BIOS222
Pathology and Clinical Science 2 & 3

Session 7
Integumentary System
Disorders 1
Bioscience Department
Session Learning Outcomes

At the end of the session, student should be able to:

- Review the normal anatomy and structure of Skin and its accessory structures.
- Identify and understand the various examination and investigation used for diagnosing the skin disorders.
- Identify and define the terms used to describe common manifestations of skin disorders.
- Conceptualise the causes, clinical features and management of major manifestations.
- List the probable causes and give differential diagnosis of the major skin conditions.
Session Plan

- Normal anatomy and structure of Skin and its accessory structures.
- Examination and investigation of the Integumentary system
- Presenting problems in skin disease
  - The changing mole
  - Itch (pruritus)
  - The scaly rash
  - Erythroderma
  - Urticaria (hives)
Session Plan

- Photosensitivity
- Blisters
- Leg ulcers
- Abnormal Skin colour
- Vulval itch
- Conditions affecting Hair
- Abnormalities of nails
Normal Anatomy and Structure of Skin
Skin Normal Structure

Sectional view of skin and subcutaneous layer

Figure 5-1a Principles of Anatomy and Physiology, 11/e © 2006 John Wiley & Sons
Epidermis:

- Layers of epidermis
  - Stratum basale, Stratum granulosum, Stratum Spinosum, Stratum lucidum, Stratum corneum
- Cells of epidermis
  - Keratinocytes, melanocytes, langerhans cells, merkel cells
Skin Normal Structure

- **Dermis**
  - Papillary dermis
  - Reticular dermis
  - Cells of dermis:
    - Fibroblasts, mast cells, mononuclear phagocytes, T lymphocytes, dendritic cells, neurons and endothelial cells
  - Acellular dermis:
  - mainly of fibres, including collagen I and III, elastin and reticulin, synthesised by fibroblasts

- **Subcutaneous**
  - layer of fat
Accessory Structures of Skin

Hair
- Shaft and root
- Hair follicle
- Epithelial root sheath
- Dermal root sheath
Accessory Structures of Skin

- **Nails**
  - Root, Body, and free edge
  - Lunula
  - Nail bed
Accessory Structures of Skin

- **Glands**
  - Sebaceous glands
  - Sudoriferous glands (sweat gland)
    - Eccrine
    - Apocrine
  - Ceruminous glands
Functions of Skin

- Protection
- Blood reservoir
- Thermoregulation
- Cutaneous sensations
- Excretion and absorption
- Synthesis of vitamin D
Examination and Investigation of the Integumentary System
Examination of the skin

- **History taking**
  - onset, progress, duration, size of the lesion, extent, recent changes, danger signs, modalities.

- **Examination**
  - Examination of the skin, hair, nails, mucous membranes and peripheral lymph nodes.

- **Terminology**
  - Correct use of terminology for examination findings
# Skin Lesions

<table>
<thead>
<tr>
<th>Primary Lesions</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Macule</strong></td>
<td>A circumscribed flat area of skin of ≤ 1 cm diameter that appears different from the skin surrounding it, usually because of different colour.</td>
</tr>
<tr>
<td><strong>Patch</strong></td>
<td>The same as a macule but larger</td>
</tr>
<tr>
<td><strong>Papule</strong></td>
<td>A discrete elevation of skin of ≤ 1 cm diameter</td>
</tr>
<tr>
<td><strong>Nodule</strong></td>
<td>Similar to a papule but having significant depth (into dermis or even subcutaneous layer) and usually &gt; 1 cm in diameter</td>
</tr>
<tr>
<td><strong>Plaque</strong></td>
<td>A raised area of skin with a flat top, &gt; 1 cm in diameter</td>
</tr>
<tr>
<td><strong>Vesicle and Bulla</strong></td>
<td>A small (≤ 1 cm) and a larger (&gt; 1 cm in diameter) fluid-filled blister, respectively</td>
</tr>
<tr>
<td><strong>Petechiae, purpura and ecchymosis</strong></td>
<td>Petechiae are pinhead-sized, flat macules of extravascular blood in the dermis; purpura are larger and may be palpable; ecchymosis (‘bruise’) is the term used to describe bleeding that involves deeper structures</td>
</tr>
</tbody>
</table>
Skin Lesions

