

Skin and its appendages

四川大学组织学与胚胎学教研室

- **largest organ of the body**
- **two layers: epidermis & dermis.**
- **appendages: glands, hair & nails**

Functions:

protection

sensory reception

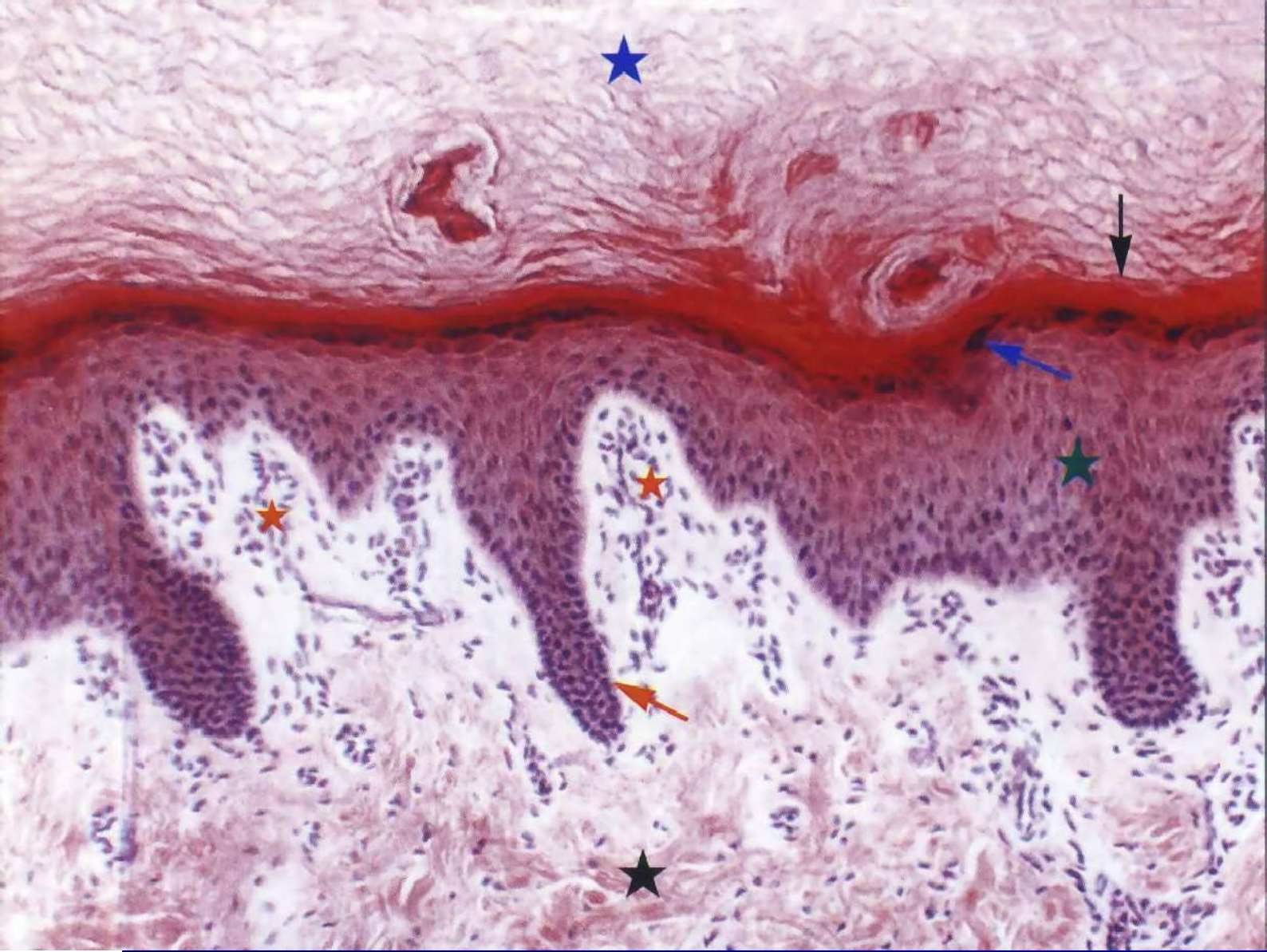
excretion & thermoregulation

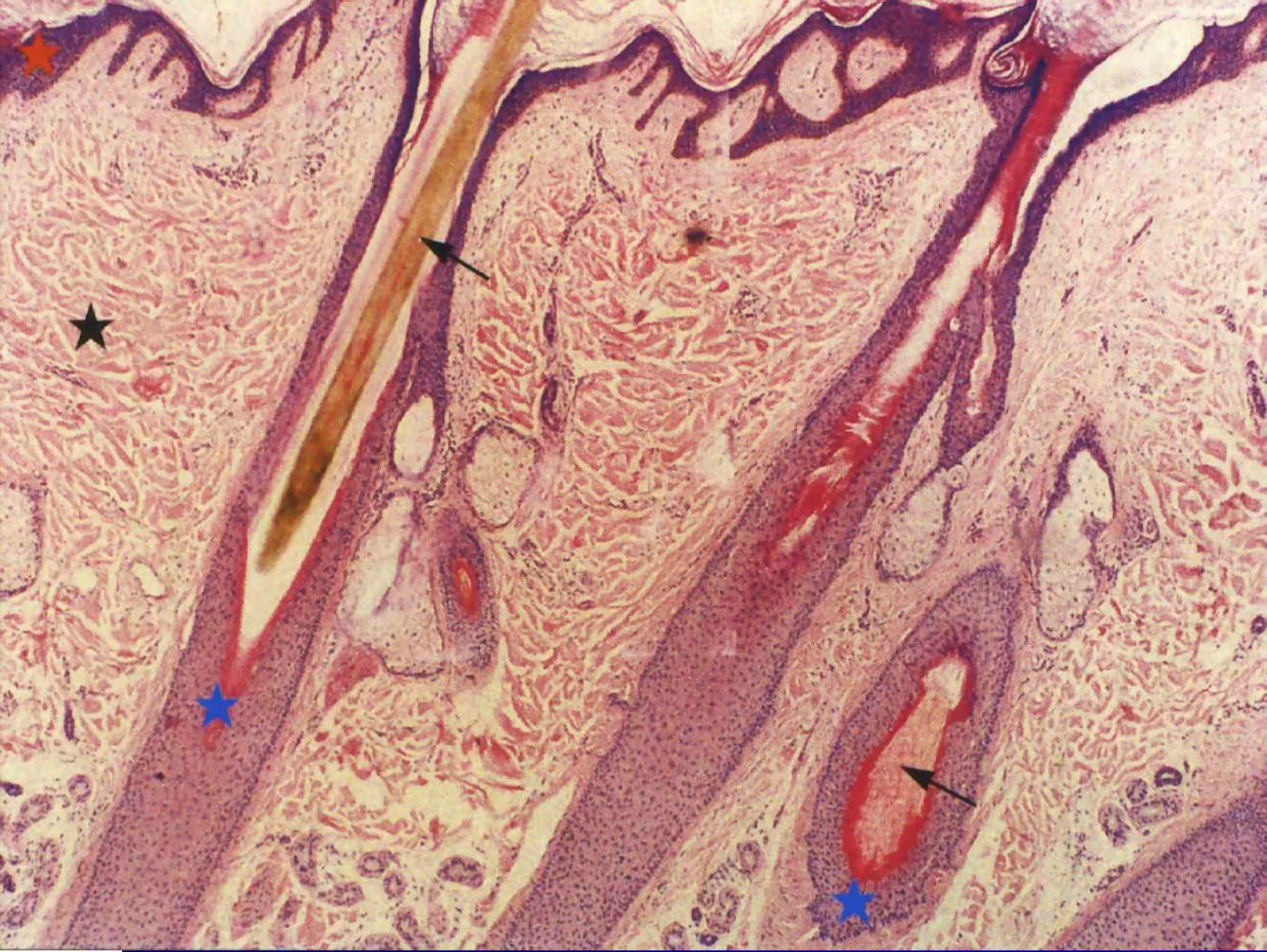


epidermis

dermis

skin appendages





❖ Epidermis

stratified squamous keratinized epi

two types of cells:

