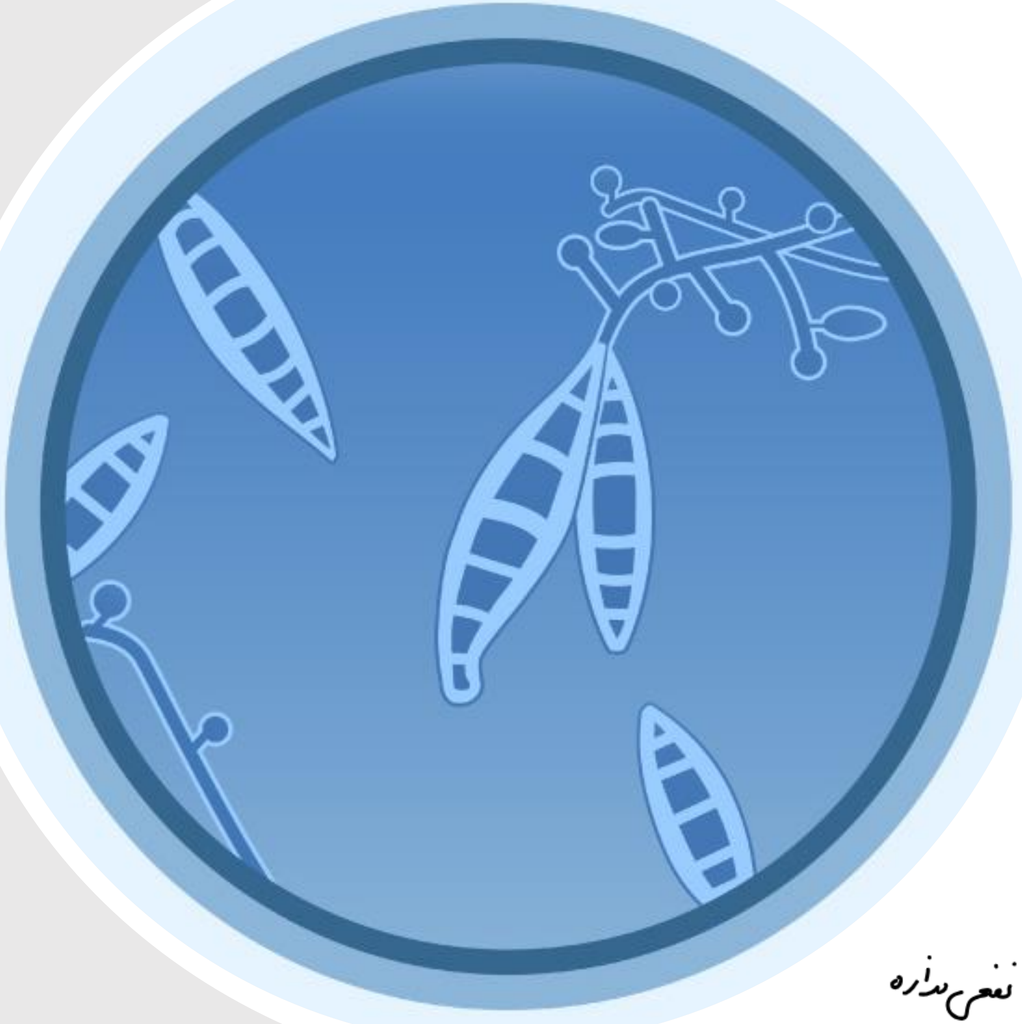

Dermatophytosis

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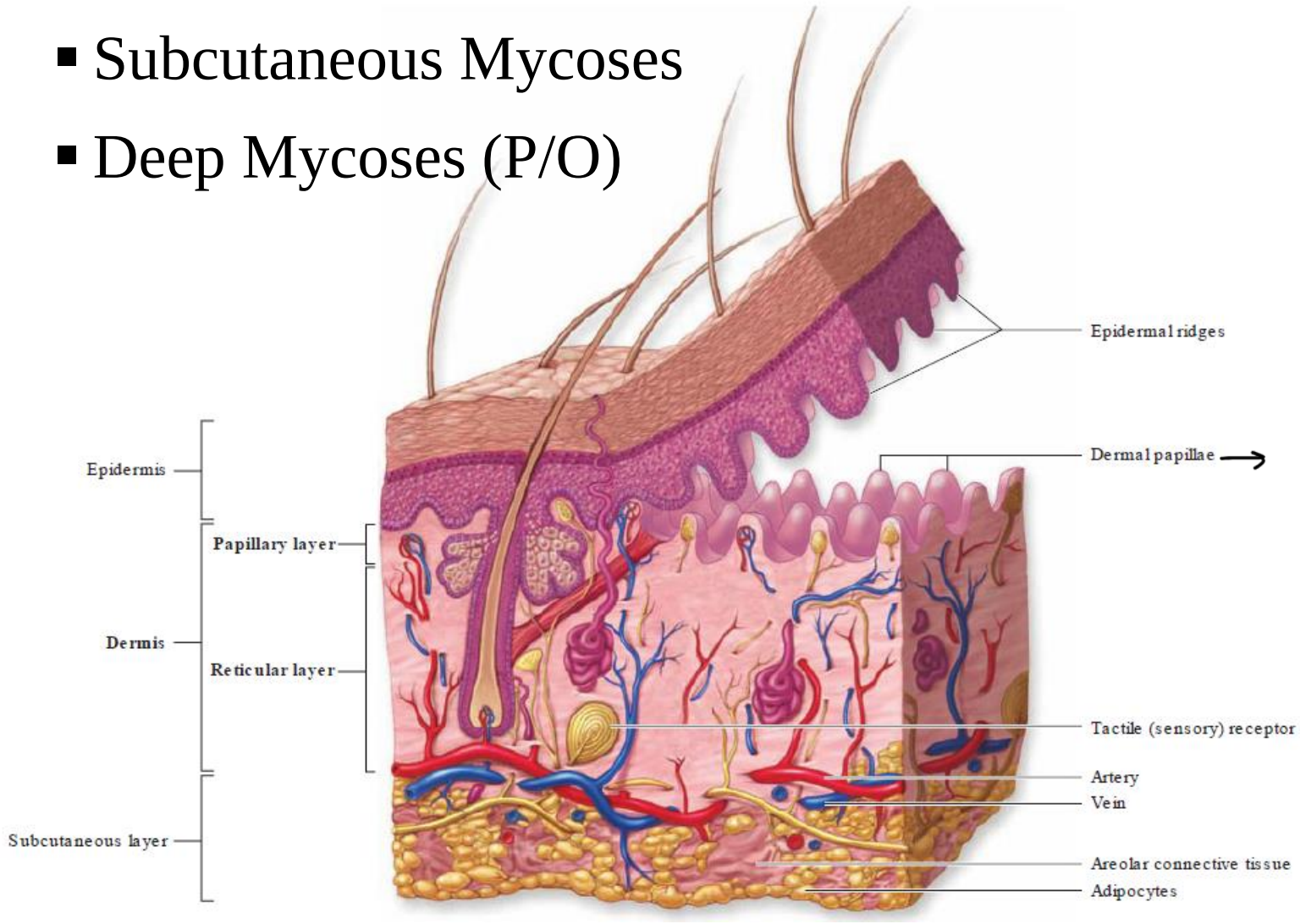
به گیرنده های درد اصلاً نمی‌رسن ← نفعی نداره
غذا ندارن اونجا + با سیستم ایمنی درگیر می‌شوند.

Introduction

- Superficial Mycoses
- Cutaneous Mycoses → عفونت های جلدی
- Subcutaneous Mycoses
- Deep Mycoses (P/O)



نهایتا می ریزد

Cutaneous fungal infections

- These are fungal infections of the skin, hair, or nails.
- No living tissue is invaded, however, a variety of pathological changes occur in the host because of the presence of the infectious agent and its metabolic products.
- Dermatophytosis (tinea or ringworm) is caused by a closely related group of keratinophilic fungi known as dermatophytes, which have the ability to utilize keratin as a nutrient source, i.e., they have a unique enzymatic capacity [keratinase].
- The type and severity of the host response are often related to the species and strain of dermatophyte causing the infection.

Dermatophytosis

- The disease process in dermatophytosis is unique for two reasons:

✓Firstly, no living tissue is invaded the keratinised stratum corneum is simply colonised. However, the presence of the fungus and its metabolic products usually induces an allergic and inflammatory eczematous response in the host.

✓Secondly, the dermatophytes are the only fungi that have evolved a dependency on human or animal infection for the survival and dissemination of their species.

- The distinctive circular pattern of skin and sometimes nail lesions led ancient physicians to believe that there was a worm in the tissue. Even though the etiology of these lesions is known to be a fungus rather than a worm, they are still referred to as ringworm infections today.

What fungi causes dermatophytosis?

- *Trichophyton* 16
- *Epidermophyton* 1
- *Microsporum* 3
- *Nannizzia* 9
- *Paraphyton* 3
- *Lophophyton* 1
- *Arthroderma* 21

How does tinea infection occur?

