

Southeast Environmental Microbiology laboratories, Inc

Fungal Information

Acremonium sp. (Cephalosporium sp.) - Reported to be allergenic. Can produce a trichothecene toxin, which is toxic if ingested. It was the primary fungus identified in at least two houses where the occupant complaints were nausea, vomiting, and diarrhea. Asexual state of *Emericellopsis* sp., *Chaetomium* sp., and *Nectriopsis* SP. It can produce mycetomas, infections of the nails, onychomycosis, corneal ulcers, eumycotic mycetoma, endophthalmitis, meningitis, and endocarditis. *Acremonium* species may be confused with *Fusarium* species that primarily produce microconidia in culture. *Fusarium* genera are generally much more rapid growers and produce more aerial mycelium

Alternaria sp. - Extremely widespread and ubiquitous. Outdoors it may be isolated from samples of soil, seeds, and plants. It is commonly found in outdoor samples. It is often found in carpets, textiles, and on horizontal surfaces in building interiors. Often found on window frames. The species *Alternaria alternata* is capable of producing tenuazonic acid and other toxic metabolites, which may be associated with disease in humans or animals. *Alternaria* produces large spores having sizes between 20 - 200 microns in length and 7 - 18 microns in width, suggesting cases that the spores from these fungi are deposited in the nose, mouth, and upper respiratory tract. It may be related to baker's asthma. It has been associated with hypersensitivity pneumonitis, sinusitis, dermatomycosis, onychomycosis, subcutaneous phaeohyphomycosis, and invasive infection. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include edema and bronchospasms; chronic may develop pulmonary emphysema.

Ascomycete. - One of the major classes of fungal organisms. This class contains the "sac fungi" and yeasts. Some ascomycete spores can be identified by spore morphology, however; some care should be exercised with regard to specific identification. Many ascomycete spores are reported to be allergenic.

Aureobasidium sp. - is a saprobe, or weak parasite, type I & III allergen, and common in a variety of soils outdoors. It is widespread in the indoor environment and is common in places that moisture accumulates like bathrooms, kitchens, shower curtains, tile grout, and windowsills. This genus has 14 species, *A. pullulans* being the most common. Indoors *A. pullulans* is often found as a black stain on damp materials in homes such as painted wood. This species has also been reported to cause chromoblastomycosis (in an immunocompromised patient), which is a chronic cutaneous infection of the skin. Morphology is characterized by producing black, shiny colonies.

Aspergillus sp. - A genus of fungi containing approximately 150 recognized species. Members of this genus have been recovered from a variety of habitats, but are especially common as saprophytes on decaying vegetation, soils, and stored food, feed products in tropical and subtropical regions. Some species are parasitic on insects, plants and animals, including man. Species within this genus have reported Aw's (water activities) between 0.75 - 0.82. All of the species contained in this genus should be considered allergenic. Various *Aspergillus* species are a common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include edema and bronchospasms. Chronic cases may develop pulmonary emphysema. Members of this genus are reported to cause a variety of opportunistic infections of the ears and eyes. Severe pulmonary infections may also occur. Many species produce mycotoxins, which may be associated with disease in humans and other animals. Toxin production is dependent on the species or a strain within a species and on the food source for the fungus. Some of these toxins have been found to be carcinogenic in animal species. Several toxins are considered potential human carcinogens.

Basidiomycetes - One of the major classes of fungal organisms. This class contains the mushrooms, shelf fungi, puffballs, and a variety of other macro fungi. It is extremely difficult to identify specific genera of mushrooms by using standard culture plate techniques. Some basidiomycete spores can be identified by spore morphology, however; some care should be exercised with regard to specific identification. Many basidiomycete spores are reported to be allergenic.

Botrytis sp – contaminant, parasitic on plants and fruits. Rarely involved in human infection, but it is reported to be allergenic.