***keratinocyte**

***non- keratinocyte**

melanocyte

Langerhans cells

Merkel's cells

➤ **Layers of epidermis**

five layers: from the dermis outward

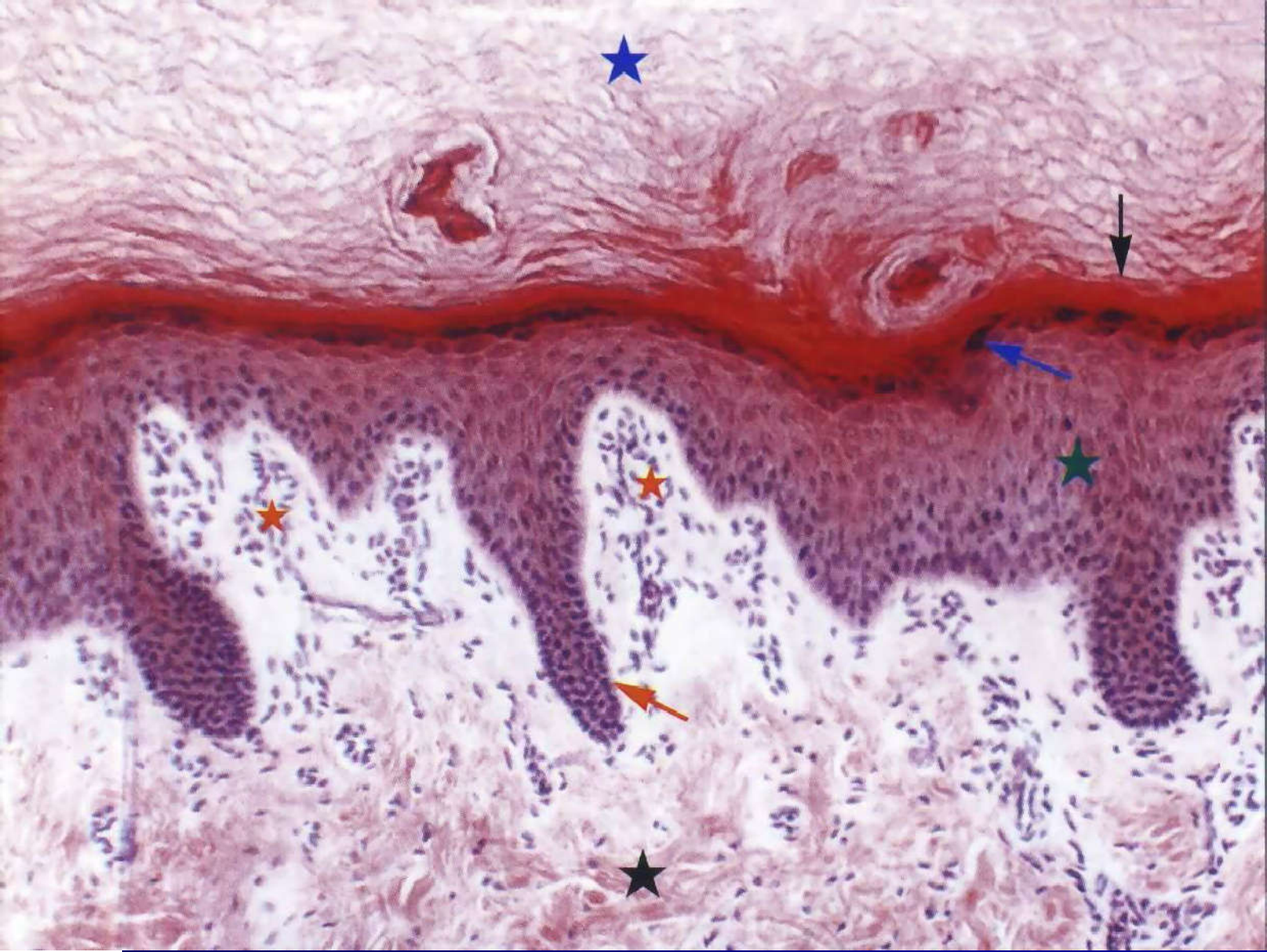
stratum basale

stratum spinosum

stratum granulosum

stratum lucidum

stratum corneum



① stratum basale

* one layer of cuboidal or columnar cells

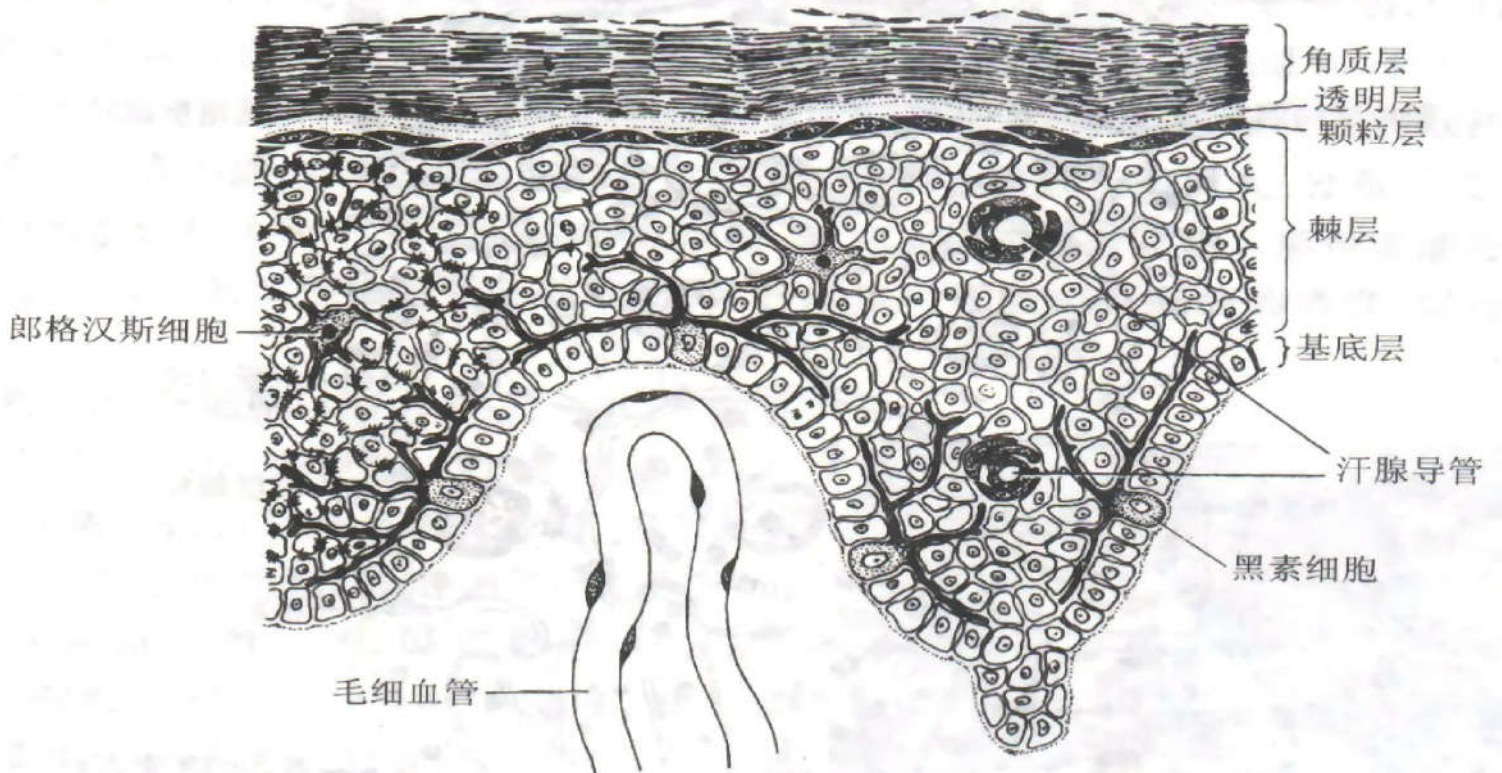


图 11-2 表皮细胞组成模式图

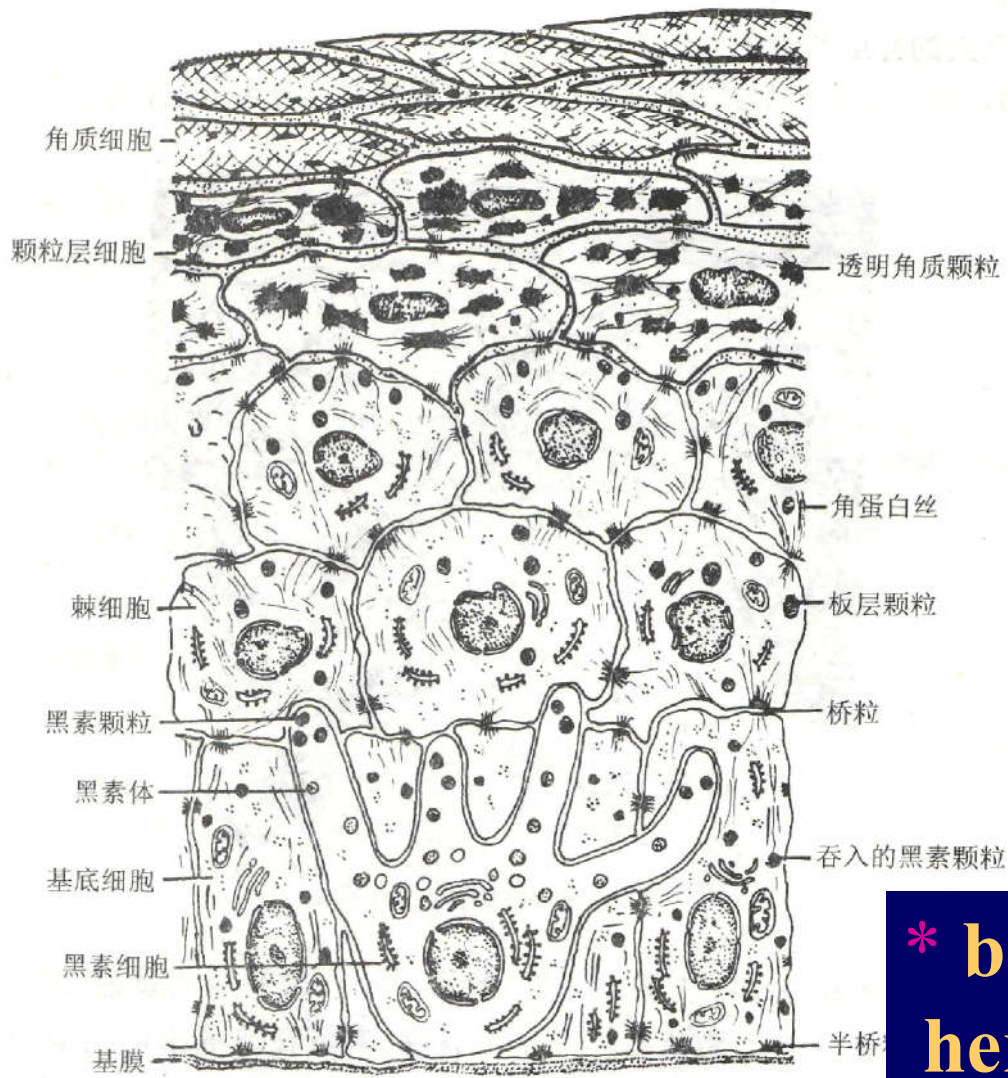


