Handout 6
2007

PLATE 104
see also 8, 4, 5

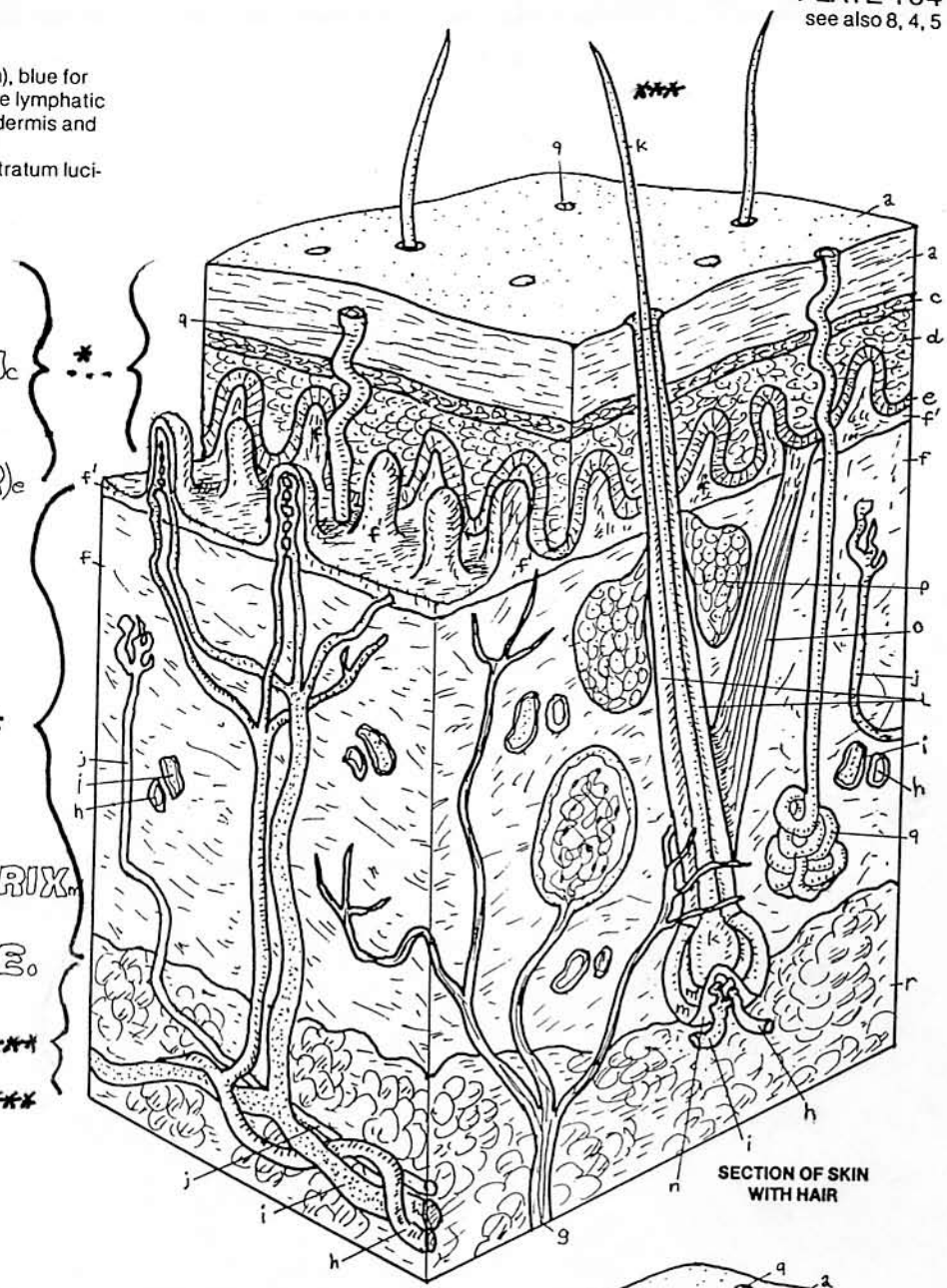
INTEGUMENT (SKIN) ORGANIZATION*

CN 18

1. Reserve yellow for the nerve (g), red for the artery (h), blue for the vein (dotted vessel labeled i), and a light color for the lymphatic vessels (j). Note the vessels cut in cross section in the dermis and at the papilla of the hair follicle.
2. Color both drawings simultaneously. Note that the stratum lucidum (b) is shown only in the lower drawing.

EPIDERMIS*
- STRATUM CORNEUM a
- STRATUM LUCIDUM b
- STRATUM GRANULOSUM c
- STRATUM SPINOSUM d
- STRATUM BASALE e (GERMINATING LAYER) e

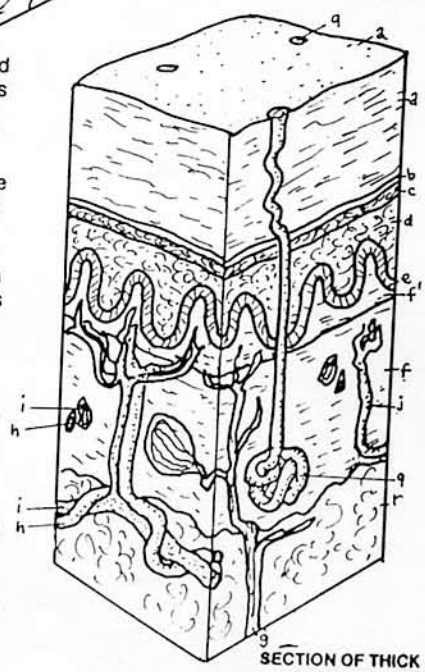
DERMIS**
- CONNECTIVE TISSUE f
- PAPILLAE f'
- NERVE g
- ARTERY h VEIN i
- LYMPHATIC VESSEL j **
- HAIR***
  - SHAFT k
  - FOLLICLE l
  - BULB OF FOLLICLE m MATRIX m
  - DERMAL PAPILLA n
  - ARRECTOR PILI MUSCLE o
  - SEBACEOUS GLAND p
- SWEAT GLAND q ****
- SUPERFICIAL FASCIA r *****