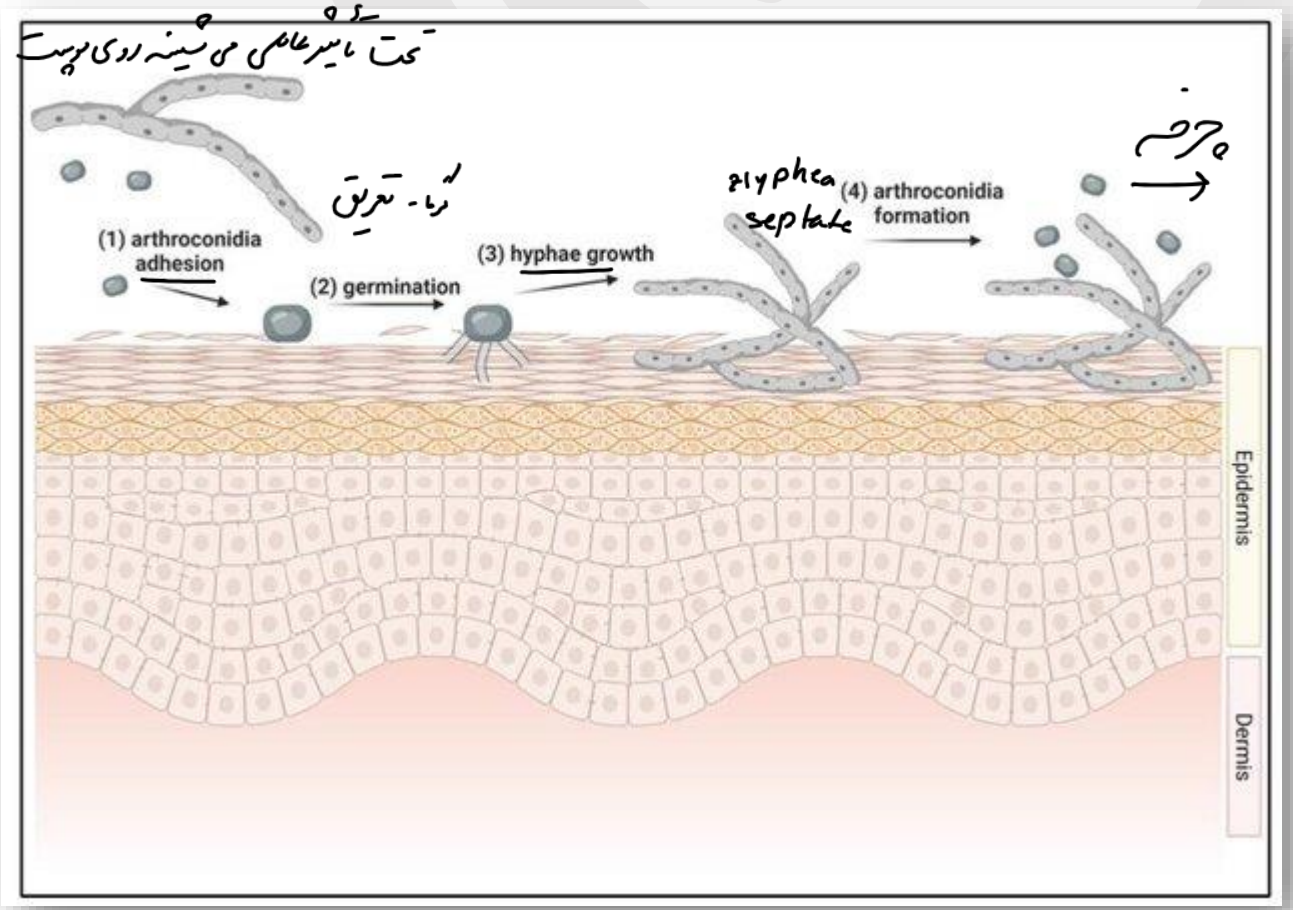
- Initiation of dermatophyte infection in skin.

(1) Arthroconidia from the environment or other infected host contact the new host's skin. Adhesion to skin occurs between 2–6 h after contact.

(2) Arthroconidia begin to germinate in the top layer of the epidermis, forming germ tubes.

(3) Hyphae continue to grow within the epidermis.

(4) Within 7 days of infection, arthroconidia are formed, allowing for the cycle to repeat.

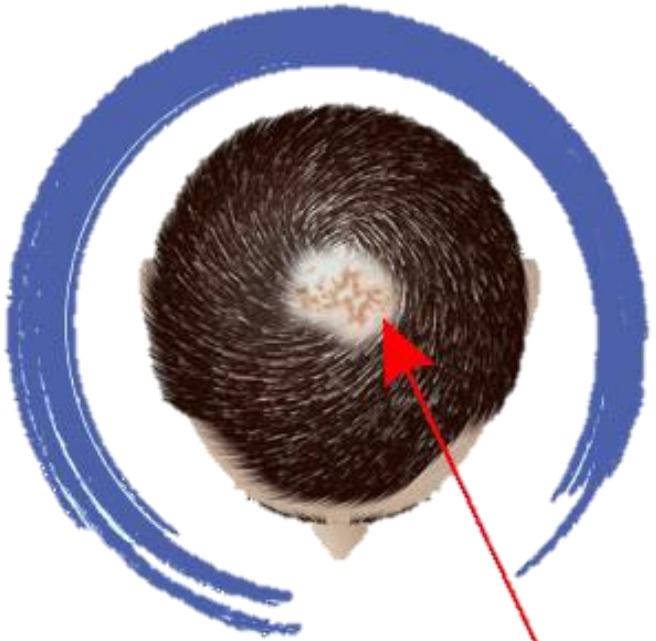


Anatomic location:

- tinea capitis
- tinea corporis
- tinea unguium “onychomycosis”
- tinea pedis “athlete’s foot”
- tinea cruris “jock itch”
- tinea manuum
- tinea barbae

Tinea capitis

- The fungal infection that affects child's scalp, hair, eyebrows, and eyelashes.
- Tinea capitis is less common after puberty owing to the increase in oily secretions in the scalp.
- Risk factors include animal contact, household crowding, lower socioeconomic status, warm humid environments, and contact sports.



پس از یا شستی هم امکان داره درصدت بعود متبالنه

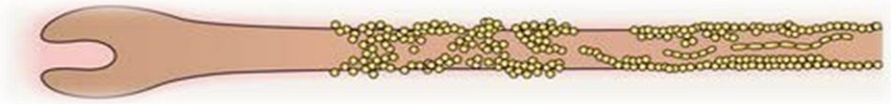
tinea capitis

How does tinea capitis infection occur?

- Following the invasion of the keratinised stratum corneum of the scalp, the fungus grows downwards into the hair follicle and the hair shaft.
- It penetrates the hair cuticle and typically invades the hair shaft in one of three ways:

❖ Ectothrix infection
❖ Endothrix infection
❖ Favus infection

Ectothrix



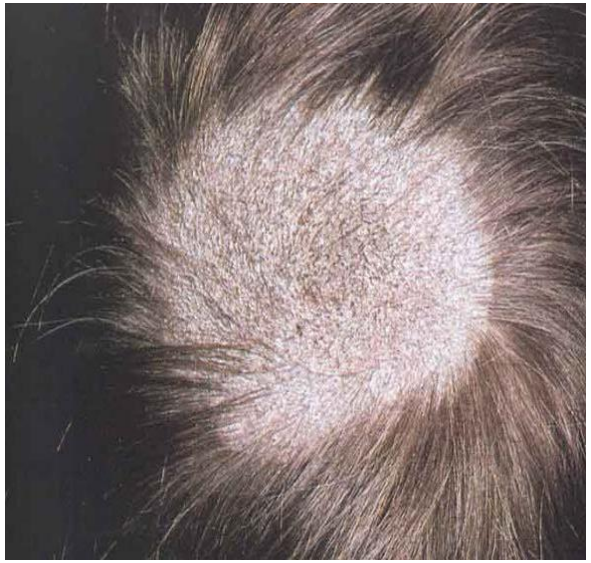
tinea capitis

- Arthroconidia around the hair shaft or just beneath the cuticle.
- The cuticle of the hair is destroyed.

➢Two clinical signs include:

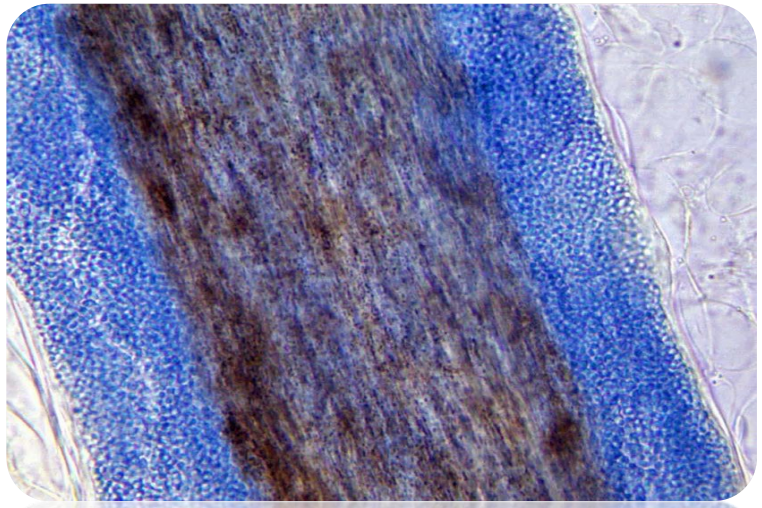
- Common agents include:

1. ***Microsporum canis***
2. ***Microsporum audouinii***
3. ***Nannizzia gypsea***
4. ***Trichophyton mentagrophytes***
5. ***Trichophyton verrucosum***



1. Kerion

2. Gray patch



Endothrix

داخل موی سالم

- Arthroconidia within the hair shaft.
- Fungal spores are retained inside the hair shaft, and the cuticle is not destroyed. → بعد از درمان برمی‌گردد
- All endothrix-producing agents are anthropophilic.

