

Bacterial & Fungal skin, Soft Tissue & Muscle infections

For Second Year Medical Students

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Bacterial Infections of Skin & Soft Tissues

Skin infections may involve one or several layers of Skin & Soft Tissues (epidermis, dermis, subcutaneous tissue, muscle).. Mild superficial **skin infections** cause rarely chronic lesions.

Acute Skin Infections are associated with: warm skin, swelling, tenderness, blisters, ulceration with pus cells, fever & headache.. Rarely may become systemic disease involving blood, bones or any other body organ.

Few types Bacteria & Yeast live normally in hair follicles- Skin pores .. may cause inflammation in Hair follicles (folliculitis or abscess formation)/ Boils.

Types of skin Infections(Abscess, Boil/Furuncle, Acne, Impetigo)



Common Normal Skin Flora & Pathogens

Skin infection increased by presence of minor skin injuries, abrasions.. Increase production **Androgenic Hormones** after puberty.. Increase activities of sebaceous ducts.. secretion **Sebum oil** (Fatty Acid- Peptides).. Increases keratin & skin desquamation .

Anaerobic ***Propionibacteria acnes*** (gram+ve small bacilli) & ***Staph spp.*** excrete enzymes.. Split sebum & cause mild inflammation..developing **Acne.**

Common skin opportunist Bacteria: *Staphylococci*, *hemolytic Streptococci* (Group A,less other groups), *Propionibacteria*, *Acinetobacter* , *Pityrosporum* and other Yeasts/*Candida* species.

Localized & Systemic Skin Infections

Certain Systemic Infection may be associated with skin inflammation reaction **like:**

N. meningitidis .. Haemorrhagic lesions

S. typhi ..Skin rash as rose spots

Treponema pallidum.. Genital ulcers, Syphilis lesions/ chancres.. later stage only Skin rash,

Pseudomonas aeruginosa & other **Gram-ve bacteria** ..localizes wound lesions

Many fungi & Viruses may cause skin rash

The accurate etiology of infection should be confirmed by **culture of skin specimen/lesion**

Common Staphylococcal skin infections

S. aureus : Coagulase+ve.. Produce various toxins & enzymes.. Associated with the most common & important cause of **human Skin Diseases & Sepsis** in community & hospital (**up 50% of skin abscess**).

About **15-40 % healthy humans** are healthy carriers of *S. aureus* in their **nose**.. **Less rates skin/ feces**.

Folliculitis / Boils/ Furuncles .. Hair follicular-infections called pustules.. common in faces young adults..continue for weeks to years.

Erythematous lesions.. affect All ages.. Mostly staph mixed infection with other bacteria or lipophilic yeast & Candida, infant & persons suppressed immunity.

Impetigo: Inflammation superficial layers skin.. blisters, skin sores, crusted lesions.. Face, hands & legs.. Mostly young children following minor injury.

Picture of Impetigo



[View More](#)

Scalded Skin Syndrome



Toxic Staphylococcal skin diseases

Toxic Shock Syndrome: Caused by localized infection.. •
Certain Staph. strains release **2 types TSST- (enterotoxin-1)** act as Super-antigens.. activate T-lymphocytes & released Cytokines Causing Skin rash & skin desquamation.. may be associated with sepsis, high fever, multi-organ failure & death.

Scalded Skin Syndrome: Epidermolytic/ Exfoliative Toxins •
(A,B) Followed minor skin lesion..causing destruction skin intercellular connection.. Large blisters containing fluid & skin scaling, Painful, Majority children less 6-year.. lack of immunity.

Methicillin Resistant *S. aureus*

S. epidermidis.. Coagulase-ve, common normal inhabitants of the skin, nose.. Less pathogenic. Most its infections occur in normal individuals as **mild wound infection**.. Injury & underlying illness increase the risk of systemic infection in infants & immune-compromised patients

Most staphylococci strains are becoming increasingly resistant to many commonly used antibiotics including:

All B-lactamase-resistant penicillins.. Methicillin & flucloxacillin, Augmentin (amoxycillin + clavulonic acid).

Worldwide spread **Methicillin-resistance (MRSA)**.. 20-90% ..
Jordan about **70 % of clinical isolates (2012)**

Diagnosis & Treatment of staphylococcal infections

Lab Diagnosis of staphylococcal infections should be confirmed by: culture, gram-stain positive cocci, +ve catalase , coagulase test ..

