

## Brief Description of Common Molds

Please Note: This description is for reference only, not for diagnostics or therapy purposes.

### ***Absidia* sp.**

The genus *Absidia* is a common mold, containing 21 mostly soil-borne species. The fungal species is characterized by a differentiation of the hyphae into arched stolons bearing more or less verticillate sporangiophores at the internode, and rhizoids formed at the point of contact with the substrate (at the node). *A. corymbifera* is the only species of *Absidia* known to cause disease in man and animals. *A. corymbifera* has a world-wide distribution mostly in association with soil and decaying plant debris.

*Absidia corymbifera* is a common human pathogen, causing pulmonary, rhinocerebral, disseminated, CNS or cutaneous types of infection. It is also often associated with animal disease, especially mycotic abortion.

### ***Acremonium* sp.**

The genus *Acremonium* currently contains 100 species, of which most are saprophytic, being isolated from dead plant material and soil. A number of species are recognized as opportunistic pathogens of man and animals, causing mycetoma, onychomycosis, and hyalohyphomycosis, these include *A. falciforme*, *A. kiliense*, *A. recifei*, *A. alabamensis*, *A. potroni*, *A. roseo-griseum* and *A. strictum*. However, many reports only identify *Acremonium* species to genus level. Clinical manifestations of hyalohyphomycosis caused by *Acremonium*; include arthritis, osteomyelitis, peritonitis, endocarditis, pneumonia, cerebritis and subcutaneous infection.

### ***Alternaria* sp.**

*Alternaria* species are world-wide distribution, containing about 40 species of which most are plant parasites, but a few species are ubiquitous and are also frequently soil-borne. They are also one of most common indoor molds. Colonies are fast growing, black to olivaceous-black or grayish.

*A. alternata* is the commonest of these. Although usually as saprophytes, *Alternaria* species are recognized causative agents of mycotic keratitis and phaeohyphomycosis. Clinical manifestations include cutaneous infections, paranasal sinusitis, osteomyelitis and peritonitis in patients on continuous ambulatory peritoneal dialysis.



### ***Aspergillus* sp.**

*Aspergillus* species are the commonest molds indoor and out door, having more than 100 species. The colonies are usually fast growing, with various colors. Among them, *A. fumigatus* is the most recognized opportunistic pathogen, especially for individuals with weak defence system. The fungus *A. flavus* is widely considered as one of important “toxic” molds. The list of the most important species that are potential human or animal pathogens include:

- *Aspergillus flavus*
- *Aspergillus fumigatus*
- *Aspergillus nidulans*
- *Aspergillus niger*
- *Aspergillus terreus*
- *Aspergillus uretus*

### ***Aureobasidium pullulans***

*Aureobasidium pullulans* has worldwide distribution and it is usually isolated as a saprophyte, occasionally from skin and nails. However, it has also been reported as a rare causative agent of phaeohyphomycosis, mycotic keratitis and peritonitis in patients on continuous ambulatory peritoneal dialysis.

### ***Beauveria* sp.**

Three species of *Beauveria* are recognized, two of which are well known parasites of insects. *B. bassiana* is the most common species and is best known as the causal agent of the disastrous muscardine in silkworms.

### ***Bipolaris* sp. (Teleomorph: *Cochliobolus* sp.)**

*Bipolaris* spp. are common fungi with world-wide distributions, but mostly subtropical plant parasites, containing about 45 species mostly from soil. This is also commonly found as indoor-mold. Colonies are moderately fast growing. However several species, notably *B. australiensis*, *B. hawaiiensis* and *B. spicifera* are well-documented human pathogens..

Clinical manifestations include mycotic keratitis, subcutaneous phaeohyphomycosis, sinusitis, peritonitis in patients on continuous ambulatory peritoneal dialysis and cerebral and disseminated infections. Phaeohyphomycosis caused by *Bipolaris* species has been reported in both normal and immunosuppressed patients.

