

## **Mycology(fungal diseases): Prof. Dr. Khudair Al-Kayalli .**

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**Fungi : Are typical eukaryotic** cells , representing a distinct Kingdom , estimated 1/4 of a million species , only few are **pathogenic to humans** , or other warm-blooded animals . All fungi are **heterotrophic** and must exist as **saprophytes or parasites** .

The fungi may be broadly divided into **two basic forms , the Moulds and the yeasts.**

**Moulds:** are made up of long multinucleated filaments , called **hyphae** (one is hypha) , which are either **larger coenocytic (a septet)** ,or divided into a series of cells by regular cross walls or septa (septet) , the aggregation of hyphae is termed a **mycelium** , and the whole mass of the fungus is the **thallus , e.g. mushrooms** .

**Yeasts:** the main phase of the life cycle is unicellular , made up of ovoid to globes cell which usually reproduce by budding , or more rarely by fission . Some pathogens can also form filaments that may be true **hyphae** , similar to those of moulds , or **pseudohyphae** which develop when two cells fail to separate after budding .

**Fungi reproduce (multiply)** both sexually (2types) and a sexually (one type) , some time simultaneously . The sexual reproduction involved the fusion of two nuclei followed by meiotic division , usually the fungi are haploid , because diploid phase being relatively short lived .

**According to the level of skin involvement the fungal infections are divided into:-**

1. **Superficial mycosis** – which include diseases that generally do not provoke a significant histopathological inflammatory response in the host e.g. **TV , tinea nigra , black & white piedra** .
2. **Cutaneous mycosis-** which induce pathological changes in the host , although the fungus is confined to the stratum corneum , include : **dermatophytosis , candidiasis , and other non-dermatophyte infections** .
3. **Deep or subcutaneous mycosis** – which involved the dermis and subcutaneous tissues e.g. **sporotrichosis , coccidioidomycosis , actinomycosis** .

**Laboratory methods for diagnosis of superficial and Cutaneous fungal infections are :**

- a. **Direct microscopical observation** of the pathogens in a samples from the affected area . Skin scraping , bulled hairs or nail clipping , the mucosa of the mouth and vagina may be sampled using a blunt scalpel or by using swabs , which also used for sampling of external ear canal . The **collected specimens** are examined by routine direct microscopical examination , after **mounting in 10-30% KOH** , nail specimen required about 30min. before examination , and hair specimens should be examined as soon as possible after mounting .
- b. **Culture – on Sabouraud's dextrose agar** (4% sugar , 1% peptone and acid PH) , or **Emmons's modification** (2% sugar , 1% peptone and a neutral PH) , at 26-28C for 3-4weeks (for moulds) and at 37C for one week for (Candida) .
- c. **Specific identification of fungus – e.g. PCR , Wood's light examination** by UV light of 365nm , which give brilliant green fluorescence in ***M. audouini*** , ***M. canis*** , and pale- green fluorescence of hair in ***T. schoenleinii*** .

## **Pityriasis versicolor (tinea versicolorTV):**

**Definition** – it is a mild chronic infection of the skin caused by ***Malassezia*** yeast , and is characterized by **discrete or concrescent , scaly , discolored or hypopigmented** areas mainly on the upper trunk .

**Aetiology** – it is caused by *Malassezia* yeast, which is a lipophilic normal skin flora. There are at least **seven separate species** of lipophilic yeast exist on the human skin, *Malassezia sympodialis*, *M. globosa*, *M. restricta*, *M. slooffiae*, *M. furfur*, *M. obtuse*, and *M. dermatis*, so the previously known as *M. furfur* therefore probably include a complex of species. There are dense colonization in the scalp, upper trunk and flexures, the *M. globosa* is the species most frequently associated with pityriasis versicolor, and *M. sympodialis* is that found most commonly on normal skin.

TV in most cases represent a shift in the relation between a human and his or her resident yeast flora, in this **shift multiple factors are contributing :-**

1. **Some *Malassizia* species** more readily become mycelial, and have perhaps a slightly greater pathogenic potential.
2. **A positive family history of TV** suggest a genetically determined host-susceptibility, or the greater opportunity for heavy colonization by *Malassizia* species, also defect in cell-mediated immunity.
3. **Transmission from one individual to another is possible.**
4. **TV may be occur in association with other diseases e.g.** seborrheic dermatitis, Cushing's syndrome, malnutrition, pregnancy, contraceptive.
5. **Environmental factors**, like warmth and humidity increases the incidence, and as many as 40% of population in tropical areas had TV.

**Both sexes** affected equally with peak in the early twenties.

**Pathology-** hyperkeratosis, parakeratosis and slight acanthosis, with a mild inflammatory infiltrate in the upper dermis. The **depigmentation**, has been explained on the bases of **dicarboxylic acid** produced by *Malassizia* species (e.g. azaleic acid), causing competitive inhibition of **tyrosinase** and perhaps a direct cytotoxic effect on the hyperactive melanocytes. The explanation for the hyperpigmentation seen in fair-skinned subjects remains obscure, but abnormally **large melanosomes may** be responsible.

**Clinical features-** the chief complain is patchy change of skin colour, but also mild irritation. The primary lesion is a **sharply demarcated, macule, some time slightly erythematous, with fine branny scaling, brown colour or hypopigmented**. Typically the eruption shows large confluent areas, scattered, oval patches and outlying macules, **the sites most commonly affected are; the upper trunk, upper arms, the neck and the abdomen, lesions in the axillae, groin, thighs and genitallia occurs**, and extension down the forearms, on the backs of the hands, popliteal fossae is by no means rare. **Facial and scalp** involvement are well recognized in the tropics, and palmer lesions also have been reported. **The hair shaft, nail or mucous membranes are not attacked by *Malassizia* species**, but recently **pulmonary infections** in infants on long-term intravenous lipid therapy have been reported.

**Diagnosis-** D.D, vitiligo, chloasma, seborrheic dermatitis, pityriasis rosea, 2ry syphilis, pinta and tinea corporis (more inflammatory changes than TV), erythrasma. **Lab. Diagnosis** by direct examination shows coarse mycelium, with spherical thick walled yeast 2-8µm in diameter.

**Treatment** – topical azole antifungal (clotrimazol, miconazol ...), the usual time to recovery is 2-3weeks, **terbinafine 1%cream**.

**Ketoconazole as shampoo 2-3applications**, topical application of 2.5% selenium sulphide (selsun shampoo), left overnight, every other night over 2weeks.

**Oral ketakonazole (nizoral 200mg), a single 400mg dose.**

**Itraconazole (sporonex) 150mg/day for 5days (800-1000mg total).**

**Relapses** is unfortunately very common , whatever the primary treatment . Patients should be warned that repigmentation may take several months , as well as report of treatment failure .

### **Dermatophytosis:**

**Introduction:** is skin infection caused by dermatophytes , which is called ring worm . The dermatophytes are moulds belonging to three asexual genera : *Microsporum* , *Trichophyton* and *Epidermophyton* . Both sexual and asexual states are presented , but sexual states are not routinely seen in the diagnostic laboratory , the asexual anamorph names will be used through out this section .

