LABORATORY DIAGNOSIS OF COMMON FUNGAL DISEASES

Lab . 17-19
By
Assist . Lect. Ola Abbas Khdhair

Mycotic Infections

Superficial

Cutaneous

Subcutaneous

Opportunistic

*Mycotoxicosis

*Allergies

Superficial mycoses

Disease	Causative organisms
SKIN	
• **Pityriasis versicolor**	• ***Malassezia furfur***
• **Tinea nigra**	• ***Exophiala werneckii***

Superficial mycoses

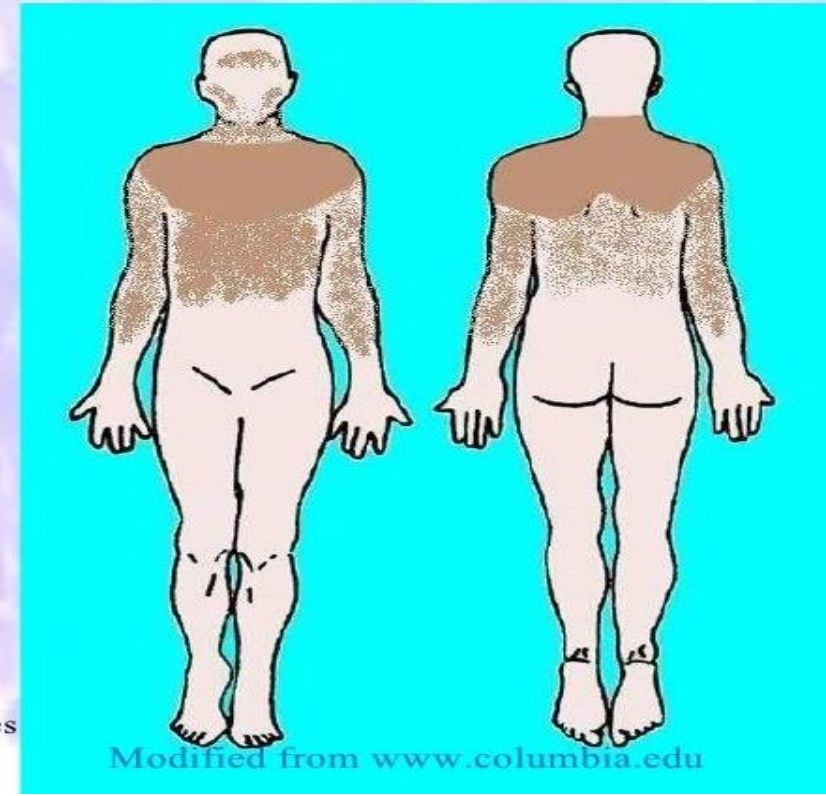
Disease	Causative organisms
HAIR	
• White piedra	• *Trichosporon beigelii*
• Black piedra	• *Piedraia hortae*

Pityriasis versicolor

- **Lesion**
  - **-An-an”**
  - **-Hyperpigmented or hypopigmented macular lesions**

Pityriasis versicolor

- **Lesion**
  - scale readily, giving a chalky branny appearance
  - occurs on the trunk, shoulders & arms, face and neck



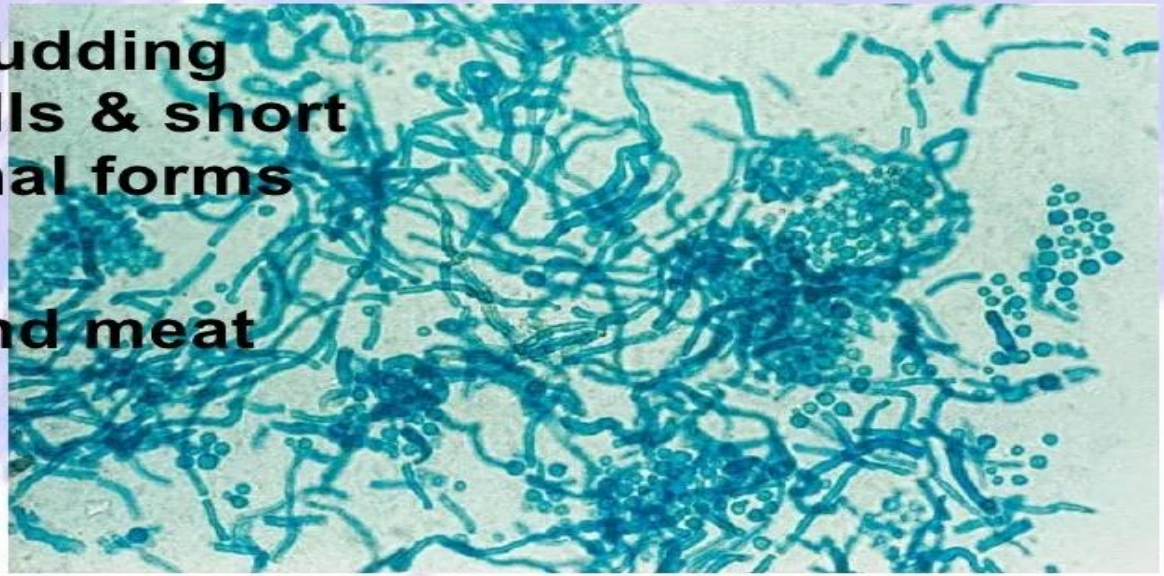
Pityriasis versicolor

- Lesion
  - fluoresce pale greenish under Wood's lamp
- Distribution
  - worldwide
  - more common in tropical than temperate climates

Pityriasis versicolor

KOH of skin scrapings

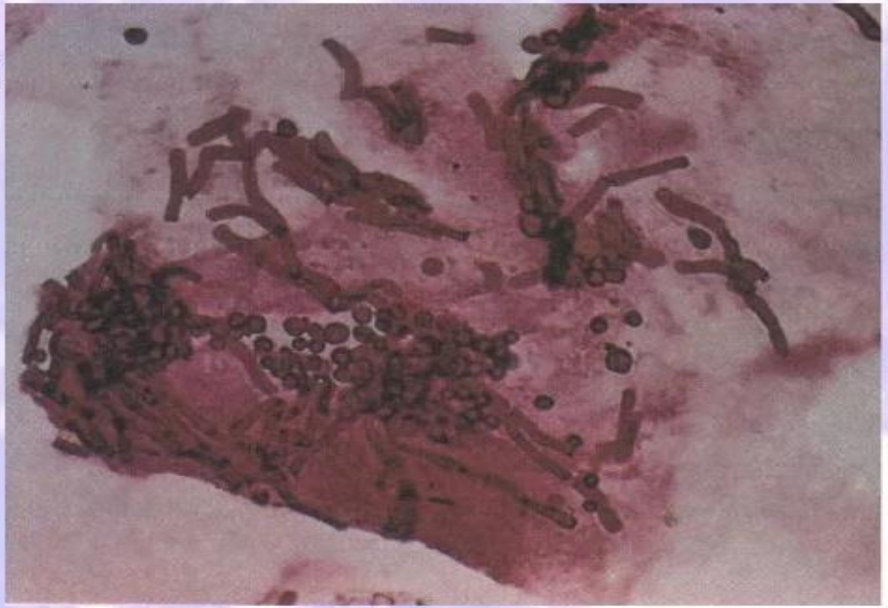
- **clusters of budding yeast-like cells & short angular hyphal forms**
- **“spaghetti and meat balls”**



