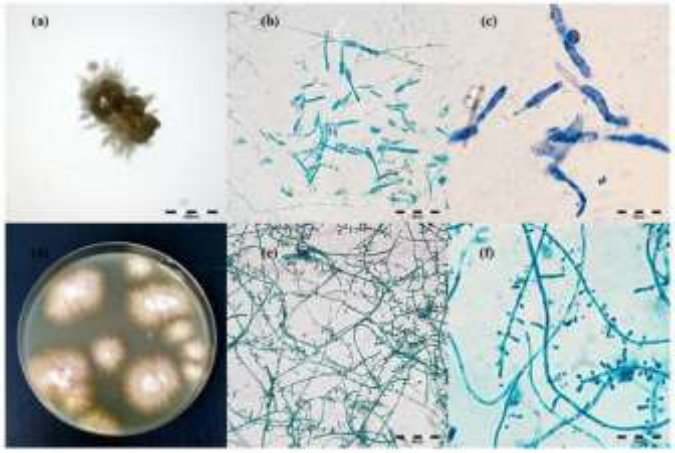
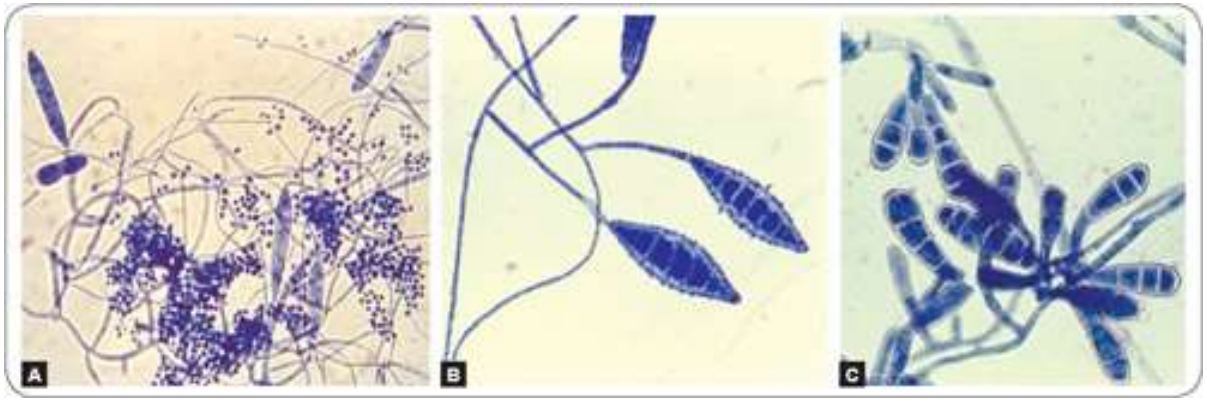


Dermatophyte



Dermatophytosis

- Cutaneous mycoses are caused by fungi that infect only the keratinized tissue (skin, hair, and nails). The most important of these are the dermatophytes, a group of about 40 related fungi that belong to three genera: Microsporum, Trichophyton and Epidermophyton.

Dermatophytosis (tinea or ringworm) of the scalp, glabrous skin, and nails

- is caused by a closely related group of fungi known as dermatophytes which have the ability to utilize keratin as a nutrient source ,they have a unique enzymatic capacity

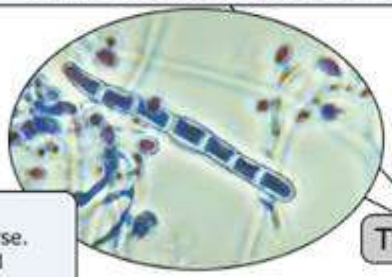
[keratinase] .

Dermatophytes

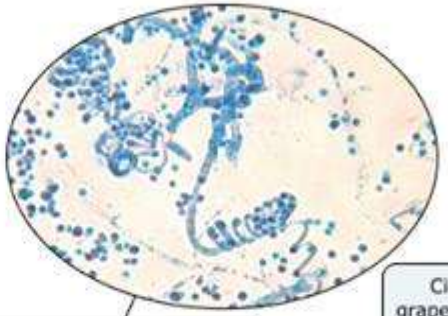
Trichophyton

T. rubrum

Colony with white center and red periphery and red reverse. Macroconidia with parallel sides that may break into arthroconidia, microconidia with 'bird on wire' appearance, no fluorescence, hair perforation test negative, urea negative.



T. mentagrophytes



Cigar-shaped macroconidia, grape-like clusters of microconidia, spiral hyphae, no fluorescence, hair perforation test positive, urea positive at 5 days.

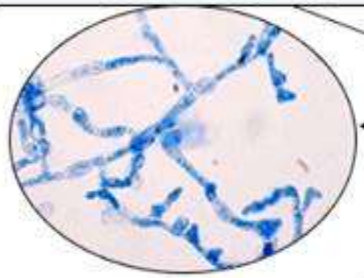
T. tonsurans

Rare, irregular macroconidia, numerous microconidia in various shapes, intercalary and terminal conidia, no fluorescence, hair perforation test positive at 14 days, requires thiamine.

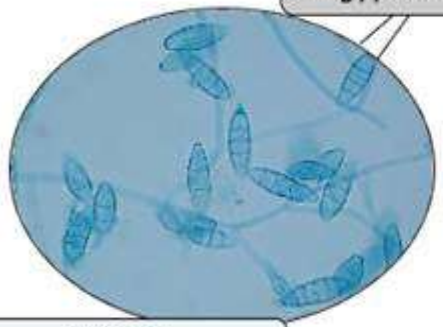
Microsporum

M. audouinii

Ringworm. Colony off-white with salmon reverse. Pectinate hyphae, poorly shaped macroconidia called spindle, rare microconidia, hair perforation test negative, yellow-green fluorescence.

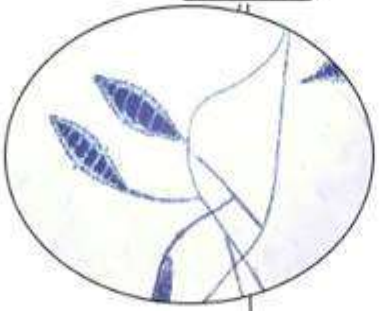


M. gypseum



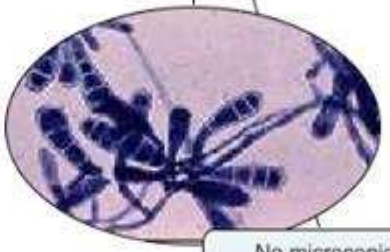
Symmetric macroconidia with somewhat rounded ends and no more than 6 compartments, microconidia are club-shaped, no fluorescence, hair perforation test positive, urea positive.

M. canis



Colony with white center ringed with yellow. Spindle macrospores, bud-like microspores, yellow-green fluorescence, hair perforation test positive, urea positive, yellow pigment when grown on rice.

Epidermophyton



No microconidia
Macroconidia beaver tail
No special structures

There are three genera of dermatophytes

1. ***Trichophyton*** species (26 species).

- modes of transmission anthropophilic , zoophilic.

2. Microsporum species (16 species).

- modes of transmission anthropophilic , geophilic ,zoophilic .

3. Epidermophyton floccosum .

- modes of transmission anthropophilic **.**


T. tonsurans


T. rubrum


M. canis

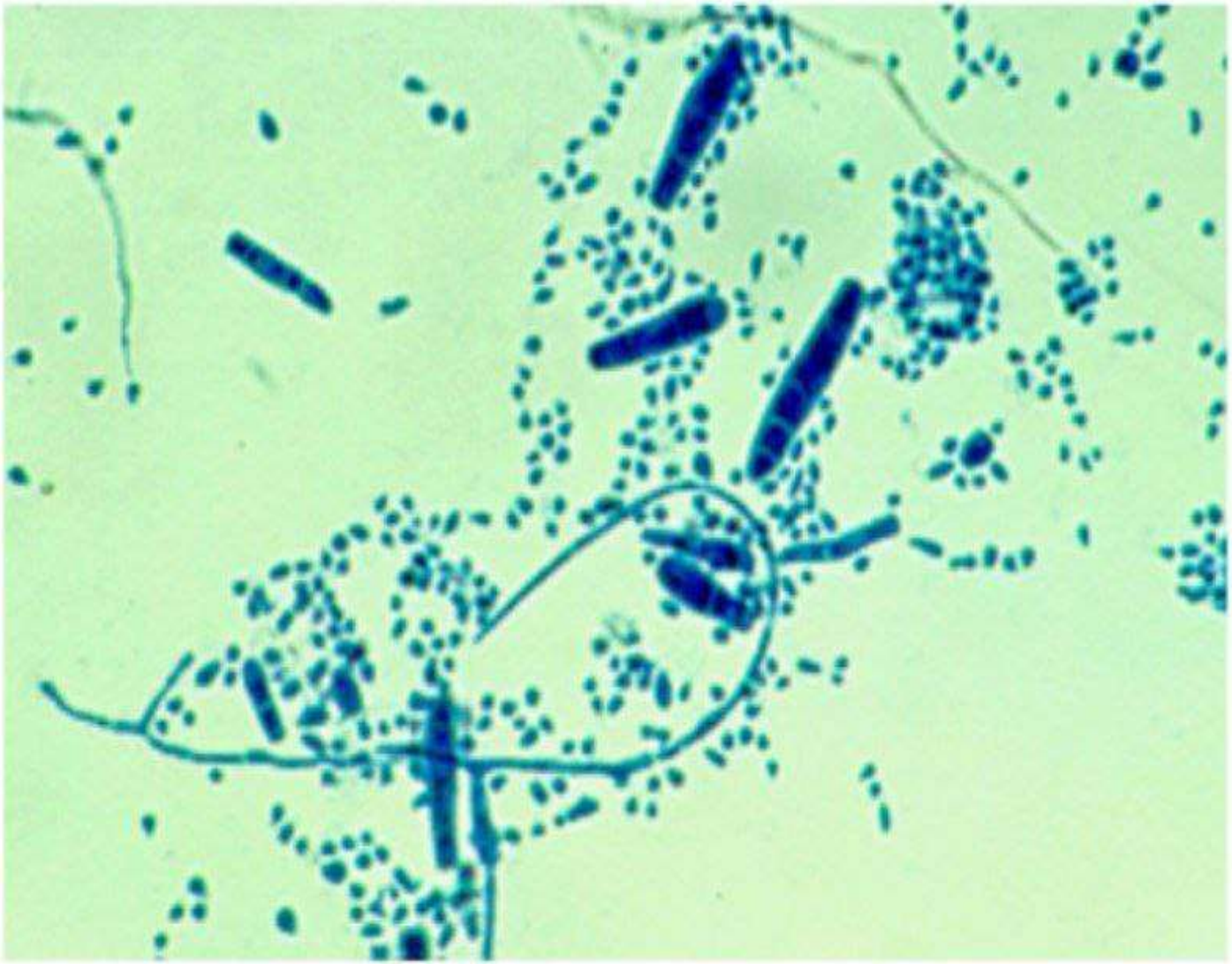

M. gypseum

1.Trichophyton

These infect skin, hair and nails. They rarely cause subcutaneous infections, in immuno-compromised individuals. Trichophyton species

take 2 to 3 weeks to grow in culture. The conidia are large (macroconidia), smooth, thin-wall, septate (0-10 septa), and pencilshaped. and small

(microconidia) They are present in a round shape, clustered in clusters , colonies are a loose aerial mycelium that grow in a variety of colors. Identification requires special biochemical and morphological techniques.



