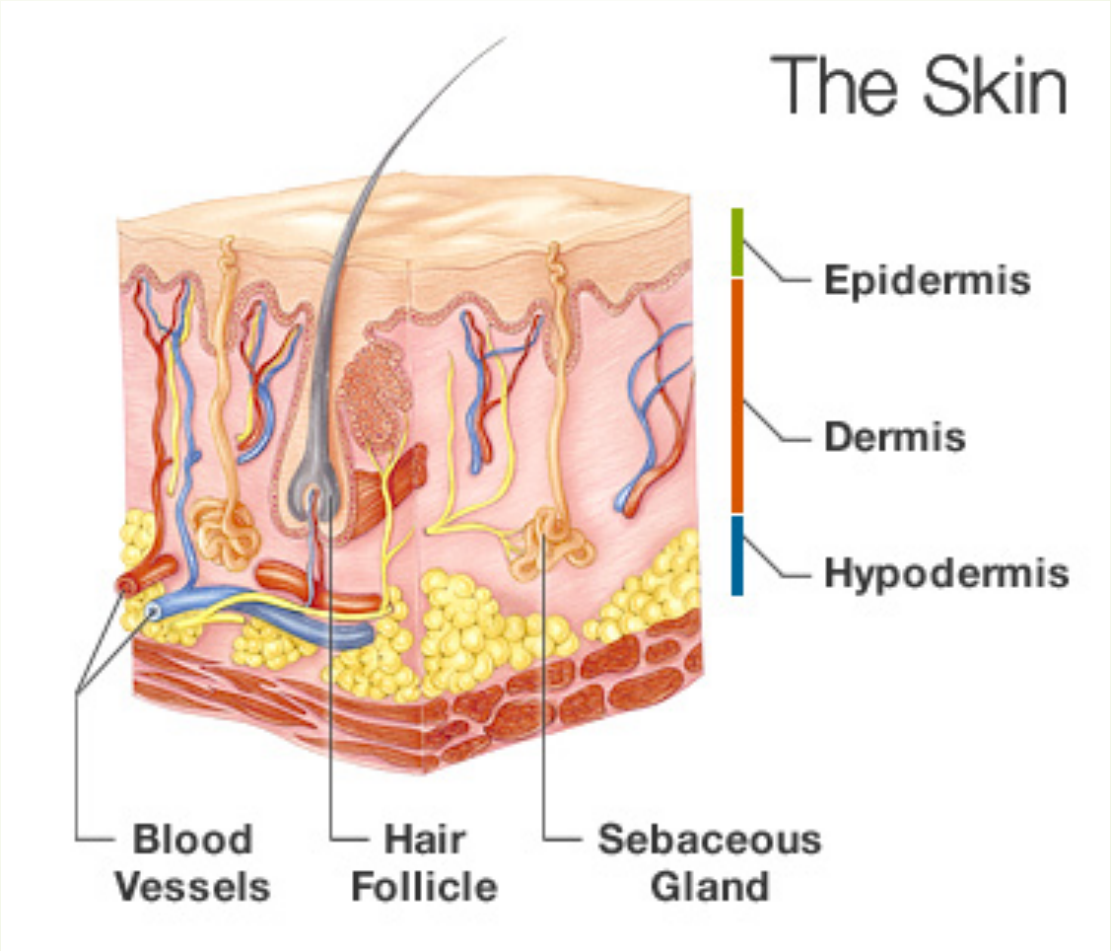
Normal skin

5th year medical students – Dermatology rotation

Introduction

- The skin represents the largest organ of the human body. The average adult has 1.75 m^2 (18.5 ft^2) of skin
- The thickness of the skin varies considerably over all parts of the body, and between men and women and the young and the old.

Layers of the skin



Embryology

- Epidermis : Ectoderm.
- Dermis & sub-cutaneous tissue : Mesoderm.
- Melanocytes : Neural crest & migrate along the neuron.

Function of the skin

Function	Selected failings
Prevent infection via innate and adaptive immunity	Fungal, bacterial and viral infections; autoimmunity, cancer
Maintain a barrier	Infection, dehydration
Repair injury	Cancer, leg ulcers
Provide circulation	Infarction (due to embolization, vasculitis, or other forms of occlusion)
Communicate	Sensory neuropathy, pruritus
Provide nutrition	Vitamin D deficiency
Regulate temperature	Hypothermia, hyperthermia
Attract attention	Photoaging, vitiligo, alopecia

Epidermis

- the outer layer of skin and it consists of a thin matrix of cells
- 4 major types of cells
  1. Keratinocytes 95%
  2. Melanocytes → neural crest
  3. Langerhans cells → bone marrow
  4. Merkel cell → bone marrow

Epidermis - keratinocytes

1) Basal cell layer HPV / basal CC
   - 1st row of cells, columnar
   - Mitotic activity restricted to these cells, and form the cells of other layers
   - Melanocytes are found between the basal cells
2) Prickle cell layer (spinous, squamous): Pemphigus vulgaris, acanthokysis
   - Polygonal cells
   - Intercellular cement (desmosomes) and intracellular cement (tonofilaments)
   - **Stratum germinativum** with basal layer

3) Granular cell layer: L.P

- Diamond shape
- Contain keratohyalin granules

4) Keratin layer (S. corneum, horny layer):

- Results from keratinization → no nucleus in cells
- Function as a normal barrier
- Normal keratinization takes 4 weeks

