

Introduction to Residential Mold Assessment

Presented by:

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HITA Inspector Portal



1. Assuredbio.com
2. Learning Center (Top Right)
3. Home Inspectors of TN Class (Drop-down Menu)

A photograph showing various pieces of scientific equipment and personal protective gear arranged on a white surface against a wrinkled white background. The items include:

- Two handheld electronic devices: one yellow and black, the other orange and black.
- A pair of black nitrile gloves.
- A clear face shield with pink side attachments.
- A white N95 respirator mask with yellow straps.
- Four small blue vials or containers stacked together.
- Three syringes in their original packaging.
- Several small white packets or sachets.
- A coiled clear plastic tube.
- A digital thermometer displaying 07.20.
- A metal tripod stand with a vertical pole and a horizontal arm at the top.
- A black rectangular box with some text and a label, possibly a power supply or control unit.

What's in the Mold Inspection Kit ?

- Collection Pump & Tubing
- Tripod
- Timer
- Spore Traps
- Swabs
- Tape Lifts
- Moisture Meter
- Flashlight
- Respiratory Protection
- Notepad & Pen
- Camera/Phone
- Thermometer
- Humidity Meter

Initial Customer Contact

Why the air quality assessment?

- Real estate transaction?
- Complaint area?
- Remediation Follow-up?
- Curiosity?
- Avoid entirely?

Choosing the Best Sampling Plan

- Budget Consideration
- Project Timeline (Lab TAT, Closing Date)
- Specific Customer Request

Mold Screening vs. Mold Inspection

- Screening a property for potential mold elevation will typically involve lower sample quantity and possibly some simple recommendations.
- Inspection of a property may be warranted following a screen. Inspection will involve more in-depth sampling and evaluation. Some projects may jump directly to inspection.

Types of Mold Analysis

- Microscopy- “Good Enough”, Inexpensive, Genus ID
24 hour turn, \$22 - \$30
- DNA, PCR- “The Future”, High Resolution, Species ID
72 hour turn, \$55 - \$250
- Culture- “The Original”, Only Viable, Genus/Species ID
7-14 day turn, \$45 - \$100

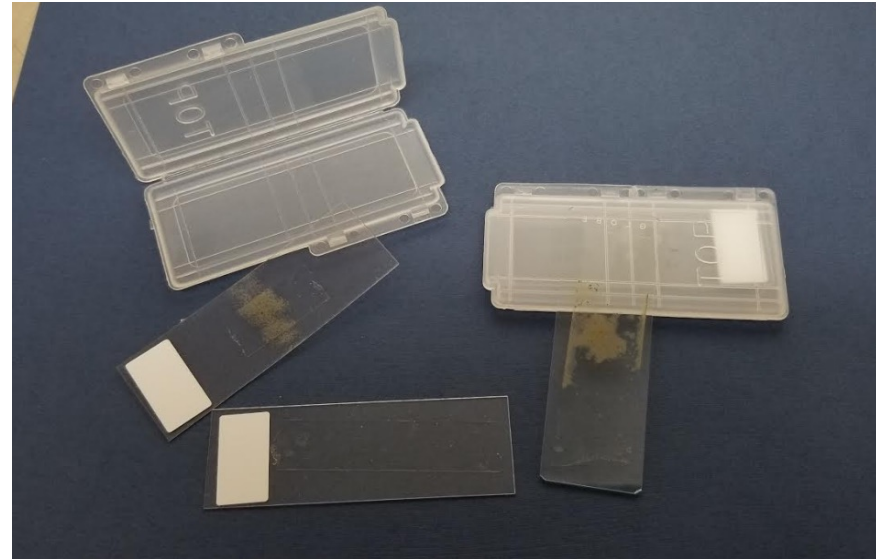
Direct Exam/ Microscopy

Limitations of Direct Exam Analysis

- Surface Swab or Tape Lift— Effective when collected from suspect mold growth.
- Air Sample- Interpretation based on Indoor/Outdoor sample comparison.
- Genus level identification. Some IDs are less specified.

