Methodic elaboration for practical lesson in

Dermatovenerology

for students of Medicine Faculty nr.2

Topic N4

FUNGAL DISEASES

Fungal infection can be superficial, subcutaneous, or systemic, depending on characteristics of the organisms and of the host.

Fungal infection in humans is common and mainly due to two groups of fungi:

- Dermatophytes: multicellular filaments or hyphae;
- Yeasts: unicellular forms that replicate by budding.

Dermatophytes

The dermatophytes are a group of taxonomically related fungi. Their ability to form molecular attachments to keratin and use it as a source of nutrients allows them to colonize keratinized tissues, including the stratum corneum of the epidermis, hairs, nails, and the horny tissues of animals.

Epidemiology

Numerous ways of classifying superficial fungi exists, including habitat and pattern of infection.

Anthropophilic ("man-loving") species have adapted to humans as hosts. Unlike the sporadic geophilic and zoophilic infections, anthropophilic infections are often epidemic in nature. They are transmitted from person to person via direct contact or fomites. Infections with these species can vary from asymptomatic to markedly inflammatory due to variability in virulence as well as host susceptibility. Host variability also affects presentation.

Zoophilic ("animal-loving") species are usually found on animals, but are also transmitted to humans. Domestic animals and pets are common source of these infections in urban areas. Transmission may occur through direct contact with a specific animal species or indirectly when infected animal hair is carried on clothing or present in contaminated buildings or feed. Exposed areas such as the scalp, beard, face and arms are favored sites of infection. Inflammatory dermatophytes are most commonly produced by zoophilic dermatophytes.

Geophilic "earth-loving" organisms originate in the soil and only sporadically infect humans, usually by direct contact with the soil. These infections are usually spread by the spores, which can live for years in blankets and grooming tools. Infections produced by these organisms are usually inflammatory. Strains of *Microsporumgypseum,* the most common geophilic pathogen cultured from humans.

Pathogenesis

Dermatophytes can survive solely off of human stratum corneum, which provides a source of nutrition for the dermatophytes and for growing fungal mycelia. Dermatophyte infections involve three main steps: adherence to keratinocytes, penetration through and between cells, and the development of a host response.

Adherence Superficial fungi must overcome several obstacles in order for the arthroconidia, the infectious element, to adhere to keratinized tissue. They must resist

the effects of ultraviolet light, variation in temperature and moisture, competition from normal flora, and sphingosines produced by keratinocytes. Fatty acids produced by sebaceous glands are fungistatic. The presence of these fatty acids is postpubertal children may account for the dramatic decrease in tinea capitis infections after puberty.

Penetration After adherence, spores must germinate and penetrate the stratum corneum at rate faster than desquamation. Penetration is accomplished by the secretion of proteinases, lipases, and mucinolytic enzymes, which always provide nutrients to the fungi. Trauma and maceration also facilitate penetration and the important factors in the pathogenesis of tinea pedis. Fungal mannans in the cell wall of dermatophytes may also decrease the rate of keratinocyte proliferation.

Development of a host responseThe degree of inflammation is influenced both by the patient's immune status and by the organism involved. Immune detection and chemotaxis of inflammatory cells may occur through several mechanisms:

- Some fungi produce low-molecule-weight chemotactic factors much like those produced by bacteria
- Others activate complement via the alternative pathway, creating complement – derived chemotactic factors
- Alternatively, type IV, or delayed-type hypersensitivity (DTH), plays a pivotal role in combating dermatophytoses; in patients without previous exposure to a dermatophyte, primary infection causes minimal inflammation (mild erythema and scale); it's hypothesized that dermatophyte antigen is then processed by epidermal Langherhans cells and presented in local lymph nodes to T lymphocytes; the T lymphocytes undergo clonal proliferation and migrate to the infected site to attack the fungus; at this time, the lesion becomes abruptly inflammatory, and the epidermal barrier becomes permeable to the migrating cells; soon, the fungus is cleared, and the lesion spontaneously resolves.