**The three asexual dermatophyte genera are distinguished by the morphology of the large multicellular macroconidia** that are produced :

- a. *Microsporum* –the macroconidia are **rough** , usually **thick walled** , and range from **fusiform to abovate** in shape , with **1-2 or more septa** *M. canies* .
- b. *Trichophytone*- are thin walled , **smooth** and may be **cylindrical** , **fusiform or clavate in shape** , with **up to 12transvers septa** , *T. mentagrophytes* .
- c. *Epidermatophytone*- the macroconidia is clavate , **broadened and rounded at its distal pole** , **thin walled** , and has **up to 5septa** , e.g. *E. floccosum* .

**Epidemiologically** – dermatophytes are classified into three groups according to the source or origin: a. **Geophilic** – species originating in the **soil** , produce mild but chronic infections , e.g. *M. gypseum* , *M. praecox* .

b. **Zoophilic** – species having **animal origin** , produce highly inflammatory reactions in human , and this may lead to a spontaneous cure , e.g. *M. canis* , *M. equinum* , *T. equinum* , *T. mentagrophytes var-mentagrophytes* , *T. verrucosum* .

c. **Anthropophilic** –species which are largely restricted to human skin , produce mild but chronic infection , e.g. *E. floccosum* , *M. audouini* , *M. ferrugineum* . *T. rubrum* .

**Pathogenesis**- invasion of the epidermis by dermatophyte follows a common pattern , starting with adherence between arthroconidia and keratinocytes , followed by penetration through and between cells and the development of a host response .

### **Clinical forms of ringworm infection:**

The clinical feature of dermatophyte infection result from a combination of **keratin destruction and an inflammatory host response** . The wide variation in **clinical presentation depends upon** : \*size of the inoculums , \*site of body inoculation , \*immune status of the host .

**Clinically , ringworm infection is divided into different types according to the site of the body infected , in terms of diagnosis and management .**

### **Tinea corporis (ringworm of the body , tinea circinata):**

**Definition**- ringworm of non-hairy skin (trunk and limbs) , can be produced by all known dermatophytes .

**Pathogenesis** – natural infection is acquired by the deposition of viable arthrospores or hyphae on the surface of the skin of susceptible individual . The **source of infection** is usually an active lesion on an animal or on other human , although **fomite transmission** is known to occur , and infection from soil is well –established in unusual occurrence . Invasion of the skin at the site of infection is followed by centrifugal spread through the horny layer of epidermis . After this period of establishment (incubation) which last 1-3weeks , the tissue response to infection become evident , the **characteristic annular appearance** of many ringworm

infections result from the elimination of the fungus from the center of the lesion , and the subsequent resolution of the inflammation at the site .

**Clinical features-** the site of infection is typically on exposed skin , unless the infection represents an extension from a pre-existing infection , in such cases , infection may spread from scalp to the neck and upper trunk , or from the groins on to the buttocks and lower trunk . **Characteristic lesions** is **circular , usually sharply margined with a raised edge** , lesion may be single or multiple , **erythematous plaques** , which remain discrete or become confluent . The *T. corporis* is generally less inflammatory than *T. capitis* or *T. barbae* . In **inflammatory T. corporis** , pustules or vesicles may dominate , scaling is a common but not invariable feature of *T. corporis* , which is often incomplete , and may show post –inflammatory pigmentation .

**Diagnosis** – in practice the diagnosis is usually straight forward , but in D.D **seborrhoeic dermatitis** (symmetrical bilateral with scalp involvement) , **psoriasis** , **patches of impetigo** , **lichen simplex chronicus** , **nummular eczema** , **herald patch of PR.** , **candidiasis** , **3ry syphilis** and **TV.**

### **Tinea capitis (ringworm of the scalp , tinea tonsurans) .**

**Definition-** ringworm of the scalp in which the essential feature is invasion of hair by a dermatophyte fungus , it is predominantly an infection of children . **Species** concerned , most species of dermatophyte are capable of invading hair but species (e.g.*M.audouinii* , *T.schoenleinii* and *T.violaccum*) , have a distinct predilection for the hair shaft . *E.floccosum* , *T.concentricum* and *T.mentagrophytes var-interdigitale* are exceptional in apparently never causing tinea capitis .

**Pathogenesis-** there are several **distinct types of hair invasion** that are worthy of note :

1. **Microsporum types** – this may be a small-spored ectothrix , caused by *M.audouinii* , *M.audouinii var-rivalieri* , *M.canis* , *M. canis var-distortum* ---- etc . In this type , the hair shaft is invaded in mid-follicle , the intrapillary hyphae continue to grow inwards toward the hair bulb , secondary extrapillary hyphae burst out and grow in tortuous manner over the surface of the hair shaft , which is growing out words continuously , to produce a mass of small arthroconidia (2-3um in diameter) . This type of hair invasion shows **positive fluorescence Wood's lamp** .
2. **Trichophytone types** – **this** may be large-spored ectothrix (in chains) , caused by *T.verrucosum* , *T. mentagrophytes var-mentagrophytes* , *T.rubrum* (rarely) . The arthroconidia are spherical , arranged in straight chains and again confined to the external surface of the hair shaft , up to 10um in diameter , **no fluorescence** .
3. **The endothrix type** – may be caused by *T. tonsurans* , *T.soudanense* , *T.violaceum* , *T.rubrum* (rare) . In which intrapillary hyphae fragmented into arthroconidia up to 8um in diameter which are entirely contained within and completely fill the hair shaft , so the hair breaks off close to the scalp surface , **it is non-fluorescent** .
4. **The favic type** – is caused by *T.schoenleinii* , broad , regularly septet hyphae and air spaces are seen in the hair shaft , but arthroconidia are absent , the affected hair is less damaged than in other types , **give greenish fluorescence.**

**Clinical features-** the clinical appearance of ringworm of the scalp is most variable , depending on the : **\*type of hair invasion ,\*level of host resistance , \*the degree of inflammatory host response** . The appearance there for may vary from a few dull ,

grey , broken-off hairs , with a little scaling , detectable only on careful inspection , to a sever painful inflammatory mass covering most of the scalp , itching is variable . In all types , the cardinal features are **partial hair loss with inflammation of some degree . The following clinical pictures are described :-**

