Common views on etiology and pathogenesis of skin diseases and oral mucosa. Treatment principles in dermatovenereology. Deontology in patient care. Parasitic dermatoses. Pyoderma and its forms.

- If you have some questions about lecture you may call to your lecturer

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Plan of the lecture

- 1. Treatment principles in dermatovenereology.
- 2. Define skin, Functions of the skin.
- 3. Layers of the skin.
- 4. Glands and skin appendages
- 5.Morphological elements of rash
- 6.Classification of pyoderma
- 7.The etiology and pathogenesis of pyoderma
- 8.Clinical forms of pyoderma
- 9.The symptoms that are characteristic of pyoderma
- 10.Differential diagnosis of pyoderma
- 11.Clinical management of patients with pyoderma
- 12. Treatment

Dermatologic Therapy Special Techniques

Dermatologic Therapy

Dermatological Treatment

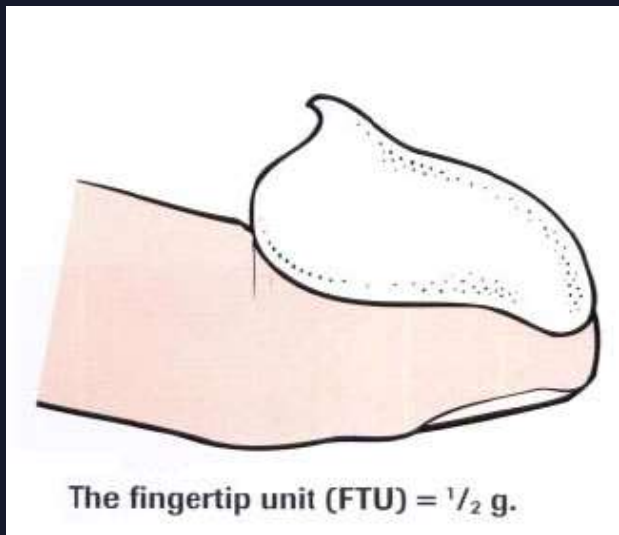
- topical
  - direct delivery
  - reduced systemic toxicity
  - consist of vehicle (base) and active ingredient
- system
  - for more serious skin conditions and infections

Topical Treatment (vehicle)

- **Lotion** – a liquid vehicle, often aqueous or alcohol-based, which may contain a salt in solution. A *shake lotion* contains an insoluble powder
- **Cream** – a semi-solid emulsion of oil-in-water; contains an emulsifier for stability, and a preservative to prevent overgrowth of microorganisms
- **Gel** – a transparent semi-solid, nongreasy emulsion
- **Ointment** – a semi-solid grease or oil, containing little or no water but sometimes with added powder. No preservative is usually needed. The active ingredient is suspended rather than dissolved
- **Paste** – an ointment base with a high proportion of powder (starch or zinc oxide) producing a stiff consistency

Quantities Required

- one application to the whole body requires 20-30 g of ointment
- the adult face or neck requires 1 g
- trunk (each side) 3 g
- arm 1.5 g, hand 1.5 g, leg 3 g and foot 1 g
- *'fingertip unit'* (FTU) – the amount of cream or ointment that canbe applied to the terminal phalanx of the index finger
- one FTU equals 0.5 g



The fingertip unit (FTU) = ½ g.

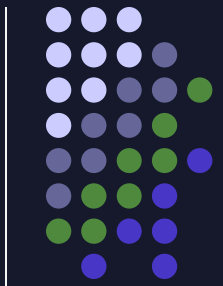
Pharmacokinetics

- The ability of a drug to penetrate the epidermis depends on several factors:
  - the drug's molecular structure
  - the vehicle
  - the site on the body (absorption is greatest through the eyelid and genitalia)
  - whether or not the skin is diseased.

Emollients

- emollients help dry-skin conditions such as eczema and ichthyosis by re-establishing the surface lipid layer and enhancing rehydration of the epidermis
- common emollients include emulsifying ointment, aqueous cream, Unguentum M, Diprobase, Hydromol, Dermol, E45 Ultrabase, Eucerin and Aquadrate creams
- oils added to bath water can also help (e.g. Oilatum, Balneum, Alpha-Keri, Aveeno, Dermol and Emulsiderm).

Topical Steroids



- wide variety of indications
- divided to four groups based on the relative potencies (mild, moderately potent, potent, very potent)
- side effects:
  - atrophy of the skin - thinning, erythema, telangiectasia, purpura and striae
  - induction of acne or perioral dermatitis, and exacerbation of rosacea
  - atypical fungal infection (tinea incognito);
  - allergic contact dermatitis
  - systemic absorption
  - tachyphylaxis — reduced responsiveness to the steroid after prolonged use

Special Tools and Techniques

Magnifying Lens

- helpful aid to diagnosis because subtle changes in the skin become more apparent when enlarged
- attached to spectacles will leave your hand free

Wood's Light

- emitting long wavelength ultraviolet radiation, will help with the examination of some skin conditions
- fluorescence is seen in some fungal infections, erythrasma and pseudomonas infections
- some subtle disorders of pigmentation can be seen more clearly under Wood's light, e.g. the pale patches of tuberous sclerosis, lowgrade vitiligo and pityriasis versicolor, and the darker *cafŭ-au-lait* patches of neurofibromatosis
- the urine in hepatic cutaneous porphyria often fluoresces coral pink, even without solvent extraction of the porphyrins

Infectious organisms glowing
under Wood's lamp illumination

A.D.A.M.

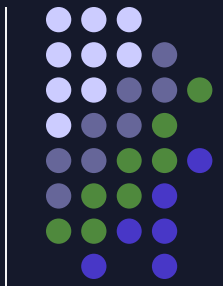
Diascopy

- technique in which a glass slide or clear plastic spoon is used to blanch vascular lesions and so to unmask their underlying colour

Photography

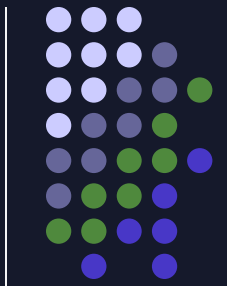
- conventional or digital, helps to record the baseline appearance of a lesion or rash, so that change can be assessed objectively at later visits
- small changes in pigmented lesions can be detected by analysing sequential digital images stored in computerized systems

Dermatoscopy



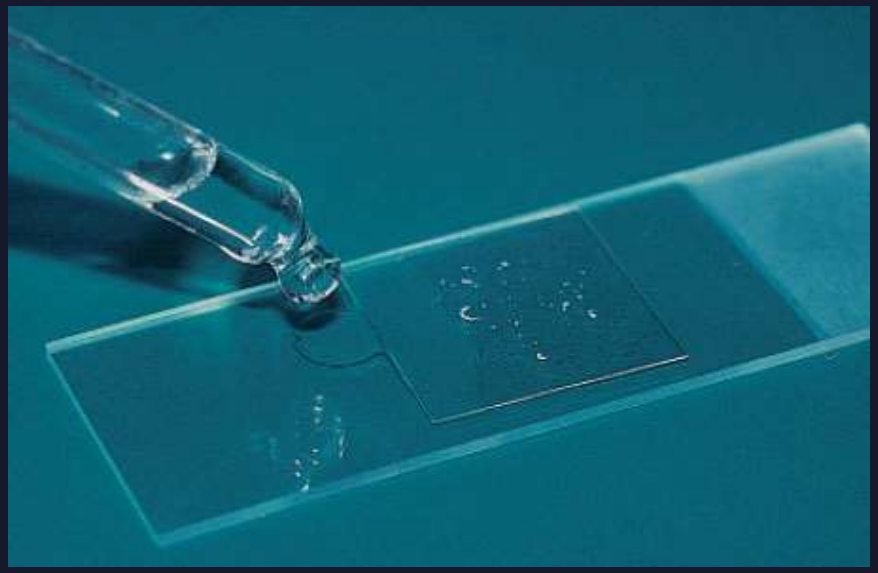
- non-invasive technique for diagnosing pigmented lesions *in vivo*
- useful in the diagnosis of malignant melanomas
- the lesion is covered with mineral oil,alcohol or water and then illuminated and observed at 10x magnification with a hand-held dermatoscope

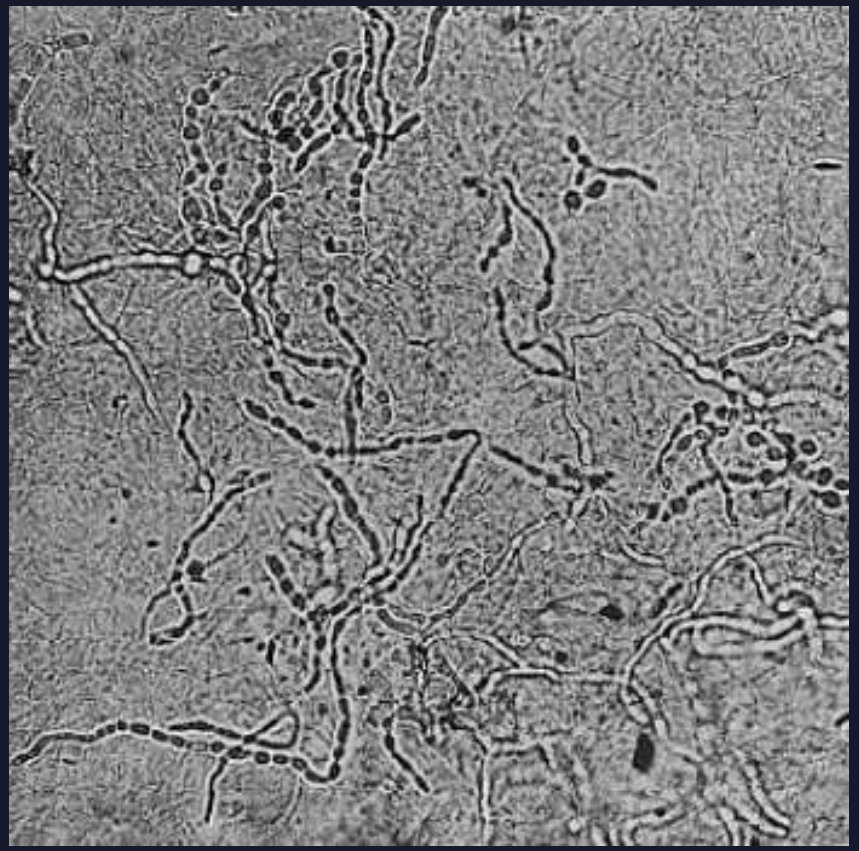
Potassium hydroxide preparations



- if a fungal infection is suspected, scales or plucked hairs can be dissolved in an aqueous solution of 20% potassium hydroxide (KOH)
- the scale from the edge of a scaling lesion is vigorously scraped on to a glass slide with a scalpel blade or the edge of a second glass slide
- a drop or two of the KOH solution is run under the cover slip
- after 5–10 min the mount is examined under a microscope

