Microbiology Team

Team Leaders

Lolwah Al-Ashgar

Faisal Al-Rashed

Team members

Bayan Al-Tassan

Dalal Fatani

Haifa Al-Abdulkareem

Jazeel Al-Mulla

Jumana Al-Shammari

Maymonah Al-Abdaly

Nourah Al-Swaidan

Sara Al-Eisa

Ghassan Al-Kharboush

Abdullah Baqais

Saeed Al-Assiri

Abdulrahman Al-qudaib

Fungal Infections of The Skin

- The RED color for the important points.
- The GREEN color for the points in which the doctor said but he didn't wrote them in the slides.
- The BLUE color for explanation only.

Skin Fungal Infections

- Clinical Skin infections are generally divided into:

  - **Superficial**
    - tinea versicolor, tinea nigra and piedra.
  - **Cutaneous**
    - Dermatophytosis, Candidiasis of skin ,mucosa, and nails and others.
  - **Subcutaneous**
    - Mycetoma "most common", sporotrichosis, chromoblastomycosis; and others.

Superficial Mycoses

- **Definition:**
  - The infection in which The pathogen will NOT INVADE THE TISSUE just restricted on the Stratum Corneum of the skin with no tissue reaction.
  - NO IMMUNE RESPONSE.
  - PAINLESS.

    - Tinea Versicolor
    - Tinea Nigra
    - Piedra

  - Note: These are names of diseases not fungi
  - They can effect the skin or the hair shaft "some times the Scalp"
  - Not Contagious

*The stratum corneum is the outermost layer of the epidermis, consisting of dead cells (corneocytes) that lack nuclei and organelles.

Superficial Mycoses: Tinea Versicolor

- is a long-term (chronic) fungal infection "disease" of the skin "not the hair".

- **Clinical Presentation:**
  - Patches of brown or discolored skin with sharp borders and fine scales. The patches are often dark reddish-tan in color. Usually asymptomatic.

    - Hyperpigmentation: Brown patches for people with white skin
    - Hypopigmentation: discolored skin for people with dark skin

  - the patches color will not changed or darken even if the patient exposed it to the sun.

- **Common sites:** the Back, shoulders "most common" ,neck and under arms

- **Etiology:** Malassezia furfur "a yeast fungi"
  - It is Lipophilic "needs lipid to grow" so to culture it is necessary to add lipid to the media.
  - Normal Flora of the skin

Superficial Mycoses: Tinea Versicolor

- **Diagnosis:**
  - Skin scraping
  - Potassium hydroxide (KOH) "add it to the skin scraping and incubate them"
    - (KOH is a very strong base, it destroys and digest only the epithelial cells, fungi is resistant to the KOH).

- **Examine under the microscope:**
  - Short fragments of the hyphae + yeast cells "looks like spaghetti and meat balls".

- **Culture:**
  - Malassezia furfur is a Lipophilic Yeast. So, to grow, oil should be added to the media

Superficial Mycoses: Tinea Nigra

- Painless patches of the skin usually in the Palm of hand or sole of foot. We don't see them on the shoulders, underarms or the neck. Brown or black color patches
- Acquired by Piercing of skin with plant material in Agricultural soil.
- **Etiology:**
  - Exophiala werneckii, Dematiaceous (Black colored) filamentous fungus (NOT yeast).

- **Laboratory diagnosis:**
  - Skin Scrapping + KOH
  - Examine under the microscope:
    - We will see only brown septate fungal hyphae" non branched".
    - We can identify the fungi under the microscope based on the Conidia.
  - Culture on SDA & Mycobiotic: growth of Dematiaceous fungus.

SUPERFICIAL MYCOSES: PIEDRA

- Effects only the hair shaft not the skin. it looks like nodules on the hair. They are asymptomatic.

- **Classification:-**
  - **Black Piedra:**
    - Dark pigmented nodules. Hard and firmly attached to hair shaft. "can't be removed"
    - Etiology : Piedraia hortae
  - **White Piedra:**
    - Lightly pigmented, white to brown nodules, Soft, loosely attached. "easy to remove"
    - Etiology: Trichosporon beigelii. It is yeast
    - Pseudohyphae, produce spores called arthrospores.

- **Lab Diagnosis:**
  - Hair with nodule
  - Direct microscopy: 10% -20% KOH
  - Culture : on Mycobiotic & SDA

Treatment of Superficial Infections

- Usually we use topical agents.

  - **Piedra:**
    - Cutting or shaving the hair.
    - Nizoral shampoo (contains Ketoconazole) also treat Malassezia furfur and some of the skin infections.

Cutaneous Fungal Infections: Dermatophytoses

- Dermatophytose: a fungal infections of the keratinized tissues (the skin, hair, scalp and nails). "they grow in the keratin"
- It caused by a group of fungi called Dermatophytes.