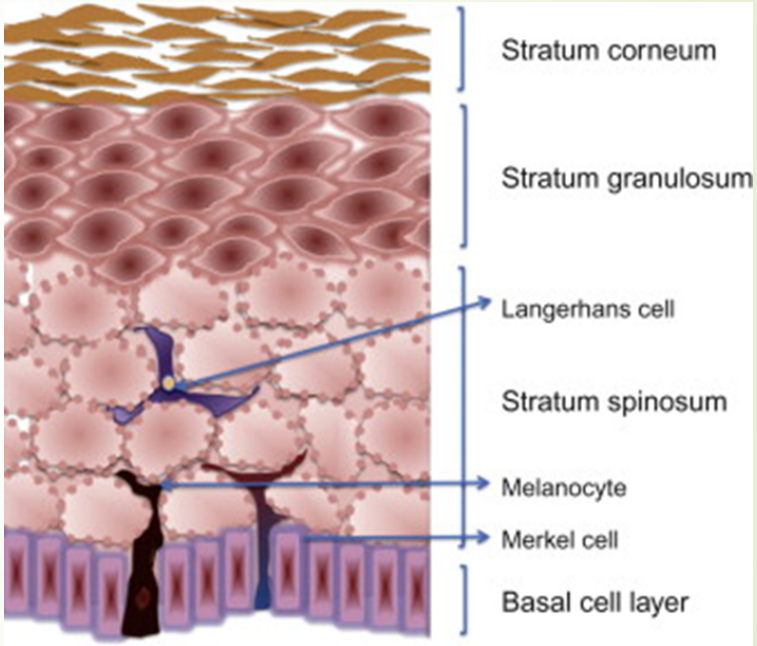
- hyperkeratosis
- acanthosis

Epidermis - melanocytes

- elaborate the light-absorbing pigment melanin, which plays a major role in protecting the skin from UV radiation.
- Melanosomes, with their complement of melanin, are produced by melanocytes (dendritic cells) and then transferred by excretion and phagocytosis into nearby keratinocytes, where they assume their preferred location above the nucleus

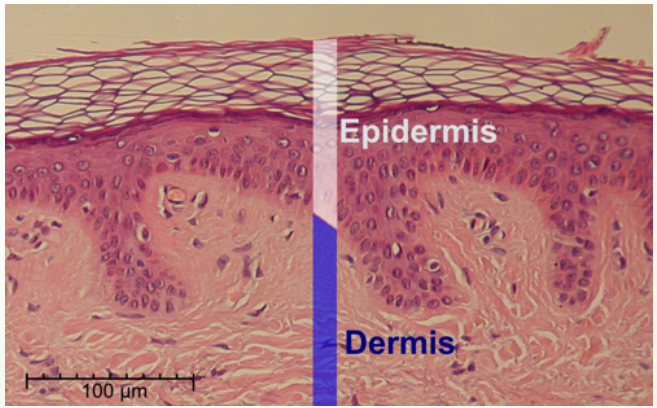
Epidermis – Langerhan and Merkel cells

- Langerhan cells : critical role in antigen presentation during the induction and regulation of immunity
- Merkel cells : found in the basal layer of the epidermis(Bell-like shaped cells). Free nerve endings below it, related to touch



Dermal–epidermal interface

- The boundary between epidermis and dermis consists of a specialized aggregation of attachment molecules, collectively known as the basement membrane.
- The basement membrane has upward projections into the epidermis formed of the dermis called **dermal papillae**.
- The downward parts of the epidermis are called **rete ridges**

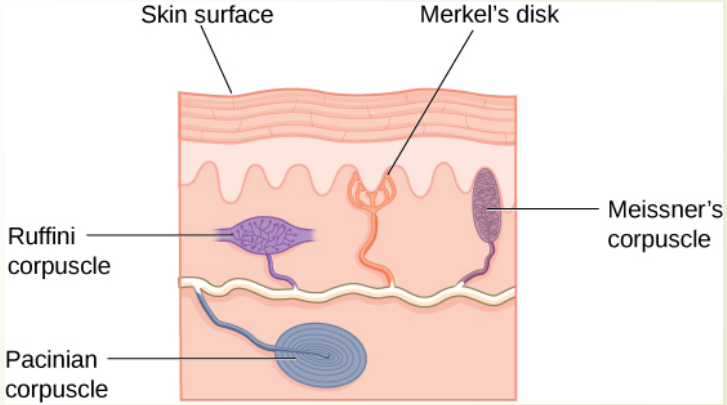


Dermis

- It is composed of a glycosaminoglycan gel held together by a collagen- and elastin-containing fibrous matrix. Vascular structures, accompanied by nerves and mast cells , course through the dermis to provide nutrition, recirculating cells, and cutaneous sensation. Three additional cells, fibroblasts, macrophages and dermal dendritic cells, complete the list of dermal residents.

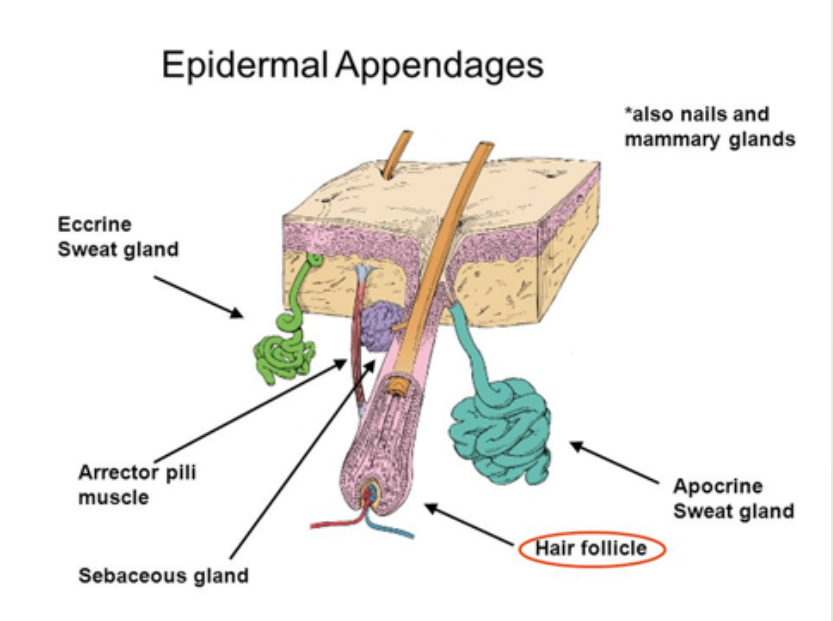
Dermis - nerves

- Meissner corpuscle: Mediates touch , In the papillary dermis ,More at tips of fingers
- Pacinian corpuscle: Deep in dermis. Mediates pressure and vibration. Onion shaped . At the Palms, soles, areola and genitalia
- Ruffini corpuscle is a slowly adapting mechanoreceptor located in the cutaneous tissue between the dermal papillae and the hypodermis
- Mucocutaneous nerve endings : Loops without capsule. The General sensory receptors
- Free nerve endings : Temperature, pain, itch