KOH preparations





Cytology (Tzanck smear)

- cytology can aid diagnosis of viral infections such as herpes simplex and zoster, and of bullous diseases such as pemphigus
- a blister roof is removed and the cells from the base of the blister are scraped off with a surgical blade
- these cells are smeared on to a microscope slide, air-dried and fixed with methanol, Giemsa, toluidine blue or Wright’s stain

Patch Tests

- patch tests are invaluable in detecting the allergens responsible for allergic contact dermatitis
- the test materials are applied to the back under aluminium discs or patches; the occlusion encourages penetration of the allergen
- the patches are left in place for 48 h and then, after careful marking, are removed
- the sites are inspected 10 min later, again at 96 h and sometimes even later if doubtful reactions require further assessment
- the test detects type IV delayed hypersensitivity reactions

Patch Testing Assessment

NT Not tested.

0 No reaction.

± Doubtful reaction (minimal erythema).

+ Weak reaction (erythematous and maybe papular)

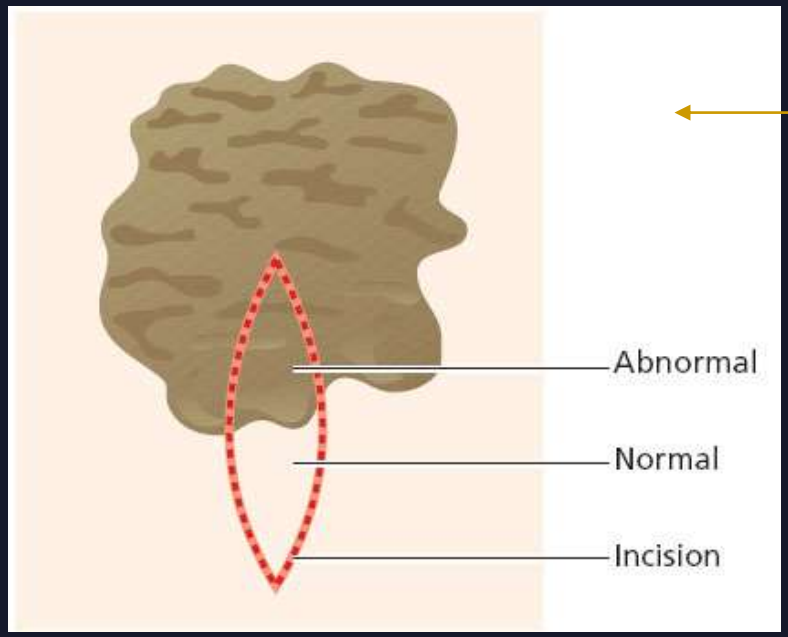
+ + Strong reaction (erythematous and oedematous or vesicular

+ + + Extreme reaction (erythematous and bullous)

Skin Biopsy

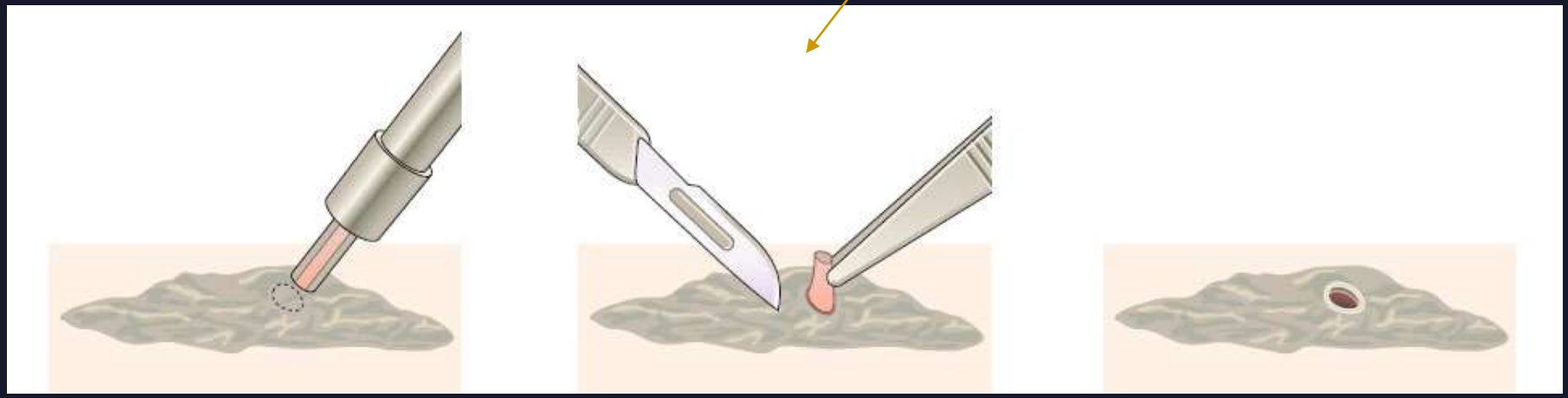
- a piece of tissue is removed surgically for histological examination and, sometimes, for other tests (e.g. culture for organisms)
- skin biopsies may be *incisional*, when just part of a lesion is removed for laboratory examination or *excisional*, when the whole lesion is cut out
- the main steps in skin biopsy are:
  - administration of local anaesthesia; and
  - removal of all (excision) or part (incision) of the lesion and repair of the defect made by a scalpel or punch

Skin Biopsy



Incisional

Punch



Infestations

- Infestation, the presence of animal parasites on or in the body, is common in tropical countries and less so in temperate ones. Infestations fall into two main groups:

1. those caused by arthropods; and
2. those caused by worms.

Lice infestations (pediculosis)

- Lice are flattened wingless insects that suck blood. Their eggs, attached to hairs or clothing, are known as nits. The main feature of all lice infestations is severe itching, followed by scratching and secondary infection.
- Two species are obligate parasites in humans: Pediculus humanus (with its two varieties P. Humanus capitis, the head louse, and P. humanus corporis, the body louse) and Phthirus pubis (the pubic louse).

Head lice

- Cause

Head lice are still common, affecting up to 10% of children even in the smartest schools. The head louse itself measures some 3–4 mm in length and is greyish, and often rather hard to find. However, its egg cases (nits) can be seen easily enough, firmly stuck to the hair shafts. Spread from person to person is achieved by head-to-head contact, and perhaps by shared combs or hats.

- Presentation and course

The main symptom is itching, at first around the sides and back of the scalp and then more generally over it. Scratching and secondary infection soon follow and, in heavy infestations, the hair becomes matted and smelly. Draining lymph nodes often enlarge.

- Complications

Secondary bacterial infection may be severe enough to make the child listless and feverish.

Head lice

- Differential diagnosis

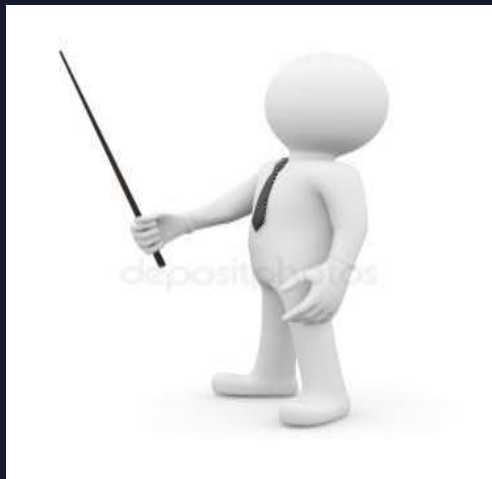
All patients with recurrent impetigo or crusted eczema on their scalps should be carefully examined for the presence of nits.

- Investigations

None are usually required.

Head lice

- **Treatment**
- Malathion, carbaryl and permethrin preparations are probably the treatments of choice now. They kill lice and eggs effectively; malathion has the extra value of sticking to the hair and so protecting against reinfection for 6 weeks. The policy whereby public health authorities rotate their use, with the aim of lessening the risk of resistant strains emerging, has fallen out of favour now.
- Lotions should remain on the scalp for at least 12 h, and are more effective than shampoos. The application should be repeated after 1 week so that any lice that survive the first application and hatch out in that interval can be killed. Other members of the family and school mates should be checked. A toothcomb helps to remove nits but occasionally matting is so severe that the hair has to be clipped short. A systemic antibiotic may be needed to deal with severe secondary infection. Some recommend, as an alternative to the treatments mentioned above, that the hair should be combed repeatedly and meticulously with a special ‘detection comb’abut the efficacy of this method has still to be established. However, a head louse repellent, containing 2% piperonal, is available over the counter and may be worth a trial for those who are repeatedly reinfested. Systemic ivermectin therapy is reserved for infestations resisting the treatments listed above.



