



# Assured Biotechnologies Corporation

## Direct Examination Analysis

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Inspector:	A Mold Inspector	Date Collected:	04/13/10
Project	Smith Residence	Date Received:	04/14/10
Job Number:	12345	Date Reported:	04/14/10
Assured Bio Identifier:	MI041410-3	Analyst:	Lab Analyst

### Selected References

1. Alexopoulos, C.J. and C.W. Mims. 1979. *Introductory Mycology, Third Edition*. John Wiley & Sons, New York, New York.
2. Barron, G.L. 1968. *The Genera of Hyphomycetes from Soil*. Robert E. Krieger Pub. Co., Malabar, Florida.
3. Ellis, M.B. 1971. *Dematiaceous Hyphomycetes*. CAB International, Wallingford Oxon OX10 8DE, UK.
4. Ellis, M.B. 1976. *More Dematiaceous Hyphomycetes*. CAB International, Wallingford Oxon OX10 8DE, UK.
5. Hanlin, R.T. 1990. *Illustrated Genera of Ascomycetes*. APS Press, St. Paul, Minnesota.
6. Hanlin, R.T. 1998. *Illustrated Genera of Ascomycetes*. II. APS Press, St. Paul, Minnesota.
7. Hanlin R.T. and M. Ulloa. 1988. *Atlas of Introductory Mycology, Second Edition*. Hunter Textbooks, Inc., Winston-Salem, North Carolina.
8. Kiffer E. and M. Morelet. 2000. *The Deuteromycetes: Mitosporic Fungi: Classification and Generic Keys*. Science Publishers, Inc., Enfield, New Hampshire.
9. Macher, J., Ed. 1999. *Bioaerosols: Assessment and Control*. ACGIH, Cincinnati, Ohio.
10. Morris, E.F. 1963. *The Synnematos Genera of the Fungi Imperfecti*. Western Illinois University Publication, Macomb, Illinois.
11. Nelson, P.E., Toussoun, T.A. and W.F.O. Marasas. 1983. *Fusarium Species: An Illustrated Manual for Identification*. Pennsylvania State University Press, University Park and London.
12. Samson R.A., Hoekstra E.S., Frisvad J.C. and O. Filtenborg, Ed. 2002. *Introduction to Food and Airborne Fungi*. Ponsen and Looyen, Wageningen, The Netherlands.
13. Wistreich G.A. 1997. *Microbiology Laboratory: Fundamentals and Applications*. Prentice Hall, Upper Saddle River, New Jersey.

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### Methods of Analysis

Assured Biotechnologies Corp. uses the following Standard Operating Procedures for the analysis of samples:

Spore Traps	- Assured Biotechnologies Corp. Document Number 105
Swabs	- Assured Biotechnologies Corp. Document Number 106
Tape Lifts	- Assured Biotechnologies Corp. Document Number 107
Bulk Material	- Assured Biotechnologies Corp. Document Number 108

### Interpretation of Spore Trap Results

**The Interior vs. the Outside Control:** There are currently no national guidelines or standards for the acceptable number of mold spores present in indoor air. It has become the industry standard for professionals to do a comparison between samples collected on the interior of a home or building and the outside control. The fungal spores recovered indoors should be similar in type and number to those collected outside. When this occurs the area is considered to be in equilibrium or is seen as a normal indoor environment. It is very common for multiple samples to be collected on the interior. This is done to pinpoint any problem areas where air quality may be abnormal.

**Limit of Detection:** This number is the lowest number of spores that can be detected based on the volume of the sample collected.

**Background Particulate Density:** This rating indicates the presence of airborne particulates other than mold (pollen, dander, insects, ect.). As the Background Particulate Density increases, the ability to visually detect smaller mold spores (such as *Penicillium/Aspergillus* or *Acremonium*) decreases. The Level of Debris can be interpreted using the following scale:

Low	- Very little particulate present. Virtually no spores undetectable.
Low-Medium	- Little particulate present. 97% likelihood that all spores have been counted.
Medium	- Moderate level of particulate present. 95% likelihood that all spores have been counted.
Medium-High	- Increased level of particulate present. 75% likelihood that all spores have been counted.
High	- Very heavy particulate. Less than a 75% likelihood that all spores have been counted.

**Raw Count:** This number is the total number of fungal spores counted under the microscope.

**Total Mold Spores:** This is an estimate of the fungal spores present per cubic meter of air sampled within that particular sampling location. This number is derived by multiplying the total spores counted on the spore trap by a conversion factor involving the volume of air sampled.

### Interpretation of Tape Lift, Swab, or Bulk Material Results

Assured Bio. quantifies the presence of mold spores detected on a tape lift, swab, or bulk sample using the following scale:

Low	- Less than 1/3 of the microscopic field of view is obscured by the identified mold spore.
Moderate	- Between 1/3 and 2/3 of the microscopic field of view is obscured by the identified mold spore.
High	- Over 2/3 of the microscopic field of view is obscured by the identified mold spore.