SECTION OF SKIN WITH HAIR

The *integument* (cutaneous layer), variably thick, highly sensitized and vascular, covering the body consists of two layers: the multilayered epithelial epidermis and the fibrous dermis. The dermis is continuous below with the fatty, fibrous superficial fascia (subcutaneous tissue), an intermediate layer of variable thickness between skin and the deeper structure (fascia-lined skeletal muscle or periosteum-lined bone). The *epidermis* consists of layers of cells most of which arise from the frequently dividing *germinating* cells of the *stratum basale*. The daughter cells are pushed up to form another layer characterized by flattened cells with short spines/processes (*stratum spinosum*). The older cells of the next layer (*stratum granulosum*) have granules that relate to the protein keratin. The next outer layer of cells, seen only in thick skin, consists of flattened cells that form a bright layer (*stratum lucidum*) immediately adjacent to the outer, thick *stratum corneum*. This outer layer consists of flattened ghosts of cells in which the cytoplasm and nucleus have been replaced by keratin (densely packed filaments embedded in a dense structureless medium). It is largely variations in thickness in this layer that account for differences in skin thickness. Cells of the epidermis that do not arise from germinating cells are the pigment cells found in the basal and dermal layers. These cells secrete melanin pigment into the lower epidermal layers and the hair follicles.

The *dermis* consists of thick bundles of fibrous tissue among which are found many *blood* and *lymphatic vessels* oriented in networks, sweat glands, hair follicles and the related sebaceous glands and arrector pili muscles. The avascular epidermis gets its nutrition from vessels reaching up through the *papillae of connective tissue*. *Sweat glands* found throughout almost all skin help to stabilize body temperature by excreting in response to excessive heat. The subsequent evaporation of the excreted fluid is a cooling process. *Sebaceous glands* excrete an oily material (sebum), which helps to protect the skin from dehydration. *Hair* is an outgrowth of epidermal cells that pushed down into the dermis to form the *hair follicle* during early fetal development. Within the follicle *bulb*, concentric layers of keratinized, pigmented cells (originating from the *matrix*) form the hair *shaft* that grows out beyond the surface of the skin. The *dermal papilla*, like the papillae under the epidermis, supply the hair shaft with nutrition from the tuft of vessels. Loss of the papillae means loss of the hair. The *arrector pili muscle*, attached to the hair follicle, elevates the hair shaft and aids excretion of sebum. Skin and all its appendages protect the body against injurious invasion by microorganisms, chemicals, and ultraviolet radiation; play an important role in body temperature regulation; and act as a sensor informing the person of the state of his or her environment (see the next plate).



SECTION OF THICK SKIN FROM SOLE OF FOOT

Table 2.
Laboratory Examination of Clinical Specimens of Hair, Nail, and Stratum Corneum With Genera of Etiologic Agents

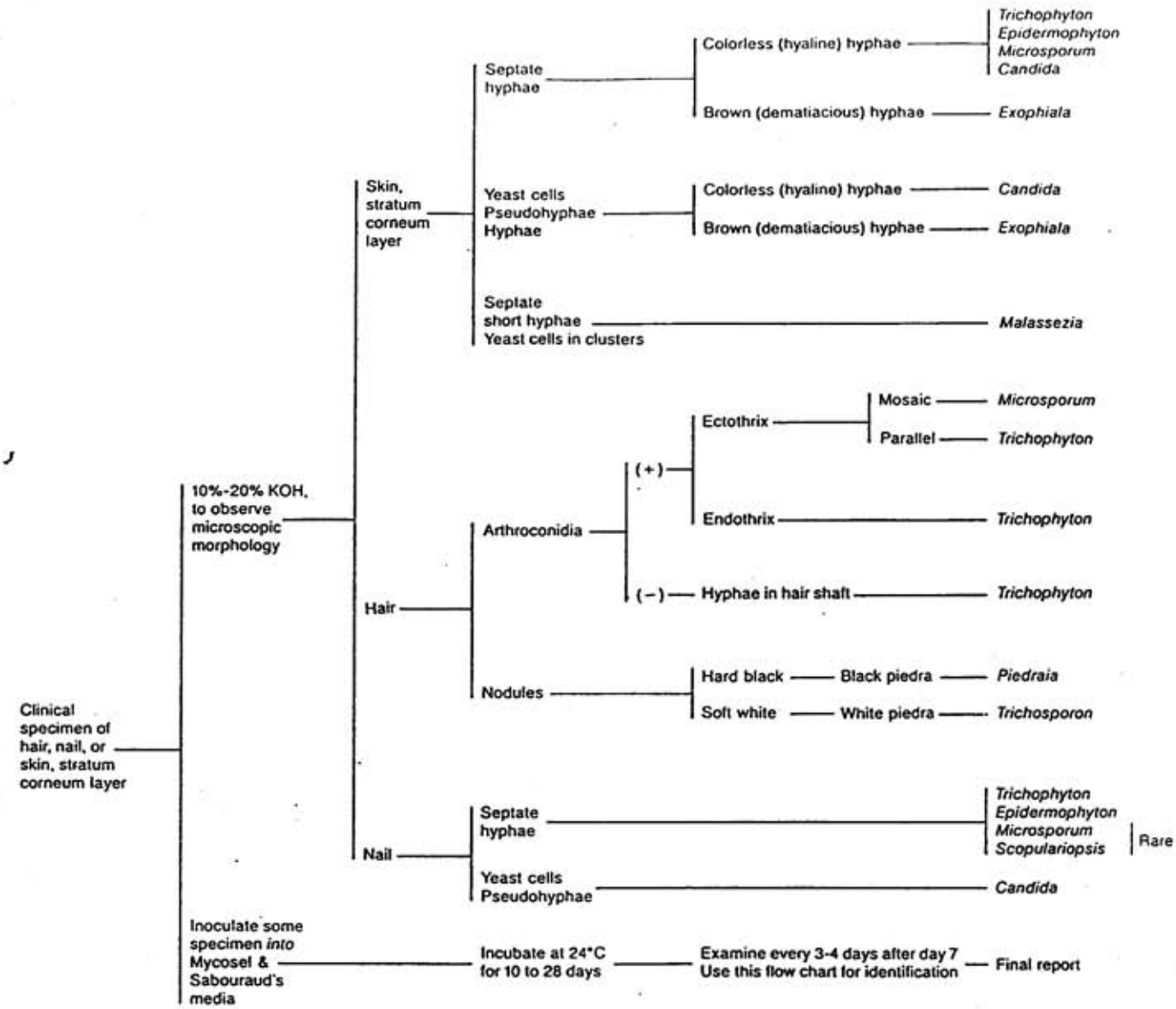


Table 3
Recommended Treatment of Dermatophytoses With Griseofulvin*

(The physician should become thoroughly familiar with the latest product information brochure before administering or prescribing griseofulvin.)