1. **Small-spored ectothrix type** – in *M.audouinii* and *M. ferrugineum* infections , the basic lesions are patches of partial alopecia , often circular in shape , but showing numerous broken-off hairs , dull grey from their coating of arthrospores . Inflammation is minimal , but fine scaling is characteristic , usually with a fairly sharp margin , the lesion may be single or multiple . In *M.canis* and in the much rare *M.canis var-distortum* infections , the picture is similar but there is typically more inflammatory change , all these types shows **green fluorescence** under the Wood's lamp , but as many as 10% of *M.ferrugineum* is negative fluorescence . This infection is much more frequent in children than adults , and *M.canis* and *M.audouinii* infections are twice high in boys than in girls .
2. **Kerion** – is the most sever pattern of reaction , it is painful inflammatory mass in which such hairs as remain are loose , follicles may be seen discharging pus , there may be sinus formation thick crusting with matting of adjacent hairs is common . The lesions may be limited , but multiple plaques are not rare , and occasionally a large confluent lesion may involve much of the scalp , lymphadenopathy is frequent . Although this violent reaction is usually caused by one of the zoophilic species , typically *T.verrucosum* or *T.mentagrophytes var-mentagrophytes* , occasionally a geophilic and arthrophilic species can cause kerion .
3. **Endothrix infections** – in *T.tonsurans* and *T.violaceum* infections , a relatively non-inflammatory type of patchy baldness occurs formation of black-dots , as the affected hair breaks at the surface of the scalp is classical in this condition . The **patches** are usually multiple , with minimal scaling , some times mimicking DLE or seborrhoeic dermatitis , the outline is angular rather than round . A low-grade folliculitis is often seen , some times a frank kerion may develop , approximately 2-3% of patients have some **nail involvement , or lesions on the face .**
4. **Favus-** is infection with *T.schoenleinii* , characterized by the presence of yellowish cup-shaped crusts known as scutula , each scutulum develops round a hair , which pierces it centrally . Adjacent crusts enlarged to become confluent and form a mass of yellow crusting . **Extensive patchy hair loss** with cicatricial alopecia and atrophy among patches of normal hair may be found in long –standing cases , in such patients , the glabrous skin commonly affected by the development of similar yellowish crusts . It is the disease of childhood with little if any tendency to clear spontaneously at puberty , particularly in women .

**Diagnosis** – clinically DD. From all conditions causing patchy alopecia with inflammatory changes of the scalp , AA , with seborrhoeic dermatitis (exclamation – mark hairs ! ) , traumatic alopecia , trichotillomania , tinea amintacea , psoriasis , impetigo , carbuncle , DLE , LP and other cicatricial alopecia .

#### **Tinea barbae (ringworm of the beard) :**

**Definition-** is a ringworm of the beard and moustache areas of the face with invasion of course hairs , it is thus a disease of **adult males . Tinea of the chin and upper lip in females and children are considered as tinea faciei .**

**Species concerned** – the animal species *T. verrucosum* , and *T. mentagrophytes var. mentagrophytes* are responsible for the great majority of cases , *M. canis* is an uncommon cause (eyelashes) , the anthropophilic species *T. violaceum* , *T. scoenleinii*, *T. megninii* and *T. rubrum* are recognized as occasional causes .

**Pathogenesis-** is similar to *tinea capitis* .

**Clinical features** – the affected men are commonly **farm workers** , in cases caused by the two main species , *T. mentagrophytes var. mentagrophytes* and *T. verrucosum* , the clinical picture is that of a kerion . The less severe form is similar to black dot tinea capitis , consist of dry circular reddish scaly lesions , with black dot .

**Diagnosis-** the classical , highly inflammatory lesions are differentiated from **boils** , **folliculitis** , **acne** , **rosacea** and **pseudofolliculitis** .

### **Tinea faciei (ringworm of the face , tinea faciale) :**

**Definition** – infection of the non-hairy skin of the face with a dermatophyte fungus (excluding the moustache and beard areas of adult males) .

**Species concerned-** *T. mentagrophytes var. mentagrophytes* and *T. rubrum* , predominate by *M. audouinii* and *M. canis* are also common causes worldwide .

**Pathogenesis** – facial skin may be infected either by direct inoculation of a dermatophyte fungus from an external source (e.g. an infected pet mouse) , or there may be secondary spread from pre-existing tinea of another body site .

**Clinical features** – the prime reason for spreading tinea faciei from tinea corporis in this account is to draw attention to the frequency of misdiagnosis in facial ringworm . The clinical features vary considerably , but complaints of itching , burning and exacerbation after sun exposure are common , history of exposure to animals , **erythema is usual** , but scaling is present in fewer than 2/3 of cases , about 1/2 of cases show annular or circinate lesions , and induration with raised margin , simple papular lesions , and a few vesicles or pustules may be found , **modification** of lesions by topical, steroid is frequent as in tinea cruris .

**Diagnosis** – **DLE**, **PLE**, **solar keratosis** , **psoriasis** , **impetigo** , **rosacea** , **seborrheic dermatitis** , and **benign lymphocytic infiltrates** .

### **Tinea pedis (foot ringworm , athletics' ) ;**

**Definition-** infection of the feet or toes with a dermatophyte fungus .

**Species concerned-** three anthropophilic species , *T. rubrum* (60%) , *T. mentagrophytes var. interdigitale* (25%) , and *E. floccosum* (10%) , are together responsible , for the vast majority of cases though the world , 5% of cases shows combination of the 3 species .

**Pathogenesis** – tinea pedis is the most common form of dermatophyte infection all over the world , as a result of occlusion , of the toe clefts through wearing shoes , more common in adults than children (mean age of onset was 15 years) , male :female ratio is 4:1 moist conditions are the most important predisposing factor .

**Clinical features-** the most common form of tenia are :

1. **Intertriginous dermatitis-** characterized by peeling , maceration , and fissuring , to involve the under surface of the toes , this picture may be produced by any of the **three species** , itching is a common complaint in warm weather , the condition is highly persistent .
2. **Squamous hyperkeratotic variety** – is *T. rubrum* infections , which is particularly chronic and resistant to treatment , affecting **soles** , **heels** , and **sides of the feet** , the affected areas are pink and covered by fine silvery white scales . If the foot is extensively involved , the term "**Moccasin foot**", or **dry-**

**type infection** are some time applied , the dorsal surface of the toes and feet are not often affected , but associated nail infection is very common . **Secondary hyperhydrosis** may occur which aggravate the condition , as well as to itching , patient may also complain of bad smell , secondary bacterial infection , with fissuring in the toe clefts , may aggravate symptoms .

3. **Vesico-bullous reaction : which is** caused *T.mentagrophytes var.interdigitale* , the changes varies from mild insignificant scaling in the toe clefts to sever acute inflammatory reaction affecting all parts of the feet , or a **vesico-bullous reaction** is more likely to be caused by this species than to any other condition (fungus) , vesicles may become pustular , where rupture leave collarettes of scaling . Spontaneous cure is frequent , but tend to recur in warm weather .
4. **Combined form** – is caused by *E.floccosum* , apart from mild toe cleft intertrigo , may produce on occasion a **vesicular infection** of the sole similar to that typically produced by *T.mentagrophytes var-interdigitale* or a **dry hyperkeratotic infection** , resembling infections caused by *T.rubrum* , but toe nail involvement is less , and chronicity may be just as troublesome .

**Acute vesicular infection** may be associated with a vesicular allergic reaction (**ide**) , on the uninfected hands .

**Diagnosis-** in DD. Erythrasma , candidiasis , (white maceration) , bacterial infections , soft corns or callosities , juvenile planter dermatitis , psoriasis , PRP , Riter's syndrome .

