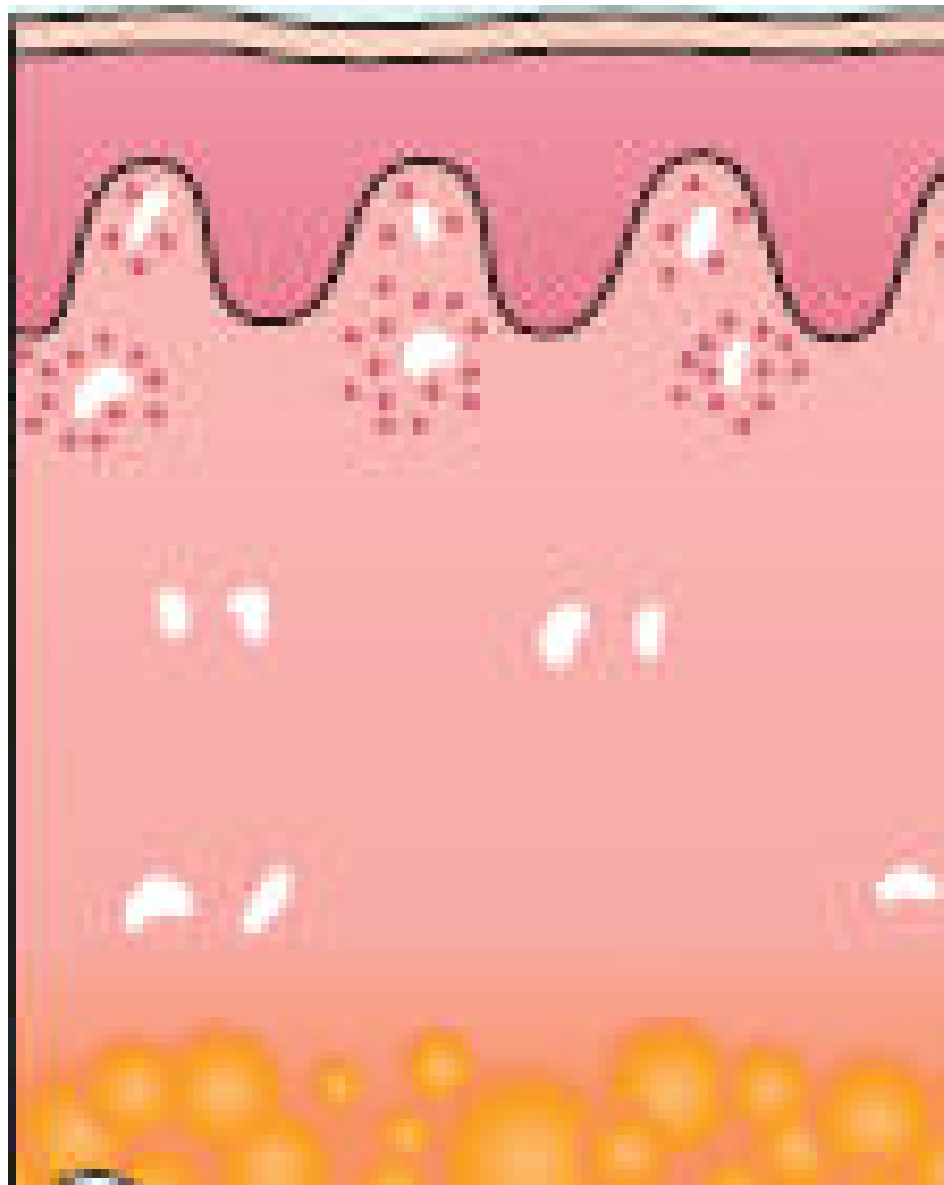
- The patterns of dermatological diseases / disorders vary from one country to another
- Even in the same city the work of dermatologists differ, depending on their particular interests & expertise & on the social mix of their patients