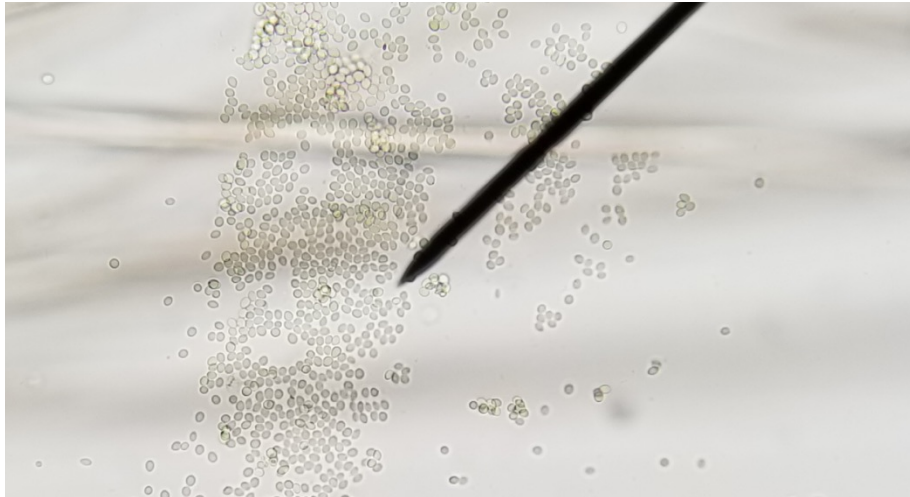
Surface Sampling for Microscopy

Swab vs. Tape Lift



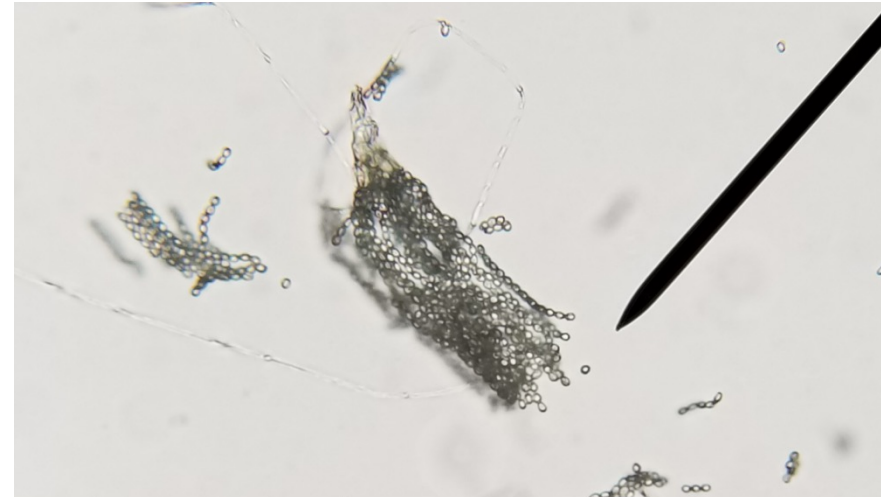
Swab

- Multi-purpose
- Easy to Operate
- More Options for Analysis



Tape Lift

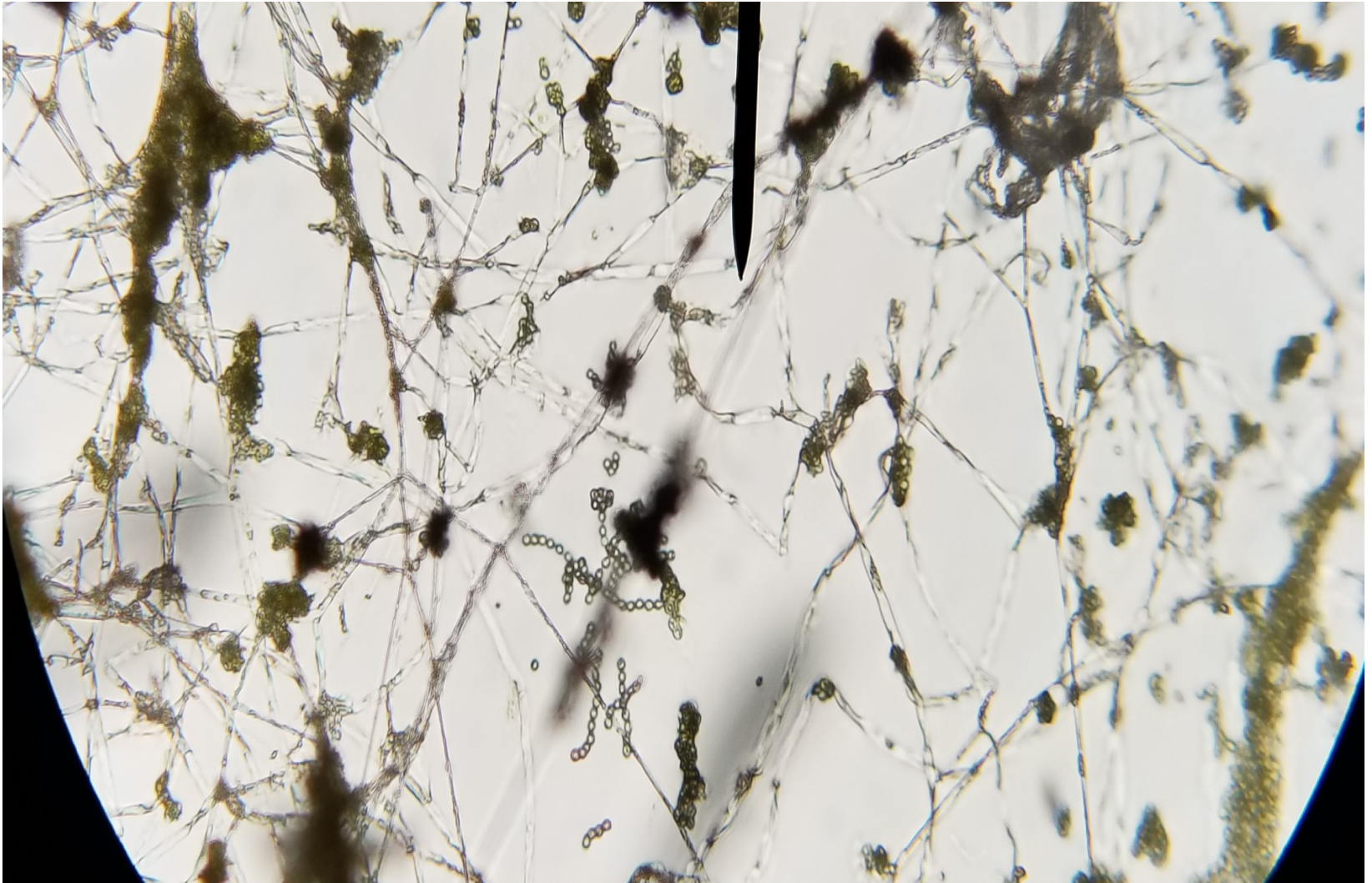
- Direct Exam Analysis Only
- Greater Possibility of Specific Result (Pen. vs Asp.)