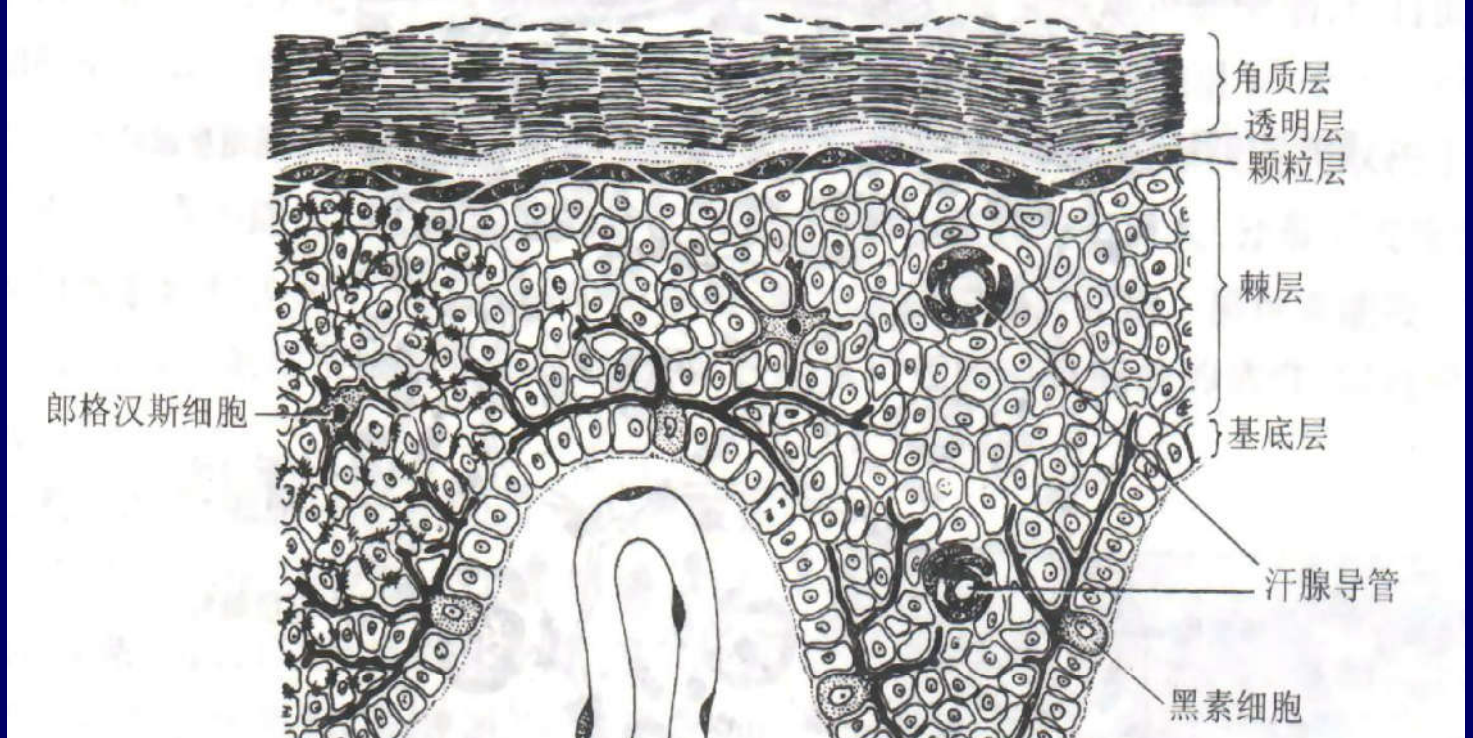
图 11-3 角质形成细胞和黑素细胞超微结构模式图

* basement m
hemidesmosome

*** intense mitotic activity**

constant renewal of epidermal cells

*** ribosome & keratin filaments (10nm)**



② stratum spinosum

* 4~10 layers of spinous cells

polygonal

round nuclei

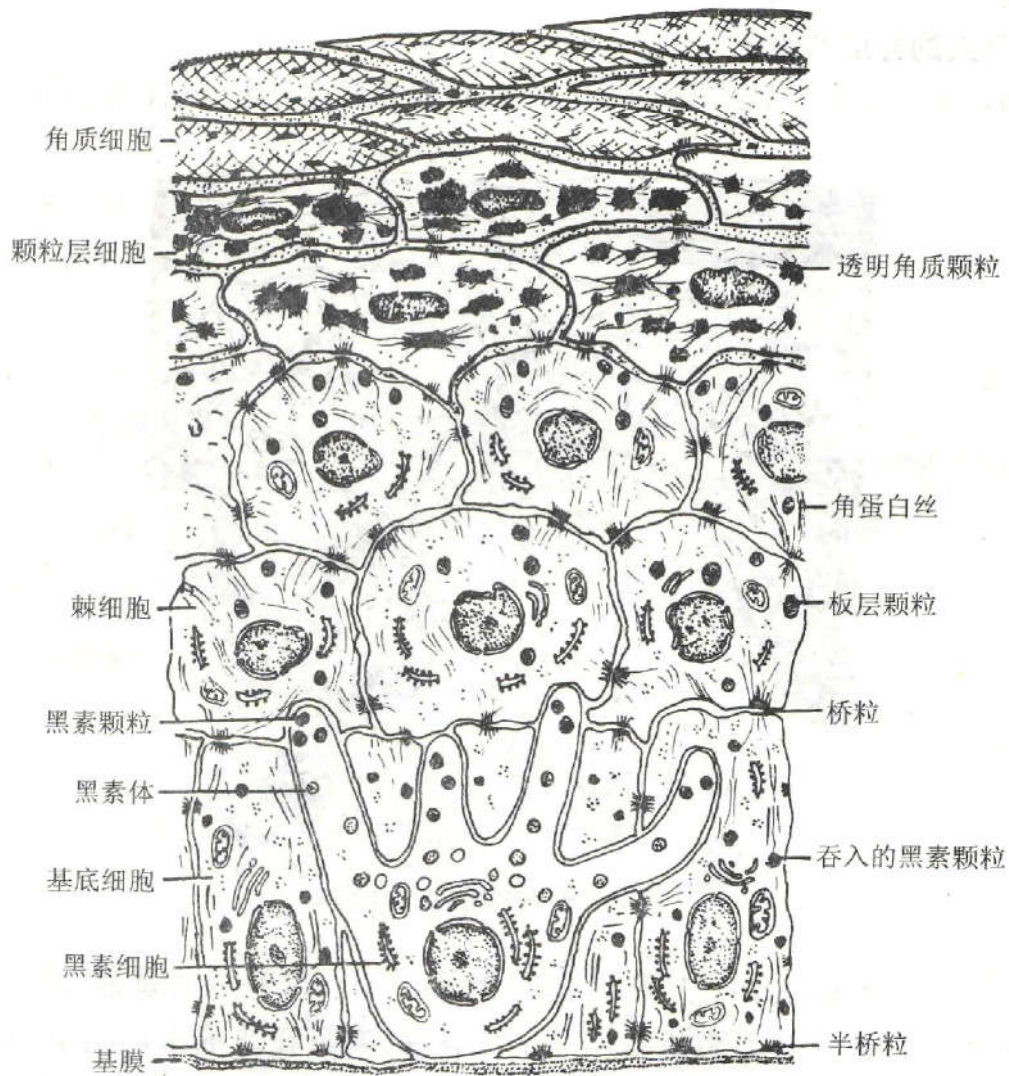


图 11-3 角质形成细胞和黑素细胞超微结构模式图

* **desmosome**

* **ribosome**

* **bundles of keratin filaments ↑**

(LM, tonofibrils)