Body lice

- **Cause**

Body louse infestations are now uncommon except in the unhygienic and socially deprived. Morphologically the body louse looks just like the head louse, but lays its eggs in the seams of clothing in contact with the skin. Transmission is via infested bedding or clothing.

- **Presentation and course**

Self-neglect is usually obvious; against this background there is severe and widespread itching, especially on the trunk. The bites themselves are soon obscured by excoriations and crusts of dried blood or serum. In chronic untreated cases (‘vagabond’s disease’) the skin becomes generally thickened, eczematized and pigmented; lymphadenopathy is common.

- **Differential diagnosis**

In scabies, characteristic burrows are seen. Other causes of chronic itchy erythroderma include eczema and lymphomas, but these are ruled out by the finding of lice and nits.

- **Investigations**

Clothing should be examined for the presence of eggs in the inner seams.

*Body lice

- **Treatment**

First and foremost treat the infested clothing and bedding. Lice and their eggs can be killed by high temperature laundering, by dry cleaning and by tumbledrying. Less competent patients will need help here. Once this has been achieved, 5% permethrin cream rinse or 1% lindane lotion (USA only) may be used on the patient’s skin.

Pathogenesis

- The pathogenesis underlying all forms of pemphigus involves the development of autoantibodies to the desmosomal proteins, which can be found in many areas of the body, but which play a major role in the epidermal layers of the integumentary system.
- Pemphigus vulgaris (PV), pemphigus foliaceus (PF) are caused primarily by antibodies to desmoglein 1 (Dsg 1) in PF, desmoglein 3 (Dsg 3) in mucosal dominant PV, or both in mucocutaneous PV. Dsg 1 and 3 are found in varying amounts in the epidermis of the skin and mucosa.

Pubic lice

- Cause

Pubic lice (crabs) are broader than scalp and body lice, and their second and third pairs of legs are well adapted to cling on to hair. They are usually spread by sexual contact, and most commonly infest young adults.

- Presentation

Severe itching in the pubic area is followed by eczematization and secondary infection. Among the excoriations will be seen small blue-grey macules of altered blood at the site of bites. The shiny translucent nits are less obvious than those of head lice. Pubic lice spread most extensively in hairy males and may even affect the eyelashes.

- Differential diagnosis

Eczema of the pubic area gives similar symptoms but lice and nits are not seen.

*Pubic lice

- **Investigations**

The possibility of coexisting sexually transmitted diseases should be kept in mind.

- **Treatment**

Carbaryl, permethrin and malathion are all effective treatments. Aqueous solutions are less irritant than alcoholic ones. They should be applied for 12 h or overnight to all parts of the trunk, including the perianal area and to the limbs, and not just to the pubic area. Treatment should be repeated after 1 week, and infected sexual partners should also be treated. Shaving the area is not necessary. Infestation of the eyelashes is particularly hard to treat, as this area is so sensitive that the mechanical removal of lice and eggs can be painful. Applying a thick layer of petrolatum twice a day for 2 weeks has been recommended. Aqueous malathion is effective for eyelash infestations but does not have a product licence for this purpose.

Scabies

- **Cause**

Scabies is caused by the mite Sarcoptes scabiei var. hominis. Adult mites are 0.3–0.4 mm long and therefore just visible, although hard to see except through a lens. It is now well established that the mites are transferred from person to person by close bodily contact and not via inanimate objects. Once on the skin, fertilized female mites burrow through the stratum corneum at the rate of about 2 mm per day, and produce two or three oval eggs each day. These turn into sexually mature mites in 2–3 weeks. The number of mites varies from case to case, from less than 10 in a clean adult to many more in an unwashed child. The generalized eruption of scabies, and its itchiness, are thought to be caused by a sensitizationto the mites or their products.

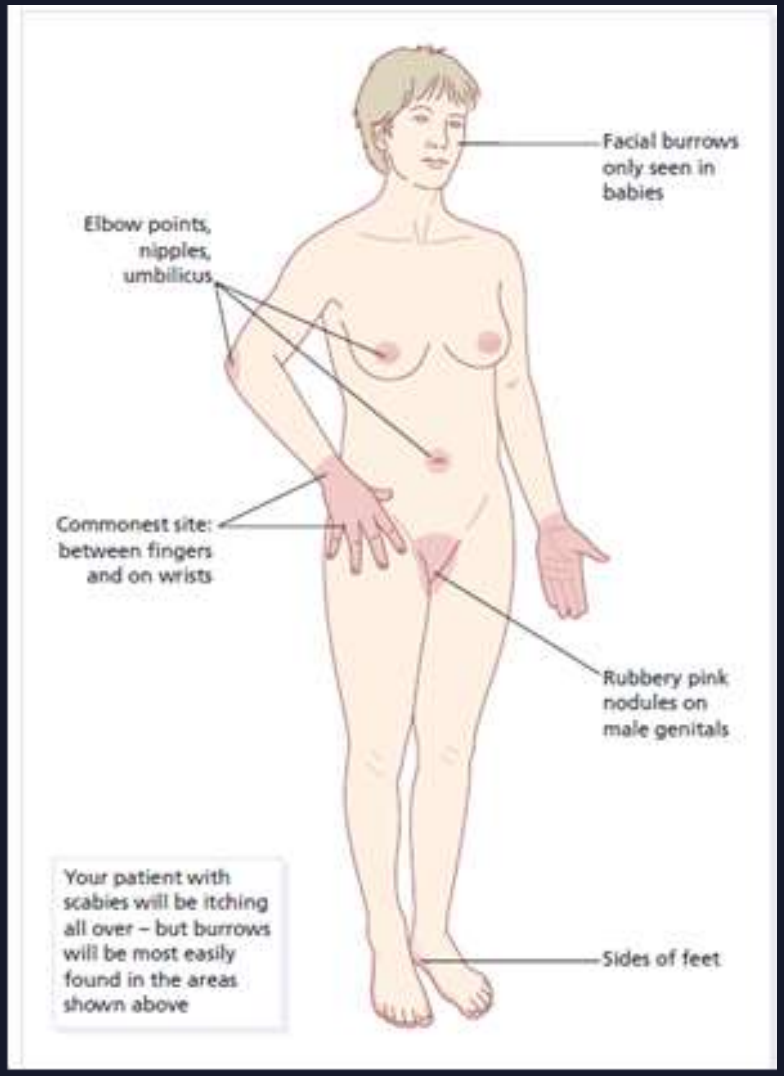
- **Epidemiology**

The prevalence of scabies in many populations rises and falls cyclically, peaking every 15–20 years. The idea of ‘herd immunity’ has been put forward to explain this, spread being most easy when a new generation of susceptible individuals has arisen.

*Scabies

- Presentation
- For the first 4–6 weeks after infestation there may be no itching, but thereafter pruritus dominates the picture, often affecting several people and being particularly severe at night.
- The most dramatic part of the eruptionaexcoriated, eczematized or urticarial papulesais usually on the trunk, but these changes are non-specific and a burrow has to be identified to confirm the diagnosis. Most burrows lie on the sides of the fingers, finger webs, sides of the hand and on the flexural aspects of the wrists. Other favourite sites include the elbows, ankles and feet (especially in infants;), nipples and genitals. Only in infancy does scabies affect the face. Burrows are easily missed grey-white slightly scaly tortuous lines of up to 1 cm in length. The acarus may be seen through a lens as a small dark dot at the most recent least scaly end of the burrow. With experience it can be removed for microscopic confirmation. On the genitals, burrows are associated with erythematous rubbery nodules.

*Scabies



Common sites of burrows in scabies

*Scabies

- **Course**

Scabies persists indefinitely unless treated. In the chronic stage, the number of mites may be small and diagnosis is correspondingly difficult. Relapses after apparently adequate treatment are common and can be put down to reinfestation from undetected and untreated contacts.

- **Complications**

•Secondary infection, with pustulation, is common. Rarely, glomerulonephritis follows this.

•Repeated applications of scabicides can cause skin irritation and eczema.

•Persistent itchy red nodules may remain on the genitals or armpits of children for some months after adequate treatment.

•Venereal disease may be acquired at the same time as scabies.

•Crusted (Norwegian) scabies, which may not be itchy, is a widespread crusted eruption in which vast numbers of mites are found. It affects people with learning difficulties or the immunosuppressed, and can be the unsuspected source of epidemics of ordinary scabies.

*Scabies

- Differential diagnosis
- Only scabies shows characteristic burrows. Animal scabies from pets induces an itchy rash in humans but this lacks burrows. The lesions of papular urticaria are excoriated papules, in groups, mainly on the legs. Late-onset atopic eczema, cholinergic urticaria, lichen planus, neurotic excoriations and dermatitis herpetiformis have their own distinctive features. Fibreglass can also cause epidemics of itching. Investigations With practice an acarus can be picked neatly with a needle from the end of its burrow and identified microscopically; failing this, eggs and mites can be seen microscopically in burrow scrapings mounted in potassium hydroxide or mineral oil. Some find dermatoscopy a quick and reliable way to identify the mite.

- **Treatment**

•Use an effective scabicide; there are many on the market now. In the UK, the preferred treatment is with malathion or permethrin; lindane is no longer available. Topical treatment plus ivermectin (on a named patient basis in the UK), in a single dose of 200 µg/kg by mouth, is effective for Norwegian scabies and scabies that does not respond to topical measures alone.

•For babies over 2 months, toddlers and young children we advise permethrin cream, 25% benzyl benzoate emulsion diluted with three parts of water, or 6% precipitated sulphur in white soft paraffin (petrolatum).

