

# Indoor Air Quality Assessments

## April 2010 REIN Presentation



Indoor Environmental Testing and Consulting

Proudly Presents

### Indoor Environmental Assessments

## Why is Air Quality Important?



### Indoor Air Quality

- In 1994 Ministry of Health Canada and the EPA in the United States made direct links between polluted indoor spaces and a variety of health problems.

The EPA found that on average pollution indoors can be 6 to 10 times higher than the outside air in most cities.

### What is IAQ

- Temperature
- Relative Humidity
- Carbon Monoxide (deadly gas from combustion)
- Carbon Dioxide (what we exhale)
- Particulates (dust, mould spores, asbestos fibres)
- VOC's (chemical off gassing)
- Mould
- Bacteria

### Temperature and Relative Humidity

- Has direct impact on how people feel in a building. Too cold...Too Hot!
- Can impact odour perception
- Related to the buildings HVAC system

### Carbon Monoxide

- Can be lethal!
- Has no taste or odour.
- Can be sucked into the building from a garage or loading dock
- Can be generated inside the building

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### Carbon Dioxide (CO2)

- We exhale it
- Can be used to measure air flow into building from outside
- If high then inadequate fresh air supply into building

### Particulates

- Anything we inhale that has substance
- Mould spores, pollen, dust, Asbestos fibres, etc.
- Measured in size from 0.3 micron to 10 micron.

### VOC

(Volatile Organic Compounds)

- Chemical off gassing from office furniture, building materials, paints, perfumes, office equipment, dry cleaning, etc.

### Mould

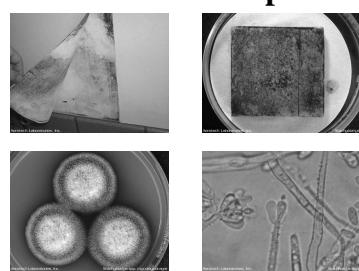
- Mildew, mould, mushrooms

### Environmental Conditions

- Xerophilic moulds are dry-loving.
- Hydrophilic moulds are moisture loving.
- Thermophilic moulds are heat loving.
- Mesophilic moulds love 'room' temperature.
- Psychrophilic moulds prefer temperatures just above freezing.

#### Microbial Organisms

#### What do Moulds look like under the Microscope ?



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### Microbial Organisms

#### **Spores:**

Fungi use spores to colonize or settle and grow in other ideal environments.

Spores are affected by the following:

- Desiccation (dry up)
- High UV
- High and Low Temperatures

### Microbial Organisms

#### **Spores: Dispersal**

Dissemination of spores:

- Many are light and friable, light and easily carried by air
- Others have spore “guns” and explode into air
- Germinate under suitable conditions (e.g. remove inhibitors or proper moisture provided)

### Microbial Organisms

#### **Spores: Dispersal**

Restoration Consultants in California did a study where they lightly misted a 1 square inch area of mould growth with water.

The result was between 1 million to 10 million spores were aerosolized.

### Microbial Organisms

#### **Spores: Dispersal**

- 1 square foot of growth would equal 12 million to 120 million spores.
- 10 square feet of growth would equal 120 million to 1.2 billion spores.
- (Note: 2,000 spores can indicate a fairly mould free environment and 10,000 spores per cubic meter should be limit exposure)

### Microbial Organisms

#### **MVOC**

(Microbial Volatile Organic Compounds)

- Moulds produce chemicals which can be detected as odour.
- These chemicals are called VOC or Volatile Organic Compounds.
- VOC's produced by mould and bacteria are called Microbial VOC or mVOC.

### Microbial Organisms

#### **Colonization Rates**

<u>Microorganism</u>	<u>Days</u>
Candidia	1-2
Rhizopus	1-2
Mucor	1-2
Cryptococcus neoformans (bird dropping)	1-2
Aspergillus	2-3
Penicillium	2-3
Stachybotrys	8-12

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### Microbial Organisms

#### What does mould need to grow ?

##### 4 Things:

- Spores (readily exist in nature).
- Nutrients like cellulose material (paper, wood, cardboard, fabrics, dust).
- Moisture (to begin the decaying process of the cellulose materials).
- Time

#### How do you find it?

### Mould Assessment

#### Investigative Tools



- Thermal Imaging Camera for temperature variance caused by wet building materials.
- Moisture Meter for moisture content.

### Mould Assessment

#### Investigative Tools



- Laser Particle Counter for aerosolized dust and mould spores.
- TVOC chemical monitor for MVOC produced by mould.