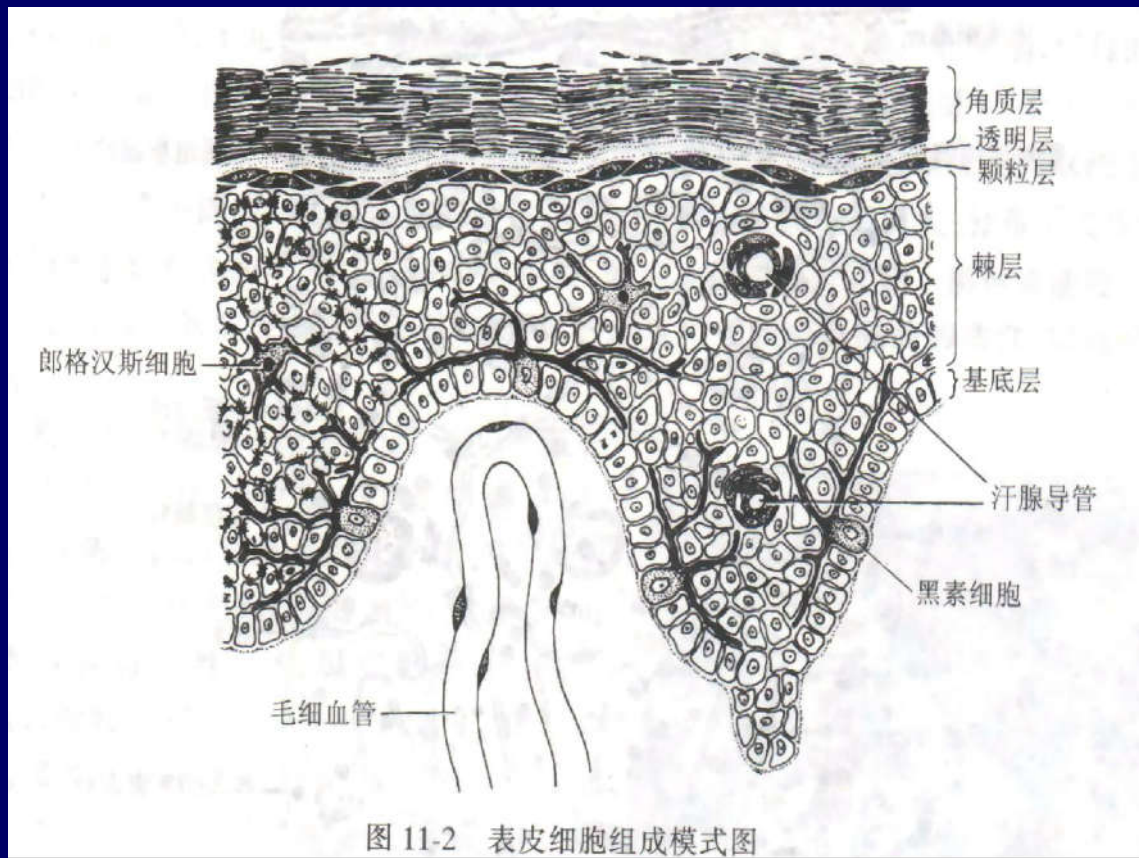
* **lamellar granules: glycolipid &**

(EM)

steroid

③ Stratum granulosum

3~5 layers of flattened polygonal cells



* **lamellar granules** ↑ (EM)

* **keratohyalin granules** (LM)

strong basophilia

without limiting m

phosphorylated histidine-rich protein

lamellar granules:

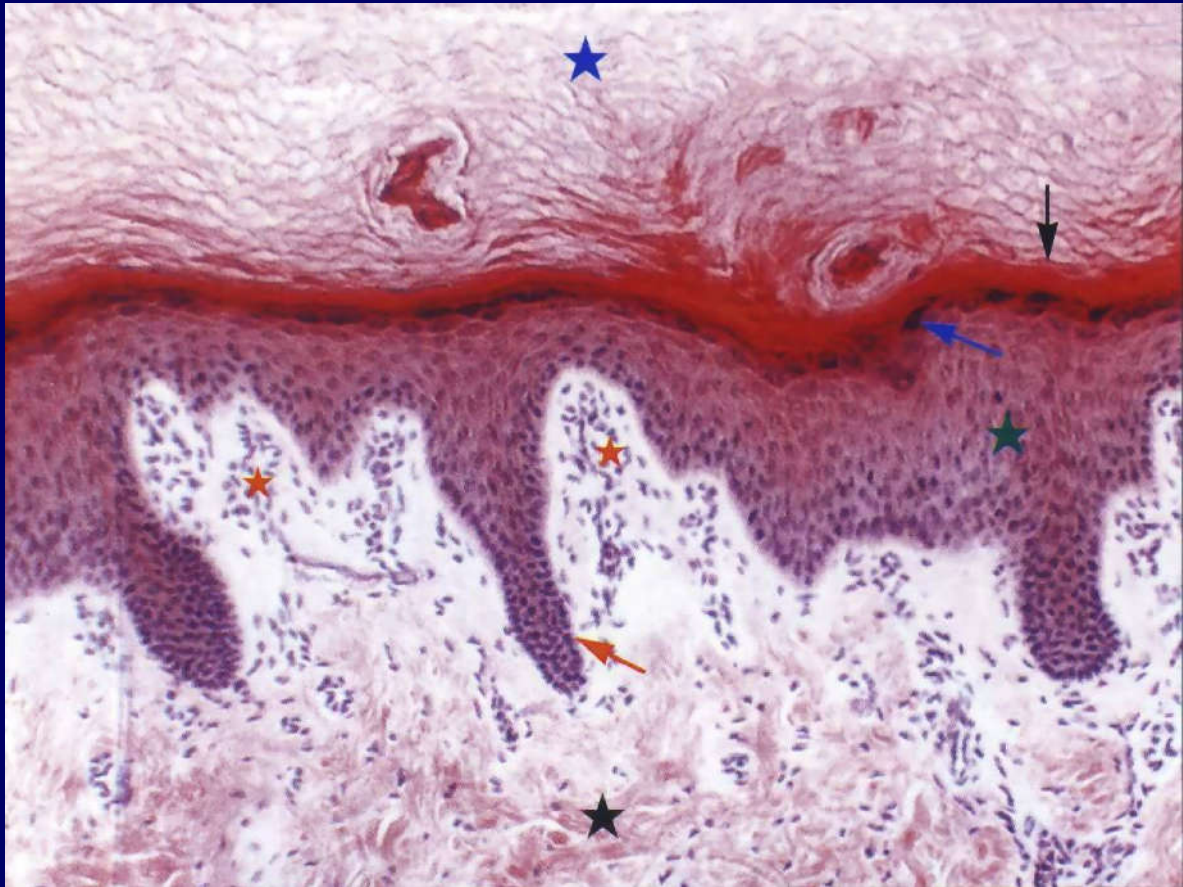
fuse with cell m → release contents →

seal off intercellular spaces → barrier

for foreign materials

④ Stratum lucidum (thick skin)

2~3 layers of cells



*** flattened**

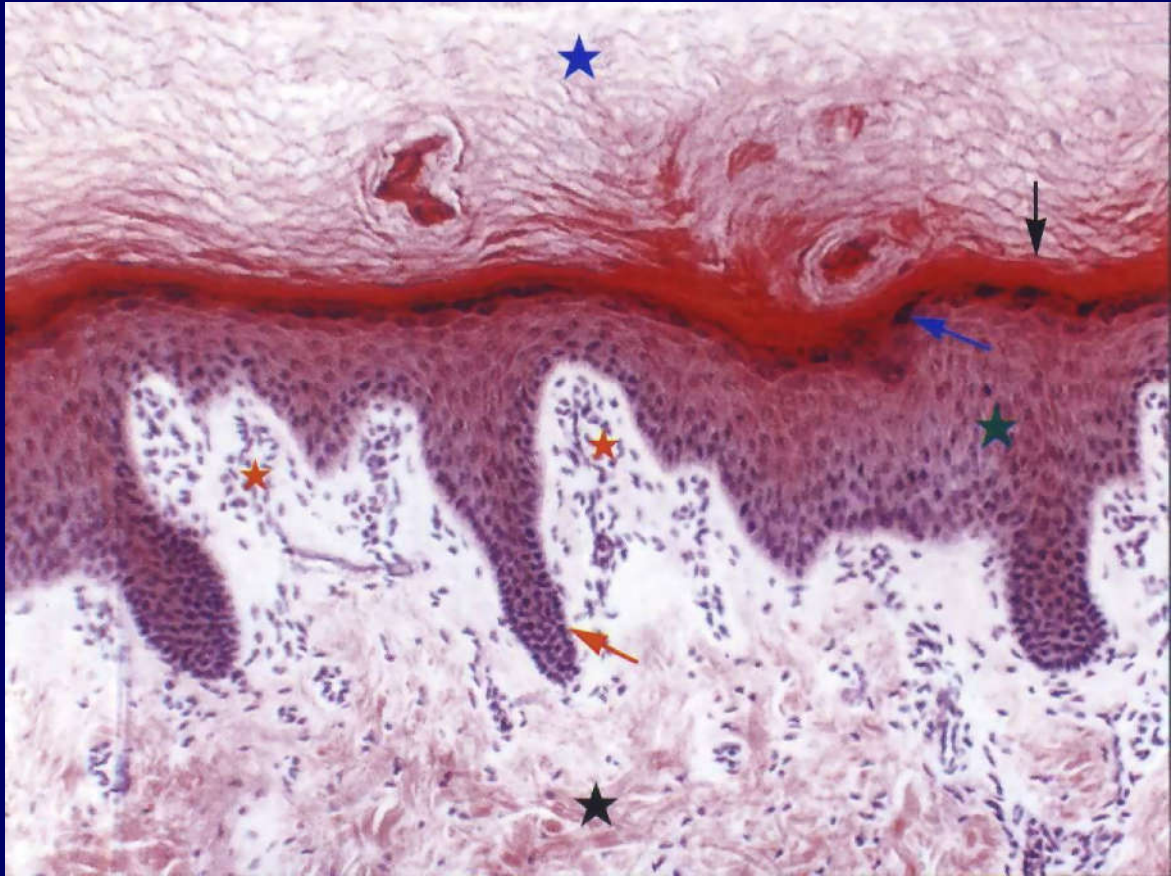
*** homogeneous, transparent & eosinophilic cells**