•It is still not clear which scabicides can be safely used to treat pregnant women or those who are breastfeeding. Despite the absence of convincing evidence that unborn children can be damaged by topical scabicides, we prefer to use the same measures that we use to treat babies (above).

•Do not just treat the patient: treat all members of the family and sexual contacts, whether they are itching or not.

•Have a printed sheet to give to the patient and go through it with them – scabies victims are notoriously confused.

•One convenient way to apply scabicides to the skin is with a 5 cm (2 inch) paintbrush. The number of applications recommended varies from dermatologist to dermatologist. There is no doubt that some preparations, such as malathion, disappear quickly from the skin, leaving it vulnerable to any mites which hatch out from eggs that have survived. A second application, a week after the first, is then essential. With permethrin, this may be less important. The main reason for recommending a second application is that it will cover areas left out during an inefficient first application.

•Make sure that patients grasp the fact that scabicides have to be applied to all areas of skin below the jaw line, including the genitals, soles of the feet, and skin under the free edge of the nails. If the hands are washed, the scabicide should be reapplied. A hot bath before treatment is no longer recommended.

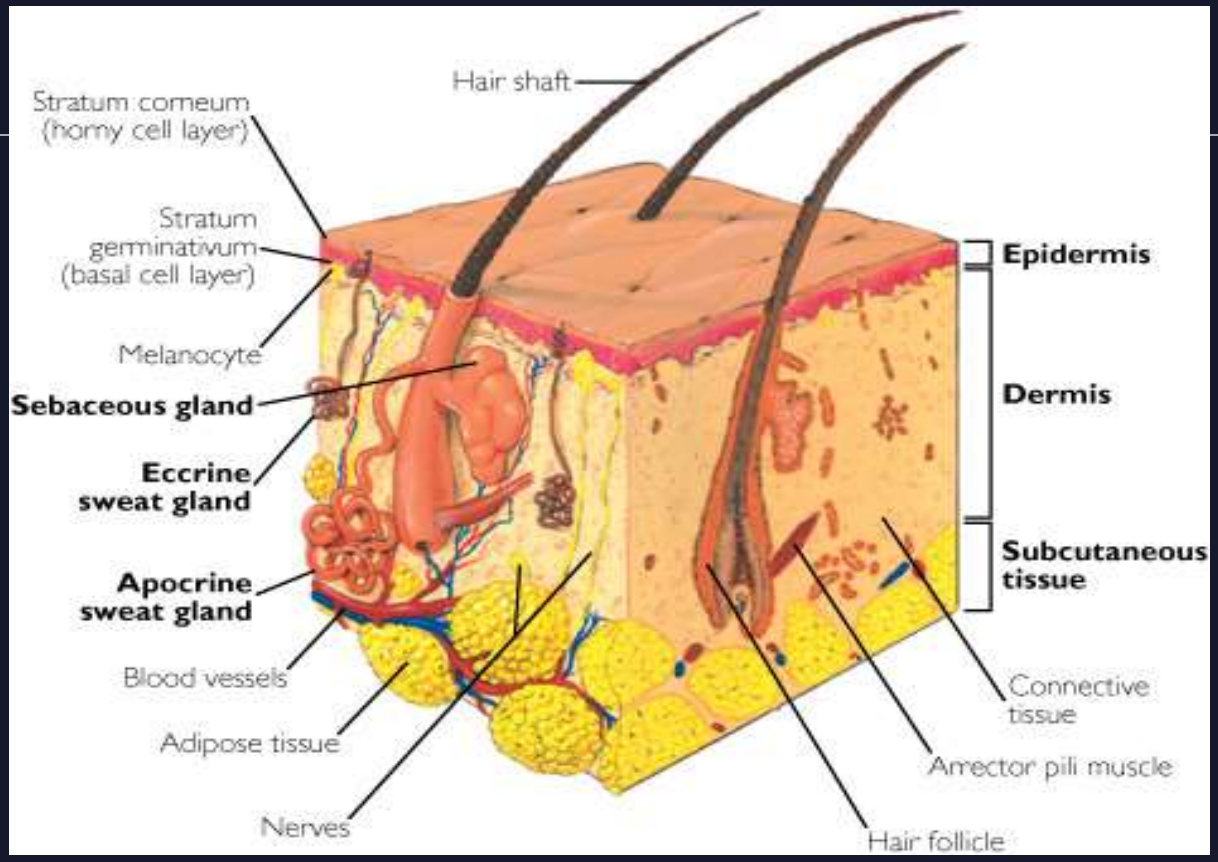
•Ordinary laundering deals satisfactorily with clothing and sheets. Mites die in clothing unworn for 1 week.

•Residual itching may last for several days, or even a few weeks, but this does not need further applications of the scabicide. Rely instead on calamine lotion or crotamiton.

Pyoderma

- Most frequently the agents of pyoderma are staphylococcus and streptococcus. Different types of pustular skin diseases can occur initially as separate nosologic entities or as a complication of other dermatoses (scabies, eczema, atopic dermatitis etc.). Staphylococci under the microscope have got rather correct round shape (their accumulations are often similar to a bunch of grapes) with a diameter of about 0.8-0.9 microns. The most virulent is Staphylococcus aureus. Staphylococci are also presented in form of spherical formations, joining in long chains. The diameter of one coccus varies from 0.5 to 1 micron. Pycocci occur on the skin in the form of avirulent microorganisms in 90-92% of healthy people, and it is possible to detect their pathogenic forms only in 8-10% of population. Saprophytes can acquire pathogenicity under certain conditions and their virulence can increase under the action of alkaline reaction of the skin or in case of joining of other agents, such as fungi. In case of Gram-stained pus smear, both staphylococci and streptococci are well stained in blue that means they are Gram-positive. The toxins, released by pyococcy, are highly toxic and are capable to lyse erythrocytes, leukocytes.

Bacterial infections of the skin



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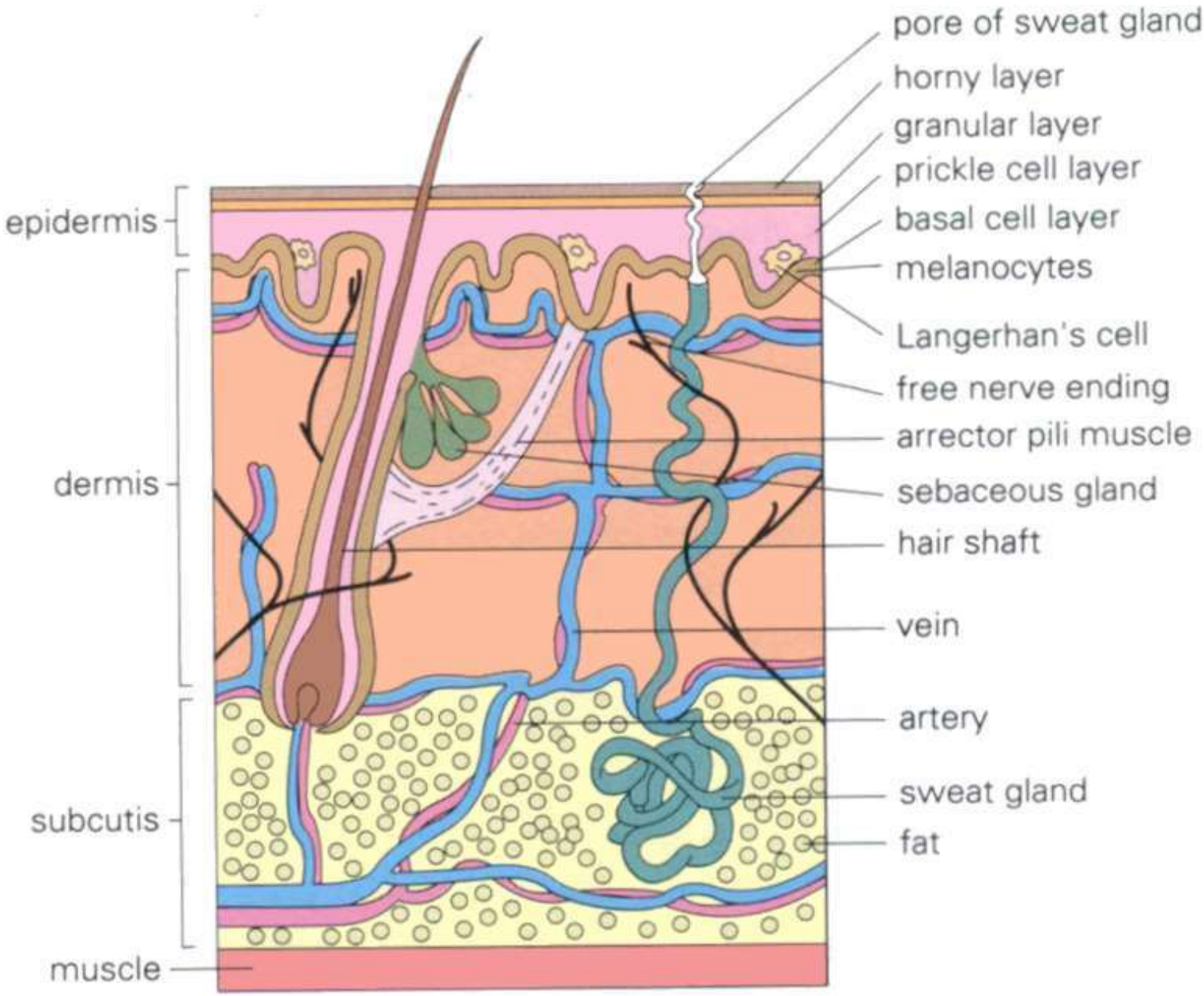
ANATOMY OF THE SKIN



Natural Defenses of the Skin

- Temperature less than 37°C
- Dry: usual infection sites are wet areas: skin folds, armpit, groin
- Keratin
- Skin sloughing
- Sebum: low pH, high lipid content
- Sweat: - low pH, high salt,
  - Lysozyme &toxic lipids
- Skin-associated lymphoid tissue (SALT)
- Resident microflora (mainly Gram positives)

Normal Skin Flora

- *Propionibacterium acnes*
- *Corynebacterium sp.*
- *Staphylococci*
  - *Staphylococcus epidermidis*
  - *Staphylococcus aureus*
- *Streptococci sp.*
- *Candida albicans (yeast)*
- *Many others*

Route of infection

1) Skin (pores, hair follicles).
2) Wounds (scratches, cuts, burns).
3) Insect & animal bites.

