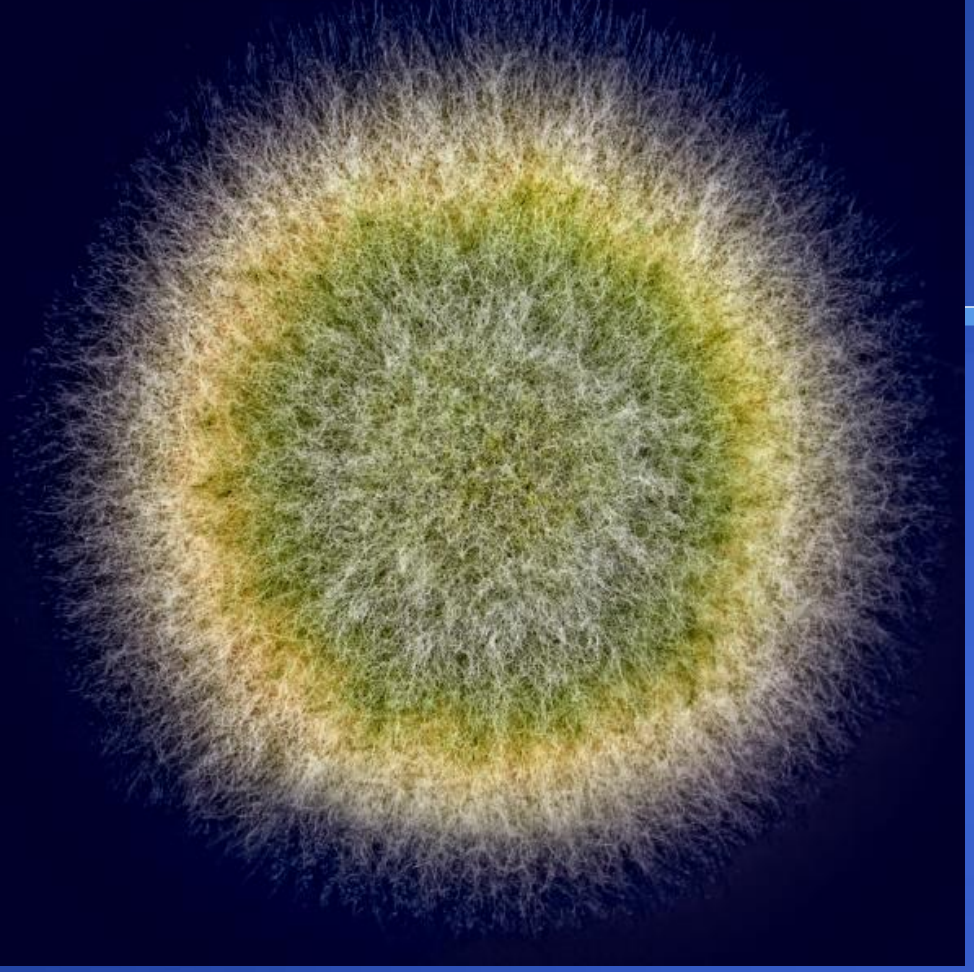


# Mold in the Workplace

## Investigation

*Wisdom Consultants*

# What is mold?

- Mold – microorganism – grows by hyphae
- Propagates – by spores, either asexual or sexual

# Molds are ubiquitous!

- Molds are everywhere….we can't see
- Can grow indoors
- Produce
  - Fragments of mycelium
  - Spores
  - Chemicals (byproducts of metabolism)
    - Antibiotics
    - VOCs
    - Mycotoxins (toxigenic molds)

# What triggers mold investigation?

- Complaints of illness - Occupants inhale mold byproducts
- Odours
- Water intrusion
- Presence of visible mold

  - No enforceable legal standards

# Assessing Health Effects from Mold Controversial

1. Individual immune systems differ

   - very young / old / immuno-compromised (cancer therapy, AIDs)….more susceptible

2. No. of immuno-compromised people in society increasing….living functional lives (outside hospitals)

3. Cannot assume "all occupants healthy"

4. Mold hard to study in humans

   - dose-response relationships not established in humans

# Specific Health Effects linked to Certain Molds

1. Infections

- - Aspergillus fumigatus (hospital acquired)
  - most common fungal infection in world…invasive to lungs
- - Cryptococcus neoformans & Histoplasma capsulatum
  - In bat / bird droppings (pneumonia)

# Specific Health Effects linked to certain molds

2. **Allergic Reaction / Irritation**

Aspergillus fumigatus, Alternaria, Penicillium, Fusarium genera…linked to allergic reaction.