Diagnostic procedures

A clinical diagnosis of a dermatophyte infection can be confirmed by microscopic evaluation or culture. Although microscopic evaluation can provide evidence of fungal infection within minutes, it does not often allow for speciation or for identification of the susceptibility profile of the infectious agent. Microscopic evaluation may also yield false-negative results, and fungal culture should be performed when a dermatophyte infection is suspected clinically.

Microscopic examination

Hair must be plucked, not cut, put on a microscopic slide with 10 percent to 20 percent potassium hydroxide (KOH), covered with a coverslip and slightly warmed. Low-power microscopy will reveal two possible patterns of infection:

- Ectothrix – small or large arthroconidia forming a sheath around the hair shaft or
- Endothrix – arthroconidia within the hair shaft.

Skin and nails

Skin samples should be taken by scraping with the dull edge of a scalpel outward from the advancing margins of a lesion.

Nail specimens must include clippings of the entire thickness of dystrophic areas of nail, as proximal from the distal edge as possible.

In a 10 percent to 20 percent KOH preparation, dermatophytes have septate and branching hyphae without constriction.

Culture procedures

Speciation of superficial fungi is based on the macroscopic, microscopic and metabolic characteristics of the organism. Sabouraud's dextrose agar (SDA) is the most commonly used isolation medium and serves as the basis for most morphologic descriptions.

Dermatophytoses

Tinea capitis is a dermatophytoses of the scalp and associated hair. It may be caused by any pathogenic dermatophyte from the genera *Trichophyton* and *Microsporum*. The most common cause worldwide is *M.canis*.

Epidemiology the incidence of tinea capitis remains unknown, but it is most commonly found in children aged 3 to 14 years old. It is uncommon in adults. Transmission is increased with decreased personal hygiene, overcrowding, and low socioeconomic status. Even after shedding, hairs may harbor infectious organisms for more than 1 year. Asymptomatic carriers are common, making tinea capitis difficult to eradicate.

Pathogenesis

Ectothrix dermatophytes typically establish infection in the perifollicular stratum corneum, spreading around and into the hair shaft of mid- to – late – anagen hairs before descending into the follicle to penetrate the cortex of the hair. Arthroconidia then reach the cortex of the hair and are transported upward on its surface. Microscopically, only the ectothrix arthroconidia may be visualized on plucked hairs, although intapilary hyphae are present as well.

The pathogenesis of endothrix infections is the same except that arthroconidia remain within the hair shaft, replacing the intrapilary keratin, and leaving the cortex intact. As a result, the hair is very fragile and breaks at the surface of the scalp where

support from the follicular wall is lost, leaving behind a tiny black dot. Thus, "black dot" tinea capitis is observed.

Clinical findings

The clinical appearance of tinea capitis depends on its etiology.

Microsporia

- Zoophilic form – erythematous plaques, less in number, 2-3 foci, about 3-5 cm in diameter, round, well-defined, covered with scales; hair shafts are broken at the 5-8 mm above the skin;
- Anthropophilic form – multiple and small plaques, non-evident desquamation, hair shaft are broken not uniform at 5-8 mm above the skin.

Trichophytoses

Inflammatory zooanthropophilic form (KerionCelsi)

- It's an inflammatory, deep, purulent infection;
- It evaluates in 3 phases: erythematous, infiltrative and with follicular **abscess (pseudotumoral);**
- It is manifested by painful, round or oval, single nodule fluctuant on palpation; if pressure is applied on the surface, pus will be discharged together with hair shaft from every hair follicle in part (honey-comb sign);
- In children –it's called tinea facies, in male adults – tinea barbae or parasitic sycosis;
- The evolution with scarring alopecia is usually.