Pityriasis versicolor

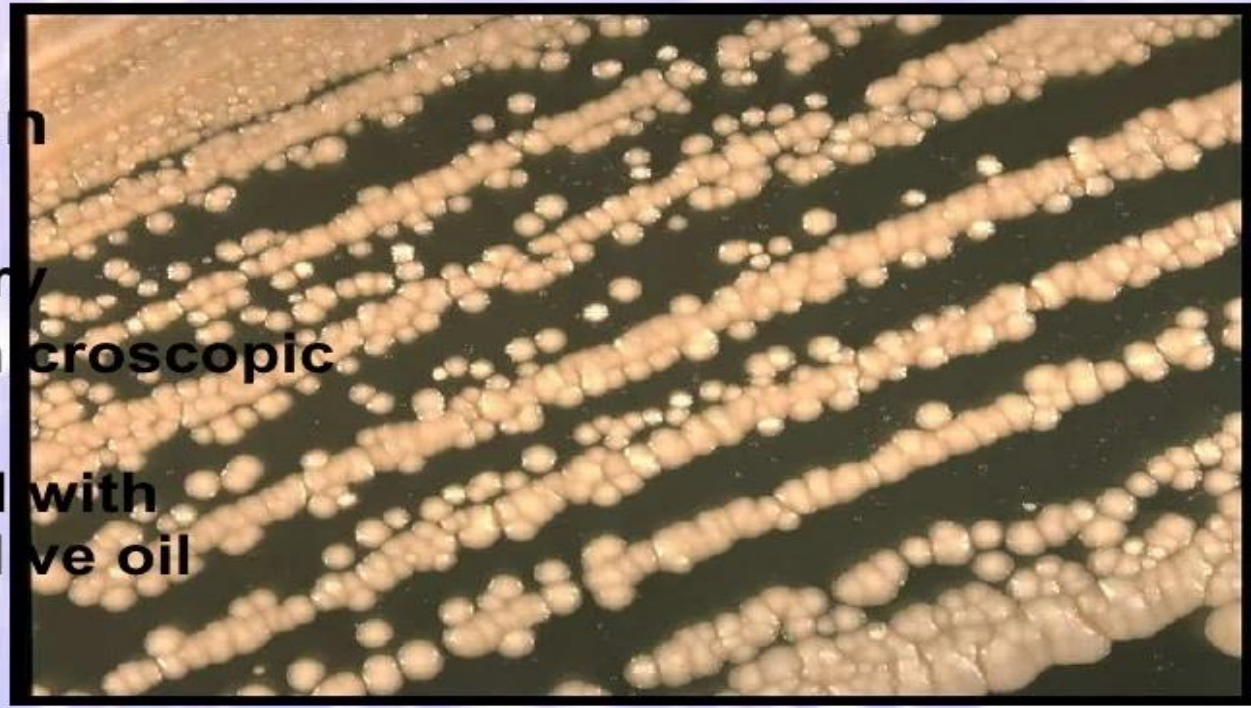
PAS of skin scrapings

- **“spaghetti and meat balls”**



Pityriasis versicolor

- Culture of skin scrapings
  - Not necessary
  - diagnostic microscopic features
  - SDA overlaid with peanut oil, olive oil



Pityriasis versicolor

- **Etiologic Agent**
  - ***Malassezia globosa***

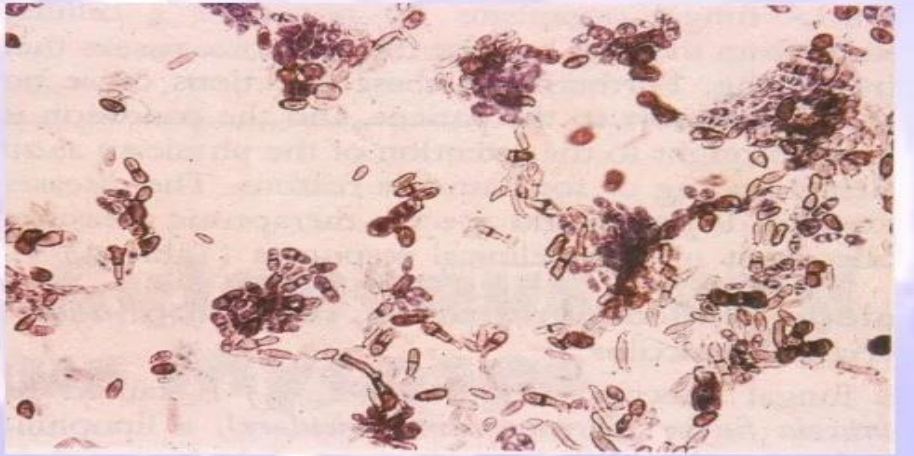
    lipophilic yeast

    part of skin normal flora

Tinea nigra

- Lesion
  - Gray to black well-demarcated macular lesions
  - most frequently occurring on the palms of the hand
  - non-inflammatory & non-scaling lesions

Tinea nigra



- **KOH**
  - **pigmented brown to dark olivaceous (dematiaceous) septate hyphal elements & 2-celled yeast cells**

Tinea nigra

- **Etiologic agent**
  - ***Exophiala werneckii***

    saprophyte found in soil, compost, humus & wood in humid tropical & sub-tropical regions

Tinea nigra

- **Culture on SDA**
  - **initially mucoid, yeast-like & shiny black**
  - **with age: aerial mycelia & dark olive color**

Tinea nigra

- **Lactophenol cotton blue (LPCB) of culture on SDA**
  - **2-celled, pale brown yeast cells**
  - **darkly pigmented septa (annelides)**
  - **one cell cylindrical, the other cell is spindle-shaped**
  - **occur in aggregated masses**

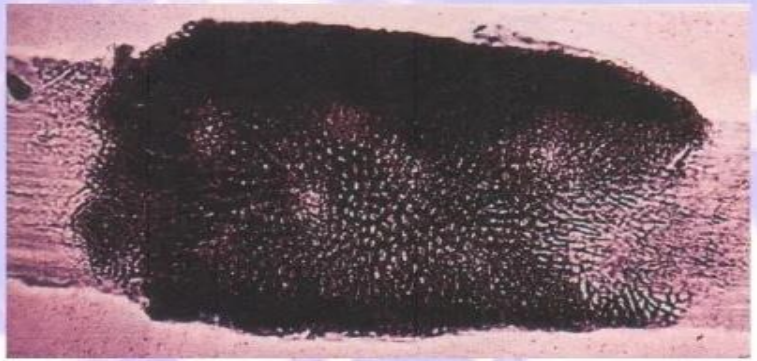
Piedra

- Fungus infection of the hair shaft
- presence of firm, irregular nodules
- *Nodules* - fungal elements cemented together along the hair shaft
- Multiple infections of the same strand