- Aspergillus, Penicillium indoors

3. **Toxicosis**

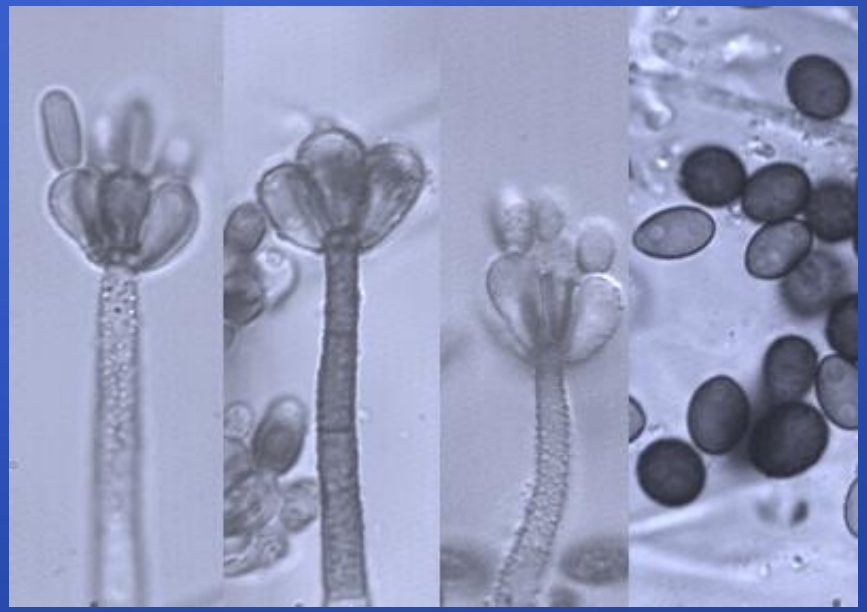
Body's reaction to mycotoxins. Stachybotrys

Earliest reports (Siberia)…large no. of horses died from moldy hay….hemorrhage of GI tract, lung inflammation, blood clotting effects.

# Specific Health Effects linked to certain molds

- Stachybotrys atra (black mold)…trichothecenes, blood
- Aspergillus flavus…aflatoxin B1, liver carcinogen
- Aspergillus versicolor…sterigmatocystin, affects liver

- EM Lab P&K



# Mold Investigation - 10 Steps

1. Act Immediately – water intrusion…Restoration company
2. Find Qualified Help
3. Meetings - Owners, managers, maintenance
4. Site Investigation – water damage, hidden moisture, mold
5. Confidential Interviews – signs & symptoms
6. Sampling
   a) Surface or bulk
   b) Air Sampling – Spore trap, Culture

# Mold Investigation - 10 Steps

7. Written Report
8. Removal of Staff or Occupants
9. Remediation of Building or Site
10. Communication – to management, encourage communication to occupants

# Air Sampling for Mold

Two main types

1. Spore trap analysis (2 days)
   - Air through sticky cassette – spores stick
   - Direct microscopic exam  of spores
   - Spores / m3
2. Culture (5 to 7 days)
   - Grow mold on agar in petrie dish
   - Growth characteristics + reproductive structures
   - CFUs / m3

# Air Sampling for Mold

## Perform both types of sampling – same time

1. Spore traps difficult to interpret
2. Sticky material on cassettes not consistent
3. Spore Trap method cannot identify fungi to genus level
   - Cannot distinguish Aspergillus from Penicillium spores
     - Spores too small
4. Compare results – increased certainty
   - two methods should agree
5. Culture Method – identifies to genus level
   - Can distinguish Aspergillus vs. Penicillium
     - Understand potential health effects