Anthropophilic form

- Squamous form: small and multiple erythematous plaques, covered with fine, adherent scales; hair shafts are broken at 1-3 mm above the skin; evolution with spontaneous healing after puberty;
- "Black dots" (chronic) form: especially in women disease continue to evaluate through lifetime, giving rise to a chronic trichophytoses of an adult – black dots, atrophic foci and discrete desquamation on the scalp;

Tinea favosa or favus

Favus is a chronic dermatophyte infection of the scalp, glabrous skin and nails characterized by thick yellow crusts (scutula) within the hair follicles, which lead to scarring alopecia.

Scalp lesions

- *Classic type (with scutula):* is characterized by the presence of yellowish cup-shaped structures that develops round grey, lusterless hairs; if adjacent scutula become confluent, form a yellow mass; extensive patch hair loss with scarring alopecia and atrophy may be

found in long standing cases, but the peripheral hair of the scalp is resistant to infection;

- Other types (without scutula) are: *pitiriasiform* with diffuse scaling of the scalp, *impetigoid* with yellow crusts, *cicatricial* with diffuse scarring alopecia.

Laboratory diagnosis in tinea capitis

- direct microscopic examination of the hairs, after clearing with 10 to 20 potassium hydroxide solution:
  - Microsporia: intrapilary hyphae and a mass of small rounded arthrospores ectothrix;
  - Black-dote type: arthrospores within the hair shaft (endothrix);
  - Kerion: large spherical arthrospores in chains, ectothrix;
  - Favus: broad hyphae and air spaces in the hair shaft (endothrix);
- Culture on Sabouraud's medium:
  - Microsporia: Microsporum, anthropophilic or zoophilic species;
  - Black-dote type: Trichophyton, anthropophilic species;
  - Kerion: Trichophyton, zoophilic and geophilic species;
  - Favus: Trichophyton, an anthropophilic and a zoophilic species;
- Wood's lamp examination: may appear a characteristic fluorescence in ultraviolet light filtered by Wood's glass (325 to 400 nm), caused by pteridine. Is positive in microsporia (brilliant green fluorescence of infected hair) and favus (paler green fluorescence).

Differential diagnosis in tinea capitis:

- Pityriasis simplex of the scalp (dandurff): diffuse scaling, with normal hair;
- Seborrheic dermatitis: erythema and greasy scales, with normal hair;
- Psoriasis of the scalp: erythema and scaling in plaques, the hair is normal;
- Alopecia areata: hair loss in patches, without erythema, exclamation point hairs at periphery of patches are present;
- Carbuncle: more painful than Kerion; occasionally there is a hair loss.

Treatment in tinea capitis

- Systemic antifungal agents:
  - Griseofulvin microcrystalline or ultramicronized: is fungistatic and is administrated oral, 15-25 mg/kg/daily for 6 to 8 weeks taken with a fatty meal to facilitate absorption; side effects are: headaches, photosensitivity, allergic rashes, digestive complaints et al.;

- Itraconazole a triazole: is fungistatic and fungicidal , administrated orally, 3-5 mg/kg/day, for 4 to 8 weeks; side effects: gastrointestinal upset, diarrhea, peripheral edema, hepatotoxicity;
- Terbinafine an allylamine: is a fungistatic and fungicidal, doses 3 to 6 mg/kg/day can cure tinea capitis in 4 to 8 weeks;

- Topical therapy:
  - Classical: benzoic and salicylic acids ointment (Whitfield's ointment);
  - Modern: imidazoles (Clotrimazole, Ketoconazole), allylamines (Terbinafine, Naftifine), tolnaftate, cyclopiroxolamine - cream, lotion, spray, shampoo;
  - The clipping of the hair is also necessary.

Tinea corporis (Tinea circinata)

Tinea corporis refers to all dermatophytoses of glabrous skin except palms, soles and groin.

Epidemiology The disease can be transmitted directly from infected humans or animals, via fomites, or via autoinoculation from reservoirs such as *T. rubrum* colonization of the feet. Children are more likely to contract zoophilic pathogens, especially *M.canis* from dogs and cats. Occlusive clothing and a warm, humid climate are associated with more frequent and severe eruptions creating an environment in which dermatophytoses flourish.