Piedra

Two varieties

- White piedra
- Black piedra



Black piedra

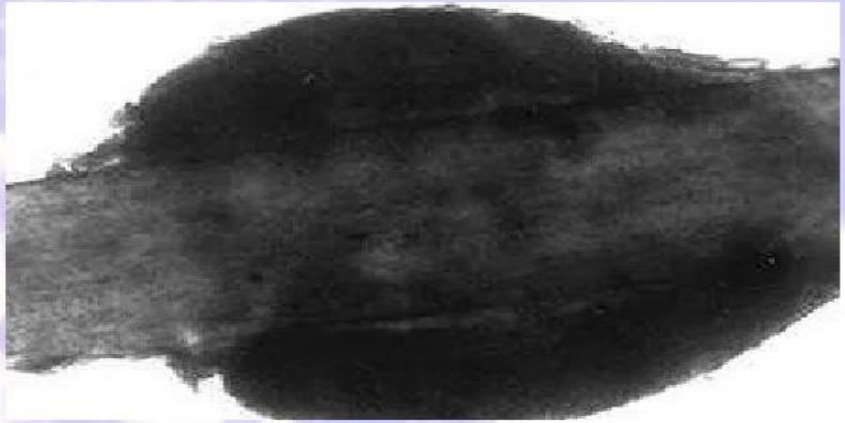
- Lesion
  - discrete, hard, gritty, brown to black concretions / nodules
  - infection of hair
    - scalp hair -common
    - beard, moustache - less common
    - axilla & groin hairs - rare

Black piedra

- **Etiologic agent**
  - ***Piedraia hortae***
  - **source of infection**

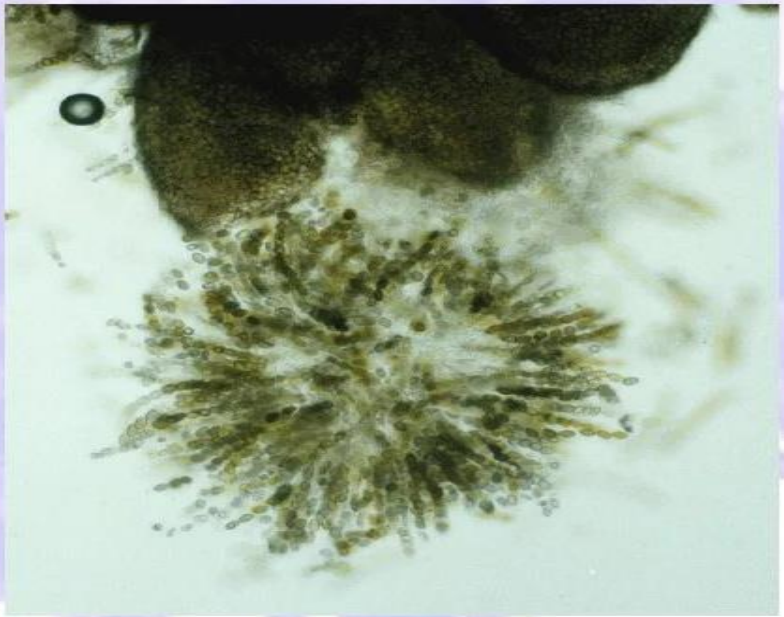
Black piedra - lab diagnosis

- Direct microscopy
  - specimen - hair with nodules
  - 25% NaOH or KOH
  - dark septate hyphae

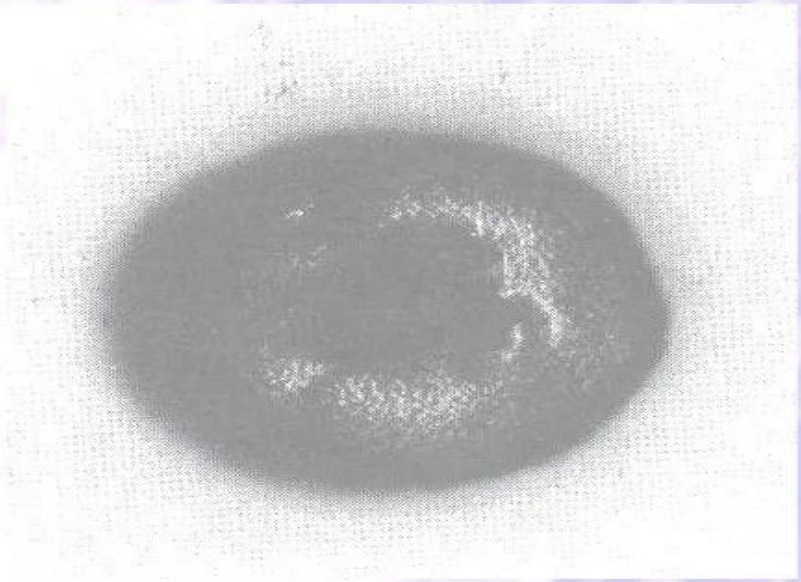


Black piedra - lab diagnosis

- **Direct microscopy**
  - **round to oval asci; hyaline, curved to fusiform ascospores**