Location	Griseofulvin Dosage	Duration
Tinea capitis		
a. Fluorescent type *M audouinii, M canis, M ferrugineum*	0.5-1.0 g/day	4 weeks
b. Nonfluorescent type	15-25 mg/kg/day	6 weeks
Tinea corporis	1.0 g/day	30 days
Tinea cruris	0.5-1.0 g/day	30 days
Tinea barbae	1.0 g/day	8-10 weeks
Tinea pedis		
a. Without onychomycosis	1.0 g/day	6-8 weeks
b. With onychomycosis‡	1.5-2.0 g/day	8-12 months
Tinea unguium†		
a. Fingers	1.5-2.0 g/day	4-6 months
b. Toes	1.5-2.0 g/day	8-18 months

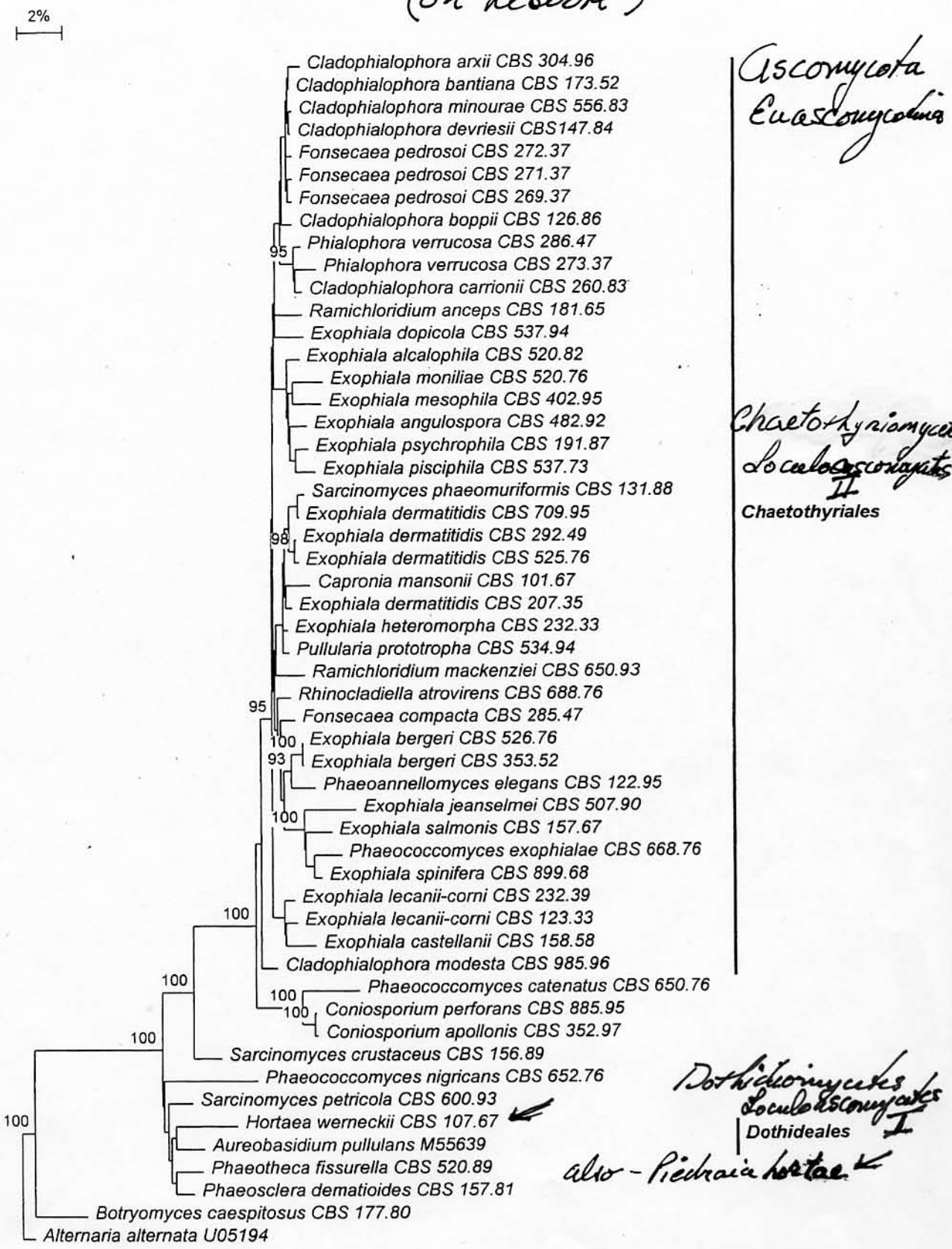


Fig. 43. Phylogenetic tree of black yeasts based on confidently aligned, near-complete SSU rDNA sequences using Neighbor joinin algorithm with Kimura correction. Bootstrap values >90 from 100 resampled datasets are shown. The tree shows the two main orders c ascomycetous black yeasts: *Dothideales* and *Chaetothyriales*. The *Dothideales* is an extremely diverse group, containing thousands c species of saprobic and plant pathogenic fungi (not shown). The *Chaetothyriales* contains numerous clinically relevant species. Note tha within the *Chaetothyriales* hardly any subdivision can be made. The anamorph genera maintained in the Atlas (Table 24) are based o morphology, but do not have any evolutionary significance. The yeast-like genus *Exophiala* is found intermingled with representatives of th filamentous genera *Cladophialophora, Fonsecaea, Phialophora, Ramichloridium* and *Rhinocladiella*. *Capronia* is a teleomorph genus.