Effective treatment For MRSA .. Vancomycin, Teicoplanin, Fusidic acid

Drainage of pus before treatment /Surgical removal (debridement) of dead tissue /necrosis.

Removal of foreign bodies (stitches) that may contribute to persisting infection

Treating the underlying skin disease..Prevent nosocomial infection..No Vaccine available

Streptococcal Skin Infections-1

Streptococcus pyogenes / B-H-Group A).. Secrete Erythrogenic /pyrogenic exotoxins A,B,C).. Similar to **Toxic Shock Syndrome toxin of S. aureus.**

Scarlet fever: Followed Sore throat infection.. Erythematous tongue-skin rash due to release **Erythrogenic Toxin**.. Mostly small children.. Not all streptococci strains.. Long-live immunity.

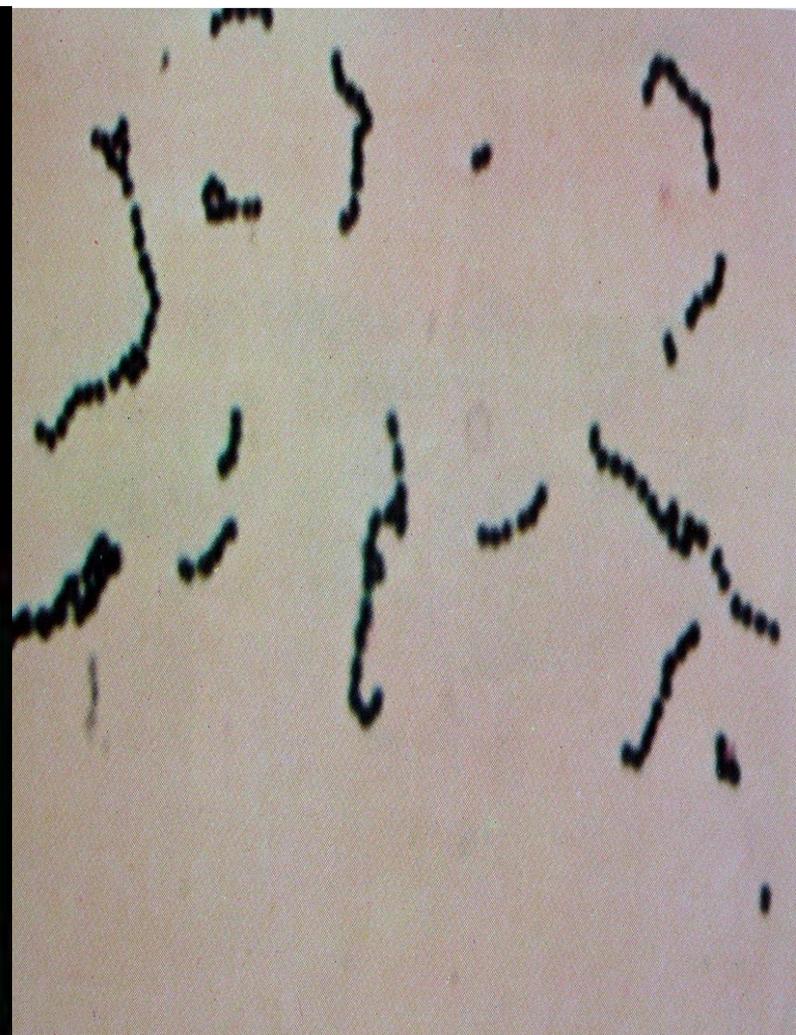
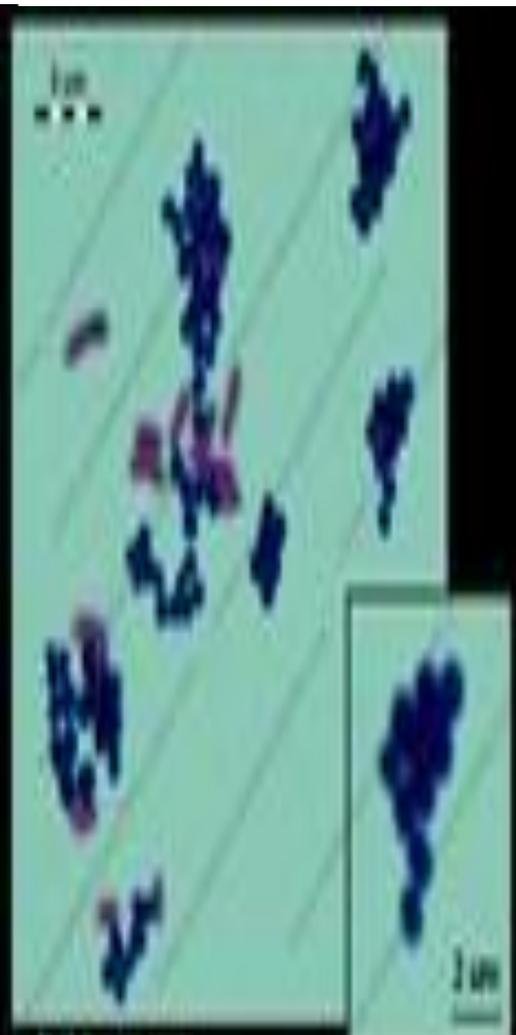
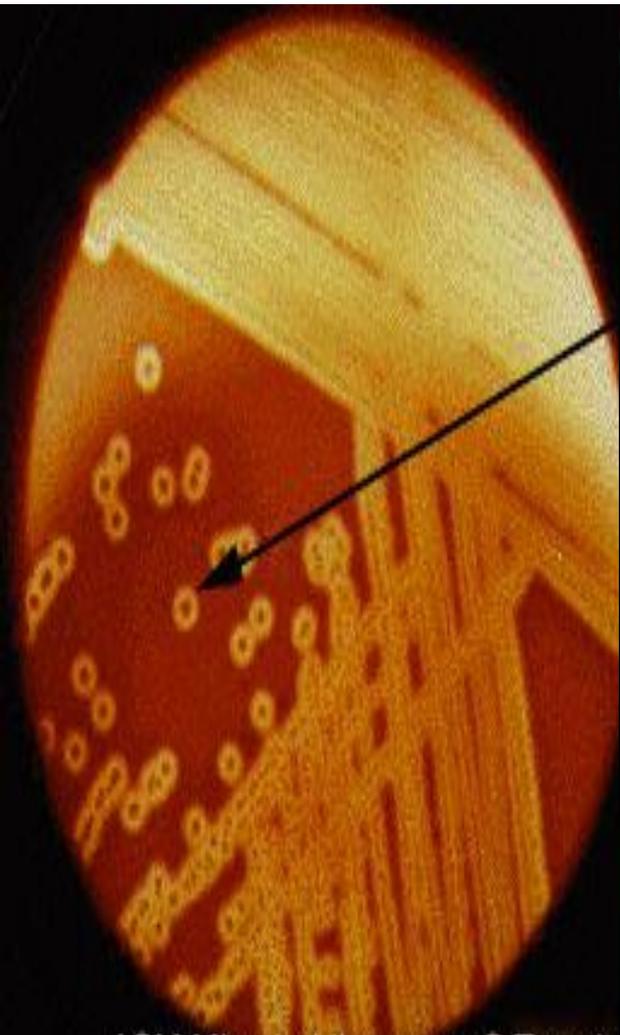
Impetigo/Pyoderma: localized & superficial skin face, arms ,legs.. children followed Strept. sore throat.

Cellulites/ Erysipelas : Acute rapidly spreading infection of skin & subcutaneous tissues..massive edema, fever, Lymphatic's inflammation/sepsis.. Mostly young children.

Skin rash - Scarlet Fever



B-H-Streptococci & Staphylococcus



Necrotizing fasciitis(NF) : Few strains group A —
..release **pyrogenic exotoxins A & B** in Minor skin
trauma.. Following invasive infection.. affect
subcutaneous tissues & fascia..Rapid spread
necrosis..Sever tissue damage..Pain, Fever, Sever
systemic illness.. Fatal without Rapid Antibiotic
Treatment and surgery.

Complication: Patients with **NF** may develop —
bacteremia, vomiting, diarrhea, confusion, shock,
respiratory & general organ failure, high fatal
(30%) Death within few days.