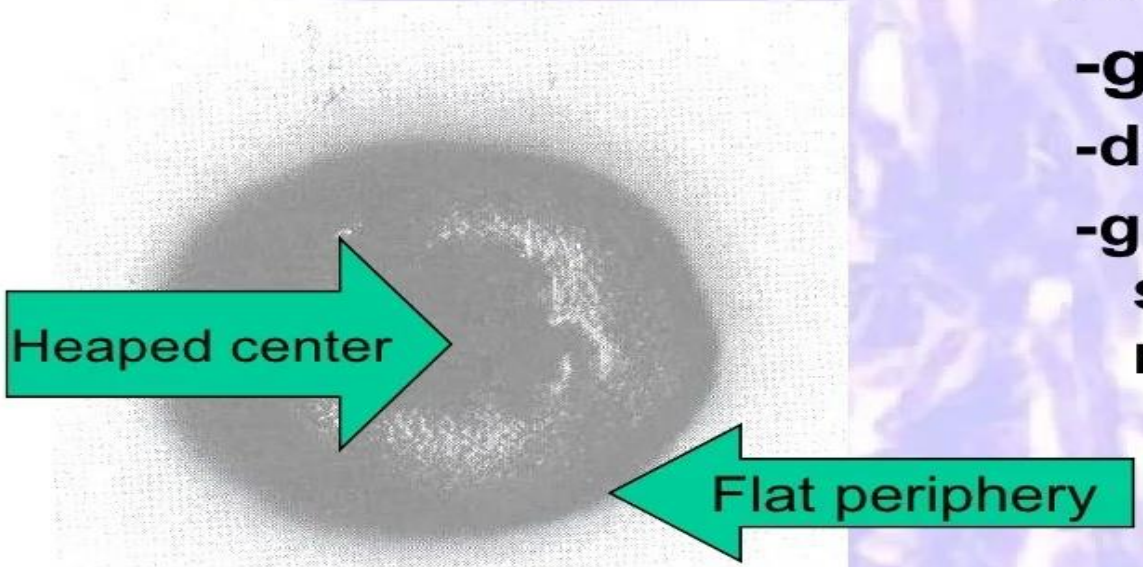
Black piedra - lab diagnosis



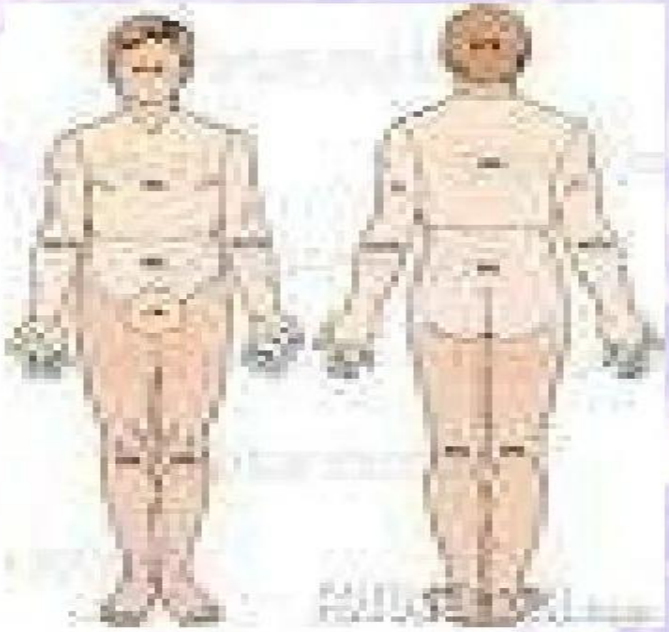
- Isolation – medium
  - SDA with chloramphenicol
  - SDA ± cycloheximide

Black piedra - lab diagnosis

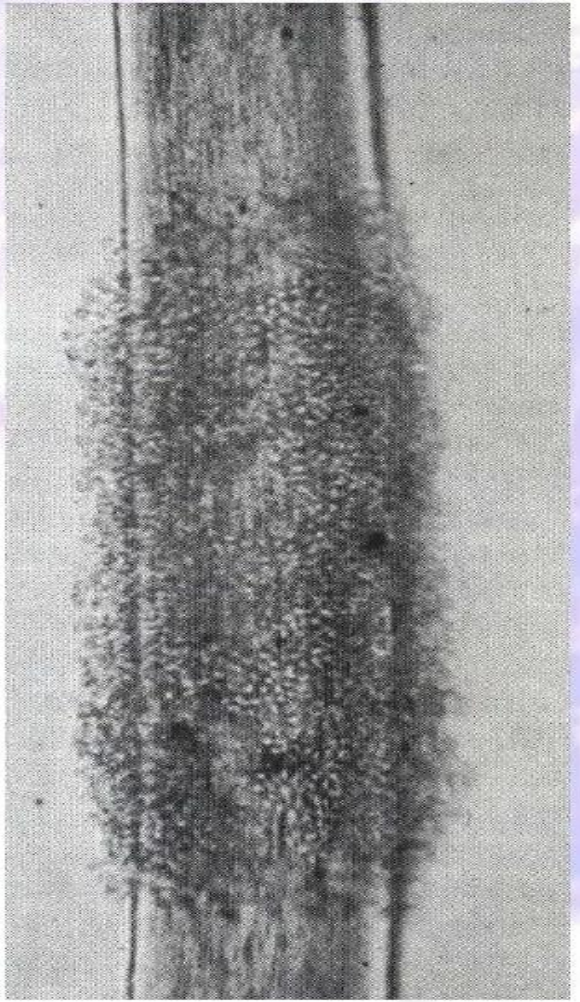
- **Isolation**
  - **-growth very slow**
  - **-dark brown to black**
  - **-greenish brown, short aerial mycelium**



White piedra



- Infection of hair shaft
  - face, axilla, genitals - common
  - scalp, eyebrows, eyelashes - less common



White piedra

Nodule

- Soft, white, yellowish, beige or greenish nodule
- Discrete
- more often coalescent, forming an irregular transparent sheath

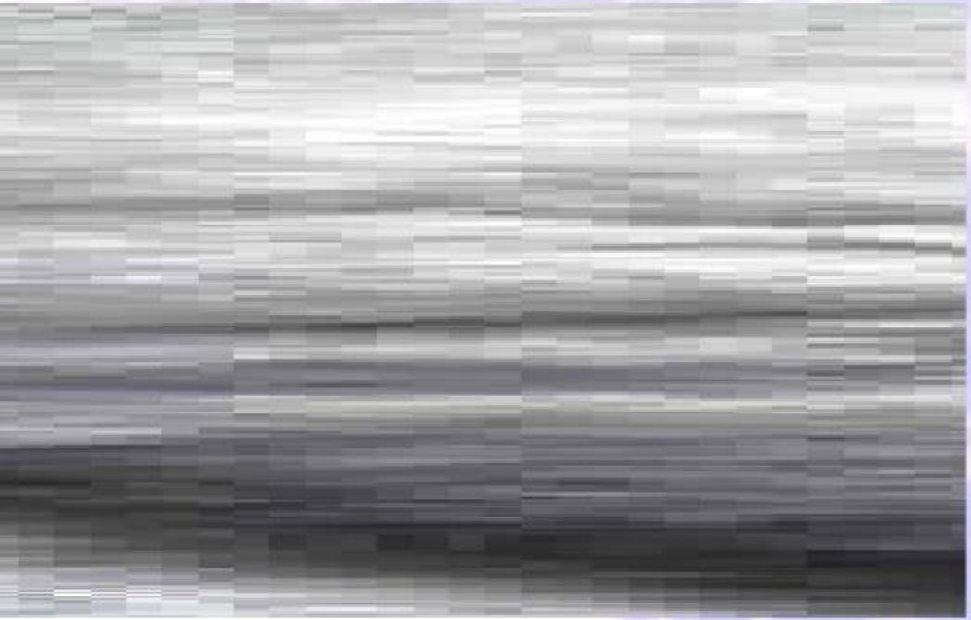
White piedra

- **Distribution**
  - common in S. America & Asia
  - sporadic in N. America & Europe
- **Etiologic agent**
  - *Trichosporon beigelii* or *T. cutaneum*

White piedra - lab diagnosis

- **Microscopic direct examination**
  - **specimen - hair with nodules**
  - **10% KOH or 25% NaOH + 5% glycerin**
  - **hyaline septate hyphae**
  - **oval or rectangular arthroconidia**
  - **occasional blastoconidia**

