Diagnosis The diagnosis of systemic *Trichosporon* infection is established by growth of the organism from involved tissues or from blood. Histopathologic examination of a skin lesion showing a mixture of yeast forms, arthroconidia, and hyphae can lead to an early presumptive diagnosis of trichosporonosis. The serum cryptococcal antigen latex agglutination test may be positive in patients with disseminated trichosporonosis because *T. asahii* and *Cryptococcus neoformans* share polysaccharide antigens.

Treatment and Prognosis Rates of response to AmB have been disappointing, and many *Trichosporon* isolates are resistant in vitro. Voriconazole appears to be the antifungal agent of choice and is used at a dosage of 200–400 mg twice daily. The mortality rates for disseminated *Trichosporon* infection have been as high as 70% but are decreasing with the use of newer azoles, such as voriconazole; however, patients who remain neutropenic are likely to succumb to this infection.

SUPERFICIAL CUTANEOUS INFECTIONS

Fungal infections of the skin and skin structures are caused by molds and yeasts that do not invade deeper tissues but rather cause disease merely by inhabiting the superficial layers of skin, hair follicles, and nails. These agents are the most common cause of fungal infections of humans but only rarely cause serious infections.

YEAST INFECTIONS

Etiologic Agents The lipophilic yeast *Malassezia* is dimorphic in that it lives on the skin in the yeast phase but transforms to the mold phase as it causes disease. Most species require exogenous lipids for growth.

Epidemiology and Pathogenesis *Malassezia* species are part of the indigenous human flora found in the stratum corneum of the back, chest, scalp, and face—areas rich in sebaceous glands. Disease is more common in humid areas. The organisms do not invade below the stratum corneum and generally elicit little if any inflammatory response.

Clinical Manifestations *Malassezia* species cause tinea versicolor (also called *pityriasis versicolor*), folliculitis, and seborrheic dermatitis. Tinea versicolor presents as flat round scaly patches of hypo- or hyperpigmented skin on the neck, chest, or upper arms. The lesions are usually asymptomatic but can be pruritic. They can be mistaken for vitiligo, but the latter is not scaly. Folliculitis occurs over the back and chest and mimics bacterial folliculitis. Seborrheic dermatitis manifests as erythematous pruritic scaly lesions in the eyebrows, moustache, nasolabial folds, and scalp. The scalp lesions are termed *cradle cap* in babies and *dandruff* in adults. Seborrheic dermatitis can be severe in patients with advanced AIDS. Fungemia and disseminated infection occur rarely with *Malassezia* species—almost always in premature neonates receiving parenteral lipid preparations through a central venous catheter.

Diagnosis *Malassezia* infections are diagnosed clinically in most cases. If scrapings are collected on a microscope slide on which a drop of potassium hydroxide has been placed, a mixture of budding yeasts and short septate hyphae is seen. In order to culture *M. furfur* from those patients in whom disseminated infection is suspected, sterile olive oil must be added to the medium.

Treatment and Prognosis Topical creams and lotions, including selenium sulfide shampoo, ketoconazole shampoo or cream, terbinafine cream, and ciclopirox cream, are effective in treating *Malassezia* infections and are usually given for 2 weeks. Mild topical steroid creams are sometimes used to treat seborrheic dermatitis. For extensive disease, itraconazole (200 mg/d) or fluconazole (200 mg/d) can be used for 5–7 days. The rare cases of fungemia caused by *Malassezia* species are treated with AmB or fluconazole, prompt removal of the catheter, and discontinuance of parenteral lipid infusions. *Malassezia* skin infections are benign and self-limited, although recurrences are the rule. The outcome of systemic infection depends on the host's underlying conditions, but most infected infants do well.

DERMATOPHYTE (MOLD) INFECTIONS

Etiologic Agents The molds that cause skin infections in humans include the genera *Trichophyton*, *Microsporum*, and *Epidermophyton*. These organisms, which are not components of the normal skin flora, can live within the keratinized structures of the skin—hence the term *dermatophytes*.

Epidemiology and Pathogenesis Dermatophytes occur worldwide, and infections with these organisms are extremely common. Some organisms cause disease only in humans and can be transmitted by person-to-person contact and by fomites, such as hairbrushes or wet floors, that have been contaminated by infected individuals. Several species cause infections in cats and dogs and can readily be transmitted from these animals to humans. Finally, some dermatophytes are spread from contact with soil. The characteristic ring shape of cutaneous lesions is the result of the organisms' outward growth in a centrifugal pattern in the stratum corneum. Fungal invasion of the nail usually occurs through the lateral or superficial nail plates and then spreads throughout the nail; when hair shafts are invaded, the organisms can be found either within the shaft or surrounding it. Symptoms are caused by the inflammatory reaction elicited by fungal antigens and not by tissue invasion. Dermatophyte infections occur more commonly in male than in female patients, and progesterone has been shown to inhibit dermatophyte growth.

Clinical Manifestations Dermatophyte infection of the skin is often called *ringworm*. This term is confusing because worms are not involved. *Tinea*, the Latin word for *worm*, describes the serpentine nature of the skin lesions and is a less confusing designation that is used in conjunction with the name of the body part affected—e.g., tinea capitis (head), tinea pedis (feet), tinea corporis (body), tinea cruris (crotch), and tinea unguium (nails, although infection at this site is more often termed *onychomycosis*).

Tinea capitis occurs most commonly in children 3–7 years old. Children with tinea capitis usually present with well-demarcated scaly patches in which hair shafts are broken off right above the skin; alopecia can result. Tinea corporis is manifested by well-demarcated, annular, pruritic, scaly lesions that undergo central clearing. Usually one or several small lesions are present. In some cases, tinea corporis can involve much of the trunk or manifest as folliculitis with pustule formation. The rash should be differentiated from contact dermatitis, eczema, and psoriasis. Tinea cruris is seen almost exclusively in men. The perineal rash is erythematous and pustular, has a discrete scaly border, is without satellite lesions, and is usually pruritic. The rash must be differentiated from intertriginous candidiasis, erythrasma, and psoriasis.

Tinea pedis also is more common among men than among women. It usually starts in the web spaces of the toes; peeling, maceration, and pruritus are followed by development of a scaly pruritic rash along the lateral and plantar surfaces of the feet. Hyperkeratosis of the soles of the feet often ensues. Tinea pedis has been implicated in lower-extremity cellulitis, as streptococci and staphylococci can gain entrance to the tissues through fissures between the toes. Onychomycosis affects toenails more often than fingernails and is most common among persons who have tinea pedis. The nail becomes thickened and discolored and may crumble; onycholysis almost always occurs. Onychomycosis is more common in older adults and in persons with vascular disease, diabetes mellitus, and trauma to the nails. Fungal infection must be differentiated from psoriasis, which can mimic onychomycosis but usually has associated skin lesions.

Diagnosis Many dermatophyte infections are diagnosed by their clinical appearance. If the diagnosis is in doubt, as is often the case in children with tinea capitis, scrapings should be taken from the edge of a lesion with a scalpel blade, transferred to a slide to which a drop of potassium hydroxide is added, and examined under a microscope for the presence of hyphae. Cultures are indicated if an outbreak is suspected or the patient does not respond to therapy. Culture of the nail is especially useful as an aid to decisions about both diagnosis and treatment.

Treatment and Prognosis Dermatophyte infections usually respond to topical therapy. Lotions or sprays are easier than creams to apply to large or hairy areas. Particularly for tinea cruris, the affected