### **Tinea manuum (ringworm of the hand) :**

**Definition-** any species of dermatophyte may affect the skin of the hand (palmer skin).

**Species concerned-**three anthropophilic species involved in tinea pedis are concerned . *T. rubrum* is the commonest , *E.floccosum* and *T.mentagrophyte var.interdigitale* are involved in small minority of cases .

**Pathogenesis** – in most cases , there is pre-existing foot infection with or without toenail involvement , **rings** , **wrist watches** , **anatomical deformities or occupational usage** , predispose to maceration between fingers , and to the development of tinea manum (predominantly *T.mentagrophytes var. interdigitale*) , which may occur without obvious foot involvement . **Poor peripheral circulation and palmer keratoderma** are other possible predisposing factors .

**Clinical features** – *T.rubrum* may take several different clinical forms , hyperkeratosis of the palms and fingers affecting the skin diffusely , is the most common variety and is unilateral in about half of cases , with accentuation of the flexural areas , is a characteristic feature . **Other clinical variants include :** \***creseptic exfoliating scales** , \***circumscribed vesicular patches** . **Discrete** , red , papular and follicular scaly patches , and erythematous scaly sheets on the dorsal surface of the hands . The **later forms** are more likely to be zoophilic infections .

**Diagnosis- in DD.** Primary ICD , psoriasis , PRP , keratoderma , syphilis , and post-streptococcal peeling , must all be considered , **candidiosis** , **bacterial intertrigo (from web spaces tinea)** .

### **Tinea cruris (ringworm of groin):**

**Definition-** is infection of the groin by a species of dermatophytes , the species are those implicated in **foot ringworm** ,but in different proportions . *T.rubrum* is the main cause , *T.mentagrophytes var.interdigitale* and *E.floccosum* accounts for some cases .

**Pathogenesis-** tinea cruris is a common condition throughout the world , more prevalent in tropical zones , the warm humid conditions are seem to be important , much more common in men than in women . **Autoinfection** from the foot to the groin is important , **sharing of towels** and sports clothing is undoubtedly important (cases with normal toe webs) .

**Clinical features-** itching is a predominant feature , early lesions are **erythematous plaques , curved , with sharp margins** , extending from the groin down the thighs , scaling is variable , vesiculation is rare , but dermal nodules forming beading along the edge are commonly found in older lesions , one or two pustules are often detected. Some **central clearance is usually present but is often** incomplete with nodules scattered throughout the affected area , **satellite lesions** , if present are few in number and relatively large , **spread to scrotum** is common , but scaling is minimal and inflammation is conspicuous . *E.floccosum* infections are clinically indistinguishable from *T.rubrum* infections (chronic more nodular) . *T.mentagrophytes* infections may be **vesicular and inflammatory** . Extension from groins to other sites is common , in *T.rubrum* classically to buttocks , the lower back and the abdomen , the penis occasionally affected .

**Diagnosis-** in differential diagnosis , **candidiasis** is common in women , no distinct raised margin , white pustules are often found , satellite lesions are numerous and small , frayed peeling edge as a result of ruptured tiny pustules . **Pityriasis versicolor and erythrasma** , both are usually non-inflammatory and asymptomatic and rarely shows central clearing , **intertrigo** with heavy bacterial colonization (in obese , both sex , other flexures may be involved) , **seborrhoeic dermatitis , psoriasis , mycosis fungoides , atopic eczema , contact dermatitis , Hailly-hailly disease** .

### **Onychomycosis (ringworm of the nail , tinea unguium):**

**Definition-** invasion of the nail plates by species of dermatophytes , which include :-

1. **With associated foot and hand infections** , *T.rubrum* , *T.menttagrophyte var. interdigitale* , and *E.floccosum* .
2. **With associated scalp infections** , *T.tonsurans* , *T.violaceum* and *T.soudanensei* .

**Pathogenesis** – tinea unguium occurs in all parts of the world , in great majority of cases they are associated with tinea pedis or tinea manuum , and the three species most commonly implicated are there for : *T.rubrum* , *T.mentagrophytes var. interdigitale* and *E.floccosum* . In areas where tinea capitis is common , other species are predominate , which include : *T.tonsurans* , *T.violaceum* , and *T.saudanensei* . Tinea unguium is largely a disease of adults , **poor peripheral circulation , nail trauma and elderly are predisposing factors** .

**Clinical features-** four distinct patterns of tinea unguium have been described :-

1. **Distal and lateral subungual onychomycosis (DLSO):** is the most common pattern of infection , and usually presents as a streak or a patch of discoloration , white or yellow , at the free edge of the nail plate , often near the lateral nail fold . It commonly spreads towards the base of the nail and may occasionally become darker brown or black , the nail plate becomes obviously thickened , and may crack as it is lifted up by the accumulation of soft subungual hyperkeratosis , later on a massive destruction of the nail plate (**total dystrophic onychomycosis , TDO**) , is manifested. Although commonly starting with a single affected nail , other digits later become invaded .



2. **Superficial white onychomycosis (SWO):** is a less common presentation , and can produce a distinct form of nail invasion in which the dorsal surface of the nail plate is eroded in well –circumscribed powdery white patches , often a way from the free edge , the surface of the nail plate may be thus affected , and occasionally this picture may also coexist with deep invasion of the nail plate of ordinary type starting at the free edge . More commonly with *T.mentagrophyte var. interdigitale* but occasionally with *T.rubrum* and *non-dermatophytes* . Toenails are usually affected , but in **AIDS both** toe and finger nails may be affected .
3. **Proximal subungual onychomycosis (PSO):** this pattern is very uncommon , but in the last 10years has become particularly associated with **AIDS** patients . In which rapid invasion of the nail plate from the posterior nail fold may develop to produce a white nail with only marginal increase in thickness , the most common cause is currently , *T.rubrum* , rarely *T.megninii* .
4. **Endonyx onychomycosis :**this is seen with infection caused by dermatophytes that cause **endothrix scalp** infections , notably *T.sondanense* . The nail plate is scarred with pits and lamellar splits , the invasion occurs from the top surface , but penetrates deeply into the nail plate .

**Diagnosis-** in DD. Psoriasis , nail eczema , LP , paronychia , onychogryphosis , (T.unguium usually only one hand is affected .

#### **Steroid modified tinea (tinea incognito):**

**Definition-** is ringworm infections modified by corticosteroid , either systemically or topically prescribed , for some pre-existing pathology or given **mistakenly** for the treatment of misdiagnosed tinea .

**Pathogenesis and clinical features:** the usage of steroid either topically or systemically , may result in modification of the clinical picture of the ringworm by , **suppression of the inflammatory response , suppression of cell-mediated immune response , and increasing susceptibility to that infection** . The degree of modification is often minor in systemic steroid , but pronounced with topical steroids . The usual sites of this problem are the **groins , lower legs , face , hands and elsewhere tinea circinata occurs** .