Etiology Although any dermatophyte can cause tinea corporis, the most common cause is *T.rubrum*. *T.mentagrophytes*, *M.canis* and *T.tonsurans* are also common pathogens.

Clinical findings The classic presentation is an annular lesion with scale across the entire erythematous border. The border is often vesicular and advances centrifugally. The center of the lesion is usually scaly but may exhibit clearing. Lesions may be serpiginous and annular ("ring-worm" like).

Differential diagnosis in tinea corporis:

- numullar eczema: erythematous, coin-shaped plaques, 1 to 10 cm in diameter, studded by pinpoint vesicles; lesions sometime clear centrally; pruritus is present;
- erythema annulare centrifugum: annular or polycyclic erythematous plaques, that slowly enlarge or migrate;
- psoriasis: erythematous, well circumscribed plaques, with thick scales, without active margin;

- seborrheic dermatitis: erythematous plaques with greasy scales, sharply marginated, nonpruritic, in areas with a rich supply of sebaceous glands.

Tinea cruris

Tinea cruris is a common dermatophytoses of the groin, genitalia, pubic area, perineal and perianal skin. The designation is a misnomer, because in Latin "cruris" means of the leg. It is the second - most common dermatophytosis worldwide.

Epidemiology Much like tinea corporis, tinea cruris spreads via direct contact or fomites, and is exacerbated by occlusion and warm, moist climates. It is three times more common in men than in women, and adults are affected more commonly than children. Autoinfection from distant reservoirs such as tinea pedis caused by *T.rubrum* or *T. mentagrophytes* is common.

Etiology Most tinea cruris is caused by T. rubrum and Epidermophyton floccosum, with the later being most often responsible for epidemics.

Clinical findings Tinea cruris usually appears as multiple erythematous papulovesicles with a well-marginated, raised border. Pruritus is common, as is pain with maceration or secondary infection. *E.flocossum* tinea cruris is more likely to display central clearing, and is most often limited to the genitocrural crease and the medial upper thigh. In contrast, *T.rubrum* infections are often coalescent with extension to the pubic, perianal, buttock, and lower abdominal areas. The genitalia are typically unaffected.

Differential diagnosis in tinea cruris:

- candida intertrigo: erythema, maceration deep in the fold, pustules at periphery after rupture become erosions surrounded by scales;
- bacterial intertrigo: erythema, bullae at periphery, erosions and exudation;
- erythrasma: brown, well demarcated plaques, with the scale, itching may occur.

Tinea pedis and Tinea manus

Tinea pedis is a dermatophytosis of the feet, whereas tinea manus affects the palmar and interdigital areas of the hand.

Epidemiology Present worldwide, tinea pedis and tinea manus are the most common dermatophytoses. The prevalence of tinea pedis is approximately 10 percent, primarily attributable to modern occlusive footwear. The incidence of tinea pedis is higher among those using communal bath, showers, or pools. Tinea manus may be acquired by direct contact with an infected person or animal, the soil, or autoinoculation. However, it is nearly

always associated with tinea pedis and occurs most commonly in the hand used to excoriate the feet.

Etiology Tinea pedis and tinea manus are caused predominantly by *T.rubrum* (most common), *T.mentagrophytes* and *E.floccosum*.

Clinical findings

Tinea pedis (Athlete's foot):

- intertriginous type: with erythema, scaling, maceration and fissuring in the interdigital or subdigital areas. The lateral toe webs (4^{th} to 5^{th} or 3^{rd} to 4^{th}) are the most common sites of infection; the lesions may spread to the sole, seldom involves the dorsum of the foot; itching and burning are present;
- vesicular or vesiculobullous type: erythema, small vesicles and vesiculopustules; after rupture they leave collarettes of scaling; the localization is habitually near the instep and on the mid-anterior plantar surface; larger bullae can be seen; itching is present;
- squamous hyperkeratotic type: minimal inflammation and patchy or diffuse moccasin-like scaling over the soles; fissures by dryness and the pain are present;
- acute ulcerative variant: maceration, weeping, denudation and ulceration of great areas of the sole; a specific odor is present.

