Safety Manual 3.2.1

Biological Hazards (Mould and Bacteria)

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Table of Contents

Mould and bacteria can have **immediate** health effects. When doing a mould assessment you must be aware of the hazards and **have appropriate PPE with you**!

You must bring the following PPE to **ALL** biological jobs:

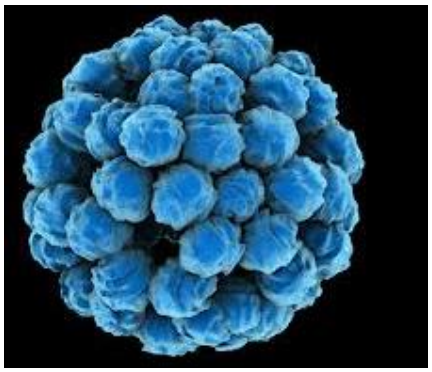
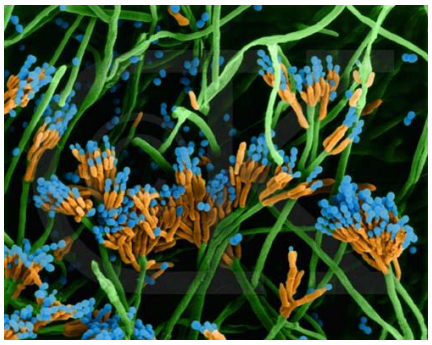
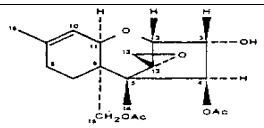
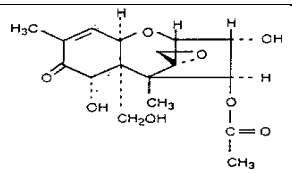
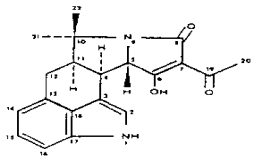
- Fit tested respirator
    - Organic vapour cartridges with particulate filters,
    - Or Particulate filters with activated charcoal.
- Disposable overalls,
- Disposable boot covers,
- Disposable gloves,
- Safety glasses.

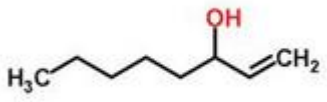
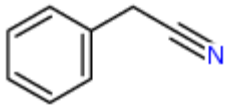
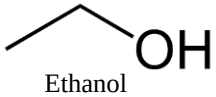
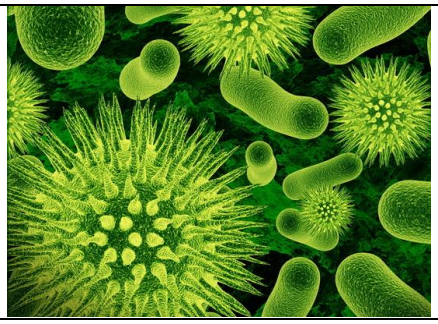
You may not need all this PPE but you must have it with you as you often don't know how bad it is until you arrive on site. See below for determining what PPE to wear.

You **MUST** have done the training in the training manual for biological assessments.
C:\1 Training Manual\Training Resources\Occ Health\Biological\Mould and Fungus

1 WHAT IS THE HAZARD?

Micro-biological species that can affect a person's health. These include:-

	**Mould spores** • Released from growing mould, • Easily airborne, • Respiratory risk, • Cause a variety of health symptoms depending on species and growing conditions.
	**Mould fragments** • From dead and growing mould • Can become airborne, • Respiratory risk • Can contain toxic compounds, such as mycotoxins
 (a) Diacetoxyscirpenol  (b) Fusarenone X  (c) Cyclopiazonic acid	**Mycotoxins** • Toxic compounds produced by mould, • Relatively large and not easily evaporated, • Can become airborne, • Often found in mould spores and fragments, • LONG lasting in the environment (months to years).

 1-Octen-3-ol  Benzyl cyanide  Ethanol	**Microbial Volatile Organic Compounds (mVOC)** • Relatively small molecules that have strong odours, • Easily evaporate and become airborne gases, • Often the cause of the earthy/musty smells associated with mould growth.
	**Bacteria** • Grows when there is a lot of water, • Can cause infections, diseases and allergies on contact.
	**Hydrogen sulphide** • Product of bacterial breakdown of organic matter, • Rotten egg smell • **This gas is heavier than air, very poisonous, corrosive, flammable and explosive.**

2 COMMON CAUSES?

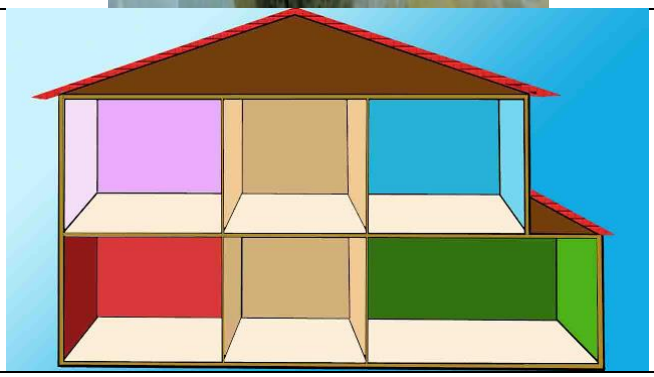
Water!