Microconidia, macroconidia, in *T. mentagrophytes*

Click icon for audio

Trichophyton mentagrophytes

- Colony morphology:

Downy | Granular | Velvet

2.Microsporum

These may infect skin and hair, rarely nails.

The loose, cottony mycelia produce

- macroconidia which are thick-walled, spindle-shaped, multicellular(1 -15) cells, and spiny. Microconidia also present , very small.
- Microsporum canis is one of the most common dermatophyte species infecting humans.

Figure 5. Macroscopic feature of

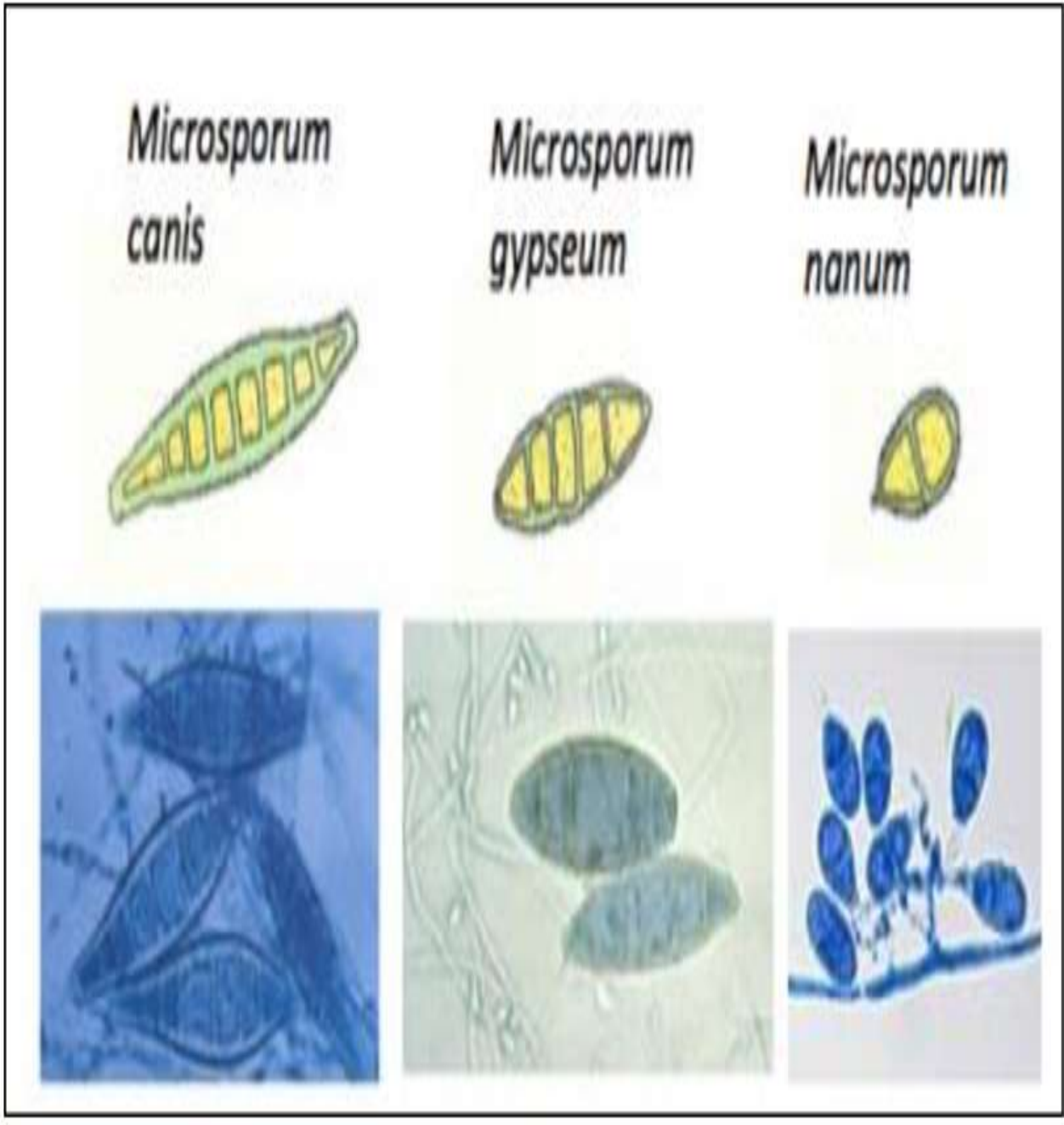
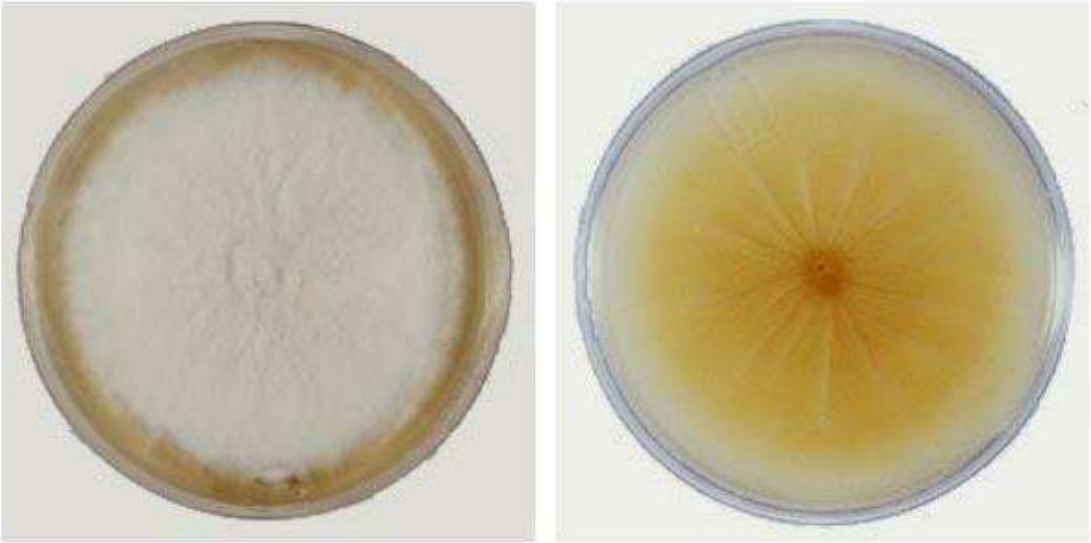


Figure 6. Microscopic feature of *Microsporum* spp

Click icon for audio

Microsporum canis

- Colony morphology:

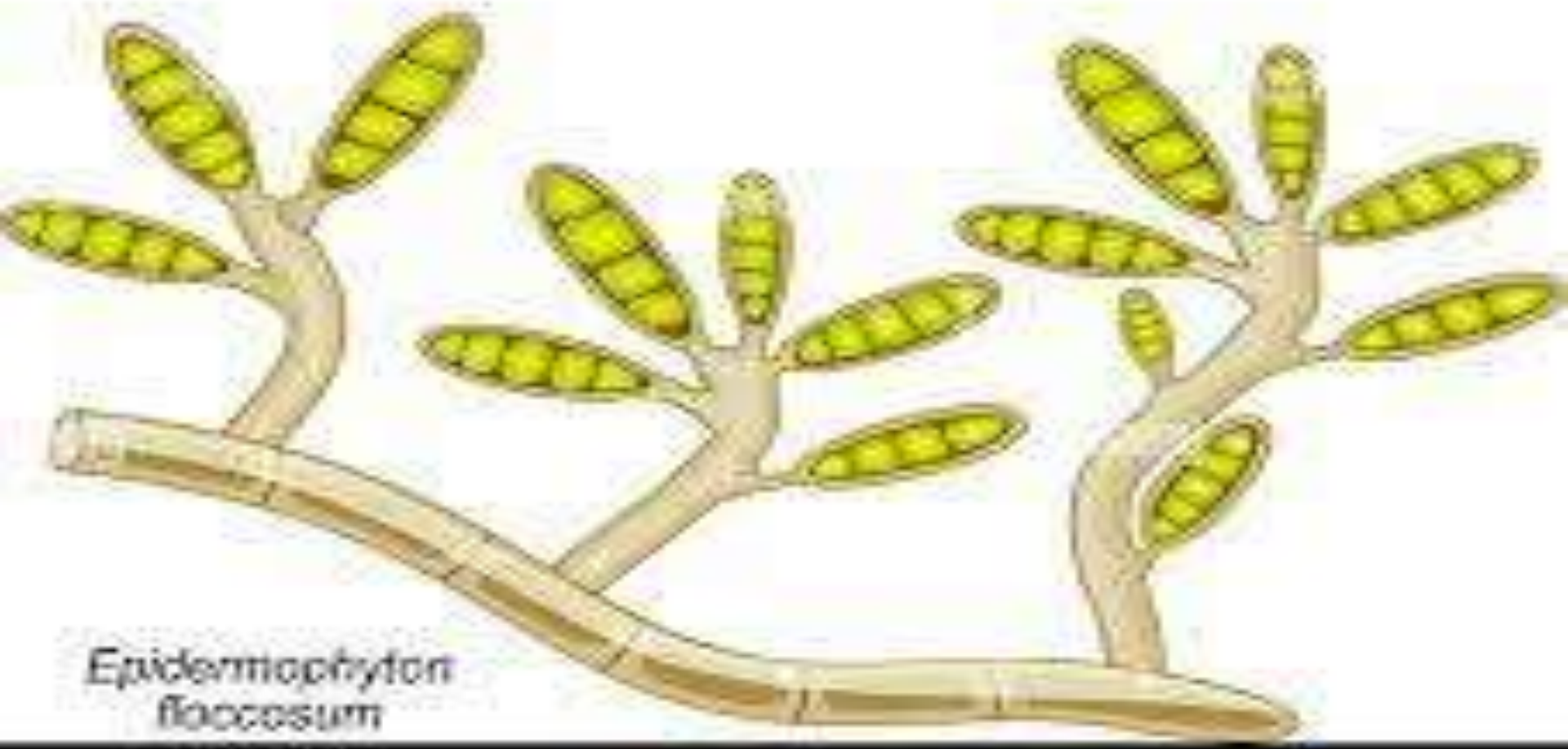


3.Epidermophyton floccosum

- These infect skin and nails and rarely hair. They form yellow-colored, cottony cultures and are usually readily identified by the thick, bifurcated hyphae with multiple smooth, club-shaped macroconidia .