Tinea manus:

- common type: hyperkeratosis of the palms and fingers, affecting the skin diffusely; is unilateral in half of cases;
- other clinical types: vesicular, with erythematous and scaly patches on the dorsum of the hand.

Differential diagnosis in tinea pedis and manus:

- eczema: erythema, vesicle, erosions, exudation and pruritus in the toe webs;
- dyshidrosis: an eruption of tense, deep seated, pruritic vesicles on the sides and volar aspects of the palms, soles and digits;
- psoriasis vulgaris: erythematous and scaly plaques, well defined, on the palms and soles.

Laboratory findings in dermatophytosis of glabrous skin:

- direct microscopic examination of the scales, taken from the advancing margins of the lesion by scraping; clearing with 10 to 20 % KOH (dissolve the keratin in the cells of the host, but not the fungal hyphae); a positive result is evidentiated by septate and branching hyphae elements;
- culture on Sabouraud's medium to identify the species.

Treatment

Systemic treatment: in widespread infections, in long-staging manifestations, resistant to topical therapy:

- Griseofulvin – in adults 500 mg daily; in children 15 to 25 mg/kg/day 4 weeks or more;
- Itraconazole – in adults 100 mg daily for 15 days; in children – 5mg/kg/day for 1 week;
- Terbinafine – in adults 250 mg daily for 2 weeks; in children 3 to 6 mg/kg/day for 2 weeks.

Topical treatment:

- Classical: benzoic and salicylic acid ointment, Castellani's paint, potassium permanganate solution;
- Modern: imidazoles (Clotrimazole cream 1%, Ketoconazole cream 2%, Isoconazole cream 1%); allylamines (Naftifine cream 1%, Terbinafine cream 1%).

Onychomycosis

Onychomycosis denotes any infection of the nail caused by dermatophyte fungi, nondermatophyte fungi, or yeasts. *Tinea unguium*, however, refers strictly to dermatophyte infection of the nail plate. Onychomycosis is the most prevalent nail disease and accounts for approximately 50 percent of all onychopaties.

Epidemiology Onychomycosis is a common infection, with a prevalence estimated in population – based studies at 2 percent to 8 percent, which is likely an underestimate. The increasing prevalence of this disease may be secondary to tight shoes, increasing numbers of immunosuppressed individuals, and increased use of communal locker rooms. The dermatophytoses commonly begins as tinea pedis before extending to the nail bed, where eradication is more difficult. This site then serves as a reservoir for recurrent skin infections, particularly in the setting of a hot and humid environment created by occlusion or tropical climates.

Etiology The dermatophytes cause the great majority of onychomycosis. *T. rubrum* is responsible for approximately 71 percent of all tinea unguium cases, and *T.mentagrophytes* adds another 20 percent. Yeasts are the source of approximately 5 percent of onychomycosis, the majority of which is caused by *Candida albicans*. The nondermatophyte molds *Aspergillus, Scopulariopsis, Scytalidium* account for approximately 4 percent of onychomycosis.

Clinical findings

There are three clinical presentations of onychomycosis due to dermatophytes:

- distal subungual onychomycosis: initially is a streak or a patch of yellow – brown or white discoloration at the free edge of the nail plate or near the lateral nail fold, by a subungual hyperkeratosis; progression produces separation of the nail plate from the nail bed; the nail plate is invaded by fungi from the ventral surface, becomes thickened and may crack; the infection spreads towards the base of the nail; a gross invasion may lead to destruction of the nail plate;
- white superficial onychomycosis: appear white, sharply demarcated areas on the surface of the toe nails; the surface of the nail plate becomes rough, crumbly and friable; in progression much of the nail surface can be involved;
- proximal subungual onychomycosis: is a white or brown-yellow area on the proximal part of the nail plat that may progress distally; is the least common type

Laboratory diagnosis in onychomycosis:

- direct microscopic examination of the nail fragments after clearing with 10% KOH could evidentiate septate filaments
- culture on Sabouraud's medium;
- biopsy of the nail, if the KOH preparation and fungal culture fail to reveal the microorganism; it's necessary to stain by PAS (periodic acid-Schiff), to help visualize hyphae.