*** without nuclei and organelles**

*** densely packed keratin filaments embedded in matrix.**

⑤ Stratum corneum

many layers of flattened horny cells



horny cell:

- * **dead cell**
- * **nonnucleated**
- * **eosinophilic cytoplasm**
- * **keratin - filamentous scleroprotein**
 - keratin filaments
 - keratohyalin granules
- * **thickened cell membrane**

* **horny cell is bearable to physical & chemical stimuli**

* **desquamation:**

superficial horny cells are continuously shed to form scurf.

proliferation & shedding

keep a dynamic balance:

basal layer → cornified layer

keratinocytes:

proliferate → differentiate →

superficial layer → shed

this process maintains the normal
structures and thickness of epidermis.

keratinization:

keratinocytes produce

keratin to become horny cells.

**? Which changes have taken place
during this process?**

Layer	Contents	Changes
basal	keratin filaments	
spinous	keratin filaments ↑	
	lamellar granules	
granular	keratin filaments ↑	*keratin filaments
	lamellar granules	insert into kerato-
	keratohyalin granules	hyalin granules
		*lamellar granules
		release contents
		into intercellular s

Layer	Contents	Changes
lucid	keratin filaments	keratin filaments are embedded in the cell matrix
cornified	keratin	*keratin formed by keratohyalin granules & keratin filaments *thickened cell m *lipid materials in intercellular space

➤ **Non- keratinized cells of epidermis**

- 
- melanocyte**
 - Langerhans cells**
 - Merkel's cells**

① melanocytes

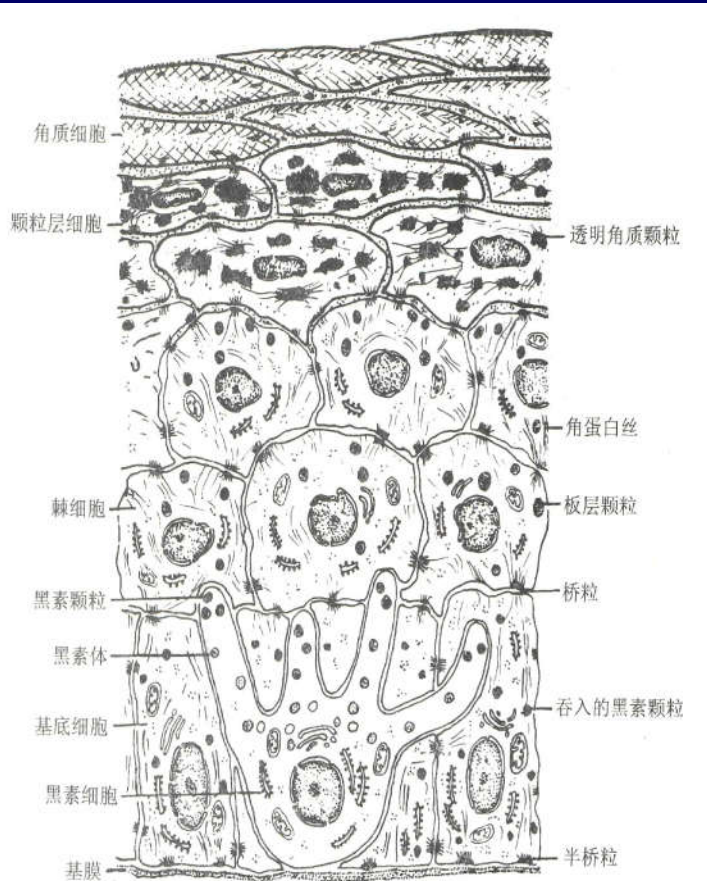
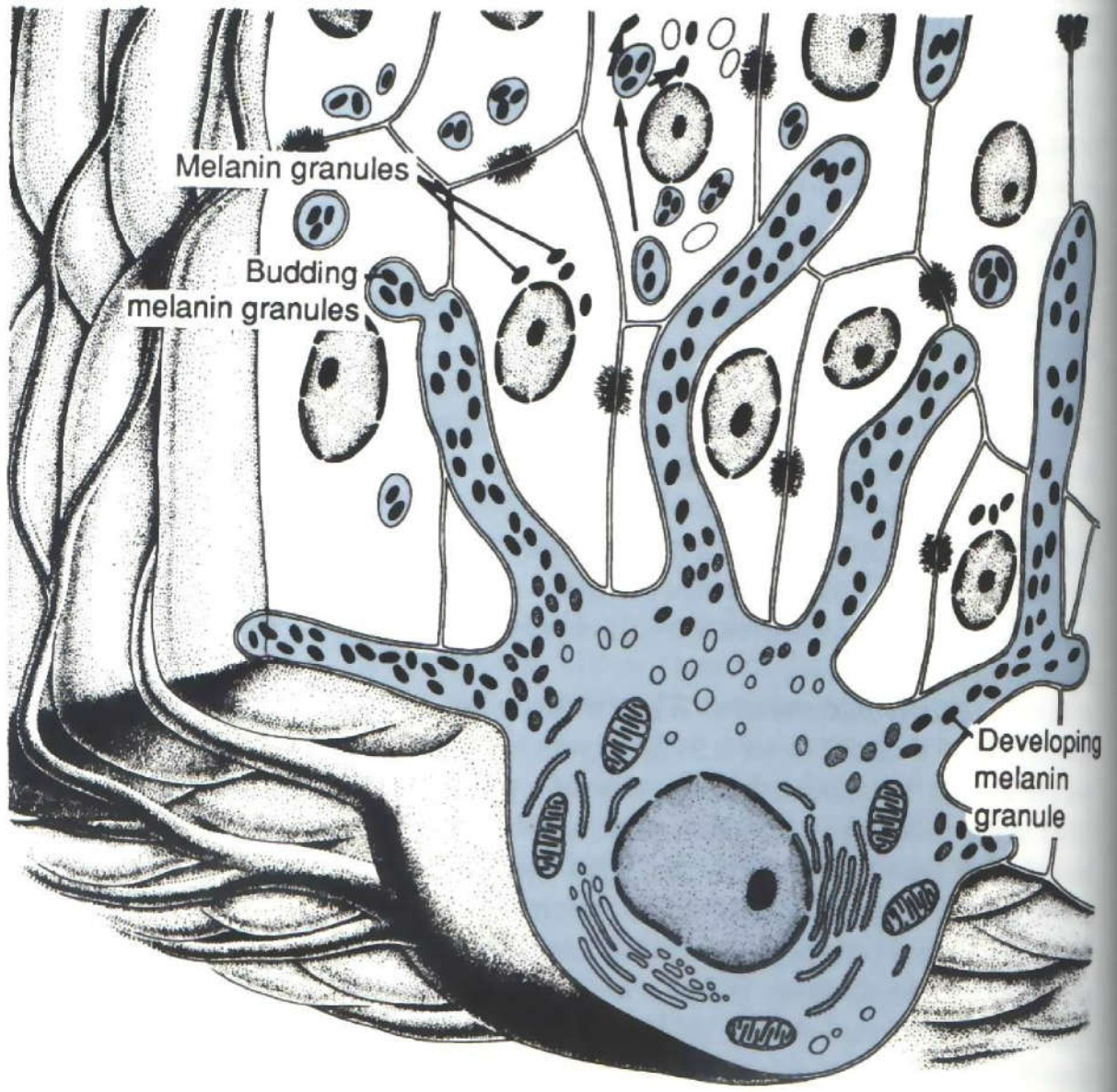


图 11-3 角质形成细胞和黑色素细胞超微结构模式图

- * large cell with long processes
- * located among the basale & spinous cells



- * **derive from neural crest**
- * **melanosome which contains tyrosinase**

tyrosine $\xrightarrow{\text{tyrosinase}}$ **melanin**

melanin granules

- **skin color**
- **protect the body from the damage of ultraviolet**

② Langerhans cells

- * **star-shaped cells**
- * **mainly in the stratum spinosum**
- * **bone marrow-derived macrophage**
- * **antigen presenting cells**

③ **Merkel's cells**

- * with short processes**
- * in the basal cell layer**
- * their function is not clear,
may be sensory mechanoreceptors**