Common sources include.

- Water leaks
    - Flooding
    - Leaky roofs or walls
    - Plumbing leaks
    - Overflow from sinks or sewers
    - Sprinkler spray hitting the house
- Water vapour
    - Damp basement or crawl space
    - Steam from shower or cooking
    - High humidity and poor ventilation
    - Humidifiers
    - Wet clothes drying indoors or clothes dryers exhausting indoors.
    - Discarded waste/rubbish
    - Deceased animals
    - Lack of ventilation
    - Respiration (breathing in and out)

3 WHERE TO FIND IT?

3.1 Mould growth

	Mould and fungi typically grow in wet or damp conditions. Mould cannot grow without a source of moisture.
	If enough moisture is present mould can grow on almost any organic material including, but not limited to: • Plaster board, • Wood, • Paper, • Dirt, • Food, • Fabric, • Dead skin and other dust particles
	Mould can be found: • On Walls, • Floors, • Benches, • Inside wall cavities, • Inside floor and ceiling cavities… • Basements, • **Anywhere that has excess moisture.**

3.2 Bacterial growth

Often where there is mould growing due to moisture issues, there will also be bacteria present that can be a health risk

The Good

Helpful bacteria that live in harmony with humans:

- Bacteria in a humans digestive system,
- Yoghurt – *Lactobacillus* bacteria.

The Bad

Cause negative health effects to humans:

- Legionnaires disease - *Legionella*
- Pneumonia
- *Campylobacter* - Food poisoning
- Pseudomonas bacteria – can cause serious infections and diseases.

The Ugly

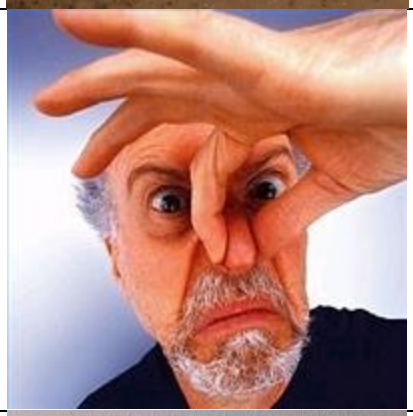
- Skin and lung infections (especially if exposed to broken skin),
- Serious health complications can result after exposure to some bacteria.
- Stagnant pooling water.

Pooling stagnant water

- VERY Likely to contain bacteria, such as pseudomonas,
- Likely to have a negative health effect to humans.
- AVOID CONTACT!!!
- If exposure occurs – wash area IMMEDIATELY!

4 HOW TO RECOGNIZE IT?

4.1 Mould

	Mould growth on surfaces can often be seen as: • Discoloration to building materials, paper etc. • Cottony or speckled patterns on walls, ceilings or furniture. • Fluffy or furry growth on surfaces.
	An earthy musty odour often accompanies mould growth.
 	Signs of water damage can be warning signs for mould as well, such as: • Bubbling of paint. • Water stains on building materials. • Warped floors or rotten wood.

4.2 Bacteria

	Hazardous bacteria is often present in stagnant or pooling water.
	**Not visible to the naked eye.**
	A strong sulphur or rotten egg odour can accompany bacterial growth. • If you smell rotten eggs, particularly in enclosed spaces, you MUST leave the area immediately. • Rotten egg smell is caused by Hydrogen Sulphide gas. • This gas affects the olfactory senses, after initial exposure they shut down, this leads to people thinking the smell has gone.