Treatment

Treatment of onychomycosis depends both on the severity of nail involvement and on the causative fungus. Onychomycosis can be divided into cases with and without matrix area involvement. In cases without matrix area involvement, topical treatment alone can be sufficient for treatment, whereas oral and combination treatments are recommended for cases with matrix involvement.

Systemic therapy

- Itraconazole: pulse dosing - 400 mg daily for 1 week per month or continuous dose of 200 mg daily, both of which require 2 month treatment for fingernails and at least 3 months to toenails;
- Terbinafine: a course of 250 mg daily for 6 weeks is effective for most fingernail infections, while a minimum 12-week course is require for toenail infections;
- Fluconazole: the usual dosage is 150 to 300 mg once per week for 3 to 12 months, although 450 mg weekly may be used in refractory onychomycosis.

Topical therapy:

- Topical imidazoles, allylamines or others could be associated with systemic therapy;
- Some methods for destruction of the nail plate can be tried to destroy the fungus:
    - 40% urea cream under occlusive dressing;
    - Avulsion of the nail or removal of the infected areas with a drill or burr;
- Nail lacquers: ciclopiroxolamine or amorolfine applied once a week.

Candidiasis

Candidiasis (or candidosis) refers to a diverse group of infections caused by *Candida albicans* or by other members of the genus *Candida*. Theses organisms typically infect the skin, nails, mucous membranes and gastrointestinal tract, but they also may cause systemic disease.

Etiology

The genus *Candida* is a heterogenous group of approximately 200 yeast species. Many species of *Candida* are opportunistic human pathogens, although, the majority don't infect humans. *C. albicans* is a dimorphic yeast that is responsible for 70 percent to 80 percent of all candidial infections, which makes it the most common cause of superficial and systemic candidiasis. Epidemiologic studies indicate that the relative prevalence of *C. albicans* in clinical isolates is declining and other species such as C. glabrata, C. tropicalis, C. krusei and C. parapsilosis are increasingly encountered as pathogens.

Pathogenesis

C. albicans is always found as a saprophyte and colonizes the mucous membranes of warm-blooded animals. The yeast is rarely isolated from normal human skin except occasionally from intertriginous areas. There are a lot of factors which predisposed to Candida infection, as follows:

- Mechanical factors:
    - trauma;
    - local occlusion, moisture, maceration;
    - obesity;
- Nutritional factors:
    - avitaminosis;
    - iron deficiency;
    - generalized malnutrition;
- Physiologic alterations:
    - extremes of age;
    - pregnancy;

- menses;
- Systemic illness:
  - Diabetes mellitus;
  - Cushing disease;
  - Uremia;
  - Malignancy;
- Immunodeficiency:
  - Acquired immunodeficiency syndrome;
  - Severe combined immunodeficiency syndrome;
  - Chediak- Higashi syndrome;
  - Di George syndrome;
- Iatrogenic causes:
  - Indwelling catheters and intravenous lines;
  - X-ray irradiation;
- Medications:
  - Glucocorticosteroids;
  - Antibiotics;
  - Oral contraceptives.

Clinical manifestations

The cutaneous and mucosal manifestations of candidiasis can be divided into several distinct clinical syndromes.

