Basic Characteristics

- Medium growth rate (1-3 weeks)
- Identification
  - Colony morphology
  - Microscopic morphology
    - Hyphae – hyaline & septate
    - Macroconidia, Microconidia
  - Physiological tests
- Clinical significance – Tinea (ringworm)

Clinical Significance

- Skin
  - Tinea corporis
  - Tinea pedis
  - Tinea cruris

- Hair
  - Tinea capitis
  - Tinea barbae
  - Ectothrix
  - Endothrix

- Nails
  - Tinea unguium

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<tr>
<th>Dermatophyte</th>
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<tr>
<td>Microsporum</td>
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Epidemiology

- Anthropophilic
  - Man
- Zoophilic
  - Animals
- Geophilic
  - Soil

What three body sites do the dermatophytes infect?

Hair, skin and nails

What is the difference between endothrix and ectothrix?

Endothrix means the mold has conidia inside the hair shaft, whereas Ectothrix means the conidia are only on the outside of the hair shaft.

What infection do the dermatophytes cause?

Tinea (also referred to as “ringworm”). Another term that can be used is dermatophytosis.

Laboratory Diagnosis

- Specimen collection
- Direct examination
- Culture
- Identification

Specimen Collection

- Hair
  - Plucked, not cut, from edge of lesion
- Skin
  - Wash, scrape from margin of lesion
- Nails
  - Scrapings from nail bed or infected area
- Transport in sterile petri dish
Direct Examination

- Examine hair for fluorescence
  - Wood’s lamp
  - Yellow green fluorescence = positive

Laboratory Diagnosis

Specimen processing

- Hair
  - Cut into short segments
- Nails
  - Mince into small pieces

Culture Media

- Select two media types
  - General purpose – Sabouraud’s agar
  - Selective – Mycosel agar
- Antibiotics
  - Gentamicin: inhibits normal bacterial flora
  - Cycloheximide: inhibits saprophytic fungi

Culture Growth Requirements

- Place specimen pieces on culture media
- Can streak for isolation
- Incubate at 30°C in ambient (room) air
- Growth at 3 days to 3 weeks
- Examine plates frequently for 4 weeks

Identification

- Colony morphology
- Microscopic morphology
  - Scotch tape preparation
  - Tease prep
  - Slide culture
Laboratory Diagnosis

Identification

- Physiologic tests
  - Urea hydrolysis
  - Hair perforation

- Rice grain media
- Vitamin requirements

How can hair, skin and nails be evaluated directly for fungal elements?

Wood’s lamp fluorescence (hair only), 10% KOH preparation, and Calcofluor white fluorescent stain.

What are the incubation requirements when suspecting a dermatophyte infection?

Fungal media is incubated at 30°C in ambient air for 4 weeks. There is one exception and that is *Trichophyton verrucosum* that requires 35°C.

What primary procedures are performed to identify the dermatophytes?

Colony morphology, microscopic morphology (Scotch tape prep, tease prep, or slide culture), and physiologic tests such as urea hydrolysis and hair perforation.

Etiologic Agents

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

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*Microsporum canis*

- Colony morphology:
**Microsporum canis**

- Microscopic morphology:

**Microsporum gypseum**

- Colony morphology:

**Microsporum audouinii**

- Colony morphology:

![Microsporum gypseum](image)

**Microsporum gypseum**

- Microscopic morphology:

**Microsporum audouinii**

- Microscopic morphology:

How can *Microsporum* species be differentiated from each other microscopically?

Characteristic appearance of the macroconidia, and the general appearance of the hyphae (such as pectinate bodies). As a group, *Microsporum* have few to absent microconidia.
**Epidermophyton floccosum**

- Colony morphology:

**Trichophyton rubrum**

- Colony morphology:

**Trichophyton rubrum**

- Physiological tests
  - Urea: negative
  - Hair perforation: negative

**Trichophyton mentagrophytes**

- Colony morphology:

  - Downy
  - Granular
  - Velvet
**Trichophyton mentagrophytes**

- Microscopic morphology:

**Trichophyton mentagrophytes**

- Physiologic tests:
  - Urea: positive
  - Hair perforation: positive

**How can Trichophyton mentagrophytes be differentiated from Trichophyton rubrum?**

Urea hydrolysis and hair perforation tests. 
*T. mentagrophytes* is positive for both, and 
*T. rubrum* is negative for both.

**Dermatophytes**

**In Summary …**

- Causes Tinea (ringworm)
- Medium growth rate = 1-3 weeks
- Grows on Mycosel agar
- Identification
  - Colony morphology, microscopic exam, and physiologic tests
- Etiologic agents
  - *Microsporum, Epidermophyton, Trichophyton* species

**Who am I?**

*Microsporum canis*

- Potato Dextrose Agar
- Reverse
- LPCB Stain of Slide Culture
Who am I?

Epidermophyton floccosum

Who am I?

Trichophyton mentagrophytes

Who am I?

Microsporum gypseum