Dermatology

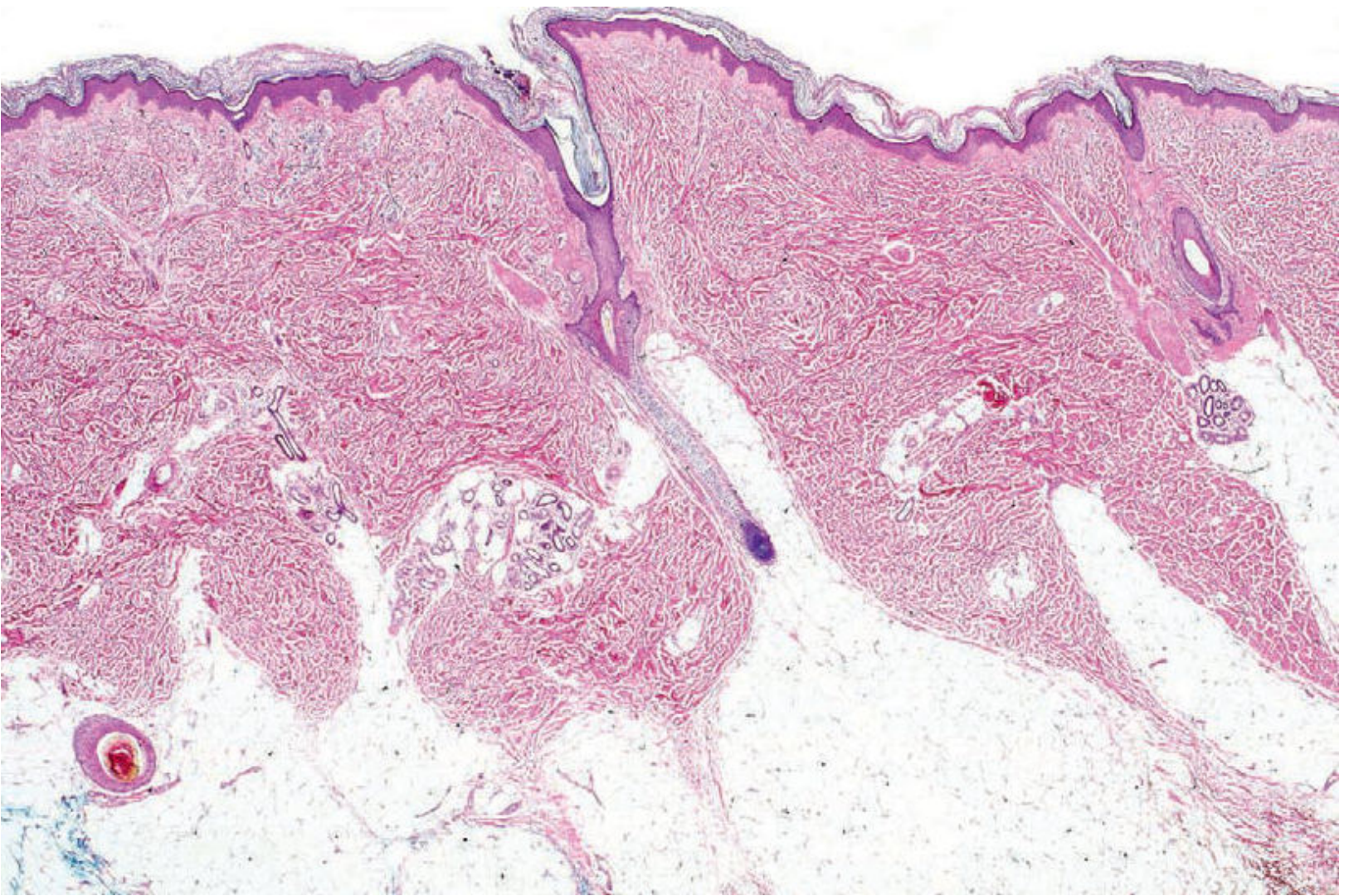
- Largest organ of the body
- In a 70 - kg person: skin wt- >5 kg; SA = 2 m²
- Consists of a stratified, cellular epidermis & an underlying dermis of connective tissue
- Epidermis is mainly composed of keratinocytes & is typically 0.05 – 0.1 mm in thickness, up to 1.5 mm in palms & soles

