

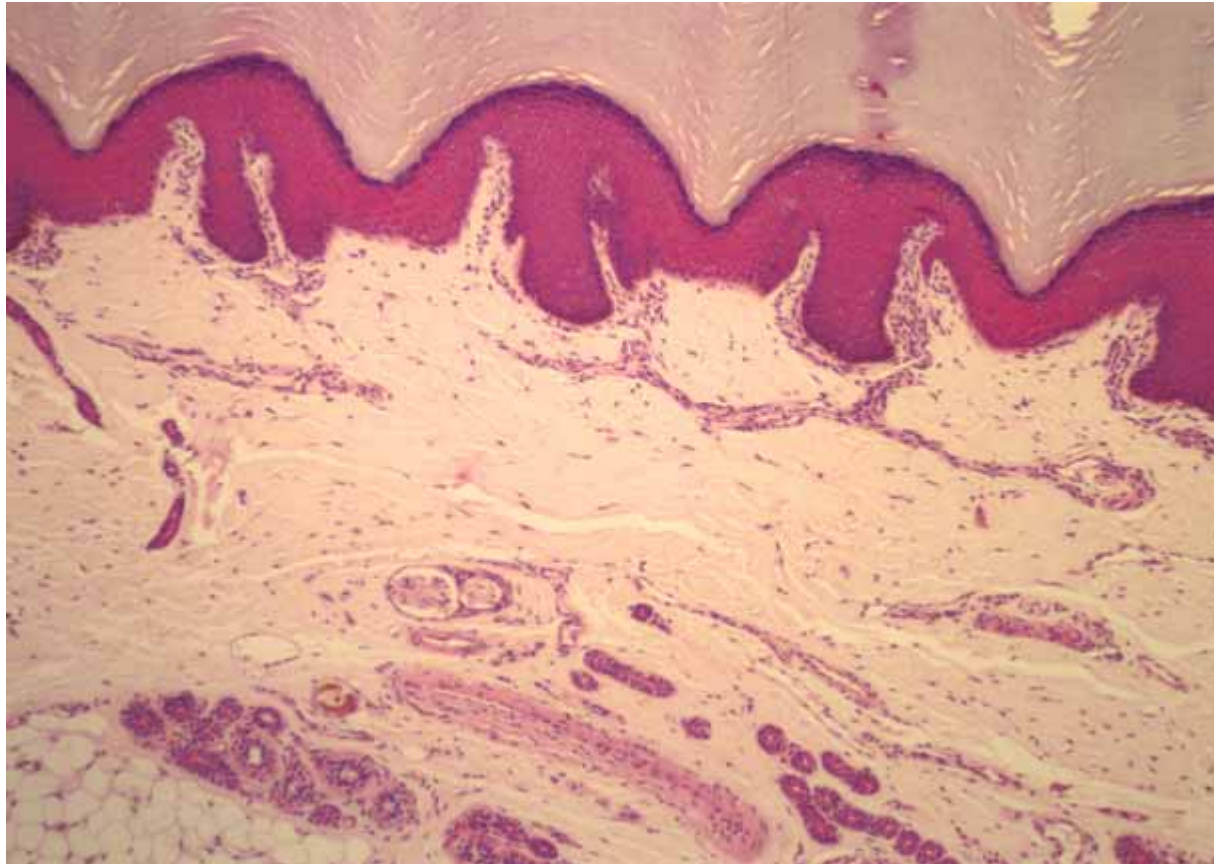
# Basic Skin Histology

Mark Berryman, PhD

Dept. of Biomedical Sciences

Ohio University College of Osteopathic Medicine

Athens, Ohio — March 17<sup>th</sup>, 2004



*Protection*

*Sensation*

*Thermoregulation*

*Metabolism*

# Layers of Skin

## 1) Epidermis

➔ stratified squamous epithelium

➔ epidermal ridges

## 2) Dermis

### a) papillary layer

small blood vessels, lymph & nerves

fine collagen & elastic fibers

### b) reticular layer

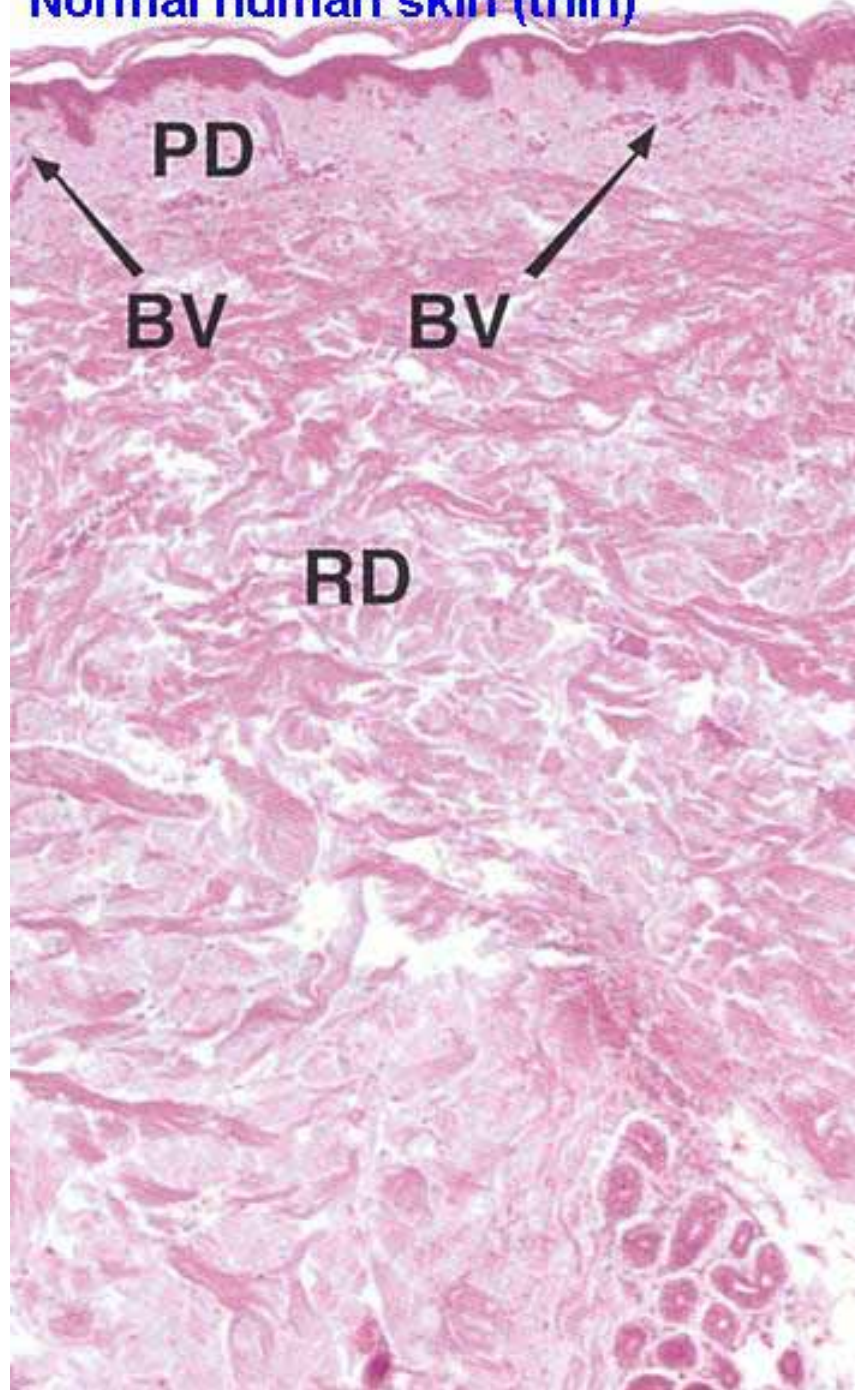
vascular plexus, lymph, nerves & appendages

compact collagen fibers & thick elastic fibers

## 3) Hypodermis (subcutaneous)

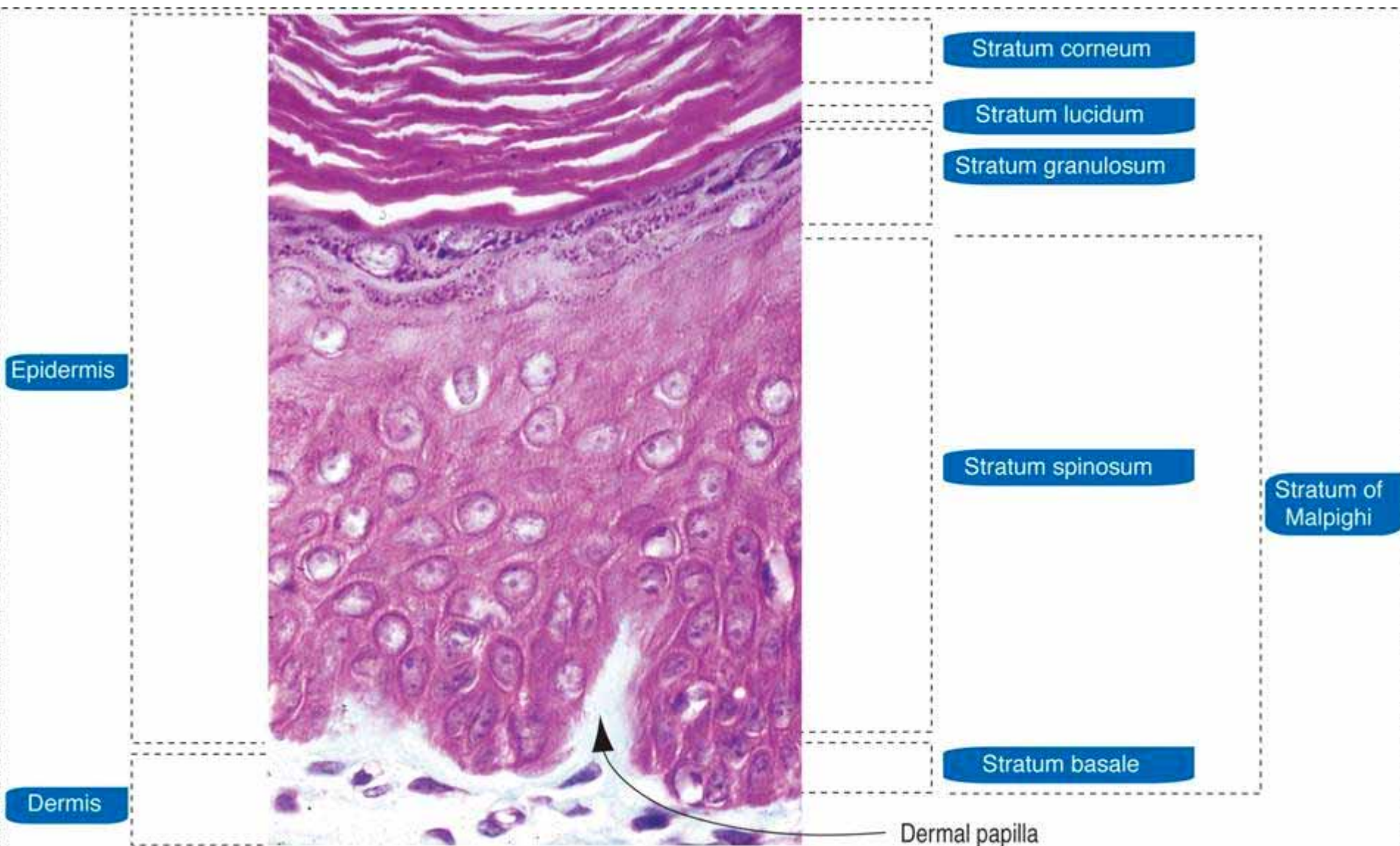
➔ mainly adipose tissue

Normal human skin (thin)



