1. Sporotrichosis

**Outline**
- *Sporothrix schenckii* in the soil enters the human body through a minor injury. Farmers and infants are most commonly affected.
- A red papule or a pustule first occurs, forming a firm subcutaneous nodule or ulcer.
- A granuloma containing asteroid bodies is found histopathologically. Sporotrichin test is positive.
- Oral antifungal drugs are the first-line treatment. Potassium iodide and thermotherapy are also effective.

**Clinical features**

After a latency of about 3 weeks, a red papule or pustule occurs at the site of bacterial invasion (Fig. 25.20). The eruption gradually enlarges to a firm, infiltrative, subcutaneous nodule up to 4 cm in diameter. The nodule easily ruptures, and chronic ulcer forms at the center. Mild pain may accompany the ulceration; sporotrichosis is otherwise asymptomatic. It is clinically subdivided into fixed, lymphangitic and systemic. The systemic subtype features generalized subcutaneous nodules on the whole body. In fixed sporotrichosis, eruptions appear solitarily and enlarge gradually. The face and upper arms of children are most commonly involved. Lymphangitic sporotrichosis causes multiple skin lesions along the lymph vessels, and most frequently occurs on the area between the dorsal hands and forearms of adults.

**Pathogenesis, Epidemiology**

Sporotrichosis is caused by *Sporothrix schenckii*, a fungus that lives in soil and is widely distributed in tropical and temperate regions. It occurs most commonly in tropical and temperate regions and in those who often are exposed to the soil, such as farmers, gardeners, and children who play outdoors. *Sporothrix schenckii* invades the dermis through a minor injury such as a cut, scratch or splinter.

**Pathology**

A nonspecific chronic granulomatous lesion is observed by HE staining. Eosin-chromophilic asteroid bodies may be found in the lesion. In PAS staining, PAS-positive spherical spores may be found at sites with abundant cellular infiltration.

**Laboratory findings, Diagnosis**

To confirm the diagnosis, crust or exudative fluid is cultured in
Sabouraud’s glucose agar. If a mass of *Sporothrix schenckii* is identified by slide culture, the diagnosis is sporotrichosis. Sporotrichin intradermal test is a specific test for sporotrichosis: 48 hours after intradermal injection of 0.1 ml sporotrichin antigen fluid in the flexor surface of the forearm, the site is examined for nodule formation; a nodule of 10 mm or larger is considered a positive. If a reddish-brown granulomatous lesion or ulcer that does not respond to antibiotics is found, sporotrichosis is suspected. The crust should be cultured for identification. As it is difficult to find spores and asteroid bodies histopathologically, detection of *Sporothrix schenckii* using an antibody against its fungal components is also conducted.

**Treatment**

Sporotrichosis tends not to heal spontaneously, and progresses for several years. It heals in 1 to 3 months with oral potassium iodide, an extremely effective treatment. Oral itraconazole and terbinafine, thermotherapy and surgical removal are useful.

### 2. Chromoblastomycosis

**Synonym:** Chromomycosis

**Outline**

- It is a chronic fungal infection of the skin and subcutaneous tissues caused by dematiaceous fungi. Single or multicelled clusters with thick walls (sclerotic or muriform bodies) form in the tissue.
- The skin lesion is exophytic. It develops slowly.

**Clinical features**

Chromoblastomycosis most frequently occurs in men and women in adolescence and later. Red papules solitarily occur on sun-exposed areas of the extremities and face. They enlarge centrifugally and form red scaling or elevated plaques. The lesion may heal centrally. It may be patchy, ring-shaped or horseshoe shaped (Fig. 25.21), and slightly exudative. Since abscess formation and rupture rarely occur, the lesion tends to be dry. The surface of the lesion may become verrucous. However, chromoblastomycosis is nearly asymptomatic. It does not heal spontaneously and progresses slowly. Nevertheless, there have been some fatal cases of generalized chromoblastomycosis.

**Pathogenesis**

Dematiaceous fungi invade the skin through trauma, such as a puncture from a splinter, and form a granulomatous lesion. Most cases are caused by *Fonsecaea pedrosoi*, followed in frequency by *Phialophora verrucosa* and *Cladophialophora carrionii (Cladosporium carrionii)*. These fungi are resident in soil, plants and rotting wood. Chromoblastomycosis has been reported in North, South and Central America, the Caribbean (Cuba, Jamaica, etc.)

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**Phaeohyphomycosis**

According to dermatology textbooks in Europe and the U.S., phaeohyphomycosis is defined as “a group of superficial and deep infections caused by fungi that form pigmented hyphae and yeast-like cells in tissue.” The main causative fungal species are *Exophiliala jeanselmei* and *Wangiella dermatitidis*.
Martinique, India, South Africa, Madagascar, Australia and Northern Europe.

**Pathology, Diagnosis**

Large round or polygonal brown cells called sclerotic cells are observed in scales from the lesion by KOH direct microscopy. Histopathologically, a chronic granulomatous lesion forms in the dermis. The spores are found by regular HE staining. Spores that are phagocytosed by multinucleated giant cells are also observed.

**Treatment**

When the lesion is small, it is excised with a margin of 5 mm to 10 mm of normal skin. Oral itraconazole, flucytosine (5-FC), and terbinafine, and local injection of amphotericin B are useful. Thermotherapy, in which a warmer or infrared light is applied for a long time, may cure the lesion.

