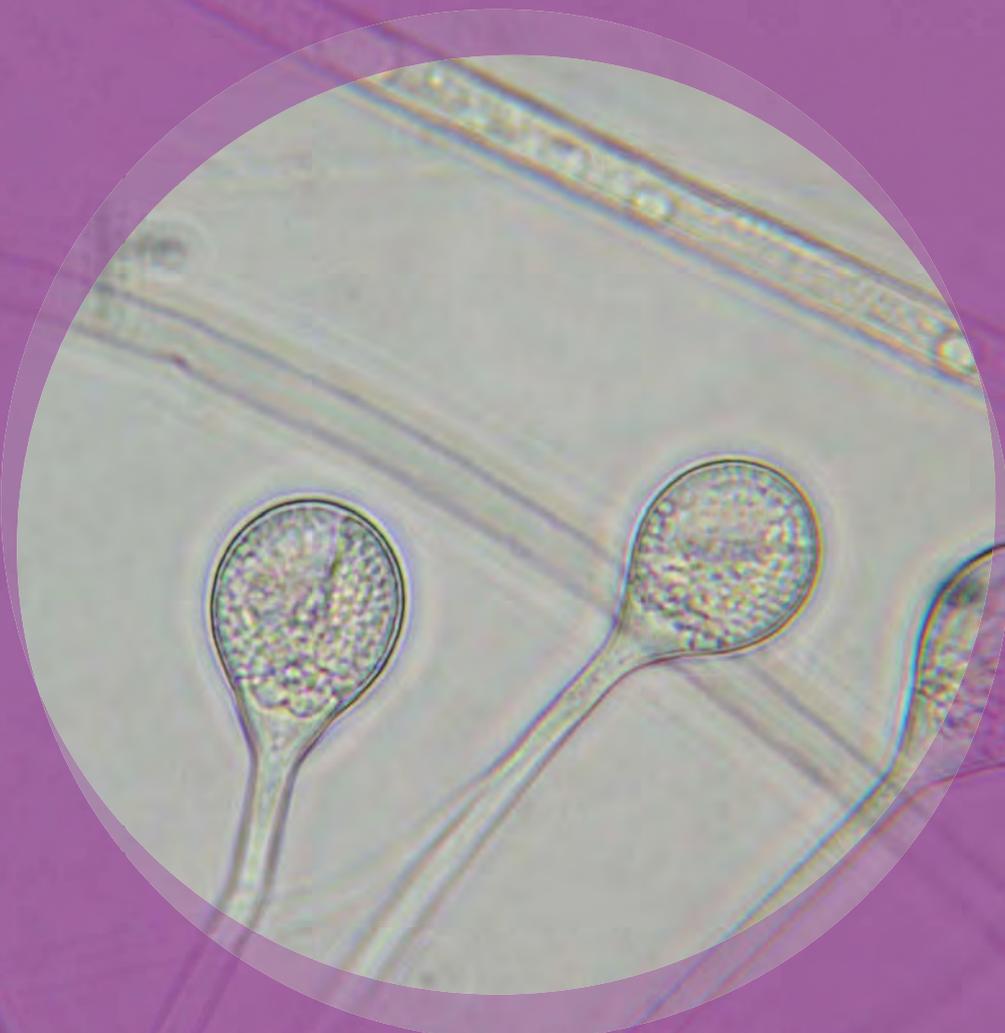


Absidia



Natural Habitats *Soil • Decaying vegetation*

Suitable Substrates in the Indoor Environment

Often found in stored grains • Other foods

Water Activity *Unknown*

Mode of Dissemination *Wind*

Allergenic Potential *Recognized as an allergen*

Potential Opportunist or Pathogen *In immunocompromised patients pulmonary invasions, the meninges (brain or spinal chord), and kidney infections can result from Absidia exposure • Absidia may also cause zygomycosis in immunocompromised patients (AIDS)*

Industrial Uses *Unknown*

Potential Toxins Produced *Unknown*

Other Comments *Absidia often causes food spoilage*



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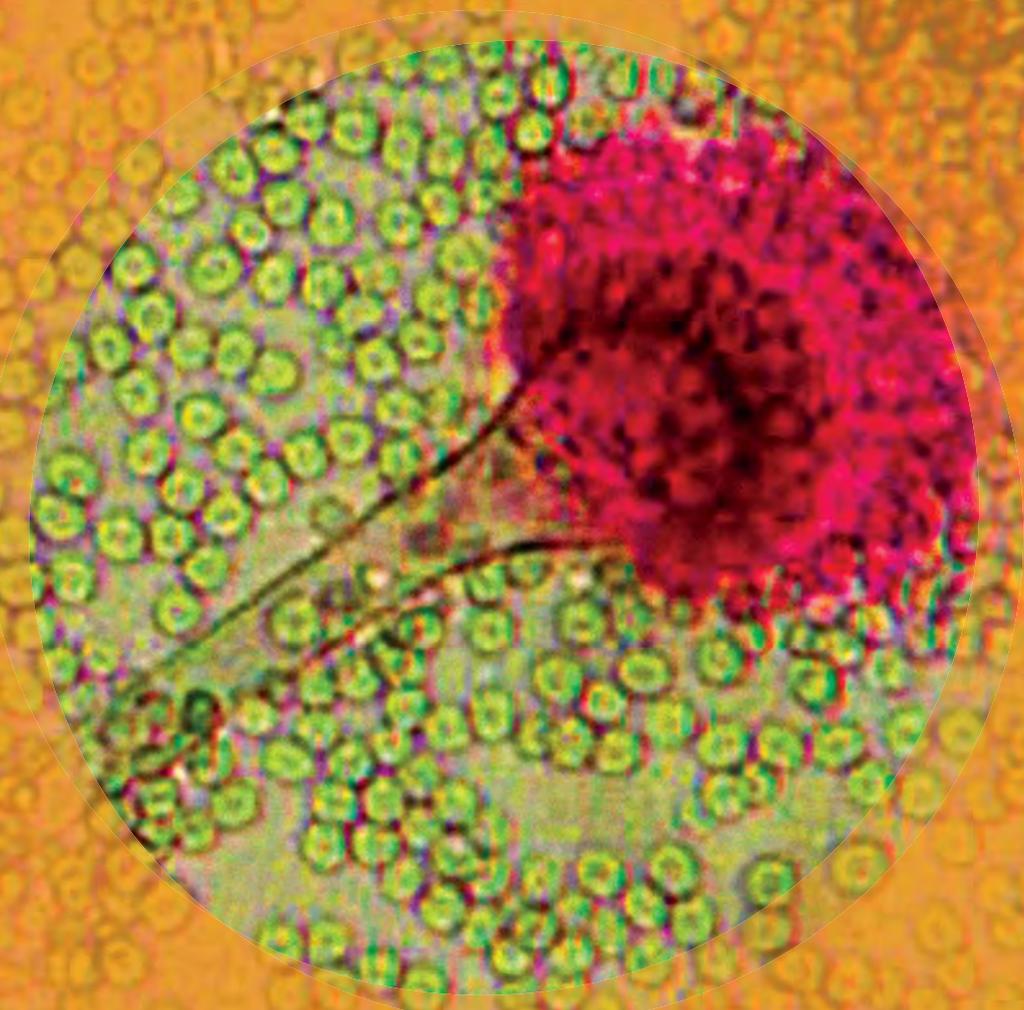
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Aspergillus



Natural Habitats Soil • Plant debris • Indoor air environment

Suitable Substrates in the Indoor Environment: • Grows on a wide range of substrates indoors • Prevalent in water damaged buildings

Water Activity $A_w=0.75-0.82$.