Oral candidiasis

Acute pseudomembranous candidiasis or thrush is the most common form of oral candidiasis. It appears as discrete white patches that may become confluent on the buccal mucosa, tongue, palate and gingivae. This friable pseudomebrane resembles milk curde and consists of desquamated epithelial cells, fungal elements, inflammatory cells, fibrin and food debris. Scraping the patches exposes a brightly erythematous surface. In sever cases, the mucosal surface may ulcerate.

Acute atrophic candidiasis (erythematous candidiasis) commonly occurs after sloughing of the thrush pseudomembrane. The most common location is on the dorsal surface of the tongue – patchy depapillated areas with minimal pseudomembrane formation.

Chronic atrophic candidiasis (denture stomatitis) is a common form of oral candidiasis seen in those wearing dentures; is manifested by chronic erythema and edema of the palatal mucosa that contacts the dentures; presumably, the chronic low-grade trauma and occlusion provided by dentures predispose to candidal colonization and subsequent infection.

Candidal cheilosis (angular cheilitis), so-called perleche, is characterized by erythema, fissuring, maceration and soreness at the angles of the mouth; lost of dentition, poorly fitting, dentures, malocclusion and riboflavin deficiency may be predisposing factors.

Vaginal and vulvovaginal candidiasis

Approximately three-fourths of all women will experience an episode of vulvovaginal candidiasis (VVC) in their lifetime. *C. albicans* cause 80 percent to 90 percent of cases of VVC and *C. glabrata* is the next most common species involved.

Patients generally present with a thick vaginal discharge associated with burning, itching and occasional dysuria. Examination shows whitish plaques on the vaginal wall with underlying erythema and surrounding edema that can extend to the labia and perineum.

Recurrent VVC is defined as four or more episodes per year and occurs in up to 5 percents of women. Changes in the hormonal environment, such as pregnancy and the luteal phase of the menstrual cycle, can induce a relapse of VVC. Use of genital cleansing solution or douche is also associated with recurrent candidiasis. If none of these factors is involved, one must suspect use of antibiotics, immunosuppression or diabetes.

Candida of male genitalia: Balanitis and balanoposthitis

Candida sp., cause up to 35 percent of infectious Balanitis. Factors predisposing to Balanitis include candidal vaginal infection in sexual partners, diabetes mellitus and uncircumcised state.

C. albicans Balanitis presents as small papules or fragile papulopustules on the glans or in the coronal sulcus. Infection may spread to the scrotum and inguinal areas. In diabetic or immunosuppressed patients, a severe edematous, ulcerative Balanitis may occur.

Cutaneous candidiasis

C. albicans has a predilection for colonizing moist, macerated folds of skin. Intertrigo is the most common clinical presentation on glabrous skin. Usual locations for intertrigo include the genitocrural, axillary, gluteal interdigital and inframammary areas and between folds of the skin on the abdominal wall.

Cutaneous candidiasis appears as pruritic, erythematous, macerated skin in intertriginous areas with satellite vesiculopustules; theses pustules break open, leaving an erythematous base with a collarette of easily detachable necrotic epidermis.

Candidial paronychia is common in individuals whose hands are habitually involved in wet work (housekeepers, baners, fishermen). Typically there is redness, swelling and tenderness of the paronychial area with prominent

retraction of the cuticle toward the proximal nail fold; occasionally pus can be expressed. Secondary nail changes include onycholysis and transverse depression of the nail plate (Beau's lines) with a brownish or green discoloration along the lateral borders.

Cutaneous candidal infection is diagnosed by the typical appearance of the skin lesions and the presence of satellite vesiculopustules.

The clinical diagnosis should be confirmed by KOH examination and culture of skin scrapings.

Disseminated candidiasis

The organisms responsible include *C. albicans, C. tropicalis, C. glabrata and C. parapsilosis.* These organisms may gain hematogenous access from the oropharynx or gastrointestinal tract when the function of mucosal barrier is compromised or through contaminated intravenous catheters. Multiple organs are involved. Skin lesions occur in some patients with disseminated infection. The characteristic skin lesions are 0.5 to 1cm erythematous papules with a hemorrhagic or pustular center. The eruption is located on the trunk and extremities and has varying number of lesions. Associated findings include fever and myalgias.