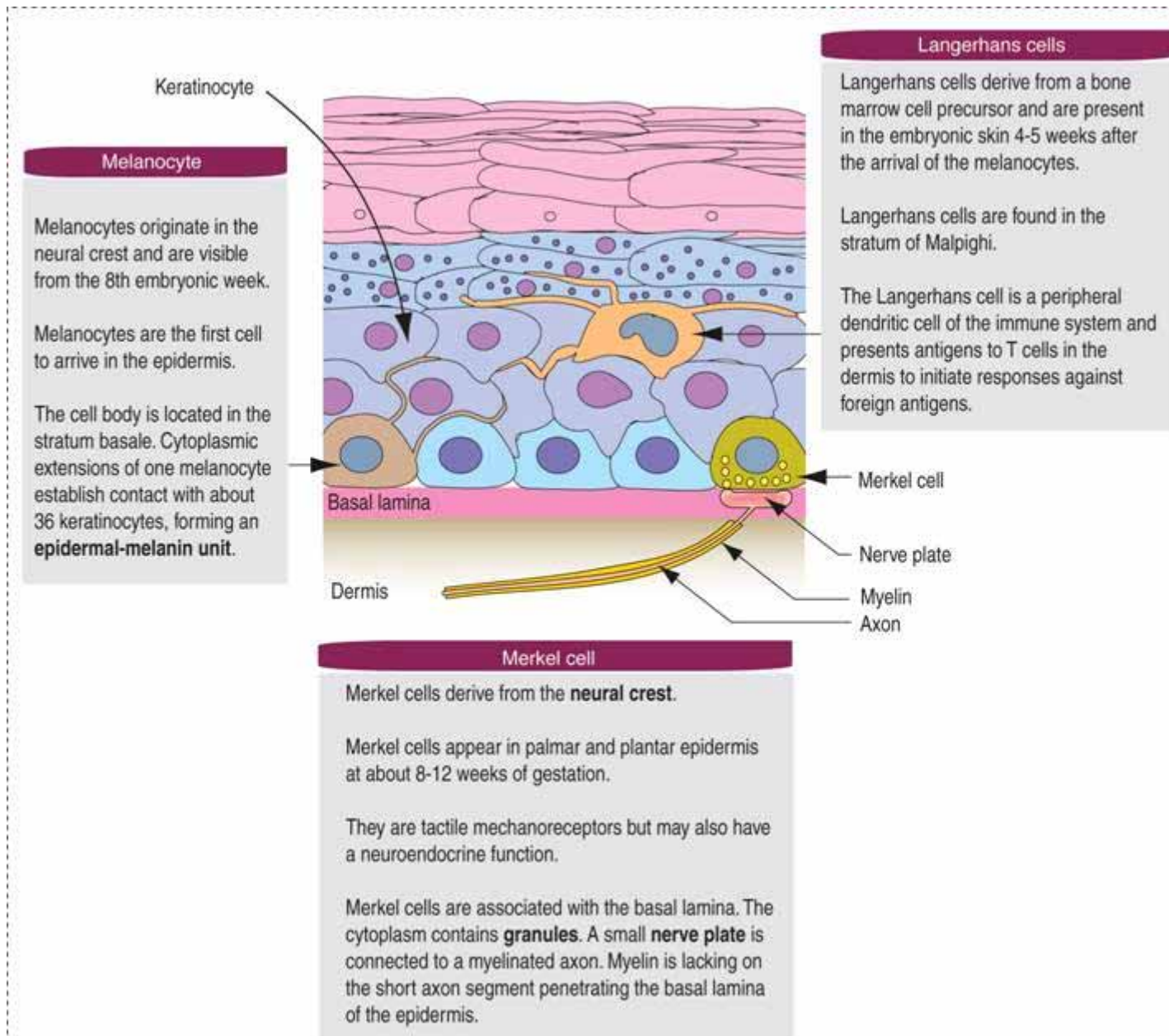


## Layers of the Epidermis of Thick Skin



4 distinct cell types: 1) Keratinocyte, 2) Melanocyte, 3) Langerhans cell, 4) Merkel cell

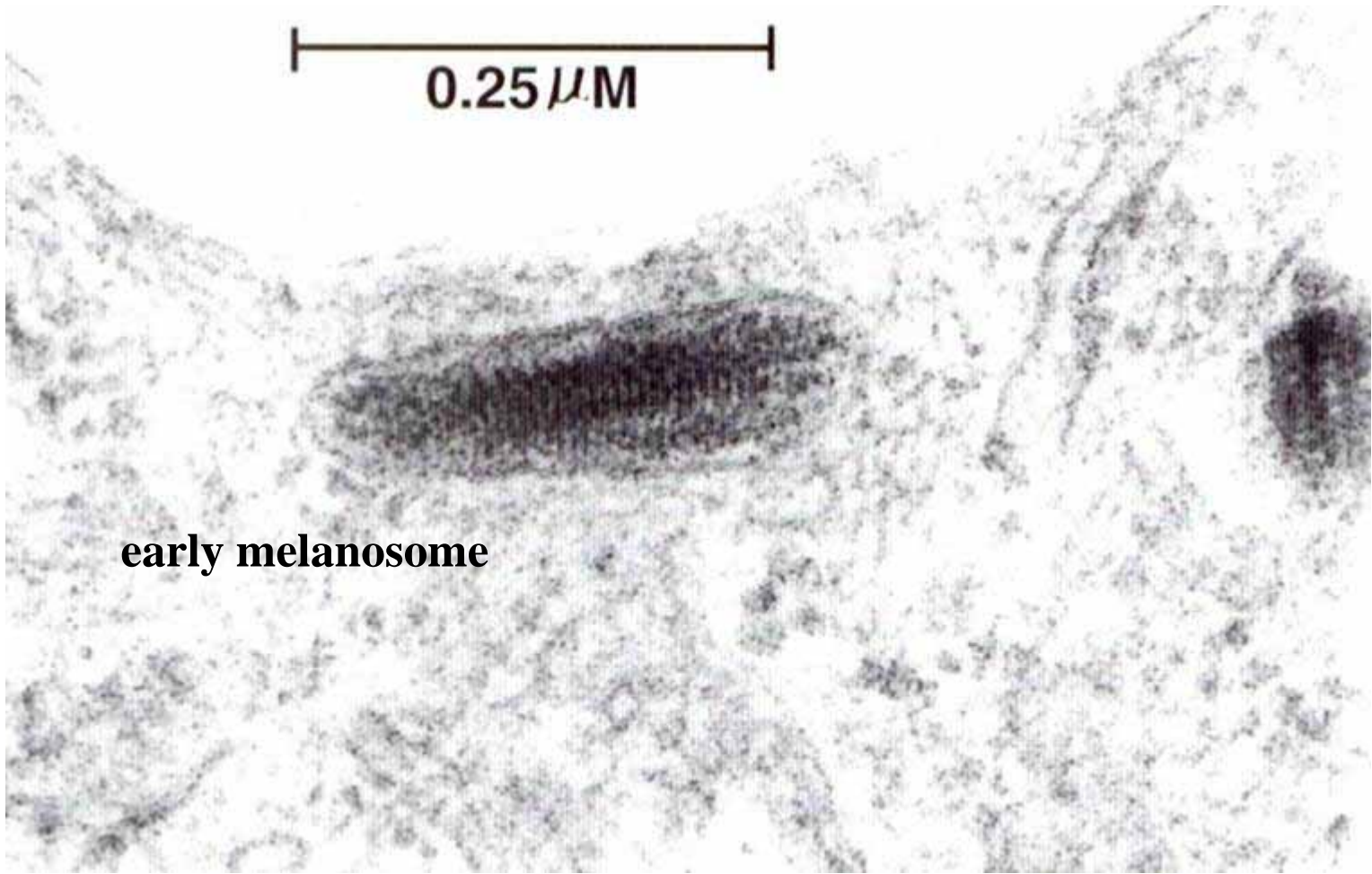
# Immigrant Cells of the Epidermis

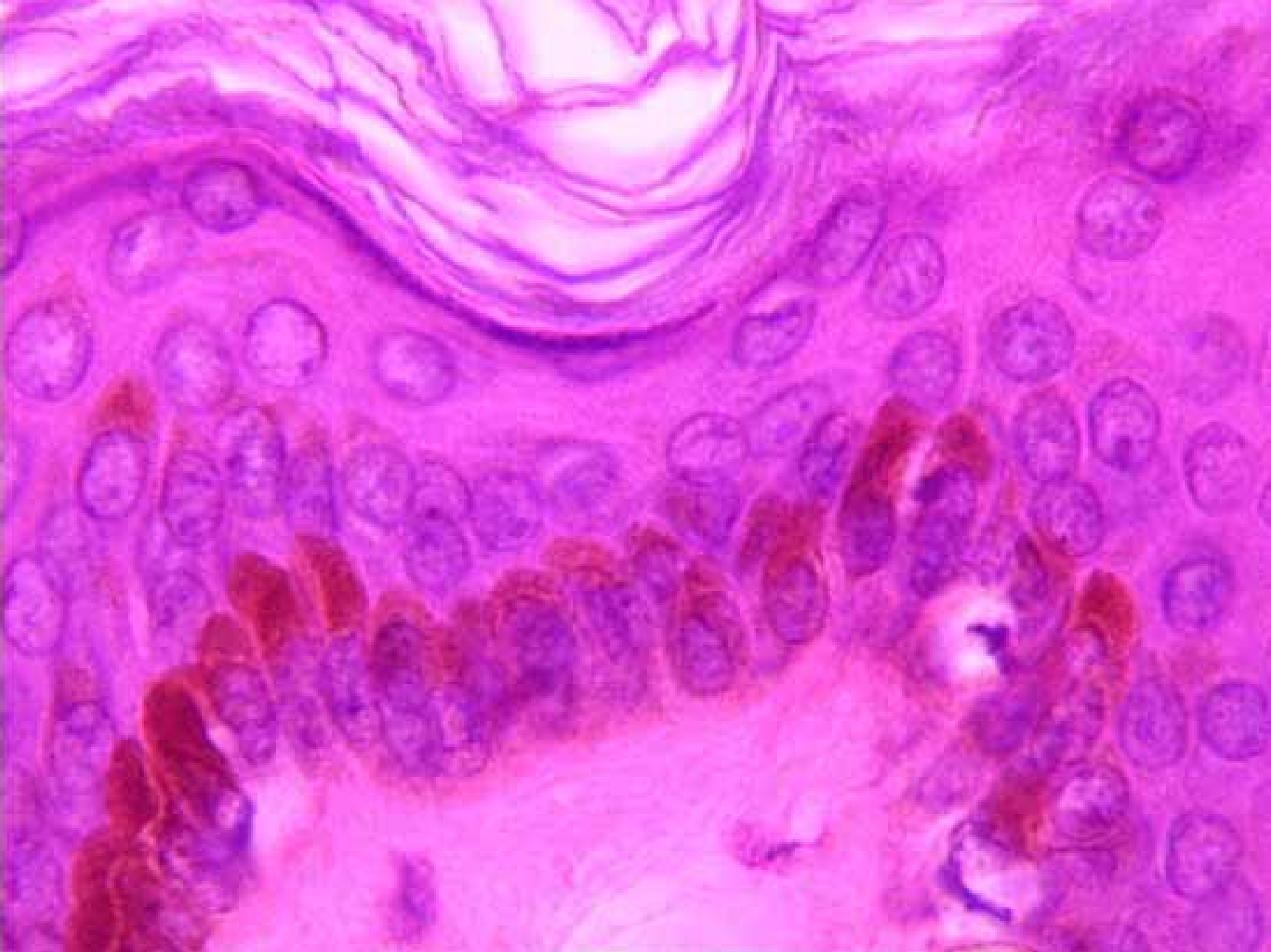






**Melanocyte:** neural crest origin; no desmosomal attachments







## Malignant Melanoma

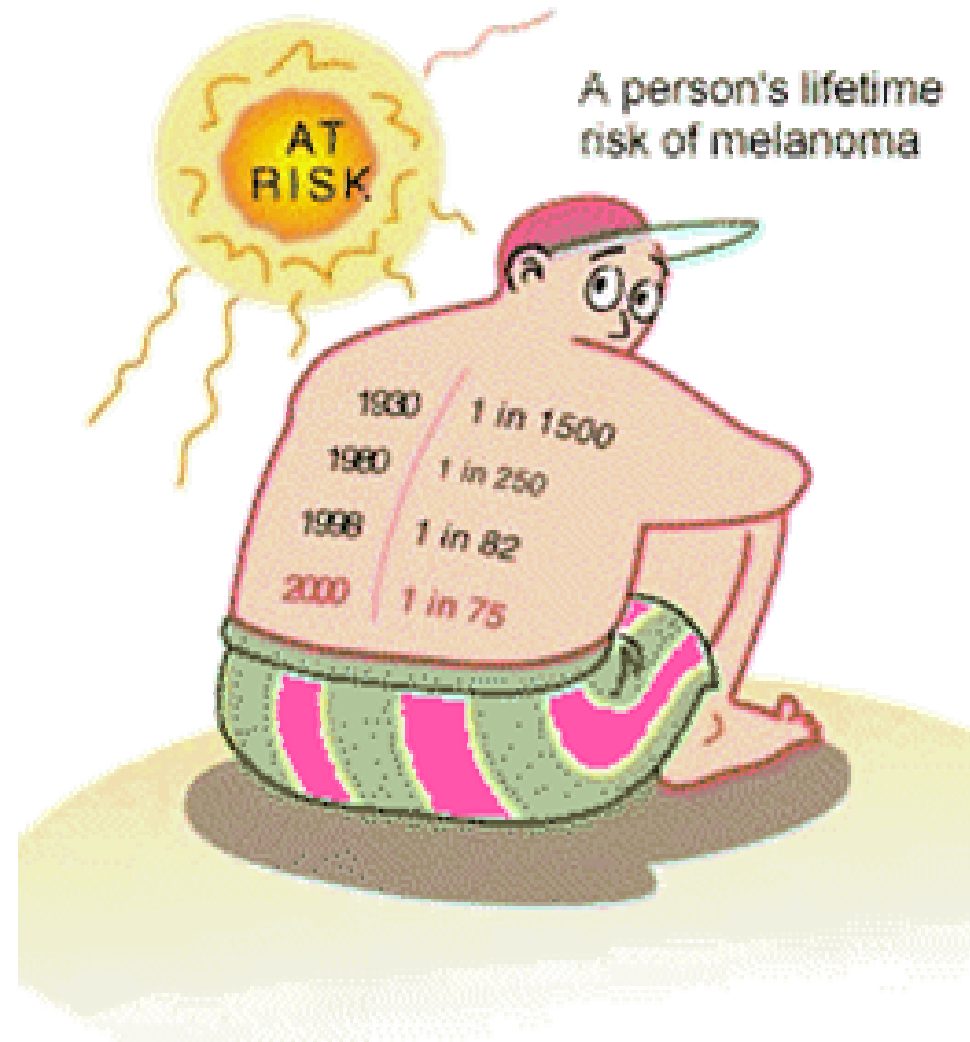
ABCD warning signs  
(American Academy of  
Dermatology):