Terms to Know

- **Hyphae**- Branching filaments that make up the mycelium of a fungus.
- **Conidiophore**- A conidium-bearing hyphal fragment associated with certain fungi

Hyphae- Branching filaments that make up the mycelium of a fungus.



Conidiophore- A hyphal fragment associated with certain fungi.



Reporting of Direct Exam Surface Samples

- Fungal Concentrations Indicated as Low, Medium, High
- Hyphal Presence Indicated
- Background Particulate Level (Non-fungal)

AB Identification Number:	DG041619-24-5
Sample Identification Number:	5
Date Collected:	Apr/16/2019
Description:	Kitchen Cabinet Plenum
Sample Type:	Swab
Sample Condition:	Intact
Comments:	
Spore Identifications	Spore Concentration
Acremonium-like	ND
Alternaria	ND
Arthrrium	ND
Aspergillus	ND
Aureobasidium	ND
Botrytis	ND
Cercospora-like	ND
Chaetomium	ND
Cladosporium	High
Coprinus	ND
Curvularia	ND
Drechslera/Bipolaris Helminthosporium/Exserohilum	ND
Epicoccum	ND
Fusarium	ND
Ganoderma	ND
Memnioniella	ND
Nigrospora	ND
Penicillium	ND
Penicillium / Aspergillus - like	Low
Pithomyces	ND
Scopulariopsis-like	ND
Spegazzinia	ND
Stachybotrys	ND
Tetraploa	ND
Torula	ND
Trichoderma-like	ND
Ulocladium	ND
Ascomycetes-unspecified	ND
Basidiomycetes-unspecified	ND
Hyphomycetes-unspecified	High
Zygomycetes-unspecified	ND
Myxomycetes/Perconia/Smuts/Rusts	ND
Miscellaneous structures	
Hyphae	Present
Clamydospores	ND
Perithecia	ND
Sclerotia	ND
Background Particulate Density	Medium

Air Sampling for Fungal Direct Exam

15 Liter

vs.

5 Liter

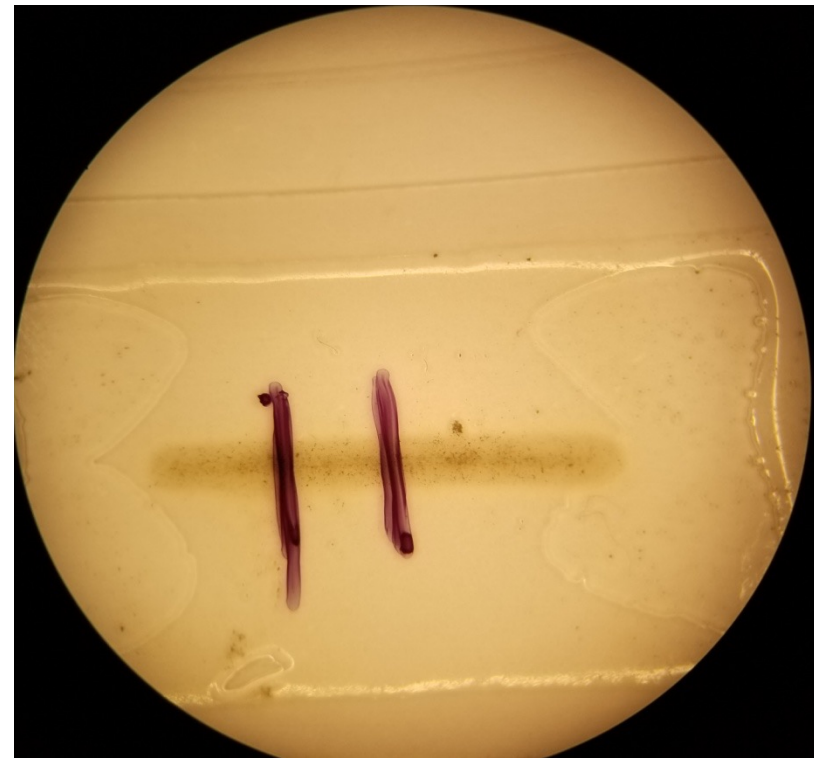


Terms to Know

- **Trace**- Airborne particulate collected and deposited into an air sample.
- **Field of View**- The area of a sample's trace that the analyst can see through their microscope at a given point during analysis.
- **Background Particulate**- Everything in the sample trace that is not fungal.