- **Macule**
- **Patch**
- **Papule**
- **Nodule**
- **Plaque**
- **Vesicle and Bulla**

http://www.pediatrics.wisc.edu/education/derm/text.html
# Skin Lesions

<table>
<thead>
<tr>
<th>Primary Lesions</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pustule</strong></td>
<td>Circumscribed elevated lesions that contain pus</td>
</tr>
<tr>
<td><strong>Abscess</strong></td>
<td>A localised collection of pus in a cavity larger than 1 cm in diameter</td>
</tr>
<tr>
<td><strong>Scale</strong></td>
<td>Flakes that represent compacted desquamated layers of stratum corneum</td>
</tr>
<tr>
<td><strong>Burrow</strong></td>
<td>A linear or curvilinear papule, caused by a burrowing scabies mite</td>
</tr>
<tr>
<td><strong>Comedones</strong></td>
<td>A plug of keratin and sebum in a dilated pilosebaceous orifice</td>
</tr>
<tr>
<td><strong>Wheal</strong></td>
<td>An area of oedema in the upper epidermis. Often irregular; size and colour vary</td>
</tr>
<tr>
<td><strong>Telangiectasia</strong></td>
<td>Visible dilatation of small cutaneous blood vessels</td>
</tr>
</tbody>
</table>
Skin Lesions

Pustules

Scale

Burrow

Comedones

Wheal

Telangiectasia

http://www.dermnetnz.org/vascular/telangiectasia.html
# Skin Lesions

<table>
<thead>
<tr>
<th>Secondary Lesions</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Atrophy</strong></td>
<td>An area of thin, translucent skin caused by loss of epidermis, dermis or subcutaneous fat</td>
</tr>
<tr>
<td><strong>Crust</strong></td>
<td>Dried exudate of blood or serous fluid</td>
</tr>
<tr>
<td><strong>Excoriation</strong></td>
<td>A linear ulcer or erosion resulting from scratching</td>
</tr>
<tr>
<td><strong>Erosion</strong></td>
<td>An area of skin denuded by complete or partial loss of epidermis</td>
</tr>
<tr>
<td><strong>Fissure</strong></td>
<td>A slit shaped deep ulcer</td>
</tr>
<tr>
<td><strong>Scar</strong></td>
<td>Replacement of normal structures by fibrous tissue at the site of an injury</td>
</tr>
<tr>
<td><strong>Sinus</strong></td>
<td>A cavity or channel that permits the escape of pus or fluid</td>
</tr>
<tr>
<td><strong>Stria</strong></td>
<td>A linear, atrophic, pink, purple or white band due to connective tissue changes.</td>
</tr>
<tr>
<td><strong>Ulcer</strong></td>
<td>An area from which the epidermis and at least the upper part of the dermis have been lost</td>
</tr>
</tbody>
</table>
Skin Lesions

- Pustules
- Ulcer
- Striae
- Erosion
- Fissure
- Scar

http://www.pediatrics.wisc.edu/education/derm/text.html
Investigations of The Skin

- Magnifying glass
  - A hand lens used under good lighting conditions (ideally daylight) is valuable in examination of the skin.

- Wood’s light examination
  - The test of exposing the skin to a long/short wavelength UV radiation with a Wood’s light.
  - Useful in diagnosing Vitiligo, Albinism, melasma, fungal infections.
Investigations of The Skin

- **Diascopy**
  - A skin test done by applying pressure on the skin lesion either by using our finger or by using a glass slide.
  - It is useful for distinguishing between the blood and melanin, the main skin pigments.

- **Dermatoscopy**
  - Skin examination using a dermatoscope - an immersion oil microscope or polarised light microscope.
  - Useful in diagnosing pigment lesions such as malignant melanoma and naevi.
Investigations of The Skin

- Incisional biopsy and histopathology
  - Incision is made and biopsy taken for the histopathological examination of skin
  - Useful for tumour diagnosis, malignant melanoma

- Immunofluorescence
  - A portion of the biopsy sample can be frozen in the liquid nitrogen for direct immunofluorescence. This allows visualising the antigens present in the skin using the specific fluorescein labelled antibodies.
  - Useful in diagnosis of autoimmune bullous disorders.
Investigations of The Skin

- **Prick tests**
  - The skin is pricked with needles through a dilution of the appropriate antigen solution
  - Used to investigate the cutaneous type 1 hypersensitivity to various antigens such as pollens, house dust mite, or dander.