Layers of Skin

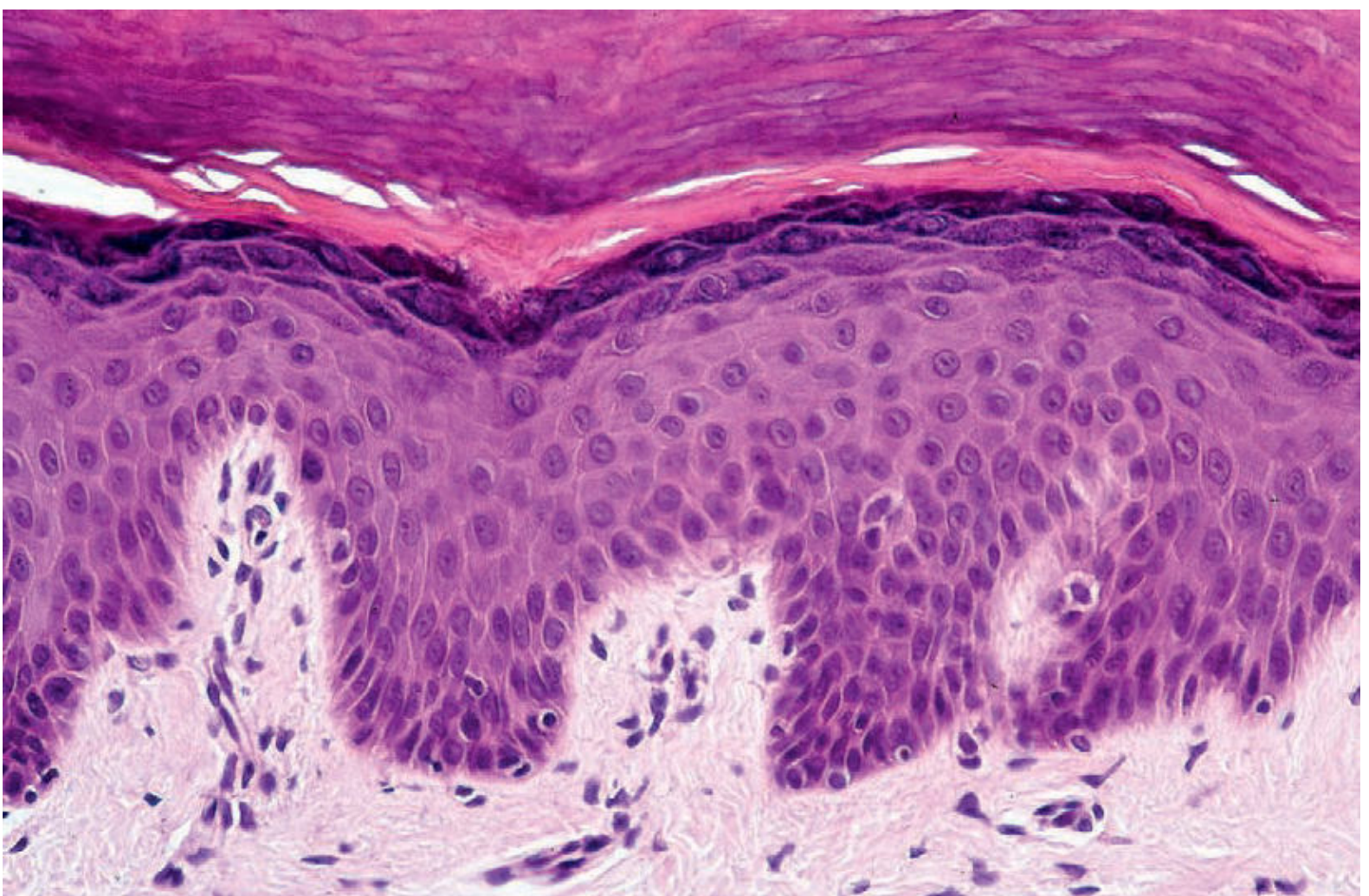
- Epidermis: Stratum basale (germinativum)
Stratum spinosum
Stratum granulosum
Stratum lucidum (palms, soles)
Stratum corneum
(Malphigian layer = basal + spinous layers)
- Dermis: Papillary dermis
Reticular dermis
- Subcutaneous Fat