Less Common Bacterial Skin Infections

Bacillus anthracis.. Cutaneous Black Lesions.._ •

Clostridium perfringens and other species: Necrotizing •
Fasciitis.. Myonecrosis.. Cellulitis ..Gas gangrene..
Surgical/Traumatic wound.. Skin- Subcutaneous (Mixed
Infection).. Release specific various anaerobic fermentation
enzymes (hyaluronidase, Phospholipase) & 4 important
Exotoxins (alpha-, beta-, epsilon-toxin)..

Borrelia Burgdorferi : Lyme disease .. Transmitted by Tick/ •
Insect bites from wild animal to human.. Annular skin rash..
Chronic Skin Lesion.. Later Cardiac & Neurological
abnormality, Arthritis, meningitis..Endemic USA, China,
Japan.

Bacillus anthrax lesion-Lyme annular skin Lesion



Tuberculosis-Leprosy-1

Cutaneous Tuberculosis (TB), Cutaneous TB is a relatively uncommon form of extra-pulmonary TB.

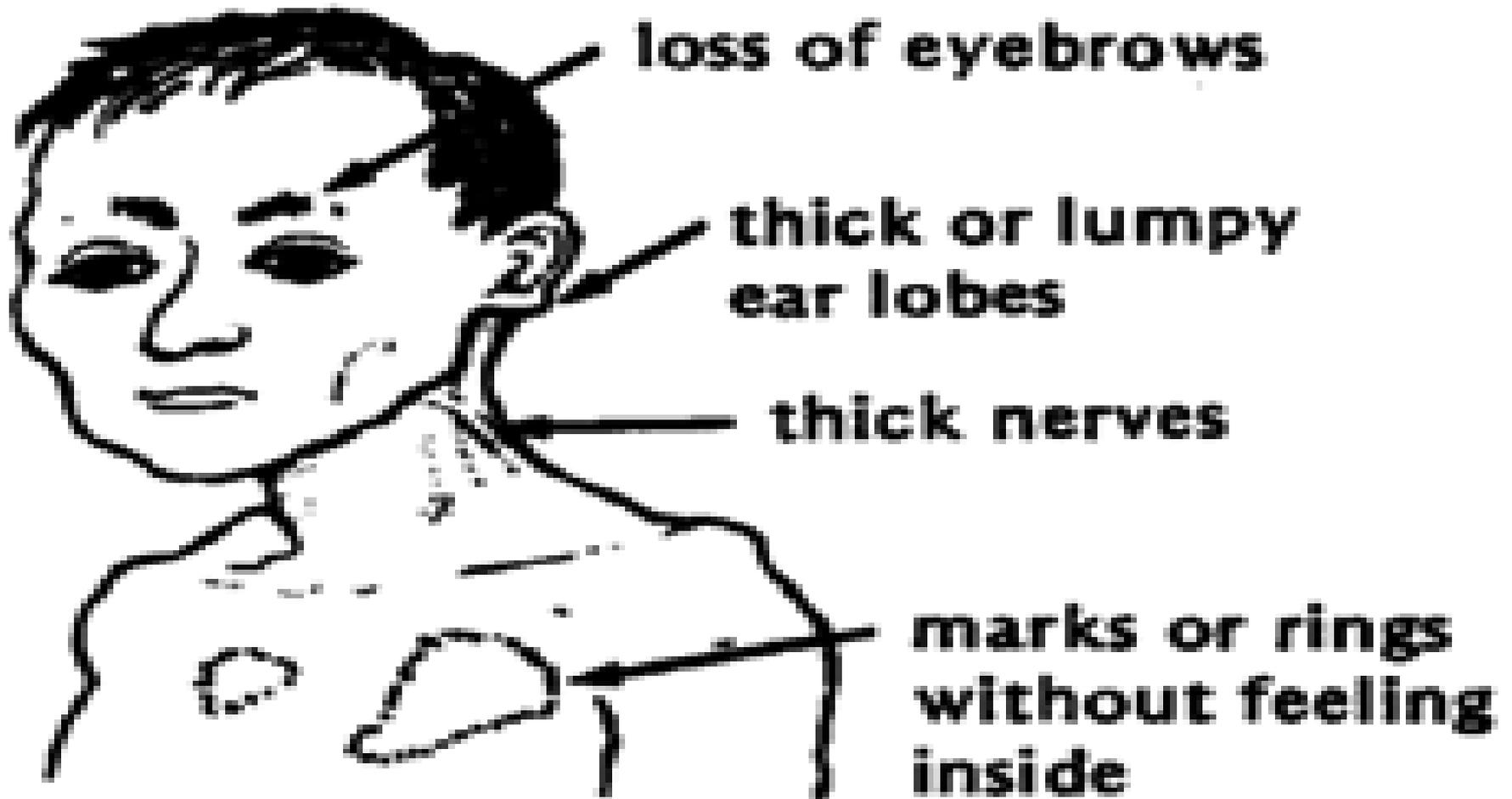
M. marinum-ulcerans.. Found in cold natural water, Skin Lesions.. Chronic cutaneous ulcer.. Granuloma.. Followed skin injury..surgical treatment and antibiotics