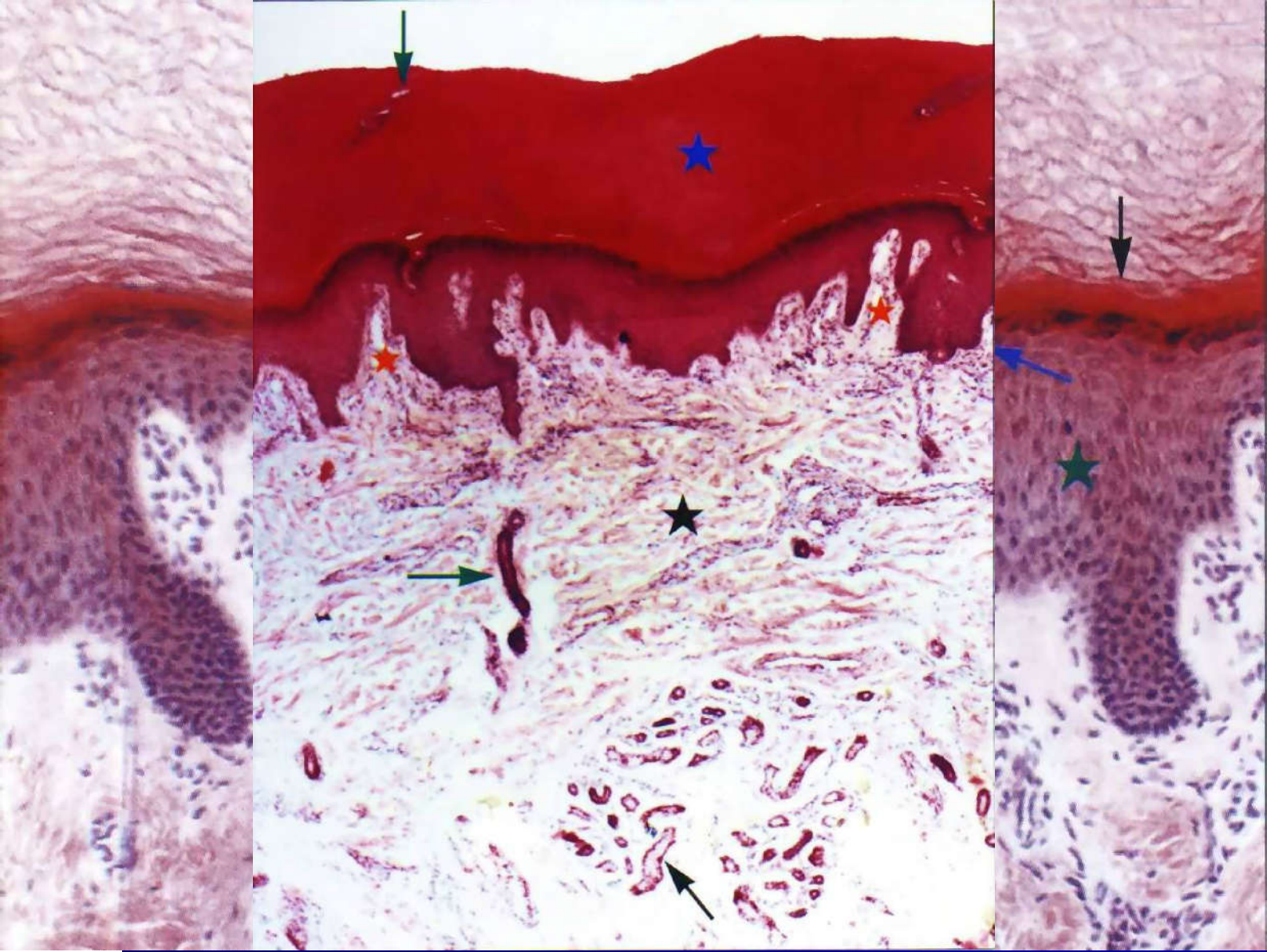
❖ Dermis

epidermis - dermis - hypodermis

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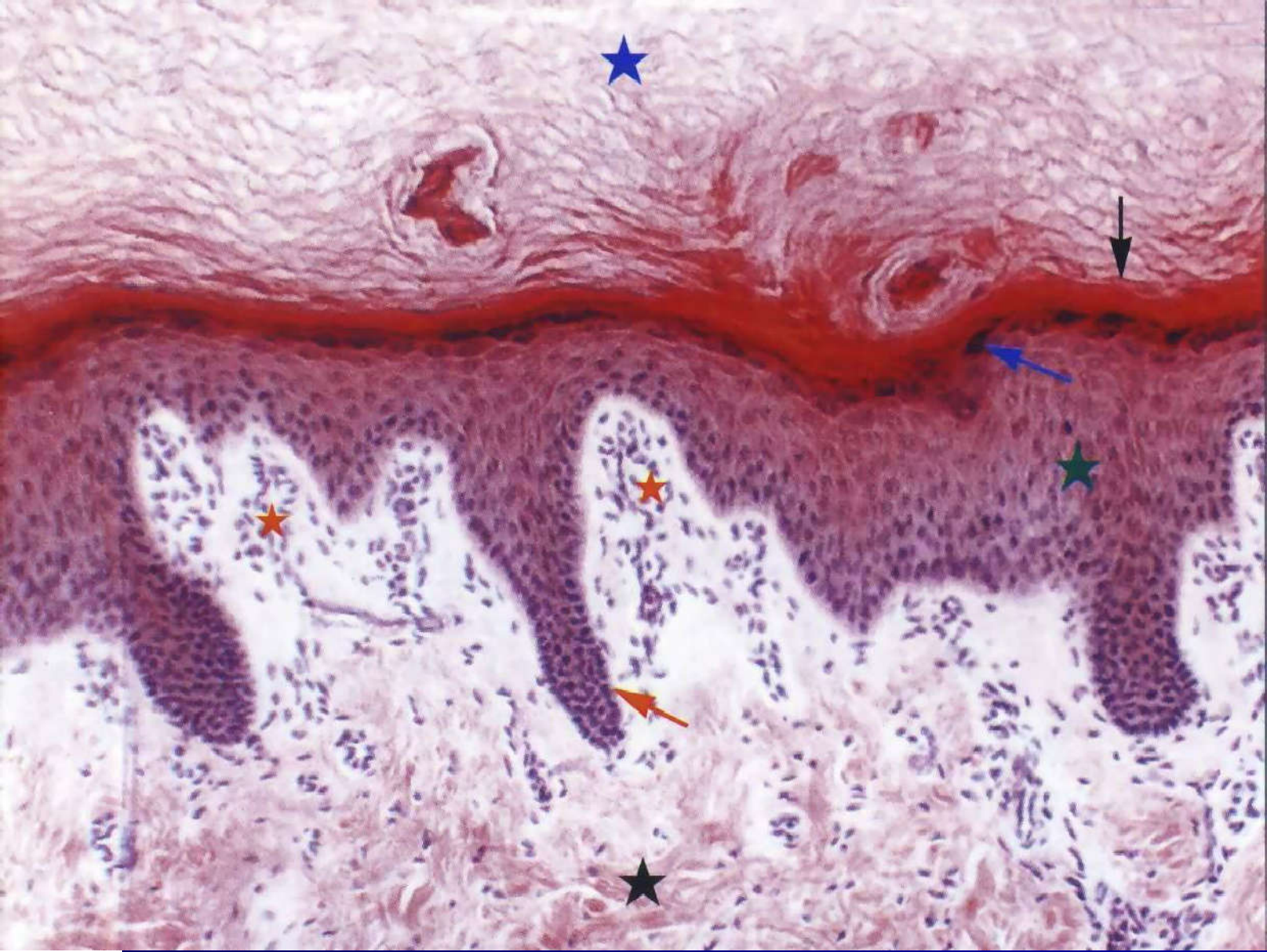
connective tissue

(papillary layer
reticular layer



➤ **papillary layer**

- **thin layer - loose CT with more cells -
capillaries & nerve endings**
- **dermal papillae: increase and reinforce
the dermal-epidermal junction**



➤ **reticular layer**

- **thick layer composed of irregular dense CT with more fibers and fewer cells**
- **make the skin very tough and elastic**