Epidermophyton

(cause fungal infections of the skin)

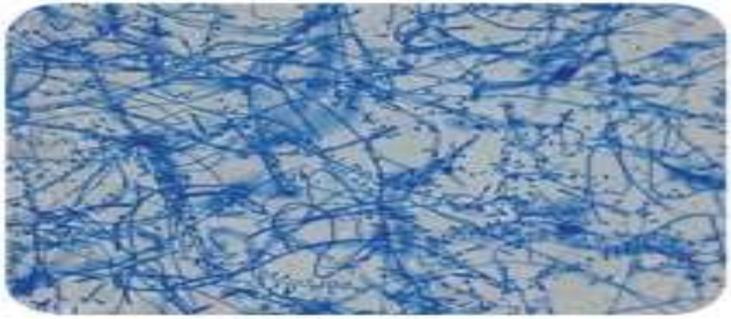


E.floccosum -colony heaped up at center on SAB after 2 weeks at 30°C

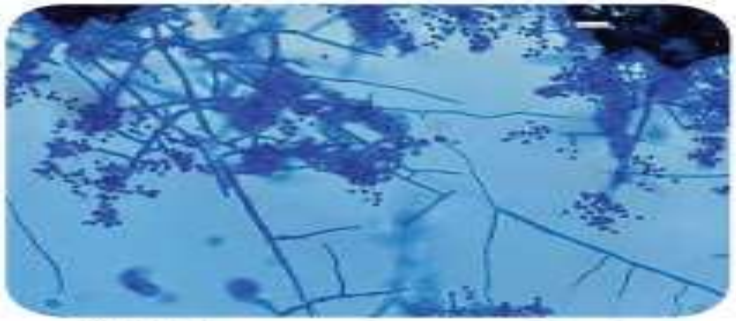
E.floccosum -colony on SAB after 3 weeks at 30°C

E.floccosum colony on SAB after 5 weeks at 30°C.
Note: white floccose patches beginning to develop.

E.floccosum -colony on SAB, 30°C after repeated subcultures has developed white floccose patches which are areas of sterile hyphae.

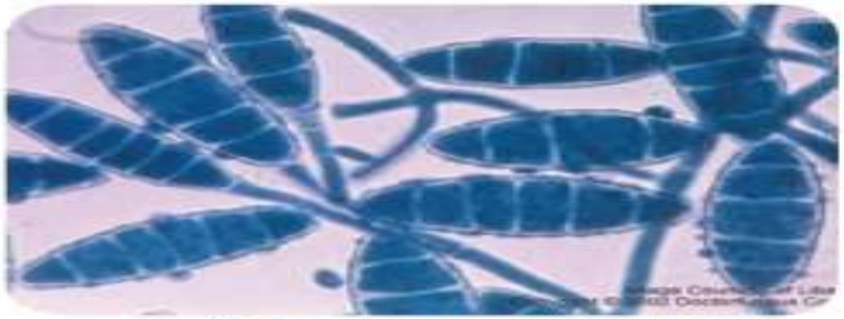


(a) T.*rubrum*



(b) T.*mentagrophytes*

(c) M.*canis*



(d) M.*gypseum*

(e) E.*flocossum*

Figure 9.6: LPCB wet mount of major Dermatophytes

Table 9.1: Microscopic and macroscopic characteristics of Dermatophytes.

S.No	Dermatophytes	Macro conidia	Micro conidia	Macroscopic Morphology – SDA
1.	*Trichophyton*	Rare, thin-walled, smooth	Abundant	
2.	*Microsporum*	Numerous, thick-walled, rough	Rare	
3.	*Epidermophyton*	Numerous, smooth-walled	Absent	

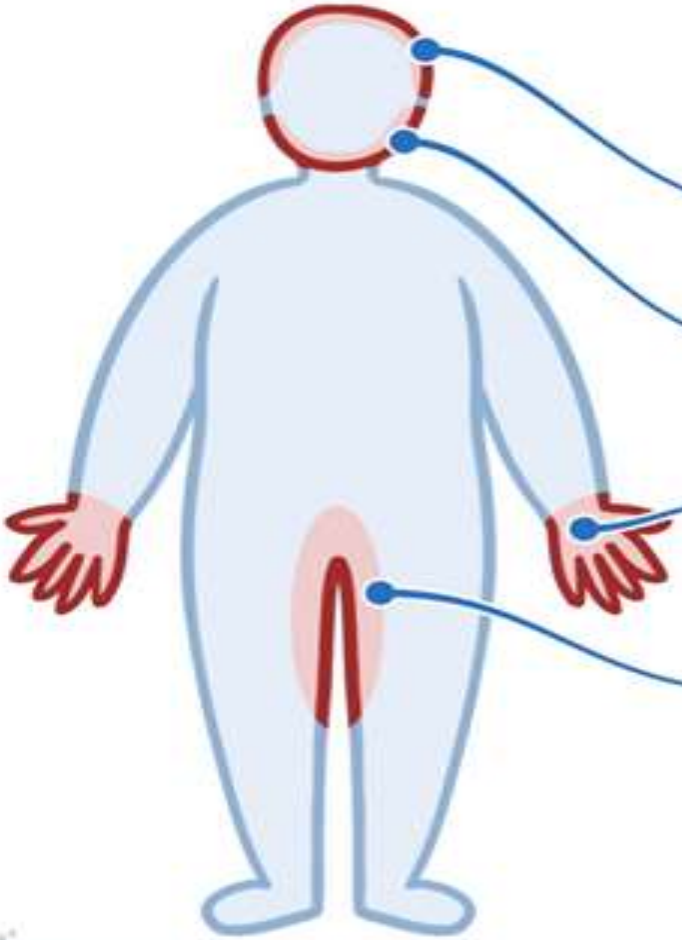
Features	Trichophyton	Microsporum	Epidermophyton
1. Site of infection	Hair, nail and skin	Hair and skin only	Skin and nail only
2. Colony	Powderly pigmented	Cotton like pigmented	Powderly greenish yellow
3. Spores a. Microconidia	Abundant	Relatively scanty	Absent
b. Macroconidia	Pencil or cylindrical shaped	Spindle shaped	Club or pear shaped

BACKGROUND

* FUNGAL INFECTION that can AFFECT SKIN, HAIR, & NAILS
  - **DERMATOPHYTES** - GROUP of FILAMENTOUS FUNGI REQUIRE KERATIN for GROWTH
  - aka DERMATOPHYTOSIS or TINEA
* ONE of the MOST COMMON CAUSES of SUPERFICIAL FUNGAL INFECTIONS

RISK FACTORS

* DECREASED IMMUNE RESPONSE
* AGE (ELDERLY & CHILDREN)
* DIABETES MELLITUS
* POOR CIRCULATION
* CORTICOSTEROID USE



TYPES

- TINEA CAPITIS (i.e. SCALP RINGWORM)
- TINEA FACIEI
- TINEA BARBAE
- TINEA CORPORIS (i.e. RINGWORM)
- TINEA MANUUM
- TINEA UNGUIUM (DERMATOPHYTE ONYCHOMYCOSIS)
- TINEA CRURIS (i.e. JOCK ITCH)
- TINEA PEDIS (i.e. ATHLETE'S FOOT)

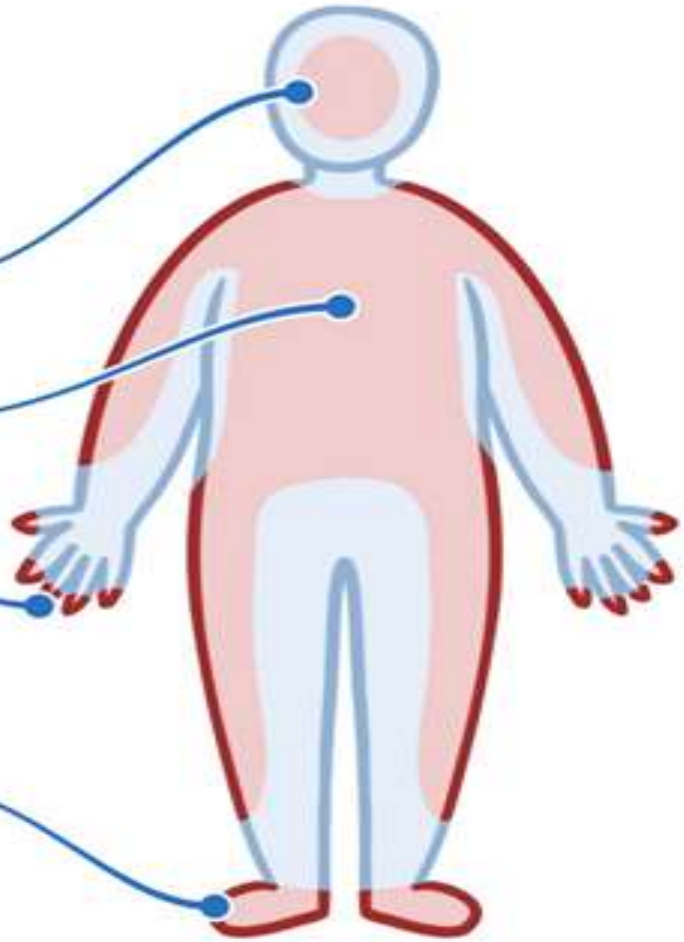


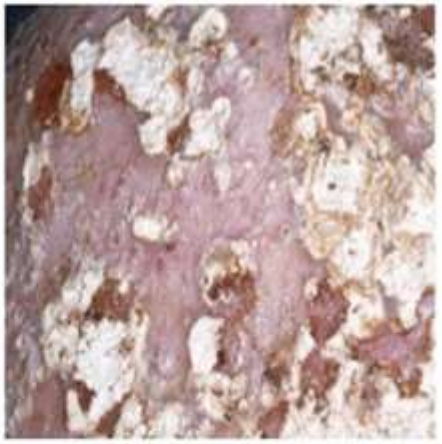
TABLE 45-3 Some Clinical Features of Dermatophyte Infection