**The history** is characteristic , the patient is often satisfied initially with the treatment , itching is controlled and the inflammatory signs settle , he or she stop applying the cream , the eruption relapses , with varying rapidity . Further applications bring renewed relief , and the cycles are repeated , in the groins , the patient may develop few **persistent nodules** , which become insuppressible by the steroid preparation .

**Typically** , the raised margin is diminished , scaling is lost , and the inflammation is reduced to a few non-descriptive nodules , often a **bruise-like , brownish discoloration** is seen , especially in the groins , on the **face** , the picture may be modified by superimposed **perioral dermatitis** , with papules and tiny pustules . Steroid-modified **eyelid infection** may closely resemble a sty , with chronic use atrophy , telangiectasia , and in groin and axillae , striae are likely to be observed . The eruption remains localized , but especially in *E.floccosum* infections it spread more widely than one would expect in the unmodified cases .

**Diagnosis-** in the groins , **candidiasis** , must be considered , discontinuation of steroid lead to prominent inflammation and scaling , so scraping is indicated to confirm the clinical diagnosis .

#### **Dermatophytide reactions (Microsporide , Trichophytide -----):**

**Definition-** it is a non-infective cutaneous eruption , representing an allergic response to a distant focus of dermatophyte infections .

**Pathogenesis and criteria-** the essential criteria required for the diagnosis of an ide reaction to a dermatophyte infection are :

1. **proven dermatophyte infection , which usually become highly inflamed before the appearance of the secondary rash .**
2. **A distant eruption , which is demonstrably free of ringworm fungus .**
3. **Spontaneous disappearance of the rash when the ringworm infection settles , with or without treatment .**
4. **Positive skin tests .**

**Clinical features** – the focus of infection is often a **kerion** , for instance caused by *T.verrucosum* , but the species is not important as long as it provokes inflammation , **highly inflammatory tinea pedis** may be insufficient . The main ide reactions are well established :

- a. **A widespread eruption of small follicular papules** , grouped or diffusely scattered , the eruption is symmetrical , usually pronounced on the **trunk** , but in sever cases extending down limbs , even at times covering the face , sometimes the follicular papules are topped by horny spine . The common causes of this type of ide reaction are **a kerion , then inflamed ringworm .**
- b. **A pompholyx –like ide reaction** , affecting the web spaces and palmer surfaces of the fingers , the palm and some times the dorsal surfaces of the hands . This eruption is characteristically associated with an acutely **inflammatory tinea pedis** , the lesions consisted of papules or vesicles , on occasions , bulla or pustules may occur , erythema nodosum seem to be suggested as ide reactions , also EM ,E.annulare and urticaria , on occasions , be manifestations of an allergic reaction to the ringworm infection .

#### **Therapy and management of ringworm infections:**

The treatment of fungal infections is now comparatively straight forward , and cure rates for many forms of dermatophytosis over 90% . In addition to treatment , some other management measures are generally helpful .

The identification of the causative agents is useful , particularly in tinea corporis and tinea capitis , where treatment of an infected animal source is important in order to prevent other infections , also in the case of tinea capitis , it will provide information on the risk of spread to other children at home or in the school . In case of tinea pedis improvement of hygiene in swimming baths may result in lower levels of infection , also use of tolnaftate powder .

**Therapeutic agents are either systemic or topical :**

**Systemic :**

**Terbinafine:** it is a member of the **ally amine** antifungal , newly developed group of drugs , which acts by inhibition of **squalene peroxides** in the formation of the fungal cell membrane , it is fungicidal , given topically or orally , which is rapidly absorbed and taken up into the stratum corneum , and it persist in the nails at high concentrations for several months (these may exceed that minimum inhibitory concentration 80%days after the end of therapy) , **dose 250mg/day** single dose in **onychomycosis , tinea pedis and tinea corporis . Sid effects** , abdominal fullness , nausea , taste loss , rarely hepatic reactions , EM and TEN sy. , (active against dermatophytes and other fungus) .

**Itraconazole (sparonox):** is an orally active **fungistatic** azole of the triazole series . It has similar activity to **ketoconazole** , but with out the risk of hepatotoxicity , it acts through the inhibition of the **cytochrome P-450-dependent demethylation** stage in

the formation of ergosterol on the fungal cell membrane . It is active in vitro against all the main superficial fungal pathogens including *Candida albicans* , as well as a wide rang of fungi that cause deep infections from *Histoplasma capsulatum* to *Penicillium marneffeii* . It rapidly penetrates to the outer stratum corneum and also found in sebum , and in nails for instance , may persist long after cessation of therapy e.g. 200mg/day for 3months , its level in the toenail persist up to 6months . **Doses** : 100mg/day for 15days in tinea corporis , or 30days in tinea pedis , the preferred regimen uses 400mg/day , give as two daily dose of 200mg , in tinea corporis for 1week , tinea pedis for 2weeks , for **onychomycosis** , a regimen of 400mg/day for one week every month for 3months is usually given . It's **absorption is impaired** in the presence of Phenobarbital , it also interacts with all drugs which acts on **cytochrome P-450** , e.g. coumarin anticoagulants , cyclosporine , rifampicin , digoxin , satins and astemazole and terfenadine , with these antihistamines , it cause cardiac arrhythmias . **Side effects** are uncommon and mainly consists of nausea , headache , abdominal discomfort and exceptionally hepatic reactions .

**Griseofulvin** : it is a metabolic product derived from several species of *Penicillium* , which was first isolated from *P. griseofulvum* , it is **fungistatic** , acts only on dermatophyte infections , through inhibition of the formation of **intracellular microtubules** , resistance to griseofulvin is rare . The drug was presented in 2forms , micronized (microcrystalline , smaller particles) , which are better absorbed than macronized (larger particles) . Unlike itraconazol , griseofulvin is not firmly bound to keratin , the usual human regimen is 10mg/kg daily , given in tablet form or solution form for children . The duration of treatment varies between 2-4weeks for tinea corporis , to over one year for onychomycosis of toenails , and 6weeks for tinea capitis . **Drug interaction with Phenobarbital and cumarin anticoagulants occur** . **Side effects** are headaches , nausea are common , but serious side effects have been extremely rare , it may precipitate or exacerbate SLE and porphyries , occasionally urticarial rash and photosensitivity . Terbinafine and itraconazole supressed the use of griseofulvin except in tinea capitis .

**Ketaconazole** : this orally active imidazol is a broad-spectrum antifungal agent , it is an alternative agent for systemic treatment of ringworm , given in dose of 200-400mg/day , with food (for adults) . **Hepatitis** is a proven complication ,occurring in 1/10000 patients , because of this , ketaconazole is reserved for second line therapy , at high dose it may also inhibit androgen biosynthesis , which cause impotence in males .