- Dermatophytes are PRIMARY PATHOGENS.
  - This means: if we isolate one of the Dermatophytes fungi from the sample It means this patient has a disease. it is always significant!

- They are also Contagious (Infectious). A patient with Dermatophytoses can transmit the disease to another human. also, humans can get the disease from animals e.g. cats. In addition, the infection can transmit from side to another side in the body.

- Tinea "most common" = Ringworm = Dermatophytoses

Cutaneous Fungal Infections: Dermatophytoses

- We name the disease based on the site of Infection:
  T: stands for tinea

Disease Name	Site Of Infection
T.Capitis	Scalp
T.Corporis	Glabrous Skin
T.Pedis	Foot (Athlete's Foot)
T.Cruris	Groin
T. Unguium	Nail
T.Barbae	beard
T.manuum	Hand

- Note: Tinea is a description. It is not just for Dermatophytes.
- Very important to know that Tinea versicolor differs from Tinea capitis… ect

DERMATOPHYTOSES

- Etiology of Dermatophytoses. A group of filamentous fungi.

- **3 Genera:**
  - **Microsporum** - infections on skin and hair "Not nail"
  - **Epidermophyton** - infections on skin and nails "Not hair"
  - **Trichophyton** - infections on skin, hair, and nails.

  Dermatophytes based on their preferred habitat

- Geophilic species: keratin-utilizing soil
- Zoophilic species: keratin-utilizing on animals
- Anthropophilic species: keratin-utilizing on humans

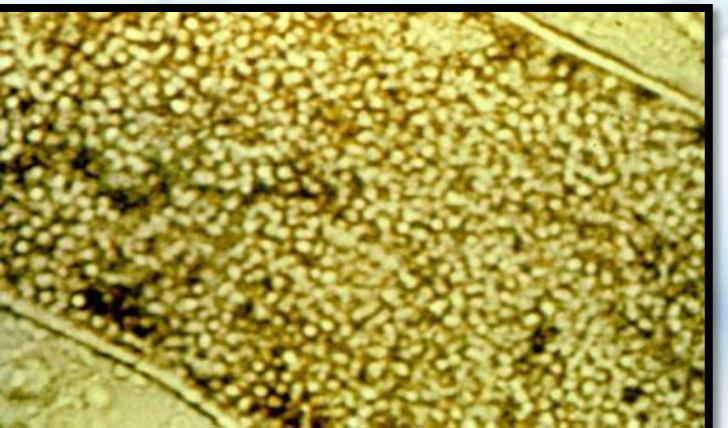
- Cross species infections usually more sever.
  - When a human have an infection from Zoophilic species it will be more sever

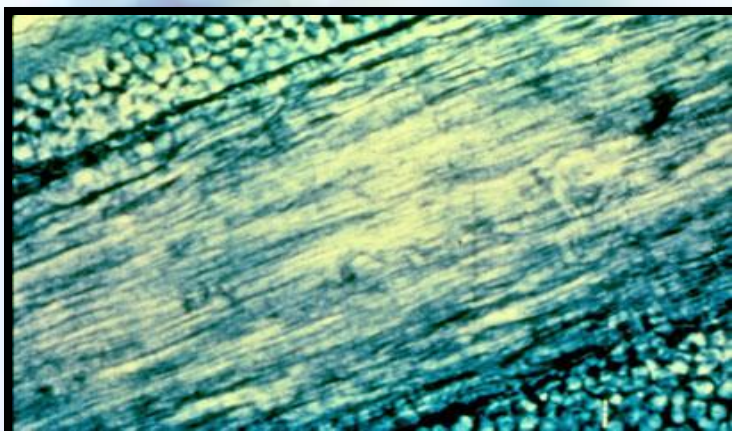
  - It is very important to understand that filamentous fungi can only be diagnosed is the conidia is present.

Tinea Capitis

- In the scalp, Presentations of Tinea Capitis (mild, infection of hair and scalp)
  - Non-inflammatory | Pustular| Inflammatory

- Kerion: it is an advanced stage of tinea capitis. Hair loss, inflammation,and pus.
- Favus (= Tinea favosa) is one of the forms of Capitis characterized by scutulum (yellow crusts) has a very bad smell
- Diagnosis:
  - Woods lamp on infected hair (fluoresce especially microsporum spp. Lesions)= UV light help in removing the infected hair
- Under the microscope:
  - When we see the fungi spores INSIDE the hair it is called: Endothrix.
  - But when we see it OUTSIDE the hair it is called: Ectothrix (Exothrix).





Tinea Capitis Diagnosis

- History
  - Contact with infected person, pets,
  - duration
- Clinical presentation
  - Broken hairs, black dots, localized, inflammatory, etc.
- Woods Lamp
  - Blue green.
- Hair Shaft Exam
  - 10-20% KOH, Endo/Exothrix
- Culture

Tinea Capitis Treatment

- To treat these infections:
  - We usually start with topical agents.
  - Then Systemic agents.

