

Spore Analysis Completed for



171 Main Street Room B 101, Ashland, MA 1721
508-881-1105
admin@warrenhomeinspections.com

| | |
|---------------------------------|------------|
| Collected Date | |
| Collected Street Address | |
| Collected & Relinquished by | |
| # of Sample Sent | 3 |
| # of Sample Received & Accepted | 3 |
| Sample/s Received & Accepted on | |
| Sample/s Received & Accepted by | |
| Sample/s Analyzed on | 03/15/2021 |
| Sample/s Analyzed by | |
| Report Approved by | |
| Report/Test Type | Standard |

Thank you for using Newton Microbial Laboratory for your microbial analysis. Currently there are no Federal regulations for fungal contamination or remediation. This document was designed to follow current industry guidelines for the interpretation of microbial sampling, analysis, and remediation. Newton Microbial Laboratory bears no responsibility for sample collection, analytical methods, or the use of test results. All samples listed on this report were received in acceptable condition unless otherwise stated. The client is solely responsible for the use or interpretation. The results in this analysis pertain to only this analysis on the stated date collected, and should not be used in the interpretation of any other job. Due to the subjective nature of fungal analysis, Newton Microbial Laboratory makes no express or implied warranties as to the health of the tested property. Newton Microbial Laboratory reserves the right to properly dispose of all samples after the testing of the samples are completed. Newton Microbial Laboratory or its employees are not liable for incidental or consequential damages arising out of the use of these test results.

Spore Analysis Completed by



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Laboratory Director, M.S. in Biology



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PAACB Analyst ID Number: 07190171

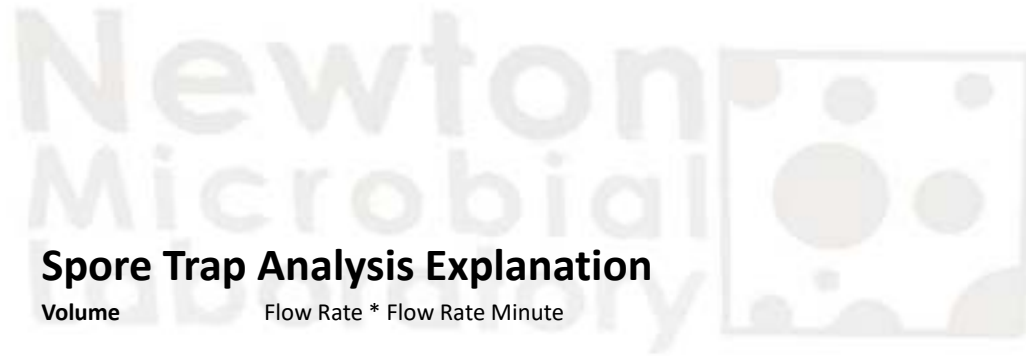


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|---|--|--|---|--|--|----------------------------|--|--|-----------------------------|--|--|----------|--|--|
| Property/Customer Name | | | Site Street Address | | | Site City | | | Site State | | | Site Zip | | |
| Company Email admin@warrenhomeinspections.com | | | Company Phone Number 508-881-1105 | | | Date Collected 3/4/2021 | | | Date Received 03/15/2021 | | | | | |
| Company Address 171 Main Street Room B 101, Ashland, MA 1721 | | | Company Name Warren Home Inspections | | | Sample Collected by | | | Date Analyzed 03/15/2021 | | | | | |