**Flucanazole**: is an orally active triazole antifungal used for treatment of *Candida* infections and systemic mycosis , however , it also has activity against dermatophyte fungi . It is given in a regimen of 150mg/week for 2-3weeks for tinea corporis and tinea cruris and some what longer for dry type tinea pedis , and also effective in onychomycosis . There are fewer interactions than with itraconazol , and side effects are rare and mainly confined to GIT discomfort , however , drug resistance in *Candida* species have been described .

**Topical agents** : a great variety of topical applications have been used for the treatment of ringworm infections , rarely allergic and irritant contact dermatitis may develop , benzoic **acid compound** , **tolnaftate** , **imidazol and ally amines (terbinafine)** .

**Treatment regimen : the indications of systemic therapy are :-**

1. **Tinea capitis , what ever its type , and tinea barbae .**
2. **Sever and extensive ringworm elsewhere .**
3. **Failure of topical therapies , what ever the type of tinea .**

4. **Systemic mycosis .**
5. **Onychomycosis .**
6. **Under certain circumstances .**
7. **Tinea incognito (steroid modified) .**

**Tinea corporis-** topical therapy 2/day for one month , terbinafine for 2weeks , in sever and extensive infections , systemic itraconazol or terbinafine for 2-3weeks .

**Tinea capitis-** oral griseofulvin 10mg/kg/day for at least 6weeks , but in *T.tonsurans* and *T.schoenleinii* 20mg/kg/day for longer courses , in **kerion** oral steroids and antibiotic are used .

**Tinea barbae-** itraconazol or terbinafine orally alone or in combination with topical therapy over a period of 2-6weeks .

**Tinea faciei-** topical tolnaftate or imidazoles for 3-4weeks .

**Tinea pedis-** topical tolnaftate or imidazol , for 30days , for mild toe cleft and wet infections (terbinafine topically for 1-7days) , with treatment of secondary bacterial infections , and use of wet compresses (e.g. Magenta paint or Castellan's paint) , potassium permanganate sol. , AlCl sol. 20-30% twice/day . In **dry type tinea pedis** terbinafine 250mg/day for 2weeks , or itraconazole 400mg/day for 1-2weeks .

**Tinea cruris-** topical therapy for 2-4weeks (tolnaftate , terbinafine , imidazol) , in **chronic , extensive , sever and steroid modified types** , systemic terbinafine or itraconazole for 1-2weeks .

**Tinea manuum – chronic form** , topical and oral therapy (terbinafine or itraconazole) , for 2-4weeks .

**Onychomycosis- for finger nails** , oral terbinafine 250mg/day for 6weeks , or itraconazole 400mg/day for 1week , given monthly for 2-3months , or griseofulvin for about 4months course is required . For cases of **toenails infections** terbinafine 250mg/day for 3months or itraconazole 400mg/day for 1week , given monthly for 3-4months . **Avulsion of the nail** or removal of the infected areas was indicated (by drill or burr or 40% urea cream under occlusion) , in **oral treatment failure , combination therapy with either terbinafine or itraconazole with amorolfine** , may be more effective than oral therapy alone .

**Steroid modified ringworm** – what ever the site is affected , oral therapy is used , and continue week steroid (1%HC) . for few days .

**Treatment failures** – most of failures of topical therapy are caused by **\*inaccurate diagnosis or \*by inappropriate use of topical therapy** (e.g. hairy areas) or because the treatment is not used .

**Failure of oral therapy** , required the checking of the following points :

1. **Is the diagnosis correct ? repeat the scraping if necessary .**
2. **Has the patient been taking the tablets regularly ?**
3. **Is the patient taking any potentially competitive drugs ?**
4. **Is the patient failing to absorb the drugs , estimate itraconazole .**
5. **Poor penetration of drugs in some patients with onychomycosis .**
6. **Is there coexisting pathology such as arterial diseases .**
7. **Is a co-pathogen or secondary infection present ?**
8. **Antifungal resistance .**
9. **Reinfection .**

If there is no obvious cause of treatment failure , the use of one of the alternative is a logical further step .

### **Candidosis (candidiasis, moniliasis, thrush) :**

**Definition** – it is an infection caused by the yeast *Candida albicans*, or occasionally by other species of *Candida*. There are **superficial infection**, involving the mucous membranes and skin and **systemic mycosis** (septicemia, endocarditis and meningitis).

**Aetiology**- *C. albicans* is an oval yeast 2-6µm in size, which can produce budding cells, pseudohyphae and true hyphae (known as polymorphism). Apart from *C. albicans*, the genus *Candida* includes over 100 species, most of which are neither **commensals nor parasites** of humans, e.g. *C. tropicalis*, *C. dubliniensis*, .....etc), **are** occasional causes of human candidiasis, particularly in AIDS patient.

**Carriers state** – *Candida albicans* is a frequent, but not invariable inhabitant of GIT (47% yeast), the use of antibiotic increases the incidence of carriage state, **vaginal carriers** for *C. albicans* is about 12.7%, pregnancy and oral contraceptive increases the carriers. Generally, neither *C. albicans* nor any other species is a permanent skin flora.

**Pathogenesis**- the following factors are important :-

#### **A. Fungal factors :**

1. **Fungal virulence** – *C. albicans* is the most virulent species, so it is the most common pathogen in skin disease, although increasingly, other species are isolated in vaginal infections and from AIDS patients (e.g. *C. glabrata*).
2. **Production of an acid proteinase by certain strains of *C. albicans***, are also known to increase virulence and pathogenicity.
3. **Production of hyphae may contribute to increase candidal virulence.**
4. **Production of proteinase has also increase the *Candida* adhesions to the epithelial surfaces, as well as to a number of receptor interaction.**
5. **Other factors have been claimed to be important in stimulating mycelium formation –temperatures >35°C, low oxygen tension, liquid media, non-sulphur –containing amino acids, a polysaccharide carbon source, serum and PH 7.5.**

#### **B. Host factors :-**

1. **Very old, very young and very ill individuals are susceptible.**
2. **Poor oral hygiene, food debris -----.**
3. **Diabetic, Sjogren's syn., iron deficiency.**
4. **Local tissue damage facilitates Cutaneous candidiasis.**
5. **Serum factors, e.g. transferring, clumping factor.**
6. **Endocrine factors – DM. Cushing syn., Addison's disease, hyperparathyroidism, hypothyroidism.**
7. **Immunological factors, both cell mediated and humeral immunity are important in the prevention of candidiasis, so immune suppressed individuals are more liable to develop the disease e.g. AIDS, leukemia, steroid therapy and malignancy.**

**Pathology**- the epidermis shows polymorphs inflammatory infiltrate, which may form micro abscesses or sub corneal pustules, with splitting of the epidermis. Dermis shows mixed inflammatory infiltrate of lymphocyte, plasma cells and histiocytes, in chronic cases, there is parakeratosis, acanthosis of epidermis, with mixed chronic inflammatory infiltrate in the dermis.