### ***Blastomyces dermatitidis***

The natural habitat of *B. dermatitidis* has yet to be clearly delineated, despite some reports of its isolation from soil. Blastomycosis is a chronic granulomatous and suppurative disease having a primary pulmonary stage that is frequently followed by dissemination to other body sites, chiefly the skin and bone. Although the disease was long thought to be restricted to the North American continent, in recent years autochthonous cases have been diagnosed in Africa, Asia and Europe.

All available clinical and epidemiological evidence indicates that humans and lower animals contract blastomycosis from some source in nature.

### ***Chaetomium* sp.**

The genus of fungi is a dematiaceous (dark-walled) mold normally found in soil, air, and plant debris. As well as being a contaminant, *Chaetomium* spp. are also encountered as causative agents of infections in humans. A few cases of fatal deep infections due to *Chaetomium atrobrunneum* have been reported in the immunocompromised host. Other clinical syndromes include brain abscess, peritonitis, and onychomycosis.

### ***Chrysosporium tropicum***

Species of *Chrysosporium* are occasionally isolated from skin and nail scrapings, especially from feet, but because they are common soil saprophytes they are usually considered as saprophytes. There are about 22 species of *Chrysosporium*, several are keratinophilic with some also being thermotolerant, and cultures may closely resemble some dermatophytes.

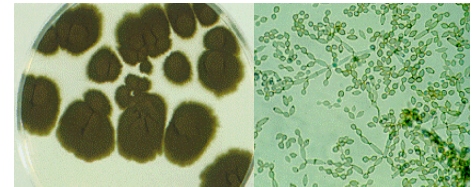


### ***Cladophialophora* spp.**

Most fungal species in this genus are soil fungus with worldwide distribution, but commonly considered as human pathogens. They are widely distributed, and have the similar ecological niches as *Cladosporium* species. The most important species include *C. bantiana* and *C. carrionii*. The later species is mainly from arid regions of tropical South America and South Africa.

### ***Cladosporium* sp.**

*Cladosporium* species have a worldwide distribution and are amongst the most common of air-borne fungi. Some 500 species have been described. *Cladosporium* is the commonest indoor and outdoor mold. The pathogenic species have now been transferred to the genus *Cladophialophora*.



### ***Coccidioides immitis/posadasii* complex**

Recently *Coccidioides immitis* has been recognised as 2 species: *C. immitis* and *C. posadasii*. *C. immitis/posadasii* is a soil inhabiting fungus endemic in south-western U.S.A., northern Mexico and various centers in South America. *C. immitis* is geographically limited to California's San Joaquin Valley region, whereas *C. posadasii* is found in the desert regions of the USA southwest, Mexico and South America. The two species appear to coexist in the desert regions of the USA southwest and Mexico. Coccidioidomycosis is initially, a respiratory infection, resulting from the inhalation of conidia, that typically resolves rapidly leaving the patient with a strong specific immunity to re-infection. However, in some individuals the disease may progress to a chronic

pulmonary condition or to a systemic disease involving the meningitis, bones, joints and subcutaneous and cutaneous tissues.

### ***Cunninghamella bertholletiae***

It is a common soil fungus with a worldwide distribution. *Cunninghamella bertholletiae* is a rare cause of zygomycosis in humans often associated with trauma and immunosuppression.

### ***Curvularia* sp.** (Teleomorph: *Cochliobolus* sp.)

The genus *Curvularia* contains some 35 species which are mostly subtropical and tropical plant parasites. However, three ubiquitous species have been recovered from human infections, principally from cases of mycotic keratitis; *C. lunata*, *C. pallescens* and *C. geniculata*. Clinical manifestations of phaeohyphomycosis include sinusitis, endocarditis, peritonitis and disseminated infection.



### **Dermatophytes.**

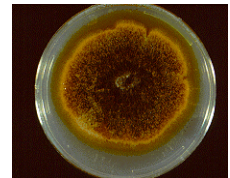
Fungi only infecting and causing diseases on skin, hair and nails are usually called dermatophytes. The most common ones are *Epidermophyton*, *Microsporum*, and *Trichophyton* species.