**A**symmetry

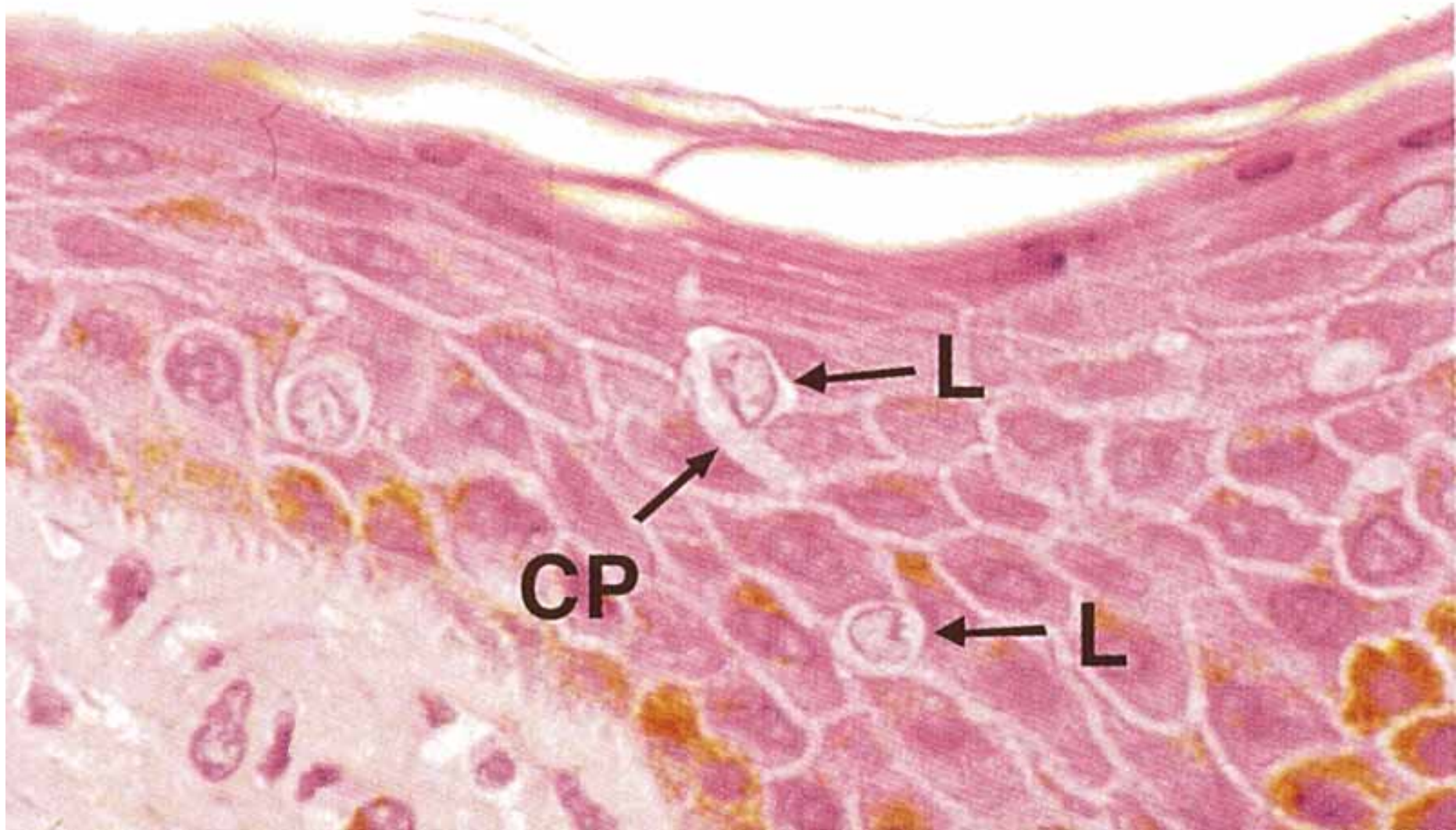
**B**order irregularity

**C**olor (non-uniform pigment)

**D**iameter (>6mm)







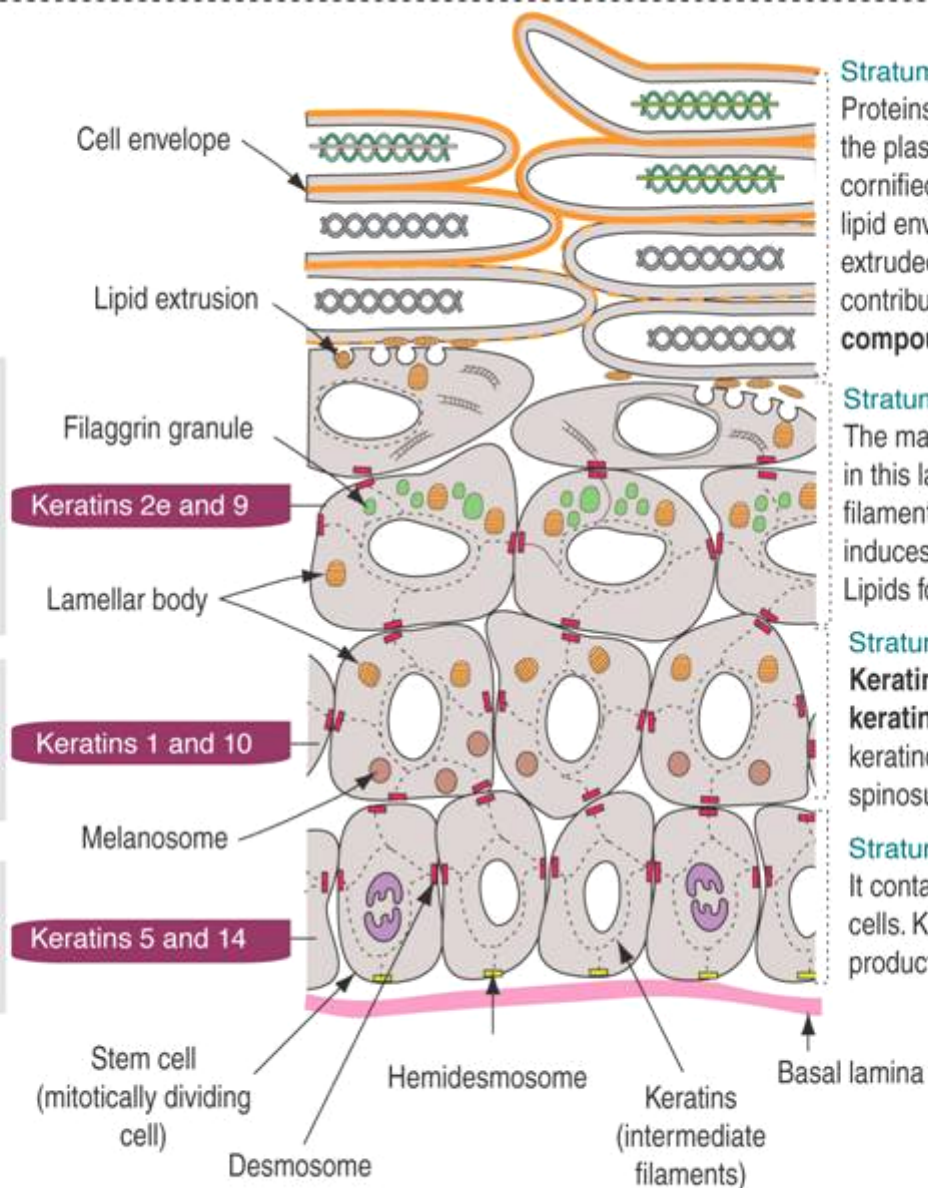
**Langerhans Cell:** dendritic processes; antigen presentation

# Keratinocyte Differentiation

Defects of **keratin 2e** cause **ichthyosis bullosa of Siemens** (IBS). A defect of **keratin 9** is associated with **epidermolytic palmoplantar keratoderma** (EPPK)

Mutation of **keratins 1** or **10** is the cause of **epidermolytic hyperkeratosis** (EHK)

Mutation of **keratins 5** or **14** is the cause of **epidermolysis bullosa simplex** (EBS)



## Stratum lucidum and corneum

Proteins deposited on the inside of the plasma membrane form the cornified **cell envelope**. An outer lipid envelope—formed by lipids extruded from the lamellar bodies—contributes to the assembly of a **compound cell envelope**.

## Stratum granulosum

The major product of keratinocytes in this layer is the nonintermediate filament protein, **filaggrin**. Filaggrin induces the aggregation of keratins. Lipids form **lamellar bodies**.

## Stratum spinosum

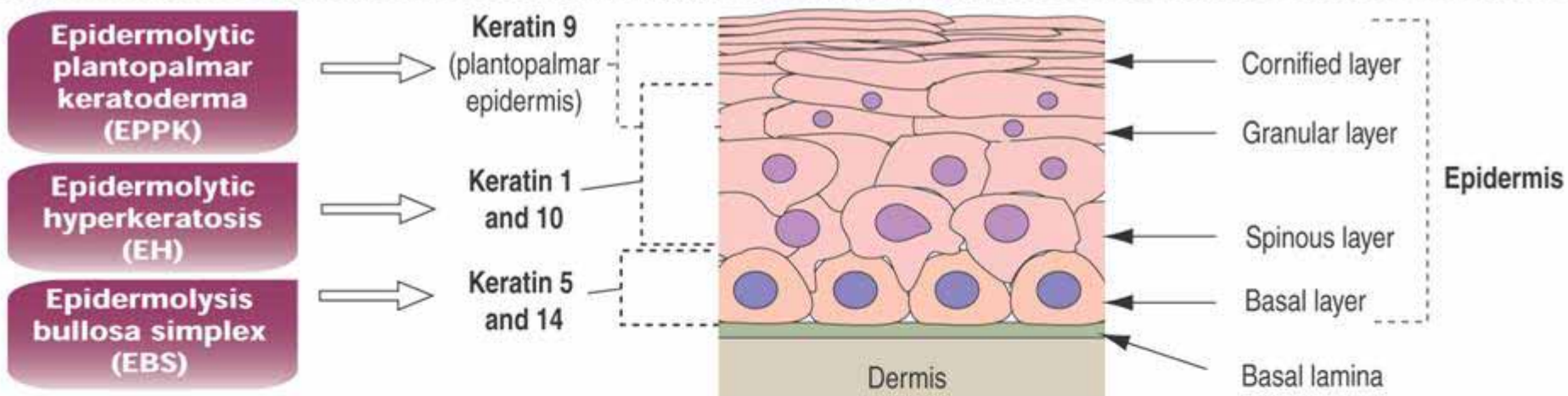
**Keratins 1 and 10** replace **keratins 5 and 14** when basal keratinocytes migrate to the stratum spinosum.

## Stratum basale

It contains mitotically dividing stem cells. Keratins 5 and 14 are major products of basal keratinocytes.



# Inherited Skin Diseases Caused by Mutations in Keratin Genes



**Epidermolysis bullosa simplex (EBS)**

**Mutation of keratins 5 and 14.**

Blisters develop soon after birth at sites subject to pressure or rubbing.

In the illustration above, blisters can be seen on the fingers of an infant.



**Epidermolytic hyperkeratosis (EH)**

**Mutation of keratins 1 and 10.**

Excessive keratinization causes a breakdown of the epidermis.



**Epidermolytic plantopalmar keratoderma (EPPK)**

**Mutation of keratin 9.**

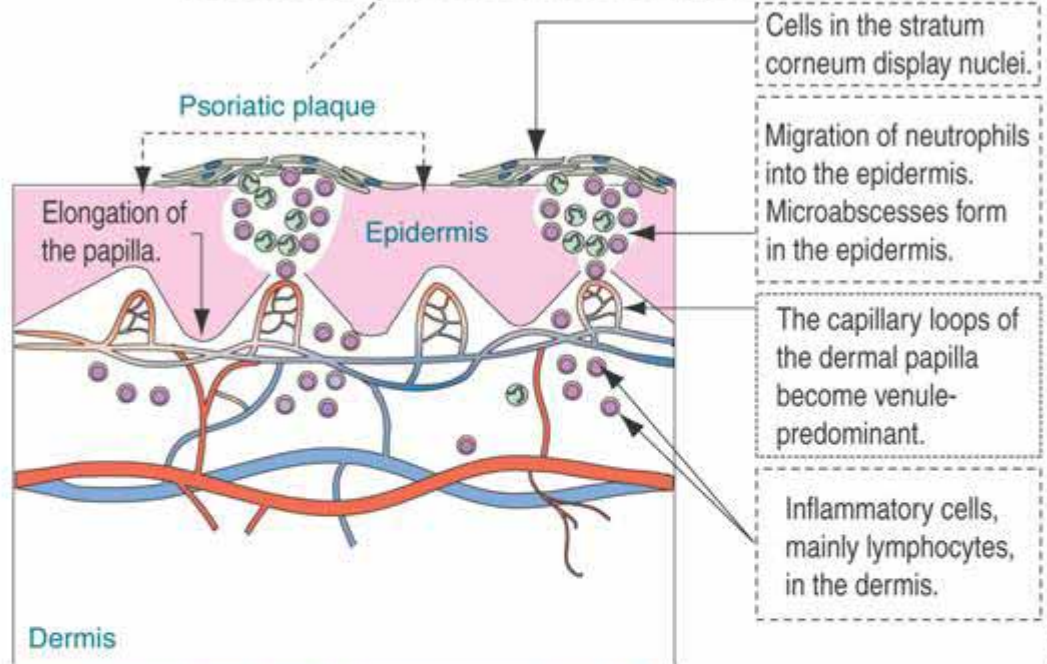
This disorder is restricted to the epidermis of palms and soles.



# Psoriasis

Psoriasis is a chronic epidermal-dermal disease characterized by:

1. Persistent hyperplasia of the epidermis by abnormal cell proliferation.
2. Abnormal microcirculation in the dermis capillary plexus.