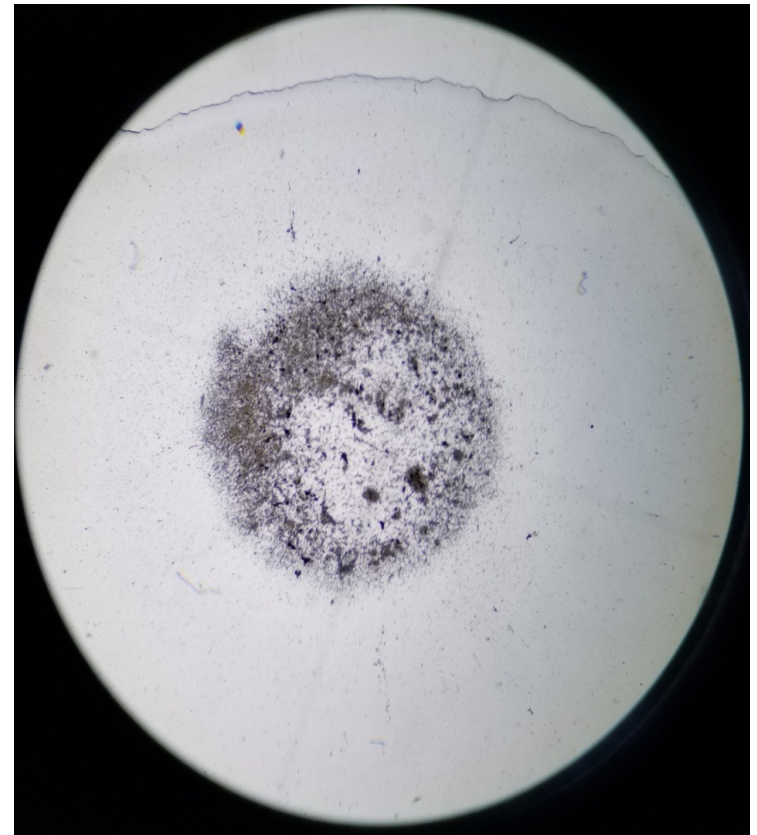
15 Liter Air-O-Cell & Allergenco

- 112 Fields of View per Sample Trace
- $\frac{1}{4}$ of the Trace (28 Fields of View) is analyzed. This number is then multiplied by 4



Micro 5, MoldSnap & Z5

- 28 Fields of View Per Sample Trace
- The Entire Trace is Analyzed



Reporting of Air Sample Data

- Quantified Result
- Reported in Spores per Cubic Meter (Spores/M₃)
- Typically Compared to Outdoor Control
 - Rain Exclusion

AB Identification Number:	DG022719-12-7	DG022719-12-3		
Sample Identification Number:	7	3		
Date Collected:	Feb/26/2019	Feb/26/2019		
Description:	Basement	Outdoor Control		
Sample Type:	Spore Trap	Spore Trap		
Sample Condition:	Intact	Intact		
Comments:	2369973	2339137		
Volume/Area Sampled:	25 L	25 L		
Reporting Limit:	40	40		
Spore Identifications	Raw Count	Spores/m3	Raw Count	Spores/m3
Acremonium-like	ND	BDL	ND	BDL
Alternaria	ND	BDL	ND	BDL
Arthrinium	ND	BDL	ND	BDL
Aspergillus	ND	BDL	ND	BDL
Aureobasidium	ND	BDL	ND	BDL
Botrytis	ND	BDL	ND	BDL
Cercospora-like	ND	BDL	ND	BDL
Chaetomium	ND	BDL	ND	BDL
Cladosporium	14	560	3	120
Coprinus	ND	BDL	ND	BDL
Curvularia	ND	BDL	ND	BDL
Drechslera/Bipolaris Helminthosporium/Exserohilum	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	ND	BDL	ND	BDL
Penicillium / Aspergillus - like	76	3040	17	680
Pithomyces	ND	BDL	ND	BDL
Scopulariopsis-like	ND	BDL	ND	BDL
Spegazzinia	ND	BDL	ND	BDL
Stachybotrys	ND	BDL	ND	BDL
Tetraploa	ND	BDL	ND	BDL
Torula	ND	BDL	ND	BDL
Trichoderma-like	ND	BDL	ND	BDL
Ulocladium	ND	BDL	ND	BDL
Ascomycetes-unspecified	2	80	1	40
Basidiomycetes-unspecified	6	240	1	40
Hyphomycetes-unspecified	3	120	ND	BDL
Zygomycetes-unspecified	ND	BDL	ND	BDL
Myxomycetes/Perconia/Smuts/Rusts	ND	BDL	ND	BDL
Miscellaneous structures				
Hyphae	Present		Present	
Clamydospores	ND	BDL	ND	BDL
Perithecia	ND	BDL	ND	BDL
Sclerotia	ND	BDL	ND	BDL
Background Particulate Density	High		Medium	
Total Spore Count	101	4040	22	880