Primary Infections

- caused by a single pathogen, usually affect normal skin.
- Impetigo, folliculitis, and boils are common types.
- The most common primary skin pathogens are *S aureus* ,β-hemolytic streptococci, and coryneform bacteria.
- Organisms usually enter through a break in the skin.

Secondary Infections

- Secondary infections occur in skin that is already diseased.
- Because of the underlying disease, the clinical picture and course of these infections vary.
- Intertrigo and toe web infection are examples

Primary Infections

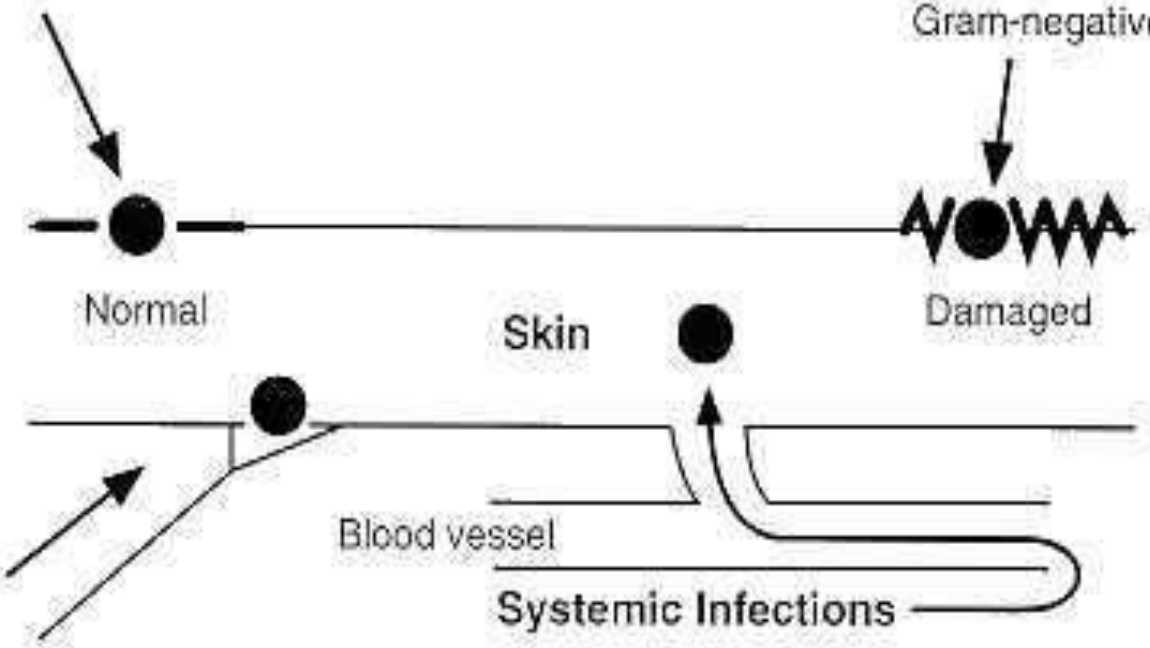
Examples:

Staphylococcus aureus
β-hemolytic streptococci
Coryneforms
Dermatophytes
Actinomycetes
Parasites

Secondary Infections

Examples:

Resident flora
Staphylococcus aureus
Pseudomonas aeruginosa
Gram-negative rods



Nerve Infections
(e.g. herpesviruses)

Examples:

Staphylococcus aureus
β-hemolytic streptococci
Measles virus
Varicella virus
Actinomyces spp

Neisseria gonorrhea
Pseudomonas aeruginosa
Salmonella typhi
Rickettsia
Treponema pallidum
Fungi

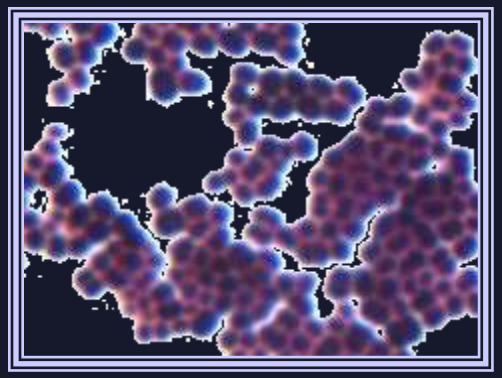
TABLE 98-1 Classification of Selected Bacterial Skin Infections

Disease	Common agents
Primary	
Impetigo	*Staphylococcus aureus, Streptococcus pyogenes*
Cellulitis and erysipelas	Group A streptococci
Staphylococcal scalded skin syndrome	*S aureus*
Folliculitis	*S aureus*
Superficial folliculitis	
Staphylococcal folliculitis	*S aureus*
Gram-negative folliculitis	*Klebsiella pneumoniae, Enterobacter aerogene, Proteus vulgaris*
Propionibacterium acnes folliculitis	*Propionibacterium acnes*
Deep folliculitis	
Sycosis barbae	*S aureus*
Furuncles or carbuncles	*S aureus*
Pitted keratolysis	Gram-positive coryneforms
Erysipeliod	*Erysipelothrix rhusiopathiae*
Erythrasma	*Corynebacterium minutissimum*
Trichomycosis	*Corynebacterium tenuis*, bacteria resembling *C minutissimum*, and lipophilic coryneforms
Secondary	
Intertrigo	Overgrowth of resident and transient bacteria
Acute infectious eczematoid dermatitis	*S aureus*
Pseudofolliculitis of the beard	Resident flora (Gram-positive cocci)
Toe web infection	Fungi, coryneform bacteria, *Brevibacterium*, and Gram-negative rods
Other diseases	
Mycobacterial infection	*Mycobacterium tuberculosis, M marinum, M ulcerans*
Actinomycete infection	*Actinomyces israelii*

Skin infections caused by S. aureus

I. Direct infection of skin and adjacent tissues

a. Impetigo
b. Ecthyma
c. Folliculitis
d. Furunculosis
e. Carbuncle
f. Sycosis barbae



II. Cutaneous disease due to effect of bacterial toxin

a. Staphylococcal scalded skin syndrome
b. Toxic shock syndrome

Skin infections caused by group A ß-hemolytic streptococci

I. Direct infection of skin or subcutaneous tissue

a. Impetigo (non bullous)
b. Ecthyma
c. Erysipelas
d. Cellulitis
e. Necrotizing fascitis

II. Secondary infection

Eczema infection

Skin and Soft Tissue Infections

1. Impetigo: Initially a vesicular infection that rapidly evolves into pustules that rupture, with dried discharge forming honey-colored crust on an erythematous base.

2. Ecthyma (Pustules): Begin as vesicles that rupture, creating circular erythematous lesions with adherent crusts.

3. Folliculitis: Inflammation at the opening of the hair follicle that causes erythematouspapules and pustules surrounding individual hairs.

4. Furuncle: Deep-seated inflammatory nodule with a pustular center that develops around a hair follicle.

(painful, localized, abscess).

5. Carbuncle: Involvement of several adjacent follicles, with pus discharging from multiple follicular orifices.

6. Cutaneous abscesses: Painful, fluctuant, red, tender swelling, on which may rest a pustule.

7. Erysipelas: Erythema and swelling of the cutaneous surface, involves the superficial

8. Cellulitis: Erythematous, hot, swollen skin with irregular edge (affects the deeper dermis and subcutaneous fat).

9. Acne: Infection of sebaceous follicles with plugs of keratin blocking the sebaceous canal, resulting in "blackheads".

10. Necrotizing fasciitis: Rapidly spreading cellulitis with necrosis (skin and deeper fascia; may involve muscle).

Begin with fever, systemic toxicity, severe pain in the development of a painful, red swelling that rapidly progress to necrosis of the subcutaneous tissue and overlying skin.

Impetigo and Ecthyma

- Impetigo is a superficial skin infection with crusting (non bullous) or bullae (bullous) caused by streptococci, staphylococci, or both.
- Ecthyma is an ulcerative form of impetigo.

Crusted erosions on the arm of a child.