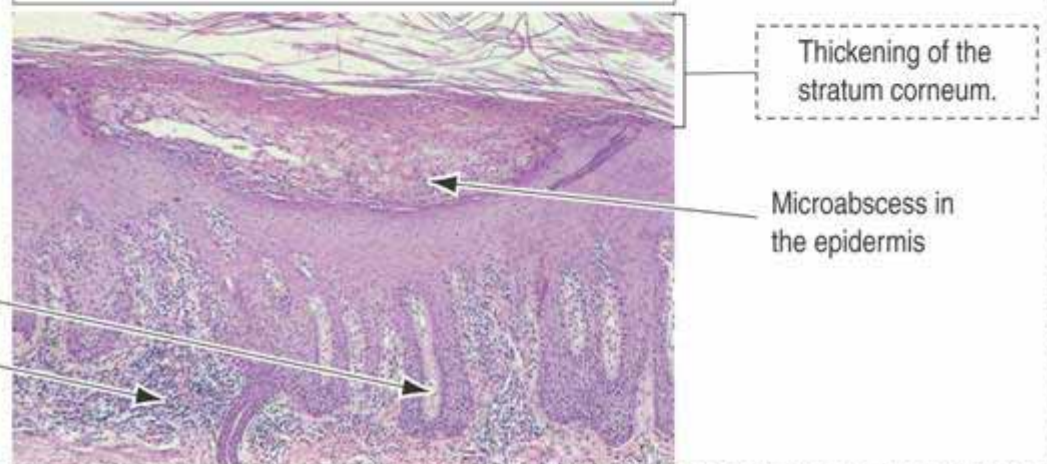


Cells in the stratum corneum display nuclei.

Migration of neutrophils into the epidermis. Microabscesses form in the epidermis.

The capillary loops of the dermal papilla become venule-predominant.

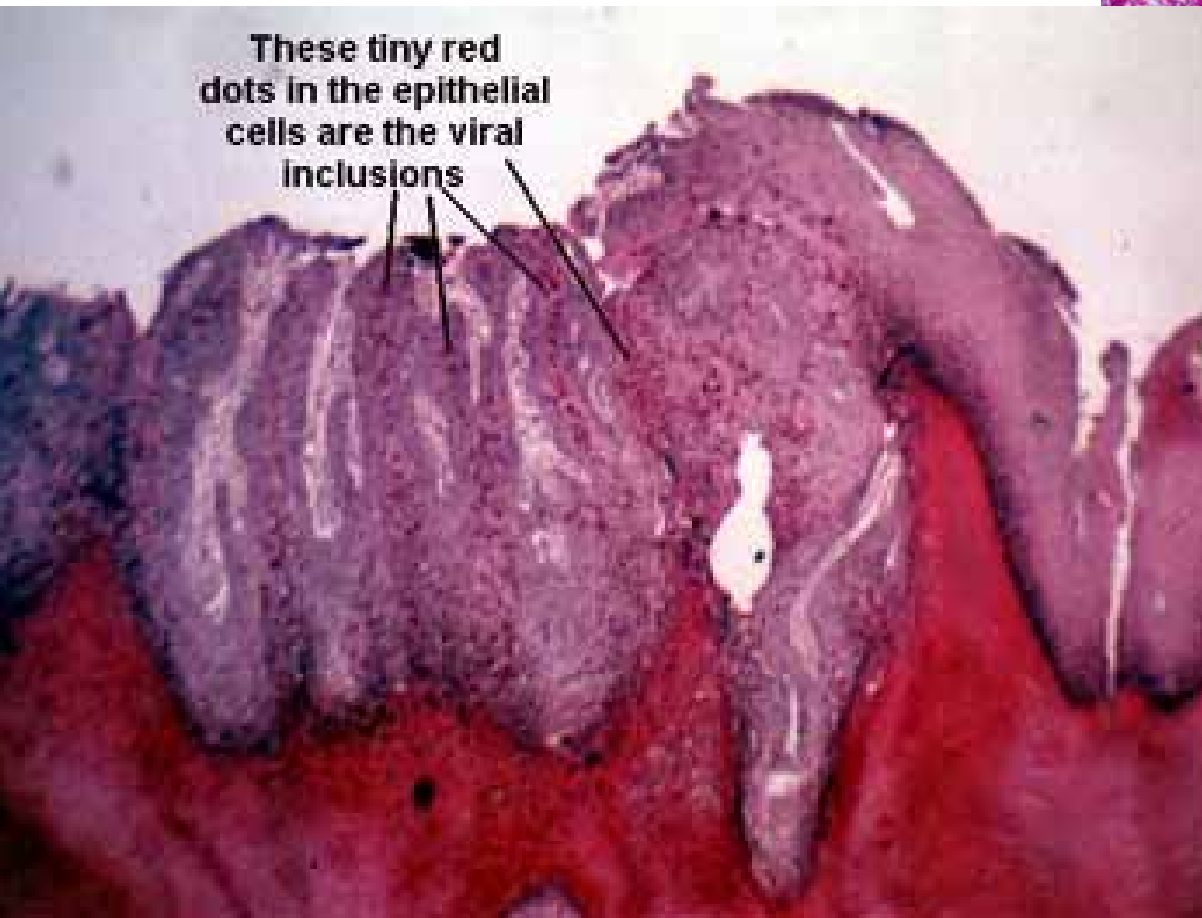
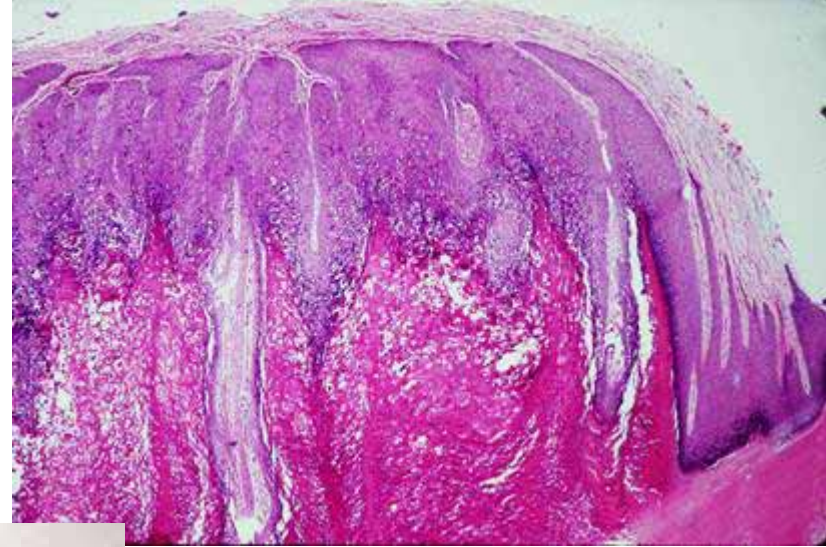
Inflammatory cells, mainly lymphocytes, in the dermis.



Elongation of the papillae

Inflammatory cells in the dermis

## Verruca Vulgaris (wart)





## Desmosomes in the stratum spinosum



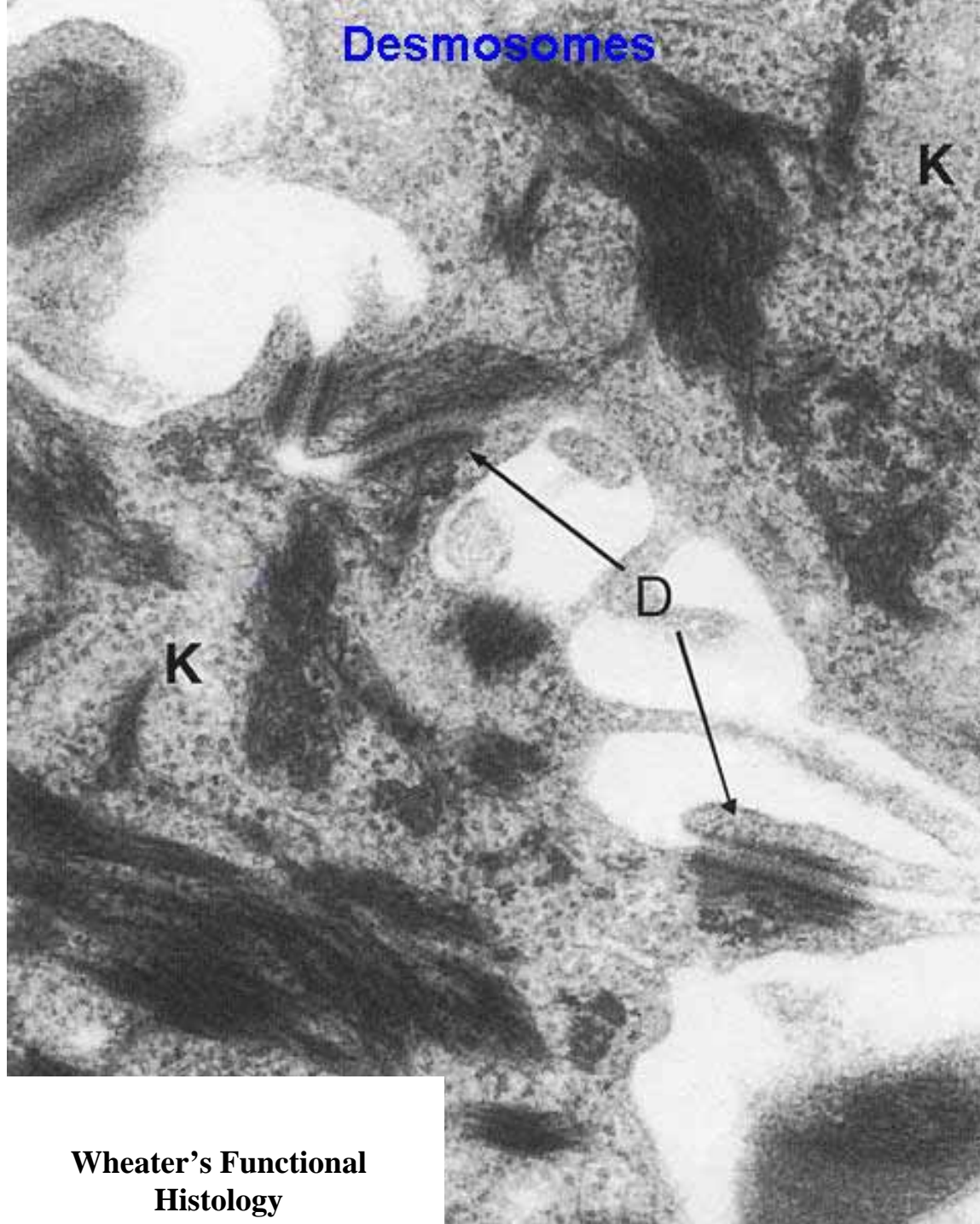
**Desmosomes: intercellular adhesion**



## Keratin Filaments

- dense cytoplasmic bundles
- crosslinked by filaggrin to form large aggregates
- concentrated at cell periphery in projections that terminate at desmosomal junctions
- crucial for structural integrity, stability, and continuity of the epithelium