### **Clinical syndromes of candidiasis :**

#### **Oral candidiasis :**

1. **Acute pseudo membranous candidiasis (APC) (oral thrush):**

The lesion consists of a sharply defined patch of creamy, crumbly, curd-like white pseudo membrane, which when removed, leaves an underlying erythematous base. There may be one or many patches, seen in buccal mucosa, gums or the palate, the tongue may be affected in immunocompromised patients. In severe cases, extension to the pharynx or the esophagus may occur, erosion and ulceration are occasional complications. The condition occurs most commonly in the first weeks of life, and the preterm infant may be especially susceptible, APC may present in adult with neutropenia or those with AIDS, in both cases, the lesions are often erosive with severe symptoms resulting in inadequate food intake because of pain, and extension of lesions to the buccal mucosa, tongue and esophagus is common. Coincident oral herpes simplex may occur in both groups.

**2. Acute erythematous candidiasis (acute atrophic oral candidiasis) (AEC).**

There is marked soreness and denuded atrophic erythematous mucous membranes, particularly on the dorsum of the tongue. It may follow APC. It is especially associated with antibiotic therapy, but may also develop in HIV-positive subjects.

**3. Chronic pseudo membranous candidiasis (CPC).** clinically similar to the APC, but the lesions are very persistent it occurs principally in immunocompromised patients.

**4. Chronic erythematous candidiasis (chronic atrophic candidiasis) CEC.** It is called denture sore or denture stomatitis, there is soreness in the epithelium of the denture-bearing area. The affected areas show a variable bright red or dusky erythema, fairly sharply defined at the margin of the denture, oedema with epithelial atrophy, and angular cheilitis, female > male, all patients are fit.

**5. Chronic plaque-like candidiasis (Candida leukoplakia).**

The lesions consisted of very persistent, firm, irregular white plaques occurs in the mouth, commonly on the cheek or the tongue, most patients are male, over the age of 30 years, only slight soreness and roughness being noticed, around the hyperplastic area, may be a margin of erythema, this plaque cannot be easily removed unlike APC, smoking appear to be a predisposing factor, there is a risk of malignant changes.

**6. Angular cheilitis (angular stomatitis, perleche).**

Soreness at the angles of the mouth extending outwards in the folds of the facial skin, not always associated with Candida infection. It is perhaps best considered as an intertrigo in which different organisms may play a part, Candida being the most common. Nutritional status and mechanical factors (e.g. depth of folds), moisture from persistent salivation or licking the lips may also be important. Usually there is a long history of soreness and cracking at the angles of the mouth, Candida carriage is frequent (mouth) or denture stomatitis.

**Candidiasis of the skin and genital mucous membranes:**

These are most commonly occurs as a result of abnormally moist conditions, due to occlusion from clothing or medical dressing, or as a result of contamination of areas close to the body orifices and the fingers with saliva, these **include:**

- 1. Candidal intertrigo (flexural candidiasis):** any skin fold may be affected, especially in obese subject, signs are typically **erythema** and a little moist exudation starting deep in the fold. As the condition develops, it spreads beyond the area of contact, forming the typical fringed irregular edge of candidiasis, with sub corneal pustules, rupturing to give tiny erosions, and then further peeling of the stratum corneum. **Satellite pustules or papules** are classical, soreness, and itching, which may on occasions be intense. **Topical**

steroids may modify the inflammatory signs and cause diagnostic confusion , involvement of the **web spaces** results in marked maceration with a thick white horny layer . In the case of the **hands** , some abnormality , including wide fatty fingers , appears to predispose to infection , in the particular syndrome , often known as **erosio interdigitalis blastomycetica or interdigital candidiasis** , in which Candida and Gram-negative bacteria are often co-pathogens . **Macerated skin** under rings and dressing may become infected with Candida . In the **DD. tinea** , seborrhoeic dermatitis , bacterial intertrigo , flexural psoriasis , Hailey-Hailey disease and flexural Darier's disease are included .

2. **Vulvovaginitis (vulvovaginal thrush)** : it is a common condition seen in women , presents with itching , soreness and thick creamy white discharge , most of them have no evidence of under lying disease . It is more common in **pregnancy** , and in non-pregnant , it is said to be more prevalent in the premenstrual time . Although largely confined to sexually active subjects , it has been described in childhood , sexually inexperienced and elderly people . **Typically , there is dusky red erythema** of the vaginal mucosa and the vulval skin , with **curdy , white flecks of discharge** , but occasionally the only sign is erythema , the rash may extend onto the perineum and into the groins , the perianal area is often involved . In extensive cases , sub corneal pustules may be seen peripherally , in **pregnancy** the picture is modified by marked physiological leucorrhoea . The disease may recur and some it appears to be a chronic condition , in which the vaginal mucosa may become glazed and atrophic , with considerable vaginal soreness or irritation as well as dyspareunia . Vaginal candidiasis increased infrequency in women with AIDS , but not always as seen in oral candidiasis . In **DD. trichomonosis** (watery brown discharge) , **bacterial vulvovaginitis** , **physiological leucorrhoea** , **psoriasis** , **contact dermatitis** , **lichen sclerosis** .
3. **Candidal balanitis** : the skin of glans penis , especially in the uncircumcised , may some –times be colonized by Candida asymptotically . **When** Candida balanitis develops , it is usually to find either abundant vaginal Candida carriage or frank vulvovaginitis in the sexual partner . In the **\*mildest cases** , transient , tiny papules or pustules develops on the glans penis a few hours after intercourse , and rupture , leaving a peeling edge , it is usually associated with a little soreness and irritation , some cases may settle spontaneously , and in some the condition continues in intermittent form . In more **\*sever form** and chronic **cases** the inflammatory changes become persistent over the glans and the prepuce , and may involve the groins . In **DD. herpes simplex** , **psoriasis** , **LP** , **balanitis circinatae of Reiter's disease** , **erythroplasia and Lichen sclerosis** , the diagnosis is confirmed by isolation of Candida .
4. **Perianal and scrotal candidiasis** : this may occur with or with out genital involvement , usually starting around the anal margin as non-specific erythema , soreness and irritation , and subsequently spread along the natal cleft , with involvement of the scrotum , in the form of a non-descriptive erythema and subcorneal pustules are rarely seen .
5. **Napkin candidiasis (diaper candidiasis)** : *C. albicans* is commonly isolated from the moist skin of the buttocks and genitalia of the infants , but is more prevalent where the skin is affected by napkin rash . The **classical sub corneal pustules** , **a fringed irregular border and satellite lesions** are found .

**Topical steroids** and antibiotics may modify the clinical features . In **DD. napkin contact dermatitis , acrodermatitis enteropathica .**

- 6. Nodular or granulomatous candidiasis of the napkin area (infantile gluteale granuloma) :** the clinical picture is that of a napkin eruption over the buttocks , genitalia , upper thighs and pubis , with in which develop nodules , some times as large as 2CM across , bluish or brownish in colour , resemble **Kaposi's sarcoma** . The primary napkin dermatitis may clear leaving only the nodules , some examples have marked scaling and hyperkeratosis over the lesions , in others the epidermis appears to be normal , topical **steroids** are important predisposing factor .