Leprosy: *M. leprae*.. AFB ..primarily infection affects cold body skin sites.. nose, ears, eye brows and testes. mucous membranes.. peripheral nerves characterized by chronic multiple lesions, sensation loss/ anesthesia.. sensory loss in the affected areas, toes, finger tips..**Incubation period: 1-40-year**

Tuberculoid form: Skin sores/ flat lesions, some nerve involvement , Few AFB cells, +ve Tuberculin

Lepromatous form: Severe intensive tissue-nerve destructions & loss , numerous AFB..Infectious type.

Leprosy



Epidemiology, Diagnosis & Treatment

- Granulomas type ..infiltrate in the deeper layers of the skin, involvement of the nerves..Numerous AFB, loss of organs/tissue ..tuberculin-ve reaction
- Worldwide prevalence is reported to be around **5.5 million**, with 80% of these cases found in 5 countries: India, Indonesia, Myanmar, Brazil and Nigeria.
- **Lab Diagnosis:** Detection few/numerous AFA, No culture or protected vaccine is available.. **BCG** may help & reduce the severity of disease
- **Treatment:** Combination of Dapsone, Rifampin, Clofazimine. Life-long Treatment ..No complete cure but Less tissue Damage and spread of infection.

Common Fungal Skin Infection

Superficial & Cutaneous Mycosis: Invade only dead tissues of the skin or its appendages.. More dead keratinized tissues.. Skin, Hair, Nails. •

Dermatophytes: Trichopyhton, Microsporum, Epidermatophyton spp. Their spores are common in nature, domestic animals..skin of dogs,cats. •

Transmission: Directly from person to person or animal to person.. Skin scales, hair & dust particles •

Tinea corporis: Skin Annular Lesion, Erythematic lesions, Vesicles, Scaling.. Itching.. Rash.. All Ages •