Basidiomycetous yeasts

from Atlas of Clinical Fungi (on Reserve)

General remarks. Basidiomycetous yeasts are anamorphs of members of jelly fungi (*Hymenomycetes; Tremellales*) or of smuts (*Ustilaginomycetes*, *Ustilaginales*). They are recognized by presence of urease and extracellular DNAse, and by the less widely used Diazonium Blue B (DBB) staining reaction, which is also positive. In addition, mostly extracellular starch-like compounds are produced, inositol is mostly assimilated, and sugars are not fermented or only in amounts that are not detected by standard methods. Bud formation mostly percurrent. Generative reproduction is mostly produced after mating of suitable partners. A clamped mycelium with thick-walled, brown teliospores is formed, which eventually germinate with a non-septate basidium (holobasidium) or a septate basidium (phragmobasidium), bearing sessile basidiospores. Ultrastructure: cell walls are multilamellar; septa have dolipores or simple pores.

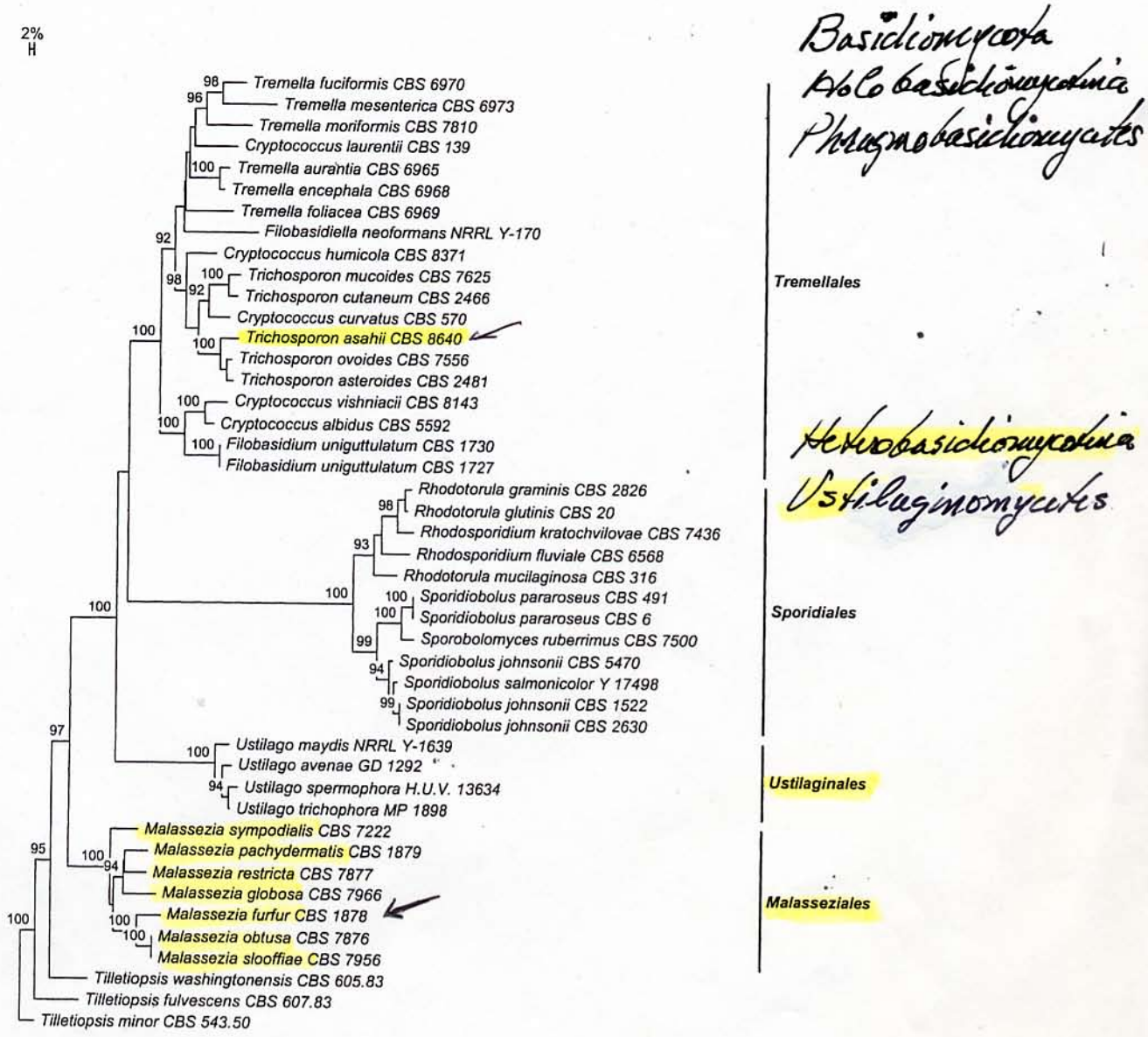


Fig. 18. Phylogenetic tree of basidiomycetous yeasts based on confidently aligned, D1/D2 domains of LSU rDNA, using Neighbor joining algorithm with Kimura correction. Bootstrap values >90 from 100 resampled datasets are shown. *Tilletiopsis minor* was chosen as outgroup. Note that numerous orders of basidiomycetous yeasts are known, which do not contain any clinically significant representatives. Medical fungi are mainly found in two orders, the *Tremellales* and the *Sporidiales*, which are clearly apart from each other. *Malassezia* takes an isolated position and therefore Begerow *et al.* (2000) maintained the order *Malasseziales* for this group.

TABLE 8–1. The Classification of Sabouraud and Its Present Equivalent

Genus	Group	Type Species	Synonomy and Present Name
Trichophyton			
	Endothrix	*T. tonsurans*	
	Neoendothrix	*T. flavum*	*(T. tonsurans)*
	Ectothrix		
	Megaspores	*T. roseum*	*(T. megninii)*
	Faviformes	*T. ochraceum*	*(T. verrucosum)*
		T. violaceum	
	Microides		
	Gypseum	*T. mentagrophytes*	
	Niveum	*T. felineum*	*(T. mentagrophytes)*
Microsporum			
Neomicrosporum		*M. canis*	
Eumicrosporum		*M. audouinii*	
Achorion			*(Trichophyton)*
Neoachorion		*A. gallinae*	*(M. gallinae)*
Euachorion		*A. schoenleinii*	*(T. schoenleinii)*
Epidermophyton		*E. floccosum*	