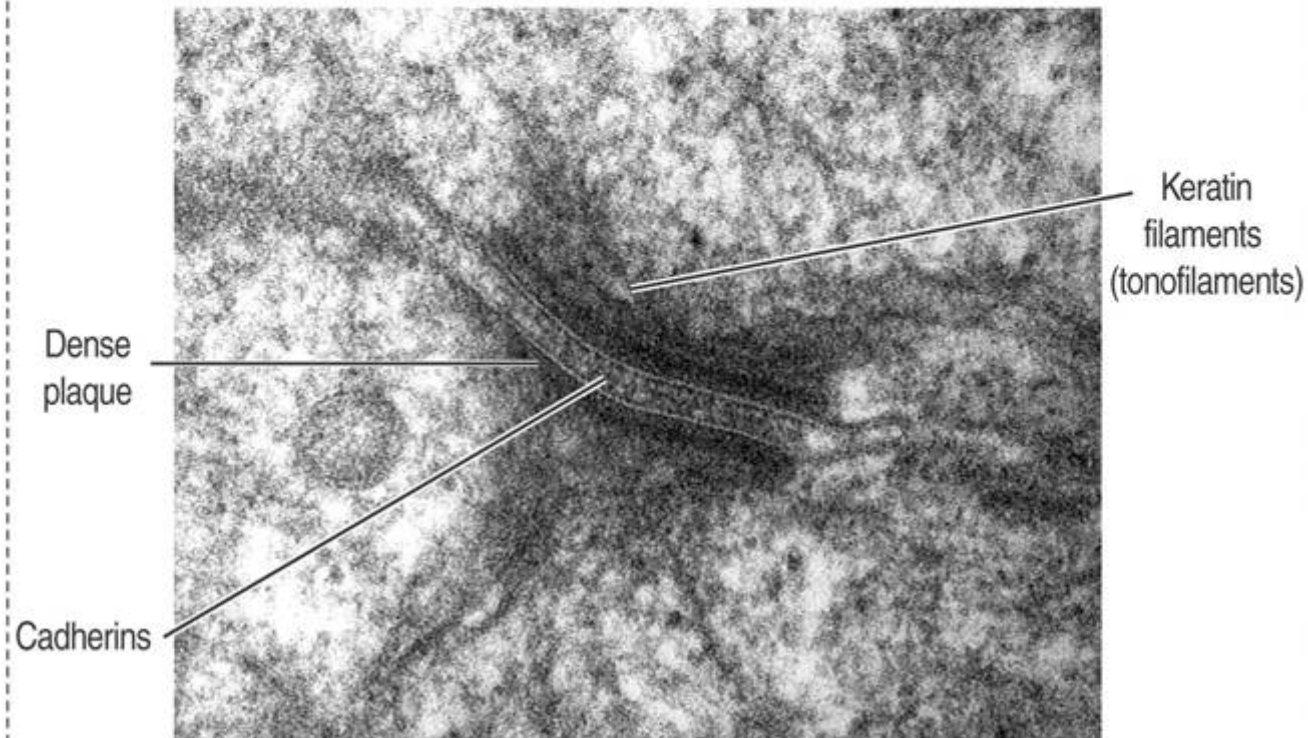
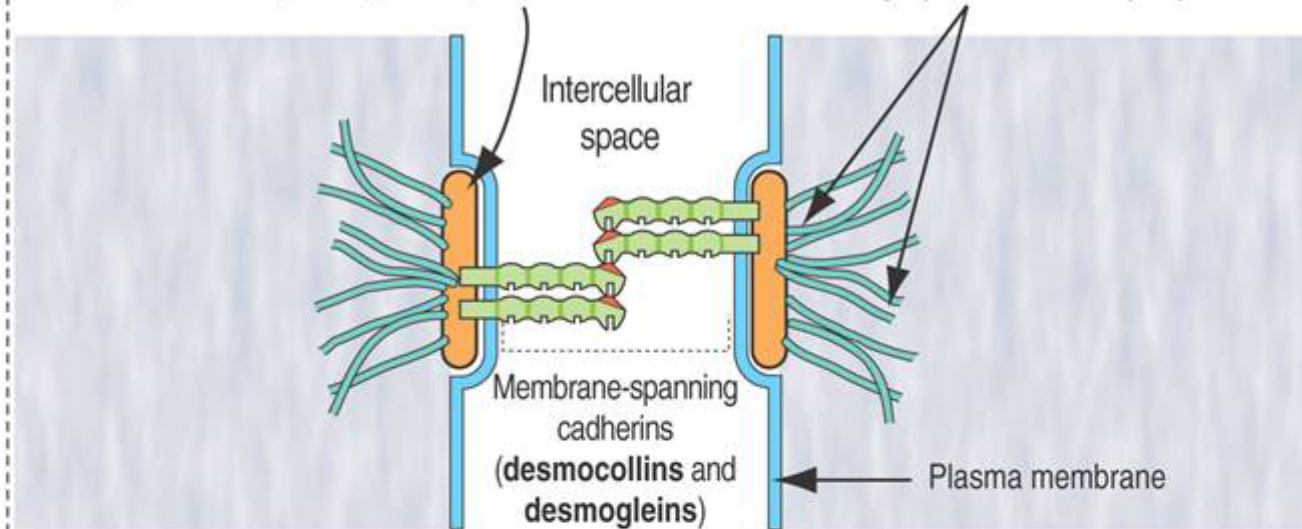


**Wheater's Functional  
Histology**



Cytoplasmic dense plaque containing **desmoplakin** and **plakoglobin** proteins

Keratin filaments (tonofilaments) anchored to the cytoplasmic dense plaque

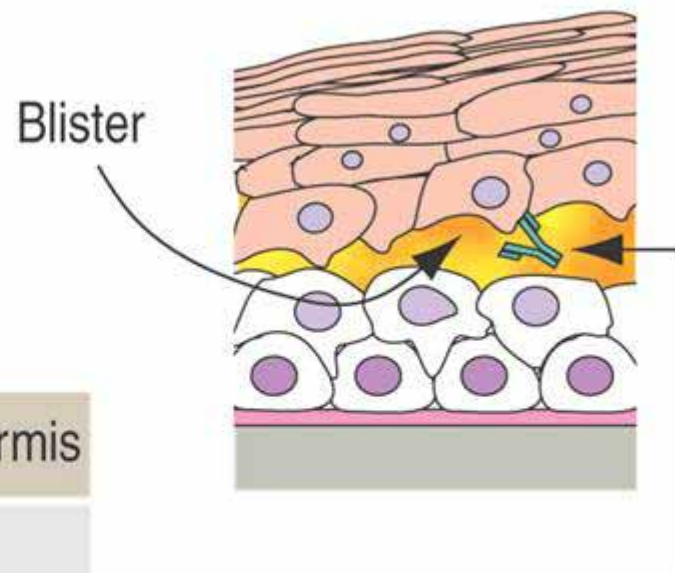
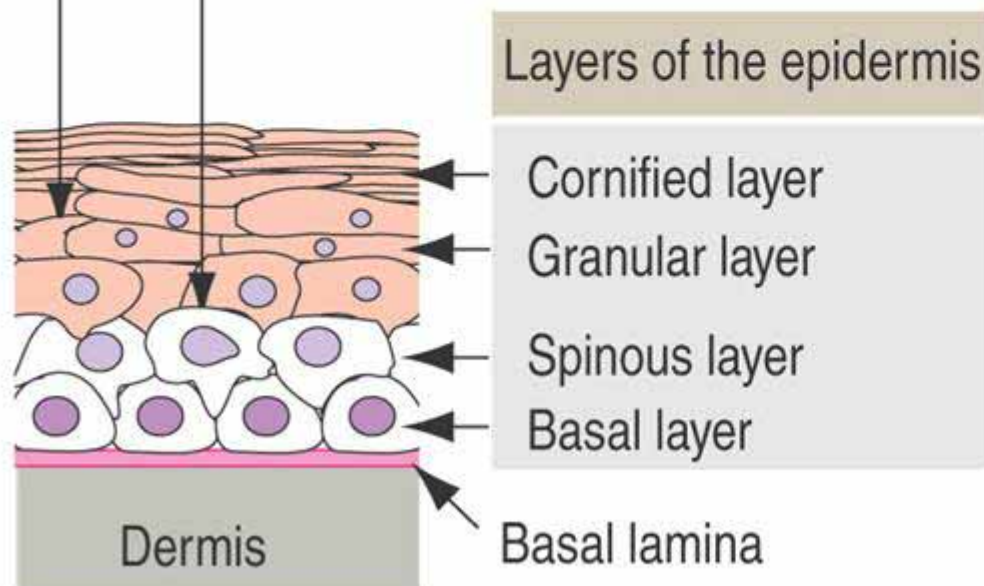




## Desmogleins in Autoimmune Skin Disease: Pemphigus

**Desmoglein 1** is present in all the layers of the epidermis.

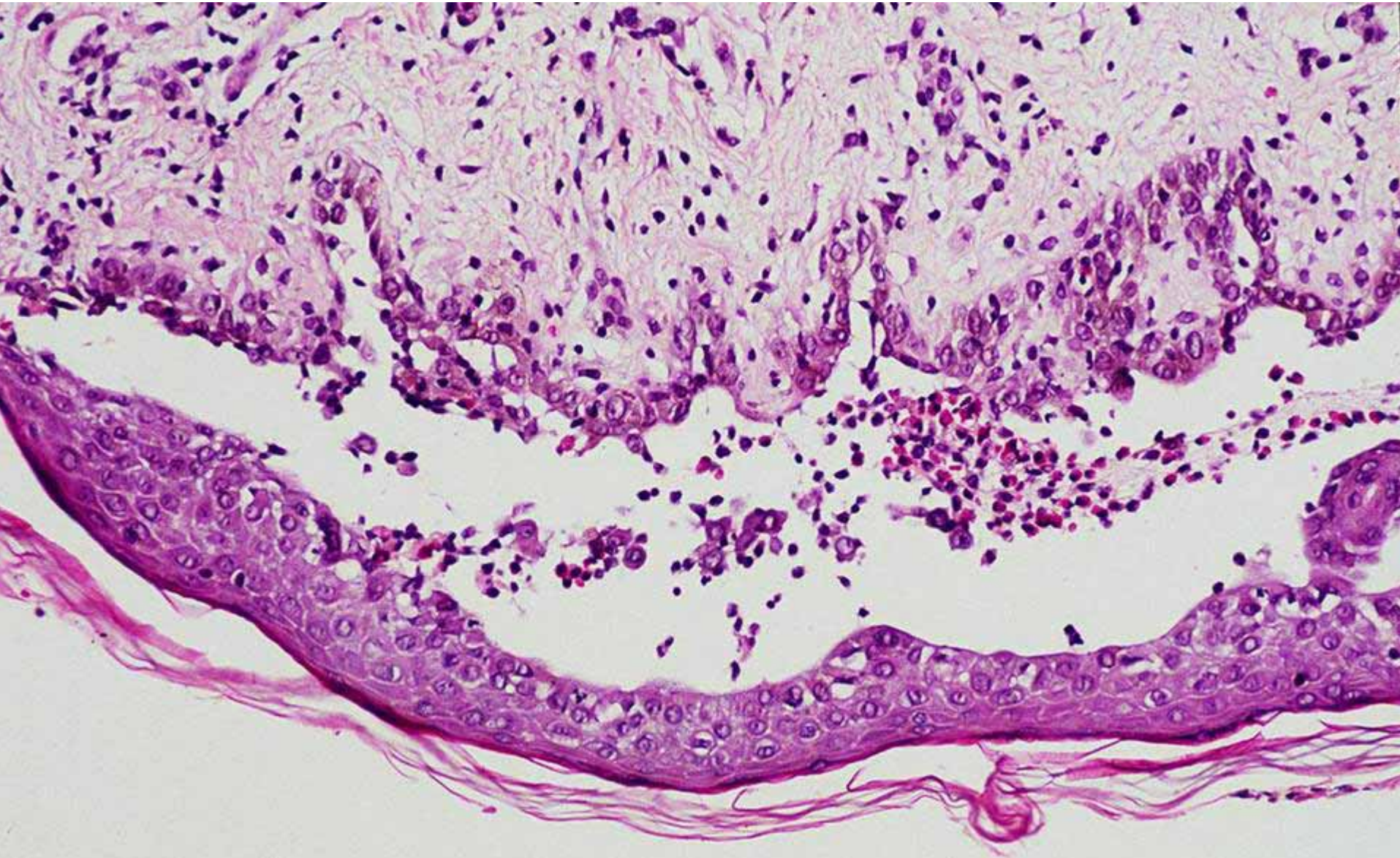
**Desmoglein 3** is present in the basal and spinous layers.



**Pemphigus foliaceus** is an autoantibody-mediated blistering disease in which antibodies against **desmoglein 1** cause a loss of adhesion of keratinocytes in the superficial layers of the epidermis.