HPE Skin - forearm – very thin epidermis



HPE – Palm – stratum lucidum



Different Types of Cells in Epidermis

- Keratinocyte
- Melanocyte
- Langerhans' cell
- Merkel cell

Strata (layers) of Epidermis

- Stratum basale: Columnar / cuboidal cells; large oval nuclei, dense basophilic cytoplasm
- Stratum spinosum (spinous / prickle cell layer): Polygonal cells with delicate processes, desmosomes connect adjacent keratinocytes
- Stratum granulosum: Flattened diamond-shaped cells filled with coarse basophilic 'keratohyaline' granules

Strata of Epidermis

- Stratum lucidum : Clear layer found in palms and soles, cells are nucleated, sometimes k/a *transitional* cells
- Stratum corneum : Flat, non-nucleated, eosinophilic layer; cells k/a corneocytes
Dead layer shed during epidermal turnover

Epidermal turnover/ transit time:

- Time taken for a cell to pass from basal layer to surface of skin
- Apprx. 40 – 56 days (normal skin)

Melanocyte

- Neural crest derived cells
- Dendritic arborizing cells that synthesize and secrete melanin containing organelles called melanosomes
- Located in basal layer; 1:10 ratio
- Epidermal-Melanin Unit: A single melanocyte supplies melanosomes to 36 keratinocytes (1:36)
- Melanosomes vary in number and size according to skin type → differing skin color