ABC Identification Number:	MIO41410-3-1	MIO41410-3-2
Sample Identification Number	1703458	1703476
Date Collected:	04/13/10	04/13/10
Description:	Kitchen	Outside
Sample Type:	Spore Trap	Spore Trap
Sample Condition:	Intact	Intact
Comments:	PRV	PRV
Volume/Area Sampled:	25	25
Analytical Sensitivity	40	40

Spore Identifications	MIO41410-3-1		MIO41410-3-2	
	Raw Count	Spores/m3	Raw Count	Spores/m3
Acremonium-like	ND	BDL	ND	BDL
Alternaria	ND	BDL	6	240
Arthrinium	ND	BDL	ND	BDL
Aureobasidium	ND	BDL	ND	BDL
Botrytis	ND	BDL	ND	BDL
Cercospora	ND	BDL	ND	BDL
Chaetomium	ND	BDL	1	40
Cladosporium	8	320	14	560
Coprinus	ND	BDL	3	120
Curvularia	ND	BDL	1	40
Drechslera/Bipolaris	ND	BDL	ND	BDL
Epicoccum	ND	BDL	ND	BDL
Fusarium	ND	BDL	ND	BDL
Ganoderma	ND	BDL	ND	BDL
Memnoniella	ND	BDL	ND	BDL
Nigrospora	ND	BDL	ND	BDL
Penicillium/Aspergillus-like	16	640	1	40
Pithomyces	ND	BDL	ND	BDL
Scopulariopsis	ND	BDL	ND	BDL
Spegazzinia	ND	BDL	ND	BDL
Stachybotrys	ND	BDL	2	80
Tetraploa	ND	BDL	ND	BDL
Torula	ND	BDL	ND	BDL
Trichoderma	ND	BDL	ND	BDL
Ulocladium	ND	BDL	ND	BDL
Wallemia	ND	BDL	ND	BDL
Ascomycetes-unspecified	2	80	9	360
Basidiomycetes-unspecified	ND	BDL	ND	BDL
Hyphomycetes-unspecified	ND	BDL	ND	BDL
Rusts/Smuts/Myxomycetes	ND	BDL	ND	BDL
Zygomycetes-unspecified	ND	BDL	ND	BDL
Total Spore Count	26	1,040	37	1,480
Hyphae	ND	BDL	ND	BDL
Background Particulate Density	Medium		Low-Medium	



ABC Identification Number:	MI041410-3-3	MI041410-3-2
Sample Identification Number	1703555	1703476
Date Collected:	04/13/10	04/13/10
Description:	Main Living Area	Outside
Sample Type:	Spore Trap	Spore Trap
Sample Condition:	Intact	Intact
Comments:	PRV	PRV
Volume/Area Sampled:	25	25
Analytical Sensitivity	40	40

Spore Identifications	MI041410-3-3		MI041410-3-2	
	Raw Count	Spores/m3	Raw Count	Spores/m3
Acremonium-like	ND	BDL	ND	BDL
Alternaria	ND	BDL	6	240
Arthrinium	ND	BDL	ND	BDL
Aureobasidium	ND	BDL	ND	BDL
Botrytis	ND	BDL	ND	BDL
Cercospora	ND	BDL	ND	BDL
Chaetomium	ND	BDL	1	40
Cladosporium	ND	BDL	14	560
Coprinus	ND	BDL	3	120
Curvularia	ND	BDL	1	40
Drechslera/Bipolaris	ND	BDL	ND	BDL
Epicoccum	ND	BDL	ND	BDL
Fusarium	ND	BDL	ND	BDL
Ganoderma	ND	BDL	ND	BDL
Memnoniella	ND	BDL	ND	BDL
Nigrospora	ND	BDL	ND	BDL
Penicillium/Aspergillus-like	6	240	1	40
Pithomyces	ND	BDL	ND	BDL
Scopulariopsis	ND	BDL	ND	BDL
Spegazzinia	ND	BDL	ND	BDL
Stachybotrys	ND	BDL	2	80
Tetraploa	ND	BDL	ND	BDL
Torula	ND	BDL	ND	BDL
Trichoderma	ND	BDL	ND	BDL
Ulocladium	ND	BDL	ND	BDL
Wallemia	ND	BDL	ND	BDL
Ascomycetes-unspecified	ND	BDL	9	360
Basidiomycetes-unspecified	ND	BDL	ND	BDL
Hyphomycetes-unspecified	ND	BDL	ND	BDL
Rusts/Smuts/Myxomycetes	ND	BDL	ND	BDL
Zygomycetes-unspecified	ND	BDL	ND	BDL
Total Spore Count	6	240	37	1,480
Hyphae	ND	BDL	ND	BDL
Background Particulate Density	Medium		Low-Medium	