| Newton ML Sample ID | CAE20210315010S001AS | | | CAE20210315010S002AS | | | CAE20210315010S003AS | | |
|---|------------------------|--------------------|------------|----------------------|--------------------|------------|----------------------|--------------------|------------|
| Sample Name/Location | Control, Outdoor Entry | | | Basement | | | 2nd Floor Hall | | |
| Volume (L) | 75 | | | 75 | | | 75 | | |
| Background | 2 | | | 4 | | | 3 | | |
| Analyt. Sensitivity 100X (Cts/M ³) | 13 | | | 13 | | | 13 | | |
| Analyt. Sensitivity 400X* (Cts/M ³) | 26* | | | 26* | | | 26* | | |
| Sample Type | Spore Trap | | | Spore Trap | | | Spore Trap | | |
| Organism | Counted | Cts/M ³ | % of Total | Counted | Cts/M ³ | % of Total | Counted | Cts/M ³ | % of Total |
| Alternaria | Not Detected | | | Not Detected | | | Not Detected | | |
| Ascospores | 24 | 320 | 36.74% | 4 | 53 | 4.78% | 4 | 53 | 1.64% |
| Aspergillus Penicillium* | 21 | 538 | 61.73% | 36 | 922 | 82.56% | 18 | 461 | 14.16% |
| Basidiospores | 1 | 13 | 1.53% | Not Detected | | | Not Detected | | |
| Bipolaris Drechslera | Not Detected | | | Not Detected | | | Not Detected | | |
| Chaetomium | Not Detected | | | Not Detected | | | Not Detected | | |
| Cladosporium* | Not Detected | | | 5 | 128 | 11.47% | 106 | 2,714 | 83.38% |
| Curvularia | Not Detected | | | Not Detected | | | Not Detected | | |
| Epicoccum | Not Detected | | | Not Detected | | | Not Detected | | |
| Fusarium* | Not Detected | | | Not Detected | | | Not Detected | | |
| Memnoniella* | Not Detected | | | Not Detected | | | Not Detected | | |
| Myxomycetes Smuts | Not Detected | | | Not Detected | | | 2 | 27 | 0.82% |
| Pithomyces | Not Detected | | | Not Detected | | | Not Detected | | |
| Stachybotrys | Not Detected | | | Not Detected | | | Not Detected | | |
| Stemphylium | Not Detected | | | Not Detected | | | Not Detected | | |
| Torula | Not Detected | | | Not Detected | | | Not Detected | | |
| Trichoderma* | Not Detected | | | Not Detected | | | Not Detected | | |
| Ulocladium | Not Detected | | | Not Detected | | | Not Detected | | |
| Unspecified Spore | Not Detected | | | 1 | 13 | 1.19% | Not Detected | | |
| Total | 46 | 871 | 100.00% | 46 | 1,116 | 100.00% | 130 | 3,255 | 100.00% |

| | | | | | | | | | |
|-----------------|--------------|--|---|---|----|---|---|----|---|
| Hyphal Fragment | Not Detected | | - | 2 | 27 | - | 3 | 40 | - |
| Comments | | | | | | | | | |





Spore Trap Analysis Explanation

| | |
|--|--|
| Volume | Flow Rate * Flow Rate Minute |
| Background | <p>None: Recollect</p> <p>1: <5%</p> <p>2: 5% ≤ Background Coverage < 25%</p> <p>3: 25% ≤ Background Coverage < 70%</p> <p>4: 70% ≤ Background Coverage < 90%</p> <p>5: 90% ≤ Background Coverage < 100%, Recollect</p> |
| Cts/M³ | Spore Counts per Cubic Meter |
| Hyphal Fragment | Fragments of hyphae. Can be an additional indicator of possible mold presences |
| Unspecified Spore | Less commonly identified spore types, other than those listed on the report |
| Limit of Detection | 1 spore count per coverage examined area |
| Sample Type | |
| Spore Count | Spore Trap Cassettes Identification & Enumeration of Fungal Spores |
| Spore Count+ | Spore Trap Cassettes Identification & Enumeration of Fungal Spores + Total Dander, Fiber, and Pollen Count |
| Spore Trap Analytical Report Method | NML-SAM-1611, adapted from ASTM D7391-9 |

* Uncertainty available upon request

Ascospores



Growth and Distribution

Ascospores refers to spores produced in a sac-like structure known as an ascus (plural asci). These spores are specific to fungi of the phylum Ascomycota. Ascomycota is a broad division containing a large number of genera and individual species. Identification of the genus and/or species based on spore morphology alone is not always possible, therefore these spores are often given the more general classification of "Ascospores" in microscopic analysis.

- Ascospores are found worldwide with prevalence and distribution depending on particular genus and species.
- **Outdoors:** Ascospores are found ubiquitously in outdoor environments; often found on dead and decaying plant material. Many types are known to have pathogenic or parasitic properties in plants.
- **Indoors:** Common substrates include damp building materials such as gypsum or lumber, carpeting, dust, and other organic materials.

Health Effects

- **Allergen**
 - Ascospores can be allergenic to sensitive individuals, most often producing Type I or Type III hypersensitivity reactions. These include allergic asthma, conjunctivitis (redness of the eye), rhinitis (hay fever), anaphylaxis, angioedema (dermal swelling), urticarial (hives) or hypersensitivity pneumonitis (Type III). (5)
 - Reactions due to spore inhalation may increase following rain or high humidity. (5)
 - Unlike some fungi which rely on air currents for spore dispersal, ascomycetes are capable of a more active form of spore dispersal that utilizes water droplets to catapult their spores into the air. Various species of Ascospores are known to use this method to liberate spores every single day, regardless of air flow. Subsequently, exposure to ascospores may be more consistent from day to day than exposure to other spores which are only dispersed with adequate air currents. For this reason these spores may be of particular interest in cases of chronic respiratory disease such as asthma and rhinitis (5).
- **Pathogen**
 - Some types can be pathogenic; dependent upon genus and species.
- **Toxins\Metabolites**
 - Vary greatly depending on genus and species.