Mode of Dissemination Wind

Allergenic Potential Allergic bronchopulmonary aspergillosis (ABPA) which is common in asthmatic and cystic fibrosis patients • Aspergillus sinusitis • Invasive aspergillosis in immunocompromised patients

Potential Opportunist or Pathogen Aspergilloma and chronic pulmonary aspergillosis in people with lung disease

Industrial Uses *A. oryzae* is used in soy sauce production • *A. terreus* produces meviniolin which is able to reduce blood cholesterol • *A. niger* produces enzymes used to make some breads and beers and is also used in plastic decomposition. • *A. niger* and *A. ochraceus* are used in cortisone production.

Potential Toxins Produced Secalonic acid D • Aflatoxin B • Aflatoxin G • Aflatoxin M1 • Aflatrem (alkaloid) • Aflatrem (indole alkaloid) • Aspertoxin • Brevianamide A • Citreoviridin, • Citrinin • Cyclopiazonic acid • Fumagillin • Fumigaclavine • Fumitremorgin A • Gliotoxin • Helvolic acid • 3-Nitropropionic acid • Ochratoxin A • Ochratoxin B • Ochratoxin C • Penicillic acid • Phthioic acid • Patulin • Sphingofungins • Sterigmatocystin • Terrein • Terreic acid • Terretinin • Territrem A • Versicolorin A • Verruculogen • Viomellein

Other Comments It is the second most common opportunistic pathogen following *Candida*.

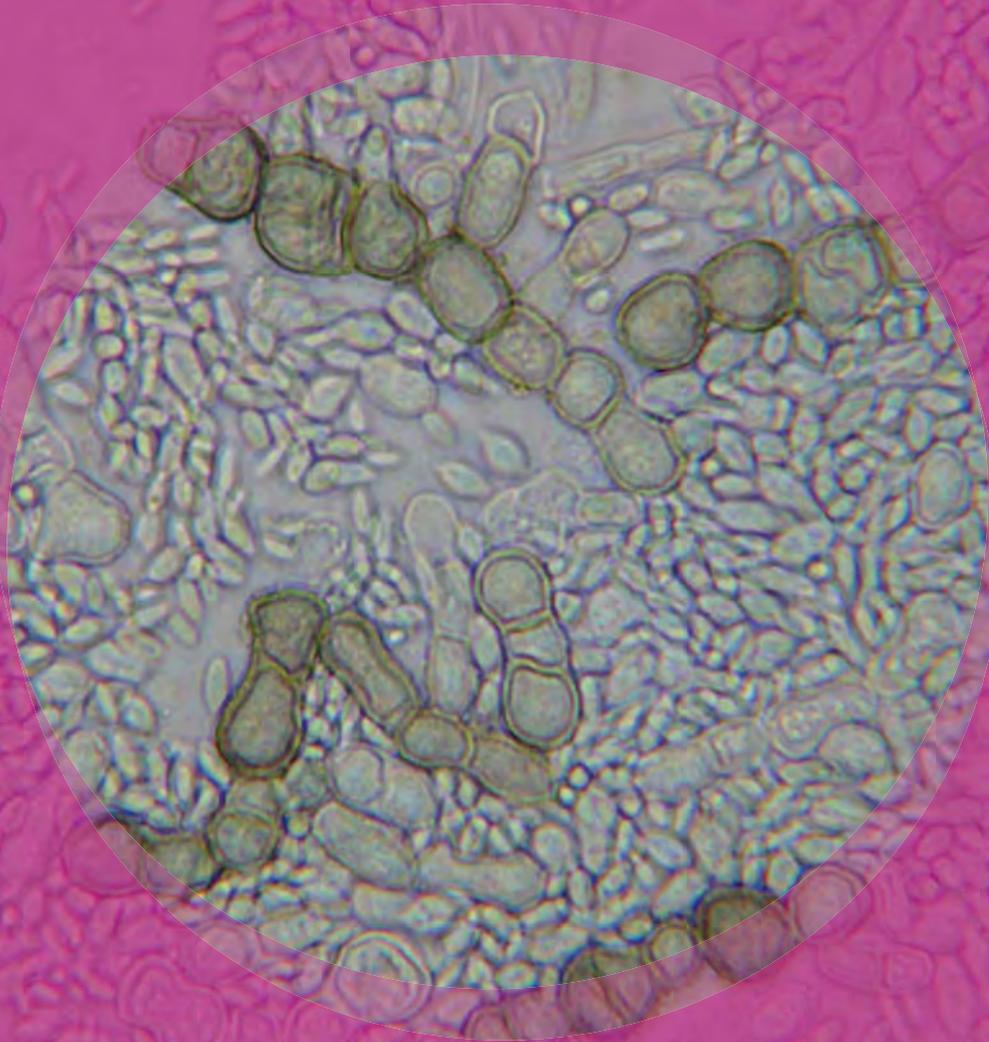


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Aureobasidium



Natural Habitats Soils • Plant leaf and stem tissue • Wood • Fresh Water • Plant Debris

Suitable Substrates in the Indoor Environment Damp areas including kitchens, bathrooms, grout, and shower curtains • Painted interior surfaces and textiles • Skin and nails of people

Water Activity Grows well where moisture accumulates (88.5 RH on woodchip wallpaper)

Mode of Dissemination Water droplets, rain • Wind when spores become dry

Allergenic Potential Type I (asthma and hay fever) • Type III (hypersensitivity) • Skin irritant causing dermatitis

Potential Opportunist or Pathogen Keratomycosis • Phaeohyphomycosis • Pulmonary mycosis with sepsis

Industrial Uses *A. pullulans* produces pullulan which is used for packaging food and drugs.