Skin Disease	Location of Lesions	Clinical Features	Fungi Most Frequently Responsible
Tinea corporis (ringworm)	Nonhairy, smooth skin	Circular patches with advancing red, vesiculated border, and central scaling. Pruritic	*T. rubrum, E. floccosum*
Tinea pedis (athlete's foot)	Interdigital spaces on feet of persons wearing shoes	Acute: itching, red vesicular. Chronic: itching, scaling, fissures	*T. rubrum, Trichophyton mentagrophytes, E. floccosum*
Tinea cruris (jock itch)	Groin	Erythematous scaling lesion in intertriginous area. Pruritic	*T. rubrum, T. mentagrophytes, E. floccosum*
Tinea capitis	Scalp hair. Endothrix: fungus inside hair shaft. Ectothrix: fungus on surface of hair	Circular bald patches with short hair stubs or broken hair within hair follicles. Kerion rare. *Microsporum*-infected hairs fluoresce	*T. mentagrophytes, Microsporum canis, Trichophyton tonsurans*
Tinea barbae	Beard hair	Edematous, erythematous lesion	*T. mentagrophytes, T. rubrum, Trichophyton verrucosum*
Tinea unguium (onychomycosis)	Nail	Nails thickened or crumbling distally; discolored; lusterless. Usually associated with tinea pedis	*T. rubrum, T. mentagrophytes, E. floccosum*
Dermatophytid (id reaction)	Usually sides and flexor aspects of fingers. Palm. Any site on body	Pruritic vesicular to bullous lesions. Most commonly associated with tinea pedis	No fungi present in lesion. May become secondarily infected with bacteria

Tinea Capitis

Fungal Infection of Scalp



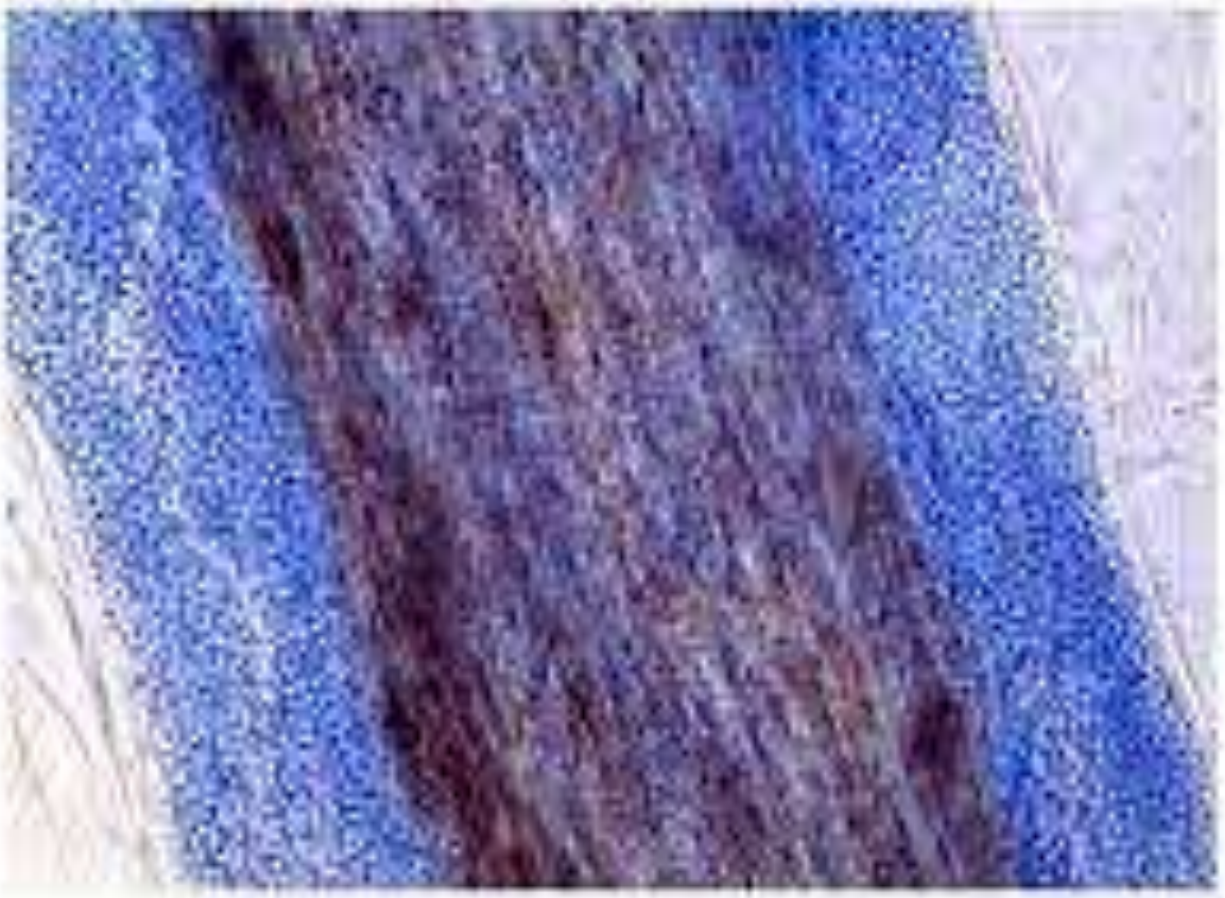



1.Tinea capitis(Scalp Ringworm)

Tinea capitis refers to dermatophytosis of the scalp. Three types of in vivo hair invasion are recognised:

1. **Ectothrix** invasion is characterized by the development of arthroconidia on the outside of the hair shaft. The cuticle of the hair is destroyed and infected hairs usually fluoresce a bright greenish yellow colour under Wood's ultraviolet light. Common agents include M. canis, M. gypseum, and T. verrucosum.

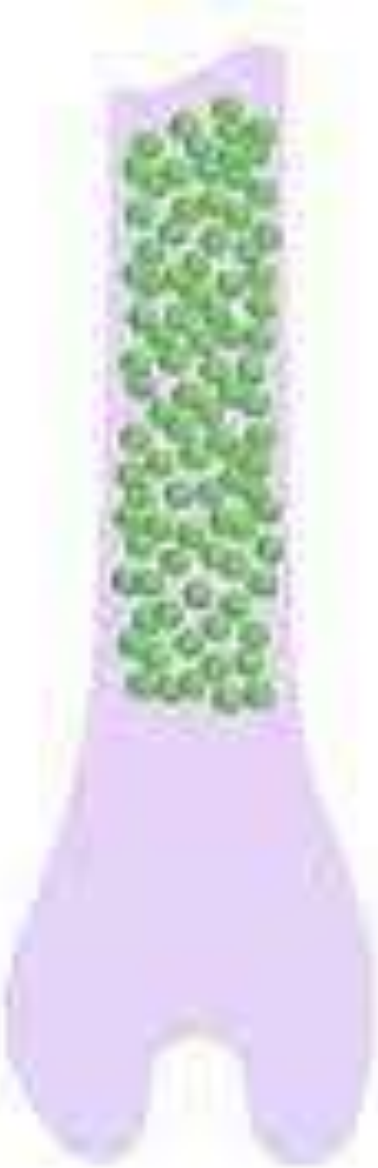
ectothrix



2. **Endothrix** hair invasion is characterised by the development of arthroconidia within the hair shaft only. The cuticle of the hair remains intact and infected hairs do not fluoresce under Wood's ultraviolet light.

All endothrix producing agents are anthropophilic T. tonsurans and T. violaceum.

endothrix



- 3. **Favus** usually caused by T. schoenleinii, produces favus-like crusts and corresponding hair loss.