The confluence of lesions in the antecubital fossa suggests prior atopic dermatitis at the site that became secondarily infected

IMPETIGO (non-bullous)

IMPETIGO (bullous)

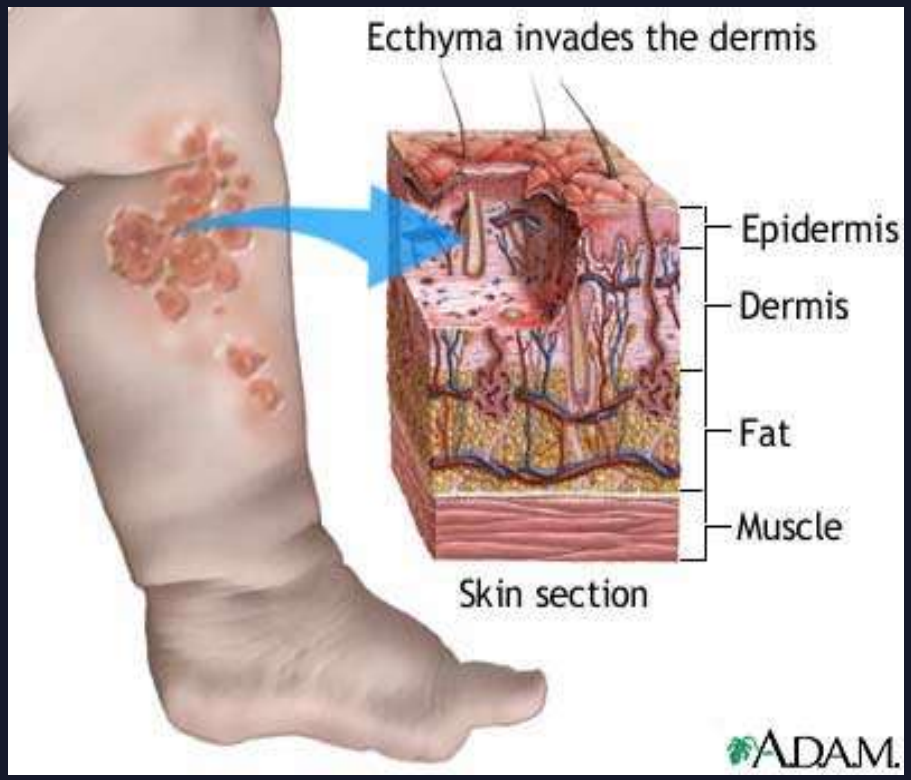
A large, single bulla with surrounding erythema and edema on the thumb of a child; the bulla has ruptured only in the center and clear serum exudes from it

Impetigo (Non-Bullous)

Non-bullous impetigo is a superficial skin infection that manifests as clusters of vesicles or pustules that rupture and develop a honey-colored crust.

Impetigo (Bullous)

Bullous impetigo is a superficial skin infection that manifests as clusters of vesicles or pustules that enlarge rapidly to form bullae. The bullae burst and expose larger bases, which become covered with honey-colored varnish or crust.

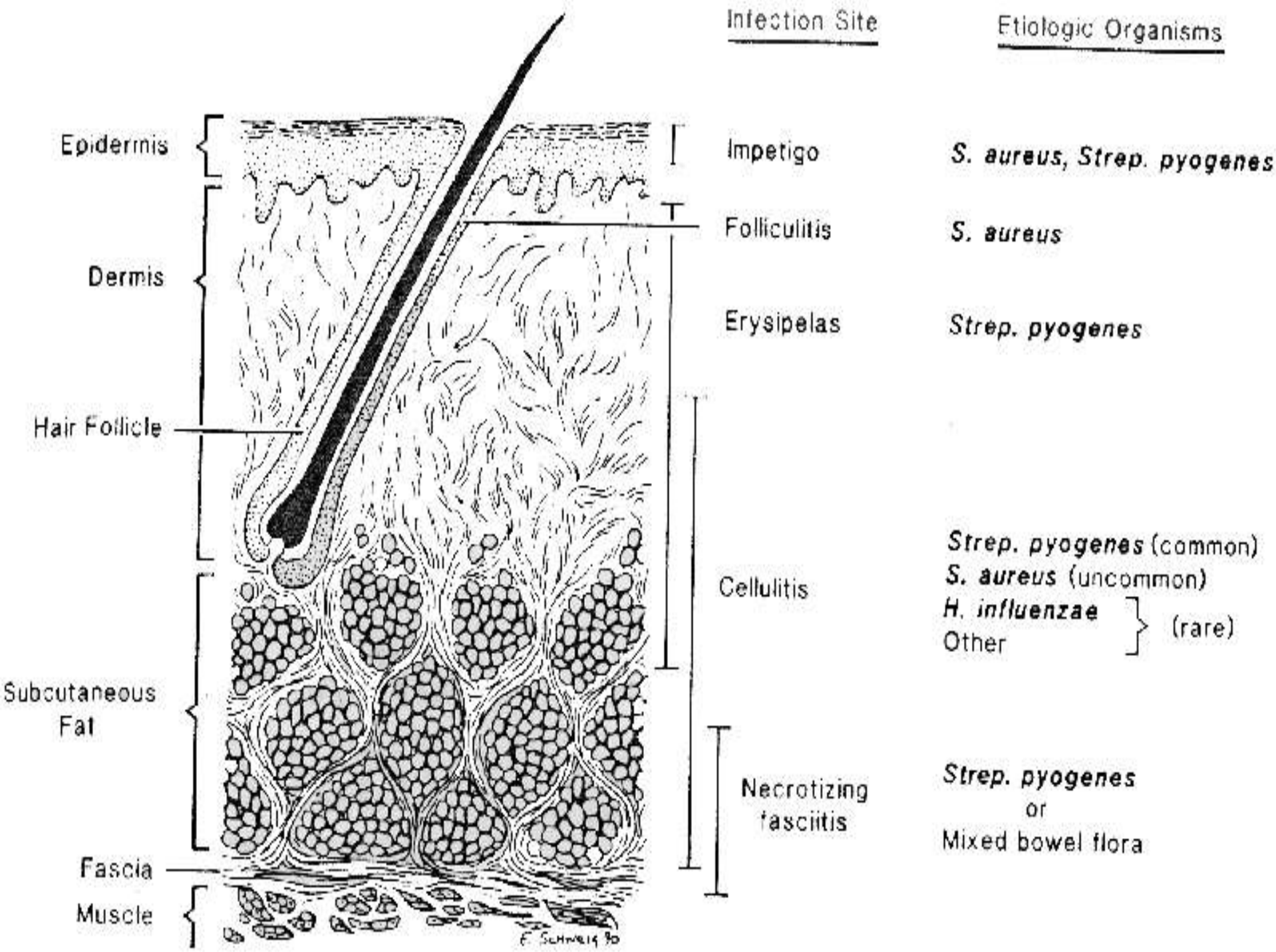


Ecthyma is a skin infection similar to impetigo, but more deeply invasive. Usually caused by a **streptococcus infection**, ecthyma goes through the outer layer (epidermis) to the deeper layer (dermis) of skin, possibly causing scars.

Ecthyma gangrenosum is a bacterial skin infection (caused by *Pseudomonas aeruginosa*) that usually occurs in immuno-compromised individuals

Folliculitis

- ***Folliculitis is a bacterial infection of hair follicles.***
- **It is usually caused by Staphylococcus aureus but occasionally Pseudomonas aeruginosa (hot-tub folliculitis)**
- **The bacteria is commonly found in contaminated whirlpools, hot tubs or physiotherapy pools .**
- **Children tend to get hot tub folliculitis more.**
- **Hot-tub folliculitis occurs because of inadequate treatment of water with chlorine or bromine.**


Infection Site
Etiologic Organisms
Epidermis
Dermis
Hair Follicle
Subcutaneous Fat
Fascia
Muscle
Impetigo
S. aureus, Strep. pyogenes
Folliculitis
S. aureus
Erysipelas
Strep. pyogenes
Cellulitis
Strep. pyogenes (common)
S. aureus (uncommon)
H. influenzae
Other
(rare)
Necrotizing fasciitis
Strep. pyogenes
or
Mixed bowel flora

FOLLICULITIS

Folliculitis manifests as superficial pustules or inflammatory nodules surrounding hair follicles.

Superficial erythematous papules & crusts of hair follicles in the beard area , aggravated by shaving.

Furuncles and Carbuncles

- ***Furuncles** are skin abscesses caused by **staphylococcal** infection, which involve a hair follicle and surrounding tissue.*

- ***Carbuncles** are clusters of furuncles connected subcutaneously, causing deeper suppuration and scarring. They are smaller and more superficial than subcutaneous abscesses*

FURUNCLE

Furuncles (boils) are tender nodules or pustules caused by staphylococcal infection. Carbuncles are clusters of furuncles that are subcutaneously connected.

CARBUNCLE

***Staph aureus* - Large, inflammatory plaque studded with multiple pustules, some have ruptured, draining pus, on the nape of the neck. This very painful area is surrounded by erythema and edema, extends down to fascia, formed from a confluence of many furuncles.**

Carbuncles

Cellulitis

- Cellulitis is an acute bacterial infection of the skin and subcutaneous tissue most often caused by streptococci or staphylococci.
- Some people are at risk for infection by other types of bacteria. They include people with weak immune system, and those who handle fish, meat, poultry, or soil without using gloves.
- Cellulitis can occur anywhere on the body. In adults, it often occurs on the legs, face, or arms. In children, it is most common on the face or around the anus. An infection on the face could lead to a dangerous eye infection.

CELLULITIS

Portal of entry of infection is seen on the lateral thigh with necrosis of skin; infection has extended mainly proximally from this site.

Erysipelas

- Erysipelas is a type of superficial cellulitis with dermal lymphatic involvement.
- It is characterized clinically by shiny, raised, indurated and tender plaque-like lesions with distinct margins (you can see a clear border between normal and infected skin).
- Erysipelas is most often caused by group A β-hemolytic streptococci and occurs most frequently on the legs and face.
- Other causes : Staphylococcus aureus (including MRSA), Klebsiella pneumoniae, H.influenzae, E. coli).
- It is commonly accompanied by high fever, chills, and malaise. Erysipelas may be recurrent and may result in chronic lymphedema.

ERYSIPELAS

Cutaneous Abscess

- ***A cutaneous abscess is a localized collection of pus in the skin and may occur on any skin surface.***

(Necrotizing Fasciitis)

- Typically caused by a mixture of aerobic & anaerobic organisms that cause necrosis of subcutaneous tissue, usually including the fascia.
- This infection most commonly affects the extremities and perineum. Affected tissues become red, hot, and swollen, resembling severe cellulitis.
- Without timely treatment, the area becomes gangrenous. Diagnosis is by history and examination.
- Treatment involves: antibiotics,surgical debridement. Amputation if necessary

Necrotizing Fasciitis "Flesh Eating Strep"

Streptococcus pyogenes **(Group A β hemolytic Streptococci (GABHS) is the causative agent**

- **Necrotizing fasciitis:**

The disease starts as localized infection that rapidly spreading cellulitis with necrosis (skin and deeper fascia; may involve muscle).