- **Patch tests**
  - A patch of potential antigens is applied to the skin of the back for about 48 hours and then examined for reactions. Usually a positive reaction is suggested by development of eczematous reaction on the skin
  - Useful to detect the delayed type IV hypersensitivity.
Investigations of The Skin

- Phototesting
  - Skin is exposed to a graded series of doses of uv radiations of known wavelength, either on one occasion or repeatedly.
  - Useful in investigation of presumed photosensitive drug reactions and idiopathic photodermatoses such as solar urticaria or SLE.

- Microbiology
  - Bacteriology: Bacterial swabs
  - Virology: Immunofluorescence and polymerase chain reaction (PCR),
  - Mycology: Scale, nail clippings and plucked hairs
Presenting Problems in Skin Disease
Presenting Problems in Skin Disease

- The changing mole
- Itch (pruritus)
- The scaly rash
- Erythroderma
- Urticaria (hives)
- Photosensitivity
- Blisters
- Leg ulcers
- Abnormal skin colour
- Vulval itch
The Changing Mole

- Definition: Moles are benign cutaneous tumours/overgrowth of Melanocytes. It is necessary to examine a mole esp. if changes are noted in its size, shape, structure or colour.

- ABCDE Features of malignancy:
  - Asymmetry
  - Border irregularity
  - Colour change
  - Diameter greater than 6 mm
  - Elevation irregular

Pruritus

- **Definition:** An unpleasant sensation that provokes the desire to scratch.

- **Aetiology:**
  - Primary skin diseases
  - Secondary causes
  - Pregnancy related causes

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## Pruritus

### 28.7 Secondary causes of pruritus

<table>
<thead>
<tr>
<th>Medical condition</th>
<th>Cause of pruritus</th>
<th>Treatment*</th>
<th>Medical condition</th>
<th>Cause of pruritus</th>
<th>Treatment*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Liver disease</strong></td>
<td>- Central opioid effect</td>
<td>Naltrexone</td>
<td>Thyrotoxicosis</td>
<td>Unknown</td>
<td>Emollients</td>
</tr>
<tr>
<td></td>
<td>- Elevation in bile salts</td>
<td>Colestyramine</td>
<td>Hypothyroidism</td>
<td>Unknown</td>
<td>Emollients</td>
</tr>
<tr>
<td></td>
<td>- may contribute</td>
<td>Rifampicin</td>
<td>Carcinoid syndrome</td>
<td>Unknown</td>
<td>Emollients</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sedative antihistamines</td>
<td>(p. 782)</td>
<td>5HT-mediated</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>UVB</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Renal failure</strong></td>
<td>Unknown; uraemia contributes</td>
<td>UVB</td>
<td>HIV infection</td>
<td>Infection, infestation, e.g. Candida</td>
<td>Treatment of</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Oral activated charcoal</td>
<td>Eosinophilic folliculitis</td>
<td>infection</td>
<td>infection</td>
</tr>
<tr>
<td><strong>Haematological disease</strong></td>
<td></td>
<td></td>
<td>Seborrhoeic dermatitis</td>
<td>Local corticosteroids, UVB</td>
<td>Anti-pityrosporal</td>
</tr>
<tr>
<td>Anaemia</td>
<td>Iron deficiency</td>
<td>Iron replacement</td>
<td></td>
<td>treatment, UVB</td>
<td>treatment</td>
</tr>
<tr>
<td>Polycythaemia rubra vera</td>
<td>Unknown (often aquagenic pruritus)</td>
<td></td>
<td></td>
<td></td>
<td>UVB</td>
</tr>
<tr>
<td>Lymphoma</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leukaemia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Myeloma</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Endocrine disease</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>Increased infection risk, e.g. candidiasis, tinea</td>
<td>Treatment of infection</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Pruritus

