

# NWSE Microbiology Safety Guidelines for Middle School Projects

## When can you use these safety guidelines?

Normally, students whose projects may involve pathogenic microbes must work with a Qualified Scientist (a person with a Ph.D. in microbiology) before and during the project to be sure the project is done safely. They are also required to get the project pre-approved by a Scientific Review Committee (SRC). However, for Middle-School students we allow certain types of projects that may involve pathogens to be carried out with parental permission and teacher's supervision, without requiring a Qualified Scientist. It is not necessary to involve a Qualified Scientist or pre-approval by an SRC for Middle-School projects **IF** the projects:

1. Involve cultures that are certified as being non-pathogenic by the supplier of the microorganisms; or
2. Involve collecting samples from nature (which therefore may contain pathogens), but the procedures in this document are carefully followed.

So, the procedures in this document may be substituted for the ISEF rules if one of the above conditions is met. The teacher takes the responsibility that these procedures are followed. If they are not, the project will be disqualified at the Intel NWSE.

## When do you need to follow ISEF rules?

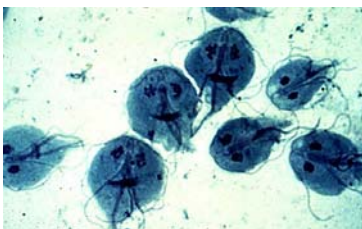
You need to follow the International Science and Engineering Fair (ISEF) rules if:

1. The microbiology experiments propose to use known pathogens.
2. The microbiology experiments propose to sub-culture, transfer, or isolate any microorganisms.

In these 2 cases, a SRC must approve the proposed research before the experiments are started, and the experiments may only be performed under the direct supervision of an experienced Qualified Scientist. Non-specialist teachers should not carry out or supervise this work except as approved by the Qualified Scientist.

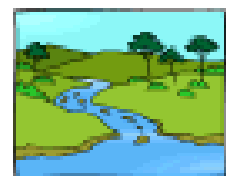
### What are microorganisms and pathogens?

A microorganism is an organism of microscopic size. A pathogen is an organism that causes disease. Pathogens are often microorganisms such as a fungus, bacterium, protozoan, or virus. Most microorganisms are not pathogens.



### What kind of samples may contain pathogens?

Any samples that are collected from the environment (soil samples, water samples, etc.) have the potential to contain pathogens. Any samples collected from the body (fingers, hands, etc.) also have the potential to contain pathogens. When samples are collected from nature, it must be assumed that the samples may contain pathogens.



### Safe culturing and observation of microorganisms

1. Do not culture organisms from environments that are likely to contain harmful organisms (toilet seats, pet wastes, etc.).
2. Do not use culture media that selects for potential pathogens (such as blood agar, MacConkey's agar, etc.).  
**Nutrient Agar** is inexpensive and suitable for the growth of many bacteria.
3. Prevent accidental exposure to cultures by taping the lids and bottoms of Petri dishes after they have been inoculated so the dishes will not open. Petri dishes must remain closed after inoculation, during incubation, and during observation or counting of the colonies.
4. After a culture has been grown, do not subculture or transfer organisms from one medium to another.
5. The supervisor (teacher) should supervise students while students observe the colonies.

### Safe disposal of cultures and organisms

All Petri dishes and cultures must be sterilized before disposal to kill all microorganisms. Acceptable methods of sterilizing cultures are:

- ❖ **Autoclave:** Follow the directions on the autoclave for proper use.
- ❖ **Pressure Cooker:** Loosen lids on any glass bottles, and place cultures in a heat-resistant plastic "oven" bag. Add 1 inch of water to the cooker and then place the heat-resistant plastic bags into the pressure cooker. Cook at 15 pounds per square inch (psi) (approximately 1 atmosphere) for 20 minutes after the cooker begins releasing steam.
- ❖ **Bleach Solution:** Soak cultures for 15 minutes in a 3% bleach solution.

### General safety precautions

1. No eating, drinking, smoking, or applying make-up in the laboratory.
2. Wear a lab apron/coat and disposable gloves if they are available.
3. Wash hands before and after lab activities with soap and water and cover any cuts with bandages.
4. Clean lab benches with a commercial disinfectant solution (such as a 10% bleach solution) before and after lab activities. Only allow personal items such as lab manuals and notebooks on the lab bench.
5. Do not allow hand-to-mouth activities such as licking labels, mouth pipetting, or placing objects such as pens and pencils in the mouth.
6. Discard cotton swabs and other disposables in heat-resistant bags ("oven" bags).
7. Report any accidents that involve spilled cultures. If you spill a culture, place paper towels over the spill, liberally apply disinfectant or bleach solution to the towels and let the disinfectant soak in for several minutes. Wearing gloves, dispose of the paper towels into a heat-resistant bag ("oven" bags).

### Additional Resources

- ASM. 2002. American Society for Microbiology: education; middle and high school teachers.  
<http://www.asm.org/edusrc/edu9.htm>
- Ewald, H. T., J. H. Brashears, C. N. Huynh, E. B. Freeman, M. V. Corvini, M. F. Davis, E. M. Femenia, B. R. Hart, and C. W. Vermeulen. 1997. Micro-organisms for education. <http://www.science-projects.com/safemicrobes.htm>
- SGM. 2001. Society for General Microbiology basic practical microbiology: safety guidelines.  
<http://www.microbiologyonline.org.uk/forms/BPMSafeG.pdf>
- The Chemical Heritage Foundation. 2002. Microbiology Safety Guidelines.  
<http://www.chemheritage.org/EducationalServices/pharm/tg/antibiot/activity/reslab.htm>