**Dr. Shaimaa Nabhan**

**Dep. of Microbiology**

 **Mycology**

**CLASSIFICATION OF PATHOGENIC FUNGI**

Fungal diseases are classified into 4 groups according to pathogenic fungi and their location or position in the body:

* + **Superficial mycoses.**
	+ **Cutaneous mycoses.**
	+ **Subcutaneous mycoses.**
* **Deep (Systemic) mycoses.**

**SUPERFICIAL MYCOSES:**

 The superficial mycosis is the infection of the superficial part of skin and hair that do not involve a tissue response or cannot penetrate skin and hair. The superficial mycosis include:

* + **Pityriasis (Tinea versicolor ).**

Tinea versicolor is a chronic mild superficial infection of the stratum corneum caused by the yeast *Malassezia furfur* or other types of *Malassezia.* The lesion appear as discrete, serpenting hyper or hypopigmentation macule occur on the skin, usually on the chest, upper back, arms and abdomen.

*Malassezia furfur* is Lipophilic yeast and mostly require lipid in their medium for growth

* **Diagnosis:** the diagnosis can be done by taking scraping or swab from the lesion and mounted with drop of KOH 10% on surface of clean slide, and heat gently for 5 min.let the slide to cool and put one drop of Lactophenol cotton blue and put the cover slip and examine under microscope by using 40X lens and look for the cells of the yeast which appear as spherical cells around short unbranched hyphae.
* **Treatment:** The disease is treated with daily application of selenium sulphide or can be treated by oral or topical azole compounds.
* **Tinea nigra:**

 It is superficial infection of the stratum corneum of the sole of hand caused by *Exophilia wernekii.*lesion appear as dark brown or black discoloration of palm.

* Diagnosis: A sample must be taken from periphery of the lesion and put on surface of clean slide, and mixed with drops of KOH 10% and heat gently for 5 min.let the slide to cool and put one drop of Lactophenol cotton blue and put the cover slip and examine under microscope by using 40X lens to see branched septated hyphae and budding yeast cells.
* **Piedra :**

 It is type of superficial mycosis on the surface of hair shaft which appear as masses of the causative agent on the surface of hair.There are two types of Piedra:

 Black piedra : which is appear as nodules on hair shaft caused by *Piedra hortei.*

 white piedra : which is appear as large ,softy, yellowish on hair shaft of beard,scalp, caused by *Trichosporon spp*.

**Cutaneous Mycosis**

Associated with:Skin ,Eyes, Sinuses, Oropharynx and external ears, Vagina and Feathers

Cutaneous Mycosis may be called Dermatophytosis or ringworm in animals. And tinea ……….in human but followed by other name that indicate part of the body infected like tinea capitis,tinea corporis.

The skin lesions of cutaneous mycosis characterized by red margins, scales and itching.

 **Dermatophytosis and Dermatomycosis**

**Dermatophytosis** - "ringworm" disease of the skin & its appendeges like nails, hair, feather, horn and/or stratum corneum caused by group of fungi that called dermatophytes.

**Dermatophytes:** are keratinophilic "keratin Loving” because Keratin is a major protein found in horns, hooves, nails, hair, and skin.

**Cause: Several genera of dermatophytic fungi**

***Trichophyton Spp.*,**

***Microsporum Spp.*,**

***Epidermophyton Sp.*,**

**Dermatophytes:** General features are:

* Molds producing keratinase.
* Saprophytes on skin and its appendeges, inflammation below

 Transmitted by contact with infected persons or animals .

* **Dermatomycosis:** more general name for any skin disease caused by a fungus. Caused by many different species other than dermatophytes .like *Candida albicans.*

**Classification of Dermatophytes according to their habitat.**

Geophilic species - keratin-utilizing soil saprophytes and can infect both man and animal(e.g., *M. gypseum*, *T. nanum).*

Zoophilic species - keratin-utilizing on hosts - living animals i.e. mainly infect animal and can be transmitted to human (e.g., *M. canis* which infect dog and cat. *T. verrucosum* which infect cattle and sheep).

Anthropophilic species -  keratin-utilizing on hosts – humans i.e. mainly infect human and can be transmitted to animal (e.g., *M. audounii*, *T. tonsurans).*

**Species found in different anamorphic genera are the cause of different clinical manifestations of ringworm.**

*Microsporum* - infections on skin and hair (not the cause of TINEA UNGUIUM)

*Epidermophyton* - infections on skin and nails (not the cause of TINEA CAPITIS)

*Trichophyton* - infections on skin, hair, and nails.

**Clinical manifestations of ringworm infections are called different names on basis of location of infection sites.**

* tinea capitis - ringworm infection of the head, scalp, eyebrows, eyelashes
* tinea corporis - ringworm infection of the body (smooth skin)
* tinea unguium - ringworm infection of the nails
* tinea pedis - ringworm infection of the foot (athlete's foot)

**Infection of skin.**

infection of skin by spors of any type of dermatophytes 1- Spors localized on skin. 2- start to germinate in radiated form Ringworm.

**Infection of hair.**

 Hair contaminated or infected by any type of spore of speceis T. or M. 1- Spore directed downward to reach the bulb of hair. 2- start to germinate to form hyphae. 3- Hyphae extend up word inside or inside and outside of hair. 4- then fragmented or break-down to form arthrospors (take mosiac &reguler form). Endothrix or Ectothrix .

**Diagnosis of dermatomycosis**

The diagnosis of dermatomycosis depend on:

* Clinical signs: 1- Roughness of skin 2- falling of hair

 3- Itching.

* Wooden lamp examination.
* Isolation & Identification of the causative agent from skin and hair, this include:

 Sample of skin: 1- skin scraping from edges of lesion.

 2-collect sample in petridish or paper.

 3-send to the lab.

In lab. The samples are divided into 2 parts: the first one for direct examination by rapid test, while the second part for indirect examination by Inoculation on mycologycal media

The direct or rapid examination of skin or hair samples:

1. Take part of sample on clean slide
2. Fload with KOH 10%
3. Heat for about 5-10 min.
4. Let the slide to cool
5. Put one drop of Lactophenol cotton blue stain
6. Examin under microscope and look for :
* The presence of hyphae in case of skin samples
* The presence of ectothrix or endothrix in case of hair samples

The indirect examination of skin or hair samples:

1. The other part of sample was inoculated on mycological media
2. Then incubate at 30˚c for 2-3 weeks and look macroscopically for shape and colour of the fungal growth.
3. then take small part from fungal growth and put on surface of clean slide .
4. mixed with one drop of Lactophenol cotton blue stain
5. Look for the appearance of macroconidia which differ in shape and in number of septation internally.

**In general the macroconidia of :**

*Trichophyton spp*. are large in size and regularly divided internally.

*Macrosporum spp*. Are wider in the middle and narrow in the end.

*Epidermophyton sp*. Take pyriform shape.