- The drug of choice for **Dermatophytoses**:
  - **Griseofulvin**
  - **Terbinafine** **only for dermatophoes**

- The duration may be long. (weeks to months only stop treatment if the infection is gone. If there is a repeated case of the infection, whole family has to be checked)

ONYCHOMYCOSIS (TINEA UNGUIUM)

- Infections of the nail.

- General Appearance:
  - Typically begins at distal nail corner
  - Thickening and opacification (cloudy appearance) of the nail plate
  - Nail bed hyperkeratosis (thickening of the stratum corneum)
  - Onycholysis (detachment of the nail from the nail bed)
  - Discoloration: white, yellow, brown
  - Edge of the nail itself becomes severely eroded.

- NO INFLAMMATION AROUND THE NAIL >>> no pain

- Some or all nails may be infected
- Often accompanying Tinea Pedis

- Candida or Bacteria we can see swelling and redness>>> sever pain.

Diagnostic Tests

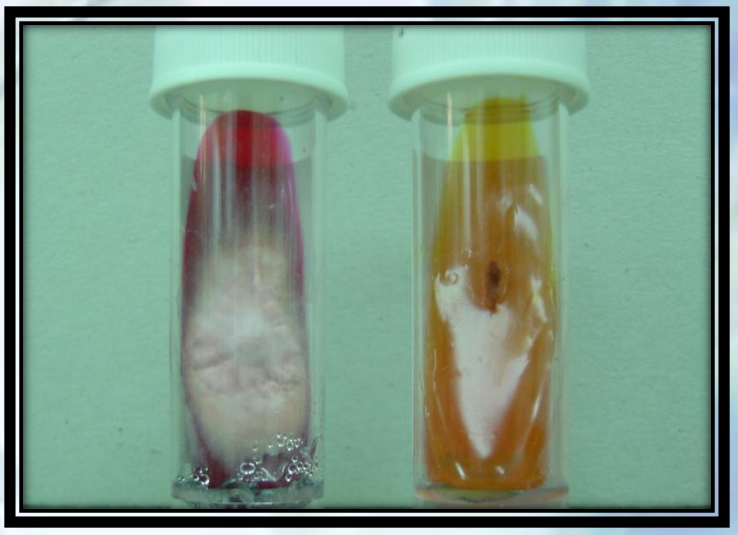
- KOH Preparations

- Based on the infection, we can take:
  - Skin
  - Nails (takes longer time. Low sensitivity in the lab)
    - Thin clipping, shaving or scraping
    - Let dissolve in KOH for 6-24 hours. (long period because nails don't easily dissolve)
    - Can be difficult to visualize. (Bad to use heat to seep up the process)
    - Culture often required.
  - Hair (take a hair sample)
    - Apply KOH
    - Look for fungal elements (such as spores)

  - **Swab is NOT ADEQUATE for Cutaneous or superficial fungal infections.**
  - We can take Biopsy and Skin scrape (best)

  - **Wood's lamp is used with Tinea Capitis NOT Tinea Pedis**

Diagnostic Tests



- **Fungal Cultures**
  - Sabouraud dextrose Agar (SDA)
  - **DTM (Dermatophyte Test Medium) only for dermatophytes**
  - Yellow (-) to red is (+).

- **Dermatophyte test media:** Contains acidic PH, Antibacterial agent, Antifungal agents (most of candida and aspergillus will not grow). It also has an indicator for the PH. If the Ph is acidic the color is yellow but if it becomes alkaline the color will change to red. Dermatophytes will produce alkaline substances if they grow and that will change the PH of the media (make it alkaline) and so the color will change to red (DTM is best avoided clinically)

- **If we see:**
  - Growth but NO change in color = **Negative**
  - No growth and no change in color = **Negative**
  - Growth + Change in color = **Positive** (this fungi is Dermatophyte).

Diagnostic Tests

- Other Identification Tests:
  - Endothrix & Ectothrix hair infection.
  - Hair perforation test.
  - Urease test.
  - Pigment production in PDA & CMA media.
  - Nutrient requirement such as – Trichophyton series Agar 1-7.

- "Not that important"

Treatment of Dermatophytes

- Topical treatment most of the time but we may use systemic.
- Dermatophytes respond well to systemic treatments. some don't respond for topical (mainly nail infections) because the topical drug cannot penetrate the nail very well.

- The drug of choice for **Dermatophytoses**:
  - **Griseofulvin**
  - **Terbinafine (Lamisil)**

- We can also use topical Azoles or systemic such as **Itranazole.**

(for your own understanding: If the infection is caused by deratomophytes use the 1st two drugs>>> no good >>> use Azoles)

DERMATOMYCOSES

Infections of the skin and nail (Onychomycosis) but they are NOT Dermatophytes.