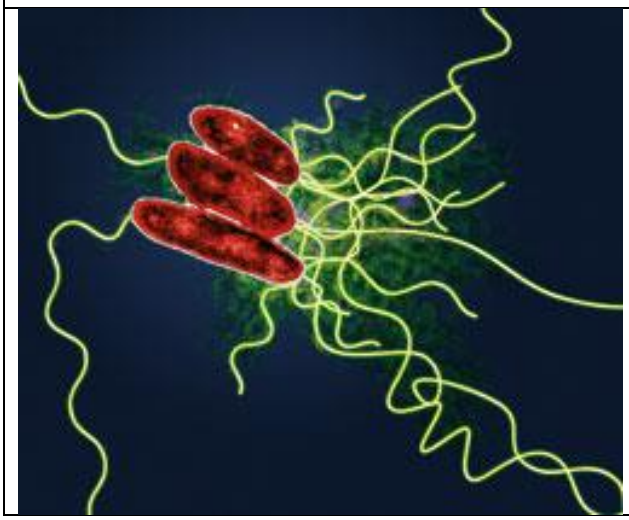
5 FURTHER READING

For information on how to do a mould assessment read the test methods in the following folder:

\\K2NAS\K2-data\2 Technical Manual\TM4 Test methods\2 Occupational Health\2 Biological\Methods

6 EXAMPLES OF THE HAZARD

Example photos	*Mould damage classification*	*Species*
	**Level 4:** Extensive visible growth on: • More than 25% of surfaces • Or greater than $10m^2$.	***Stachybotrys*** mould (The dreaded "Black Mould") – Can have toxic effects • This is a greenish black mould that grows on material with a high cellulose content, such as fiberboard, paper covering gypsum wallboard (such as GIB), wallpaper, dust and wood. • It requires very wet conditions for weeks in order to grow. Usually takes 2-3 months
	**Level 3:** Visible growth on: • Less than 25% of surfaces • Or greater than $1m^2$ but less than $10m^2$.	***Penicillium/Aspergillus*** type mould/spores – Respiratory illnesses • Grow in damp conditions, • Often an indication of elevated humidity.

	**N/A**	**Basidiomycetes** type fungi – Timber and building material decay. • Grows in wet building materials, • Often causing structural damage to timber and other materials, • Can cause allergic reactions to some people.
	N/A	**Legionella bacteria** – Disease causing bacteria. Documented sources include: • Cooling towers, • Potting mix • Swimming pools • Ice making machines • Dental equipment • Hot springs • Fountains…etc Favors very wet conditions!!

7 EXPOSURE SYMPTOMS

Common symptoms of mould and bacteria exposure include:

- Cold and flu like symptoms
    - Respiratory problems,
        - Wheezing,
        - Shortness of breath;
        - Dry, hacking cough;
    - Nasal and sinus congestion
    - Eye irritation (
        - Burning,
        - Watery,
        - Reddened eyes.
    - Nose or throat irritation;
    - Skin rashes or irritation.
    - Fever
    - Headaches

- General unwellness,
    - Memory problems
    - Mood swings
    - Nosebleeds
    - Body aches and pains

Most people who experience negative health effects associated with mould fully recover upon leaving the contaminated site or once the building has been cleared of the contamination.

Negative health effects due to bacteria can require medical treatment, such as antibiotics.

8 VULNERABLE GROUPS

Everyone is exposed to some mould spores and bacteria on a daily basis without noticeable harm.

Mould spores usually cause health problems when they are inhaled in large numbers. However some people are more vulnerable than others. For example:

- **Asthmatics**. People with pre-existing asthma are at greater risk when exposed to mould. Relatively low exposures can trigger an asthma attack.
- **Weakened Immune System**. People undergoing chemotherapy or those infected with HIV are more susceptible to health effects of mould.
- **Elderly and infants** are also likely to be more vulnerable.

Anybody that is in one of these vulnerable groups should not be going onto sites where it is suspected that elevated mould levels are likely to be present.

9 LEGISLATION

The Health and Safety in Employment Act 1992 (HSE Act) details how to manage the health and safety of people in the workplace.

The act states that "all **practicable steps** must be taken to manage hazards in the workplace".

10 MANAGEMENT OF THE HAZARD

These hazards **cannot** be eliminated, as we are usually there to assess this hazard. However you can:

- Minimize your exposure time where possible,
- Wear appropriate PPE, this will depend on the extent of the biological contamination, (**see section 11 below**)
- Be aware of exposure symptoms and get out if they show (**See section 7 above**),
- Wash any areas that come into contact with mould, bacteria or stagnant water immediately,
- Discard all disposable PPE upon completion of assessment,

If exposure occurs and a technician starts to notice any of the exposure symptoms above:

- Leave the contaminated area and seek fresh air immediately,
- If fresh air does not help seek medical advice
- If symptoms are severe call an ambulance, or have a colleague take you to the emergency room.

If a technician is exposed to water that is likely to be contaminated while on site:

- Wash the area of exposure **immediately** with fresh water.
- Inform others of the hazard and avoid any further contact with the water.
- Any contaminated clothing must be removed, and washed.