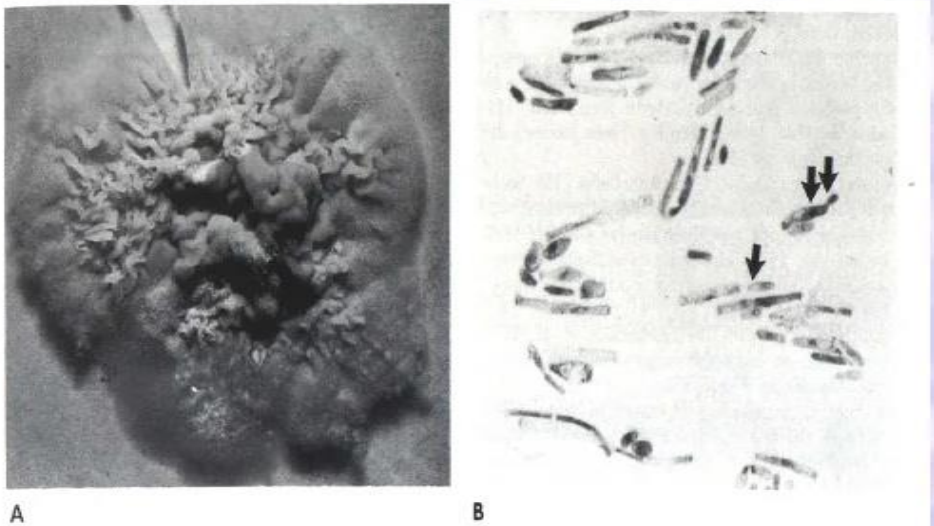
White piedra - lab diagnosis



Isolation

- medium - SDA with chloramphenicol without cycloheximide
- growth/culture
  - rapid
  - cream-colored, soft
  - membranous, wrinkled radial furrows, irregular folding

White piedra - lab diagnosis



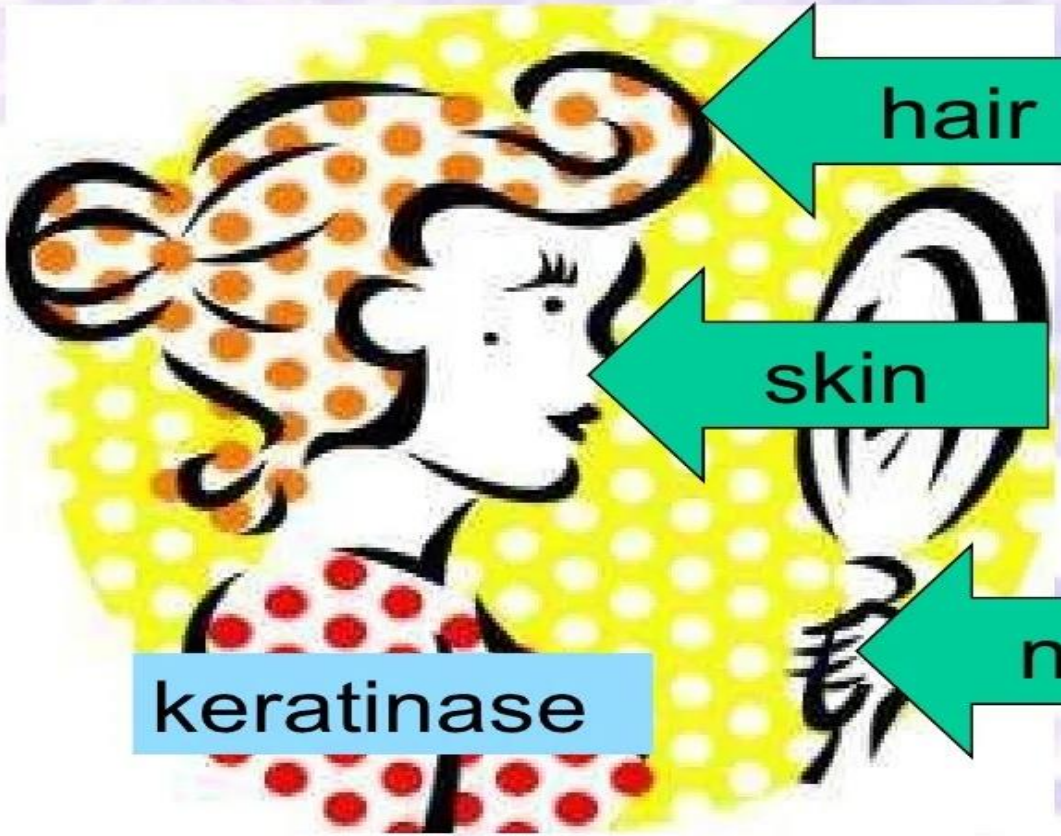
A B

Figure 7–10. *A*, Thallus of *Trichosporon beigelii* of a buttercream color and consistency. *B*, Microscopic aspect of *T. beigelii*. Both arthroconidia (*single arrow*) and blastoconidia (*double arrow*) formations are found. The blastoconidia are formed sympodially. Electron micrographs show that the septa are dolipores, which indicates that this fungus belongs in the Basidiomycotina.

Isolation

- microscopic exam of culture
  - hyaline hyphae
  - arthroconidia
  - blastoconidia

Cutaneous mycoses



- No living tissue
- Host Rxn to fungus

Cutaneous mycoses

Disease	Causative organisms
• Dermatophytosis	• Dermatophytes

- *Microsporum*
- *Trichophyton*
- *Epidermophyton*

Cutaneous mycoses

Disease

- **Candidiasis of skin, mucous membranes & nails**
- dermatomycosis

Causative organisms

- ***Candia albicans* & related species**
- Soil fungi (Scytalidium, Fusarium, etc.)
- Systemic fungi (*Histoplasma, etc)*

Ecological Groups of Dermatophytes

Geophilic

- inhabit soil where they decompose keratinaceous debris
- Dead animals

Zoophilic

- parasitic on animals

Anthropophilic fungi

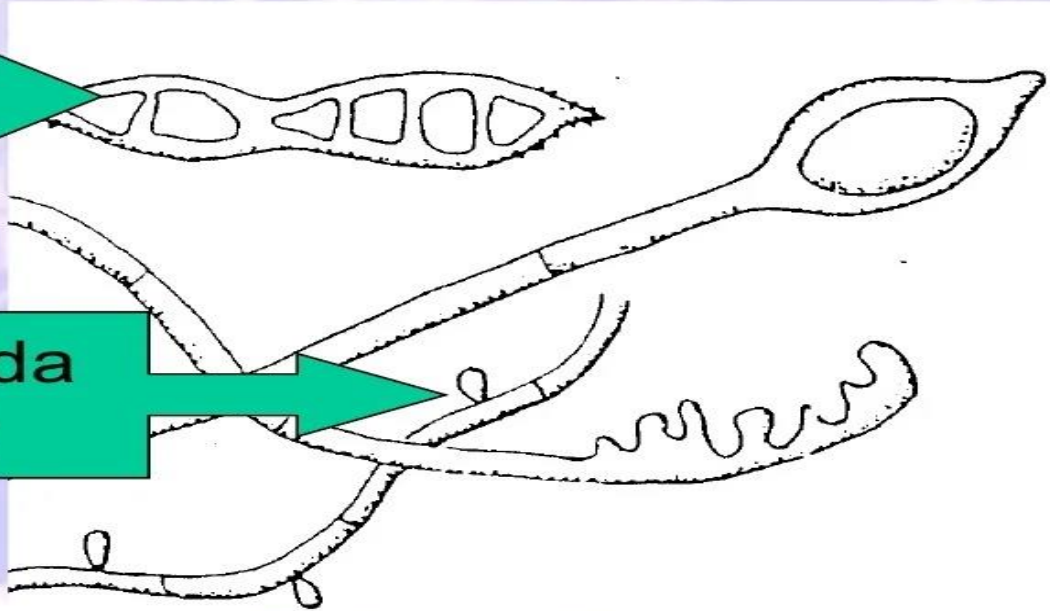
- **Anthropophilic fungi:**
  - **Examples:**
    - ***M. audonii***
    - ***T. rubrum***
    - ***T. schoenleinii***
    - ***T. tonsurans***
    - ***T. violaceum***