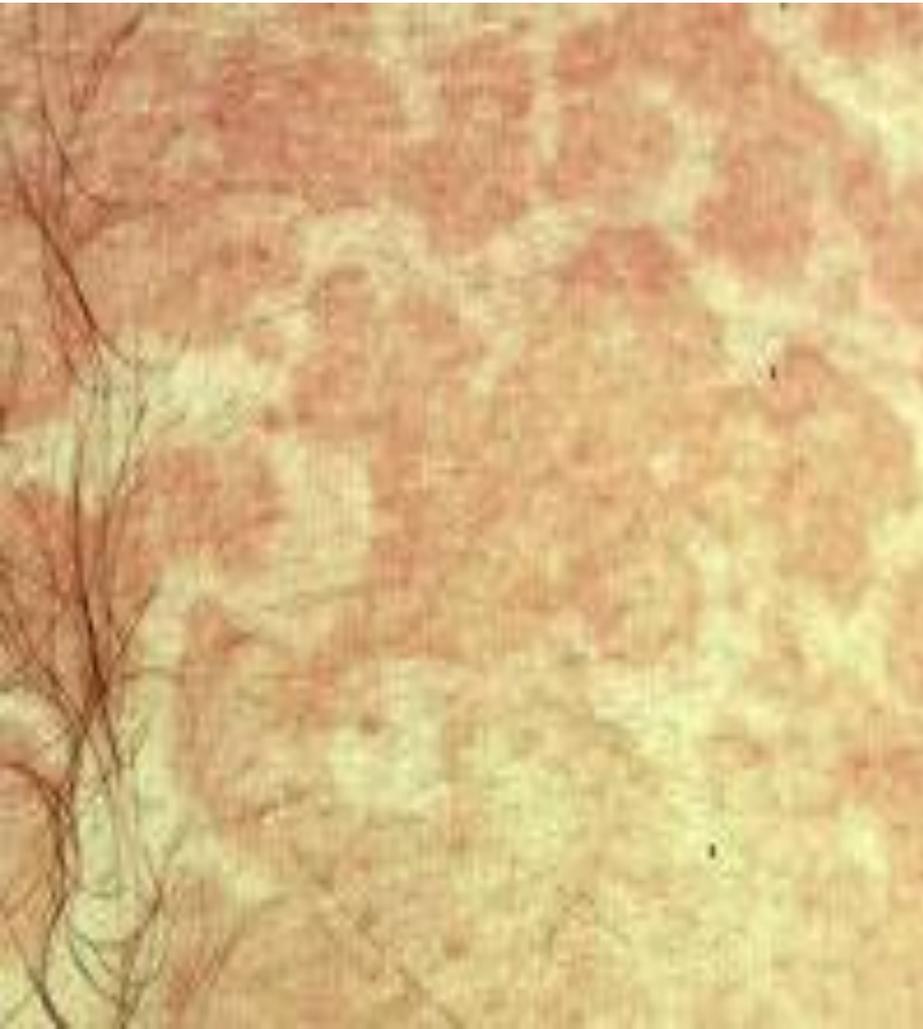
Tinea Versicolor/Pityriasis: Lipophilic Yeast (Normal skin flora) *Malassezia furfur* / Pityrosporum folliculitis.. Less Trichosporons yeast. •

Tinea Corporis



Tinea Pityriasis / versicolor

Seborrheic dermatitis/ Reddish skin color & White or yellowish crusty scale



Skin Dermatophytes Infection-2

Tinea pedis : Red itching vesicles.. chronic mild-severe erythematous lesions.. Interdigital toe spaces, Plantar skin surface.. Feet skin peeling.. All types. •

Tinea cruris: Pelvic area.. Groin.. Erythematous lesions, Itching, Chronic forms.. more common in male young adults.. Mostly *Epidermatophyte spp.* •

Tinea unguium / Onychomycosis: Often caused *Trichophyton* ,*Microsporum*, *Candida*.. fingernails & toenails. Nails become colorless/colored, thicken, disfigure and brittle.. Diabetes, Suppressed immunity. •

Tinea capitis: Hair shaft/follicles.. Scalp, Children, caused by *Trichophyton* ,*Microsporum spp.* ■

Tinea pedis -Tinea capitis kerion



Onychomycosis-Psoriasis



Cutaneous Candidiasis

Candida albican, C. krusei, C. aglabrata. •

Can occur on any part of skin..folded skin, armpits, nails & •
between finger, breast nipple , rectum

Mostly infants, other ages with immunodeficiency •

Infection appears red like-rashes, skin peeling, painful & •
itchy ..may progress to skin cracking/damage, blisters,
pustules.

Contributing factor for Candidiasis: Antibiotics, warm •
moist weather, poor hygiene, tight clothing, diabetes,
pregnancy, immunosuppression.

Treatment: Topical Azole drugs..ketoconazole, miconazole, •
fluconazole, avoid moist.. skin dryness

Lab diagnosis-4

Direct microscopic wet examination of skin scales dissolved in a 10 % KOH & lactophenol cotton blue stain demonstrating the fungus as small Filaments / Yeast like structures.

Culture: Sabouraud Dextrose agar, Incubation at room temperature 25 & 37 C.. Slow growth, 2-6 Weeks for all Dermatophytes..No serological tests

ChromCandida agar.. used for rapid identification of common *Candida species*. Rapid growth 2-3 days.

Treatment : Most skin infections respond very well to topical antifungal drugs .. interact with Ergosterol cell membrane ..causing fungal cell death.. **Azole drugs** miconazole, clotrimazole, ketoconazole, fluconazole, Nystatin topical and oral .