11 MOULD ASSESSMENT - PPE CLASSIFICATION SYSTEM

Classification	Photo Examples	Conditions	PPE Requirements
Level 1		• No visible mould growth • No mould odour • No health complaints • No known or obvious moisture damage	• No Mask required • No Protective clothing required
Level 2		• Limited visible mould growth • Known water damage present • Suspected mould growth • Mould odour is present • No Serious health complaints from time spent in building	• Half-Face Respirator Mask • HEPA Filters on mask • Activated carbon or organic vapour filters on mask if strong odours • No Protective clothing
Level 3		• Visible mould on less than 25% of surfaces and less than 10m2 • Serious mould damage over period of time. • Known health complaints	• Half-Face Respirator Mask • HEPA Filters • When strong odours present use full-face mask with activated carbon or organic vapour filters • Splash goggles • Disposable overalls • Gloves
Level 4		• Extensive visible growth on more than 25% of surfaces and greater than 10m2 • Likely structural damage to building • Known health complaints	• Maximum of 2 hour exposure! • Full-Face respirator mask • HEPA filters with activated carbon or organic vapour filters on mask • Disposable overalls • Disposable gloves • Disposable shoe protectors • All joins in protective clothing to be sealed with tape (ankles and wrists)

12 UPDATE LOG

Date	Version	Author	Changes	Check	Approved by
July 2014	Ver. 1	Jess Newcombe	The whole thing was written		
21 July 2014	Ver. 1	Ben Keesing	Added several new sections for Jess to review		
30 Jan 2015	Ver. 1	Jess Newcombe	Finished writing updated Bens Suggestions	Shona Huffadine James Piesse	
9 Feb	Ver 1	Stuart Keer-Keer	Review and suggest improvements		
13 Dec 15	Ver 2	Stuart	Reviewed, very small subtle change		Stuart

Questions to answer when you have read the biological hazard form:

Name	Question 1	Question 2	Question 3
Jason Dickson	What color is *Stachybotrys*	Why do you need charcoal filter in type 2 mask	What are the signs that mould is present
Matthew Taylor	What do you need for *pseudomonas* to grow?	What do you need for *pseudomonas* to grow?	What documents should I read if I want to learn more
Katie Andrews	What type of filter (3m) is suitable for type 2, 3, 4 ppe.	What does the procedure say about hazards even though there is no visible mould growth.	What do you need for *pseudomonas* to grow?
Matthew Wilson	What do you need for *pseudomonas* to grow?	What ventilation is suggested in this method	What are Mycotoxins
James Piesse	Before you do an assessment how do you know what PPE to use?	What do you need for *pseudomonas* to grow?	What will I notice if I am affected by mould exposure
Charles McClutchon	What do you need for *pseudomonas* to grow?	Why do you need charcoal filter in type 2 mask	Who is the most vulnerable people?
Jessica Newcombe	Is penicillin a mould or Fungi?	What does the procedure say about mould in wall spaces?	Who should not be going into Mould affected properties
Carol Keer-Keer	What are Mycotoxins	What do you need for *pseudomonas* to grow?	Dry carpet can that be a hazard?
Stephanie Keer-Keer	What do you need for *pseudomonas* to grow?	What are Mycotoxins	What are the health effects from mould exposure?

Luke Greenfield	What color is *Stachybotrys*	Why do you need charcoal filter in type 2 mask	What are Mycotoxins
Stephen Nouwens	What is used to make Cheese?	Is all mould bad?	Why is camebert soft and others not soft
Stuart Keer-Keer	What protection factor does the procedure say must be obtained on the mask	What do you need for *pseudomonas* to grow?	Where does *Stachybotrys* typically grow?
Lance Constable	What color is *Stachybotrys*	What are Mycotoxins	What causes mould to grow
Kathy Higgins	What color is *Stachybotrys*	Why do you need charcoal filter in type 2 mask	What type of filter (3m) is suitable for type 2, 3, 4 ppe.
Cameron Keer-Keer	What do you do with your PPE after a visiting a site that has type 3 or 4 PPE	What do you need for *pseudomonas* to grow?	What color is *Stachybotrys*
Shona Huffadine	What color is *Stachybotrys*	Why do you need charcoal filter in type 2 mask	What do you need for *pseudomonas* to grow?
Nicholas Pothecary	What is likely to be present in pooling water	Where would you expect to find Basidomytes?	What will happen if you are exposed to H_2S
Mike King	What health effects are likely from exposure to mould	What sulphur gases can be found in a contaminated site	How do you know if mould is present?
Megan Sagar	What persons are most likely to be affected by biological contamination?	How can you detect H_2S	How long does it take for Stachybotrys to grow
Beth Scarrow	What persons are most likely to be affected by biological contamination?	How can you detect H_2S	How long does it take for Stachybotrys to grow