93d

Table 8–3. *The Currently Recognized Dermatophytes*

Anamorph Genera and Species

Epidermophyton Sabouraud 1907
- **E. floccosum* (Hartz 1870) Langeron et Milochevitch 1930
- ~~*E. stockdaleae* Prochacki et Engelhard-Zasada 1974~~

Microsporum Gruby 1843
- ~~*M. amazonicum* Moraes, Borelli, et Fco 1967~~
- **M. audouinii* Gruby 1843
- ~~*M. boullardii* Dominik et Majchrowicz 1965~~
- **†M. canis* Bodin 1902
- ~~*M. cookei* Ajello 1959~~
- ~~*†M. distortum* DiMenna et Marples 1954~~
- *†M. equinum* (Delacroix et Bodin 1896) Gueguén 1904
- **M. ferrugineum* Ota 1921
- **M. fulvum* Uriburu 1909
- *†M. gallinae* (Mégnin 1881) Grigorakis 1929
- **M. gypseum* (Bodin 1907) Guiart et Grigorakis 1928
- *†M. nanum* Fuentes 1956
- *†M. persicolor* (Sabouraud 1910) Guiart et Grigorakis 1928
- *M. praecox* Rivalier 1954
- *M. racemosum* Borelli 1965
- ~~*†M. ripariae* Hubabek et Rush Munro 1978~~
- *M. vanbreuseghemii* Georg, Ajello, Friedman, et Brinkman 1962

Trichophyton Malmsten 1845
- ~~*T. ajelloi* (Vanbreuseghem, 1952) Ajello 1968~~
- **T. concentricum* Blanchard 1895
- *†T. equinum* (Matruchot et Dassonville 1898) Gedoelst 1902
- ~~*T. flavescens* Padhye et Carmichael 1971~~
- ~~*T. georgiae* Varsavsky et Ajello 1964~~
- ~~*T. gloriae* Ajello 1967~~
- ~~**T. gourvilii* Catanei 1938~~
- ~~*T. longifusus* (Florian et Galgoczy 1964) Ajello 1968~~
- **T. megninii* Blanchard 1896
- **†T. mentagrophytes* (Robin 1853) Blanchard 1896
  - var. *mentagrophytes*
  - var. *interdigitale*
  - var. *erinacei*
  - var. *quinckeanum*
- ~~*T. phaseoliforme* Borelli et Fco 1966~~
- **T. rubrum* (Castellani 1910) Sabouraud 1911
- **T. schoenleinii* (Lebert 1845) Langeron et Milochevitch 1930
- *†T. simii* (Pinoy 1912) Stockdale, Mackenzie, et Austwick 1965
- **T. soudanense* Joyeux 1912
- ~~*T. terrestre* Duric and Frey 1957~~
- **T. tonsurans* Malmsten 1845
- ~~*T. vanbreuseghemii* Rioux, Tarry, et Tuminer 1964~~
- **T. verrucosum* Bodin 1902
- **T. violaceum* Bodin 1902
- **T. yaoundei* Cochet et Doby Dubois 1957‡

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*Commonly isolated from human infection.

†Commonly isolated from animal infection.

The remainder are soil keratinophilic fungi rarely if ever involved in disease. *T. thuringiense* Koch 1969 is now considered in synonymy with *T. terrestre* (fide Padhye), and *T. fluviomunience* Miguens 1968 is a granular form of *T. rubrum* (fide Ajello), and *T. proliferans* English and Stockdale 1968 is in synonymy with *T. mentagrophytes* var. *erinacei*. Two more species, *T. fischeri* and *T. mariati*, have recently been isolated.

‡T[illegible] species lacks a proper Latin diagnosis and is therefore [illegible]*omen nudum*.

See Sz 14+15 for comments about species eliminated

Some Onygenales

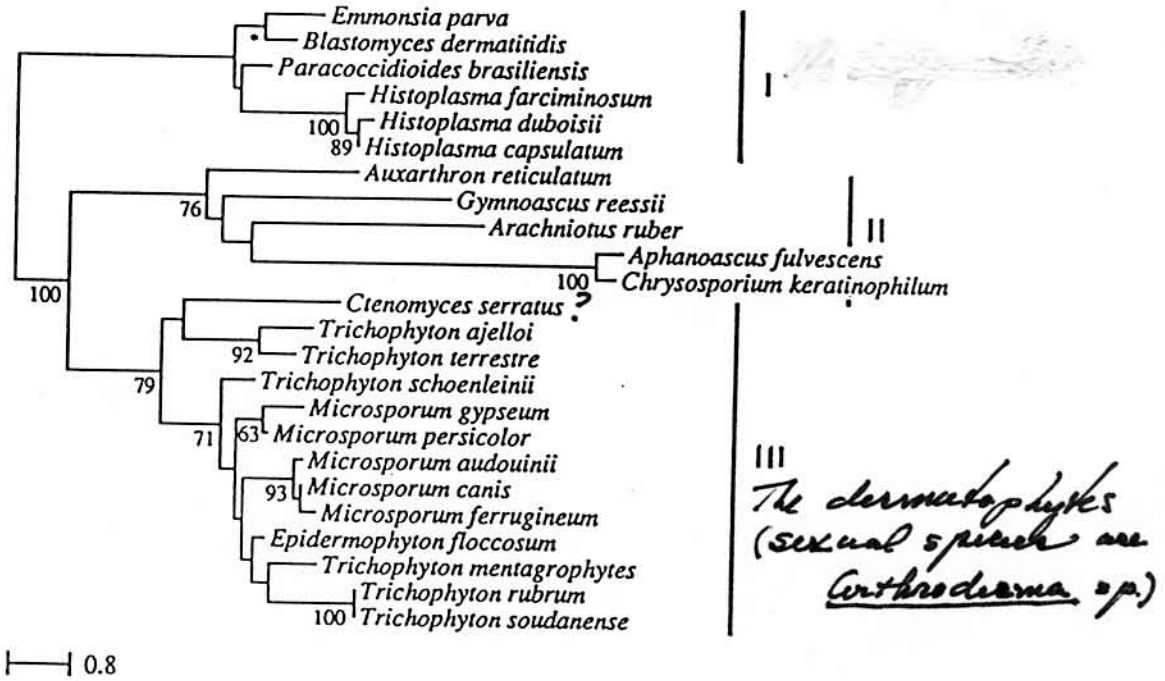

FIG. 3. Phylogenetic distance tree of Onygenales without *B. striatosporus* generated by the Fitch & Margoliash method [10] using all differences (transitions, transversions and indels). As for the general phylogenetic tree of Fig. 2, the bootstrap values were obtained from the maximum parsimony treatment using the DNAboot program of the PHYLIP package [9]. Scale bar=0·8% of differences.