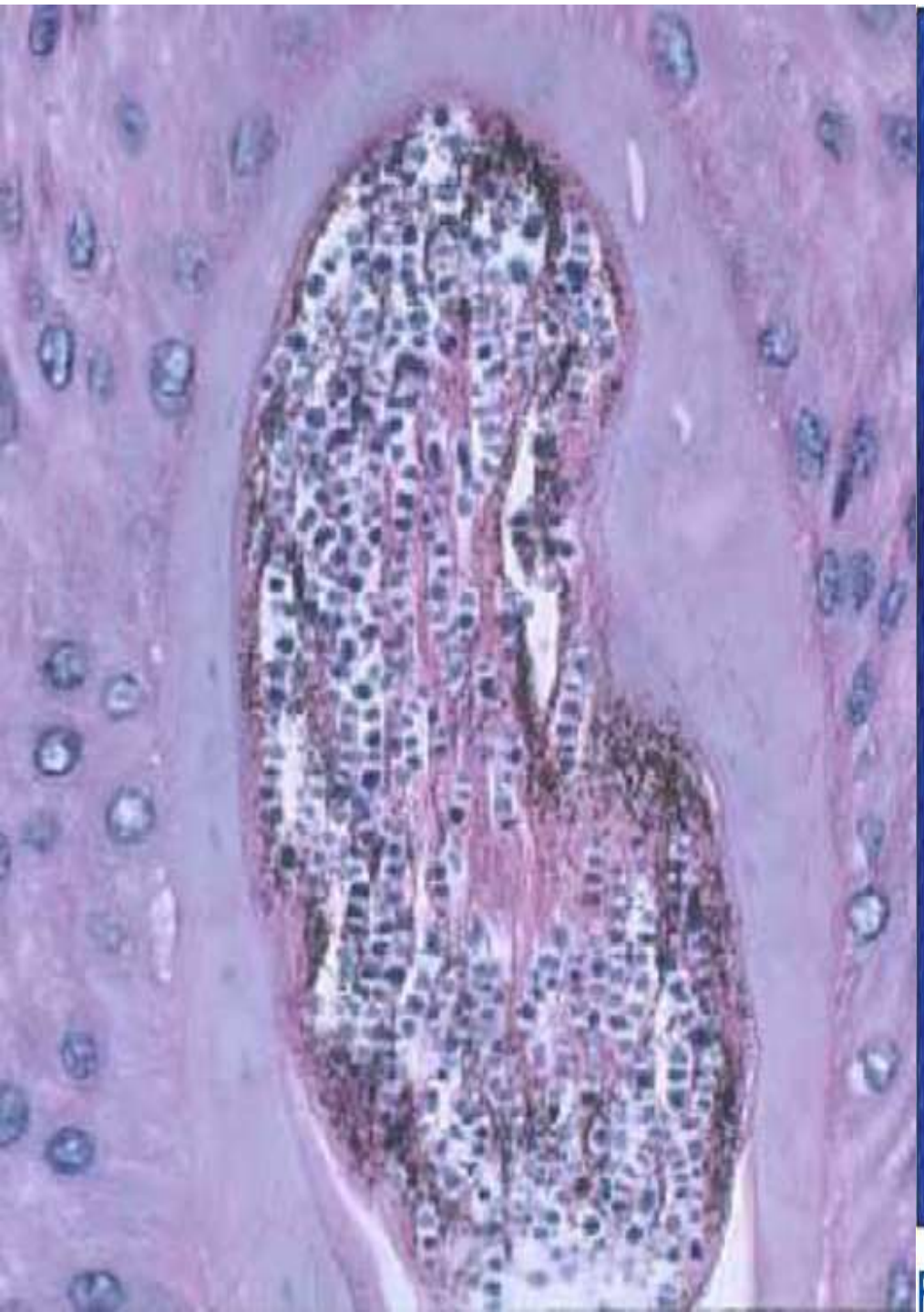


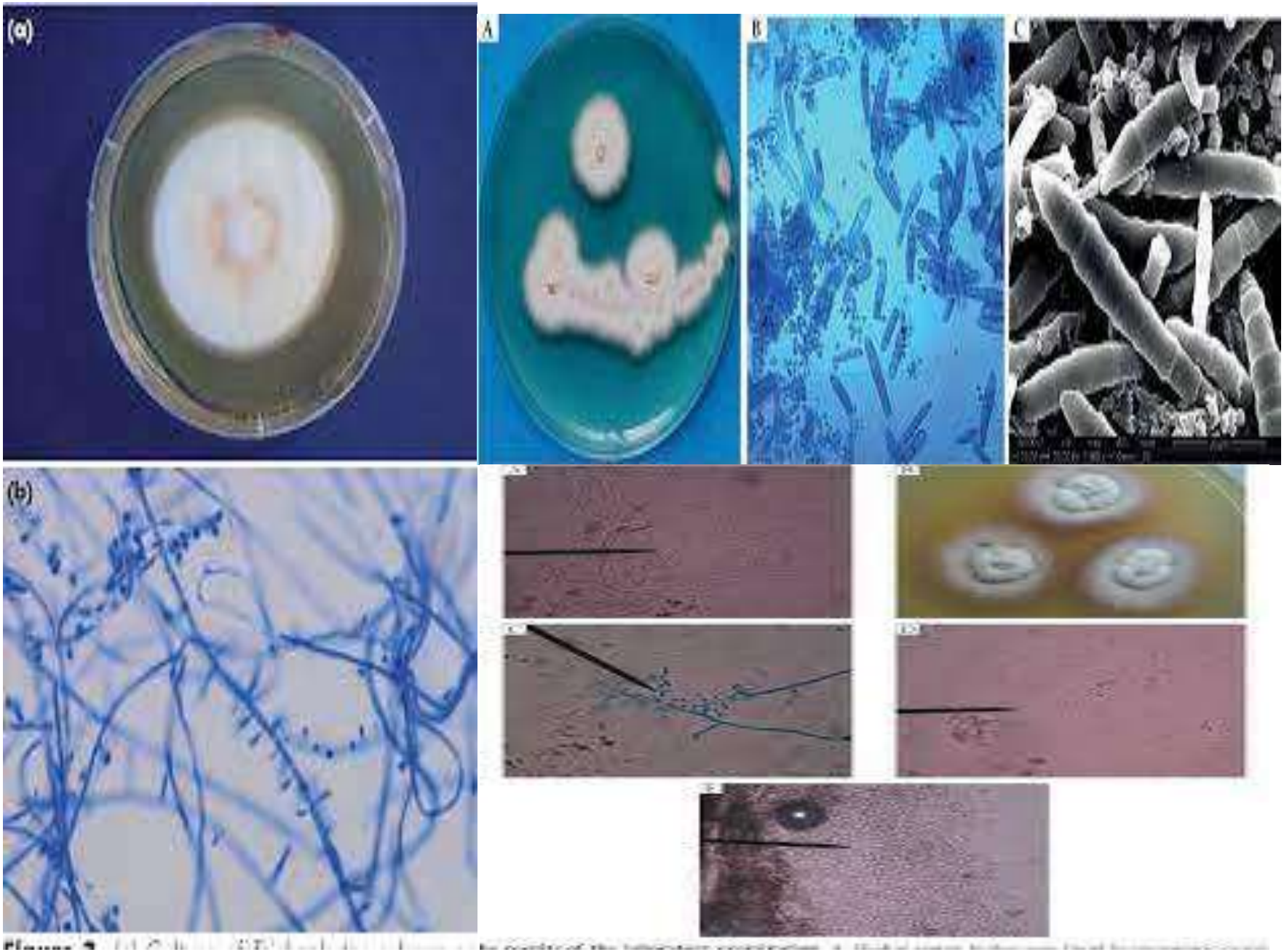
Figure 2: Culture of the specimens revealed the presence of

2.Tinea faciei

is a superficial dermatophyte infection limited to the glabrous skin of the face. In pediatric and female patients, the infection may appear on any surface of the face, including the upper lip and chin. In men, the condition is known as tinea barbae when a dermatophyte infection of bearded .


SFS

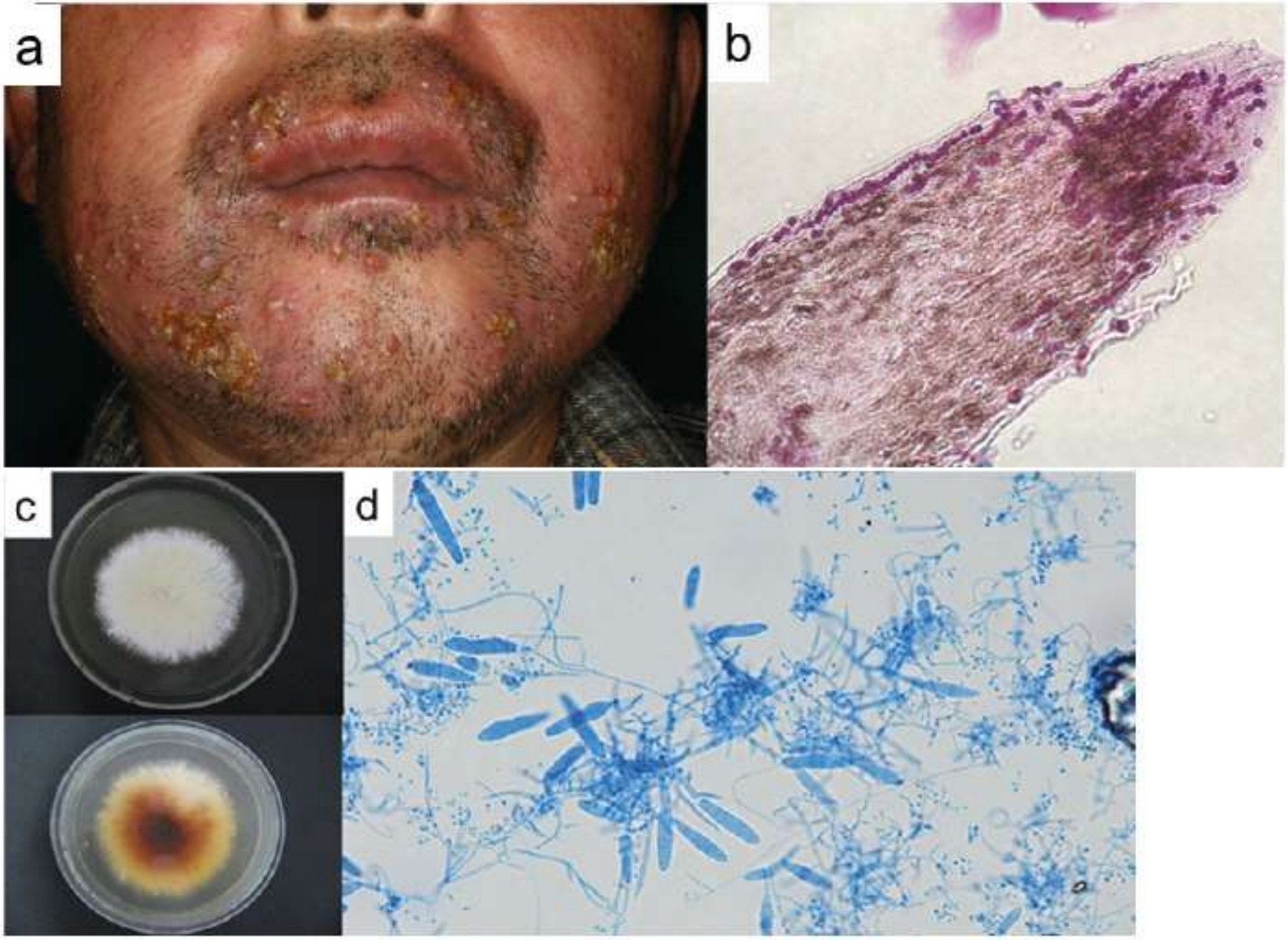

SFS


(a)
A
B
C
(b)

3.TINEA BARBAE (Barber's Itch)

Tinea barbae is a dermatophyte infection of the beard area most often caused by Trichophyton mentagrophytes or T. verrucosum.