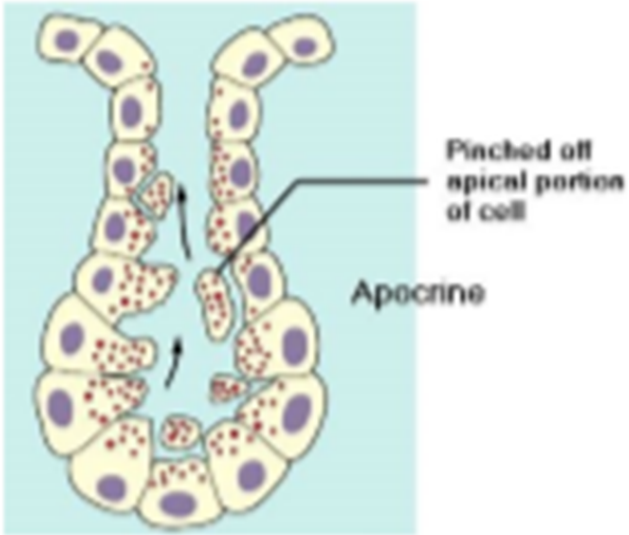
Epidermal appendages

- These are structures originating from the epidermis but present in the dermis:
  - Keratinous structures: hair/ nail
  - Glandular structures:
    - Apocrine sweat glands, controlled by nerves
    - Eccrine sweat glands, controlled by nerves
    - Sebaceous (holocrine) glands, controlled by androgens



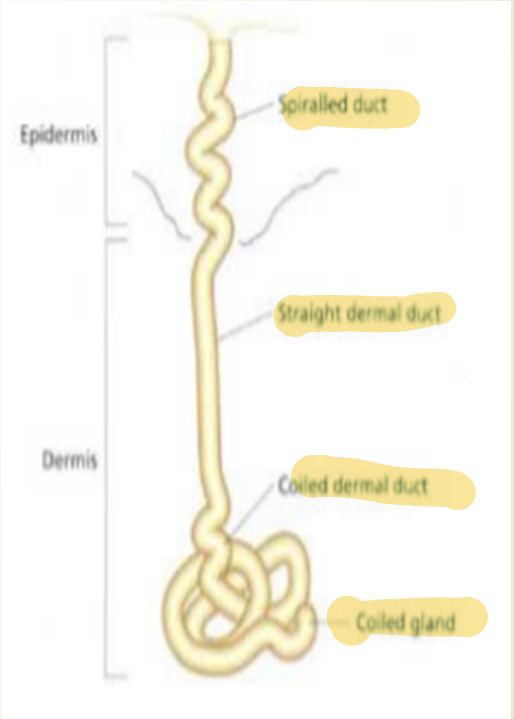
Apocrine sweat glands

- Large sweat glands, present at specific locations in the body e.g: axillae, groin..
- Decapitation secretion: the apical portion of the secretory cell of the gland pinches off and enters the lumen.
- Composed of a coiled secretory portion located at the junction of the dermis and subcutaneous fat, from which a straight portion inserts and secretes into the infundibular portion of the hair follicle



Eccrine sweat glands

- Are the major sweat glands in the body, Almost present everywhere on the human body
- Produce clear, odorless fluid containing mainly water and electrolytes → Merocrine secretion
- Eccrine glands are composed:
  - intraepidermal spiral duct, the "acrosyringium";
  - dermal duct, comprising a straight and coiled portion
  - secretory tubule, coiled deep in the dermis or hypodermis.
- Eccrine glands are innervated by the sympathetic nervous system, primarily by cholinergic fibers