JMVM 96

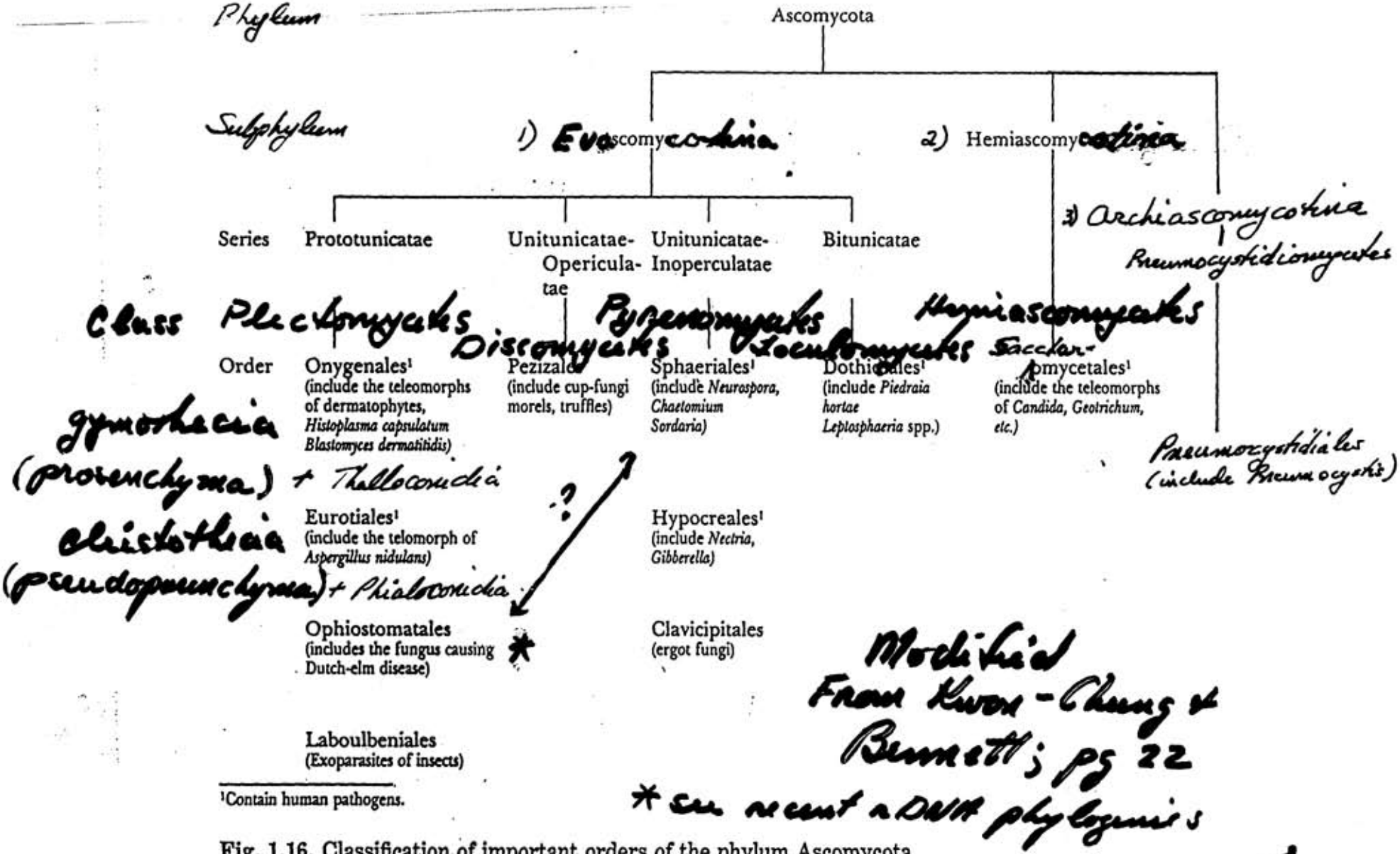

Fig. 1.16. Classification of important orders of the phylum Ascomycota.

TABLE 8–5. Ecology of Human Dermatophyte Species

Anthropophilic	Zoophilic	Geophilic
E. floccosum	*M. canis*	*M. gypseum*
M. audouinii	*M. gallinae*	*M. fulvum*
T. mentagrophytes var. *interdigitale*	*T. mentagrophytes* var. *mentagrophytes*	*M. nanum*
T. rubrum	*T. verrucosum*	*T. ajelloi*
T. schoenleinii	*T. equinum*	*T. terrestre*
T. tonsurans	*M. equinum*	
T. violaceum		
Rare and Geographically Limited Species		
M. ferrugineum	*T. mentagrophytes* var. *erinacei*	*M. racemosum*
T. concentricum		*M. cookei*
T. gourvilii	*T. mentagrophytes* var. *quinckeanum*	
T. megninii		
T. soudanense	*T. simii*	
T. yaoundei	*M. persicolor*	

Table 8–6. *Dermatophyte Infections—Clinical Diseases and Common Etiologies*

Disease	*Dermatophyte Involved*	*Disease*	*Dermatophyte Involved*
Tinea capitis	*Microsporum*, any species	Tinea imbricata	*T. concentricum*
	Trichophyton, any species except *T. concentricum*	Tinea cruris	*E. floccosum*
			T. rubrum
Tinea favosa	*T. schoenleinii*		*T. mentagrophytes (Candida albicans)**
	T. violaceum (rare)	Tinea pedis	*T. rubrum*
	M. gypseum (rare)		*T. mentagrophytes*
Tinea barbae	*T. mentagrophytes*		*E. floccosum (Candida albicans)**
	T. rubrum	Tinea manuum	*T. rubrum*
	T. violaceum		*E. floccosum*
	T. verrucosum		*T. mentagrophytes*
	T. megninii	Tinea unguium	*T. rubrum*
	M. canis		*T. mentagrophytes*
Tinea corporis	*T. rubrum*		(rare: *T. violaceum, T. schoenleinii, T. tonsurans)*
	T. mentagrophytes		*(*C. albicans* and other fungi are involved in a similar clinical disease, onychomycosis)
	M. audouinii		
	M. canis, almost any dermatophyte, and *Candida albicans**		
Tinea of animals (hair, skin, claws, feathers)	*M. canis*	Tina favosa (favus of animals)	*T. equinum*
	M. nanum		*M. gallinae*
	T. mentagrophytes		
	T. verrucosum		

**Candida albicans*, an opportunistic yeast of the normal human flora, can elicit infections that mimic true dermatophyte disease, particularly in the clinical types marked with an asterisk.