Air Sampling Pumps



Zefon Bio-Pump



Zefon Z-Lite-IAQ



Zefon Z-Lite-IAQ-DC

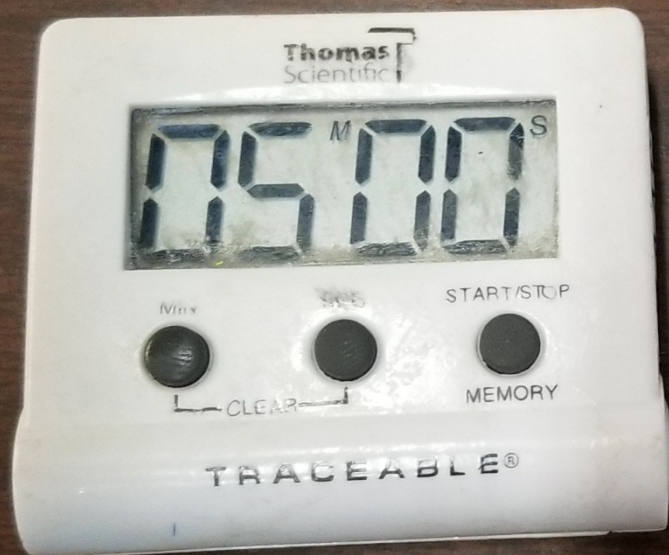
Spore Trap Collection Video

[How to collect an air sample using spore traps - YouTube](#)