### Mould Assessment

#### Investigative Tools



- Temperature and Relative Humidity Meter.
- CO2 Meter to determine ventilation rates.

### Mould Assessment

#### Investigative Tools



- Certified Mould Detection K-9.
- Used for finding hidden source growth areas.

# Indoor Air Quality Assessments

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### Mould Assessment

#### Investigative Tools



##### Laboratory sampling

- Viable mould cultures.
- Spore traps for both viable and non-viable mould spores.



### Mould Assessment

#### Signs of a problem



- Green coloured growth on box
- Black coloured growth on carpet
- Wet carpeting

### Mould Assessment

#### Signs of a problem



- Wet drywall
- Normal drywall has 13% to 15% moisture content.
- Moisture over 20% can start mould growth

### Mould Assessment

#### Signs of a problem



- Wet insulation inside ceiling cavity.
- Vapour barrier trapping moisture
- Moisture source...leak or condensation.

### Mould Assessment

#### Signs of a problem



- Water staining on wood framing
- Cellulose material!

### Mould Assessment

#### Signs of a problem



- Moisture in basement
- Drywall wet
- Concrete floor wet

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### Mould Assessment

#### Signs of a problem

- Moisture in basement
- Drywall wet
- Concrete floor wet



### Mould Assessment

#### Signs of a problem

- Water staining on ceiling
- Clear signs of damage to drywall
- Delamination



### Mould Assessment

#### Signs of a problem

- Mould growth on contents
- Does not have to be black. Can be white, green, pink, brown, black.



### Mould Assessment

#### Signs of a problem

- Growth on wood framing



### Mould Assessment

#### Signs of a problem

- Black growth behind wall paper
- Water staining on wall paper
- Bubbling of wall paper
- Vinyl wall paper!!!



### Mould Assessment

#### Advanced Problems

- Black staining on ceiling
- Water staining on ceiling



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### Mould Assessment

#### Advanced Problems



- Severe mould growth
- Multiple coloured growth
- Strong odor
- Physical damage to drywall and wood floor

### Mould Assessment

#### Hidden Problems



- Mould growth on insulation
- No signs of water damage on drywall

### Mould Assessment

#### Hidden Problems



- Mould growth behind drywall on tar paper
- No signs of water damage on wood panelling

### Mould Assessment

#### Hidden Problems



- Mould growth in the attic from condensation issues.
- Mould growth in the attic from roof leaks.

### Mould Assessment

#### Hidden Problems



- Mould growth under hard wood floors.
- No signs of damage on surface.

### Mould Assessment

#### Alive or Dead

#### It doesn't matter

- Once the mycotoxins are produced they remain attached to the spore.
- If you have a wall with mould and you spray bleach on it...you will kill it.
- However, these dead spores when inhaled still retain the mycotoxins.
- You will have the same health problems.

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### Mould Assessment

#### What are the effects?

Mycotoxins can produce a variety of short term as well as long term health effects. Symptoms can include:

- Dermatitis,
- Cold and flu symptoms,
- Headache,
- Sore throat,
- Fatigue,
- Diarrhea,
- Impaired immune function,
- Infections,
- Coughing, asthma,
- Nose bleeds,
- Breathing problems,
- Hypersensitivity
- Pneumonitis,
- Pulmonary hemosiderosis,
- Cancer,
- Even Death

### Mould Assessment

#### What are the costs?

Mould remediation can be costly!

Small Issues such as one wall to several small areas within one area:      \$2,500 to \$5,000

### Mould Assessment

#### What are the costs?

Mould remediation can be costly!

Medium Issues such as several walls within a large room or several rooms within a small area:      \$5,500 to \$12,000

### Mould Assessment

#### What are the costs?

Mould remediation can be costly!

Large Issues such as an entire basement.      \$12,500 to \$30,000+

### Mould Assessment

#### What are the costs?

Mould remediation can be costly!

Severe Issues such as an entire house.      Can exceed the value of the home.

### Mould Assessment

#### What are the costs?

Mould remediation can be costly!

Does not include repair of the remediated area or the cost to move a tenant!!!

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### Mould Assessment Overview

- Mould can grow within 24 to 48 hours.
- Mould need moisture and a cellulose material.
- Moulds is capable of growing and surviving in wide range of conditions.
- Mould spores are easily dispersed.
- Mould is a real threat to a building and occupant health.

### Prevention

**All indoor environments should be tested prior to purchase and on a regular basis.**

- **Mitigate loss! The sooner you find it the lower the cost to fix it.**
- **Less down time for a property.**
- **Happier tenants pay rent!**