شایع‌ترین عوامل مجری در ایران:

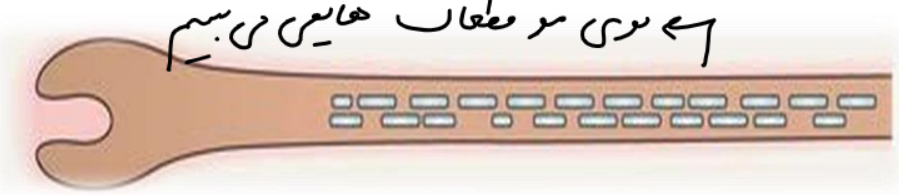
Common agents include:

1. ***T. tonsurans*** → شایع در ایران
2. ***T. violaceum***
3. ***T. soudanense***

حالت انتهایی شسته

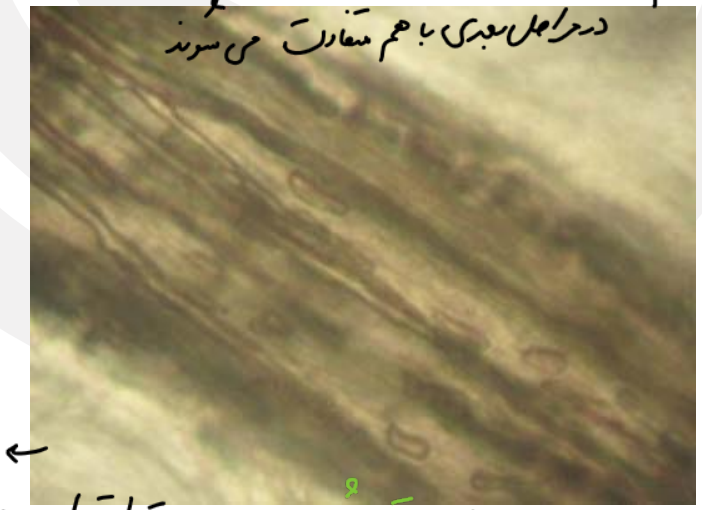
Black dot → به محض اینکه مو می‌خواد دربیاد می‌شکنه

Favus



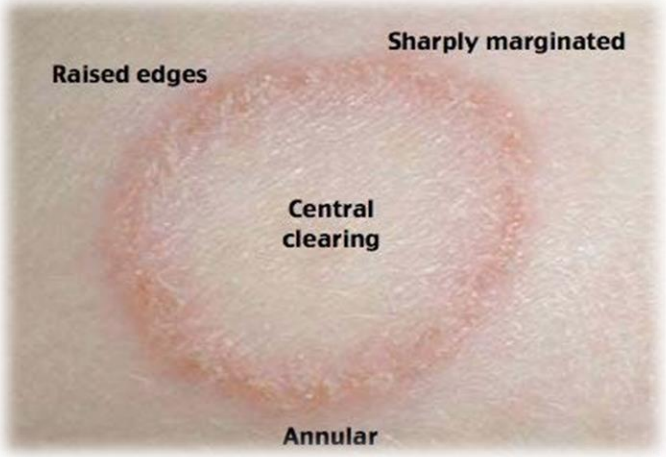
- clusters of hyphae within the hair shaft, with air spaces in the hair shafts.
- Favus or tinea favosa is a rare severe and chronic inflammatory dermatophyte infection, due in most cases to *T. schoenleinii*.
- It is characterized by matted hair and the formation of yellow, crusted cup-shaped lesions (scutula) around the base of the hairs.
- Scutula contains hyphae and keratin debris and may coalesce to form a large mass.

tinea capitis



Tinea corporis

- Ringworm infection of the body (trunk, face, neck, and limbs).
- The etiologic agents are zoophilic and anthropophilic species.
- Skin manifestations vary from the classic ring-shaped lesion with raised edges, sharply marginated and central clearance, to a diffuse, erythematous rash.
- There is usually scaling, and often an itch is reported.



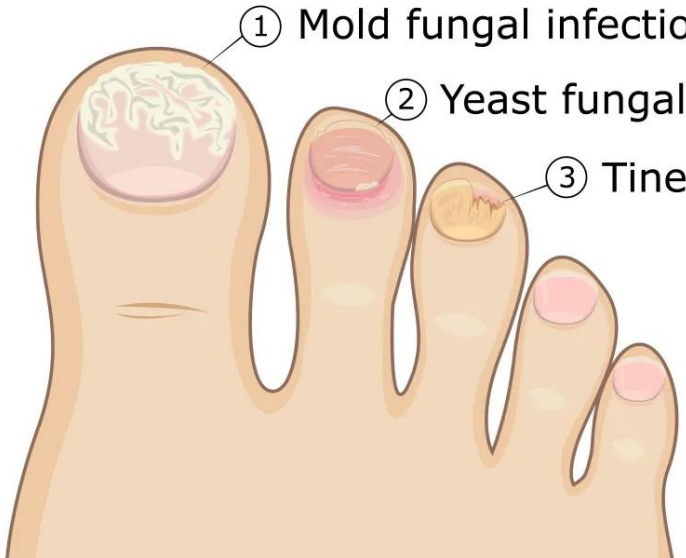
Tinea corporis

نباید تشخیص سریع قطعی داد. ←
معلنه موادی زده باشه که ضایعه رو
تحریک کرده باشه یا خارش ↑

Tinea unguium

onychomycosis

- Tinea unguium is a dermatophyte infection of the nail.
- It is characterized by thickened, discolored, broken, and dystrophic nails.
- The nail plate may be separated from the nail bed.
- *T. rubrum* and *T. interdigitale* .
- The toenails are affected more often than the fingernails.
- The 1st, and 5th are most frequently affected.



onychomycosis

- It is important to stress that only 50% of dystrophic nails have a fungal etiology, therefore, it is essential to establish a correct laboratory diagnosis by either microscopy and/or culture before treating a patient with a systemic antifungal agent.
- Distal subungual onychomycosis is the most common form of dermatophyte onychomycosis.

➢Hyperkeratosis

➢Onycholysis

➢Thickening of the nail plate

Athlete's foot

tinea pedis

- Tinea pedis is a foot infection due to a dermatophyte fungus.
- Particularly prevalent in hot, tropical, urban environments.
- very sweaty / tight-fitting shoes/ heavy industrial boots/ Underlying immunodeficiency
- 19-50/70%
- Tinea pedis may be accompanied by tinea cruris, tinea manuum or tinea unguium.
- *T. rubrum*, *T. interdigitale*, *E. floccosum*
- The condition is contagious and can be spread via contaminated floors, towels or clothing.

tinea pedis

- Itchy erosions and/or scales between the toes, especially between 4th and 5th toes.

tinea pedis

به صورت یک دست کف پا آلوده

- scaling hyperkeratotic moccasin-type of the plantar surface of the foot; usually caused by *T. rubrum*

ضخامت

tinea pedis

- Small to medium-sized blisters, usually affecting the inner aspect of the foot (vesiculobullous type).

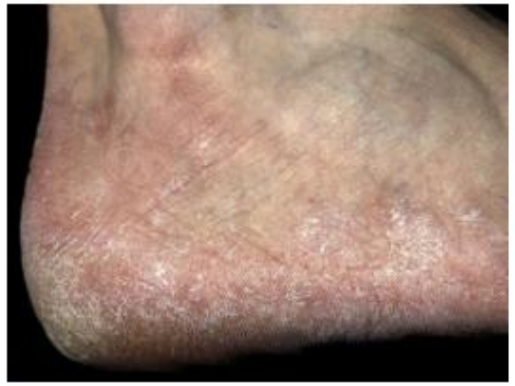
tinea pedis

Tinea pedis

Tinea pedis

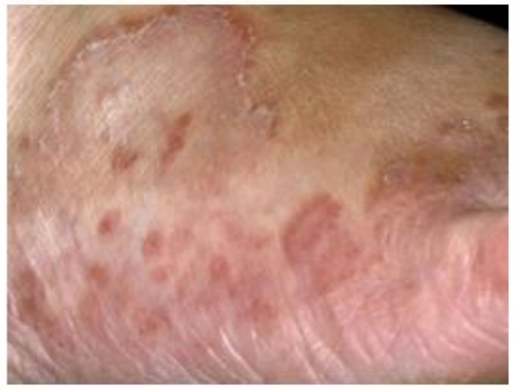
Tinea pedis

Tinea pedis



Tinea pedis

Tinea pedis



jock itch → کشاله ران سوارکاران شیبه

tinea cruris کچلی کشاله ران

- Due to a dermatophyte fungus affecting the groin, pubic region, and adjacent thigh.
- Acute or chronic asymmetrical rash.
- Particularly common in hot humid tropical climates.
- Longstanding tinea pedis/ Occlusive clothing/ Obesity/ hyperhidrosis/ Diabetes mellitus/ Topical steroid use. (چسبان / پلاستیکی)
- Male 3:1 → تعریق ↑
- *T. rubrum*, *E. floccosum*
- The condition is contagious (مسری) and can be spread via contaminated towels and clothing.

tinea cruris

- Tinea cruris is usually itchy.
- Bilateral but asymmetrical rash.
- Scaly rash in inguinal skin fold.
- Raised border, central clearing.

tinea cruris

- Tinea cruris clears with appropriate treatment in 80–90% of cases. However, recurrence(20-25%) is common, especially if predisposing factors are not addressed or antifungal treatment is stopped before mycological cure.
- Residual hyperpigmentation may persist in skin of colour.