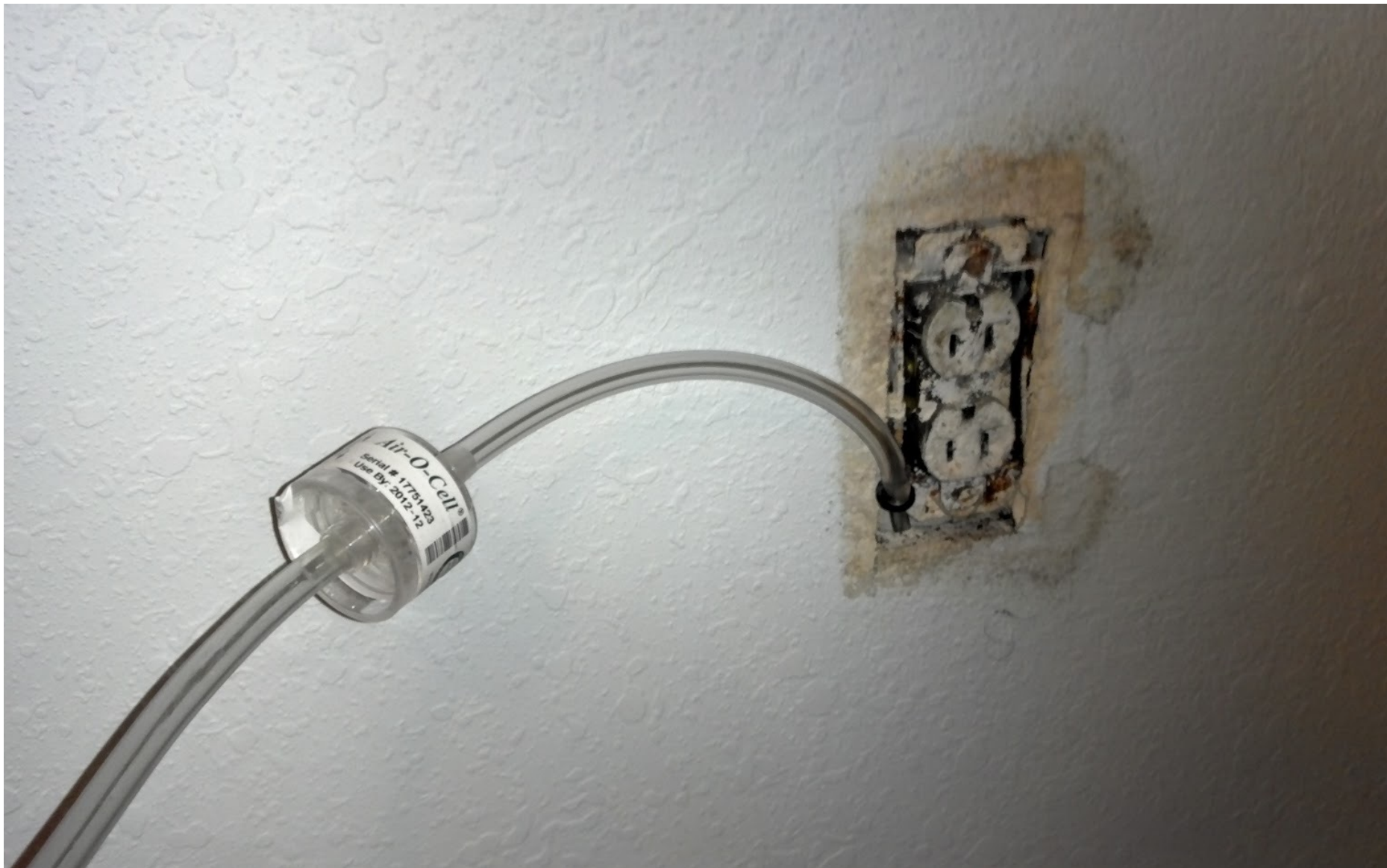
Standard Spore Trap Collection



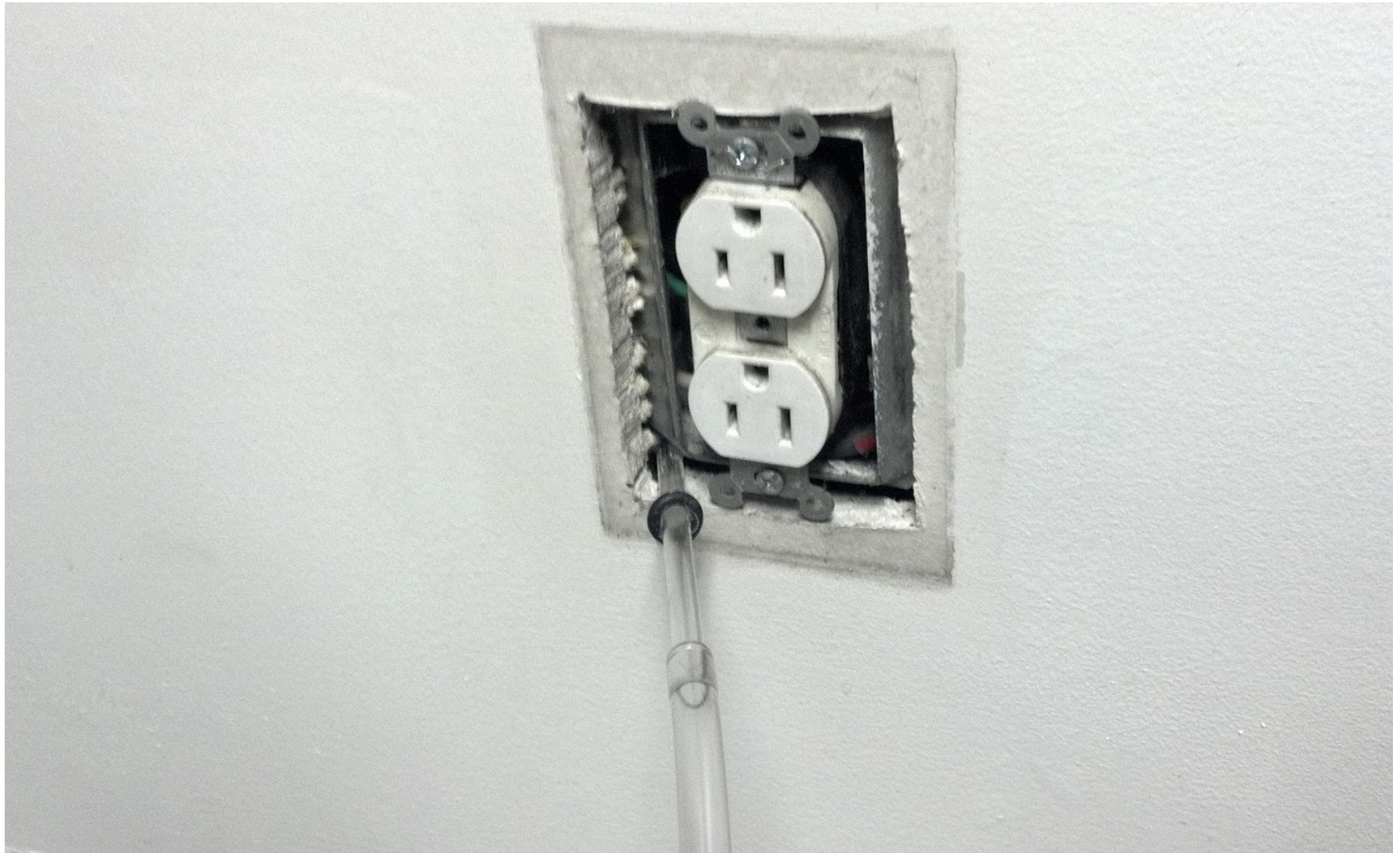




Wall Cavity Air Sample Collection



Wall Cavity Air Sample Collection



Wall Cavity Air Sample

<https://www.youtube.com/watch?v=8QBCFhDprlA>

DNA Analysis and Composite Dust

Dust holds what was once airborne.

Uses and Limitations of DNA Analysis on Dust

- No Visible Mold Noted in the Sampled Area
- Minimal Equipment (No Air Pump Needed)
- Standardized Data Interpretation (Spores/Locations Sampled)
- Historic Data
- Can be too specific

Popular DNA-Type Screening Methods

- ERMI- (Environmental Relative Moldiness Index)
- Big 2
- ARMI- (American Relative Moldiness Index)
- Cap-15
- HERTZMI-2

Composite Dust Sampling

<https://youtu.be/6TQx0mmyAGI?t=40>

The Chain of Custody

- Submitted to the Laboratory with Samples.
- This Form is Documentation of the Inspector's Request for Analysis.
- Legally Binding

<https://assuredbio.com/wp-content/uploads/2021/07/General-Chain-of-Custody.pdf>

Personal Protective Equipment



Remember:

Water Intrusion Brings Mold

- Liquid Water Event

(Pipe Leak, Gutter Issue, Flooding)