Melanocytes in culture

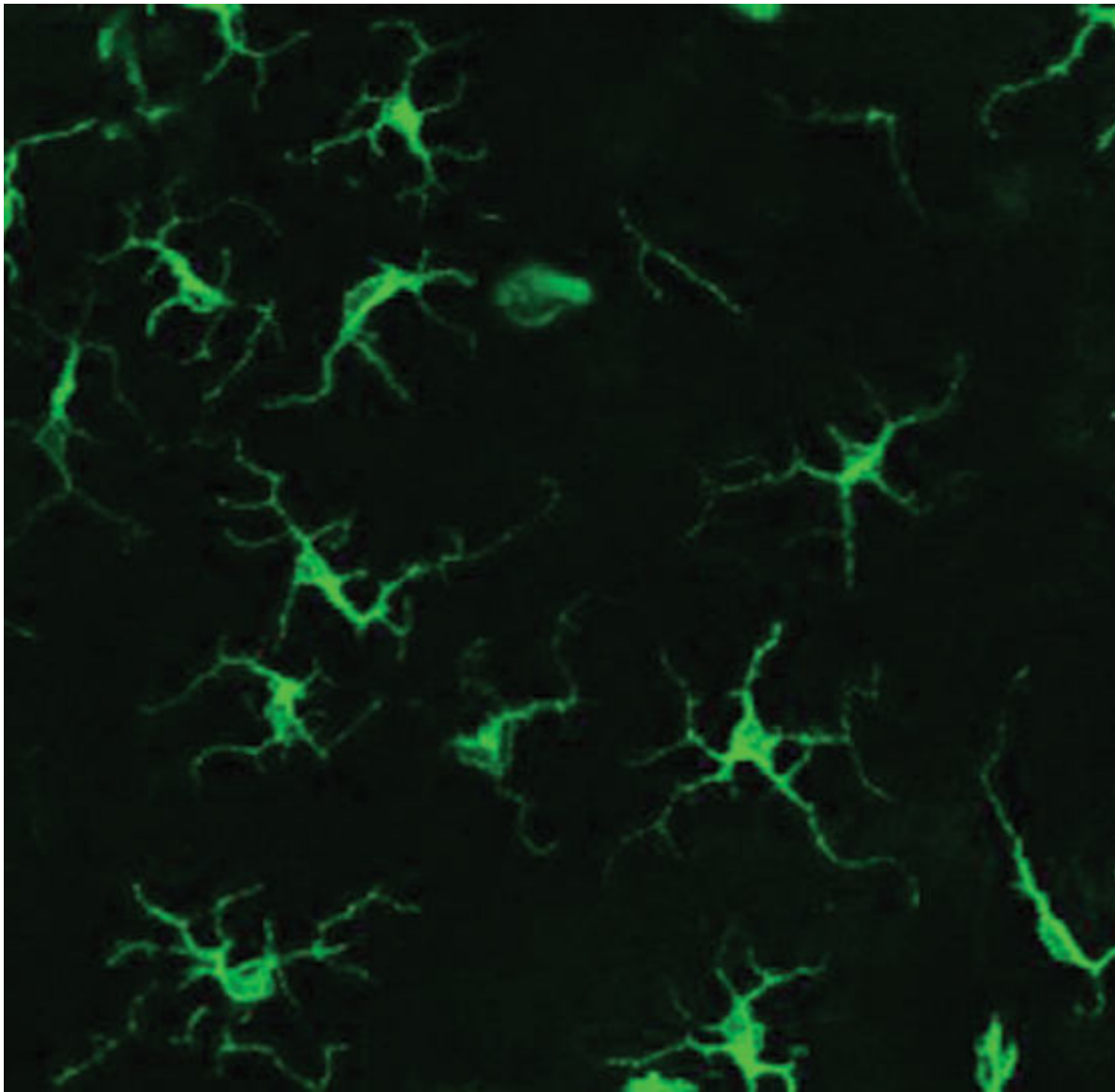


Melanocyte

- Function of melanin
 - Impart colour to skin and hair
 - Protect the skin from UV radiation
 - Biochemical neutralizer of toxic, free radical oxygen derivatives
- Melanin: Eumelanin (brown / black) & pheomelanin (yellow / red)

Langerhans' cell & Merkel cell

- Langerhans' cell
 - Type of macrophage, APCs
 - Originate from bone marrow (mesodermal in origin)
 - Role in various immune processes like allergic contact dermatitis, immune tolerance, surveillance against neoplasia



- Merkel cell also k/a Merkel-Ranvier cell:
 - Oval receptor cells
 - Probably derived from keratinocytes
 - Associated with sensation of light touch
discrimination of shapes & textures

Dermis

- Papillary dermis – A thin zone which lies beneath the epidermis
- Reticular dermis - thick zone which extends from base of papillary dermis to the surface of subcutaneous fat

Structure of dermis

- Mainly non-cellular connective tissue
- Constituted of collagen, elastic fibers & ground substance (mucopolysaccharides, chondroitin sulphate & glycoproteins)
- Embedded nerves, blood vessels / capillaries, lymphatics, muscles & pilosebaceous, apocrine & eccrine units
- Cellular contents include fibroblasts, mast cells, histiocytes, Langerhans' cells, lymphocytes & eosinophils

Variation in thickness of skin

- Difference of thickness of the skin is dependent largely on dermal thickness, with the palms and soles being thickest (about 1.5 mm) & thinnest in the eyelids & post-auricular region (about 0.05 mm)
- Children & elderly have thinner skin than adults
- Males have thicker skin than females

Hair

- Hair - a keratinized product of the hair follicle, a tube-like structure continuous with the epidermis at its upper end
- Present all over the skin except on vermillion of lips, palms, soles & skin of nail folds