### ***Drechslera* sp.** (Teleomorph: *Pyrenophora*)

*Drechslera* species are mostly found from soil and plants. *Drechslera biseptata* has recently been reported from a brain abscess.

### ***Epicoccum nigrum***

*Epicoccum nigrum* is a cosmopolitan saprophyte of worldwide distribution, which is occasionally isolated from clinical specimens, like skin.



### ***Exophiala* sp.**

*Exophiala* species are common environmental fungi often associated with decaying wood and soil enriched with organic wastes. However, several species notably *E. jeanselmei*, *E. moniliae* and *E. spinifera*, are well-documented human pathogens. Clinical manifestations include mycetoma (especially for *E. jeanselmei*), localized cutaneous infections, subcutaneous cysts, endocarditis and cerebral and disseminated infections. Phaeohyphomycosis caused by *Exophiala* species has been reported in both normal and immunosuppressed patients.

### ***Exserohilum* sp.**

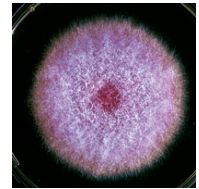
*Exserohilum* species are common environmental moulds found in soil and on plants, especially grasses. Several species have been reported as agents of phaeohyphomycosis, notably *E. rostratum* (= *E. halodes*), *E. meginnisii* and *E. longirostratum*. Clinical manifestations include mycotic keratitis, subcutaneous phaeohyphomycosis, endocarditis, osteomyelitis and sinusitis in both normal and immunosuppressed patients.

### ***Fonsecaea pedrosoi/monophora* complex**

The genus contains two species, *Fonsecaea pedrosoi* and *Fonsecaea monophora* which are recognized etiologic agents of chromoblastomycosis. Both species are soil fungi and *F. pedrosoi* is also associated with forest litter decomposition.

### ***Fusarium* sp.**

Most *Fusarium* species are soil fungi and have a worldwide distribution. Some are plant pathogens causing root and stem rot, vascular wilt or fruit rot. Other species cause storage rot and are important mycotoxin producers. Several species, notably *F. oxysporum*, *F. solani* and *F. moniliforme*, are recognized as being pathogenic to man and animals causing mycotic keratitis, onychomycosis and hyalohyphomycosis, especially in burn victims and bone marrow transplant patients.



Clinical manifestations of hyalohyphomycosis caused by *Fusarium*; include cutaneous and subcutaneous infections, endophthalmitis, osteomyelitis, and arthritis following traumatic implantation. Peritonitis has also been reported in patients on continuous ambulatory peritoneal dialysis. Disseminated infections are similar to disseminated aspergillosis, however fungemia and ulcerated skin lesions are often more pronounced.

### ***Geotrichum candidum***



*Geotrichum candidum* is an extremely common fungus with a worldwide distribution and is the causative agent of geotrichosis. Pulmonary involvement is the most frequently reported form of the disease, but bronchial, oral, vaginal, cutaneous and alimentary infections have also been reported.

### ***Gliocladium* sp.**

*Gliocladium* species have a worldwide distribution and are commonly isolated from a wide range of plant debris and soil.

### ***Graphium* sp.**

*Graphium* is one of the anamorphs of *Pseudallescheria boydii* and is commonly found on woody plant material. *Pseudallescheria boydii* becomes more important fungus in clinical isolations.

### ***Histoplasma capsulatum***

*Histoplasma capsulatum* has a world wide distribution, however, the Mississippi-Ohio River Valley in the U.S.A. is recognized as a major endemic region. Environmental isolations of the fungus have been made from soil enriched with excreta from chicken, starlings and bats. *H. capsulatum* exhibits thermal dimorphism by growing in living tissue or in culture at 37C as a budding yeast-like fungus or in soil or culture at temperatures below 30C as a mould.

Histoplasmosis is an intracellular mycotic infection of the reticuloendothelial system caused by the inhalation of conidia from the fungus *Histoplasma capsulatum*. Approximately 95% of cases of histoplasmosis are inapparent, subclinical or benign. Five percent of the cases have chronic progressive lung disease, chronic cutaneous or systemic disease or an acute fulminating fatal systemic disease.