- Humidity Event

(HVAC Issue, Foreclosure/Long-term Vacancy, Inadequate Air Exchange)

How to Approach the Visual Inspection

1. Living Space (Complaint Area Last)
2. Attic
3. HVAC Unit
4. Crawlspace (Always Inspected Last)

Living Area / Occupied Space

- Make Note of Complaint Areas. “What is the Reason for this Mold Inspection?” Inspect These Last
- Possible Water Intrusion?
- Flashlight Walkthrough
- Crawlspace Penetrations (Floor Vent Boot)

Failed Solder Joint Inside a Wall



Elevated Moisture Content



Humidity Related Surface Mold



Window Leaks



Toe Kick Plenum Interior





Toe Kick Plenum Interior



Vent Boot Penetration to Crawlspace



Vent Boot Penetration to Crawlspace



Attic

- Roof Leaks?
- Evidence of Gutter Overflow?
- Condensation of Unit or Ducting?
- Insulation Type? Fiberglass vs. Blown Cellulose
- Cellulose & Humidity

Compromised Shingles



Roof Leak at Vent Pipe



Condensation of Attic Air Handler



HVAC Unit

- Condition of Ducting (Broken Foil Wrap)
- Inside of Air Handler (Condition of Duct Liner, Standing Water in Drain Pan)

Leak in Ducting at Attic Unit



Standing Water in Air Handler



Air Handler Access Door



Commercial HVAC Duct Liner



Duct Liner- Post Duct Cleaning



Crawlspace

- Vapor Barrier
- Wood Moisture Content of Joists & Subfloor (Below 18%)
- Relative Humidity Level (Below 55%)
- Mold Growth/ Wood Rot
- Condition of Ducting & Air Handler



Vapor Barrier Not Intact



Elevated Moisture in Joist



Crawlspace Air Handler



Disconnected HVAC Duct



JACK REYNOLDS
1049

SPIKE DERRIE
ARIZO

Client Interaction

Terms to Use & Terms to Avoid

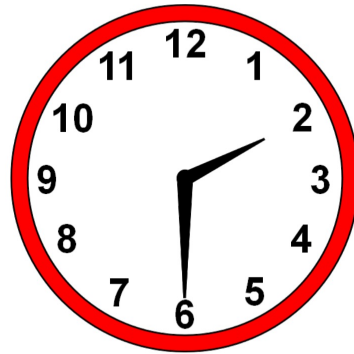
Safe Terms to Use

- “...suspected fungal growth until lab verification”
- “...at the time of sampling.”
- “...may contribute to...”

Things to Avoid

- Microbial identification in the field without lab analysis.
- Overstating data interpretation
- Reluctance to recommend second opinion
- Fogging used as mold remediation

Time Check



Creating Your Mold Inspection Report

The goal of an inspection report is to efficiently combine:

Environmental Forensics

-

Photographic Evidence

-

Lab Data

Layout of The Inspection Report

1. Cover Page
2. Summary
3. Environmental Forensics
4. Protocol/Recommendations
5. Attached Lab Reports

The Cover Page

- Who conducted the inspection (Company or Group)
- When was the inspection conducted?
- Depiction of the inspected property (ex: Photo of Building)



Microbial Inspection Report

Mold, Allergen, and Bacterial Detection and Solutions

115 Mold Hill Ln., Knoxville TN



**Initial Investigation:
October 20, 2014**

The Summary

- The summary is a written outline of your findings.
(Individual Bullet Point for Each Issue)
- Reference lab data and inspection photos where applicable.

To Whom It May Concern:

Please find enclosed the findings of Assured Bio Inspections' initial environmental investigation conducted on August 12, 2014. An investigation was requested due to concerns of a possible mold issue in the basement of the home.

Executive Summary

- The study was performed by D. Graves and K. Lathrop on August 12, 2014.
- Investigation of the home consisted of a visual inspection conducted by two Assured Bio technicians. Moisture meter readings were collected from multiple areas throughout the basement, along with the collection of air and surface samples in order to assess the presence of mold.
- Visual inspection of the basement level found multiple surfaces exhibiting suspected fungal growth. Direct exam analysis of a surface swab sample collected from contents in the blue corner bedroom on the basement level verified the presence of *Penicillium/Aspergillus*-like molds. (Reference: Figures 1-4/ Assured Bio Direct Exam Report- Sample #8)
- Direct exam analysis of air samples collected from two rooms on the basement level of the home indicate the presence of elevated airborne levels of *Penicillium/Aspergillus*-like molds. (Reference: Assured Bio Direct Exam Report- Samples #1-2)
- DNA analysis conducted on surface swab samples collected from settled dust on both levels of the home indicated an elevation of settled mold spores on surfaces. For the duration of an indoor mold issue, spores are released from mold colonies into the air where they will be potentially deposited in dust. Results rendered from analysis of this type of sample can be used as an indicator of the mold burden on surfaces that do not exhibit suspected visible growth. (Reference: Assured Bio Mold Investigator Report: Sample #5-6)
- Moisture meter readings collected throughout the basement level of the home found multiple walls exhibiting elevated moisture content. A common industry guideline for preventing fungal growth is to maintain a moisture content of below 20%. Multiple areas of exterior basement walls were found to be at or above 20% moisture content at the time of inspection. Many interior walls which were checked with a moisture meter were found to have moisture content above 15%. 10-15% moisture content is sometimes viewed as "average" moisture content for structural wood in a home. (Reference: Figures 5-8)