Tinea manuum

- Tinea manuum is a dermatophyte infection of one or both hands. It is much less common than tinea pedis.
- Contact with another site of infection/ Contact with another person with tinea/ Direct contact with an infected animal or soil/ hyperhidrosis/ Contact with a contaminated object such as a towel or gardening tool.
- Anthropophilic dermatophytes: *T. rubrum*, *T. interdigitale*, *E. floccosum*
- Zoophilic and geophilic dermatophytes: *T. erinacei*, *T. verrucosum*, *M. canis*, *N. gypsea*.
- In most cases of tinea manuum, only a single hand is involved.

Tinea manuum

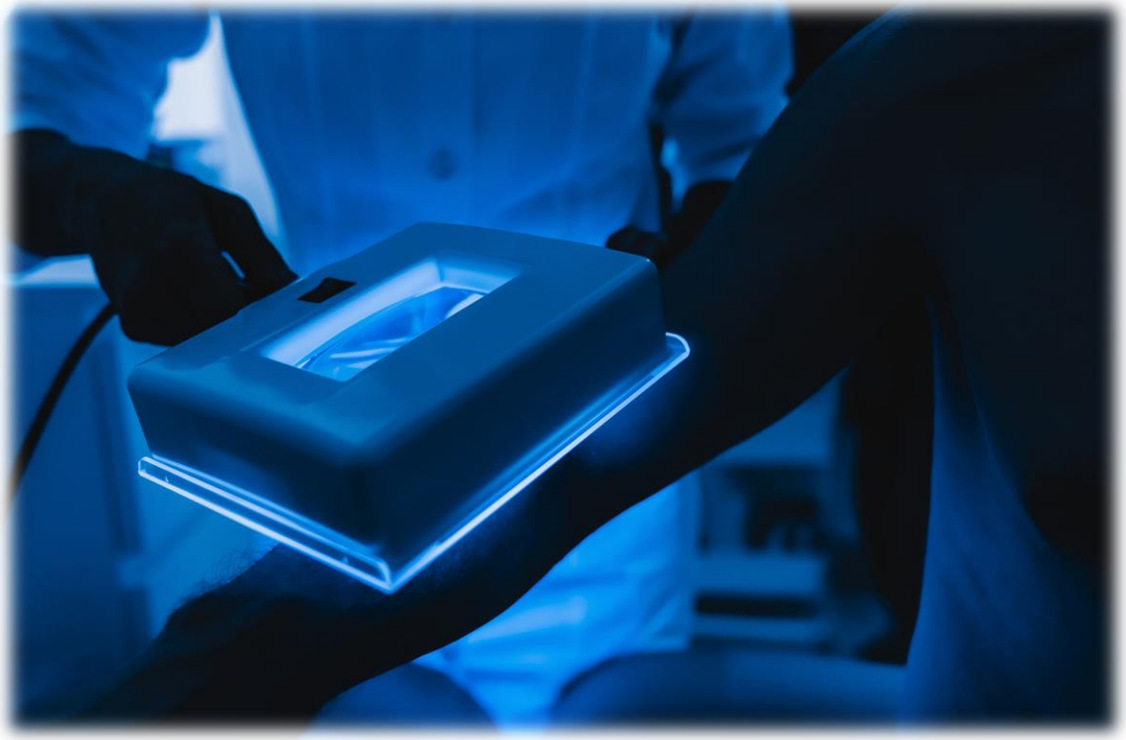


- More frequently, tinea manuum causes a slowly extending area of peeling, dryness and mild itching on the palm of one hand (hyperkeratotic tinea).
- There is usually a raised border and clearing in the middle (ringworm).
- These fungi may also cause a blistering rash on the edges of the fingers or palm.
- Tinea manuum can be clinically distinguished from hand dermatitis.

Tinea barbae

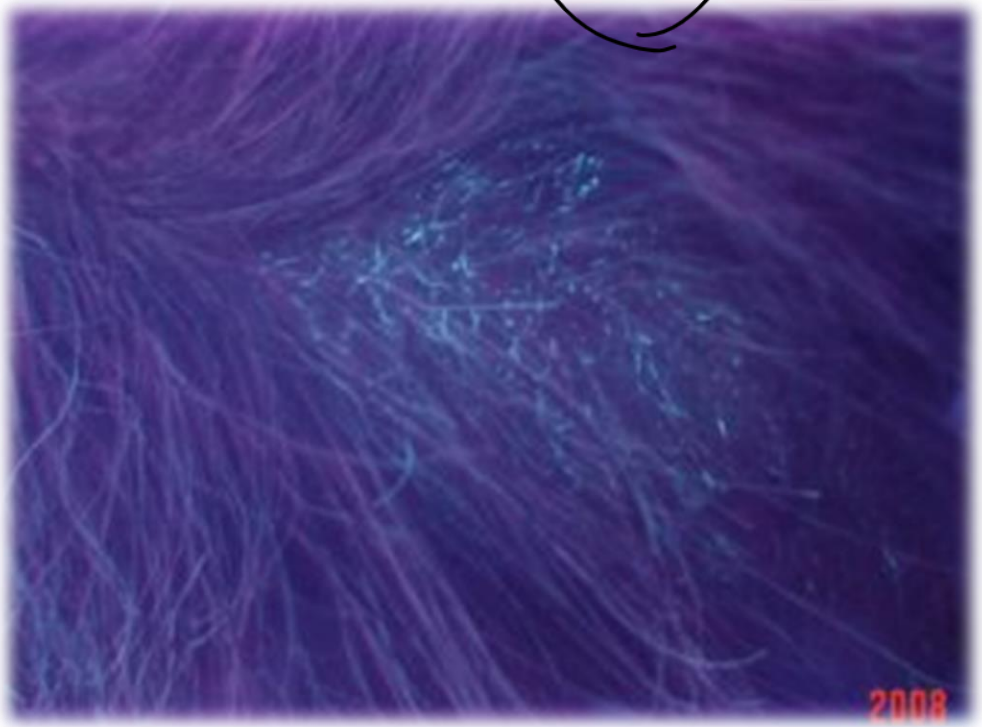
- Tinea barbae is the name used for infection of the beard and moustache areas of the face with a dermatophyte fungus.
- Generally, affects only adult men.
- Most often a zoophilic (animal) fungus: *T. verrucosum*, *T. equinum*, *T. interdigitale*

Wood's Lamp



Fluorescence seen under wood's lamp

Microorganism	Fluorescence Color
Microsporum audouinii	Bright – green
Microsporum canis	Bright – green
Microsporum ferrugineum	Blue – green
Microsporum distortum	Blue – green
Microsporum gypseum	Dull – yellow
Trichophyton schoenleinii	Dull – green



Sampling

به ۳-۴ cm آدل نیاز داری

ابتدا تمیز

→ از ریشه می‌کنی و ۱۰ تا ۱۵ تا می‌کنی. نباید زور بزنی. موی قارچی به راحتی کنده می‌شه

Diagnosis

→ با تیغ (استریل باشه!) از زیر ناخن سمپل می‌گیریم

درد نداره!

ناخنش اصلا از زیر جدا شده

به خود ناخن فشار میاری

آگه کچلی باشه پودر می‌شه باهاش؟

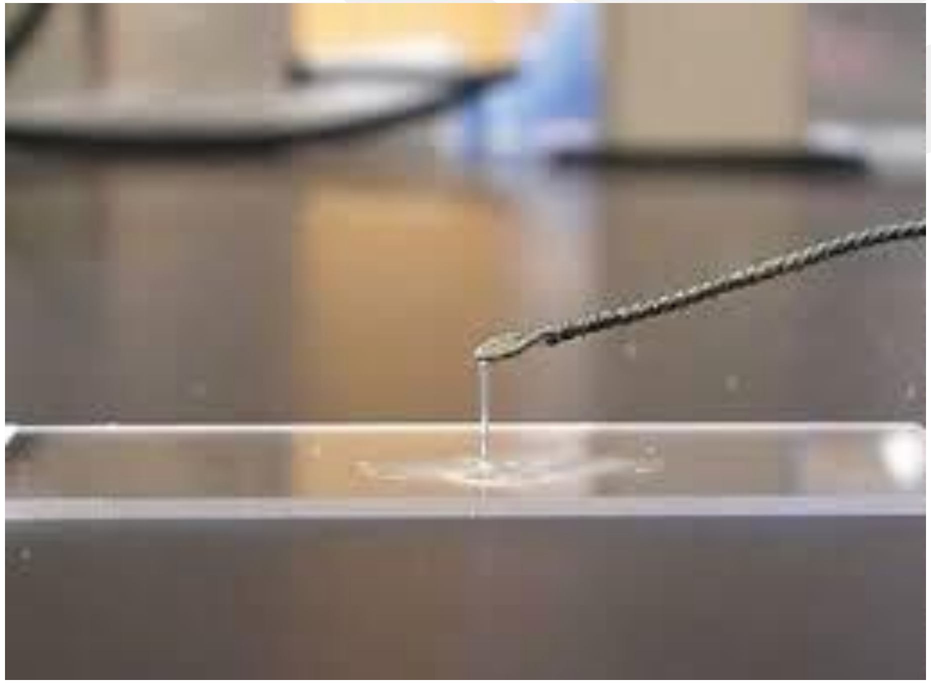
آگه منفی بود کمی بیشتر جلو می‌ریم

← سریع منفی نمی‌دی!

