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Observing bread mould

Posted by Anonymous on Thu, 2019-05-09 15:59

Observing bread mould: Can we grow some mould on bread in a plastic bag and then open the bag to transfer some mould onto a glass slide, with glycerine and a coverslip to view under a microscope? Can we also transfer some onto an agar plate? We only have fume cupboards (no laminar flow cupboards) if that helps.

Voting:



No votes yet

Year Level:

Senior Secondary

Laboratory Technicians:

Laboratory Technicians

Showing 1-1 of 1 Responses

Answer by labsupport on question Observing bread mould

Submitted by sat on 09 May 2019

In brief:

It is permitted to grow and observe mould on bread in a sealed plastic bag or sealed Petri dish, however, it is not advisable to open the bag or Petri dish because of the hazards associated with the release of fungal spores.

Common household microorganisms associated with bread mould include *Rhizopus stolonifera*, *Penicillium sp.*, *Aspergillus sp.* and *Cladosporium sp.* These are not considered pathogens but are referred to as 'opportunistic'. Opportunistic microorganisms are those able to cause disease if provided with appropriate conditions.

The intent to conduct activities beyond simple observation of bread mould in a sealed container requires a high level of staff training in microbiology and certain laboratory facilities. Staff training includes knowledge and experience in aseptic techniques, sterilisation and decontamination procedures to recognise and control or manage the risk. A minimum of PC1 facilities and equipment such as an autoclave or appropriate pressure cooker for sterile preparation and decontamination of waste are also required.

Fume cupboards, laminar flow cabinets and biological cabinets work differently for different purposes and differ in the level of protection provided to the user. We provide some further information below.

Science ASSIST recommends observing bread mould in sealed containers and providing alternate hands-on activities for students.

Opening a container with bread mould

The presence of fungal (dry) spores if kept in a sealed container such as a zip-locked bag or Petri dish, does not present a risk.

Opening a zip-lock bag or Petri dish containing mixed species of mould growing on bread to prepare a slide or subculture onto an agar plate introduces the risk of exposure to potentially hazardous fungal spores. A large amount of fungal spores too small to be seen with the naked eye would be released into the environment which will float in the air and disperse throughout the room increasing the normal load to about 2 orders of magnitude (M. Cole, personal communication, 12 April 2019).

- To healthy adults this may not present a problem, however if inhaled the opportunity exists for people with allergies, asthma, or those immunosuppressed to be adversely affected.
- The spores are likely to stay in the room for a long time, possibly for up to 4-5 weeks. (M. Cole, personal communication, 12 April 2019)
- Given that there are several different groups of teachers and students that may use the same science laboratory, the risks of adverse reactions extend beyond the staff and students who originally conducted the activity.
- Face masks as used in health care settings may not afford the level of protection required. Even if they did, one would need to consider the supply of these for everyone who would be subsequently working in that room, possibly for the next few weeks!
- Depending upon the presence and type of air-conditioning systems, these may spread the spores to rooms beyond the laboratory where the activity was conducted.

Therefore containers with bread mould should not be opened. The proposed activities would introduce further challenges and risks.

Preparing slides for microscope viewing

It is technically difficult to prepare slides of mycelium and spores for microscope viewing.

- It is most likely that students will create a slide with a mass of material on it which is tangled, and it will not be possible to discern any structures.
- Even experienced mycologists may have to prepare many slides before one is clear enough to identify the structures of a fungus.
- The manipulation of fungal cultures with forceps and needles also generates fungal spore aerosols adding to the load in the laboratory environment.

Subculturing mould from bread to an agar plate

The specialised technique of sub-culturing requires sound knowledge and expertise to minimise risks involved. Many jurisdictions do not allow cultures to be opened for any manipulation due to the significant risks of contamination and growing unknown microorganisms.

Fume cupboards and Biological Safety cabinets

Fume cupboards, laminar flow cabinets and biological cabinets work differently for different purposes and differ in the level of protection provided to the user.

- Fume cupboards are not designed for biological work.¹ They operate differently and are designed for use with chemical hazards, such as hazardous gases, vapours, fumes and dusts. They draw air away from you and protect you, the worker from chemical hazards.
- A Laminar flow cabinet directs air across the workspace and towards the user and the laboratory. It protects the specimen being used from contamination and offers no protection for the user or environment from any infectious materials/aerosols.
- A biological safety cabinet (BSC) depending on the class (I, II or III), can protect the user, the environment and the specimen being handled from contamination. Air is HEPA-filtered before release back into the environment.

The following document gives a brief comparison, see 'Use of the Laboratory Fume-hood'. University of Wollongong website.

<https://smah.uow.edu.au/content/groups/public/@web/@sci/@chem/documents/doc/uow059174.pdf>
(May 2010)

Alternative activities

It is recommended that alternative practical activities are provided for students such as the use of:

- A **Dissecting microscope or magnifying glass** to view

- bread mould through the lid of a sealed Petri dish or zip-lock bag.
- mould on other food items such as cheese, oranges or pumpkin by placing small pieces into a Petri dish, zip-lock bag or larger pieces into clear plastic containers with no holes (such as is used for supplying some products to the supermarket).
- A **Compound microscope** to view purchased prepared slides of the same or similar moulds.
- A **BioViewer** to view photomicrographs of the same or similar moulds. A BioViewer is an instrument like a microscope which requires no power source, batteries or light source. Ambient light is utilised to magnify purchased photomicrographs.
- **Food based 'wet' microorganisms** for school microbiology activities, examples include yoghurt or wine or baking yeast in wet pack. If dry it will need rehydrating for 30mins prior to using.