Summary Examples

- Inspection of the home's attic found a dryer exhaust duct line to be leaking air into the attic during operation of the clothes dryer. Introduction of humid air into an attic or crawlspace is not advised due to the potential for contributing to humidity elevation and humidity associated mold growth. (Reference: **Figure 6**)

- Visual inspection of the basement level found multiple surfaces exhibiting suspected fungal growth. Direct exam analysis of a surface swab sample collected from contents in the blue corner bedroom on the basement level verified the presence of *Penicillium/Aspergillus*-like molds. (Reference: **Figures 1-4**/ Assured Bio Direct Exam Report- Sample 8)

Environmental Forensics

Environmental Forensics = Documentation of IAQ Related Findings

- Each photo or graphic is labeled for easy reference-
(Figure 1, Table 1, etc.)
- A brief description is provided for each photo. Sample data from lab reports can be referenced at this time.

Figure 6



Figure 6 is documentation of a leaking dryer exhaust duct located in the attic of the home. Introduction of humid air into an attic may contribute to elevated humidity and associated molds.

Environmental Forensics

Figure 1



Figures 1-4 document examples of suspected fungal growth found on various items in the basement level of the home. Direct exam analysis of a surface swab sample collected from suspected growth on contents in the blue corner bedroom indicated the presence of *Penicillium/Aspergillus*-like molds. (Assured Bio Direct Exam Report- Sample #8)

Figure 2



Protocol/Recommendations

- Some basic points are always included:
 - 1) Use of Personal Protective Equipment
 - 2) Observance of Containment Procedures
 - 3) Use of HEPA Filtered Air Scrubbers
- Other points are project specific:
 - 1) Removal of Building Materials
 - 2) Decontamination of Contents
 - 3) Installation of Dehumidification Equipment

Recommendations

- During remediation, containment should be constructed in work areas and kept under negative pressure while workers are present. Fans/air movers should be used in conjunction with HEPA filtered air scrubbers while work is underway. All workers inside the containment should wear proper PPE (Personal Protective Equipment), such as Tyvek suits, gloves, and full face respirators.
- It is advised that drywall or other wall material be removed from exterior walls where fungal growth or elevated moisture content is detected. It is likely that moisture has penetrated the South-facing foundation wall, behind the visible drywall, in which case the foundation wall should be sealed prior to replacement of drywall.
- Exploratory demolition should be utilized in areas exhibiting water damage.
- HEPA vacuuming and an antimicrobial wipe-down of all solid surfaces and contents inside the basement level of the home is recommended. Clothing and textiles, such as bedding and curtains, should be dry cleaned following removal from the basement and prior to being moved into another residence. Cloth or porous items exhibiting visible surface mold may need to be disposed if they cannot be effectively cleaned. This will be at the discretion of the occupant and the contracted remediation professional.
- A duct cleaning is recommended to remove any dust build up that may harbor spores inside the HVAC system. In addition to duct cleaning, an assessment of the HVAC system is warranted due to the likelihood of a HVAC issues.
- A Hydro Fog treatment is recommended upon the completion of remediation and cleaning to eliminate any residual airborne spores.
- It is recommended that post remediation verification be performed to ensure that a balanced and healthy fungal environment has been achieved in the home.

Attached Lab Reports

- Lab reports will contain data rendered from samples collected during an inspection.
- Mold types , concentrations, and location give clues to underlying issues.

ABC Identification Number:	DG081314-1-8
Sample Identification Number:	8
Date Collected:	08/12/14
Description:	Basement Blue Bedroom Contents
Sample Type:	Swab
Sample Condition:	Intact
Comments:	

Spore Identifications	Spore Concentration
Acremonium	ND
Acremonium-like	ND
Alternaria	ND
Arthrinium	ND
Aspergillus	ND
Aureobasidium	ND
Botrytis	ND
Ceroaspora	ND
Chaetomium	ND
Claosporium	ND
Coprinus	ND
Curvularia	ND
Drechslera/Bipolaris	ND
Epicoecum	ND
Fusarium	ND
Ganoderma	ND
Memmonella	ND
Nigrospora	ND
Peechiomyces	ND
Penicillium	ND
Penicillium/Aspergillus-like	High
Pithomyces	ND
Scopuleriopsis	ND
Spegezzinia	ND
Stachybotrys	ND
Tetraploe	ND
Torula	ND
Trichoderma	ND
Ulocladium	ND
Wallenia	ND
Ascomycetes-unspecified	ND
Basidiomycetes-unspecified	ND
Hyphomycetes-unspecified	ND
Rusts/Smuts/Myxomycetes	ND
Zygomycetes-unspecified	ND
Miscellaneous structures	ND
Hyphae	Present
Chlamydospores	ND
Perithecia	ND
Sclerotia	ND
Background Particulate Density	Low

The End!