Classification of Dermatophytes

Microsporum

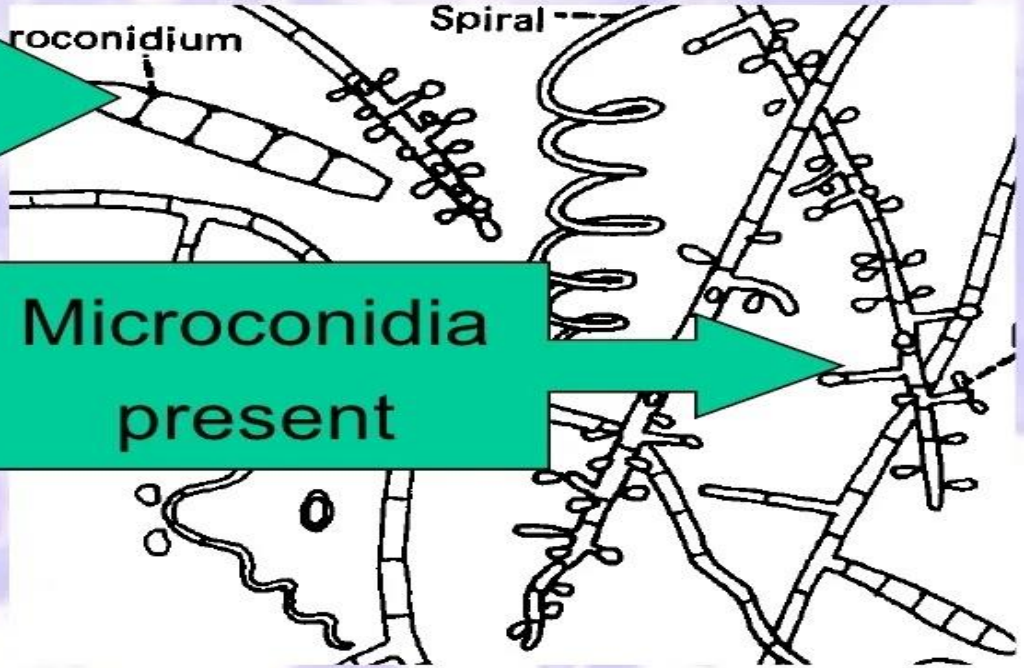
Macroconidia
Rough walled

Microconida
present



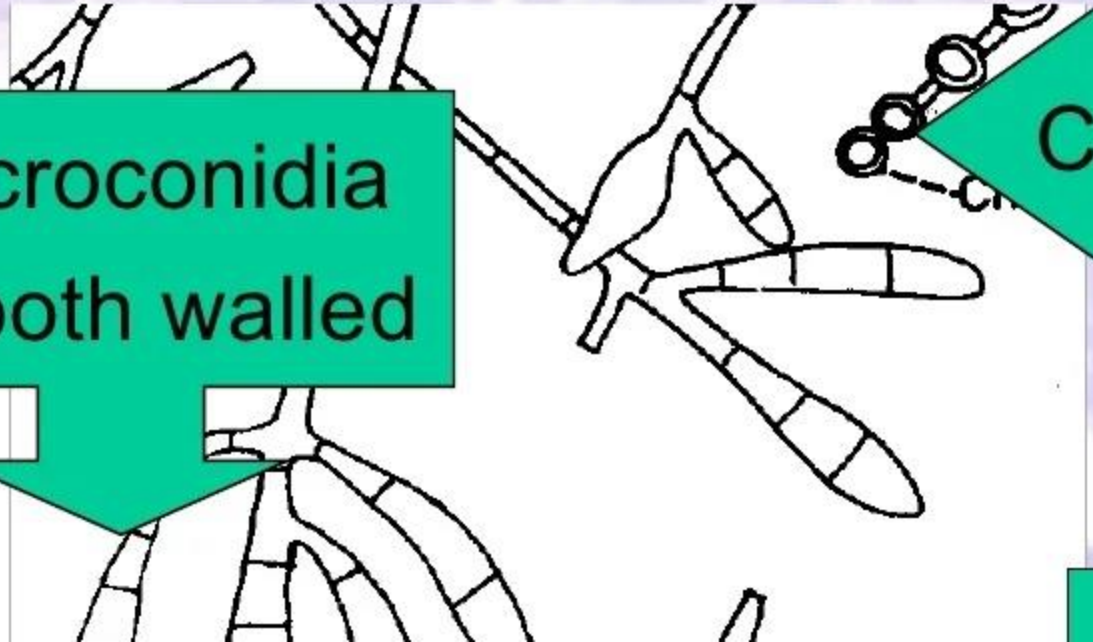
Trichophyton

Macroconidia
Smooth walled



Microconidia
present

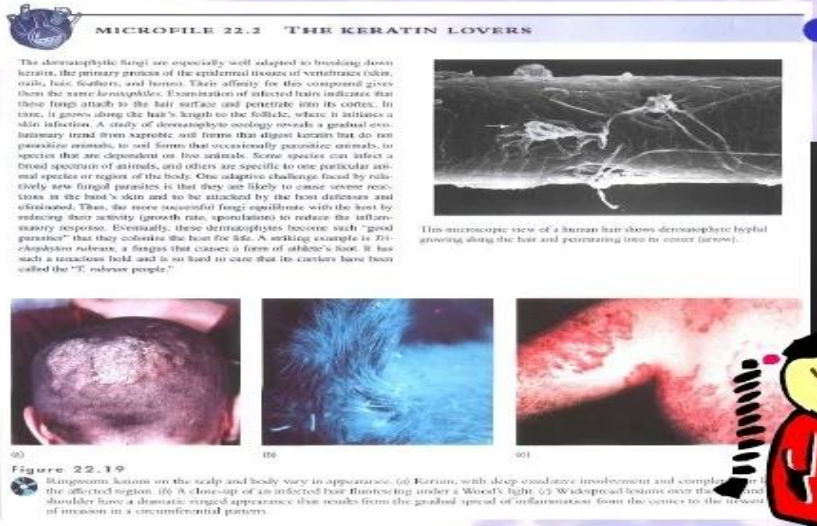
Epidermophyton



Clinical Manifestations of Dermatophytes

Tinea capitis

- Scalp, eyebrow, eyelashes
- Microsporum & Trichophyton



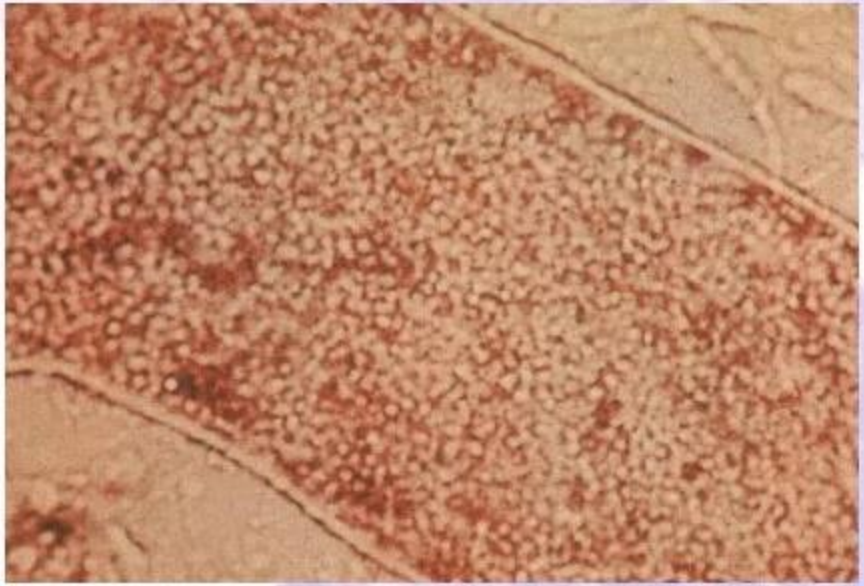
MICROFILE 22.2 THE KERATIN LOVERS

The dermatophytic fungi are especially well adapted to breaking down keratin, the primary protein of the epidermal tissues of vertebrates (skin, nails, hair, feathers, and horns). Their affinity for this compound gives them the name *keratophiles*. Examination of infected hairs indicates that these fungi attach to the hair surface and penetrate into its cortex. In time, it grows along the hair's length to the follicle, where it initiates a skin infection. A study of dermatophyte ecology reveals a gradual evolutionary trend from saprobic soil forms that digest keratin but do not parasitize animals, to soil forms that occasionally parasitize animals, to species that are dependent on live animals. Some species can infect a broad spectrum of animals, and others are specific to one particular animal species or region of the body. One adaptive challenge faced by relatively new fungal parasites is that