Tinea barbae manifests as superficial annular lesions, but deeper infection similar to folliculitis may occur. It may also occur as an inflammatory kerion that can result in scarring hair loss.


a
b
c
d

Tinea Corporis

Ringworm

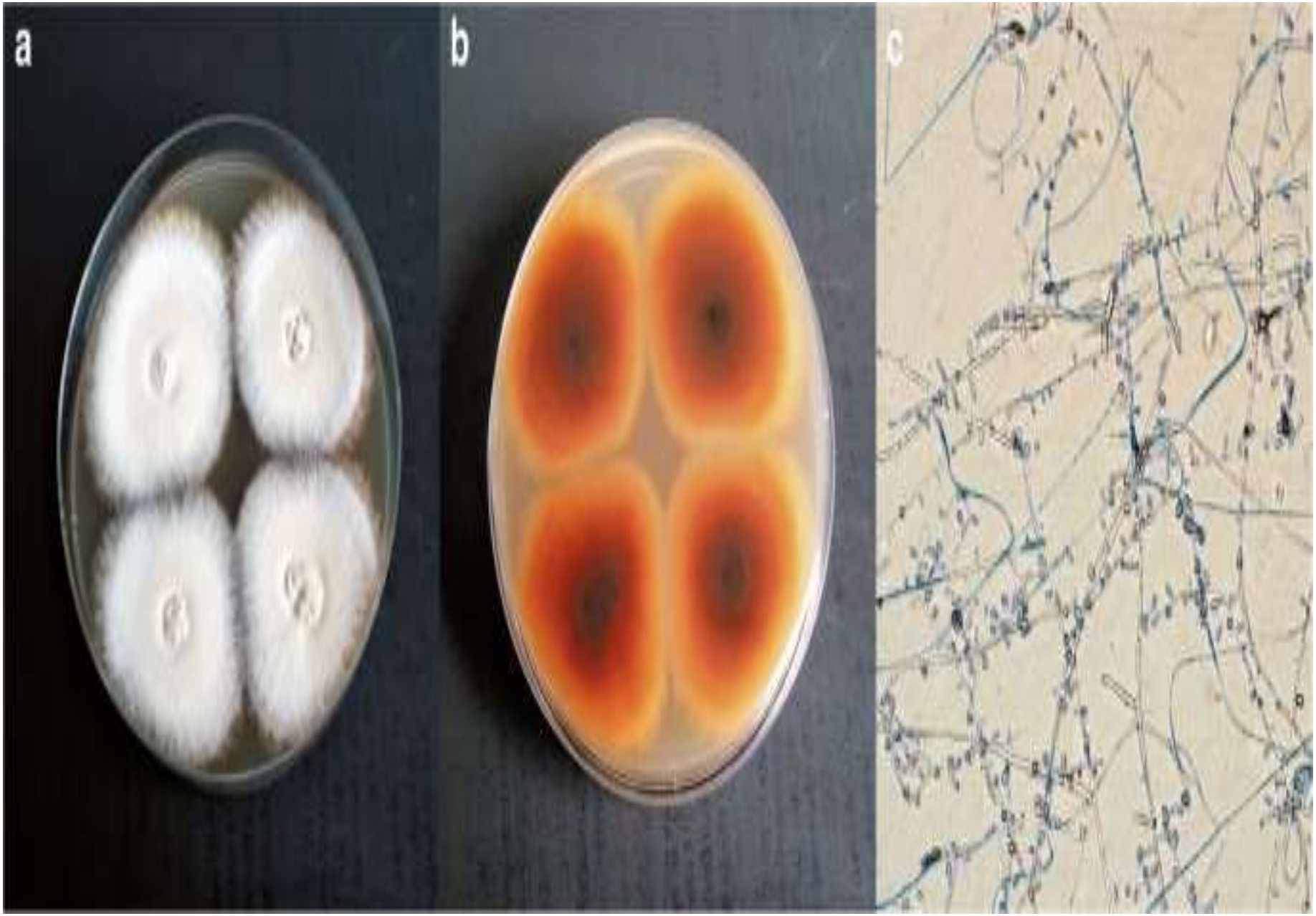



4.Tinea corporis(Body Ringworm)

Tinea corporis is a dermatophyte infection of the face, trunk, and extremities.

Common causes are T. mentagrophytes, T.rubrum, and M. canis.

Tinea corporis causes pink-to-red annular patches and plaques with raised scaly borders that expand peripherally and tend to clear centrally.


a
b
c

Tinea Cruris

Jock Itch

5.Tinea cruris(Jock Itch)

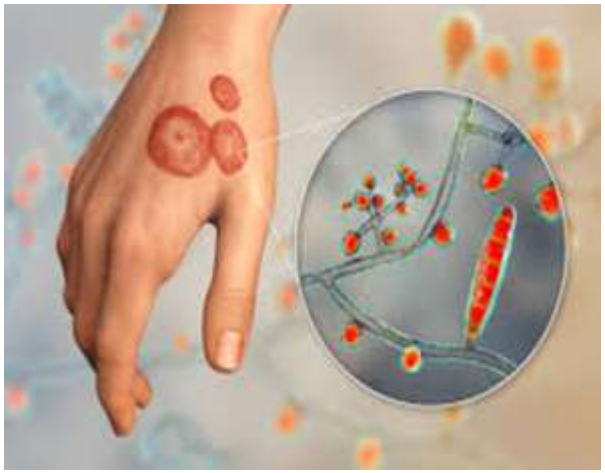
Tinea cruris is a dermatophyte infection of the groin. Common organisms include T. rubrum or T. mentagrophytes. The primary risk factors are associated with a moist environment (ie, warm weather, wet and restrictive clothing, obesity causing skin folds). Men are affected more than women because of apposition of the scrotum and thigh.

Typically, a pruritic, ringed lesion extends from the crural fold over the adjacent upper inner thigh. infection occur more often during summer.

6.Tinea Manuum

The palmar and interdigital areas of the hand are usually involved in tinea manuum, most frequently presenting as unilateral diffuse hyperkeratosis.

Most infections are caused by T. rubrum.



Tinea Manuum

Tine aunguium

7.Tine aunguium (onychomycosis)

Onychomycosis refers to the invasion of the nail plate by a fungus.

Nail infection may follow prolonged tinea pedis. With hyphal invasion, the nails become yellow, brittle, thickened, and crumbly. One or more nails of the feet or hands may be involved.

The infection may be due to dermatophyte a yeast, or non dermatophyte mould. The term "**tinea unguium**" is used specifically to describe invasive dermatophytic onychomycosis .

- Onychomycosis is classified in this way:
- • Distal subungual onychomycosis (DSO)

  T. rubrum
- • Proximal subungual onychomycosis (PSO)

  T. rubrum
- • White superficial onychomycosis (WSO)

  Trichophyton mentagrophytes

Onychomycosis

Distal subungual onychomycosis

White superficial onychomycosis

Proximal subungual onychomycosis

Candidal onychomycosis

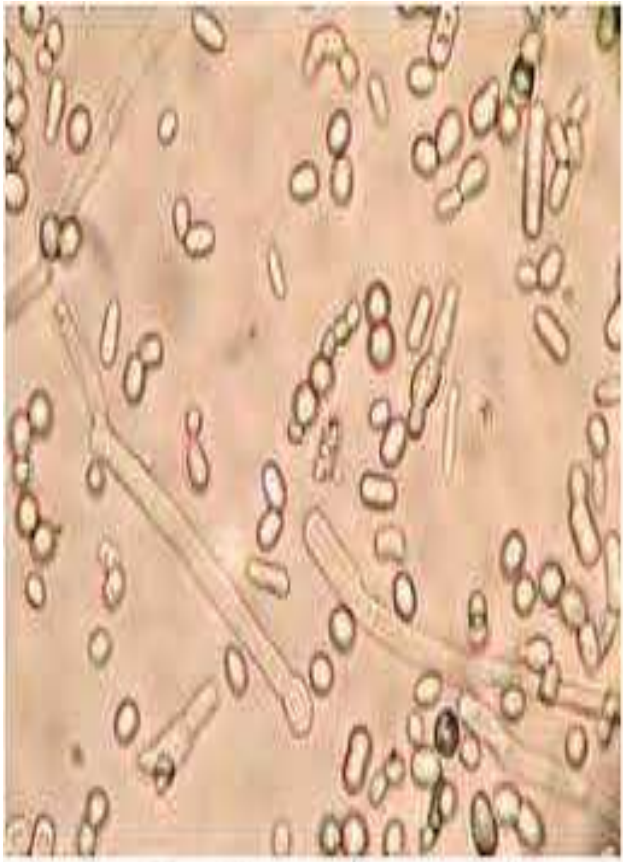
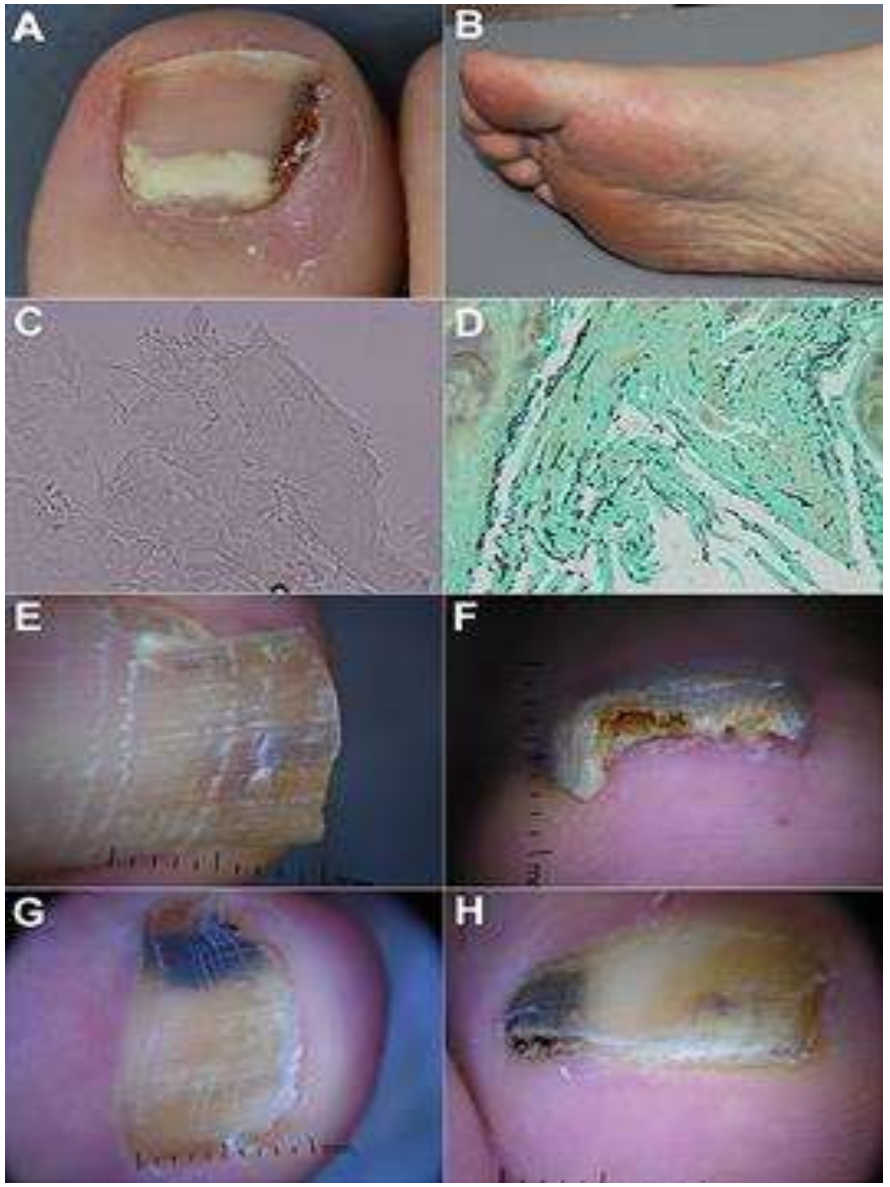