Chronic mucocutaneous candidiasis

The disease consists of several clinical syndromes characterized by chronic, treatment-resistant, superficial candidal infection of the skin, nails and oropharynx. In general, the various syndromes may be familial or sporadic. When they present in childhood, lesions are detected before the age of 3 years. Oral lesions or diaper dermatitis appear first, followed by angular cheilitis (perleche), lip fissures, nail and paronychial involvement, vulvovaginitis and cutaneous involvement. Cutaneous lesions may appear with an erythematous serpiginous border or areas of brownish desquamation on a background of mild erythema. Nail involvement is characterized by markedly thickened and dystrophic nail plates whose entire thickness is invaded by *Candida.* The paronychial areas are red and edematous, there may be pus and the fingertips are often bulbous.

Laboratory findings

- direct microscopic examination of specimens for the presence of yeast and isolation of yeast in culture are needed to diagnose infection definitively;
- in superficial candidal infections the diagnosis can be made by examining skin scrapings and observing typical budding yeasts with hyphae or pseudohyphae;

- *C. albicans* grows readily on Sabouraud's agar with added antibiotics and is usually recommended for isolation; whitish mucoid colonies grow within 2 to 5 days;
- in systemic candidiasis with skin lesions the diagnosis usually can be made from histopathologic examination and culture of appropriate skin biopsy specimens.

Treatment

Systemic therapy:

- Amphotericin a polyene antibiotic in intravenous infusion or orally administration;
- Natamycin a polyene antibiotic with oral administration;
- Itraconazole or Fluconazole are triazole fungicidal agents, with oral administration, well tolerated;
- Terbinafine an allylamine fungicidal agent with oral administration.

The usual daily doses and the duration of the treatment vary with the condition. In acute cases 10 to 14 days may be enough, but in chronic candidiasis, many months are necessary.

Topical therapy:

- Nystatin – solution, cream, ovules;
- Natamycin – solution, cream;
- Imidazoles: Clotrimazole, Isoconazole, Ketoconazole – solution, cram, ovules;
- Allylamines: Terbinafine, Naftifine – solution, cream.

Predisposing factors should be sought and eliminated.

Pityriasis versicolor (Tinea versicolor)

Epidemiology This mild chronic infection of the skin has some favouring factors responsible for mycelia transition of Pityrosporum: warmth, humid environment, immunosuppression, Cushing disease, malnourished state.

Clinical findings

The lesions are slightly erythematous, hyperpigmented or hypopigmented macules, from a few millimeters in diameter to large confluent areas. Scraping with the fingernail produces a fine scale (Besnier sign).

The sites commonly affected are: trunk, neck, upper arms, with extension to the scalp, face, axillae, groins, thighs and genitalia.

Hypopigmentation is explained by direct cytotoxic effect on melanocytes of dicarboxylic acids produced by Pityrosporum.

Laboratory findings

- direct microscopic examination of scales after clearing with 10% KOH solution confirms the diagnosis by the evidentiation of clusters of spherical yeasts and short, septate branching mycelium;
- culture on a lipid rich medium is a low value diagnostic method, Pityrosporum being a member of the normal flora;
- Wood's lamp examination: a yellowish fluorescence of involved skin.

Treatment

Topical therapy:

- Selenium sulfide (lotion, shampoo) every day for 2 weeks and after that once or twice per month;
- Imidazoles (lotion, cream, shampoo) every day for 3 weeks and after that once/week, for 7 to 10 weeks, to prevent the relapse;
- Allylamines, every day for 3 weeks and after that intermittently as long term suppressive therapy;
- Ciclopiroxolamine.

Systemic therapy is necessary in widespread cases, resistant to treatment. Can be administrated: Itraconazole, Fluconazole, Terbinafine.