they are likely to cause severe reactions in the host's skin and to be attacked by the host defenses and eliminated. Thus, the more successful fungi equilibrate with the host by reducing their activity (growth rate, sporulation) to reduce the inflammatory response. Eventually, these dermatophytes become such "good parasites" that they colonize the host for life. A striking example is *Trichophyton rubrum*, a fungus that causes a form of athlete's foot. It has such a tenacious hold and is so hard to cure that its carriers have been called the "*T. rubrum* people."

Figure 22.19

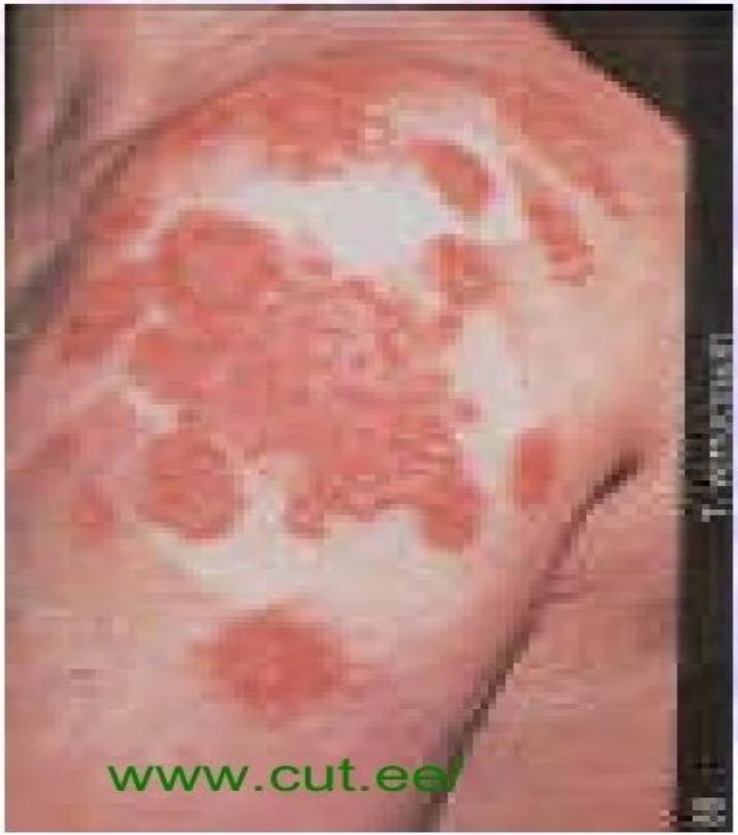
Ringworm lesions on the scalp and body vary in appearance. (a) Kerion, with deep exudative involvement and complete hair loss in the affected region. (b) A close-up of an infected hair fluorescing under a Wood's light. (c) Widespread lesions over the chest and shoulder have a dramatic ringed appearance that results from the gradual spread of inflammation from the center to the newest areas of invasion in a circumferential pattern.

Tinea capitis



- Endothrix
- Ectothrix

Tinea corporis



- Non-hairy skin
- Rings with scaly centers
- Rxn vs fungus

Tinea corporis

- *E. floccosum*
- *Trichophyton*
- *Microsporum*

Tinea barbae

- **Bearded areas of face & neck**

Tinea pedis

- Athlete's foot
- Toe webs & soles, even nails
- Id reaction, circulating fungal antigens