Found in Sample(s)

() List of references can be found at <http://newtonlaboratory.com/glossary>

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Aspergillus/Penicillium



Growth & Distribution (7):

- Aspergillus & Penicillium are incredibly adaptive and abundant organisms. Their distribution is world-wide with many species possessing abilities to tolerate environmental conditions that challenge other molds (i.e. extreme temperatures & pH levels, restricted water availability and exposure to radiation). Colony growth rates are rapid for many species. Mature colonies are capable of quickly producing large numbers of spores. Because of the morphological similarity of the spores, the two genera are typically grouped together as "Aspergillus-Penicillium."
- **Growth Rate:** Usually Rapid – Mature within 3-4 days; however, some species are slower(6).
- **Water Activity:** Aspergillus: 0.93-0.97 & Penicillium: 0.88 – 0.99 (33, 35)
- **Outdoors:** Both can be found outdoors on a variety of substrates- particularly plant materials such as cereals, grains, decaying wood, and soil (7).
- **Indoors:** Found indoors on organic materials such as wood, textiles, cellulose materials, carpeting, painted surfaces, and food stuffs such as cheeses, butter/margarine meats, breads, fruits and vegetables. Halotolerant species may be found growing on refrigerated foods (7). Penicillium is used in cheese production and is responsible for the veins in blue cheese.

Health Effects

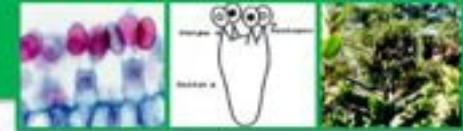
- **Allergen:**
 - Because these spores are so abundant, daily exposure to Aspergillus/Penicillium is very common in both indoor and outdoor environments. Often this exposure occurs without any noticeable reaction or symptoms. However, sensitivities may develop in some instances- especially with prolonged exposure to high spore concentrations. This can result in allergic responses.
 - Spores may progress further into the respiratory system than other common spores due to their small aerodynamic diameter.
 - Penicillium is the mold from which the antibiotic Penicillin was first derived. Penicillin is now made synthetically. It does not contain the mold Penicillium. Allergy to one does not necessarily imply allergy to the other.
- **Pathogen (6,7):**
 - There are approximately 175 species of Aspergillus, only about 20 of which are known to cause disease in humans.
 - Diseases caused by Aspergillus are known as aspergillosis and include invasive infection, colonization, & toxicosis.
 - Certain species of Penicillium are considered pathogens. Infection may occur in skin, blood, bone marrow, internal organs or lymph nodes. (6). In the immunocompromised (particularly HIV patients or those who have recently been in Southeast Asia) *P. marnefei* can cause severe infection capable of affecting respiratory, lymphatic, and nervous systems.
- **Toxins/Metabolites:**
 - Different species of Aspergillus/Penicillium are associated with an array of mycotoxins and metabolites, some of which are medically significant in humans. The importance of these toxins can vary from species to species and depends largely on the prevalence of that species.

Found in Sample(s)

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Basidiospores



Growth & Distribution:

- Basidiospores are spores produced by the division of Fungi known as Basidiomycota. These spores are unique for lacking septation, containing bilateral symmetry, and often having a visible pore at the site of detachment from the basidium (7). This is a large group of organisms consisting of a large number of individual genera & species. Distribution is world-wide with the prevalence in any given area varying for each genus and species. Like ascospores, basidiospores disperse using water droplets. Therefore, airborne spore concentrations are often higher following rain or high humidity. This division includes edible mushrooms.
- Outdoors:** Basidiospores are found growing on plant material, organic debris, and soil. Many species of basidiospores are known to be plant pathogens.
- Indoors:** Basidiospores may be found growing on damp materials. Colonies may grow given sufficient access to water (leaks, flooding, high humidity, or surrounding plumbing, heating/air conditioning components, appliances, house plants, etc.).