TABLE 8–9. The Common Dermatophytes and Their Diseases

			Species	Disease in Humans	Geographic Distribution
Invading the Hair and Hair Follicles	Small Conidia Varieties	Ectothrix Type	*Microsporum audouinii**	Prepubertal ringworm of the scalp; suppuration rare; child to child	Commonest in Nigeria, also in Romania, Libya. Now rare in U.S.
			*Microsporum canis**	Prepubertal ringworm of scalp and glabrous skin; suppuration not infrequent; kerion occasional; from pets	Uncommon in U.S. and Europe, except England and Scandinavia; common in southern South America
			Microsporum gypseum	Ringworm of the scalp and glabrous skin; suppuration and kerion common; from soil	Relatively rare in U.S.; common in South America
			Microsporum fulvum	Ringworm similar to that of *M. gypseum*	Rare and sporadic
			*Microsporum ferrugineum**	Similar to *M. audouinii*	Africa, India, China, Japan
	Large Conidia Varieties	Endothrix Type	*Trichophyton tonsurans*	Black dot ringworm of the scalp; smooth skin; sycosis; tinea unguium; suppuration common; the hair follicles are atrophied	Common in Europe, Russia, Near East, Mexico, Puerto Rico, northern South America; decreasing in U.S., now very common
			Trichophyton violaceum	Black dot endothrix in both scalp and smooth skin; onychomycosis; suppuration is the rule and kerion frequent	Decreasing in southern Europe, the Balkans; common in Central Asia, parts of Africa, the Far East
			Trichophyton soudanense *Trichophyton gourvilii* *Trichophyton yaoundei*	Inflammatory, scarring ringworm of scalp	Central and West Africa
		Ectothrix Type	*Trichophyton mentagrophytes* var. *interdigitale*	Common cause of interdriginous dermatophytosis of the foot	Ubiquitous
			Trichophyton mentagrophytes var. *mentagrophytes*	Vesicular ringworm of the smooth skin; suppurative folliculitis in scalp and beard	Ubiquitous
			Trichophyton verrucosum	Ringworm of the scalp and smooth skin; suppurative folliculitis in scalp and beard; from cattle	Ubiquitous
			Trichophyton megninii	Sycosis is the most common lesion; infection of smooth skin and nails	Sporadic distribution; Portugal, Sardinia
	No Conidia in Hair		*Trichophyton schoenleinii**	Favus in both scalp and smooth skin; scutulum and kerion	Europe, Near East, Mediterranean region; rare in U.S., South America
	Rare in Hair		*Trichophyton rubrum*	Commonest in feet, smooth skin, tinea unguium; mild suppurative folliculitis in beard; rare invasion of scalp hair endo- and ectothrix described; endoectothrix in villous hair	Ubiquitous
Not Invading the Hair and Hair Follicles			*Epidermophyton floccosum*	Cause of classic eczema marginatum of crural region; causes minority of cases of interdriginous dermatophytosis of foot; not known to infect hair and hair follicles	Ubiquitous, but more common in tropics
			Trichophyton concentricum	Cause of tinea imbricata; infection of nails and skin, not of hair	Common in South Pacific Islands, Far East, India, Ceylon; reported in west coast of Central America and northwest coast of South America, Brazil

*Infected hairs show fluorescence by Wood's lamp.

NORTH AMERICAN DERMATOPHYTES

Dermatophyte	Reservoir	Sites attacked (in order of frequency)	Age Group Attacked
Microsporum canis	Cats, dogs	Scalp, face, arms	Children
M. gypseum	Soil	Hands, arms	Adults (not common in Alberta)
M. audouinii	Children	Scalp, face	Children (rare in recent years)
Trichophyton rubrum	Man	Feet, nails, groin	Mostly adults
T. mentagrophytes	Man, small mammals	Feet, exposed skin, scalp	Adults and children
T. verrucosum	Cattle	Exposed skin, scalp	Adults and children
Epidermophyton floccosum	Man	Groin, nails (never invades hair)	Adults

Diagnosis is accomplished by direct microscopic examination of skin scales and by culture. The direct examination reveals the presence of a fungus. Cultures are necessary to identify the species. Serological tests and skin tests have not proved helpful for diagnosis. *Microsporum* scalp infections fluoresce blue-green under U.V.

Treatment: The treatment of ringworm depends on the dermatophyte species involved and on the location and severity of the lesion. Highly inflammatory lesions are usually self-limited Initial treatment should be conservative since vigorous treatment may release large amounts of fungus products and cause generalized hypersensitivity reactions. For non-inflammatory skin lesions local treatment with fungicides is usually effective. Iodine or proprietary powders or ointments may be used. For chronic infections, especially of the nails or scalp and especially when the pathogen is *Trichophyton rubrum* or *Microsporum audouinii*, systemic treatment with griseofulvin antifungal antibiotic is indicated. Griseofulvin acts by fungus-proofing newly formed keratin. Ringworm lesions do not resolve quickly. With either local or griseofulvin treatment, several weeks are required for the disappearance of skin lesions. Nail lesions require many months before the diseased nail is replaced by new.

Ringworm is not a notifiable disease, but a provincial regulation is in effect which requires children to be kept out of school if they are infected with *M. audouinii*.

Austin360
www.austin360.com/health

4/24/98

Mike Hutmacher/Wichita Eagle

Foresteen Carter says grandson Marlo Carter, 14, no longer shares caps with his friends.