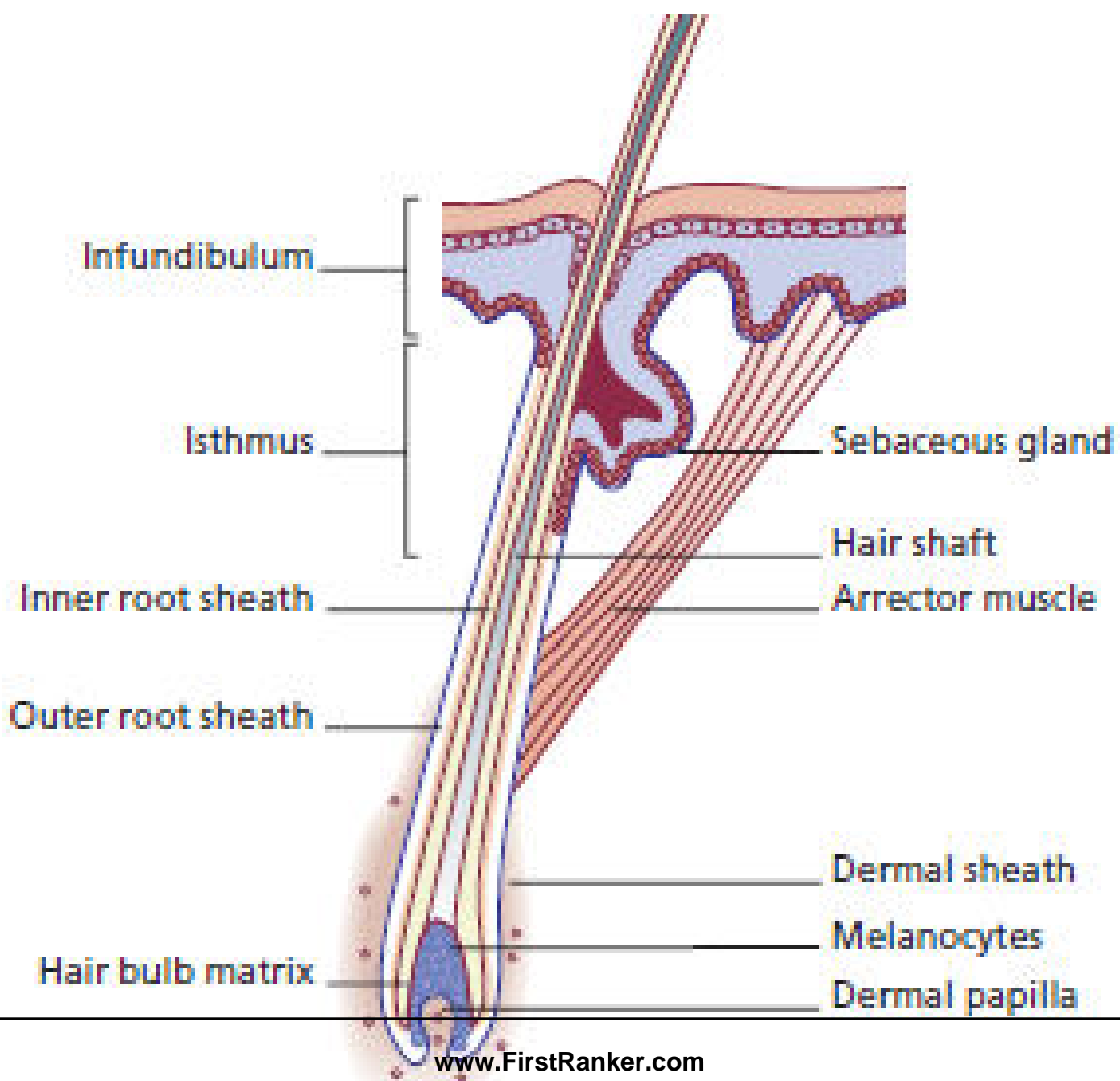
Types of hair

Types of hair:

- 1) Lanugo (fine, soft, unpigmented; seen *in utero*- shed in 8th-9th month of gestation)
- 2) Vellus (soft)
- 3) Terminal (longer, coarse, pigmented)