Potential Toxins Produced Unknown

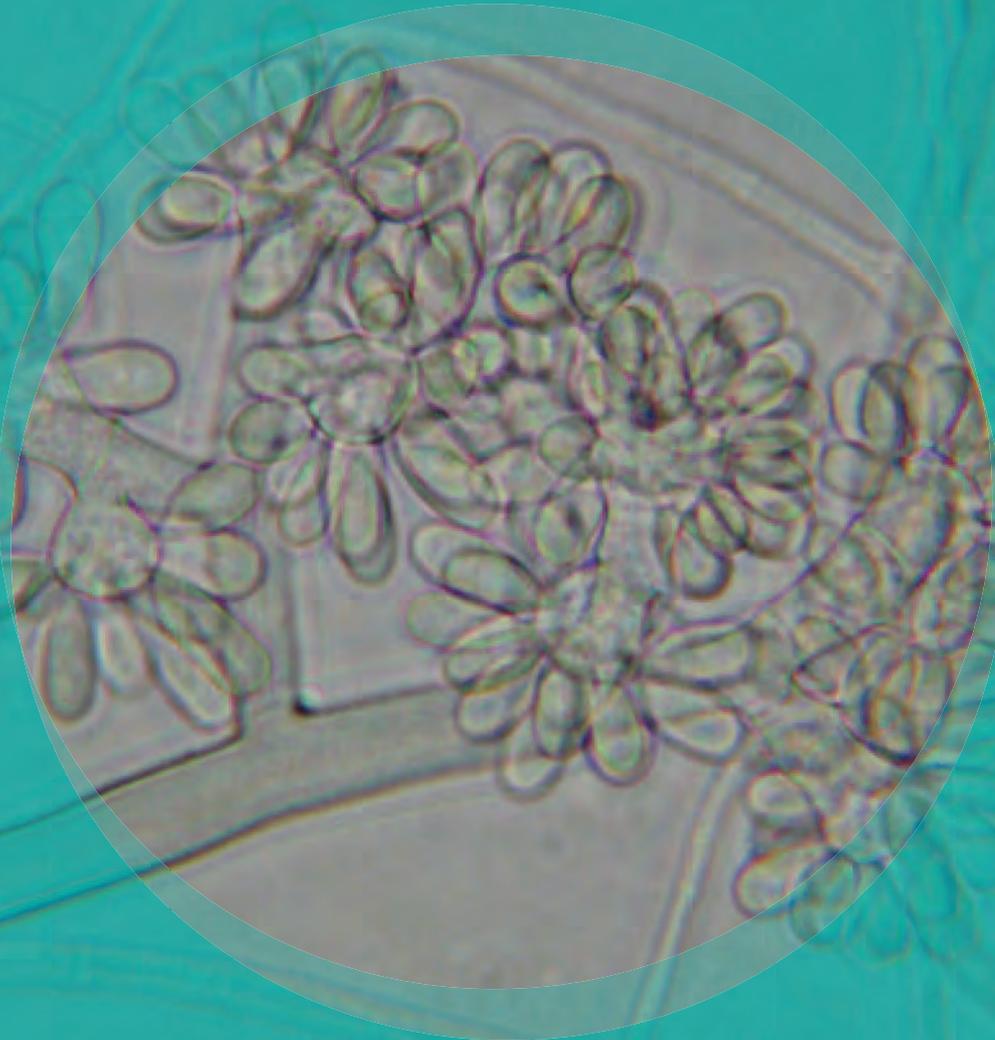


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Botrytis



Natural Habitats *Plant pathogen responsible for causing gray mold (B. cinerea) on grapes, strawberries, raspberries, blackberries, low bush blueberries, lettuce, cabbage, and onions*

Suitable Substrates in the Indoor Environment

Houseplants • Fruits • Vegetables

Water Activity *Unknown*

Mode of Dissemination *Wind*

Allergenic Potential *Type I (asthma and hay fever)*

Potential Opportunist or Pathogen *Hyalohyphomycosis*

Industrial Uses *Biocontrol agent of insects*

Potential Toxins Produced *Unknown*



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Chaetomium



Natural Habitats *Dung • Seeds • Soil • Straw*

Suitable Substrates in the Indoor Environment

Paper • Sheetrock • Wallpaper

Water Activity *Aw>0.90*

Mode of Dissemination *Wind • Insects • Water splash*

Allergenic Potential *Type I (asthma and hay fever)*

Potential Opportunist or Pathogen *Onychomycosis*

Industrial Uses *Cellulase production • Textile testing*

Potential Toxins Produced *Chaetomin • Chaetoglobosins are produced by Chaetomium globosum • Sterigmatocystin is produced by rare species*



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Cladosporium



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Natural Habitats *Dead plant matter • Straw • Soil • Woody plants*

Suitable Substrates in the Indoor Environment

Fiberglass duct liner • Paint • Textiles • Found in high concentration in water-damaged building materials

Water Activity *Aw 0.84-0.88*

Mode of Dissemination *Air*

Allergenic Potential *Type I (asthma and hay fever)*

Potential Opportunist or Pathogen *Edema • Keratitis • Onychomycosis • Pulmonary Infections • Sinusitis*