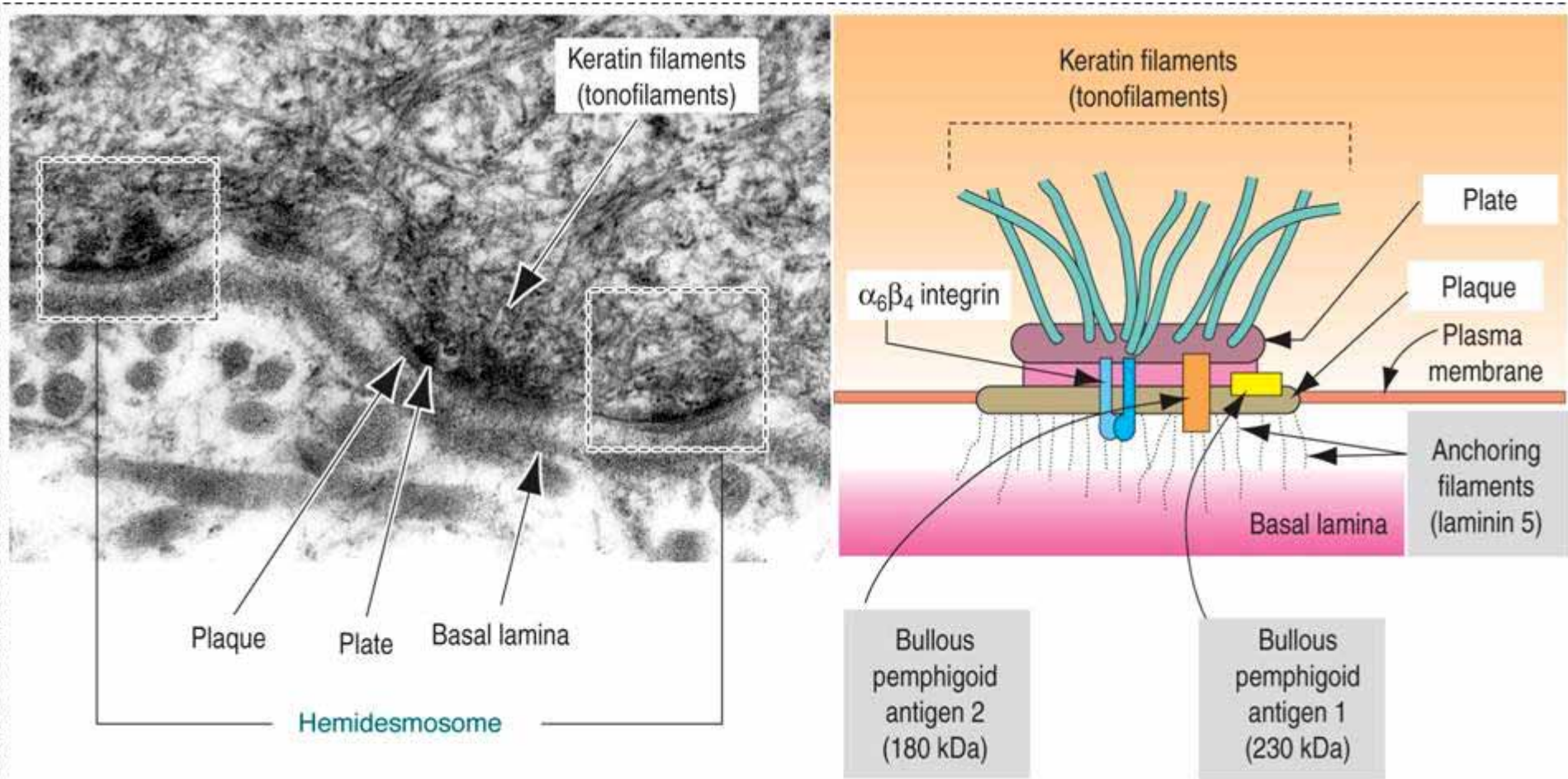


# Pemphigus



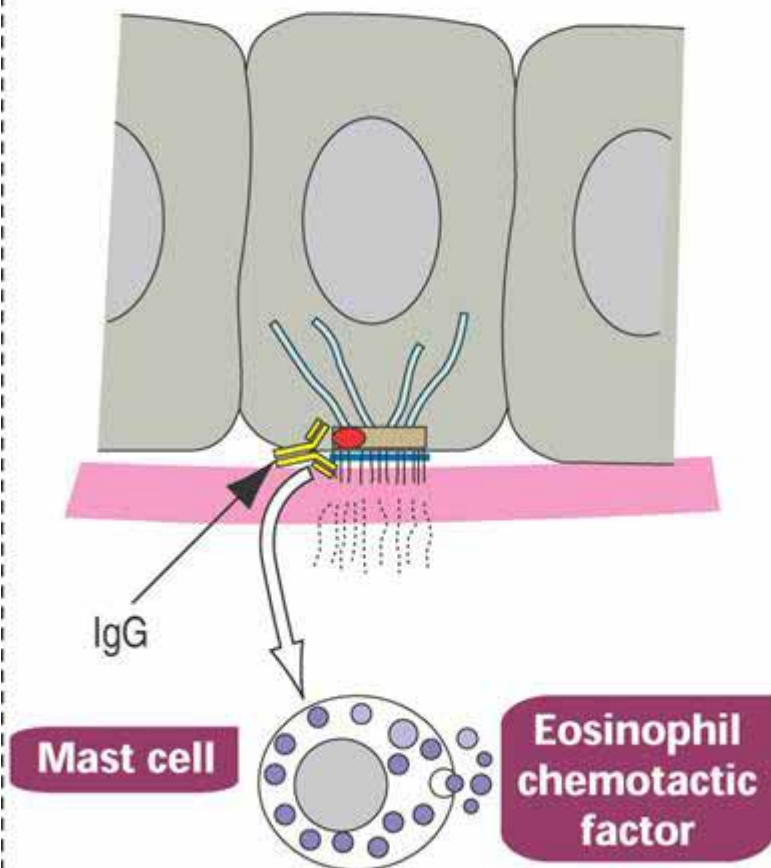


# Dermo-epidermal Junction: hemidesmosomes are also targets of autoantibodies causing blistering diseases

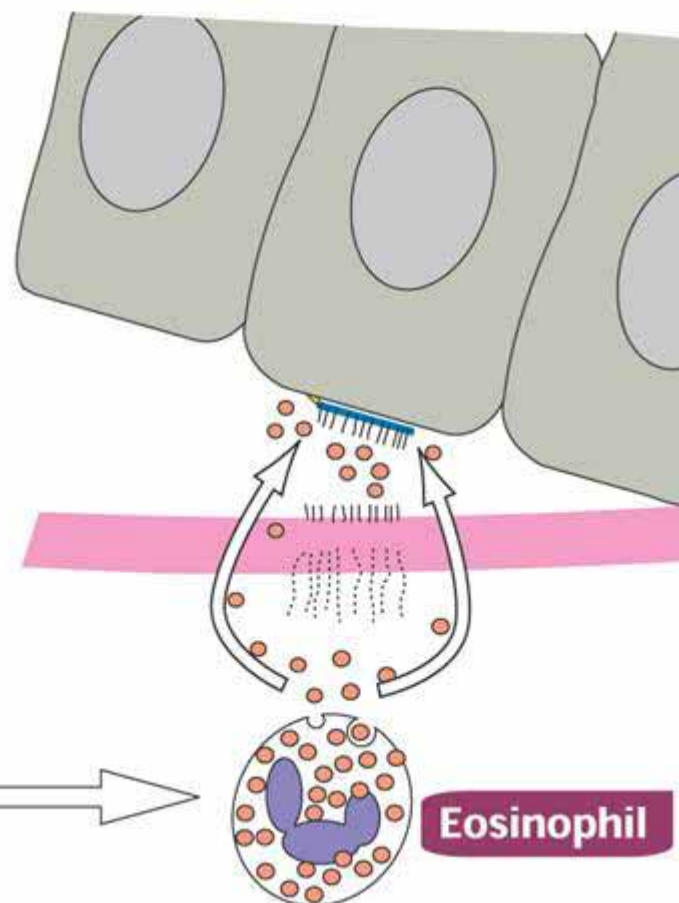


## Pathogenesis of Pemphigus Bullous

**1** A circulating antibody to bullous pemphigoid antigen triggers a local response that induces mast cells to release **eosinophil chemotactic factor (ECF)** to attract eosinophils.

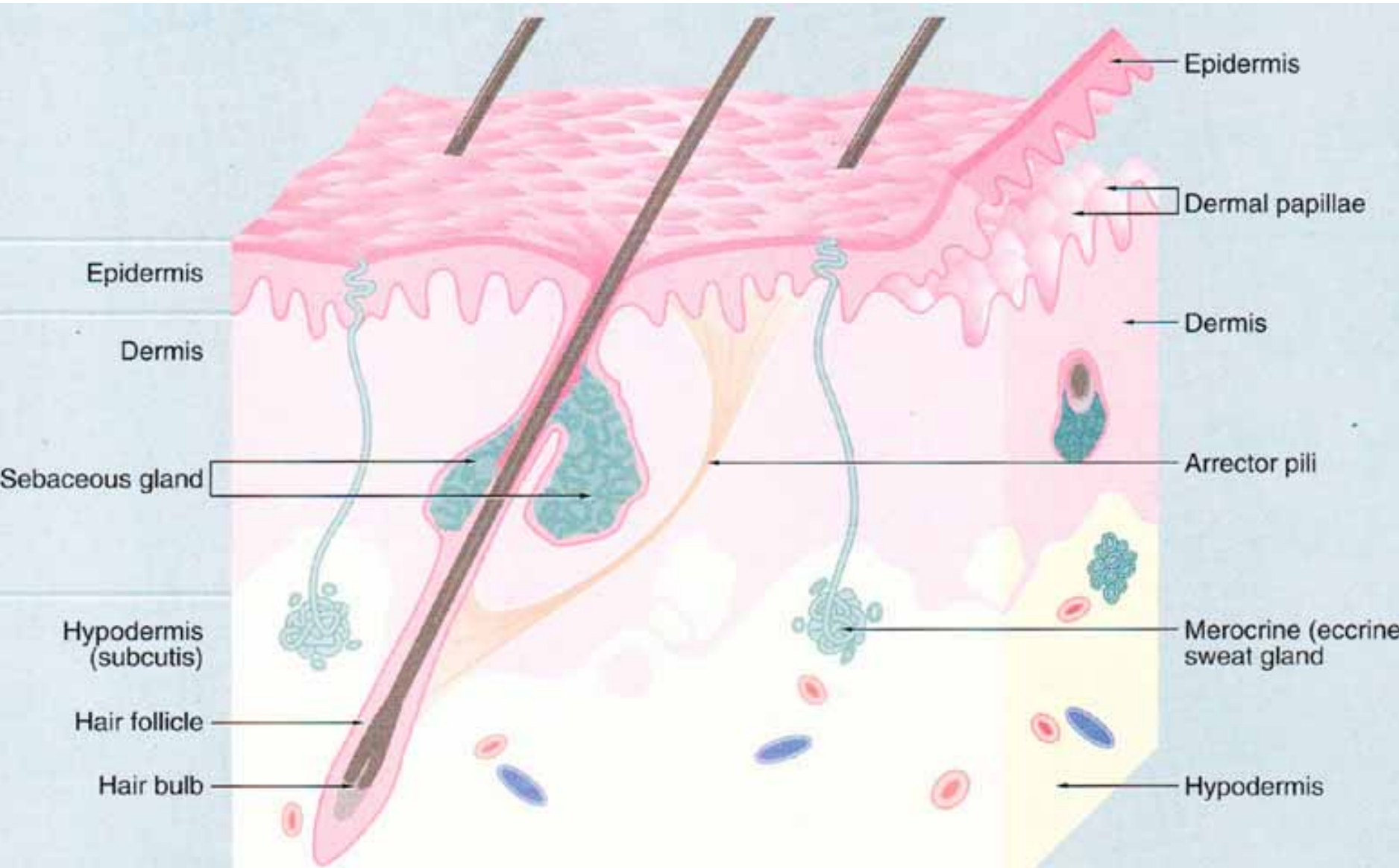


**2** Eosinophils release proteases causing the breakdown of anchoring filaments linking the attachment plaque of the hemidesmosome to the basal lamina. A blister develops.