Also *intermediate*

After puberty : secondary sexual terminal hair



Hair Cycle

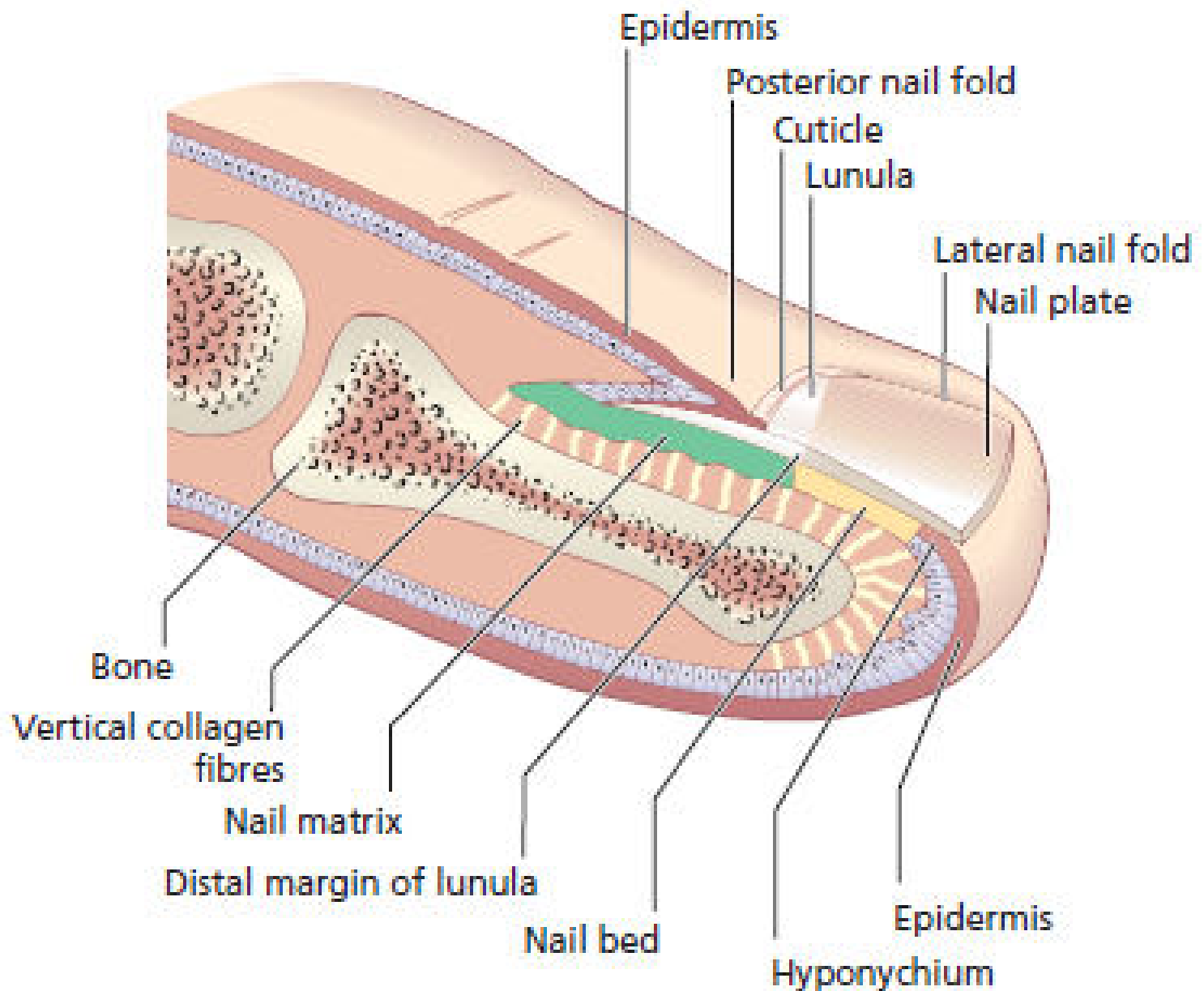
- Hair follicles undergo a repetitive sequence of growth & rest called the hair cycle
- Period of active hair growth is Anagen. Duration of this phase decides the length of hair; In humans, it is maximum on scalp
- Catagen is the regressive phase in which the follicular activity declines & ceases
- The hair stays in the Telogen (resting) phase till the beginning of next anagen phase