Conducting microbiology activities in schools

Science ASSIST has produced "GUIDELINES for best practice for microbiology in Australian schools" see <https://assist.asta.edu.au/resource/4196/guidelines-best-practice-microbiology-australian-schools>. We recommend that your school is familiar with the content of this guide before contemplating the delivery of practical activities in microbiology.

The school context is a highly variable environment, in particular the staff training in microbiology and science facilities.

When conducting a microbiology activity, it is important to consider what microorganism is being used and how it is being used. In particular, see chapter 3 and 4 regarding risk assessment; school work levels; staff training and microbiology rules. From page 13:

"Before schools embark on working with microorganisms they should ask the following questions and perform a site-specific biological risk assessment.

- *What microorganism is being used? Is it a Risk Group 1 microorganism?*
- *Do the school facilities comply with the requirements of Physical Containment Level 1 laboratories?*
- *Does the school have the necessary equipment for sterilisation and decontamination procedures?*
- *Does the staff have training in microbiological skills?*
- *What manipulations are being performed with the microorganism? Are methods being used to eliminate or minimise exposure to potentially infectious material via aerosols, splashes, ingestion, absorption and accidental inoculation?*
- *Are any staff or students wishing to participate in microbiological activities immunocompromised or immunosuppressed (include those who are pregnant or may become pregnant, or are living with or caring for an immunocompromised individual)? These individuals are more prone to infections and they should consult a doctor to determine whether their participation is appropriate."*

Science ASSIST has also produced a SOP: Growing fungi on bread². This activity aligns with Science ASSIST'S **School Work Level 1**

School work level 1 is considered very low risk due to the type of microorganism used and the

activity performed. Under this level, bread mould can be grown and observed in closed containers which are never opened.

Conditions of school work level 1 include:

- Limited to microorganisms used for food purposes and grown on substances on which they grow naturally.
- Growth conducted in closed containers at ambient room temperature.
- No agar plates used.
- No specialist training required for teacher or technician
- No special waste treatment required. Able to be placed into the regular waste or down the sink.

The higher school work levels require certain facilities and equipment and each one requires a higher level of staff training

We have also previously answered questions on similar topics

- <https://assist.asta.edu.au/question/2690/students-investigating-mould-and-bacterial-growth-food-items>
- <https://assist.asta.edu.au/question/2782/mould-investigations-extra-questions>
- <https://assist.asta.edu.au/question/3865/growing-mould-bread>

What the Australian Standards say:

The Australian Standards AS/NZS 2243.3-2010 *Safety in Laboratories Part 3 Microbiological safety and containment* states the following:

'Airborne fungal spores spread in a similar manner to aerosols. Cover or seal cultures of spore producing fungi to prevent dispersal' **5.2.3 Work Practices (PC1 Laboratories)**

'Fume cupboards and recirculating fume cabinets shall not be used when working with infectious materials' from AS/NZS 2243.3:2010 **Section 10.1 Chemicals**

'Microbiological work should be planned to limit the reliance on respiratory protective equipment (RPE). Most laboratory work with microorganisms transmissible to humans by the respiratory route is conducted in containment equipment such as a BSC' **10.2.5 Respiratory protection**

'The term 'face masks' is used to describe masks designed for use in health care, such as in operating rooms, medical and dental procedures. These types of masks are covered in AS 4381. They are not for use where an additional degree of respiratory protection is required from the risk of airborne transmission of infection, and they do not meet the requirements for RPE specified in AS/NZS 1715' **10.2.5 Respiratory protection¹**

References and further reading

¹ Standards Australia. 2010. AS/NZS 2243 *Safety in Laboratories, Part 3: 2010 Microbiological safety and containment*. Sydney, Australia. Reproduced with permission from

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² Science ASSIST. 2016. *GUIDELINES for best practice for microbiology in Australian schools*. Science ASSIST website, <https://assist.asta.edu.au/resource/4196/guidelines-best-practice-microbiology-australian-schools> (Page 84)

'Bread Mold: How To Identify Types Of Mold', Science Trends website, <https://sciencetrends.com/bread-mold-how-to-identify-types-of-mold/> (26 July 2018)

Cole, Mary. 2019. Personal communication. Agpath P/L; University of Melbourne.

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'Molds On Food: Are They Dangerous?', United States Department of Agriculture website, https://www.fsis.usda.gov/wps/portal/fsis/topics/food-safety-education/get-answers/food-safety-fact-sheets/safe-food-handling/molds-on-food-are-they-dangerous_/ct_index (22 August 2013)

'Mould', NSW Government Department of Health website, <https://www.health.nsw.gov.au/environment/factsheets/Pages/mould.aspx> (22 May 2012)

'Observing fungi in a petri dish', Microbiology online website, <https://microbiologyonline.org/teachers/observing-microbes/observing-fungi-in-a-petri-dish> (Accessed May 2019)

'Potentially Hazardous Biological Agents', The Society for Science & the Public website, <https://student.societyforscience.org/potentially-hazardous-biological-agents> (Accessed May 2019)

University of Wollongong. 2010. *Use of the Laboratory Fume-hood*, University of Wollongong website, <https://smah.uow.edu.au/content/groups/public/@web/@sci/@chem/documents/doc/uow059174.pdf>

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