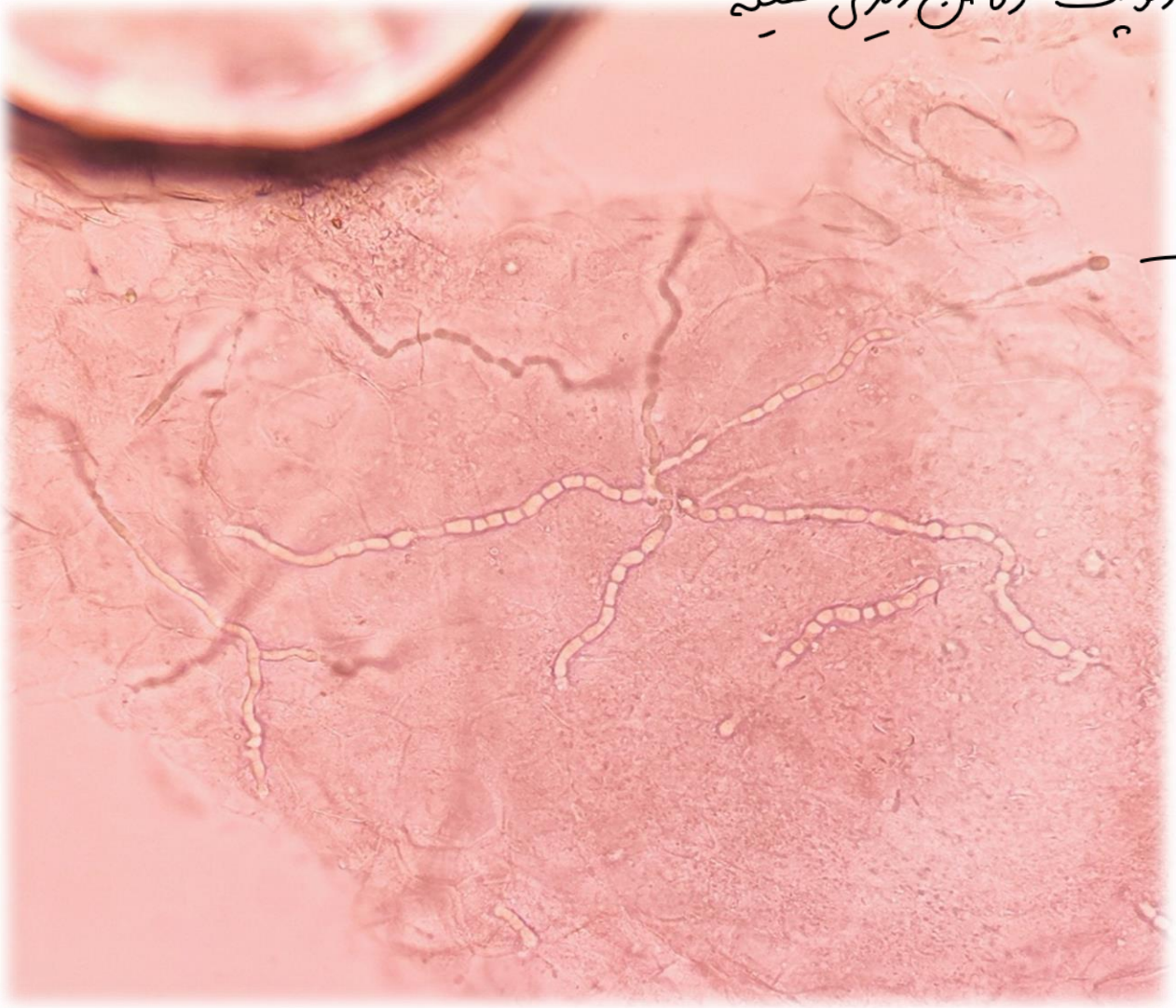
Direct testing

- KOH

۱۰٪ پوست
۳۰٪ ناخن → بقیه رو شفاف می‌کنه غیر از قارچ



Direct examination of skin and nails

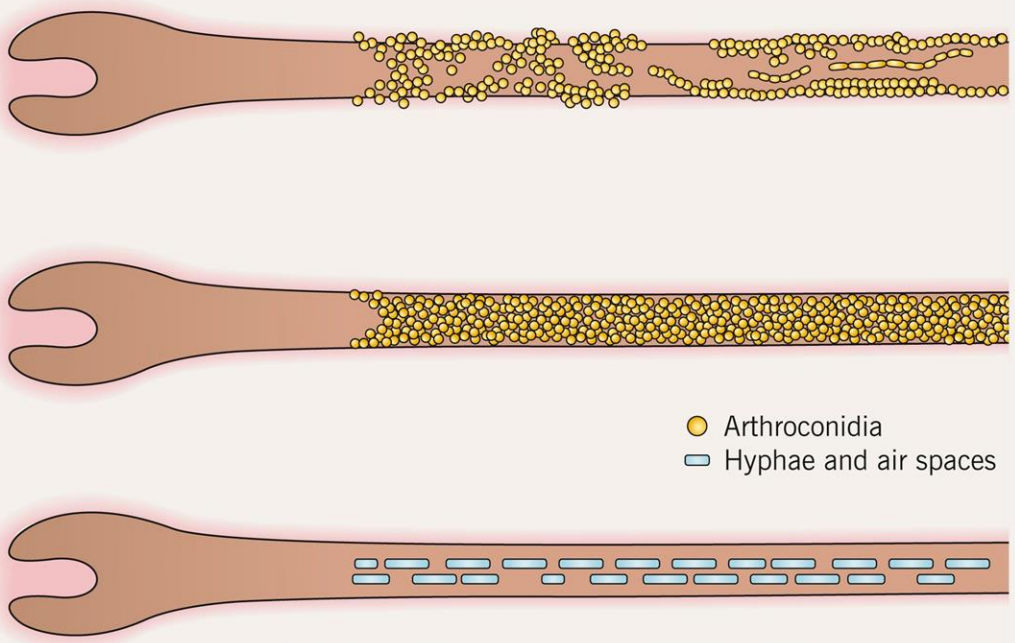


Diagnosis

Ectothrix
M. canis*
*M. audouinii**
*M. ferrugineum**
*M. distortum**
M. gypseum
T. rubrum (rarely)

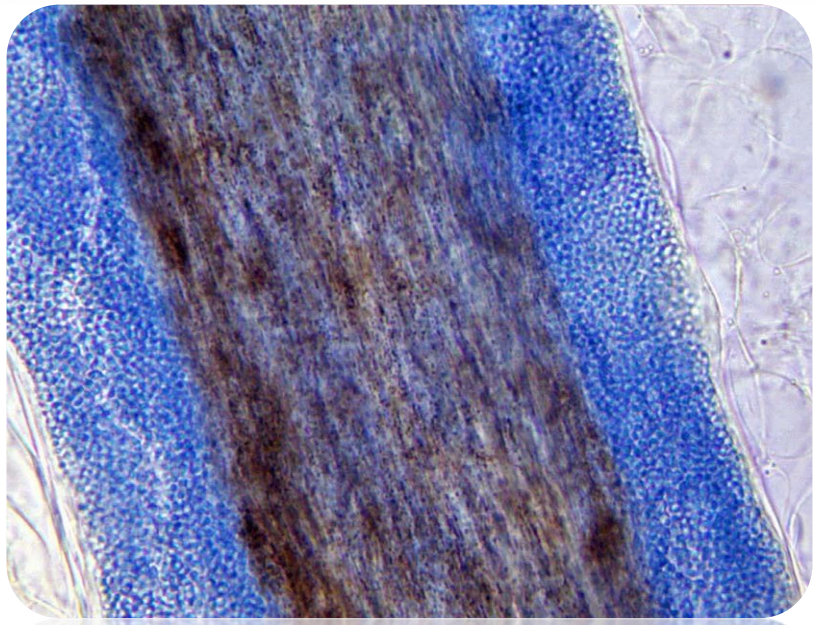
Endothrix
T. tonsurans†
T. violaceum
T. soudanense
T. gourvilli
T. yaoundei
T. rubrum (rarely)