**3. Mycetoma**

Mycetoma, a localized chronic infection, is classified by the causative microorganism as actinomyctoma (caused by *Nocardia brasiliensis, Nocardia otitidiscaviarum, Nocardia asteroides* and similar microorganisms) or eumycetoma. A small nodule gradually becomes a pusular granuloma, forming a fistula. Mycetoma is characterized by the formation of aggregated causative organisms (grains) in abscesses. Skin, subcutaneous tissues and bones of the feet and hands are severely affected. Grains are discharged by sinus drainage. Granules are observed by microscopy, appearing as a mass of bacteria 1 mm to 10 mm in diameter. Actinomycotic mycetoma is treated with large long-term doses of sulfa drugs or a combination of sulfamethoxazole and trimethoprim (combined ST). For eumycetoma, intravenous

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**Fig. 25.21 Chromomycosis.**

The surface of the lesion may appear verrucous.
amphotericin B and itraconazole or oral terbinafine are used.

4. Cutaneous aspergillosis

**Clinical features**
Cutaneous aspergillosis most frequently occurs at moist sites with chronically poor hygiene. *Aspergillus* fungi invade a hair follicle or minor injury to produce folliculitis, pyoderma, acne-like papules or carbuncle-like lesion.

**Classification, Pathogenesis**
The infection is caused by fungi of the genus *Aspergillus*, which are found in soil. In most cases, they cause a lesion in the lung or external auditory canal as an opportunistic infection; they almost never cause skin lesions. When *Aspergillus* travels hematogenously from a pulmonary lesion to the skin, a skin lesion occurs (secondary cutaneous aspergillosis). Poor hygiene, prolonged bed rest, cast immobilization or topical steroids may induce direct parasitism on the skin (primary cutaneous aspergillosis). The several species of *Aspergillus* fungi include *Aspergillus fumigatus* and *Aspergillus flavus*.

5. Cutaneous cryptococcosis

**Clinical features**
The face, neck and scalp are most commonly involved. Cutaneous cryptococcosis begins with asymptomatic papules and acne-like eruptions and abscess formation. The various skin lesions include ulcers, firm subcutaneous nodules, and cellulitis.

**Classification, Pathogenesis**
Cutaneous cryptococcosis is a dermal or subcutaneous infection caused by *Cryptococcus neoformans*, a fungus that exists in pigeon droppings and soil. The main subtypes are primary cutaneous cryptococcosis and secondary cutaneous cryptococcosis. The former is caused by direct invasion by the fungi into an external injury and may occur in healthy individuals in rare cases. The latter is caused by hematogenous dissemination from pulmonary granulomas. It is highly associated with immunodeficiency and is a symptom of AIDS.

**Pathology**
In primary cutaneous cryptococcosis, a granulomatous lesion forms but there are few cryptococcal capsules. In secondary cutaneous cryptococcosis, mild inflammatory reaction occurs, a gelatinous lesion forms, and numerous cryptococcal capsules appear.
Cutaneous cryptococcosis is diagnosed when microscopic observation shows characteristically thick, capsulated spores in the pus, or by histopathological identification of *Cryptococcus neoformans* or separation of cutaneous cryptococcosis in culture. When cultured in Sabouraud’s glucose agar, *Cryptococcus neoformans* forms glossy white colonies whose colour changes to brown. Identification of this fungus has become possible recently by IF or ELISA.

Intravenous amphotericin B in combination with oral fucytosine (5-FC) is effective. Antifungal drugs containing imidazole are useful. Primary cutaneous cryptococcosis has a good prognosis; systemic cutaneous cryptococcosis tends to have a poor prognosis.

**6. Paracoccidiomycosis**

Synonym: South American blastomycosis

This chronic granulomatous fungal infection is caused by *Paracoccidioides brasiliensis*. It is characterized by the formation of a lesion in the lung caused by aspiration. The causative fungi disseminate, leading to papules and ulceration on the skin and mucous membranes, and further spread to the lymph nodes (Figs. 25.22-1 and 25.22-2). Histopathologically, the spores germinate in the characteristic shape of the pilot’s wheel of a ship (Fig. 25.23). Itraconazole or amphotericin B is administered. Paracoccidiomycosis has been reported from most South American countries, particularly Brazil.

**7. Coccidioidomycosis**

This disease is endemic to desert areas of the southwestern United States, Mexico, and Central and South America. *Coccidioides immitis* aspirated into the lung induces a pulmonary lesion and disseminates hematogenously to the skin, causing a papule, most commonly on the medial area of the face such as the nasal region or nasolabial groove, and also on the extremities. It gradually enlarges and becomes a nodule or plaque, resembling a pustule or cellulitis. When spread to the skin or central nervous system, it may be fatal.

**8. North American blastomycosis**

It occurs in the North American continent and in parts of Africa. A pulmonary lesion occurs and readily spreads to the skin and bone. Verrucous papules, nodules and ulcers form on the face and in the oral mucosa. The causative fungus is *Blastomyces dermatitidis*. Potassium iodine agents and amphotericin B are
9. **Histoplasmosis**

It is caused by *Histoplasma capsulatum* var. *capsulatum* and occurs in tropical, subtropical and temperate areas of the world, particularly in the Mississippi Valley and Africa. This fungus is thought to inhabit bat-infested caves. It may infect humans by aspiration, forming a skin lesion hematogenously.

10. **Cutaneous zygomycosis (mucormycosis)**

It is usually caused by fungi of the orders *Mucorales* (most commonly by *Rhizopus arrhizus*). Patients with immunodeficiency or severe diabetes are prone to this infection.

11. **Protothecosis cutanea**

Caused by *Prototheca wickerhamii* or *Prototheca zopfii*, it occurs as an opportunistic infection in patients with immunodeficiency.

Clinical images are available in hardcopy only.

Fig. 25.22-2 Paracoccidiomycosis.

Fig. 25.23 Histopathology of paracoccidiomycosis.