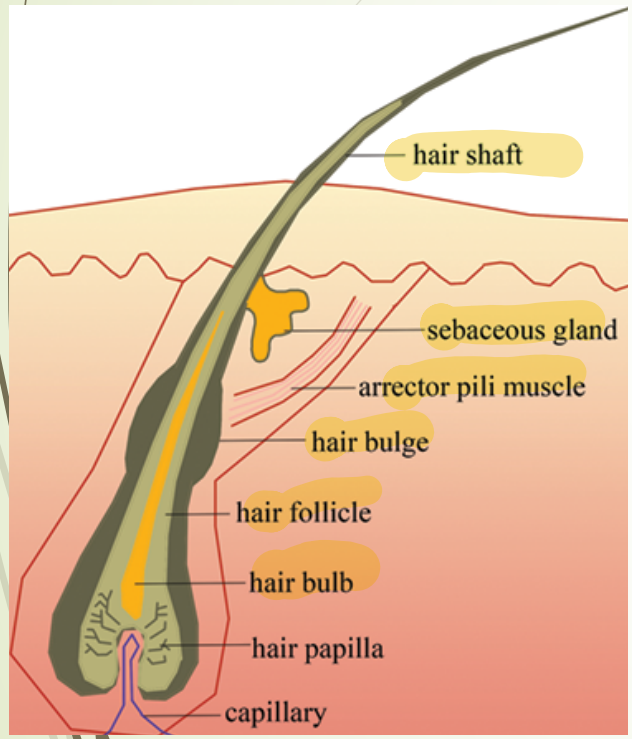
Sebaceous glands

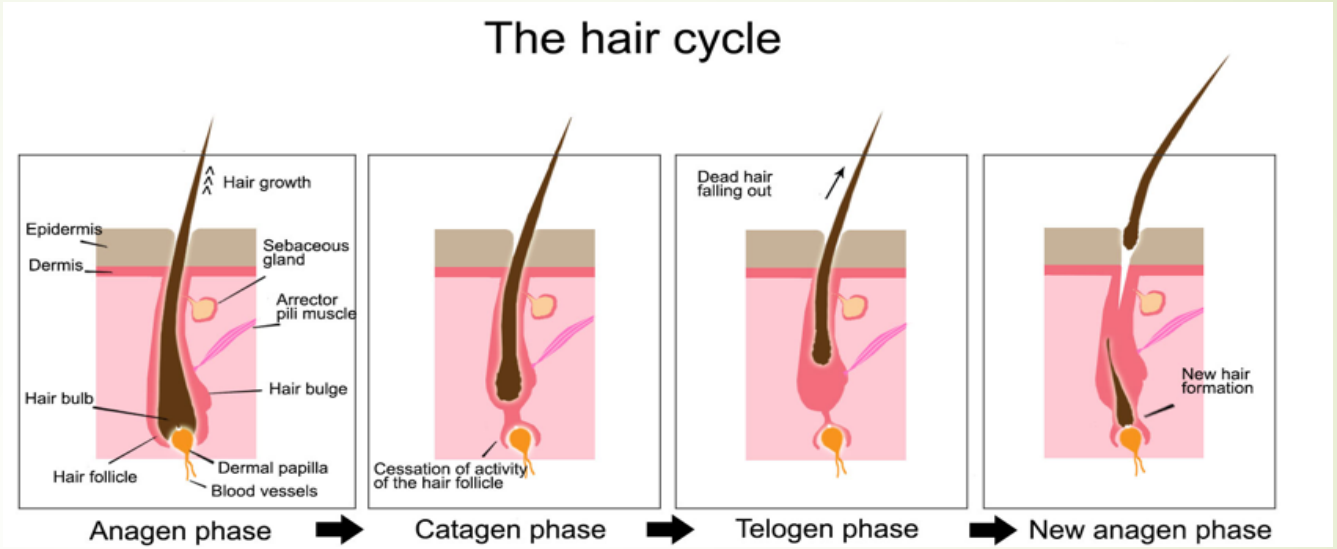
- Related to hair follicles, and their ducts open in it.
- Present all over the body except palms and soles.
- Holocrine secretion.
- Secretions controlled by androgens mainly.

Difference between eccrine and apocrine sweat glands

Features	Eccrine glands	Apocrine glands
Distribution	Through out the body	Only in limited areas like axilla and umbilicus
Opening	Exterior through sweat pore	Into hair follicle
Secretion	Clear and salty watery	Thick and milky
Regulation of body temperature	Play important role in regulating body temp.	Do not play any role in regulating body temp.