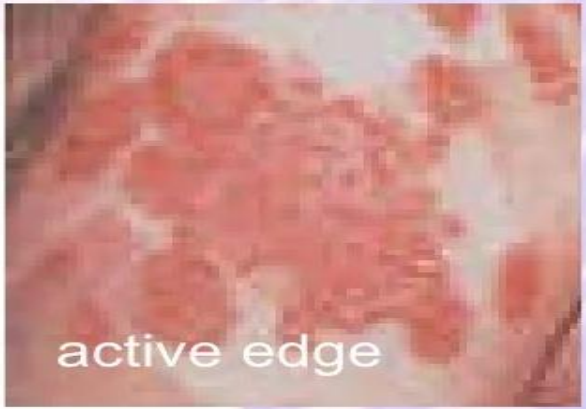
Cutaneous

Tinea unguium

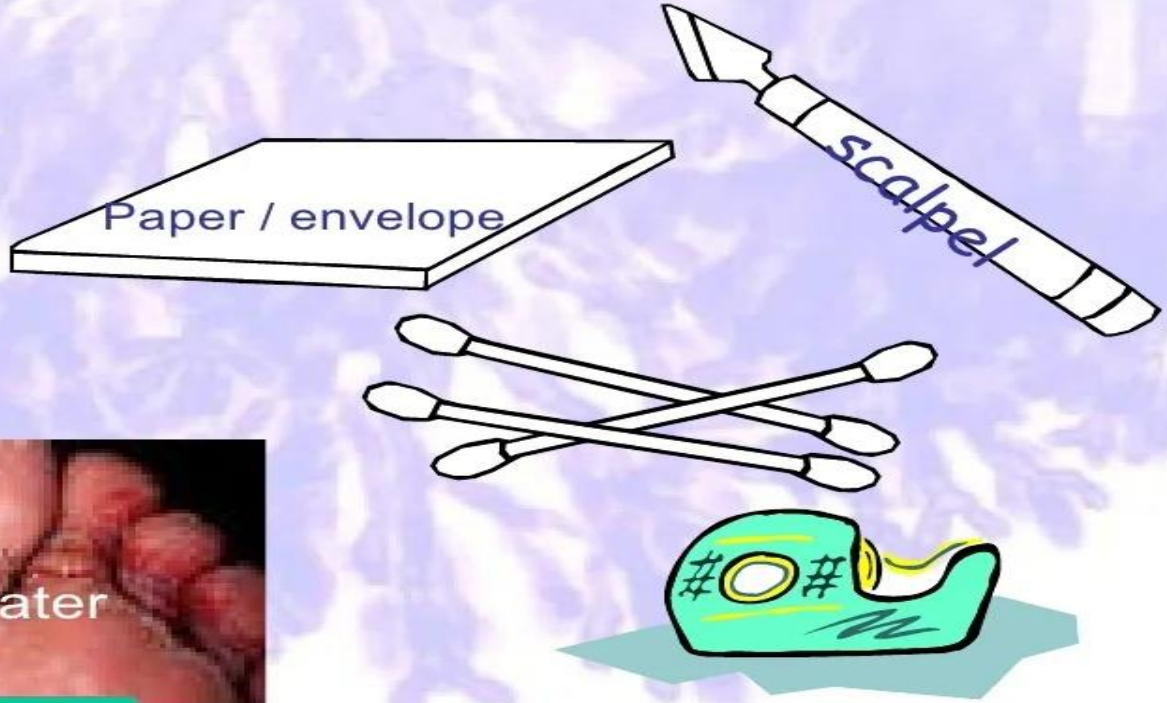
- Invasion of nail plate by dermatophytes
- Thickened, discolored & brittle
- Onychomycosis- non dermatophyte
- Yeast etc.

Laboratory diagnosis

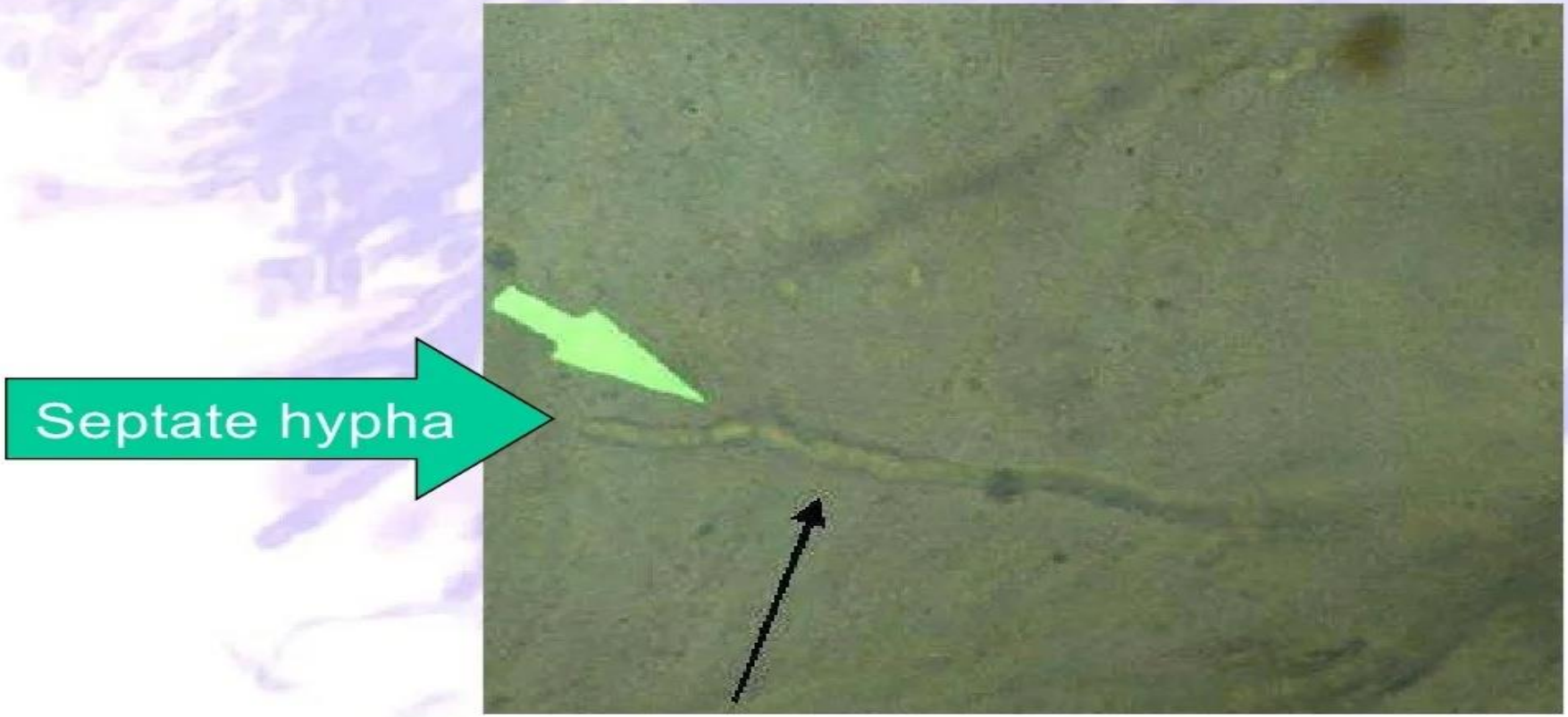
Skin scraping specimen



www.doctorfungus.org



KOH of skin scrapings



Microsporum canis

- **Zoophilic**
  - cats and dogs
- **Invades**
  - Hair
  - skin
  - rarely nails
- **distribution**
  - worldwide

Microsporum canis

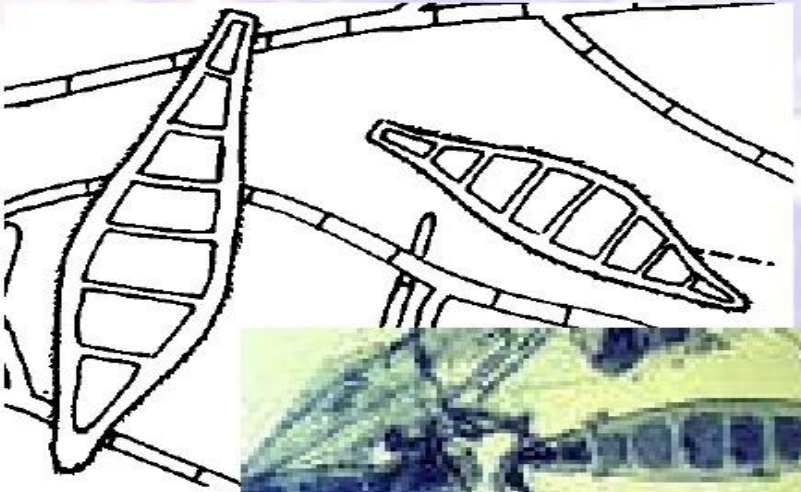
www2.provlab.ab.ca

lab diagnosis – culture

- **white cottony growth**

- golden yellow reverse colony

Microsporum canis



- **microscopic:**
  - **spindle shaped, one end pointed, other end blunt**
  - **thick walled verrucose macroconidia**
  - **6 to 12 cells**

Cutaneous