# Interpretation

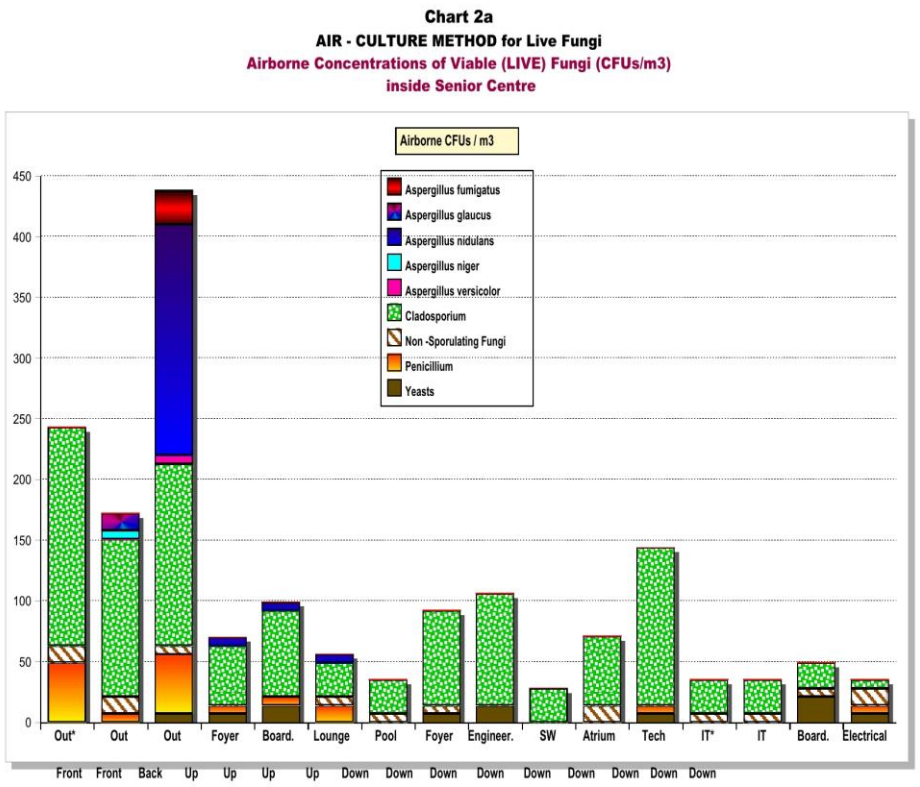
- Looking for patterns, know different genera

1. Genera – grow indoors vs. outdoors
2. Genera – grow on damp building materials
3. Genera – not routinely airborne
4. Genera – special media
5. Genera – produce mycotoxins
6. Genera – that can be pathogenic