Health Effects:

- Allergenic:**
 - Exposure to these spores is commonplace in both indoor and outdoor environments. Nonetheless they are also potentially allergenic. Allergic responses may occur following inhalation, ingestion, or direct contact. Reactions due to inhalation may be increased following rain or high humidity when spore concentrations are often elevated.
 - In sensitive individuals, typically manifest Type I or Type III hypersensitivity reactions. These include allergic asthma, conjunctivitis (redness of the eye), rhinitis (hay fever), anaphylaxis, angioedema (dermal swelling), urticarial (hives) or hypersensitivity pneumonitis & allergic sinusitis (Type III). (5)
- Pathogenic:**
 - Invasion is not typical but can occur, particularly in the immunocompromised or immunosuppressed. These infections can include sinusitis, keratitis, phaeohyphomycosis, & peritonitis.
- Toxins\Metabolites:**
 - Mycotoxins vary depending on genus and species. They are especially relevant in edible fungi of this division such as mushrooms.
 - Common sources of mushroom poisoning include *Amnita*, *Lepiota*, *Coprinus*, & *Psilocybe*

Found in Sample(s)

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Cladosporium



Growth & Distribution:

- Cladosporium are found in air and soil worldwide. Cladosporium are among the most common airborne fungi (4). Spores are produced in abundance and easily disperse through the air. Extremely common on decaying organic matter. These molds are common plant pathogens. Molds of this genus are dematiaceous with over 40 named species (1).
- **Growth Rate:** Moderately Rapid – Mature within 7 days. (6)
- **Water Activity:** 0.85-0.88 (1)
- **Outdoors:** Cladosporium can be found on food sources such as cereals, fruit, vegetables. Commonly found on dead plants and shrubs in temperate regions. Halotolerant (salt tolerant) species exist. (7) The most common species isolated from plant materials & soils (*C. cladosporioides*) experiences peak airborne spore concentrations between June/July and September/October in temperate climates (2).
- **Indoors:** Cladosporium can be found on water damaged materials (i.e. plaster, paint, textiles, gypsum, wall paper, wood, moist window sills). May affect food sources such as cheeses, butter/margarine, vegetables, fruits and vegetables(7). Often found on the surface of fiberglass duct liners, in bathroom showers, and on basement walls (2). Some studies have reported Cladosporium in 70% of homes examined in the US & 100% of homes examined in Canada (1).

Health Effects:

- **Allergen:**
 - Allergic reaction to airborne spores are of particular importance because these spores exist in such high concentrations in the air. Symptoms may increase during peak concentrations from June-October. Sensitization may occur. (1)
 - In sensitive individuals typically manifest Type I or Type III hypersensitivity reactions. These include allergic asthma, conjunctivitis (redness of the eye), rhinitis (hay fever), anaphylaxis, angioedema (dermal swelling), urticarial (hives) or hypersensitivity pneumonitis & allergic sinusitis (Type III). (5)
- **Pathogen:**
 - Is pathogenic in humans very rarely, reported cases include skin lesions, keratitis, onychomycosis, sinusitis, pulmonary infections (1).
- **Mycotoxins/Metabolites:**
 - Cladosporic acid (12)
 - Gibberellin (hormone influencing developmental processes in plants) & ergosterol (precursor to vitamin D2 which may have anti-tumor properties). (1)
 - Toxic effects have been seen in animals (chicken embryos & horses) but not known to be reported in humans to date (1,2).

Found in Sample(s)

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Myxomycetes



Growth & Distribution

- Myxomycetes is a large class with approximately 500 individual species and worldwide distribution (25). Interestingly, these organisms are no longer considered to be true fungi like other molds, but have been reclassified as protozoans. These organisms belong to group commonly called "slime molds" that exhibit an amoeba-like stage. Spores are common in both indoor and outdoor environments worldwide (15). Spores can be dispersed by air, arthropods and other animals due to their small size (4 – 20 µm)(25).
- **Growth Rate:** Generally Rapid – Mature within 2 to 4 day; however, specific growth rate does depend on species (24).
- **Water Activity:** 0.80 (this is a generalized number for common molds)(26).
- **Outdoors**
 - Found in soil, decaying plant material (especially damp wood), and dung. Species of Myxomycetes are not as geographically constricted as most organisms; most Myxomycetes species can be found world wide. (15)
- **Indoors**
 - Can be found growing indoors on damp building materials such as cardboard, wallpaper, gypsum board, wood, etc.

Health Effects:

- **Allergen:**
 - These spores are very common in both indoor and outdoor air. They are small, foreign particles which may be inhaled deep into the respiratory system and may cause allergic responses.
 - In sensitive individuals, typically manifests Type I or Type III hypersensitivity reactions. These include allergic asthma, conjunctivitis (redness of the eye), rhinitis (hay fever), anaphylaxis, angioedema (dermal swelling), urticarial (hives) or hypersensitivity pneumonitis & allergic sinusitis (Type III). (5)
- **Pathogen:**
 - Unknown
- **Toxins/Metabolites:**
 - Unknown

Founded in Samples(s)

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