Sebaceous Glands

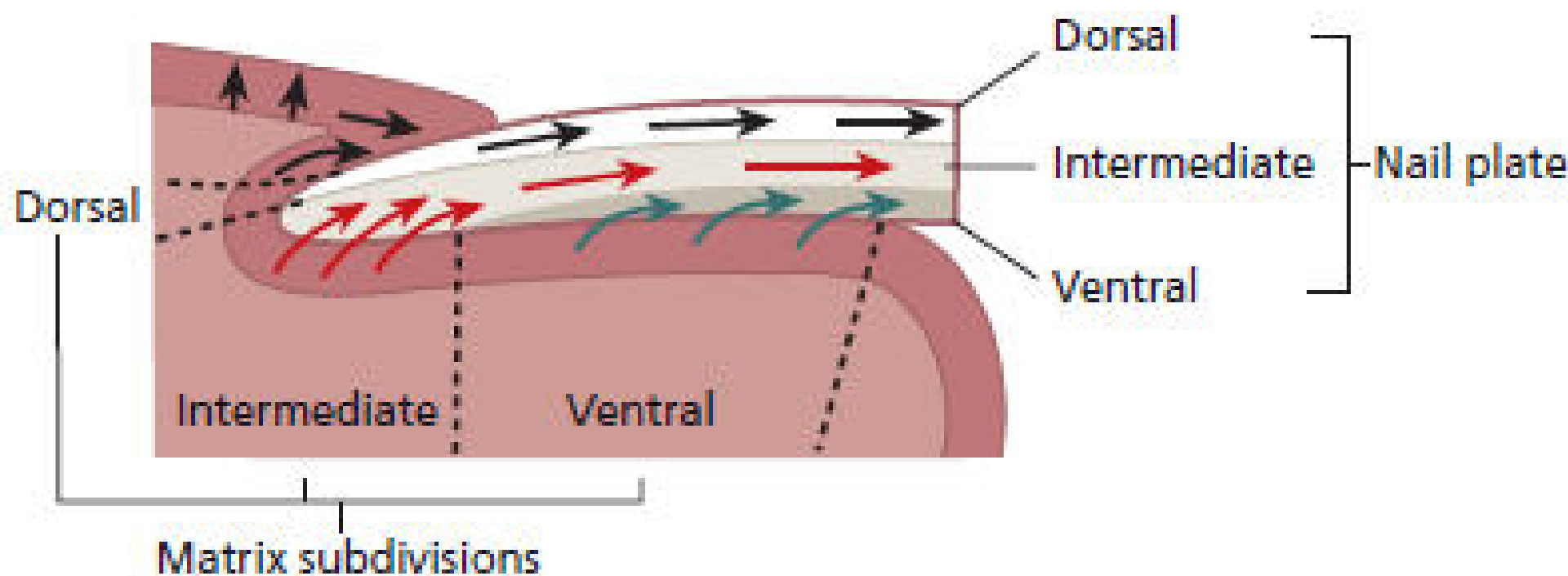
- Lipid producing holocrine glands
- Arise from the hair follicle at the junction of the infundibulum & the isthmus
- Distributed all over the body except the palms & soles; most numerous, large and productive over the face & scalp
- Mature at puberty are stimulated by various hormones
- Major components of sebum: Triglycerides, wax

esters, squalene, cholesterol esters & cholesterol

Nail



Nail Growth



Functions of nails

- Help to grasp & manipulate objects
- Help in 'pincer grip'
- Protect terminal phalanx & fingertip
- Serve an aesthetic & cosmetic purpose

Functions of Skin

- Barrier function
- Permeability
- Maintenance of fluid & electrolyte balance
- Thermoregulation- sweating
- Pigmentation
- Immune function
- Sensory receptor
- Endocrine function: Vitamin D synthesis

Thank you!

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