### ***Rhizomucor pusillus***

*Rh. pusillus* has a world-wide distribution and is commonly associated with compost heaps. *Rhizomucor pusillus* is a rare human pathogen, causing pulmonary, disseminated or cutaneous types of infection. It is more often associated with animal disease.

### ***Rhizopus sp.***

*Rhizopus oryzae* (= *R. arrhizus*) is the most common causative agent of zygomycosis, *R. oryzae* has a world-wide distribution with a high prevalence in tropical and subtropical regions. It has been isolated from many substrates, including a wide variety of soils, decaying vegetation, foodstuffs, and animal and bird dung. However, it also produces the ergot alkaloid agroclavine which is toxic to humans and animals.

### ***Mortierella wolfii***

*M. wolfii* has also been isolated from soil, rotten silage, hay and coal spoil tips. *Mortierella wolfii* is considered as an important casual agent of bovine mycotic abortion, pneumonia and systemic mycosis. Confirmed human infections have not been documented.

### ***Mucor sp.***

The genus *Mucor* contains about 50 recognised taxa, many of which have widespread occurrence and are of considerable economic importance. However, only a few thermotolerant species are considered as potential pathogens. Human infections are not often reported. Most infections reported list *M. circinelloides* and similar species such as *M. indicus* (*M. rouxii*), *M. ramosissimus* and *M. amphibiorum* as the causative agents.



### **Reported pathogenic species of *Mucor*.**

Species	Pathogenicity
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<i>M. amphibiorum</i>		Animals, principally amphibians
<i>M. circinelloides</i>		Animals, occasionally humans
<i>M. hiemalis</i>		Questionable cutaneous infections only
<i>M. indicus</i>		Humans and animals
<i>M. racemosus</i>		Questionable
<i>M. ramosissimus</i>		Humans and animals

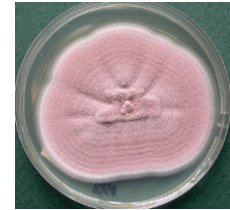
### ***Ochroconis gallopava***

*Ochroconis gallopava* is a well recognised species and has been reported as an avian pathogen, especially in poultry. Occasional human infections have also been reported.



### ***Paecilomyces* sp.**

*Paecilomyces* are common environmental moulds and are seldom associated with human infection. However, some species such as *P. variotii*, *P. marquandii* and *P. lilacinus* are emerging as causative agents of mycotic keratitis and of hyalohyphomycosis in the immunocompromised patient. Clinical manifestations include peritonitis in patients on continuous ambulatory peritoneal dialysis, endophthalmitis following lens implantation, endocarditis, pyelonephritis, sinusitis and cutaneous lesions.



### ***Penicillium* sp.**

The fungus is one of the commonest indoor and out molds, and worldwide distributions. Many species of *Penicillium* are common contaminants on various substrates and are known as potential mycotoxin producers. Correct identification is therefore important when studying possible *Penicillium* contamination of food. Human pathogenic species are rare, however opportunistic infections leading to mycotic keratitis, otomycosis and endocarditis, often following insertion of valve prosthesis have been reported. More recently, pulmonary and disseminated infections have also reported, especially by *P. marneffeii* in AIDS patients.

### ***Phaeoacremonium parasiticum***

*P. parasiticum* is a plant pathogen but it has also been reported from cases of subcutaneous infection, arthritis, mycetoma, endocarditis and mycotic keratitis.

### ***Phialophora* sp.**

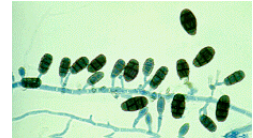
The genus *Phialophora* contains more than 40 species, most are saprophytes commonly found in soil or on decaying wood. However, several species have been documented as causing either chromoblastomycosis (*P. verrucosa*) or phaeohyphomycosis (*P. verrucosa* and *P. richardsiae*). Descriptions are provided for the following two human pathogens.