Hair

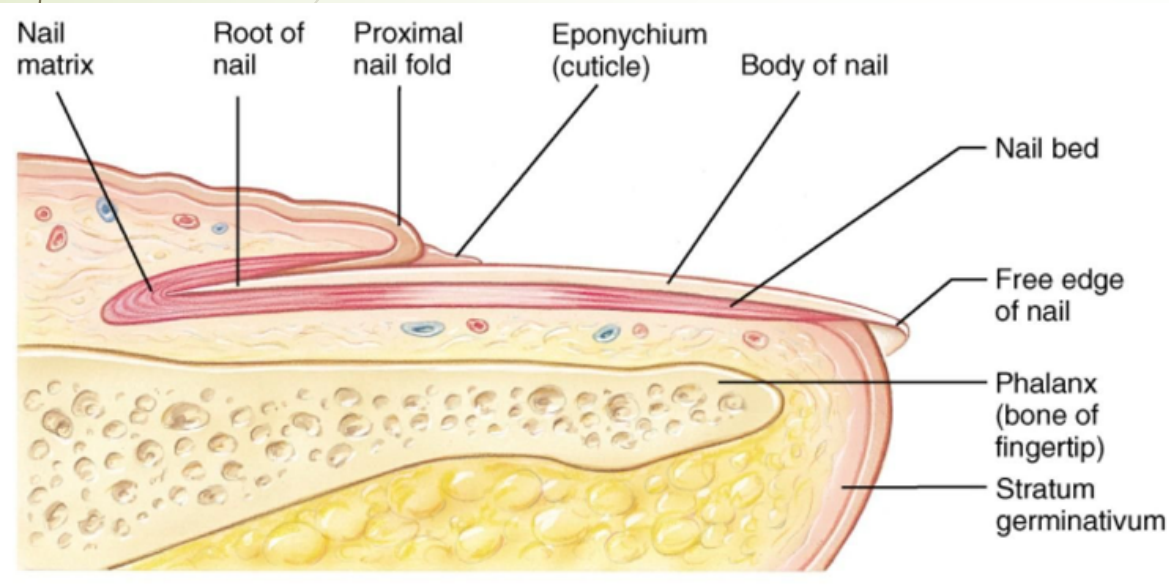




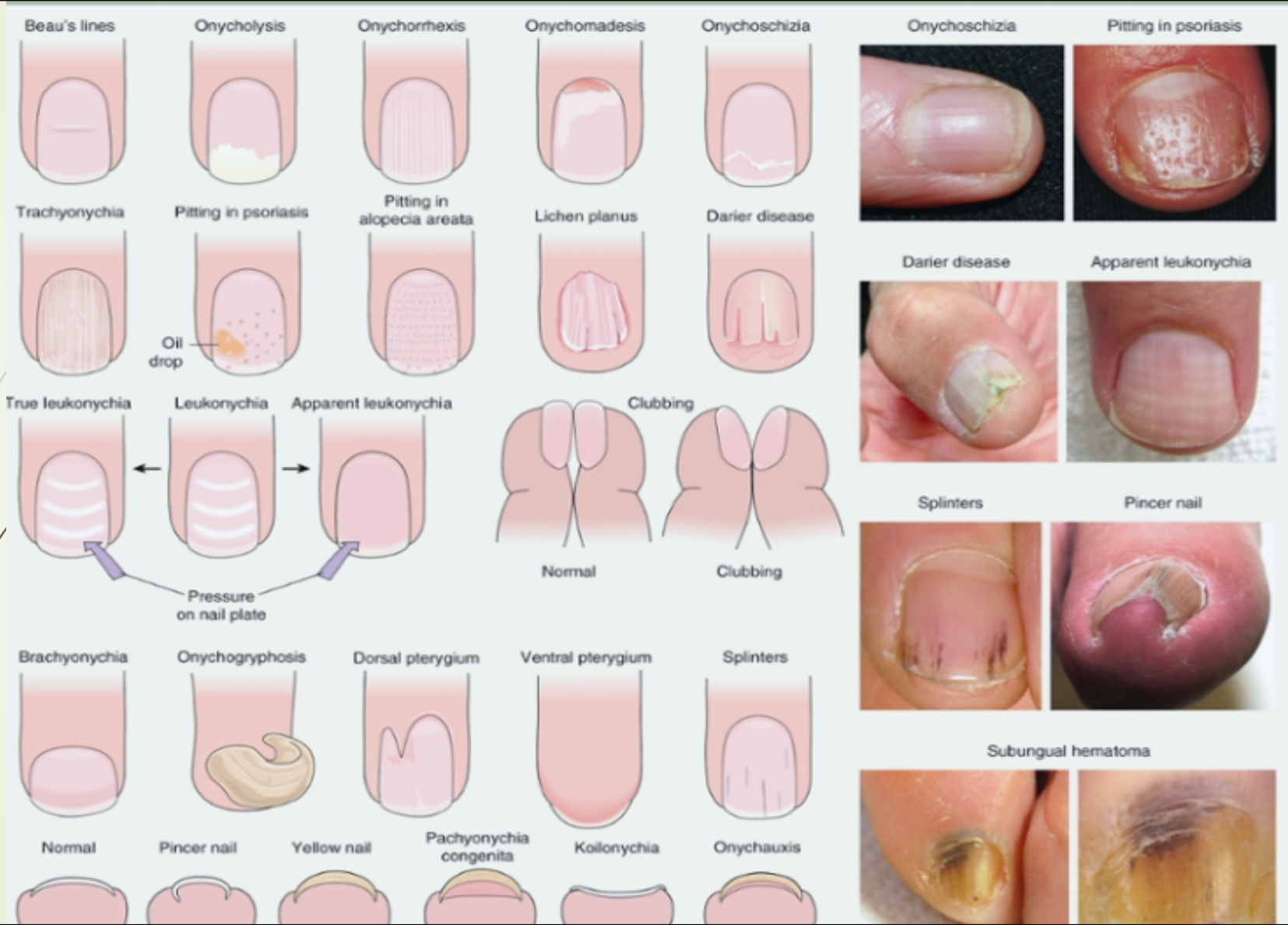
1. Anagen : period of active hair production , longest period lasts years
2. Catagen : 2 weeks , at the end of the anagen
3. Telogen : as long as 3 months

Types of hair keratin : hair keratin 1/ 2

Nails



CORRELATION OF NAIL FINDINGS WITH ANATOMIC SITE OF NAIL DAMAGE	
Affected site	**Clinical manifestation**
Proximal matrix	Beau's lines Pitting Longitudinal ridging Longitudinal fissuring Trachyonychia
Distal matrix	True leukonychia
Proximal + distal matrix	Onychomadesis Koilonychia Nail plate thinning Onychauxis (nail plate hypertrophy or thickening)
Nail bed	Onycholysis Subungual hyperkeratosis Apparent leukonychia Splinter hemorrhages

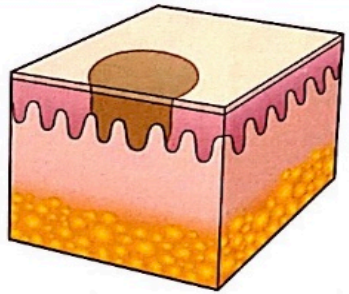
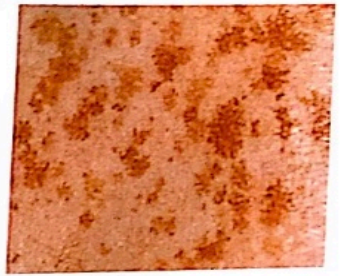
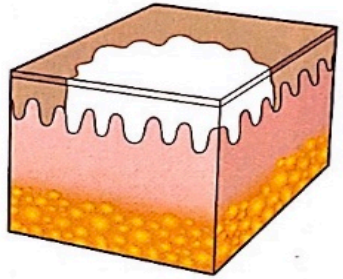
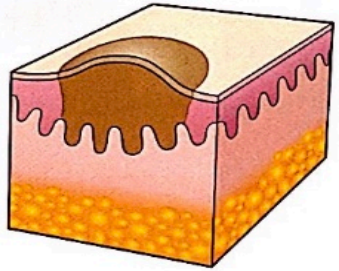
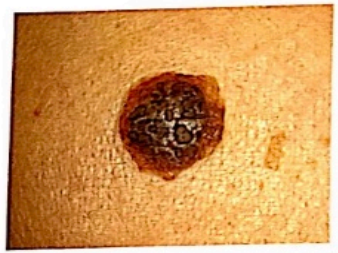

Beau's lines
Onycholysis
Onychorrhexis
Onychomadesis
Onychoschizia
Trachyonychia
Pitting in psoriasis
Oil drop
Pitting in alopecia areata
Lichen planus
Darier disease
True leukonychia
Leukonychia
Apparent leukonychia
Pressure on nail plate
Clubbing
Normal
Clubbing
Brachyonychia
Onychogryphosis
Dorsal pterygium
Ventral pterygium
Splinters
Normal
Pincer nail
Yellow nail
Pachyonychia congenita
Koilonychia
Onychauxis
Onychoschizia
Pitting in psoriasis
Darier disease
Apparent leukonychia
Splinters
Pincer nail
Subungual hematoma