### Frequently Occurring Fungi

<i>Acremonium</i>	This organism grows on dead plant material and soil. For growth indoors, it requires very wet conditions. The pathology to humans on exposure includes allergies (eg. hay fever, asthma), pneumonia, and subcutaneous infection.
<i>Alternaria</i>	This can be found on dead and dying plant material. It is easily blown by wind and found in house dust, carpets, textiles, and horizontal surfaces indoors. It can be considered a water impact mold. The pathology to humans on exposure includes allergies and asthma. Other diseases linked to <i>Alternaria</i> include mycotic keratitis, skin infections, and osteomyelitis.
Ascomycetes	This group includes over 3,000 species of fungi which mature in a sack-like structure. They are found everywhere in nature. This group includes <i>Chaetomium</i> and <i>Ascostricha</i> which can frequently found growing indoors on damp substrates. The pathology to humans on exposure is mostly allergenic.
<i>Aspergillus</i>	This can be found growing on forage products, grains, nuts, organic debris and water damaged organic building materials. Pathology to humans includes asthma, but it is less allergenic than other molds. Infections from <i>Aspergillus</i> happen mostly to persons with compromised immune systems. Aspergillosis is the second most common fungal infection requiring hospitalization in US.
<i>Aspergillus</i> / <i>Penicillium</i>	This group of fungal spores includes both the <i>Aspergillus</i> and <i>Penicillium</i> genera. This is because microscopically the two can not be differentiated unless conidiophores (fungal fruiting bodies) are present in the sample. These organisms are very common in the environment; however, an elevated presence can be indicative of a water intrusion event.
Basidiomycetes	This group of fungal spores originates from mushrooms and plant pathogens. They are found in gardens, forests, and woodlands, but basidiomycetes can grow indoors. <i>Serpula lacrimans</i> or "dry rot" and other fungi cause white and brown wood rot. They grow and destroy the structural wood of buildings. The pathology to humans on exposure is mostly allergenic (eg. hay fever, asthma).
<i>Chaetomium</i>	This organism grows on substrates containing cellulose, including paper and plant compost. It is found commonly on damp sheetrock paper. Spores are distinctively shaped and resemble a lemon or a football and mature in a sack-like structure called perithecia. The pathology to humans on exposure includes Type I and III allergens and can produce a mycotoxin shown to cause kidney and liver damage in laboratory animals.
<i>Cladosporium</i>	This genus grows on living and dead plant material, soil, paint, and textiles. It can be found growing in dirty refrigerators and on air conditioning vents. It grows especially well in reservoirs where condensation collects. Often it is found on the surface of fiberglass duct liners in the interior of supply ducts. The spores are generally dispersed by the wind. Water conditions of <i>Cladosporium</i> include houses in damp areas with poor ventilation. It can also be found living on textiles or paper under humid conditions and on moist window frames. Human exposure is rarely pathogenic, but can cause skin lesions, sinusitis, and pulmonary infections. Airborne spores can be significant allergens.
<i>Curvularia</i>	This grows on plant debris and soil. It is a facultative plant pathogen of tropical or subtropical plants and can grow indoors on a variety of substrates, usually under high humidity. The pathology to humans on exposure includes allergies (eg. hay fever, asthma). It is a relatively common cause of allergic fungal sinusitis.



### Frequently Occurring Fungi (cont.)

Hyphal Fragments	This is the growing part of fungi. Hyphal fragments present in air samples can be indicative of actively occurring mold growth within the indoor environment.
<i>Memnoniella</i>	This organism is closely related to <i>Stachybotrys</i> and grows on soil, many types of plants, and trees. It is associated often with water intrusion and can grow indoors on many different substrates. It is found frequently in conjunction with <i>Stachybotrys</i> .
Myxomycetes/Rusts/Smuts	These types of fungi are typically found outdoor. Rusts and smuts are often considered plant pathogens or parasites, while myxomycetes are slime molds. These spores are difficult to differentiate microscopically and normally are quantified together.
<i>Penicillium</i>	This fungus grows on materials such as soil, food cellulose, paint, grains, and compost piles. Spores are commonly found in carpet, wallpaper, and in interior fiberglass duct insulation. <i>Penicillium</i> can grow indoors in water-damaged buildings on wallpaper, wallpaper glue, decaying fabrics, moist chipboards, and behind paint. The pathology to humans includes allergies (eg. hay fever, asthma), moldy wall hypersensitivity, and hypersensitivity pneumonitis.
<i>Stachybotrys</i>	This can be found growing on sheet rock, paper, ceiling tiles, cellulose containing insulation backing, and wallpaper. It is a sooty black fungus occasionally accompanied by a thick mass of white mycelia. Conditions for growth include areas subject to temperature fluctuations that also have a relative humidity above 55%. The pathology to human exposure may include allergies, dermatitis, cough, rhinitis, nose bleeds, cold and flu symptoms, headache, general malaise and fever, and diarrhea. It produces mycotoxins which are extremely potent. Toxins produced by the fungus may suppress the immune system-affecting the lymphoid tissue and the bone marrow. Exposure via inhalation, ingestion, or dermal/skin should be avoided.
<i>Ulocladium</i>	This organism grows on plant materials and soils, rotten woods, paper, textiles, and water-damaged building materials. It can be found in dust and air samples. Growth indoors is widespread. It has a high water requirement. The pathology to humans on exposure includes allergies (eg. hay fever, asthma). When this organism is in the presence of <i>Alternaria</i> , symptoms may compound.