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
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: Aw=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 Opportunistic 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 mevinolin 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 • Aflatoxin (alkaloid) • Aflatoxin (indole alkaloid) • Asperptoxin • Brevisanamide 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 • Terretonin • Territrem A • Versicolorin A • Verruculogen • Viomellein

Other Comments:
• It is the second most common opportunistic pathogen following Candida.
**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
**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
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 (produced by Chaetomium globosum)
- Sterigmatocystin (produced by rare species)
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
**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
**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  Epididechlorogriseofulvin  Griseofulvins  Memnopeptide A  Trichodermol • Trichodermin.

**Other Comments**  Griseofulvin used as an anti-dermatophyte drug and is commercially available.
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: Byssochlamic 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.
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
- Biproducts of T. viride are used to make beer and wine

Potential Toxins Produced:
- Gliotoxin • Isocyanides • Trichothecene
- Trichodermin • T-2 toxin
**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** $Aw = 0.85-0.88$

**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.
**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**: Aw=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 • Fumonisins

**Other Comments**: Major plant pathogen
**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.
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
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  Aw=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 • 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

• Grisofulvin • Janthitrems • Mycophenolic acid • Paxilline • Penitrem A • Penicillic acid

• Ochratoxins • Roquefortine C • Secalonic acid D • Verruculogen • Verrucosidin

• Viomellein • Viridicatumtoxin • Xanthomegnin

Other Comments  Penicillium is one of the most common genera of fungi
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)
Scopulariopsis

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
**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 • Macrocyclic 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.
**Syncephalastrum**

**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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**LAB SERVICES:** Asbestos, Mold, Bacteria, Industrial Hygiene, Metals, Allergens, PCR-Polymerase Chain Reaction (DNA), Silica, Volatiles Scan, Formaldehyde by HPLC, Water and Materials Testing.

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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: \( A_w = 0.89 \)

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.