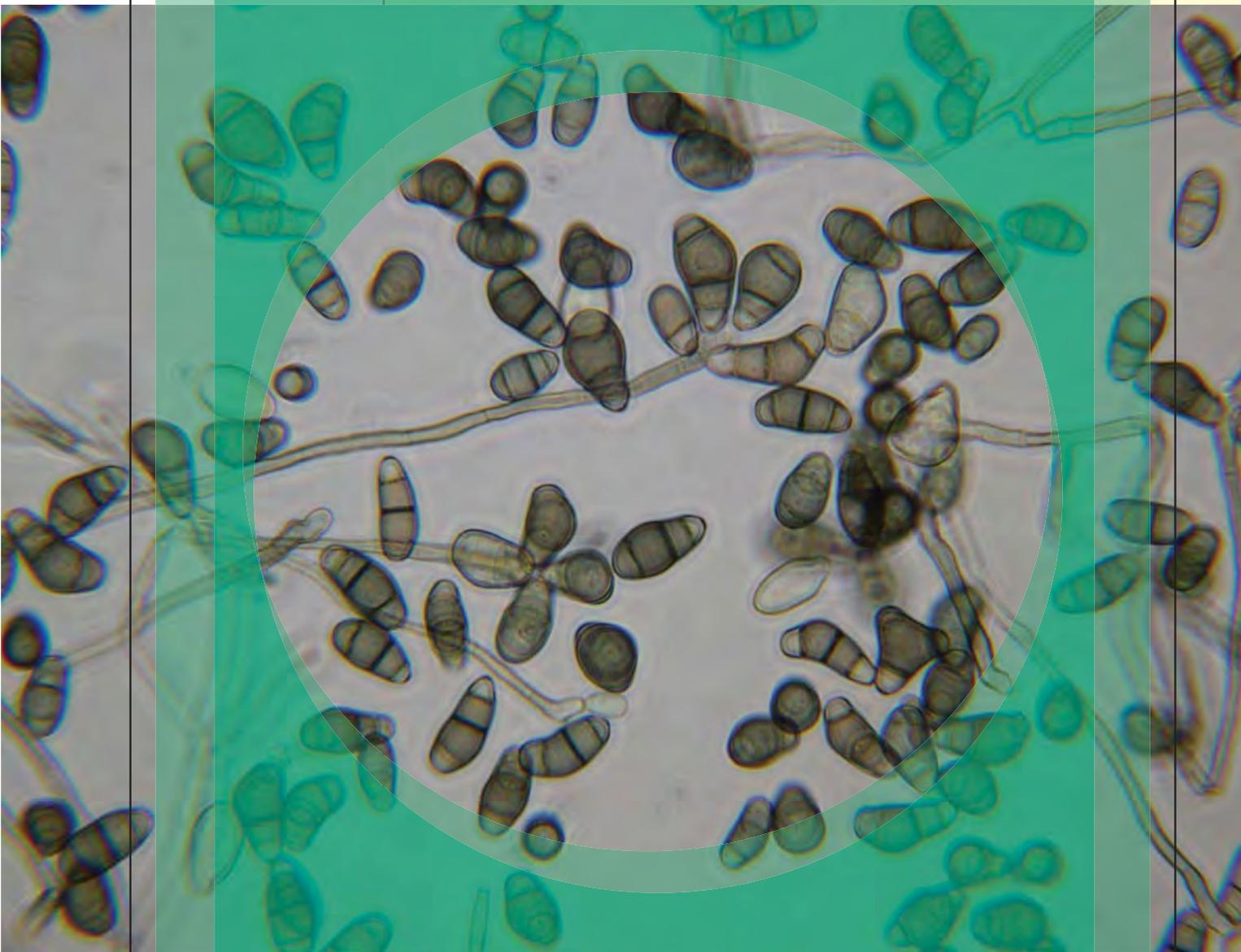
Industrial Uses *Produces 10 antigens*

Potential Toxins Produced *Cladosporin • Emodin*



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Curvularia



Natural Habitats *Plant saprobe and pathogen to cereal plants • Soil*

Suitable Substrates in the Indoor Environment

Paper • Wood products

Water Activity *Unknown*

Mode of Dissemination *Wind*

Allergenic Potential *Type I (asthma and hay fever) • A relatively common cause of allergic fungal sinusitis*

Potential Opportunist or Pathogen *In immunocompromised patients: Cerebral abscess • Endocarditis • Mycetoma • Ocular keratitis • onychomycosis • pneumonia • sinusitis*

Industrial Uses *Unknown*

Potential Toxins Produced *Cytochalasin B*



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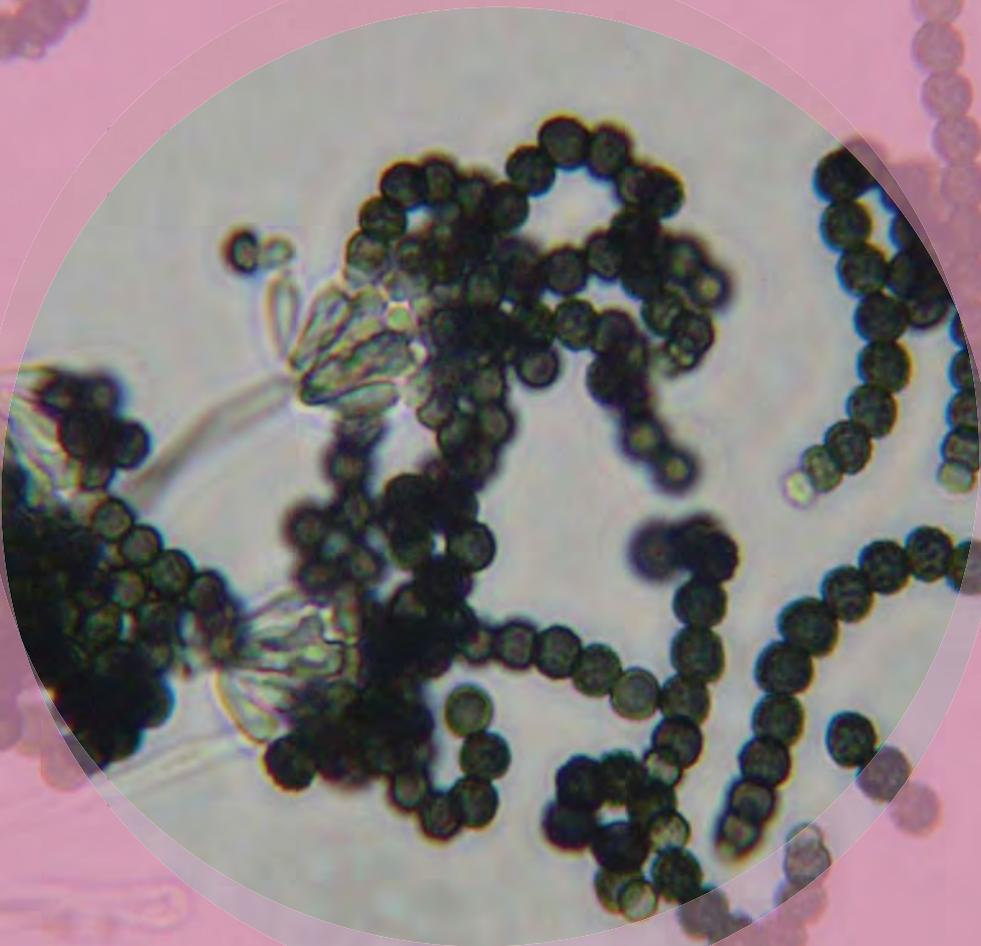
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Memnoniella



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Natural Habitats *Plant materials • Soil*

Suitable Substrates in the Indoor Environment

Paper • Sheetrock • Wood

Water Activity *Suspected to be above 0.90 Aw*

Mode of Dissemination *Wind*

Allergenic Potential *Unknown*

Potential Opportunist or Pathogen *Unknown*

Potential Toxins Produced *Dechlorogriseofulvin*

Epidechlorogriseofulvin • Griseofulvins • Memnopeptide A

Trichodermol • Trichodermin.

Other Comments *Griseofulvin used as an anti-dermatophyte drug and is commercially available.*