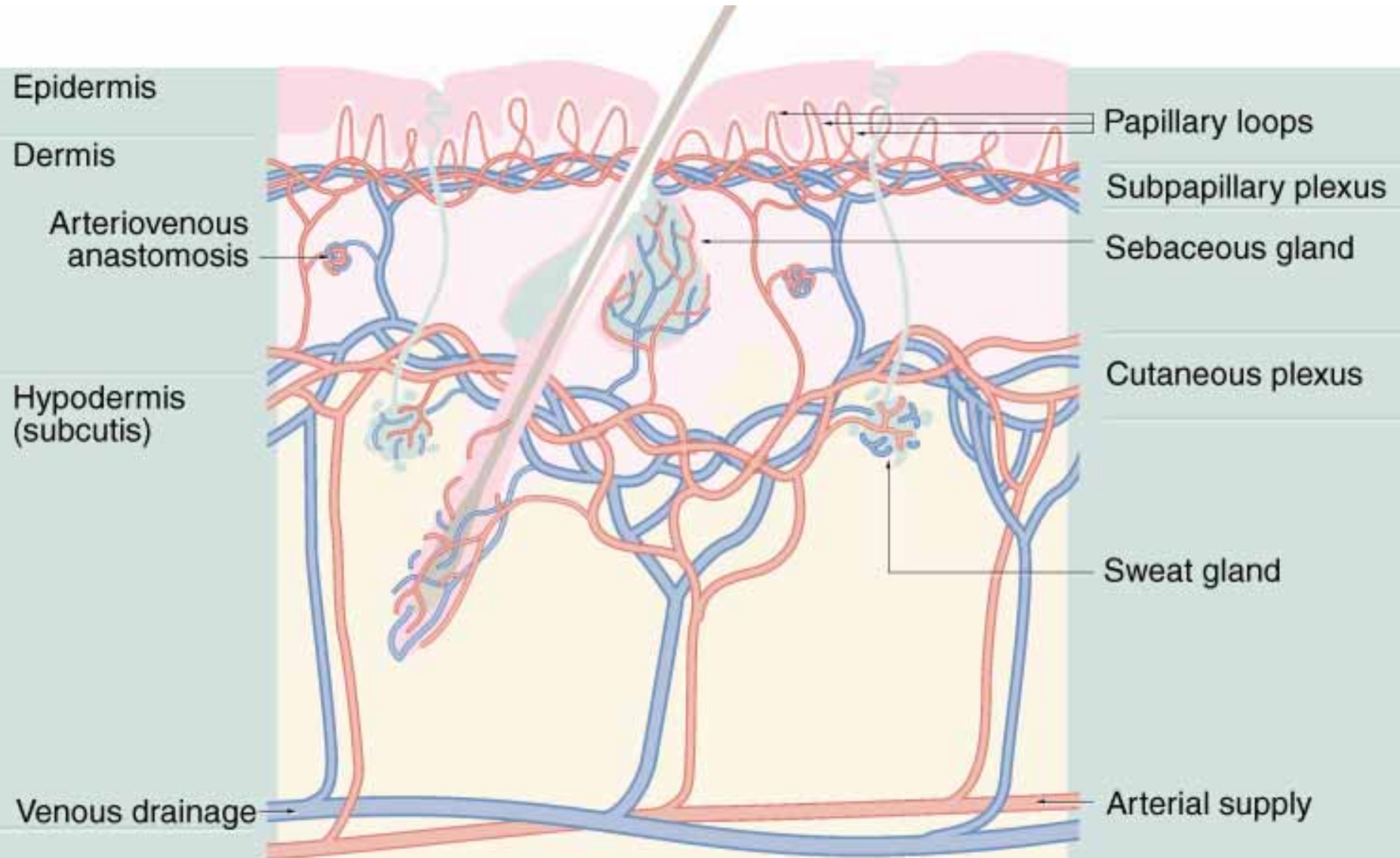




# Skin Appendages



## Circulation





# Sensory Receptors of the Skin

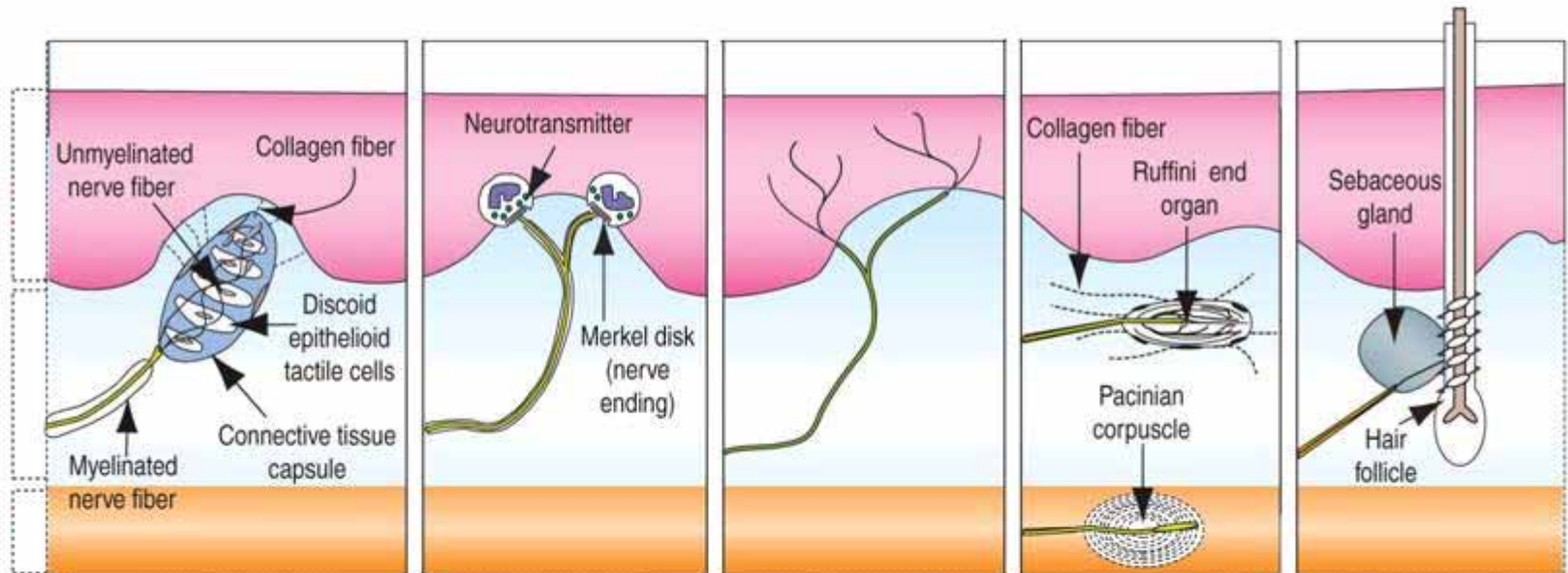
**Meissner corpuscle**  
Present in dermal papilla  
Tactile receptor

**Merkel cell**  
Neural crest-derived cell in the basal layer of the epidermis  
Tactile receptor (high resolution)

**Free nerve endings**  
Lack myelin or Schwann cells  
Respond to pain and temperature

**Ruffini end organ**  
Responds to stretching  
**Pacinian corpuscle**  
sensitive to pressure

**Peritrichial nerve ending**  
Nerve fibers wrapped around the base and shaft of the hair follicle; stimulated by hair movement



Present in fingers, hand, foot, front of forearm, lips, and tongue

Present in nonhairy and hairy skin

Found in epidermis and corneal epithelium

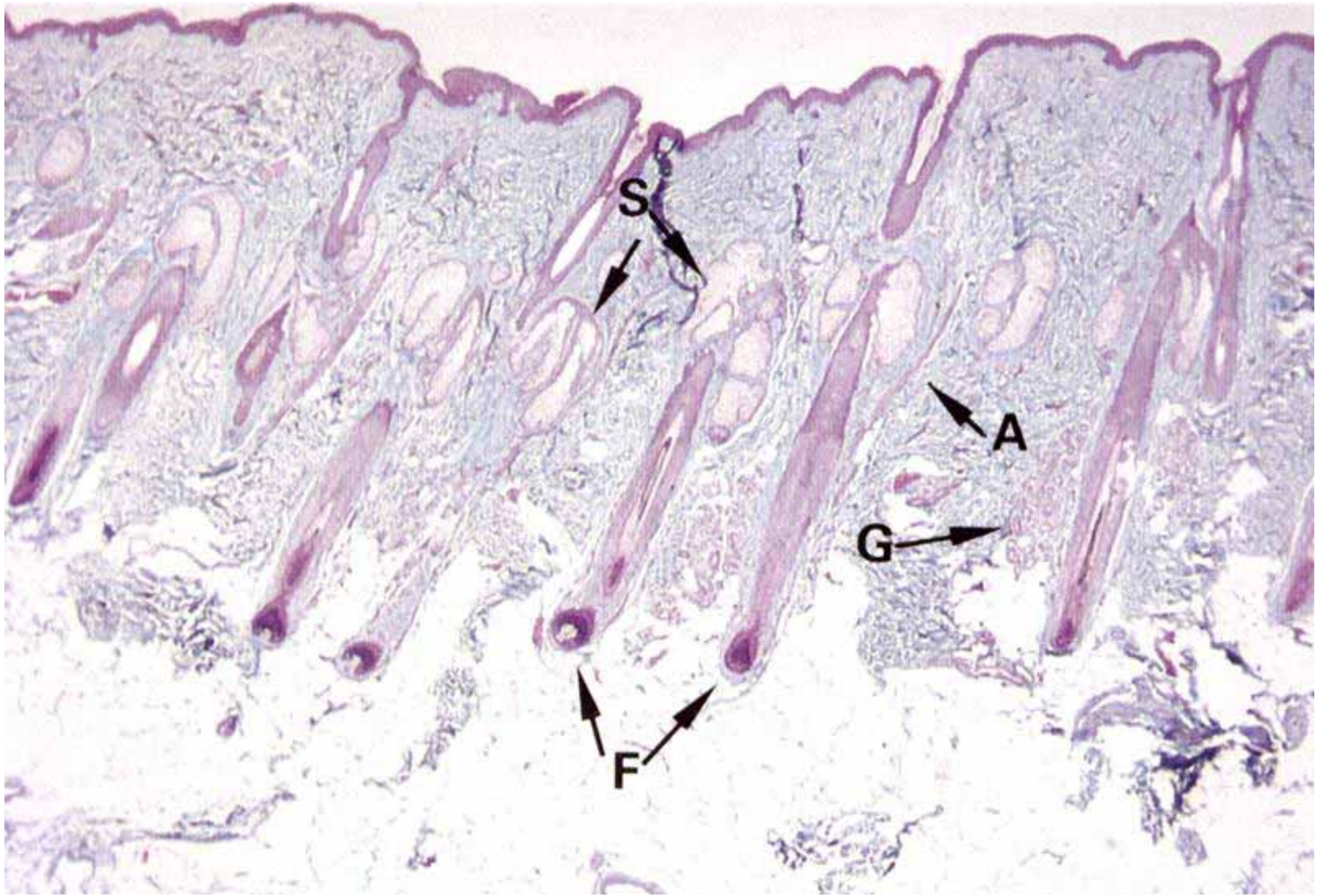
**Ruffini end organ**  
Present in skin and joint capsule

**Pacinian corpuscle**  
Found in hypodermis and deep fascia tissues

Epidermis

Dermis

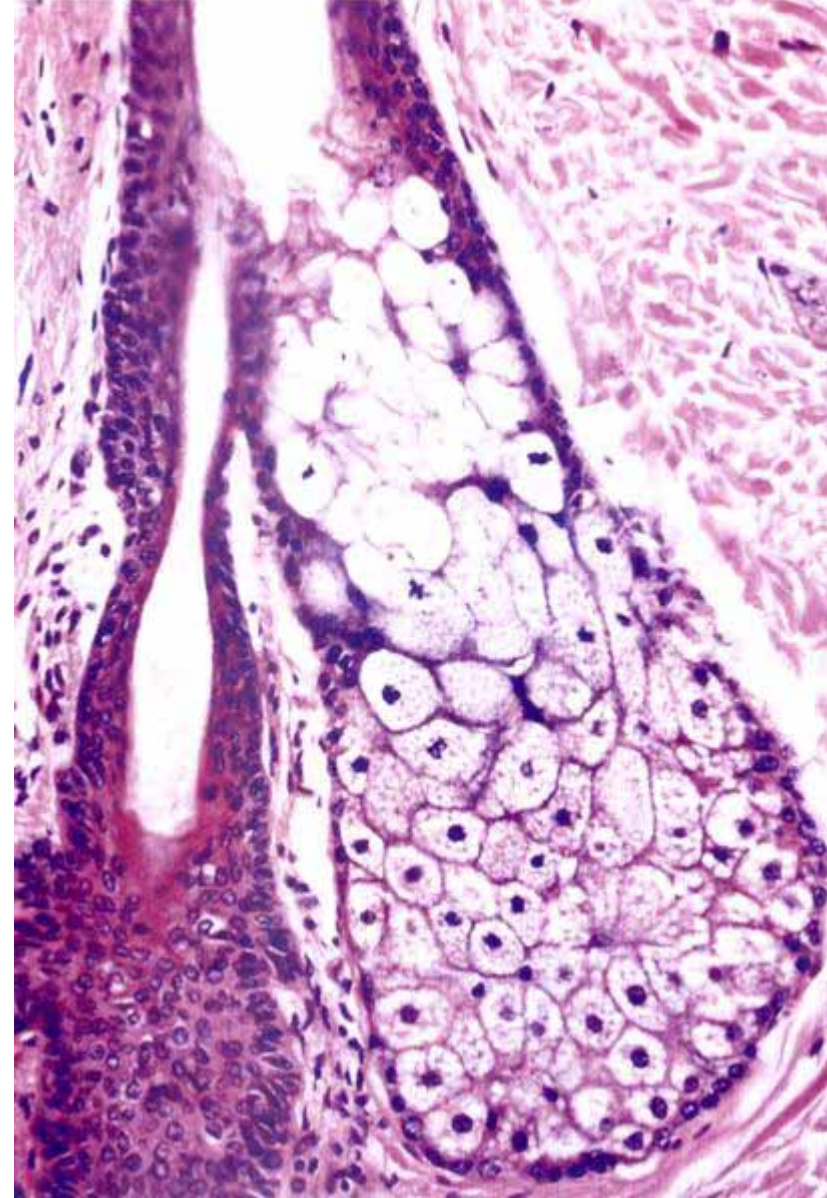
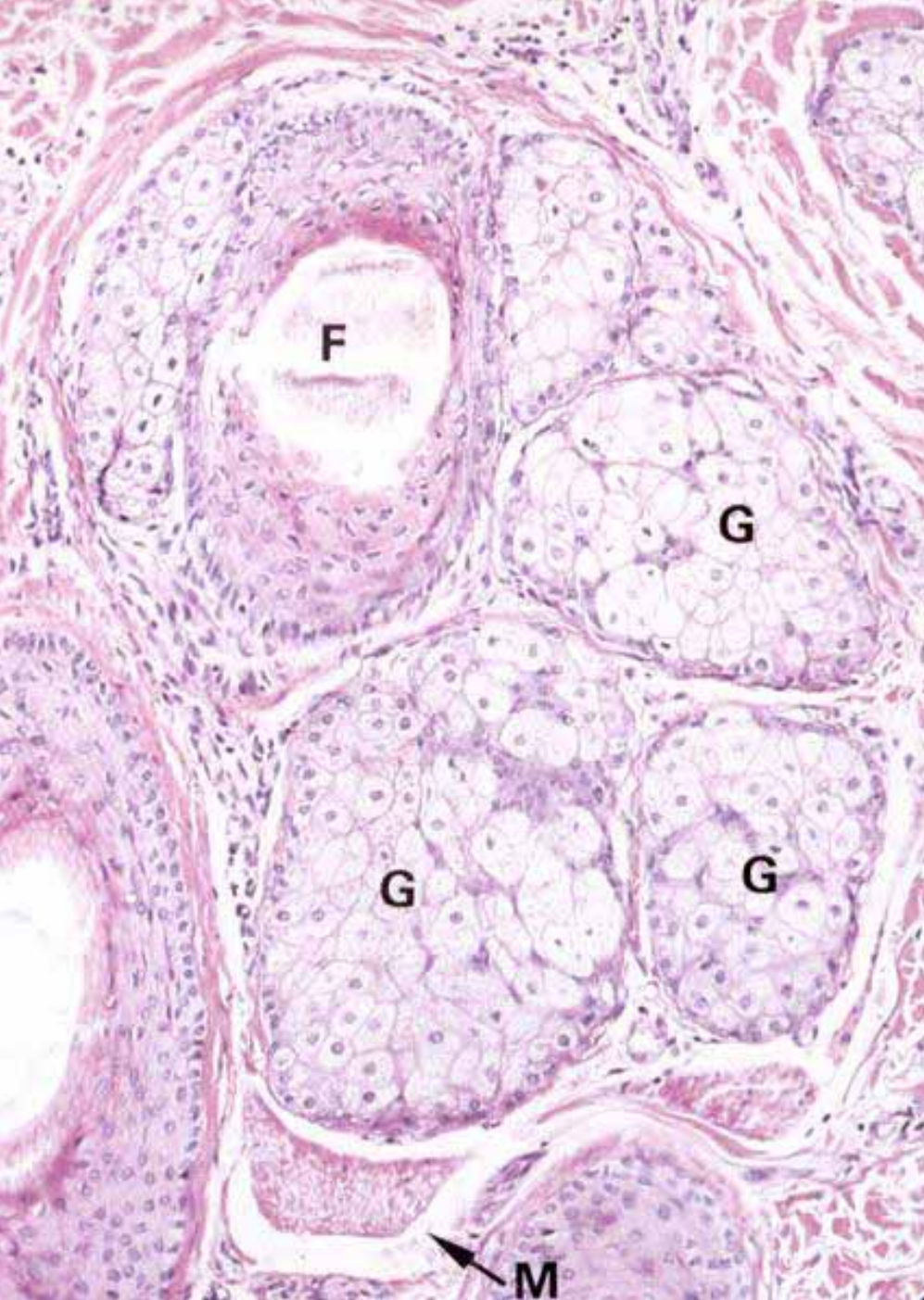
Hypodermis