Beltrania sp- is a mitosporic fungus that is very widespread and commonly found in dead leaves and plant debris in subtropical to tropical areas. It is known as an ascomycete, which is one of the major classes of fungal organisms. This class contains the "sac fungi" and the yeasts. Many are reported to be allergenic

Chaetomium sp- is found worldwide on a variety of substrates including paper, damp sheetrock, carpet, plant compost, soil, and between layers of wet plywood. Several species have been reported to play a major role in decomposition of cellulose-based materials, and is often found indoors with *Stachybotrys*. These fungi are able to dissolve the cellulose fibers in cotton and paper and thus cause the materials to disintegrate. The process is especially rapid under moist conditions. During the Second World War, countries lost a great deal of equipment to these species. *Chaetomium* is reported to have type I & III allergens, and can produce sterigmatocystin, a mycotoxin shown to cause kidney and liver damage in laboratory animals. It is not a common human pathogen, but it has been known to cause skin and nail infections. It is an ascomycete, and in most species the spores are lemon-shaped, with a single germ pore. The spore column results from the breakdown of the asci within the body of the perithecium.

Cladosporium sp. (*Hormodendrum sp.*) - Aw (water activity) in the range of 0.84 to 0.88. Most commonly identified outdoor fungus. The outdoor numbers are reduced in the winter. The numbers are often high in the summer. Often found indoors in numbers less than outdoor numbers. It is a common allergen. Indoor *Cladosporium sp.* may be different than the species identified outdoors. It is commonly found on the surface of fiberglass duct liner in the interior of supply ducts. A wide variety of plants are food sources for this fungus. It is found on dead plants, woody plants, food, straw, soil, paint and textiles. It can cause mycosis. Produces greater than 10 antigens. Antigens in commercial extracts are of variable quality and may degrade within weeks of preparation. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include edema and bronchospasms; chronic cases may develop pulmonary emphysema.

Cercospora sp.- One report of human infection in Indonesia, 1957. Common outdoors in agricultural areas, especially during harvest.

Curvularia sp. - Reported to be allergenic. It may cause corneal infections, mycetoma and infections in immune compromised hosts.

Dreschlera sp. - Conidia (spores) dimensions 40-120 x 17-28 microns. Found on grasses, grains and decaying food. It can occasionally cause a corneal infection of the eye.

Epicoccum sp. - Conidia (spores) dimensions 15-25 microns. A common allergen and rarely it can cause an infection in the skin. It is found in plants, soil, grains, textiles, and paper products.

Fusarium sp. - Aw (water activity) 0.90. A common soil fungus. It is found on a wide range of plants. It is often found in humidifiers. Several species in this genus can produce potent trichothecene toxins (5, 27). The trichothecene (scirpene) toxin targets the following systems: circulatory, alimentary, skin, and nervous. Produces vomitoxin on grains during unusually damp growing conditions. Symptoms may occur either

through ingestion of contaminated grains or possibly inhalation of spores. The genera can produce hemorrhagic syndrome in humans (alimentary toxic aleukia). Nausea, vomiting, diarrhea, dermatitis, and extensive internal bleeding characterize this. Reported to be allergenic. Frequently involved in eye, skin and nail infections.

Memmoniella sp – contaminant, found most often with *Stachybotrys* on wet cellulose. Forms in chains, but it are very similar to *Stachybotrys* and sometimes is considered to be in the *Stachybotrys* family. Certain species do produce toxins very similar to the ones produced by *Stachybotrys chartarum* and many consider the IAQ importance of *Memmoniella* to be on par with *Stachybotrys*. Allergenic and infectious properties are not well studied.

Myxomycete sp – Members of a group of fungi that are included in the category of "slime molds". They're occasionally found indoors, but mainly reside in forested regions on decaying logs, stumps, and dead leaves. Myxomycetes display characteristics of fungi *and* protozoans. In favorable (wet) conditions they exhibit motile, amoeba-like cells, usually bounded only by a plasma membrane, that are variable in size and form. During dry spells, they form a resting body (sclerotium) with dry, airborne spores. These fungi are not known to produce toxins, but can cause hay fever and asthma.

Nigrospora sp. - Reported to be allergenic.

Oidium sp-The asexual phase of *Erysiphe* sp. It is a plant pathogen causing powdery mildews. It is very common on the leaves stems, and flowers of plants. The health effects and allergenicity have not been studied. It does not grow on non-living surfaces such as wood or drywall.

Paecilomyces sp. - Commonly found in soil and dust, less frequently in air. *P. variotii* can cause paecilomycosis. Linked to wood-trimmers disease and humidifier associated illnesses. They are reported to be allergenic. Some members of this genus are reported to cause pneumonia. It may produce arsine gas if growing on arsenic substrate. This can occur on wallpapers covered with paris green.