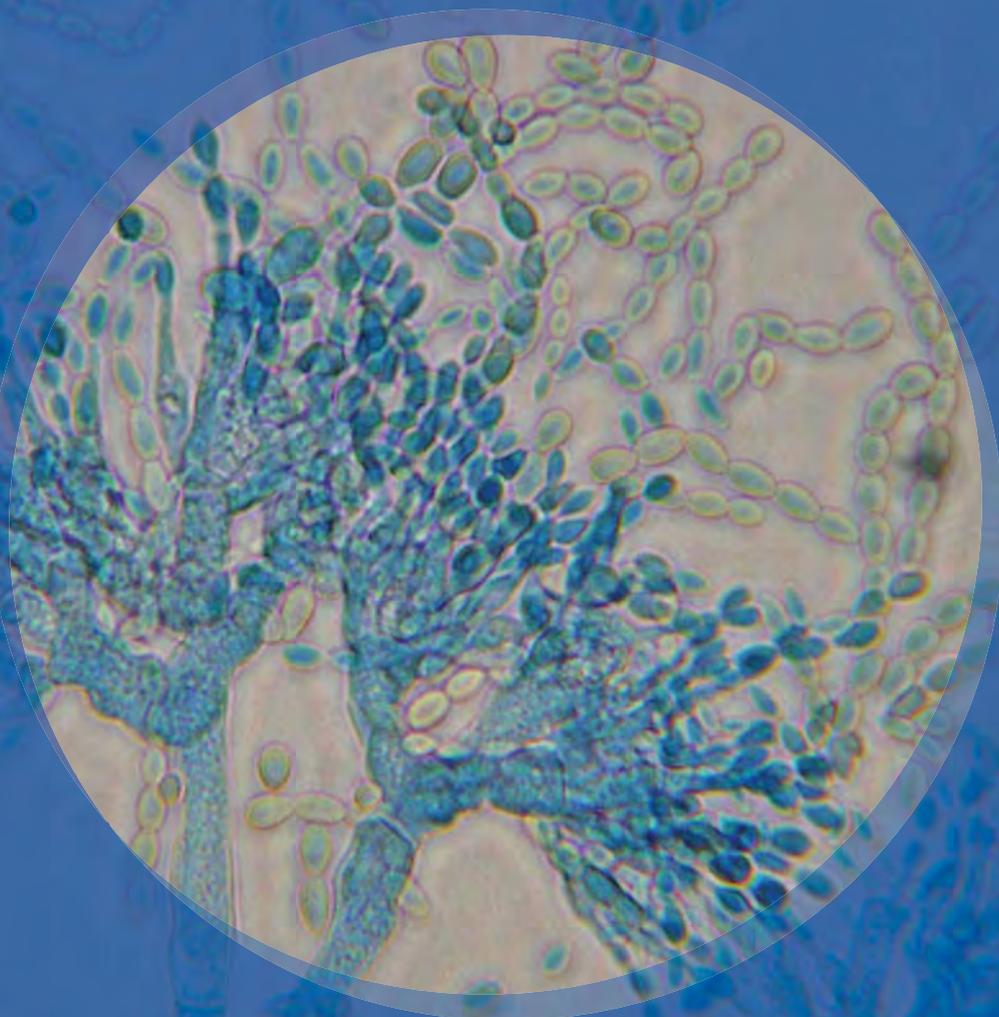


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Paecilomyces



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Natural Habitats *Decaying plant matter • Insects • Soils*

Suitable Substrates in the Indoor Environment

Optical Lenses • Leather • Paper • PVC • Jute Fibers • Tobacco

Water Activity *Aw=0.79*

Mode of Dissemination *Wind*

Allergenic Potential *Type I (hay fever, asthma)*

• *Type III (hypersensitivity)*

Potential Opportunist or Pathogen *P. variotii causes paecilomycosis (symptoms include keratitis, cellulitis, and alveolitis). • Corneal ulcers, keratitis, and endophthalmitis can occur after extended contact lens use or eye surgery due to Paecilomyces infection*

Industrial Uses *Paecilomyces fumosoroseus is currently marketed as a biocontrol insecticide*

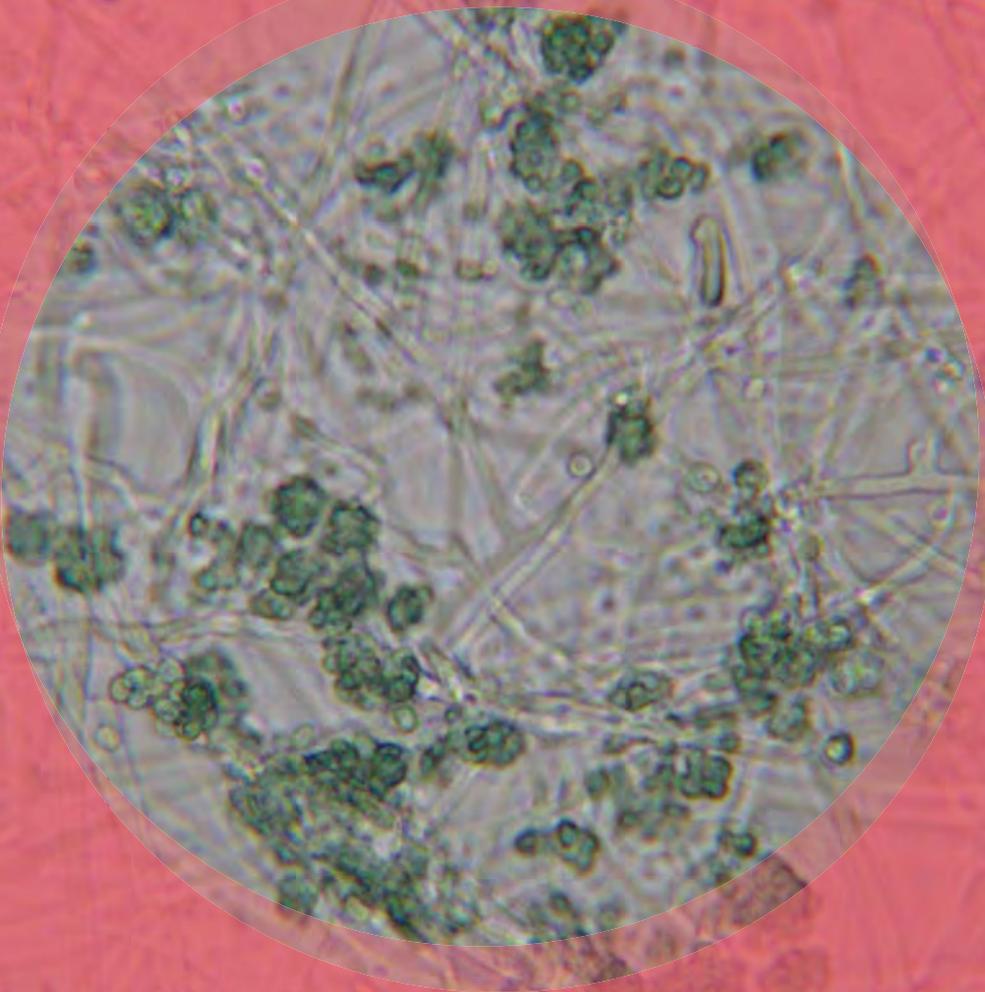
Potential Toxins Produced *Bysochlamic acid • Ferrirubin • Fusigen • Indole-3-acetic acid • Paecilotoxins • Patulin • Variotin • Viriditoxin*

Other Comments *P. crustaceus and P. variotii can grow well at temperatures as high as 50°C*

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Trichoderma



Natural Habitats *Decaying wood • Dead leaves • Soil*

Suitable Substrates in the Indoor Environment

Paper • Textiles • Wood (wet)

Mode of Dissemination *Insects • Water splash • Wind*

Allergenic Potential *Type I allergies (hay fever, asthma)*

• *Type III (hypersensitivity)*

Potential Opportunist or Pathogen *Has occasionally been associated with disease in immunocompromised individuals*

Industrial Uses *Biocontrol agent against a variety of plant pathogens*

• *Byproducts of T. viride are used to make beer and wine*

Potential Toxins Produced *Gliotoxin • Isocyanides • Trichothecene*

• *Trichodermin • T-2 toxin*



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Alternaria

Natural Habitats Common saprobe and pathogen of plants. Typically found on plant tissue, decaying wood, and foods. • Soil • Air outdoors

Suitable Substrates in the Indoor Environment

Indoors near condensation (window frames, showers) • House dust (in carpets and air)
• Also colonizes building supplies, computer disks, cosmetics, leather, optical instruments, paper, sewage, stone monuments, textiles, wood pulp, and jet fuel

Water Activity $A_w = 0.85-0.88$

Mode of Dissemination Wind

Allergenic Potential Type I allergies (hay fever, asthma) • Type III (hypersensitivity pneumonitis)

Potential Opportunist or Pathogen Phaeohyphomycosis {causing cystic granulomas in the skin and subcutaneous tissue} • In immunocompetent patients, Alternaria colonizes the paranasal sinuses, leading to chronic hypertrophic sinusitis

Industrial Uses Biocontrol of weed plants • Biocontrol of fungal plant pathogens

Potential Toxins Produced Alternariol (AOH) • Alternariol monomethylether (AME)
• Tenuazonic acid (TeA) • Altenuene (ALT) • Altertoxins (ATX)

Other Comments Alternaria spores are one of the most common and potent indoor and outdoor airborne allergens. Additionally, Alternaria sensitization has been determined to be one of the most important factors in the onset of childhood asthma. Synergy with Cladosporium or Ulocladium may increase the severity of symptoms



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Fusarium

Natural Habitats Soil • Plant pathogen causing root rot, stem rot, and wilt of many ornamental and crop plants.