- **Begin with fever, systemic toxicity and severe pain**
- **The development of a painful, red swelling that rapidly progress to necrosis of the subcutaneous tissue and overlying skin.**
- **The Invasive & spreading cellulitis may lead to loss of limb**
- **May lead to toxic shock**

NECROTIZING FASCIITIS

Acne

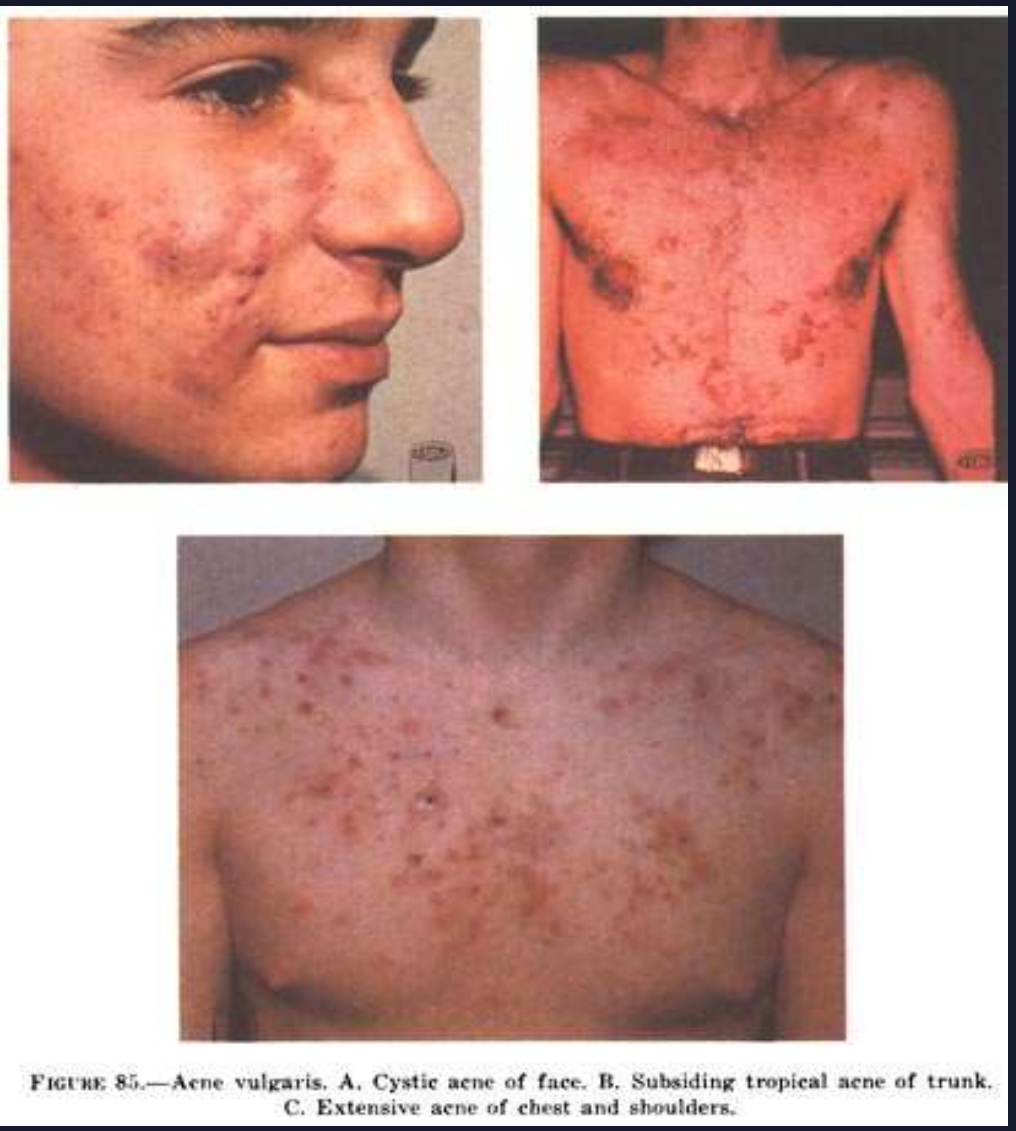


FIGURE 85.—Acne vulgaris. A. Cystic acne of face. B. Subsiding tropical acne of trunk. C. Extensive acne of chest and shoulders.

Acne

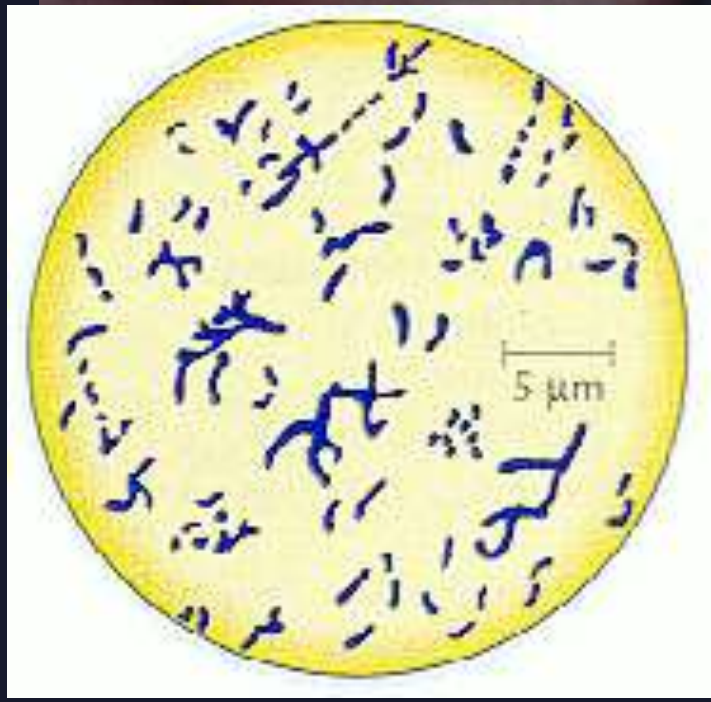
- Most common skin disease in humans
- ***Propionibacterium acnes:*** Gram +ve rod ,causative agent
- Pathogenesis: bacteria digest sebum , Attracts neutrophils

  - Neutrophil digestive enzymes cause lesions, “pus pockets”

- Obstruction of sebaceous follicles (oil glands)
- Open comedones or closed comedones
- Usually on the face, chest, back
- **Risk factors:**
  - Stressful events (hormonal changes)
  - Friction acne
  - Oil based cosmetics

Acne Treatments

- Tx: topical +/or oral antibiotics.
- Benzoyl peroxide dries plugged follicles, kills microbes
- Tetracycline (antibiotic)
- Accutane – inhibits sebum formation



HIDRADENITIS SUPPURATIVA

- Hidradenitis suppurativa is a chronic, suppurative recurring inflammatory disease of apocrine gland follicles.
- Commoner in females specially after puppetry.
- Sites: axillae, around the nipples, under the breast, perineum, groin, buttocks, neck and scalp.
- lesions: nodules, abcesses, scarring,sinus tract formation.

HIDRADENITIS SUPPURATIVA

Erythrasma

- Erythrasma is a bacterial skin infection that occurs in areas where skin touches skin, like between toes, in armpits, or groin .
- This intertriginous infection is caused by Corynebacterium minutissimum.
- Most common among patients with diabetes.
- Erythrasma is sometimes mistaken with fungal infections.
- If you have such picture that's not responding to anti-fungal therapy, see your doctor because erythrasma is easily treated with the proper antibiotics.

MRSA skin infections

- Methicillin-resistant Staphylococcus aureus
- “super-bug” – caused by staph, antibiotics abuse
- Outwits all but the most powerful of drugs – vancomycin
- Enters through cuts & wounds
- Types: CA (community acquired) or HA (Hospital acquired)
- S/S: small red bumps that resemble pimples, quickly turn to painful abscesses that can burrow deep into the body, swelling, redness, pus
- Risk Factors: recent hospitalization, long-term care, recent antiobiotic use, young age, contact sports, sharing towels, weak immune system, living in groups, health-care workers
- Dx: Tissue sample – 48hrs
- Tx: trial & error with strong antiobiotics
- Prevention: WASH HANDS, surfaces, cover wounds

MRSA skin infection

Recurrent skin infections

- Recurrent skin infections should raise suspicion of colonization
  - Staphylococcal nasal carriage
  - Resistant strains of bacteria (eg. MRSA),
  - Cancer
  - Poorly controlled diabetes
  - Other reasons for immuno-suppression (eg, HIV, hepatitis, advanced age,….).