Fig. 3. (D) Microscopic morphology of

FIGURE 1. (A) Proximal subungual onychomycosis in a patient with systemic lupus erythematosus. (B) Abnormal plantar desquamation increases the likelihood of clinically diagnosing onychomycosis. Thus, the sole should also be examined while assessing onychomycosis. (C) KOH-test highlighting presence of fungal hyphae (×200 magnification). (D) Histopathology (nail clipping) with GMS staining showing numerous fungal hyphae in the nail plate (×400). The fungi are highlighted in black with GMS staining. (E,F) Dermoscopic examination of onychomycosis showing yellowish discoloration with spikes pattern and surface scales. Distal edge dermoscopy demonstrating subungual hyperkeratosis. (G,H) Dermoscopic examination of fungal melanonychia showing reverse triangular pattern, yellow streaks, black and yellow coloration, scales, and subungual hyperkeratosis.



8.Tinea pedis(Athlete's Foot)

Tinea pedis is a dermatophyte infection of the feet. Infections by anthropophilic dermatophytes are usually caused by the shedding of skin scales containing viable infectious hyphal elements [arthroconidia] of the fungus.Tinea pedis is the most common dermatophytosis because moisture from foot sweating facilitates fungal growth.

The feet, especially the soles and toe webs, are most frequently involved in tinea pedis.

The most common clinical manifestation is

1- intertriginous

2-chronic, squamous, hyperkeratotic type

3-acute inflammatory condition,

The more chronic agents of tinea pedis are *T. rubrum,*

T. mentagrophytes var. *interdigitale, and E. floccosum.*

a) Colony morphology of the causing agent of tinea pedis on SDA after incubating at 28°C for 3 days. (b) Microscopic examination of the colony stained by LCB, the fungus possesses mycelium with septate hyphae, arthroconidia, and budding cells (Scale bar: 5µm). (c) Colony morphology of the causing agent of tinea pedis on and CHROMagar after incubating at 28°C for 3 days.

Laboratory diagnosis

Sample:

1. Skin scrapping.
2. Nail scrapping.
3. Hair plucking.

Collection of samples:

1.Skin: from the margin of the lesion, with thescalpel.

2.Nail: deeper part is collected and superficial part is discarded.

3.Hair: plucked by fine forceps.

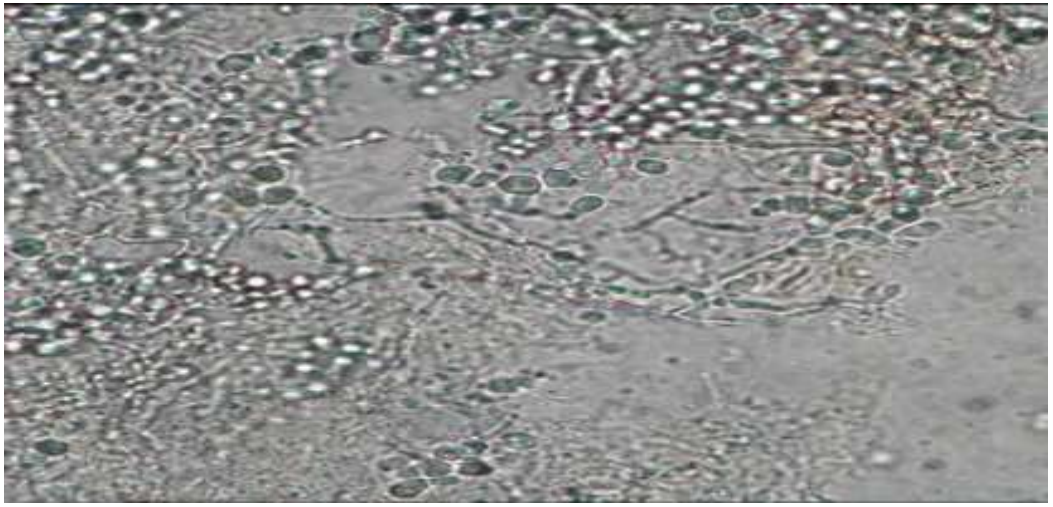
Wood's lamp test: ectothrix of *Microsporum* species impact a greenish to silvery fluorescence when examined under Wood's light.

Infectious organisms glowing
under Wood's lamp illumination

A.D.A.M.

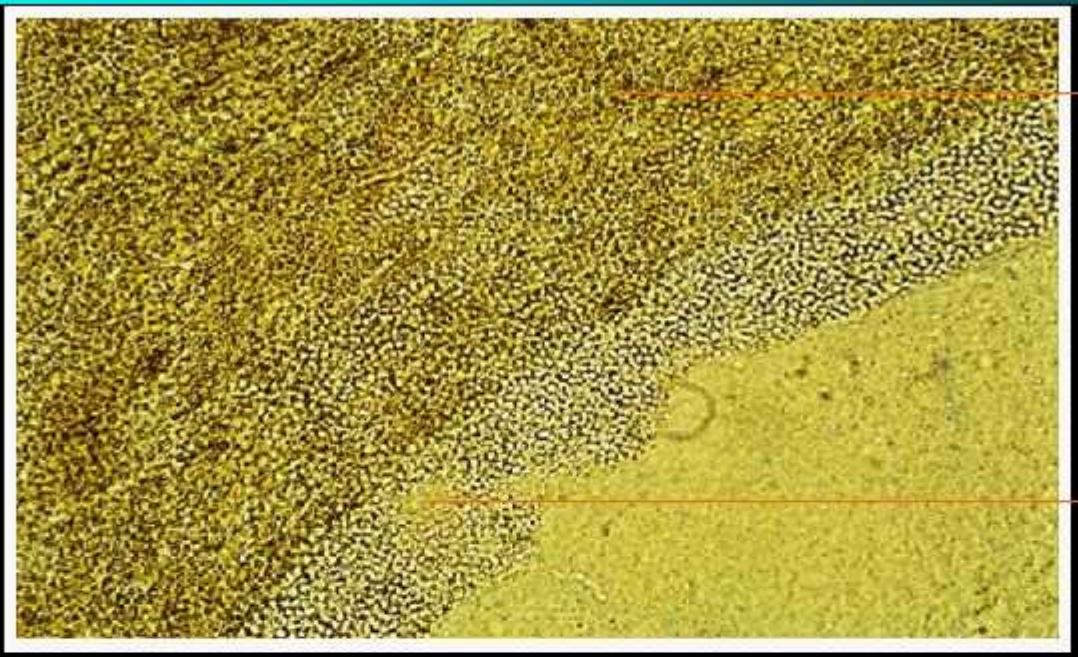
Microscopic examination:

1. KOH preparation of skin or nail: branching hyphae or chains of arthoconidia are seen.

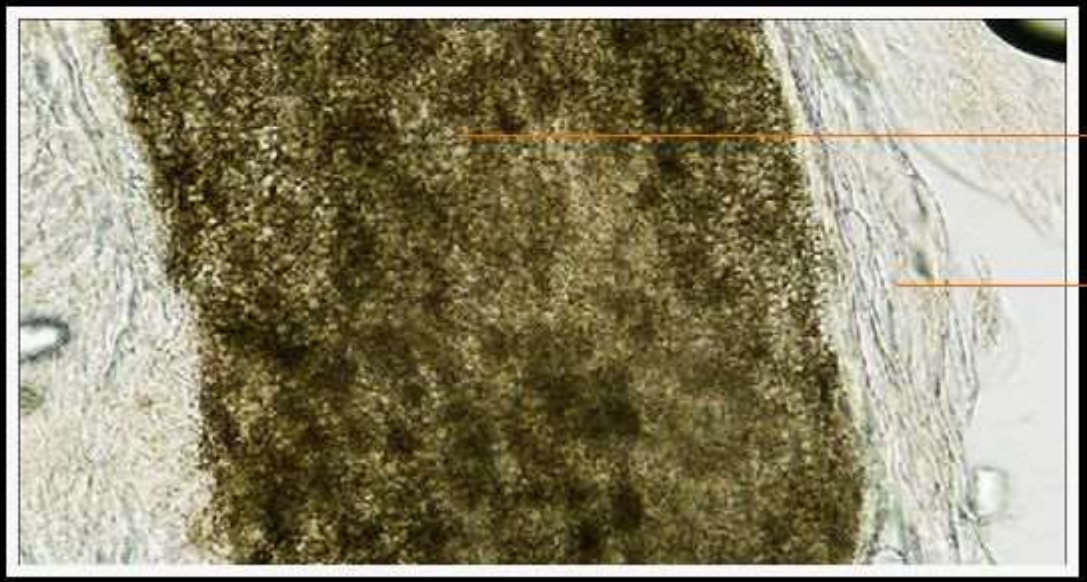


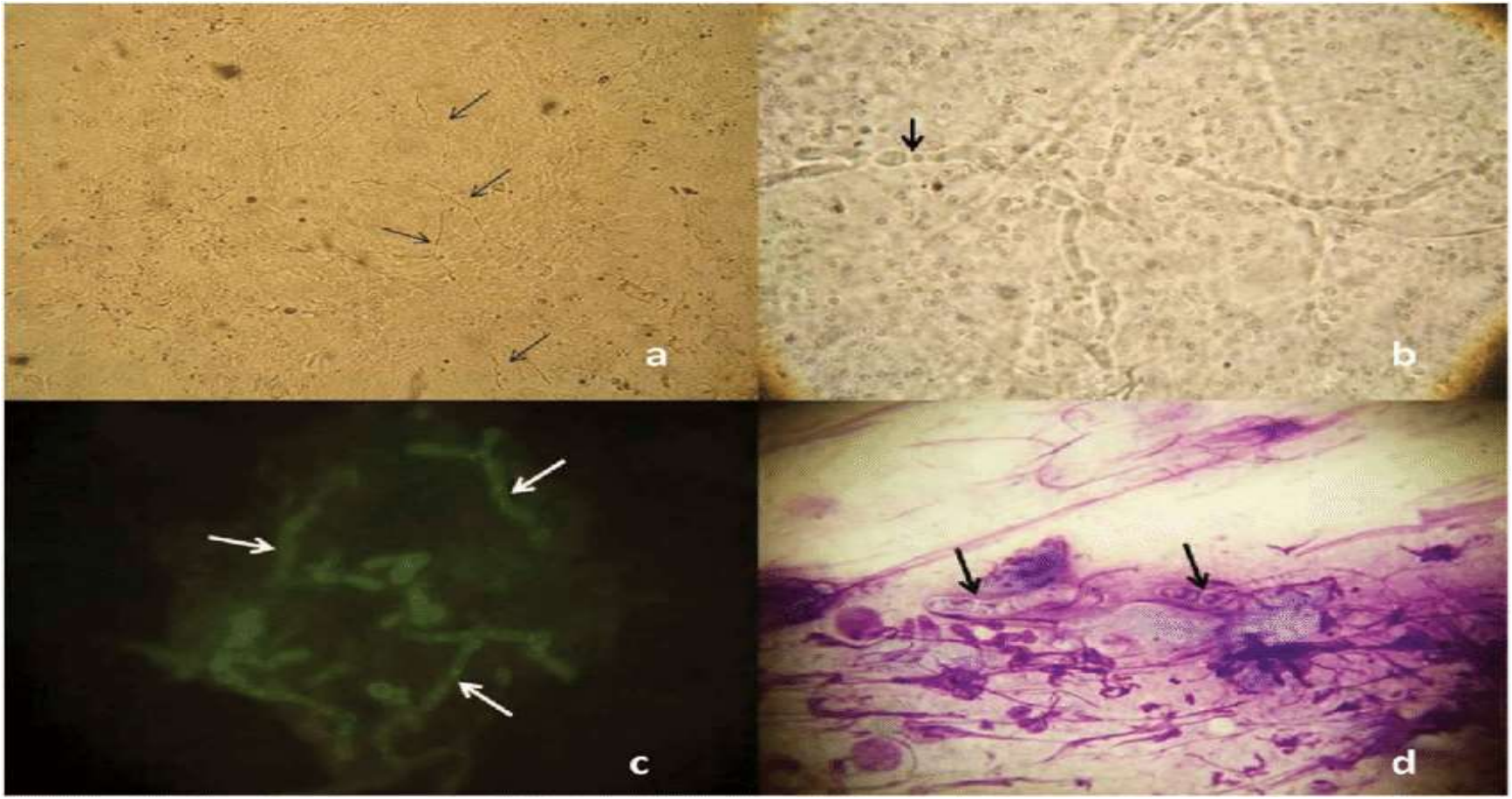
2. KOH preparation of hair: ectothrix and endothrix are seen.

Ectothrix

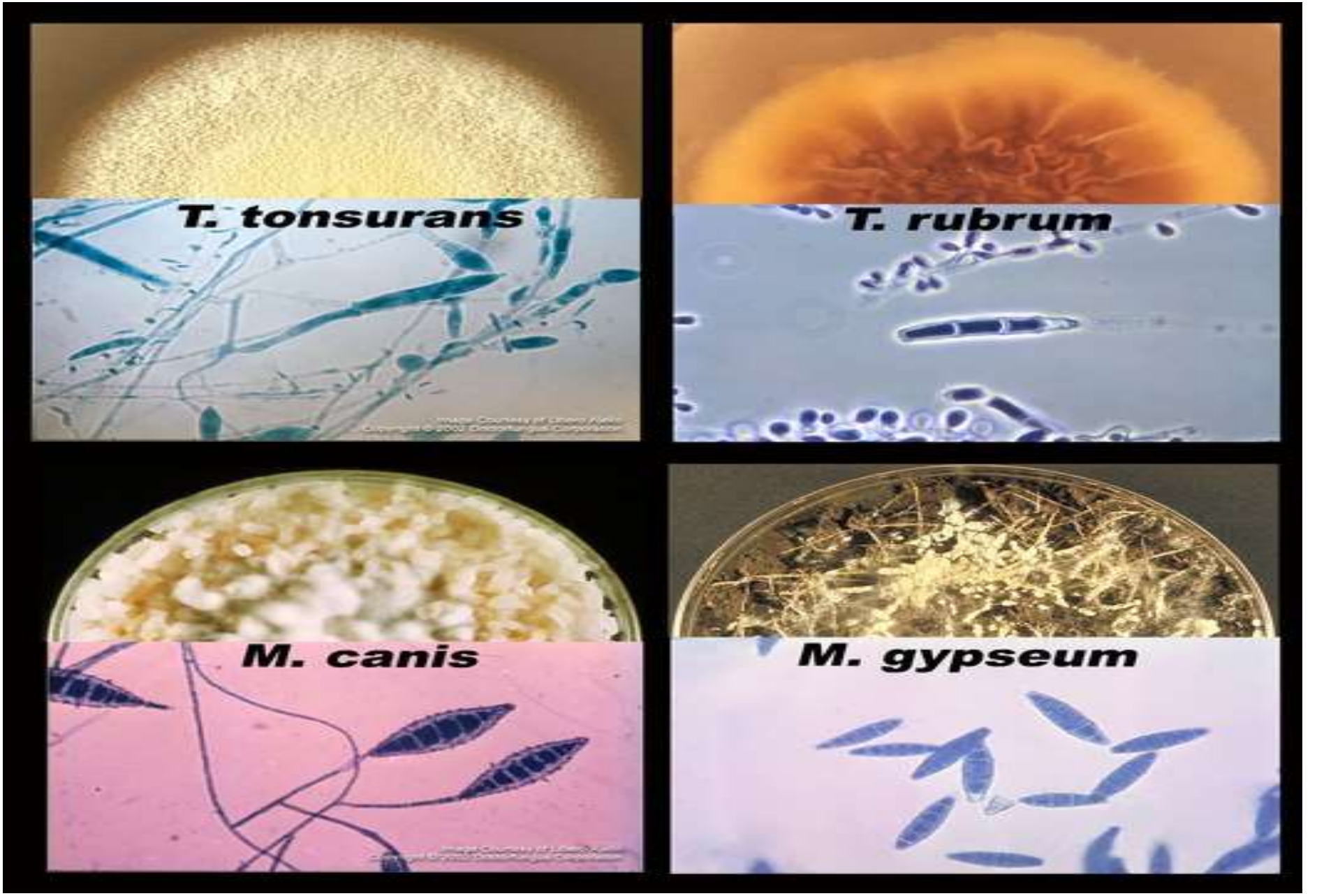


Endothrix





Microscopic examinations of dermatophytic infections. (a) KOH preparation of a toenail scraping showing several septate hyphae (arrows) (× 100 magnification) (b) Closer view of the septate hyphae (arrow) (× 100 magnification) (c) Calcofluor stain showing positive fluorescent staining of hyphae (arrows) (× 1,000 magnification) (d) May-Grünwald Giemsa stain from tzanck smear of bullous tinea pedis showing hypae (arrows) (× 1,000 magnification)


T. tonsurans
T. rubrum
M. canis
M. gypseum

Culture:

- Incubation period: 1-3 weeks. - Incubation temparature: 25° C.

- **Media used**

1. Sabouraud's dextrose agar media.

2. Dermatophyte test media: Sabouraud's dextrose agar + cyclohexamide + chloramphenicol + phenol red.

3. Malt agar.

- Colony morphology:


T. rubrum

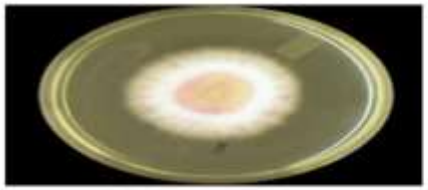

T. mentagrophytes


T. tonsurans


T. schoenleinii


T. violaceum


M. audouinii


M. canis


M. gypseum

Others:

1. **PCR**: species specific identification.
2. Nutritional test and growth at 37° C.
3. In vitro hair perforation: placing an organism in a petri dish- water, yeast extract, hair.


Thank
you