### **Candidal paronychia:**

**Definition and aetiology** - it is inflammation of the nail folds , may be caused by Candida species , not always *C. albicans* , can be isolated from the majority of the cases of chronic paronychia . The **yeast** is thought to have an aetiological role in this condition , but **bacteria and irritant or allergic contact dermatitis** also play a part . The condition is chiefly found among those whose hands are frequently immersed in water , but in chefs and pastry cooks , the presence of organic debris such as flour and other carbohydrates may be equally important , **toenail folds** are not usually affected . **Clinical features-** typically , several fingers are chronically infected , but one or all may be involved , the nail fold is red and swollen and there is loss of cuticle , and detachment of the nail fold from the dorsal surface of the nail plate , leading to pocketing . Occasionally , thick white pus may discharge , usually the patient has marked tenderness , and pain . **Nail dystrophy with** nail buckling of the nail plate and some discoloration and onycholysis around the lateral nail fold , frequently occur , rarely massive nail plate destruction is seen .

### **Onychomycosis resulting from Candida :**

**There are 3 main manifestations of Candida infection of the nail apparatus :**

- 1. Distal and lateral subungual onychomycosis (DLSD)** – is the most common type , associated with paronychia . It may be associated with erosion of the distal & lateral nail plate of the finger nails , which may progress to total nail dystrophy , by invasion with *C. albicans* , **seen most** in women , with two important predisposing conditions (**Raynaud's phenomenon or disease , and Cushing's syndrome**) . **These** cases respond well to and completely to oral antifungal e.g. itraconazole .
- 2. Complete destruction of nail plate** – seen in chronic muco-cutaneous candidiasis .
- 3. Superficial white onychomycosis (SWD)** – very rarely Candida may invade the nail plate in the neonatal period , sometimes causing an isolated nail dystrophy , with evidence of penetration of the superior aspect of the nail plate (SWO) by Candida .
- 4. Candida is not infrequently presented as secondary invader** , in the undersurface of nail plate in patients with onycholysis resulting from other causes , these conditions are not respond to antifungal therapy e.g. psoriasis . In **DD. dermatophyte onychomycosis** , chronic paronychia due to other causes.

### **Congenital candidiasis :**

This represents established candidiasis , usually of the skin and birth membranes (mucosa) , present at the time of birth , and following intrauterine infection , it is quite



distinct from oral thrush of the neonate , in which the Candida is acquired at very earliest , from the birth canal during delivery . The predisposing factors are **prematurity , intrauterine contraceptive device .**

**Clinical features** – the amniotic fluid is often turbid at delivery , the skin lesions are usually present at birth , which consists typically of discrete vesicles or pustules on an erythematous base , start on the face and chest , than become generalized over the next few days , 10% spread to deep tissues like lungs , with high mortality rate .

**Candida allergy-** both humoral and cellular immune-response are evident to *C. albicans* and other *Candida* species . A variety of clinical conditions may develop as a Candida allergy e.g. urticaria , annular erythema both ordinary and bullous type , generalized pruritis , candidide .

### **Chronic mucocutaneous candidiasis (CMC) :**

**Definition-** persistent candidal infection of the mouth , skin and the nails , refractory to conventional topical therapy , occurring as a more or less isolated feature , sometimes it is associated with a variety of other infections , both Cutaneous and systemic e.g. primary defect in immune function .

**Clinical features-** the syndrome consists of the following features , usually starting in infancy or early childhood :

- a. **Persistent oral thrush** , partially responding to conventional therapy , relapsing disease .
- b. **Cutaneous candidiasis** – of different clinical infection (described) .
- c. **Paronychia** – with total dystrophic onychomycosis (all nails) .

**Patients** with CMC are liable to develop other infections e.g. warts , dermatophytosis , recurrent aphthous ulcers , seborrhoeic dermatitis and alopecia areata .

**According to the aetiology CMC is divided in to the following types :-**

1. **Autosomal recessive CMC , usually start in the** first decade , with persistent oral and nail plate infections , good general health , no endocrine defects , improve with increasing age .
2. **Autosomal dominant CMC** , more sever than recessive type , other infections , such as dermatophytosis may be particularly troublesome .
3. **Idopathic CMC , it is called** diffuse CMC , in children , no evidence of genetic predisposition , sever form , with systemic involvement , e.g. bronchiectasis , pulmonary bullae , esophageal granulomas , skin lesions consist of hyperkeratosis plaques of the skin and scalp , there are a defective function of the neutrophils .
4. **CMC associated with endocrinopathy** , this is usually seen in early childhood , have familial polyendocrinopathy syndrome , autoimmune disease , mainly hyperparathyroidism , hypoadrenocorticalism , pernicious anemia , vitiligo and ovarian failure . It is inherited as Autosomal recessive condition , a further group of CMC with associated hypothyroidism , as Autosomal dominant .
5. **Late onset CMC** –seen in adult patients , with thymoma , SLE .

**Diagnosis** – *of all* types of candidiasis , is by clinical criteria and laboratory isolation of Candida yeast (hyphae and pseudohyphae) , there is possibility of development of dermatophytosis (chronic) .

**Treatment-**

**General principles** – including the precipitating factors and associated diseases .

**Therapeutic agents :**

1. **Polyene antibiotics** – amphotericin , nystatin , and natamycin , all used topically except amphotericin is used as IV. Infusion , when given orally only 5-10% is absorbed , resistance by *C. albicans* develops very rarely , also contact allergy rarely seen .
2. **Imidazol-** clotrimazole , miconazole , and econazole are the best known , used topically , no resistance , but contact allergy is reported .
3. **Triazoles** – fluconazole (100-400mg/day) , and itraconazole (100-200mg/day) , or ketaconazole (200mgday) , all are given orally .

**Oral candidiasis** – in infants , oral suspension of nystatin , amphotericin or miconazole gel , applied several times daily , in adults , remove the dentures , regular amphotericin lozenges , nystatin or amphotericin tab. Or suspension for 10-14days ., fluconazole 100-200mg/day , itraconazole 100-200mg/day ketakonazole 200-400mg/day is alternative .

**Genital candidiasis – vulvovaginitis** – single dose of topical preparation of clotrimazole , econazole , isoconazole (as **pessary or ovule**) , or longer course for e.g.14days . **Oral** fluconazole 150mg as single dose , or itraconazole 600mg also single dose . For **balanitis –topical therapy is sufficient** .

**Flexural & napkin candidiasis** – topical azoles or polyene creams for 2weeks .

**Paronychia and onychomycosis** – topical polyenes , imidazol , systemic itraconazole or fluconazole .

**Congenital candidiasis- by topical therapy of skin lesion and systemic amphotericin B or fluconazole for systemic infections .**

**CMC-** transfer factor or thymosin , lymphocyte grafting from blood or marrow , to restore T-cell function . Systemic anti –Candida with fluconazole , itraconazole or ketaconazole for prolonged and repeated course , also treatment of dermatophytosis if present by itraconazole or terbinafine .