## Scalp

Wheater's Functional Histology

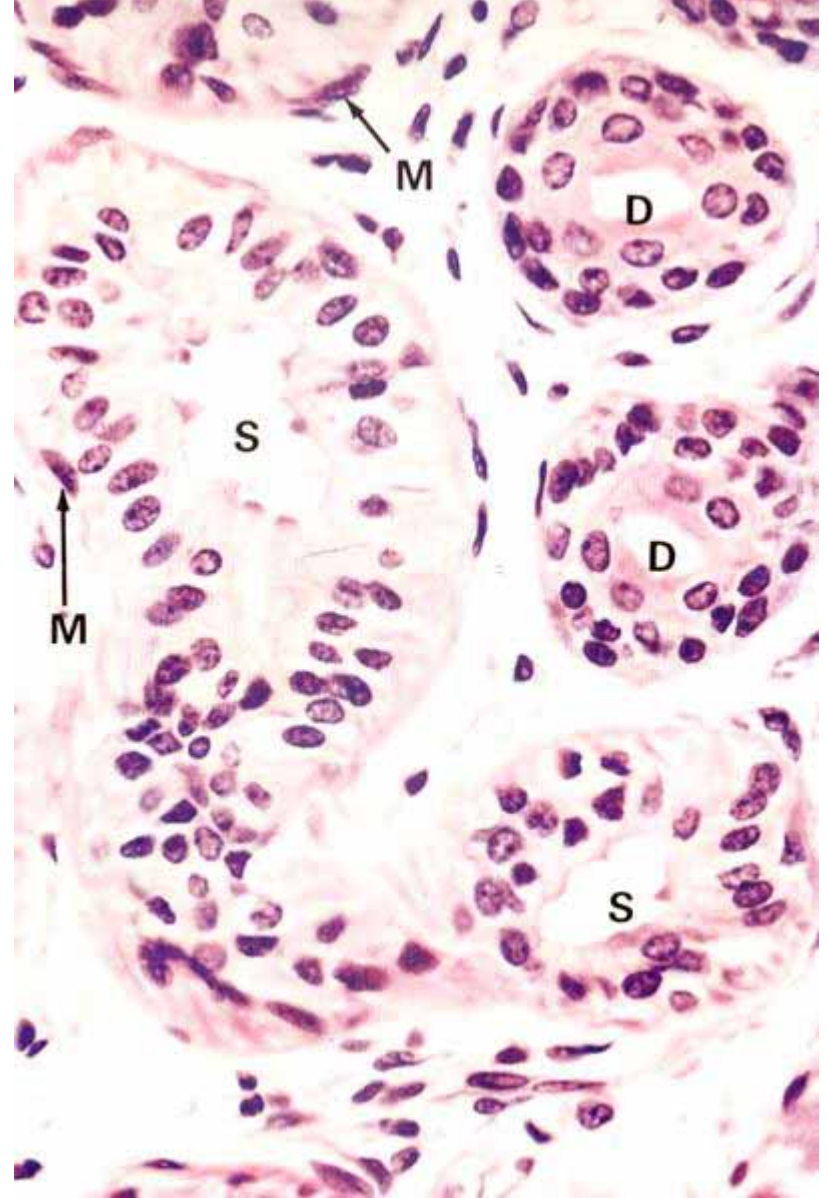
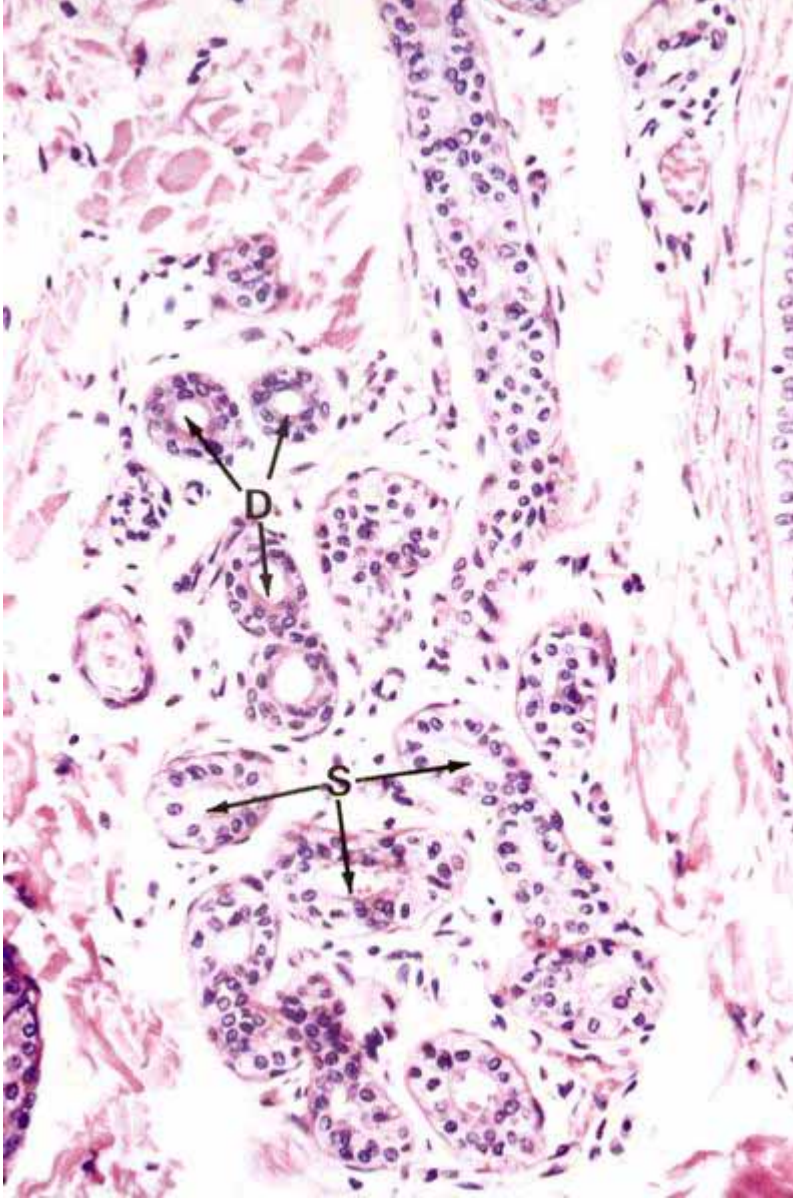




## Sebaceous Glands

Wheater's Functional Histology

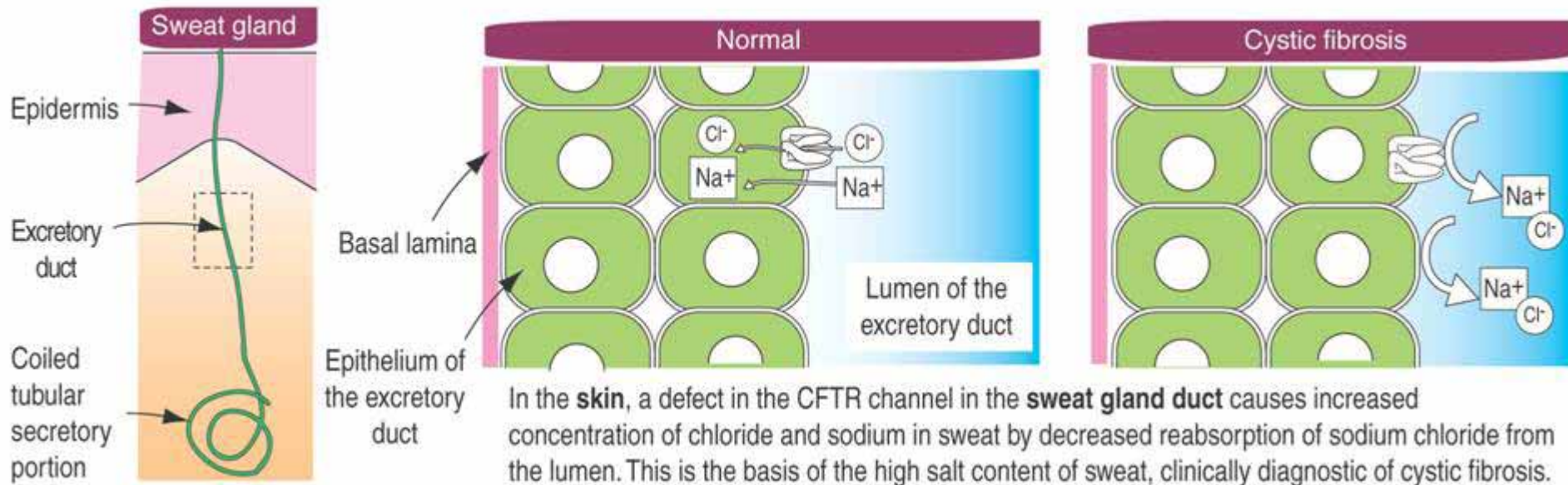




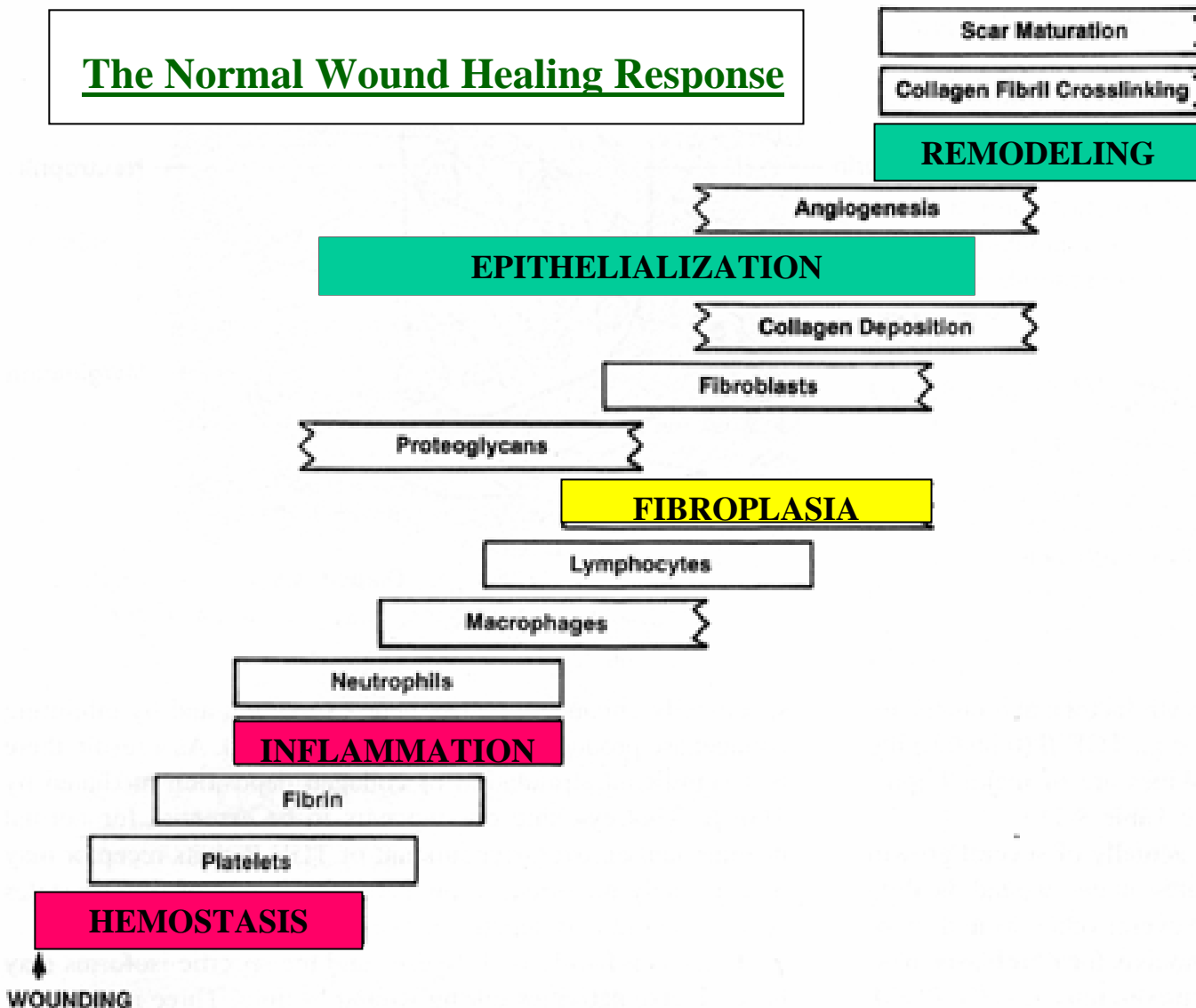
## Merocrine (eccrine) Sweat Glands



# Salty Sweat is Diagnostic for Cystic Fibrosis



# The Normal Wound Healing Response



**FIG. 8-9.** Sequence of events in wound healing. [Modified from: *Mast BA: The skin*, in Cohen IK, Diegelmann RF, Lindblad WJ (eds): *Wound Healing: Biochemical and Clinical Aspects*, chap 22. Philadelphia, WB Saunders, 1992, with permission.]



## Skin Scar from Biopsy

- ▀ fibroelastic tissue forms scar
- ▀ no skin appendages
- ▀ progressive reduction in cellularity
- ▀ progressive loss of capillaries
- ▀ contraction of scar



Basic Histopathology Fig. 2.11

## REFERENCES

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