❖ Hypodermis

loose CT

between the skin & deeper structures

❖ **Skin appendages**

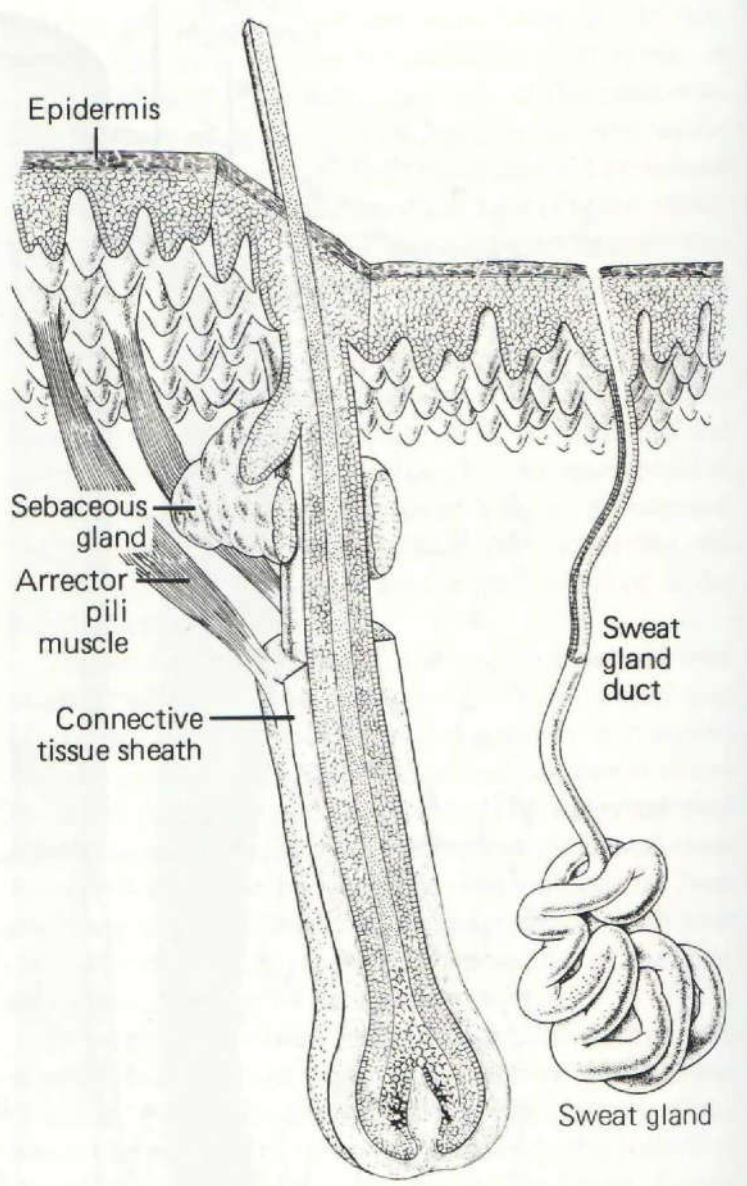
- * hair, sweat gland, sebaceous gland
& nail**
- * derive from epidermis**

① hair

- distribution
- structures

three parts:

- hair shaft
- hair root
- hair bulb



- **hair shaft & hair root**

**composed of regularly-arranged
cornified cells that contain keratin
& melanin**

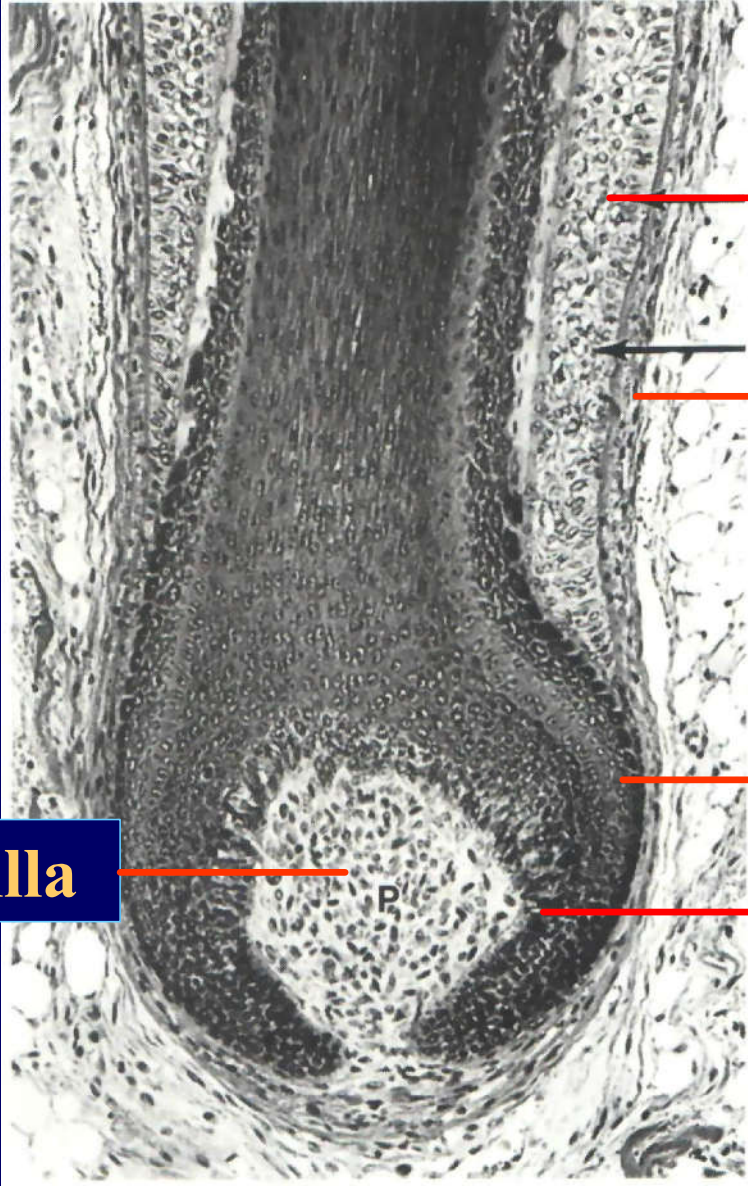
- **hair follicle**

sheath like structure - hair root

epithelium & CT

two layers:

- * **epithelial root sheath: derive from epithelium - continuous with epidermis**
- * **CT root sheath: continuous with dermis**