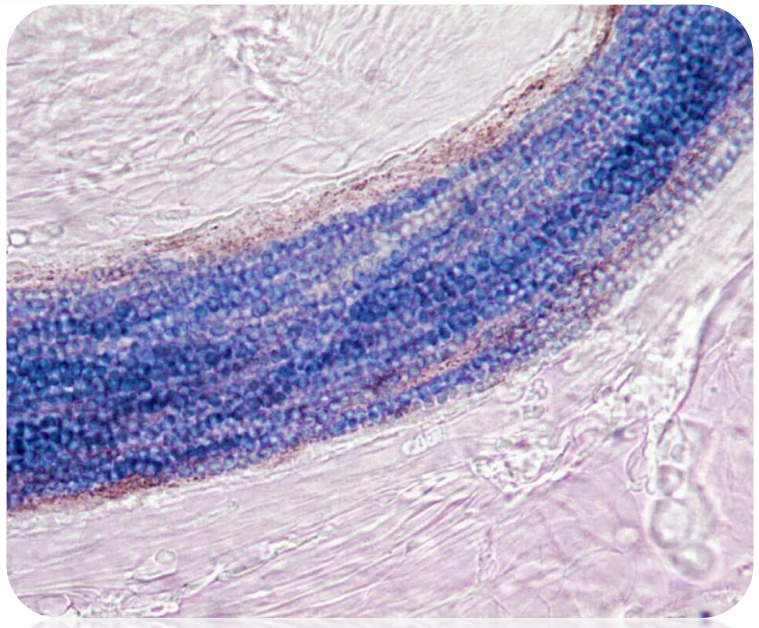
Favus
*T. schoenleinii***

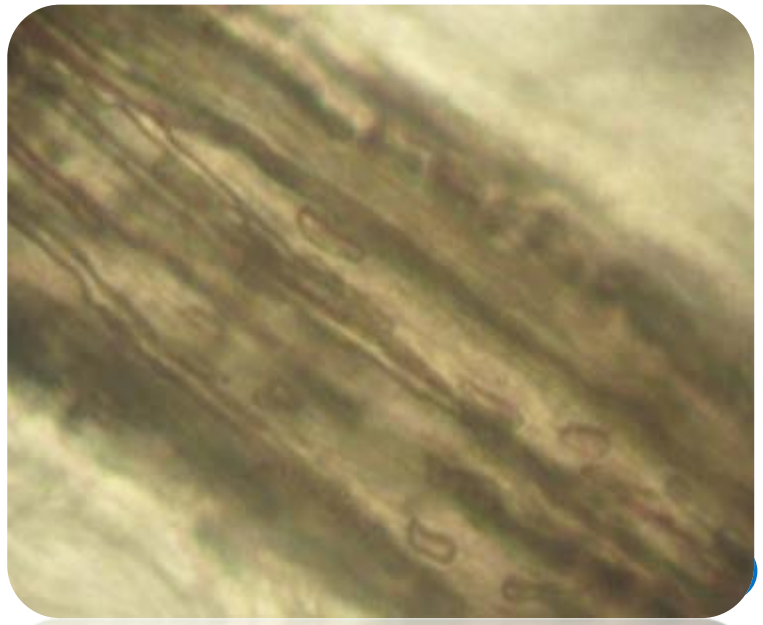


*Displays yellow fluorescence with Wood's lamp examination
**Displays blue-white fluorescence with Wood's lamp examination
†Nowadays the most common cause in the Americas, United Kingdom, and France

Direct examination of hair







Types of culture medium

- 1. Group A General culture media without cyclohexamide:
  a) SDA Emmons
  b) SC → chloramphenicol آنتی بیوتیک جلوگیری از رشد باکتری
  2. Group B General culture media with cycloheximide:
- SCC → بقیه مارچ ها

Conditions and requirements for incubation

- 1. Humidity and temperature

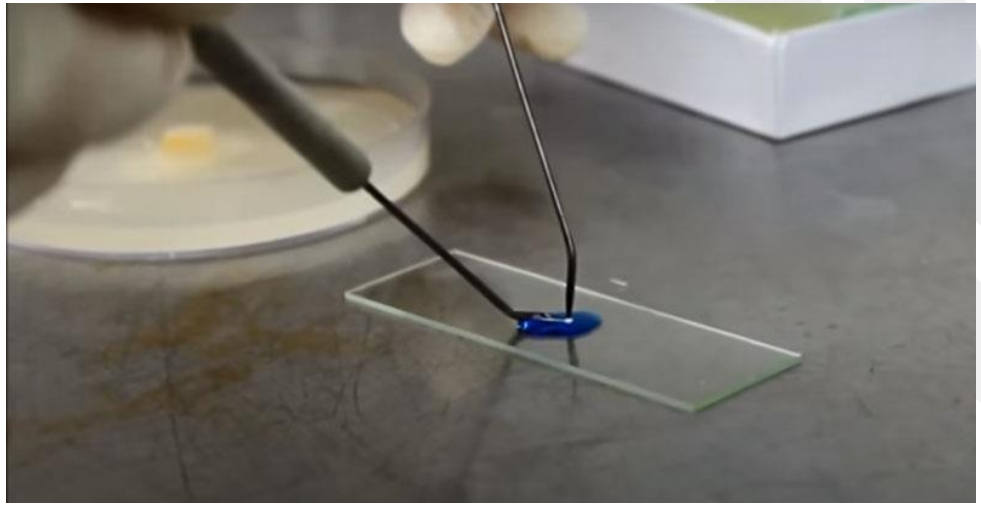
پلیت هارو توی دمای اتاق برای
← دمای پوست پایین‌تر از بدنه اصلا
توی دماهای ارگان‌ها رشد نمی‌کنند.

- 2. Incubation time

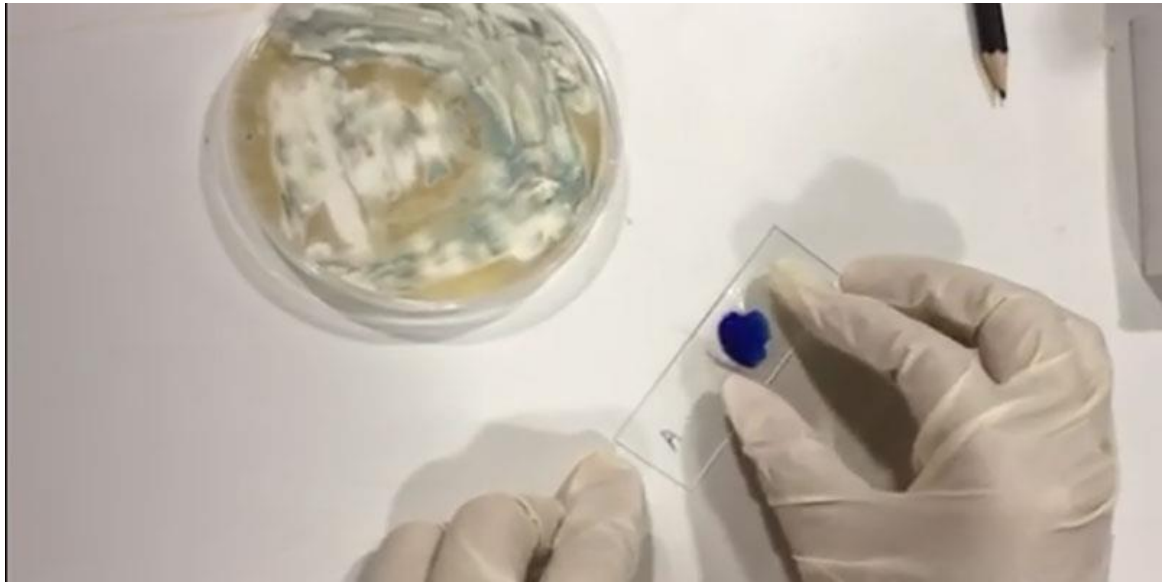
رشد از ۱ هفته تا ۳ هفته
می‌تونه طول بکشه مخصوصا
درماتوفیت‌ها