### ***Phoma* species**

Members of the genus *Phoma* have a worldwide distribution and are ubiquitous in nature, with over 2000 species having been described from soil, as saprophytes on various plants, and as pathogens to plants and humans.

### ***Pithomyces* sp.**

The genus *Pithomyces* contains 15 species commonly found on litter and soil, however, one species, *Pithomyces chartarum* is often involved with facial eczema of sheep.



### ***Ramichloridium schulzeri***

*Ramichloridium* contains about 25 species that are usually associated with forest litter and rotting wood, however the genus contains two species of medical interest; *R. mackenziei* and *R. schulzeri*.

### ***Rhinocladiella atrovirens***

*Rhinocladiella* contains 6-8 species, with two species of medical interest; *R. atrovirens* and *R. aquaspersa*.

### ***Scedosporium* sp.**

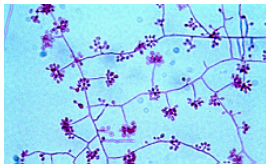
All are common soil fungi. *Scedosporium* causes a spectrum of disease similar in terms of variety and severity to those caused by *Aspergillus*. The vast majority of infections are mycetomas, the remainder include infections of the eye, ear, central nervous system, internal organs and more commonly the lungs. Infections result from either inhalation of air-borne conidia or by the traumatic implantation of fungal elements due to a penetrating injury. The etiological agents are *Pseudallescheria boydii* (anamorph *Scedosporium apiospermum*), *Scedosporium aurantiacum* and *Scedosporium prolificans*.

### ***Scopulariopsis* sp.**

Most members of the genus *Scopulariopsis* are soil fungi, however a few, in particular *S. brevicaulis*, have been reported as causative agents of onychomycosis and hyalohyphomycosis.

### ***Sporothrix schenckii***

*Sporothrix schenckii* has a worldwide distribution, particularly in tropical and temperate regions. It is commonly found in soil and on decaying vegetation and is a well-known pathogen of humans and animals.



Sporotrichosis is primarily a chronic mycotic infection of the cutaneous or subcutaneous tissues and adjacent lymphatics characterized by nodular lesions which may suppurate and ulcerate. Infections are caused by the traumatic implantation of the fungus into the skin, or very rarely, by inhalation into the lungs. Secondary spread to articular surfaces, bone and muscle is not infrequent, and the infection may also occasionally involve the central nervous system, lungs or genitourinary tract.

### ***Stemphylium* sp.**

Most species are plant pathogens with occasional isolates from soil, they are rarely seen in the clinical laboratory.

### ***Syncephalastrum* sp.**

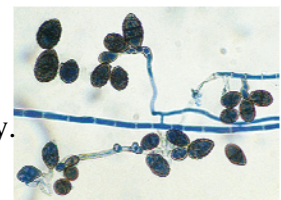
*Syncephalastrum racemosum* is the principle member of the genus and a potential human pathogen, however well documented cases are lacking. It often isolated from soil and dung in tropical and subtropical regions.

### ***Trichoderma* sp.**

*Trichoderma* is a very common genus especially in soil and decaying wood. *Trichoderma viride* has been reported as a causative agent of pulmonary fungus ball.

### ***Ulocladium* sp.**

Most species are soil fungi and they are rarely seen in the clinical laboratory.



### ***Verticillium* sp.**

Members of this genus are often isolated from the environment. It has been reported as a rare agent of mycotic keratitis.

## **Zygomycetes**

Zygomycetes are usually fast growing fungi characterized by primitive coenocytic (mostly aseptate) hyphae. Asexual spores include chlamydoconidia, conidia and sporangiospores

contained in sporangia borne on simple or branched sporangiophores. Sexual reproduction is isogamous producing a thick-walled sexual resting spore called a zygospore.

- *Apophysomyces*
- *Basidiobolus*
- *Conidiobolus*
- *Cunninghamella*
- *Mortierella*
- *Mucor*
- *Mycocladius (Absidia)*
- *Rhizomucor*
- *Rhizopus*
- *Saksenaea*
- *Syncephalestrum*