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Pregnancy, gestation and features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polymorphic eruption of pregnancy</td>
<td>Typically first pregnancy and uncommonly recurs 3rd trimester, after delivery Polymorphic urticated papules and plaques, start in striae</td>
</tr>
<tr>
<td>Acute cholestasis of pregnancy</td>
<td>3rd trimester and commonly recurs in subsequent pregnancies Abnormal liver function tests Increased fetal and maternal risk</td>
</tr>
<tr>
<td>Pemphigoid gestationis</td>
<td>Any stage, often 2nd trimester and commonly recurs in subsequent pregnancies Urticated erythema, blistering initially periumbilical Characteristic histology and immunofluorescence</td>
</tr>
<tr>
<td>Prurigo gestationis</td>
<td>2nd trimester Excoriated papules</td>
</tr>
<tr>
<td>Pruritic folliculitis</td>
<td>3rd trimester Sterile pustules on trunk</td>
</tr>
</tbody>
</table>

Scaly Rash

- **Definition:** Rashes are the eruptions of the skin associated with many skin disorders.

- **Diagnosis:** Diagnosis of the underlying skin disease is made on clinical grounds:
  - Age at onset and duration of rash
  - Body site at onset and distribution
  - Associated itching
  - Preceding illness or systemic symptoms
  - The morphology and the characteristics of the rash
### 28.4 Causes and clinical features of common scaly rashes

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Distribution</th>
<th>Morphology</th>
<th>Associated signs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atopic eczema (p. 1283)</td>
<td>Face and flexures</td>
<td>Poorly defined erythema, scaling</td>
<td>Shiny nails</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Vesicles</td>
<td>Infra-orbital crease</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lichenification if chronic</td>
<td>‘Dirty neck’ (grey-brown discoloration)</td>
</tr>
<tr>
<td>Psoriasis (p. 1286)</td>
<td>Extensor surfaces</td>
<td>Well-defined</td>
<td>Nail pitting, onycholysis</td>
</tr>
<tr>
<td></td>
<td>Lower back</td>
<td>Erythematous plaques</td>
<td>Scalp involvement</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Silvery scale</td>
<td>Axillae and genital areas often affected</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Joint involvement</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Köbner phenomenon</td>
</tr>
<tr>
<td>Pityriasis rosea (p. 1289)</td>
<td>‘Fir tree’ pattern on trunk</td>
<td>Well-defined Small, erythematous plaques Collarette of scale</td>
<td>Herald patch</td>
</tr>
<tr>
<td>Drug eruption (p. 1303)</td>
<td>Widespread</td>
<td>Macules and papules</td>
<td>Possible mucosal involvement or erythroderma</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Erythema and scale</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Exfoliation</td>
<td></td>
</tr>
<tr>
<td>Pityriasis versicolor (p. 1280)</td>
<td>Upper trunk and shoulders</td>
<td>Hypo- and hyper-pigmented scaly patches</td>
<td></td>
</tr>
<tr>
<td>Lichen planus (p. 1289)</td>
<td>Distal limbs</td>
<td>Shiny, flat-topped, violaceous papules Wickham’s striae</td>
<td>White lacy network on buccal mucosa Nail changes Scarring alopecia Köbner phenomenon</td>
</tr>
<tr>
<td></td>
<td>Flexural aspect of wrists Lower back</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tinea corporis (p. 1279)</td>
<td>Asymmetrical</td>
<td>Erythematous, often annular plaques Peripheral scale (sometimes pustules)</td>
<td>Possible associated nail, scalp, groin involvement</td>
</tr>
<tr>
<td></td>
<td>Often isolated lesions</td>
<td>Expansion with central clearing</td>
<td></td>
</tr>
<tr>
<td>Secondary syphilis (p. 419)</td>
<td>Trunk and proximal limbs Palms and soles</td>
<td>Red macules and papules, which become ‘gun-metal’ grey</td>
<td>History of chancre Systemic symptoms, e.g. malaise and fever</td>
</tr>
</tbody>
</table>

Erythroderma

- **Definition:** Erythema with or without scaling of almost all the body surface

- **Aetiology:**
  - Atopic eczema
  - Psoriasis
  - Drugs like sulphonamide, penicillin, captopril
  - Chronic actinic dermatitis
  - Seborrhoeic dermatitis
  - Idiopathic

---

Erythrodermic psoriasis.

Urticaria

- **Definition:** An area of localised dermal oedema secondary to a temporary increase in capillary permeability. If oedema involves subcutaneous or submucosal layers, the term angioedema is used.