Suitable Substrates in the Indoor Environment Often found in humidifiers • Wet, cellulose-based building materials

Water Activity $A_w=0.86-0.91$

Mode of Dissemination Insects • Water droplets, rain • Wind when spores become dry

Allergenic Potential Type I allergies (hay fever, asthma)

Potential Opportunist or Pathogen Esophageal cancer is believed to happen after consumption of *F. moniliforme* infected corn • Keratitis • Endophthalmitis • Onychomycosis • Cutaneous infections • Mycetoma • Sinusitis • Pulmonary infections • Endocarditis • Peritonitis • Central venous catheter infections • Septic arthritis • Neurological disease in horses after consumption of *F. moniliforme* infected corn • Respiratory disease in pigs after consumption of *F. moniliforme* infected corn

Industrial Uses Biological Weapon

Potential Toxins Produced Trichothecenes • Zearalenone • Fumonisin

Other Comments Major plant pathogen



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Graphium



Natural Habitats *Dung • Seeds • Soils • Woody plant tissue*

Suitable Substrates in the Indoor Environment *Unknown*

Water Activity *Unknown*

Mode of Dissemination *Beetles when mitosporic state of *Ophiostoma ulmi**

Allergenic Potential *Unknown*

Potential Opportunist or Pathogen *Unknown*

Industrial Uses *R135402, a compound with antifungal activity against *Candida albicans* and *Cryptococcus neoformans*, has been isolated from a fermentation broth of *Graphium putredinis**

Potential Toxins Produced *Unknown*

Other Comments *There have not been any reports of human infections with *Graphium* species, however, it is a mitosporic state of *Pseudoallescheria boydii* which causes subcutaneous mycoses in man*



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Nigrospora



Natural Habitats *Common on live or dead grass • Seeds • Soil*

Suitable Substrates in the Indoor Environment
Unknown

Water Activity *Unknown*

Mode of Dissemination *Forcibly ejected*

Allergenic Potential *Type I allergies (hay fever, asthma)*

Potential Opportunist or Pathogen *Keratitis • Skin lesions*

Industrial Uses *Unknown*

Potential Toxins Produced *Unknown metabolite reported with some toxic properties*



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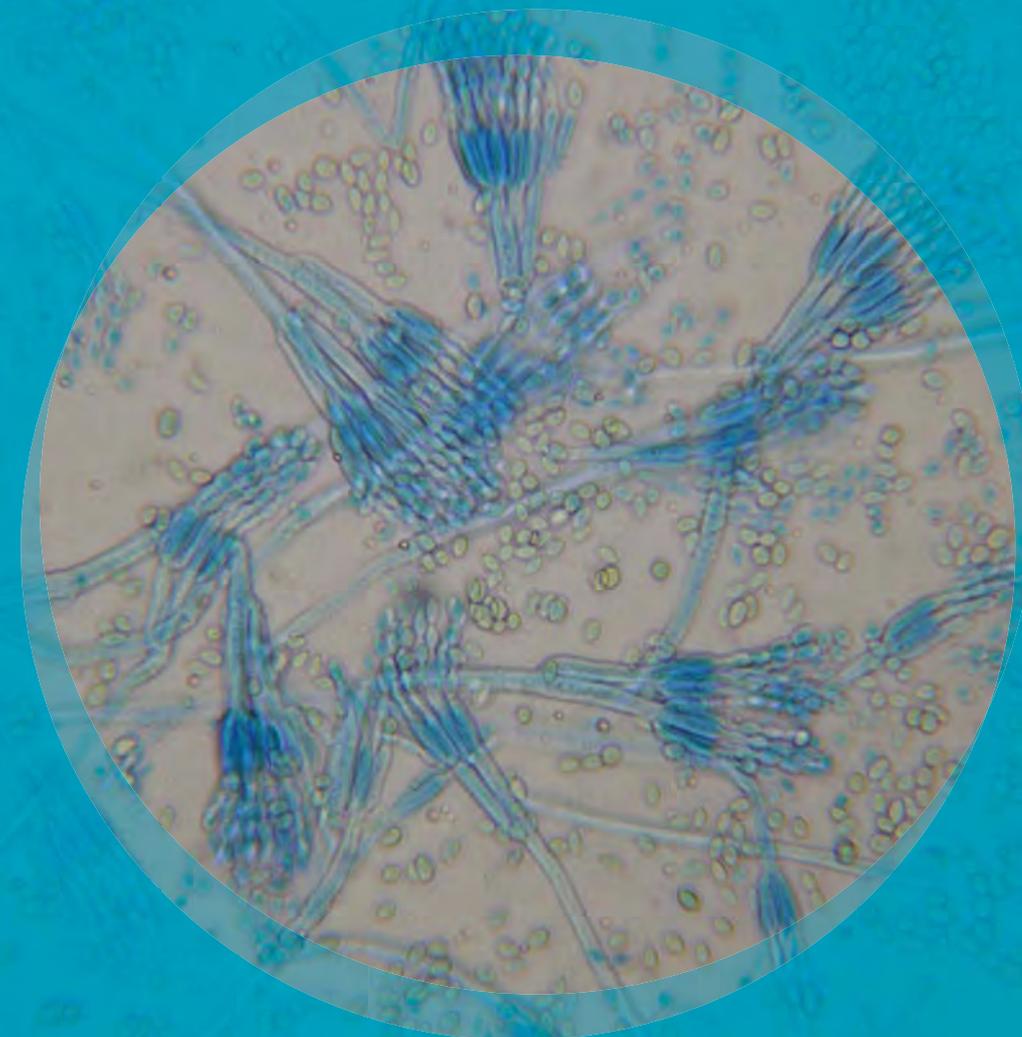
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Penicillium



Natural Habitats Soil • Seed • Cereal crops

Suitable Substrates in the Indoor Environment Foods (blue mold on cereals, fruits, vegetables, dried foods) • House dust • Fabrics • Leather • Wallpaper • Wallpaper glue

Water Activity $A_w=0.78-0.86$

Mode of Dissemination Wind • Insects

Allergenic Potential Type I (hay fever, asthma) • Type III (hypersensitivity)