LCB

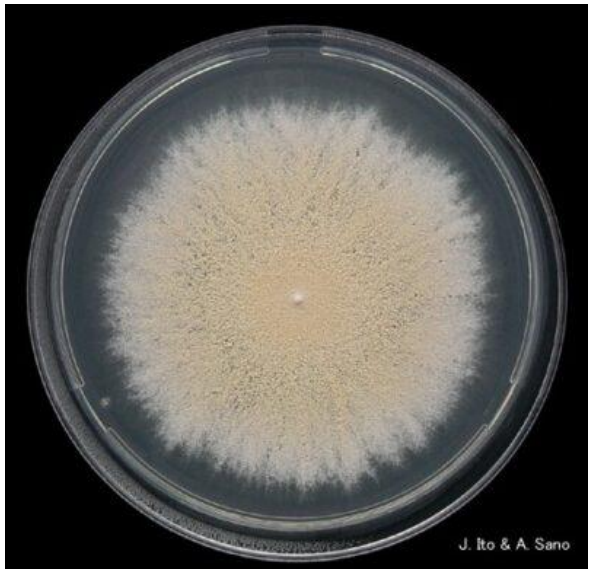
- 1. Tease mount ازمایش لمس

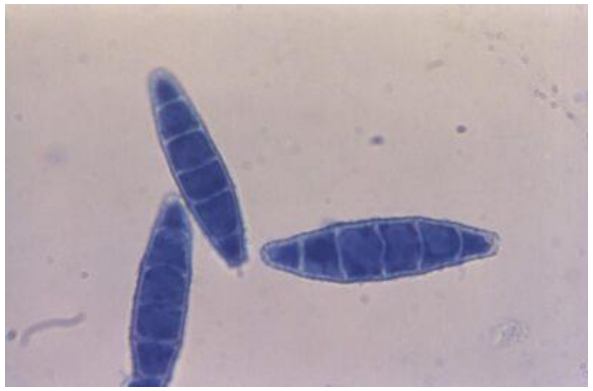


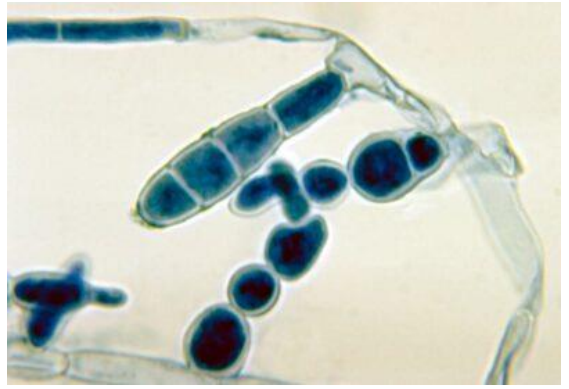
- 2. Scotch test چسب



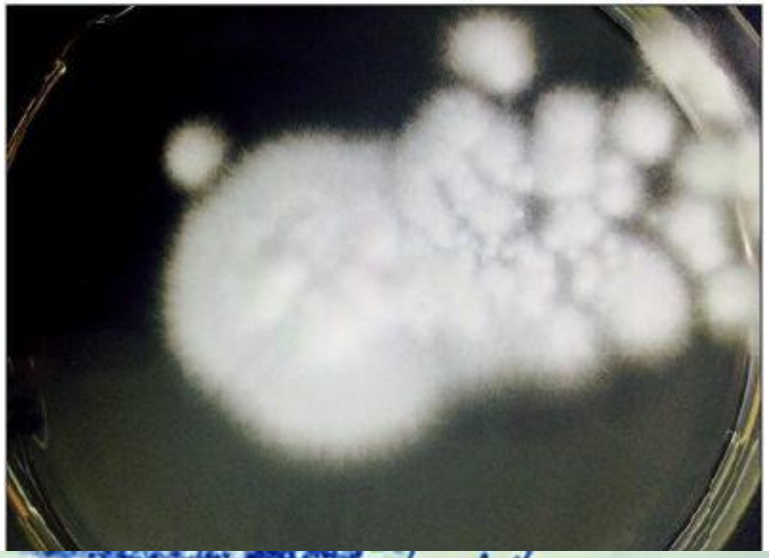
Diagnosis

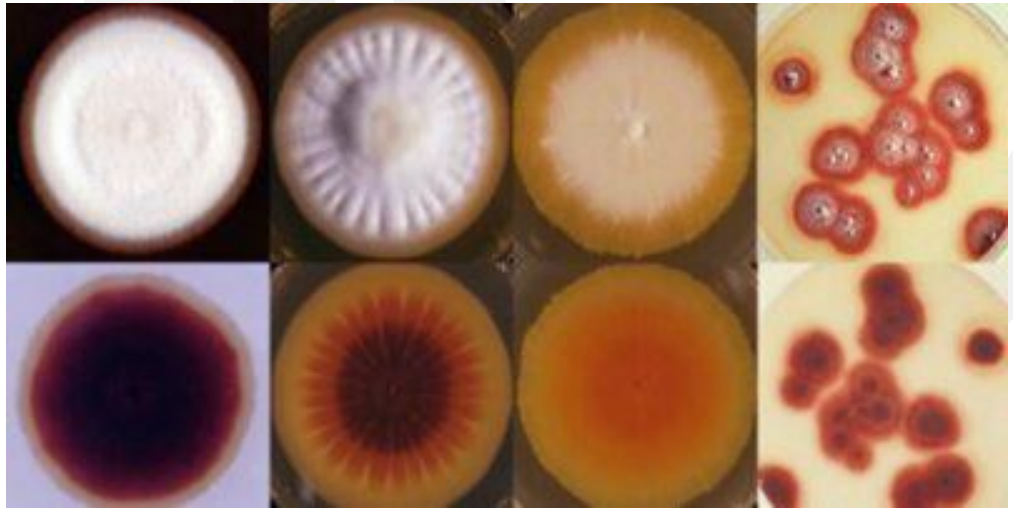


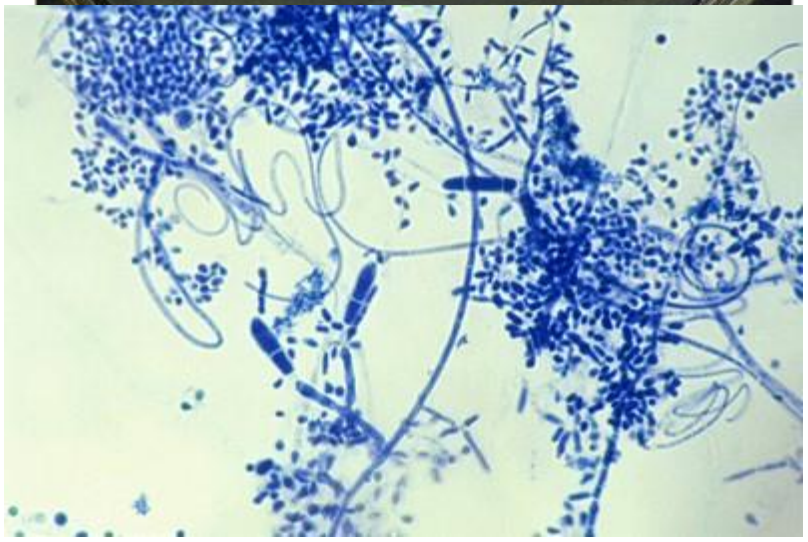


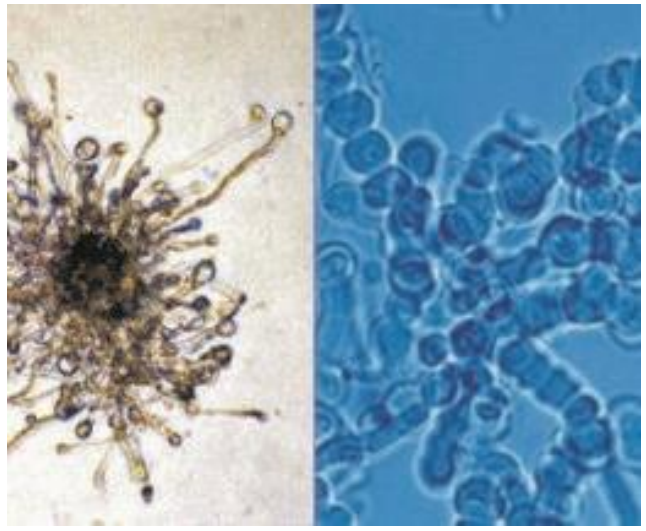


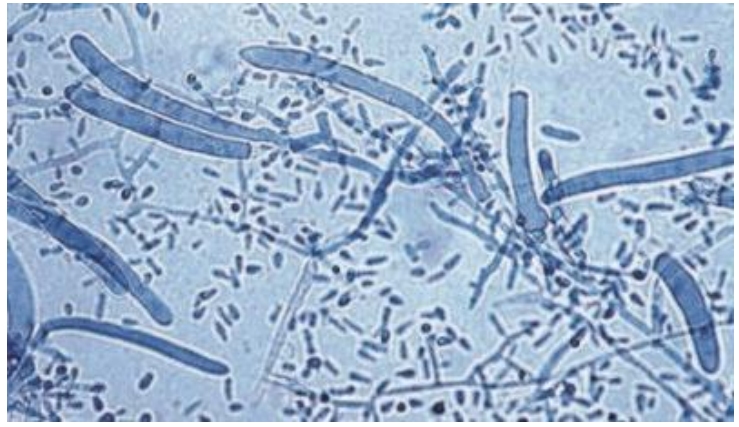
Diagnosis











Diagnosis

Diagnostic Method	Advantages	Disadvantages	Time to Results
Direct examination	• Non-invasive • Low cost	• Unable to determine species	Minutes
Wood's lamp	• Non-invasive • Low cost	• Not all species fluoresce	Minutes
Microscopy	• Can detect unique features of species • Low cost	• Unable to distinguish dead and alive fungi	Minutes
Culture	• Low cost • Easy to perform • Can distinguish between species	• Requires expertise to determine species • Can be contaminated by saprophytes	Days–Weeks
PCR	• Highly sensitive • Can distinguish between species	• Unable to distinguish dead and alive fungi	Hours–Days
ELISA	• Highly specific	• False positives due to past infections	Hours–Days
MALDI-ToF	• Highly sensitive • Can distinguish between species	• Only detect species in library	Minutes–Hours
Genetic analysis	• Can distinguish between species • Highly sensitive	• Unable to distinguish dead and alive fungi	Hours–Days

Treatment

no first line

Agent	*Formulation**	*Frequency of application*
Allylamines		
Naftifine (Naftin)	1% cream	Once daily
	1% gel	Once or twice daily
Terbinafine (Lamisil)	1% cream or solution	Once or twice daily
Benzylamine		
Butenafine (Mentax)	1% cream	Once or twice daily
Imidazoles		
Clotrimazole (Lotrimin)	1% cream, solution, or lotion	Twice daily
Econazole (Spectazole)	1% cream	Once daily
Ketoconazole (Nizoral)	1% cream	Once daily
	1% shampoo	Twice weekly
Miconazole (Micatin)	2% cream, spray, lotion, or powder	Twice daily
Oxiconazole (Oxistat)	1% cream or lotion	Once or twice daily
Sulconazole (Exelderm)	1% cream or lotion	Once or twice daily
Miscellaneous		
Ciclopirox (Loprox)	1% cream or lotion	Twice daily
Tolnaftate (Tinactin)	1% cream, solution, or powder	Twice daily

Tinea corporis
Tinea pedis
Tinea cruris
Tinea manuum

Treatment

	Elderly	Children	Pregnant women
Topical therapy (only treatment required in limited disease)	Azoles once or twice daily for 2 to 4 weeks Terbinafine 1% twice daily for 2 weeks	Azoles once or twice daily for 2 to 4 weeks Terbinafine 1% twice daily for 2 weeks	Clotrimazole Terbinafine Ciclopirox Naftifine Oxiconazole (FDA category B)
Systemic therapy first-line	First choice Terbinafine 250 mg/day for 2 to 3 weeks Second choice Itraconazole (caution against drug interactions) 100 mg/day for 1 to 4 weeks	First choice: Terbinafine For 2-4 weeks - 62.5 mg/day for weight <20 kg - 125 mg/day for weight 20-40 kg - 250 mg/day for weight >40 kg) or 3-6 mg/kg/day Itraconazole 5 mg/kg/day for 1 to 2 weeks	Not recommended
2nd line	Griseofulvin 500-1000 mg/day for 2 to 4 weeks Fluconazole 150-300 mg/week for 2 to 6 weeks	Griseofulvin >1 month of age: 10-20 mg/kg/day for 2 to 4 weeks	Not recommended

Tinea capitis

ابدا موضعی بعد سیستمی

Treatment

- Griseofulvin ($10mg/kg$ for 3m), Itraconazole ($5mg/kg/day$ for 1w in 1m), Terbinafine(250 mg/day for 4-6w).