Types of skin lesions

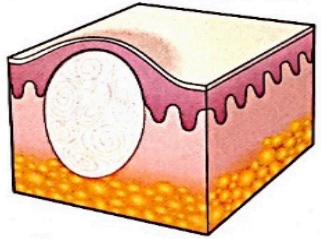
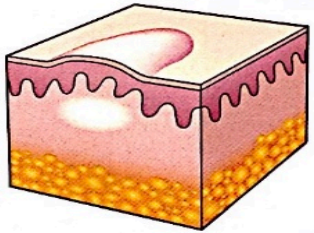
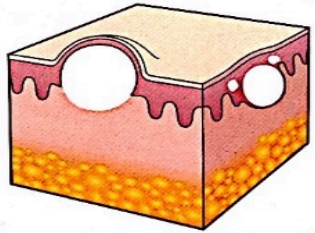
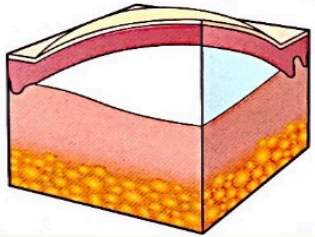
- *primary* skin lesions which refer to the most characteristic, representative or native appearance of skin lesions
- *secondary* skin lesions which can augment or even supplant primary morphologic terms. Secondary morphologic terms often reflect the effects of exogenous factors or temporal changes (e.g. “scales”, “crusts”) that evolve during the course of a skin disease.

1ry skin lesion

PRIMARY LESIONS – MORPHOLOGICAL TERMS

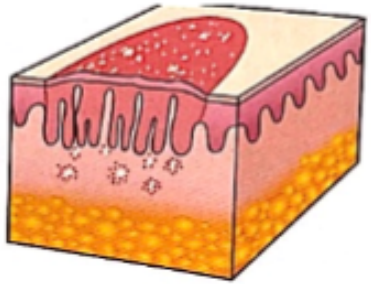
Term	Clinical features		Clinical example	Clinical disorders
Macule	• Flat (non-palpable), circumscribed, differs in color from surrounding skin • <1 cm in diameter • Often hypo- or hyperpigmented, but also other colors (e.g. pink, red, violet)		 Solar lentigines	• Ephelid (freckle) • Lentigo • Idiopathic guttate hypomelanosis • Petechiae • Flat component of viral exanthems
Patch	• Flat (non-palpable), circumscribed, differs in color from surrounding skin • >1 cm in diameter • Often hypo- or hyperpigmented, but also other colors (e.g. blue, violet)		 Vitiligo	• Vitiligo • Melasma • Dermal melanocytosis (Mongolian spot) • Café-au-lait macule • Nevus depigmentosus • Solar purpura
Papule	• Elevated (palpable), circumscribed • <1 cm in diameter • Elevation due to increased thickness of the epidermis and/or cells or deposits within the dermis • May have secondary changes (e.g. scale, crust) • The profile can be flat-topped (lichenoid), dome-shaped, umbilicated, or		 Seborrheic keratosis	• Seborrheic keratosis • Cherry hemangioma • Compound or intradermal melanocytic nevus • Verruca • Molluscum contagiosum • Lichen nitidus • Elevated component of viral exanthems • Small vessel vasculitis

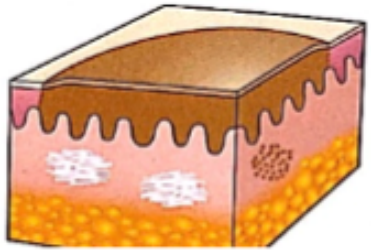
PRIMARY LESIONS – MORPHOLOGICAL TERMS

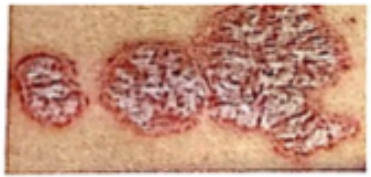
Term	Clinical features		Clinical example	Clinical disorders
Nodule	• Palpable, circumscribed • Larger volume than papule, usually >1 cm in diameter • Involves the dermis and/or the subcutis • Greatest portion may be beneath the skin surface or exophytic		 Epidermoid cyst	• Epidermoid and tricholemmal cysts • Lipomas • Metastases • Neurofibromas • Panniculitis, e.g. erythema nodosum • Lymphoma cutis
Wheal	• Transient elevation of the skin due to dermal edema • Often pale centrally with an erythematous rim		 Acute annular urticaria	• Urticaria
Vesicle	• Elevated, circumscribed • <1 cm in diameter • Filled with fluid – clear, serous, or hemorrhagic • May become pustular, umbilicated or an erosion		 Herpes zoster	• Herpes simplex • Varicella or zoster • Dermatitis herpetiformis • Dyshidrotic eczema
Bulla	• Elevated, circumscribed • >1 cm in diameter • Filled with fluid – clear, serous, or hemorrhagic • May become an erosion		 Bullous pemphigoid	• Friction blister • Bullous pemphigoid • Linear IgA bullous dermatosis • Bullous fixed drug eruption • Coma bullae • Edema bullae

Plaque

- Elevated (palpable), circumscribed
- >1 cm in diameter
- Elevation due to increased thickness of the epidermis and/or cells or deposits within the dermis
- May have secondary changes (e.g. scale, crust)
- Occasionally, a plaque is palpable but not elevated, as in morphea







Psoriasis

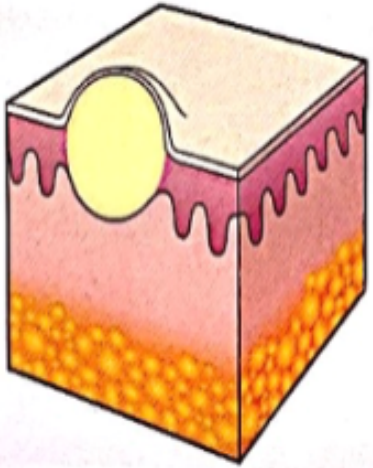
- Psoriasis
- Lichen simplex chronicus
- Nummular dermatitis