- These are caused by other fungi including:
  - **Candida albicans** **(skin and nails)**
  - Aspergillus (skin and nails)
  - Scytalidium (just nails)
  - Scopulariopsis (just nails)
  - Fusarium (very difficult to treat, effects nails)
  - Acremonium
  - and others..

Basically you just have to remember that other fungi can cause skin and nail infections other hen dermatophytes.

CANDIDIASIS

- Yeast fungi. Normal flora (in the skin and oral cavity). Usually when cause infections we can see redness and inflammation not like Dermatophytes and superficial infections.

- **Presentation:** primary lesion is a red pustule.

  - Intertrigo: they affect skin folds (obese people). It usually cause infections in humid (moist) sites.
  - Diaper rash.
  - Erosio interdigitalis blastomycetica: Infections between the fingers.
  - Paronychia Infections of the nail.
  - Oral thrush in mucus membranes. (oral cavity and people with AIDS)
  - Vaginitis, and also balanitis.

- Candida is not a opportunistic pathogen. But it can cause some problems for:
  - Immunocompromised patients.
  - Diabetic patients.
  - Obese people (if they have skin folds and humidity).

Treatment of Candidiasis of skin

- **Keep dry and clean**
- **Topical – azoles.**
- Occasionally co-administration of topical steroid may be helpful.
- Treat co-existent bacterial infection if present.

(sometimes secondary infections occur. i.e. they start as candidia and end up as bacteria … in this case antibiotics are used.)

Fungal Infections of The Skin

QUESTIONs on the **Superficial mycoses**

Summary

Type	Disease name	Clinical presentation	Types	Common sites	Etiology	Diagnosis "under Microscope "
Superficial mycoses	Tinea Versicolor	Brown or discolored Patches	Hyperpigmentation→white ppl Hypopigmentation →dark ppl.	Back, shoulders, neck, underarms	Malassezia furfur Yeast +normal flora of skin	Short fragments hyphae +yeast cells "spores" "spaghetti and meat balls"
	Tinea Nigra	Brown or black patches	----------	Palm of hand sole of foot	Exophiala werneckii	brown septate fungal hyphae
	Piedra	nodules on the hair shaft	Black Piedra:Dark pigmented nodules. can't be removed"	hair shaft	Piedraia hortae	Hair with nodule
			White Piedra: Light pigmented, easy to remove		Trichosporon beigelii yeast	

QUESTION1

- TRUE OS FALS:
  - The SWAB is the sample that can be taken for diagnosing Tinea Nigra and Tinea Versicolor ?
  - FALS, only the Skin scrapping "and maybe the skin biopsy (rarely)".

- THE DOCTOR SAID THIS QUESTION.

QUESTION2

- Why do Tinea Versicolor, Tinea Nigra and Piedra are painless and usually asymptomatic?

  - Because the fungal pathogen is not invading the tissues, so it will not provoke the immune response “there is no immune reaction”.

QUESTION3

- A 22-year-old African female came to the clinic with discolored patches on her back. The patient shows no fever and no pain. The skin scraping+ KOH under the microscope show short fragments of hyphae and yeast cells .
  - The patient might has:
    A. Tinea Versicolor
    B. Tinea Nigra
    C. Piedra
  - What is the most likely organism can cause this disease?
    A. Trichosporon beigelii
    B. Malassezia furfur
    C. Exophiala werneckii
  - What type of pigmentation the patient has?
    A. Hyperpigmentation
    B. Hypopigmentation

Answers: A, B, B

QUESTION4

- A 40-year-old farmer male came to the clinic with patches of brown color on his sole of foot. The patient shows no fever and no pain. The skin scraping+ KOH under the microscope show brown septate fungal hyphae .
  - The patient might has:
    A. Tinea Versicolor
    B. Tinea Nigra
    C. Piedra
  - What is the most likely organism can cause this disease?
    A. Trichosporon beigelii
    B. Malassezia furfur
    C. Exophiala werneckii
  - The fungus witch causes this patches is?
    A. Yeast fungus.
    B. Filamentous fungus

Answers: B, C, B

QUESTION5

- A 6-year-old Saudi female child came to the clinic with small nodules on her hair shaft. The nodules are lighter than her hair and it can be removed easily. The patient shows no fever, no pain.

  - The patient might has:
    A. Tinea Versicolor ➔Hyperpigmentation.
    B. Tinea Versicolor ➔Hypopigmentation.
    C. Piedra ➔White Piedra.
    D. Piedra ➔Black Piedra.

  - What is the most likely organism can cause this disease?
    A. Trichosporon beigelii.
    B. Malassezia furfur.
    C. Exophiala werneckii.
  - The fungus witch causes this patches is:
    A. Yeast fungus.
    B. Filamentous fungus.

  Answers: C, A, A