# Interpretation

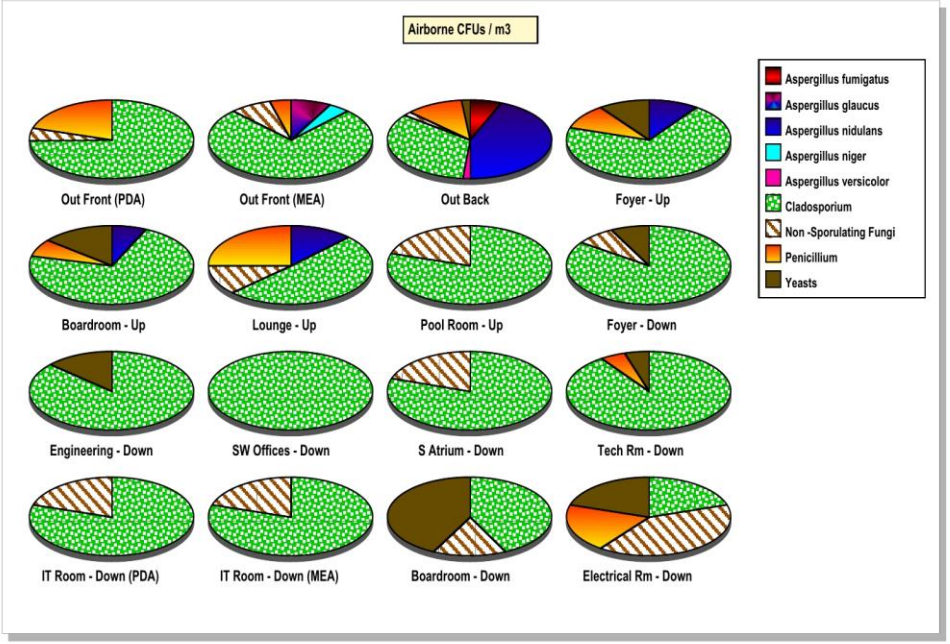
1. Cladosporium – leaf fungi, mainly outdoors
2. Grow on damp building materials – Aspergillus, Penicillium, Acremonium, Stachybotrys
3. Not routinely airborne – Stachybotrys
4. Special media – Stachybotrys
5. Mycotoxins – Aspergillus, Penicillium, Stachybotrys
6. Pathogenic - Aspergillus

# Live Airborne Mold – CFUs/m3



# Airborne Live Mold - Proportions

**Pie Chart 2b**
**AIR - CULTURE METHOD for Live Fungi**
**Proportion of Viable (LIVE) Fungi (CFUs/m3) as a % of Total Live Mold inside Senior Centre**



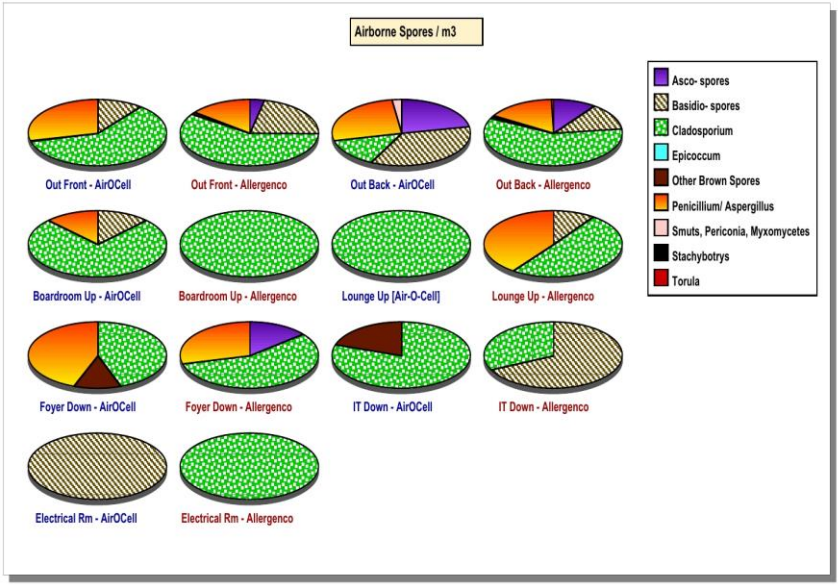
# Airborne Mold Spores – Spore Proportions

**Pie Chart 3b - AIR-O-CELL & ALLERGENCO-D**

**Airborne Fungal Spores (Spores/m3) as a Proportion of Total Spores**

**Senior Centre**

**Viable and Non-Viable Spores determined by Air-O-Cell & Allergenco Sampling)**




Spore sampling is not able to identify all fungi. Penicilium / Aspergillus spores are grouped into 'Penicillium / Aspergillus and can also contain Acremonium and Paecilomyces.

# Water Damage

# Entrance to Building

# Mold Growing Behind Wall

# Mold Growing Behind Wall

# Mold Growing Behind Wall

# Mold Air Sampling

# Mold Growing Behind Paint Layer

# Reference Material

- Moldconsultants.ca
- Wisdommoldconsultants.com
- 3rd Page of Website

- Wisdomconsultants.com
- Wisdomconsultants.ca