Potential Opportunist or Pathogen Penicilliosis

Industrial Uses *P. chrysogenum* for the antibiotic penicillin • *P. griseofulvum* for the antibiotic griseofulvin a • *P. roquefortii* for Roquefort cheese • *P. camemberti* for Camembert cheese • Brie, Gorgonzola, and Danish Blue cheese are also the products of *Penicillium* • Used to cure ham and salami • Production of organic acids such as fumaric, oxalic, gluconic, and gallic

Potential Toxins Produced Citrinin • Citreoviridin • Cyclopiazonic acid • Fumitremorgen B • Griseofulvin • Janthitrems • Mycophenolic acid • Paxilline • Penitrem A • Penicillic acid • Ochratoxins • Roquefortine C • Secalonic acid D • Verrucologen • Verrucosidin • Viomellein • Viridicatumtoxin • Xanthomegnin

Other Comments *Penicillium* is one of the most common genera of fungi

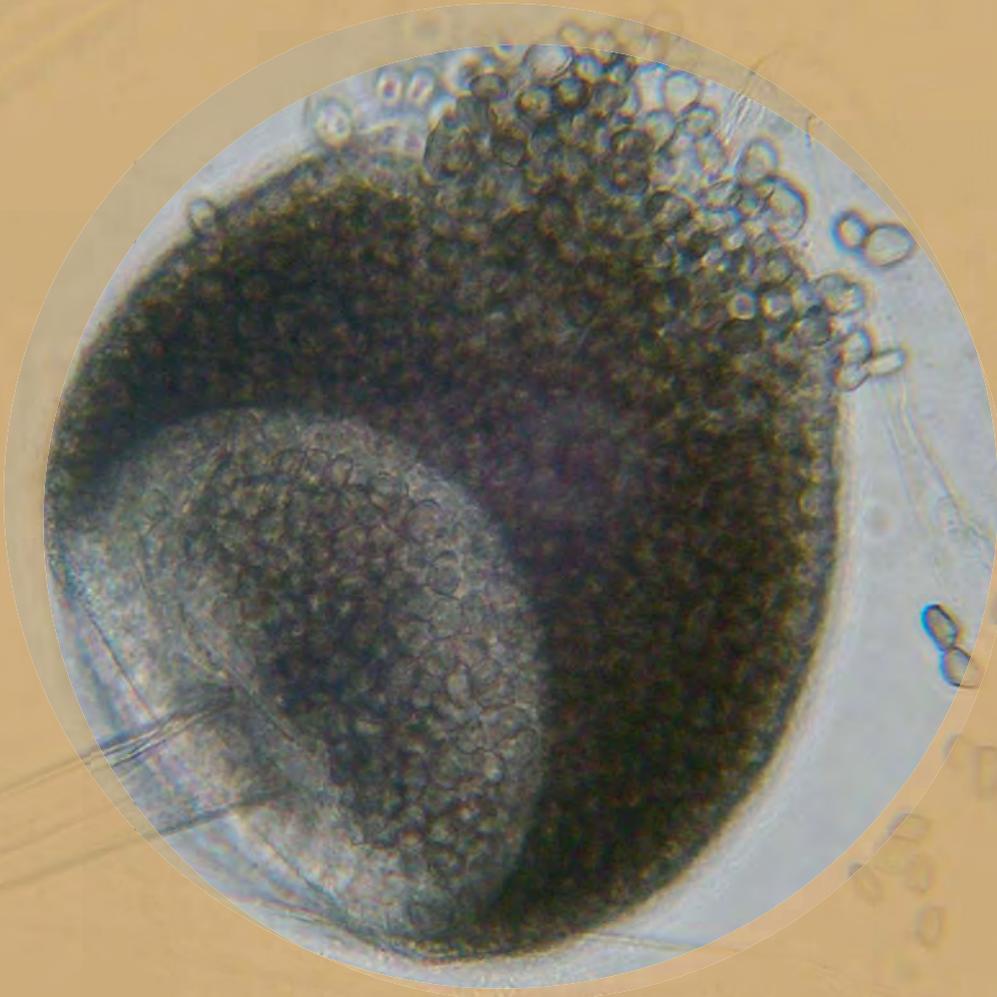


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Rhizopus



Natural Habitats *Dung • Fruits- causing rhizopus rot on stone fruits and strawberries • Soils • Vegetables*

Suitable Substrates in the Indoor Environment
Stored fruits and vegetables

Water Activity *Aw=0.93*

Mode of Dissemination *Wind*

Allergenic Potential *Type I (hay fever, asthma) • Type III (hypersensitivity)*

Potential Opportunist or Pathogen *Causal agent of zygomycosis in immunocompromised, malnourished or severely burned people*

Industrial Uses *Used to ferment rice into miso • Used to ferment soybeans to tempeh and sufu*

Potential Toxins Produced *Rhizopus oryzae produces agroclavine (an ergot alkaloid toxic to mammals)*



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Scopulariopsis



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Natural Habitats *Soil*

Suitable Substrates in the Indoor Environment

Dairy products • Fruit • Grain • Meat • Paper • Wood

Mode of Dissemination *Wind*

Allergenic Potential *Type III (hypersensitivity)*

Potential Opportunist or Pathogen *Onychomycosis in toe nails • Skin lesions • Mycetoma • Keratitis • Endophthalmitis, invasive sinusitis, pulmonary infections, endocarditis, and brain abscess typically only afflict immunocompromised patients*

Industrial Uses *Unknown*

Potential Toxins Produced *Scopulariopsis brevicaulis produces arsine gas from arsenate dyes found in wallpaper covered with Paris Green*



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Stachybotrys



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Natural Habitats *Decaying plant materials • Soil*

Suitable Substrates in the Indoor Environment

Water damaged building materials such as: ceiling tiles, gypsum board, insulation backing, sheet rock, and wall paper • Paper • Textiles

Water Activity *Aw=0.94*

Mode of Dissemination *Insects • Water • Wind*

Allergenic Potential *Type I (hay fever, asthma)*

Potential Opportunist or Pathogen *Unknown*

Industrial Uses *Unknown*

Potential Toxins Produced *Cyclosporins • Macrocytic trichothecenes:*

*roridin E, satratoxin F, G & H, sporidesmin G, trichoverrol, verrucarin J
• Stachybotryolactone*

Other Comments *Stachybotrys may play a role in the development of sick building syndrome. The presence of this fungus can be significant due to its ability to produce mycotoxins. Exposure to the toxins can occur through inhalation, ingestion, or skin exposure*