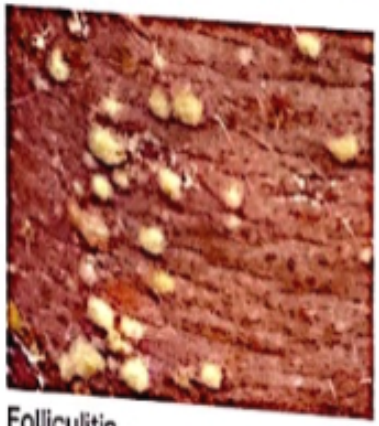
Dermal

- Granuloma annulare
- Sarcoidosis
- Hypertrophic scar, keloid
- Morphea
- Lichen sclerosus

Pustule

- Elevated, circumscribed
- Usually <1 cm in diameter
- From its onset, filled with purulent fluid





Folliculitis

Follicularly centered

- Folliculitis
- Acne vulgaris

Non-follicularly centered

- Pustular psoriasis
- Acute generalized exanthematous pustulosis
- Subcorneal pustular dermatosis

2ry skin lesions

SECONDARY FEATURES – MORPHOLOGICAL TERMS			
Feature	Description		Disorders
Crust	• Dried serum, blood or pus on the surface of the skin • May include bacteria (usually *Staphylococcus*)	 Secondarily infected hand dermatitis	• Eczema/dermatitis (multiple types) • Impetigo • Later phase of herpes simplex, varicella or zoster • Erythema multiforme
Scale	• Hyperkeratosis • Accumulation of stratum corneum due to increased proliferation and/or delayed desquamation	 Psoriasis	• Psoriasis (silvery [micaceous] scale) • Tinea (leading scale) • Erythema annulare centrifugum (trailing scale) • Pityriasis (tinea) versicolor (powdery [furfuraceous] scale) • Actinic keratoses (gritty scale) • Pityriasis rosea (peripheral collarette of scale and central scale)
Fissure	• Linear cleft in skin • Often painful • Results from marked drying, skin thickening, and loss of elasticity	 Hand dermatitis	• Angular cheilitis • Hand dermatitis • Sebopsoriasis (intergluteal fold) • Irritant cheilitis
Excoriation	• Exogenous injury to all or part of the epidermis (epithelium) • May be linear or punctate	 Neurotic excoriations	• A secondary feature of pruritic conditions, including arthropod bites and atopic dermatitis • Neurotic excoriations • Acne excoriée
Erosion	• Partial loss of the epidermis (epithelium)	 Pemphigus foliaceus	• Impetigo • Friction • Trauma • Pemphigus, vulgaris and foliaceus

Ulcer	• Full-thickness loss of the epidermis (epithelium) • May have loss of the dermis or even subcutis • The size, shape and depth should be described as well as the characteristics of the border, base and surrounding tissue	 Pyoderma gangrenosum	• Stasis ulcer • Pyoderma gangrenosum • Ecthyma • Neuropathic ulcer
Infarct	• Ischemia of tissue • Color can vary from gray–white to purple to black	 Antiphospholipid syndrome	• Can be due to vascular compromise (e.g. atherosclerosis, calciphylaxis), thrombosis, vasculitis, emboli (infectious or non-infectious), or vasospasm (see Table 0.5)
Atrophy	• Epidermal atrophy – thinning of the epidermis, leading to wrinkling and a shiny appearance • Dermal atrophy – loss of dermal collagen and/or elastin, leading to a depression (see Table 0.3)	 Striae secondary to potent topical corticosteroids	• Lichen sclerosus • Poikiloderma • Striae • Anetoderma • Focal dermal hypoplasia (Goltz syndrome)
Lichenification	• Accentuation of natural skin lines, reflecting thickening (acanthosis) of the epidermis • Often due to rubbing	 Lichen simplex chronicus	• Lichen simplex chronicus, isolated or superimposed on a pruritic condition, e.g. atopic dermatitis

Augmented Examination – Wood's Lamp

- A Wood's lamp emits primarily ultraviolet A radiation with a peak wavelength of 365 nm. A Wood's lamp examination is performed in a dark room, with the lamp 4–5 inches from the skin and illuminating the area of interest

WOOD'S LAMP EXAMINATION OF THE SKIN	
Disorder/infection/colonization	**Fluorescent color/clinical findings**
Pigmentary disorders	
Vitiligo	Chalk-white to dull bluish-white (fluorescence of dermal collagen observed due to a marked decrease or absence of melanin within the epidermis)
Ash leaf spots	Enhancement of hypopigmentation
Hyperpigmentation due to an increase in:	
1. epidermal melanin	Enhancement of brown color
2. dermal melanin	Difference in color of lesional vs nonlesional skin becomes less obvious
Bacterial infections/colonizations	
Pseudomonas aeruginosa	Green- blue
Corynebacterium minutissimum (erythrasma)	Coral red
Propionibacterium acnes	Orange–red (in comedones)
Fungal infections	
Pityriasis (tinea) versicolor due to *Malassezia* spp.	Yellowish-white, yellow–green, golden, copper–orange
Tinea capitis due to *Microsporum* spp.	Blue–green to yellow–green
Favus due to *Trichophyton schoenleinii*	Blue–white