- **Clinical features:**
  - Wheals
  - Itching
  - Angio-oedema

- **Management:**
  - Removal of trigger
  - Antihistamines

---

Photosensitivity

- Definition: an abnormal response of the skin to ultraviolet or visible radiation.

Blisters

- **Definition:** Blisters develop when there is the loss of cell adhesion within the epidermis or sub-epidermal region.

- **Aetiology:**
  - Herpes simplex
  - Herpes zoster
  - Impetigo
  - Acute eczema
  - Insect bites
  - Drug eruptions

Leg Ulcers

- **Definition:** Ulceration of the skin is defined as complete epidermal loss, thus exposing dermal (or deeper) layers. Ulcers on the lower leg are frequently caused by vascular or neurological disease.

- **Aetiology:**
  - Venous hypertension
  - Arterial disease
  - Small vessel disease
  - Abnormalities of blood
  - Neuropathy
  - Tumour and trauma
Leg Ulcers

- Characteristics: **Venous ulcers**
  - Oedema
  - Coarse, thick skin
  - Normal pulses
  - Brown pigmentation
  - Gravitational eczema or pruritic dermatitis
  - History of deep venous thrombosis, chronic incompetent venous valves, obesity
  - Medial lower leg

A chronic venous ulcer on the medial lower leg

---

Leg Ulcers

- Characteristics: **Arterial ulcers**
  - Cold, dusky, atrophic and hairless skin
  - Thin, shiny skin, thick nails
  - Pulse absent
  - Punched out, painful ulcers
  - History of claudication, smoking, hypertension, diabetes and hyperlipidaemia
  - On the shin and foot
Abnormal Skin Colour

- Hypopigmentation: Reduction in skin pigmentation.

- Aetiology:
  - Oculocutaneous albinism
  - Vitiligo
  - Pityriasis alba
  - Pityriasis versicolor

Vitiligo: Symmetrical localised patches of depigmented skin

Abnormal Skin Colour

- Hyperpigmentation: Increase in skin pigmentation.

- Aetiology:
  - Diffuse hyperpigmentation:
    - Melasma (chloasma)
    - Endocrine disease
    - Chronic renal failure
    - Drug-induced
  - Focal hypermelanosis:
    - Freckles
    - Lentigines
Vulval itching

- **Aetiology:**
  - Excessive vaginal discharge – leucorrhoea
  - Fungal or bacterial infections – *Candida albicans*
  - Herpes infection
  - HIV infection
  - Infection by human papilloma virus
  - Bowen’s disease, a carcinoma in-situ of skin and intraepithelial dysplasia of vulva, penis and anal area
  - Urinary incontinence
  - Diabetes mellitus
Conditions Affecting Hair

- Alopecia: loss of hair

- **Aetiology:**
  - Tinea capitis
  - Alopecia areata
  - Androgenetic alopecia
  - Lichen planus
  - Psoriasis
  - Seborrhoeic eczema

Alopecia areata.
Conditions Affecting Hair

- **Hirsutism**: Growth of terminal hair in a male pattern in a female

- **Aetiology**:
  - Hyperandrogenism
  - Cushing’s syndrome
  - Polycystic ovary syndrome

![Hirsutism](http://img.medscapastatic.com/pi/meds/ckb/02/30702.jpg)
Conditions Affecting Nails

- The nails in common skin diseases:
  - Dermatophyte infection/onychomycosis
  - Psoriasis
  - Eczema
  - Lichen planus
  - Alopecia areata

Nail involvement in psoriasis with coarse pitting and separation from the nail plate (onycholysis)

Conditions Affecting Nails

- The nails in systemic diseases:
  - Beau’s lines
  - Koilonychia
  - Clubbing
  - Nail discoloration

Beau’s Lines

Koilonychia
Reading and Resources

- Crowley LV, 2012, *An Introduction to Human Diseases – Pathology and Pathophysiology Correlations*, 9th edn, Jones and Bartlett Learning
Reading and Resources

- Mosby’s dictionary of medicine, nursing and health professions 2013, 9th edn, Elsevier, St. Louis, MO.
- VanMeter, KC & Hubert, RJ 2014, *Gould's pathophysiology for the health professions*, 5th edn, Elsevier, St Louis, MO.
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