	Elderly	Children	Pregnant women
Systemic therapy (first-line)	Terbinafine 250 mg daily for 2-4 weeks (in case of *Trichophyton* species)	Griseofulvin - higher efficacy against *Microsporum* species Dosage: Weight <50 kg: 15-20 mg/kg/day for 6 to 8 weeks Weight >50 kgs: 1g/day for 6 to 8 weeks Terbinafine - higher efficacy against *Trichophyton* species Dosage: Weight <20 kg: 62.5 mg/day for 2 to 4 weeks Weight 20-40 kg: 125 mg/day for 2 to 4 weeks Weight >40 kg: 250 mg/day for 2 to 4 weeks	Systemic therapy not recommended during pregnancy
Alternative systemic therapy	Itraconazole or Griseofulvin	Itraconazole - effective against both *Trichophyton* and *Microsporum* species Dose: 50-100 mg/day for 4 weeks or 5 mg/kg/day for 2 to 4 weeks	Systemic therapy not recommended during pregnancy
Topical therapy (only to prevent transmission)	2% ketoconazole or 1-2.5% selenium sulfide or 1-2% zinc pyrithione or 2.5% povidone iodine shampoos	2% ketoconazole or 1-2.5% selenium sulfide or 1-2% zinc pyrithione or 2.5% povidone iodine shampoos	Ketoconazole and selenium sulfide are both category C

Kaul S, Yadav S, Dogra S. Treatment of Dermatophytosis in Elderly, Children, and Pregnant Women. Indian Dermatol Online J. 2017 Sep-Oct;8(5):310-318. doi: 10.4103/idoj.IDOJ_169_17. PMID: 28979861; PMCID: PMC5621188.

Onychomycosis

- Itraconazole (200mg/day for 3m), Terbinafine(250 mg/day for 6w), Ciclopirox(w), Tioconazole 2-d for 6m Hand/ 9-12m Feet)

Treatment

	Elderly	Children	Pregnant women
Systemic therapy (first-line)	First choice: Terbinafine 250 mg/day (6 weeks for fingernails; 12 weeks for toenails; consider 4 weeks extension of treatment in case of inadequate response) Second choice: Itraconazole 200 mg BD for 1 week every month (2 cycles for fingernails; 3 for toenails; one extra cycle may be considered in case of inadequate response)	First choice: Terbinafine*(daily continuous) 62.5 mg/day for weight <20 kg - 125 mg/day for weight 20-40 kg - 250 mg/day for weight >40 kg) or 3-6 mg/kg/day 6 weeks forfingernail and 12 weeks for toe nail onychomycosis Second choice: Itraconazole* Pulse therapy (5 mg/kg/day for one week every month) 2 pulses for fingernail and 3 pulses for toenail onychomycosis or 5 mg/kg/dayfor 2 to 3 months	No trials/guidelines available. Systemic therapy avoided. Terbinafine is the only category B systemic agent, but data on its use in pregnancy is not available and its use is not recommended
Alternative systemic therapy	Fluconazole 450 mg/week for 3 months in fingernails and 6 months in toenail onychomycosis Griseofulvin 500-1000 mg/day for 6-9 months in fingernail and 12-18 months in toenail onychomycosis	Fluconazole 3-6 mg/kg once weekly for 12-16 weeks for fingernail infection and 18-26 weeks for toenail onychomycosis Griseofulvin** Above 1 month of age: 10 mg/kg/day for 6-9 months in fingernail and 12-18 months in toenail onychomycosis	Systemic therapy avoided
Topical therapy	Ciclopirox 8% OD, Amorolfine 5% once/week, Effinaconazole 10% OD, Tavabarole 5% OD for 48 weeks	Ciclopirox 8% OD, Amorolfine 5% once/week, Effinaconazole 10% OD, Tavabarole 5% OD for 48 weeks	Ciclopirox 8% OD, Amorolfine 5% once/week for 6 to 12 months
Adjunctive therapy	1. Surgical/Chemical nail avulsion (Partial/total) 2. Laser (Nd: Yad/CO_2) 3. PDT	1. Surgical/Chemical nail avulsion (Partial/Total) 2. Laser (Nd: Yad/CO_2) 3. PDT	1.Surgical nail avulsion (Partial/total) 2. Laser

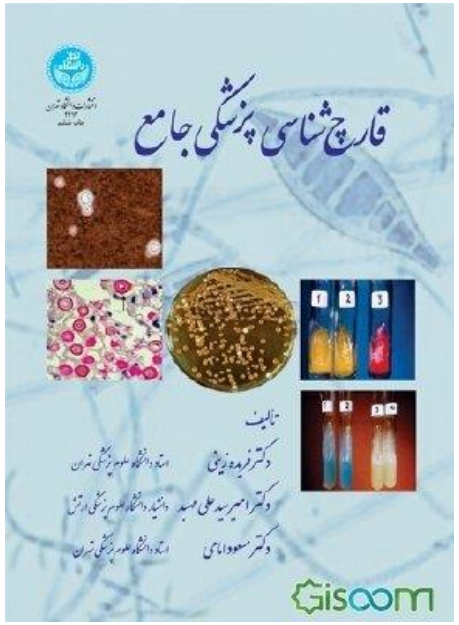
*Terbinafine and itraconazole are both not licensed for use in children, but currently are recommended for the treatment of pediatric onychomycosis; **Griseofulvin is the only systemic antifungal licensed for use in children but it is not recommended for the treatment of onychomycosis due to longer duration of treatment as well as lower efficacy

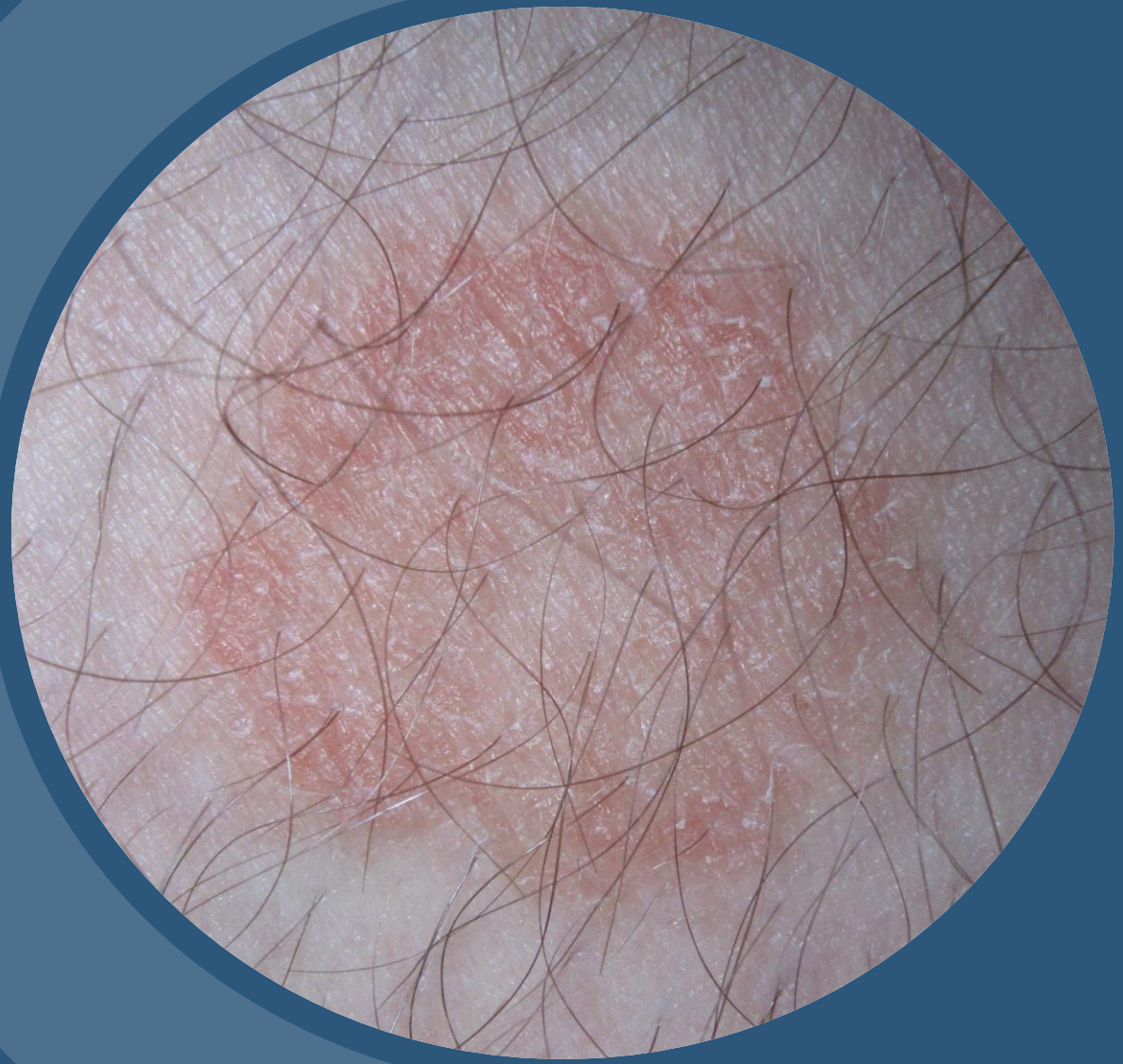
Majocchi's granuloma

Pseudomycetoma

Reference

- https://www.cdc.gov/
- Kaul S, Yadav S, Dogra S. Treatment of Dermatophytosis in Elderly, Children, and Pregnant Women. Indian Dermatol Online J. 2017 Sep-Oct;8(5):310-318. doi: 10.4103/idoj.IDOJ_169_17.





THANK YOU