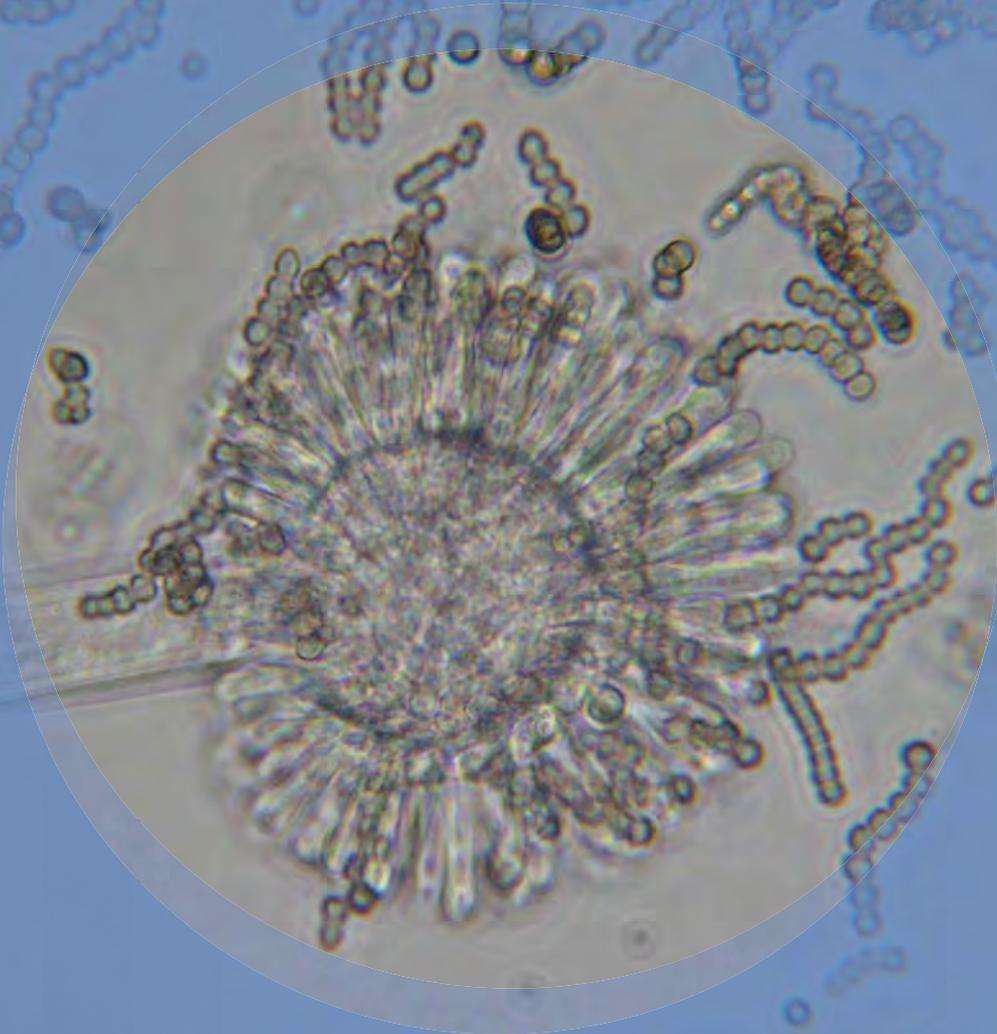


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Syncephalastrum



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Natural Habitats *Dung • Soil*

Suitable Substrates in the Indoor Environment
Unknown

Water Activity *Unknown*

Mode of Dissemination *Unknown*

Allergenic Potential *Unknown*

Potential Opportunist or Pathogen *Cutaneous infections reported*

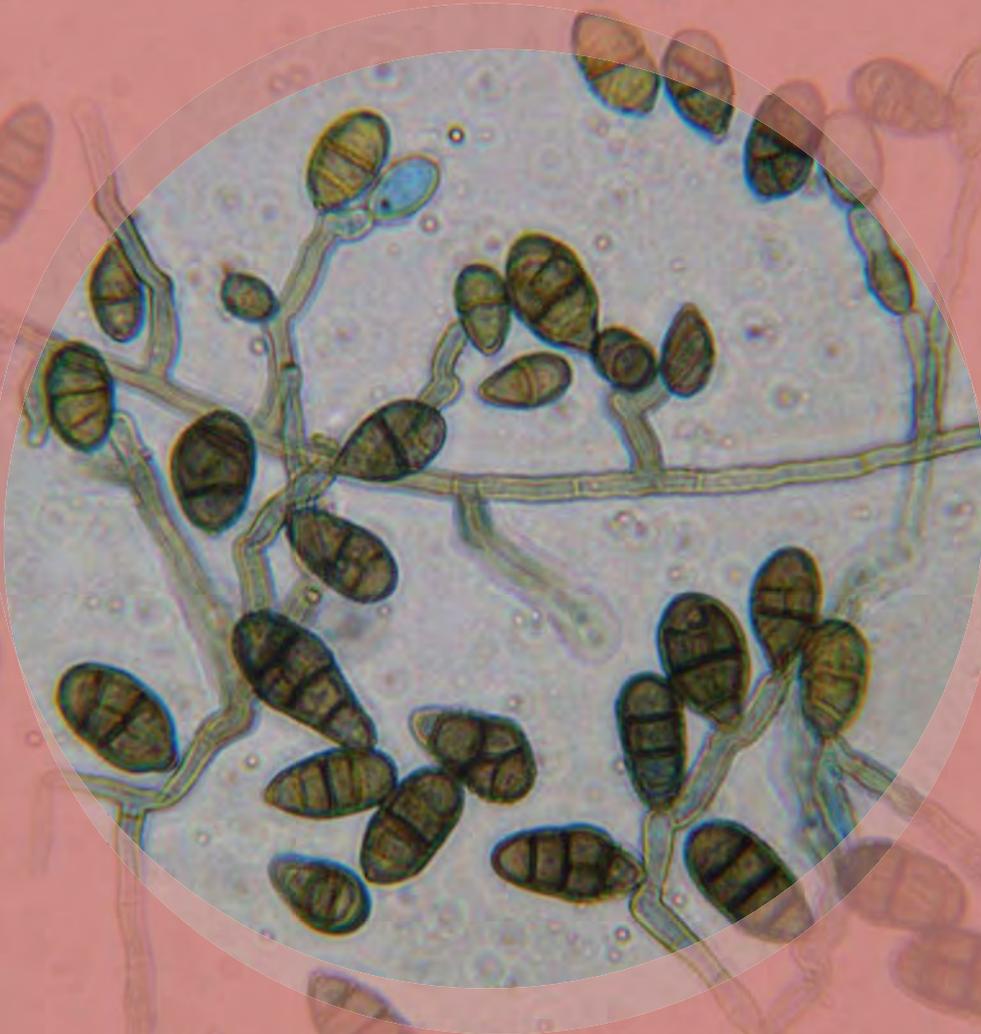
Industrial Uses *Unknown*

Potential Toxins Produced *Unknown*



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Ulocladium



Natural Habitats *Soil • Plant materials • Soil, dung, paint, grasses, fibers, wood, decaying plant material, paper, and textiles*

Suitable Substrates in the Indoor Environment *Gypsum board • Jute • Paper • Rotten wood • Textiles • Wood*

Water Activity *Aw=0.89*

Mode of Dissemination *Wind*

Allergenic Potential *Type I (hay fever, asthma)*

Potential Opportunist or Pathogen *Unknown*

Industrial Uses *Unknown*

Potential Toxins Produced *Unknown*

Other Comments *Alternaria sensitive allergy sufferers have a multiplied reaction when Ulocladium and Alternaria are present together*



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