hair papilla

epi. root sheath

CT root sheath

hair bulb

hair matrix

- **hair bulb**

both the ends of hair root & hair follicle

bind together to form a dilatation

germinal center --- hair matrix

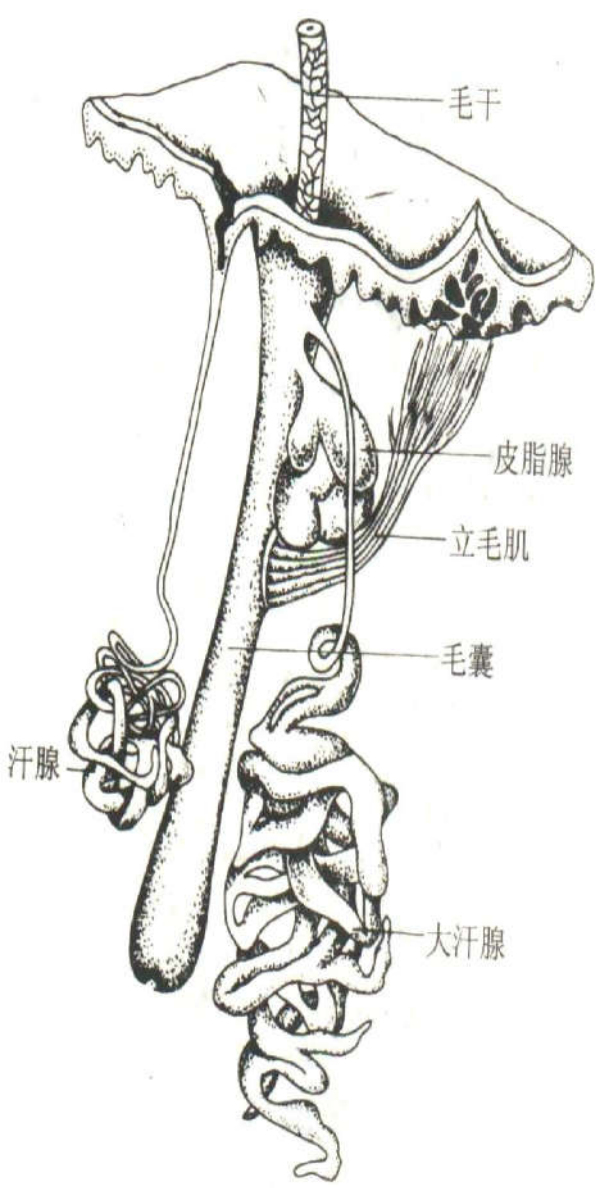


- **hair papilla**

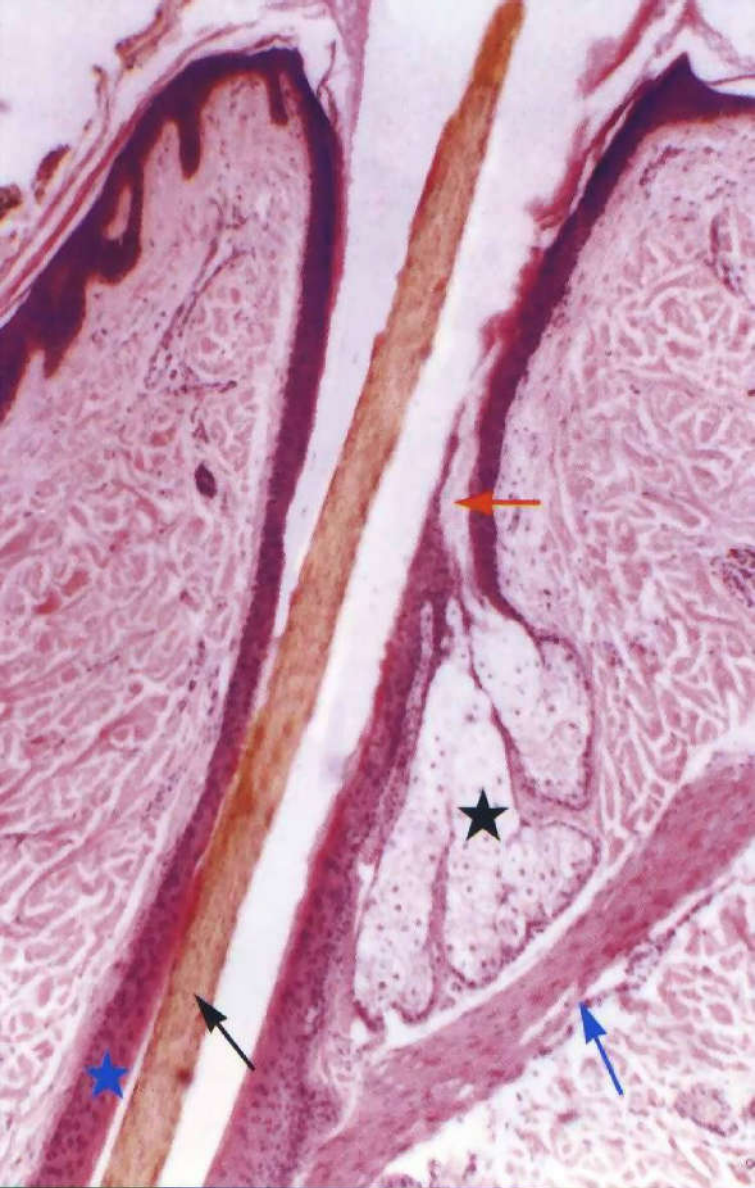
base of the hair bulb

capillary network & nerve fibers

***nutrition & sustaining**



- **arrector pili muscle**
smooth muscle in an
oblique direction
contraction of arrector
pili muscles – hair stand
on end - “gooseflesh”



② sebaceous glands

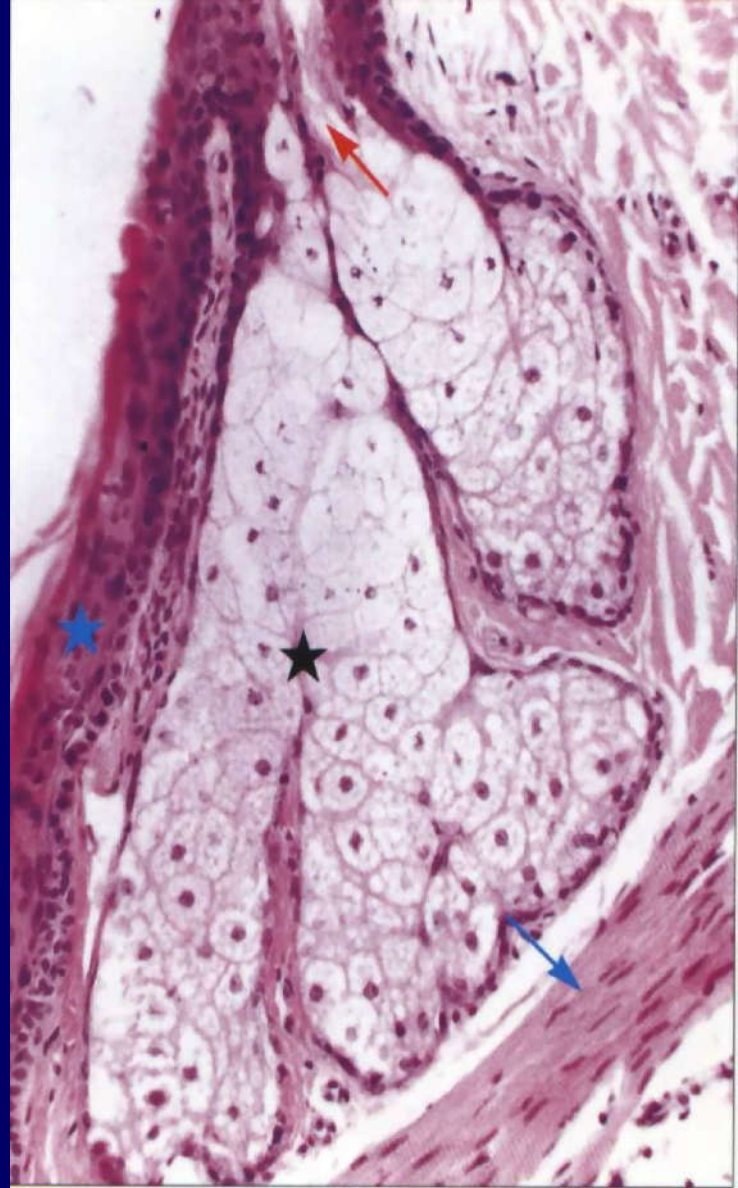
* between hair follicle
& hair muscle

* acinar glands

- short duct

- ends in the upper
portion of a hair
follicle

- **in periphery: basal cells with strong ability of mitosis**
- **in the center: mature acinar cells contain abundant fat droplets**



holocrine gland:

**the mature cells break down -
released products with remnants of
dead cells to form sebum.**

**function of sebum: *lubricate skin
*antibacterial**

at puberty: sex hormones

③ Sweat glands

two types: eccrine & apocrine

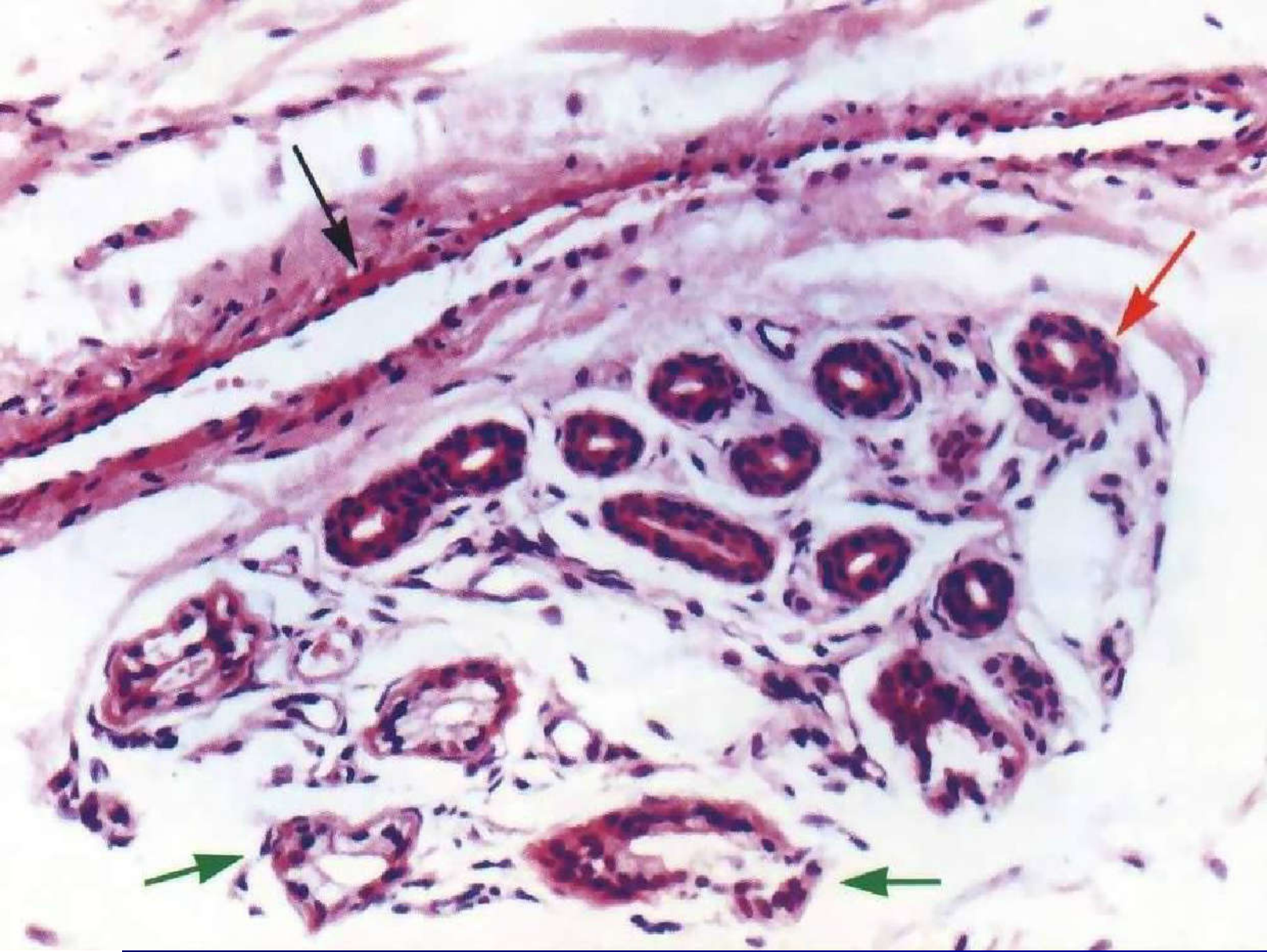
- eccrine sweat glands (small)

- * in dermis & hypodermis

- * secretory portion & ducts

- * secretion: water, sodium chloride,

- urea, ammonia and uric acid



- **apocrine sweat glands (large)**

- * **in the axillary, areolar & anal regions**

- * **secretion: viscous**

- odorless** bacterial decomposition →

- special smell (body odor)**

- * **controlled by sex hormones**