Penicillium sp. - Aw (water activity) 0.78 - 0.88. A wide number of organisms have placed in these genera. Identification to species is difficult. Often found in aerosol samples. Commonly found in soil, food, cellulose, and grains (17, 5). It is also found in paint and compost piles. It may cause hypersensitivity pneumonitis and allergic alveolitis in susceptible individuals. It is reported to be allergenic (skin) (7, 17). It is commonly found in carpet, wallpaper, and in interior fiberglass duct insulation (NC). Some species can produce mycotoxins. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include edema and bronchospasms; chronic cases may develop pulmonary emphysema.

Periconia sp- Found in soil, blackened and dead herbaceous stems, leaf spots, grasses, rushes, and sedges. Almost always associated with other fungi. Rarely found growing indoors. Reportedly associated with a rare case of mycotic keratitis.

Pithomyces sp. – Contaminant, found on decaying plants, especially leaves and grasses. Rarely found indoors, but it can grow on paper. No reports of allergies or infections, but some species produce a toxin that causes facial eczema in sheep.

Smuts sp - Type I allergies (hay fever, asthma). No reports of human infection by the plant parasitic forms. Smuts do not usually grow indoors. They are parasitic plant pathogens that require a living host for the completion of their life cycle.

Scopulariopsis sp. - It may produce arsine gas if growing on arsenic substrate. This can occur on wallpapers covered with paris green. It has been found growing on a wide variety of materials including house dust. It is associated with type III allergy.

Stachybotrys sp. - Aw (water activity) - 0.94, optimum Aw (water activity) - >0.98. Several strains of this fungus (*S. atra*, *S. chartarum* and *S. alternans* are synonymous) may produce a trichothecene mycotoxin-Satratoxin H - which is poisonous by inhalation. The toxins are present on the fungal spores. This is a slow growing fungus on media. It does not compete well with other rapidly growing fungi. The dark colored fungi grows on building material with high cellulose content and low nitrogen content. Areas with relative humidity above 55% and are subject to temperature fluctuations are ideal for toxin production. Individuals with chronic exposure to the toxin produced by this fungus reported cold and flu symptoms, sore throats, diarrhea, headaches, fatigue, dermatitis, intermittent local hair loss, and generalized malaise. The toxins produced by this fungus will suppress the immune system affecting the lymphoid tissue and the bone marrow. Animals injected with the toxin from this fungus exhibited the following symptoms: necrosis and hemorrhage within the brain, thymus, spleen, intestine, lung, heart, lymph node, liver, and kidney. The mycotoxin is also reported to be a liver and kidney carcinogen. Affects by absorption of the toxin in the human lung are known as pneumomycosis. This organism is rarely found in outdoor samples. It is usually difficult to find in indoor air samples unless it is physically disturbed. The spores are in a gelatinous mass. Appropriate media for the growth of this organism will have high cellulose content and low nitrogen content. The spores will die readily after release. The dead spores are still allergenic and toxicogenic. Percutaneous absorption has caused mild symptoms.

Tetraploa sp. - this genus is somewhat related to *Triposporium* and *Diplocladiella*. The only reported human infections are two cases of keratitis and one case of subcutaneous infection of the knee. No information is available regarding other health effects or toxicity. Allergenicity has not been studied. Natural habitat includes leaf bases and stems just above the soil on many kinds of plants and trees.

Torula sp. - primarily a contaminant, but it is reported to be allergenic. Can be found indoors on cellulose containing material.

Trichoderma sp. - It is commonly found in soil, dead trees, pine needles, paper, and unglazed ceramics. It often will grow on other fungi. It produces antibiotics, which are toxic to humans. It has been reported to be allergenic (7, 17). It readily degrades cellulose.

Ulocladium sp. - is reported to be a major type I allergen. This saprobe (weak parasite) is widespread and commonly found on plant materials, soils, dung, grass, compost, and textiles. Some species are cellulolytic and can grow on water-damaged building materials. *Ulocladium* is also found in dust and air samples; and indoors on carpets and painted surfaces. This mitosporic (lacks a sexual state) fungus has been reported from cases of phaeoophomycosis (cutaneous and subcutaneous infections caused by dematiaceous (dark-walled) fungi). Infection sites for susceptible hosts vary widely.

Hypha (plural, hyphae) -An individual fungal thread or filament of connected cells; the thread that represents the individual parts of the fungal body.