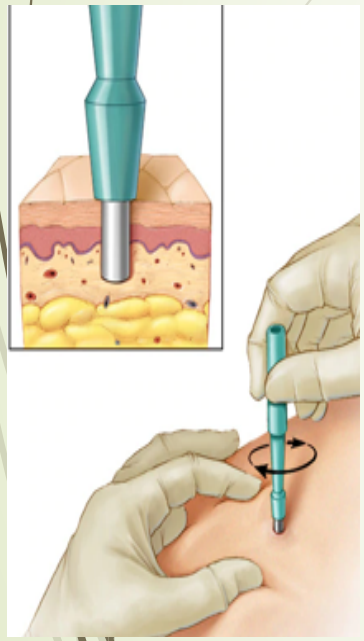
Dermoscope

- A **dermoscope** (**dermatoscope**) is a non-invasive, diagnostic tool which visualizes subtle clinical patterns of skin lesions and subsurface skin structures not normally visible to the unaided eye

Skin biopsy

1. uncertainty about the clinical diagnosis
2. to investigate a poor response to therapy
3. to exclude or investigate the evolution of one condition into another, or
4. to investigate symptoms in the absence of clinically recognizable disease

Types of skin biopsy :



1. **Superficial shave biopsy**

pathology is chiefly epidermal in nature (e.g. an actinic keratosis, squamous cell carcinoma *in situ*, seborrheic keratosis)

2. **Deep shave/saucerization biopsy**

deeper variant of the superficial shave, where greater angling of the blade removes more of the upper to mid-dermis

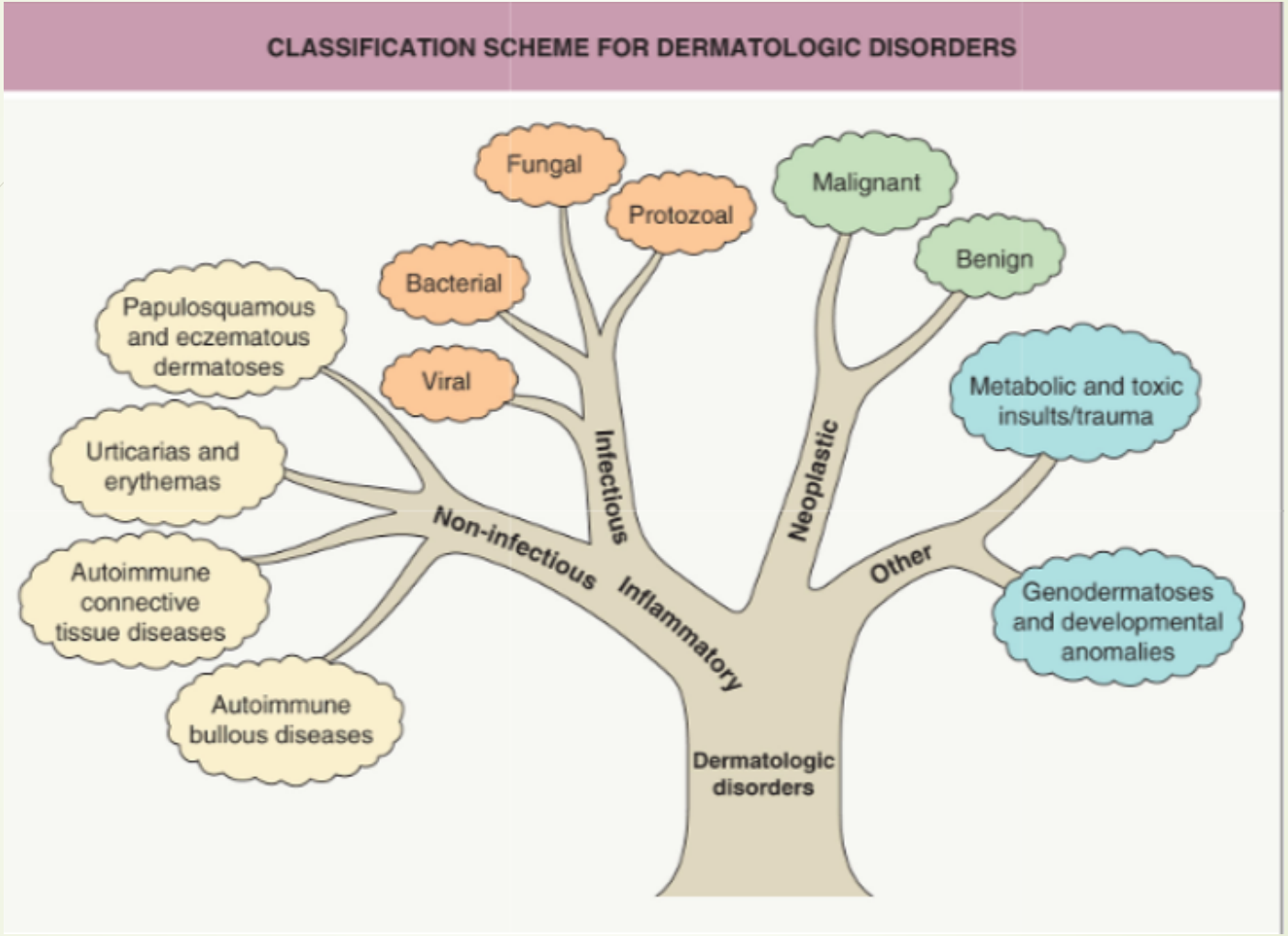
3. **Punch biopsy** : epidermis dermis / +- sub cutaneous

4. **Incisional/excisional biopsy**

removal of either a portion of a lesion (incisional) or the entire visible lesion (excisional)

FITZPATRICK

						
skin type	I	II	III	IV	V	VI
skin color	very white or freckled	white	white to olive	brown	dark brown	black
reaction to sun	always burns	usually burns	sometimes burns	rarely burns	very rarely burns	never burns*


CLASSIFICATION SCHEME FOR DERMATOLOGIC DISORDERS
Fungal
Protozoal
Bacterial
Viral
Papulosquamous and eczematous dermatoses
Urticarias and erythemas
Autoimmune connective tissue diseases
Autoimmune bullous diseases
Infectious
Non-infectious
Inflammatory
Malignant
Benign
Neoplastic
Metabolic and toxic insults/trauma
Other
Genodermatoses and developmental anomalies
Dermatologic disorders