Ringworm of scalp grows among young

By Karen Shideler
The Wichita Eagle

WICHITA, Kan. — Line up 10 young African Americans, and five of them will have ringworm of the scalp.

"It is truly an epidemic" among black youths, says dermatologist Clarence Wiley of Wichita, Kan., who treats two or three youngsters — most of them boys — every day. The condition is rare among whites.

Moses Thompson, whose 5-year-old son was treated for ringworm this year, says, "If this was head lice or anything else that was affecting nonminorities . . . it would be posted, and everyone would know about it."

Instead, Wiley and Thompson say, doctors often misdiagnose ringworm of the scalp, barbershops and beauty salons inadvertently spread it, and cultural practices perpetuate it.

Marlo Carter, who's 14, has three dime-size spots on his head where the hair is missing as a result of ringworm of the scalp, known by doctors as tinea capitis. The hair may or may not grow back.

"I noticed when he was playing football, he had this little scab on his head," says his grandmother, Foresteen Carter. At first, "it looked just like dandruff."

That's typical, says Wiley. And a doctor who thinks it's dandruff may prescribe cortisone, which suppresses the immune response and makes the problem worse.

Carter took her grandson to the doctor when the spot, at the back of his head, grew to a knot. "We thought maybe he had a tumor." Eventually, they were referred to a dermatologist.

Wiley "knew what it was right away," Carter says.

Thompson's doctor said 5-year-old Christopher had ringworm and prescribed a topical medication. It didn't work. Scalp ringworm responds to oral anti-fungal medication and medicated shampoo, Wiley says.

The fungus that causes tinea capitis spread to the United States from Central and South America, Wiley says, and has mutated during the past 20 years. He says 40 percent to 60 percent of American black youths have scalp ringworm.

Many doctors misdiagnose ringworm because they don't do a culture for it, Wiley says.

Cindy Burbach, coordinator of health services for Wichita Public Schools, says schools "don't screen for it routinely."

Ringworm is spread from person to person through hats, combs, brushes and other hair-care instruments. It even can be spread when heads share the same spot on a sofa back or theater seat.

Wiley says barbers are supposed to use a disinfectant spray on their clippers, but "even if they did it, that's not adequate," because one flake from an affected head can get into the clippers' mechanism and spread it to the next head.

African Americans tend to have dry hair, Wiley says. Dry hair means dry scalp, "and dry scalp for blacks means put on some grease," he says. But the pomade "perpetuates an unhealthy environment."

He says blacks should wash their hair with a shampoo such as Selsun Blue at least once or twice a week and avoid pomade.

He also recommends that people buy their own hair clippers and take them to the barbershop. Clippers are cheaper than treating ringworm.

4/98

Thickened toenails

Common, embarrassing

A barefoot walk on the beach may not be an option this year. You're embarrassed by the thick and yellow toenail on your big toe.

Thickened toenails can be caused by a number of factors. In severe cases, a thickened toenail may cause pain and may even make walking difficult. Depending on the cause, treatment and taking good care of your nails may help.

Slow growth

Many factors can cause one or more of your toenails to become thickened. These include an injury, various skin conditions such as psoriasis, tight or poorly fitting shoes and fungal infections.

Among these, a fungal nail infection — onychomycosis (on-i-ko-mi-KO-sis) — is the most common cause. It's estimated that between 40 percent and 50 percent of people over 50 have an infected nail.

Onychomycosis may begin as a yellow or white spot under the tip of a nail. As the infection spreads, the nail may thicken, become crumbly and ragged, and may begin to separate from the nail bed. Over a period of months, more of the nail may become discolored and, rarely, surrounding skin may become red, itchy and swollen. A fungal nail infection can spread from toenails to fingernails and vice versa.

If you have a thickened toenail and it's causing you embarrassment or significant pain, or if it continues to get thicker even without pain, see your doctor. A doctor may be able to determine what's causing the thickness and treat it early. An untreated fungal infection can persist indefinitely.

Trimming tips

Trouble trimming thickened toenails? Try these tips:

- *Soak your feet* — Soften your toenails by soaking them in warm water.
- *File* — Towel dry and gently stroke the surface of the thickened toenail with an emery board to thin the nail.
- *Use the right clippers* — Use long-handled toenail clippers that resemble a small pliers or wire cutters for better grip and control.
- *Take small clips* — Cut off a small piece at a time.
- *Make a straight cut* — Cut straight across your toenail, without rounding the corners, to reduce the chances that the corners will become ingrown.
- *Wear roomy shoes* — Leaving enough room for your toes may prevent friction and wear that can cause a nail to thicken.

Identifying the cause

Your doctor may scrape some debris from your toenail and examine it under a microscope to determine whether a fungus is causing the infection.

If no fungus is found, psoriasis may be the cause. Psoriasis can mimic a fungal infection and cause nail thickness and pitting. If you have psoriasis that is causing your thickened toenail, treatment directed at the psoriasis may help.

Many people with fungal infections choose not to treat them. Instead, they watch for changes and keep toenails trimmed for comfort and to avoid having them become ingrown. Your doctor may try one of two commonly prescribed oral antifungal drugs — itraconazole (Sporanox) or terbinafine (Lamisil).

As a fungal nail infection spreads, the nail may thicken, become crumbly and ragged.

Occasionally other medications, such as fluconazole (Diflucan), may be used. These are relatively new medications that you take on a regular basis for up to 3 months. After completing treatment, you may not immediately notice any change in the infected nail, since a new toenail can take up to a year to grow.

Oral antifungal drugs may cause side effects including heart failure or liver damage. Itraconazole and fluconazole also can interact with other drugs, such as some blood thinners and allergy drugs. Your doctor may monitor your liver function with ongoing blood tests while you're taking an oral antifungal drug.

Ciclopirox (Penlac), a prescription nail lacquer that you apply to infected nails every day for up to 48 weeks, has been shown in studies to be effective in removing infection in only one in eight people.

If neither a fungal infection nor psoriasis is the cause, your doctor may advise clipping the toenail short to see if it grows back normally.

In rare situations, such as a toe infection that's severely or extremely painful, your doctor may suggest removing the nail. A new nail may slowly replace it, but it's possible that the new nail also may be thickened. ❐