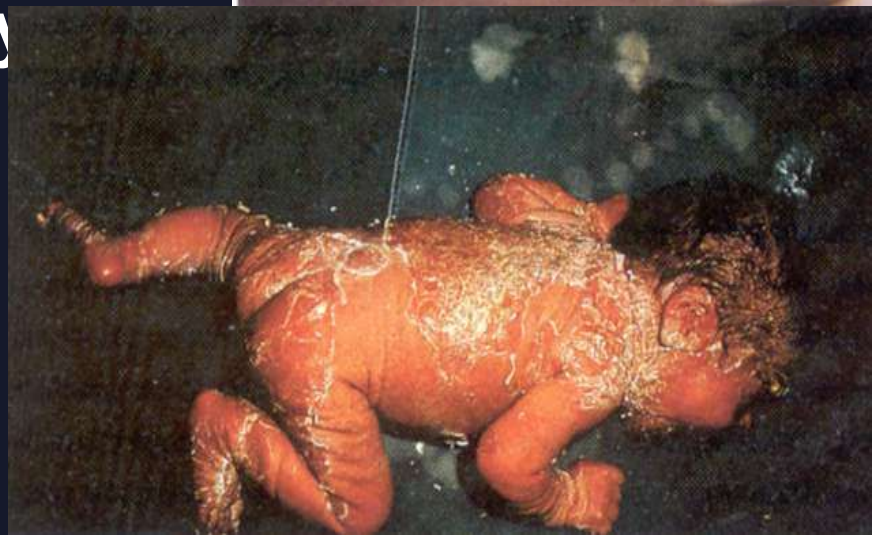
Staph. carriage elimination

- Nasal & perineal care
- Rifampicin 600 mg/d 7-10 days
- Clindamycin 150 mg/d 3 months
- Topical mupirocin
- Replacement of microflora with a less pathogenic strains of S.aurus (strain 502)

Staphylococcal Scalded Skin Syndrome(SSSS)

Mechanism: Exfoliatins

- **SSSS also called Lyell's disease or toxic epidermal necrolysis, starts as a localized lesion, followed by widespread erythema and exfoliation of the skin.**
- **This disorder is caused by staphylococcal strain which elaboratse an epidermolytic toxin. The disease is more common in infants than in adults.**



Toxic Shock Syndrome

Mechanism: **TSST-1**

Localized growth of toxigenic strains in vagina or wound.

- Starts abruptly with fever, hypotension, and diffuse macular erythematous rash.

Multiple organs & systems are involved, entire body skin desquamates.

Laboratory Diagnosis of Bacterial Infections of Skin (1)

Specimen collection:

1. Skin biopsy
2. Skin swab
3. Pus swab
4. Nasal swab

N.B.

When pustules or vesicles are present, the roof or crust is removed with a sterile surgical blade. Pus or exudate is spread as thinly as possible on a clear glass slide for Gram staining

Laboratory Diagnosis of Bacterial Infections of Skin (2)

Suspected organisms

- **Impetigo:** Group A *Streptococcus, Staphylococcus aureus*
- **Folliculitis:** *Staphylococcus aureus, Pseudomonas aeruginosa*
- **Furuncles:** *Staphylococcus aureus*
- **Carbuncles:** *Staphylococcus aureus*
- **Cellulitis:** Group A *Streptococcus, Staphylococcus aureus, Hemophilus influenzae*
- **Erysipelas:** *Group A Streptococcus*
- **Necrotizing fasciitis:** *Group A Streptococcus, Clostridium perfringens and other species, Bacteroides fragilis, the anaerobes, Enterobacteriaceae, Pseudomonas aeruginosa*

Laboratory Diagnosis of Bacterial Infections of Skin (3)

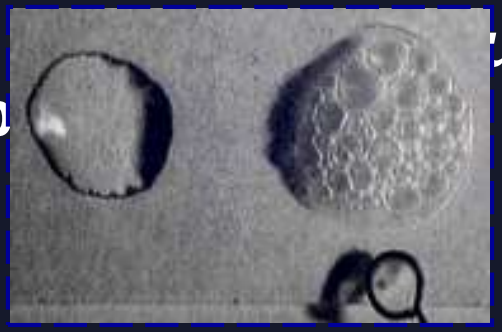
1. **Clinical specimen: Scrape the base of the skin lesion with a swab.**

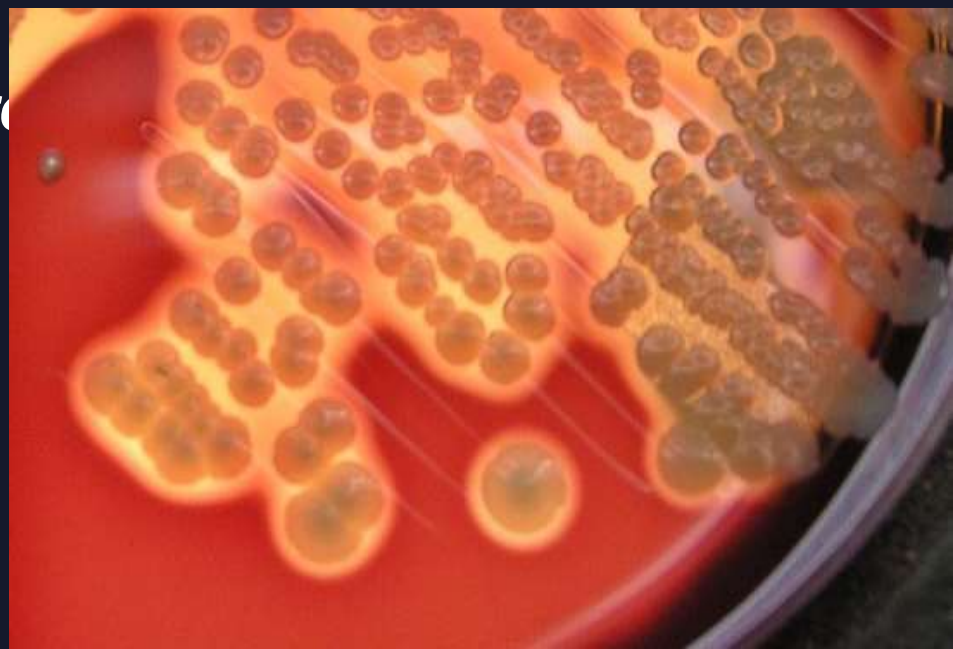
Gram stain: Gram (+) cocci in clusters (or in chains)

2. Culture: Blood Agar (for both), Mannitol Salt Agar (for staph)

Identification: catalase , Coagulase , mannitol fermentation

d
b



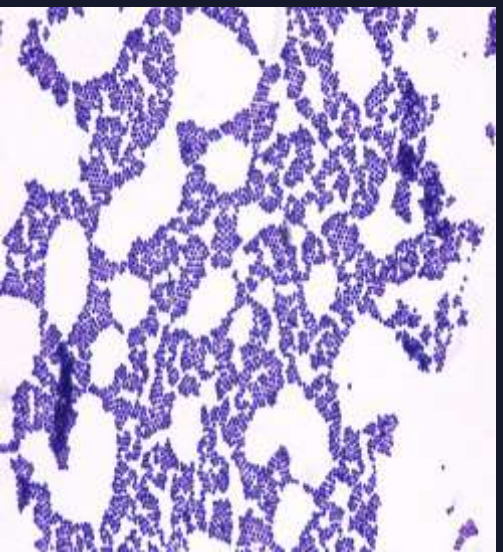


Tube Coagulase test

Catalasa test

Laboratory Diagnosis of Bacterial Infections of Skin (4)

2. Mannitol salts agar (MSA):high salt(7.5) inhibits the grow of most other organisms, *S. aureus* ferments mannitol, the acid produced turns the colonies yellow.



Principles of therapy of pyoderma

- Good personal hygiene
- Management of predisposing factors
- Aluminum chloride, a drying agent, inhibits overgrowth of opportunistic bacteria in foot, perineal, and axillary areas.
- Keratinolytic agents (e.g., topical salicylates) remove hyperkeratotic lesions that harbor pathogens, improving the exposure of the infected skin surface to other topical treatments .

Systemic

- Treatment of disease like DM
- Nutritional deficiency
- Immunodeficiency

Principles of therapy of pyoderma

- **Local therapy**
  - Cleaning with soap-water and weak KMN04 solution
  - Removal of crusts with KMN04 solution
  - Application of antibacterial creams or ointments
- **Systemic therapy**
  - Antibiotics

Topical Treatment

- Topical antibiotics contain a combination of: neomycin, bacitracin, and polymyxin.
- Some newer preparations contain: mupirocin, gramicidin, or erythromycin, and others combine these antibiotics with steroids.

Systemic Therapy

- Systemic treatment with antibiotics is mandatory for extensive pyoderma.
- Systemic antibiotics can be administered orally or parenterally. Oral therapy is sufficient for most extensive dermal infections, but the parenteral route is preferred for severe infections.

CHRONIC BACTERIAL SKIN INFECTION

- **Tuberculosis:** caused by mycobacterium tuberculosis
- **Etiology:**
- Primary inf. : acquiring the bacilli for the 1st time
- Post primary inf. occurs in pt with previous TB or previous BCG vaccination.
- **A- Localized:** as lupus vulgaris, scrofuloderma and TB verrucosa cutis.
- **B- General:** as miliary lesions, in pt with miliary TB & immune suppressed, multiple TB abscesses.
- **C- Tuberculide**

  1. papulonecrotic tuberculide.
  2. Lichen scrofulosorm.
  3. Erythema induratum.

- primary TB infection [tuberculous chancre]
- Lupus vulgaris

Scrofuloderm

- **Tuberculous warts**: [tuberculos verrucosa cutis]
- **Orificial TB**
- Papulonecrotic tuberculide

Lichen scrofulosorum
Erythema induratum

Lupus vulgaris

- Commonest 1ry infection
- Good natural immunity
- Heamatogenous spread
- Apple jelly nodule--scar
- Tuberculoid granuloma

Mx: bx, AFB
Local ttt
Anti TB

Diagnosis of skin TB

- confirmed either by find the microorganism in culture media (never to be seen in skin lesion)
- PCR
- Presence of acid fast bacilli (by ZN stain)
- History, positive tuberculin test, presence of caseating granuloma on histopathology and therapeutic response to anti-TB drugs

Discussion questions

- 1. Etiological, pathogenetic and epidemiological features
- 2. Principle of classification
- 3. Differential diagnosis
- 4. The main approaches to the general and local treatment

Questions?