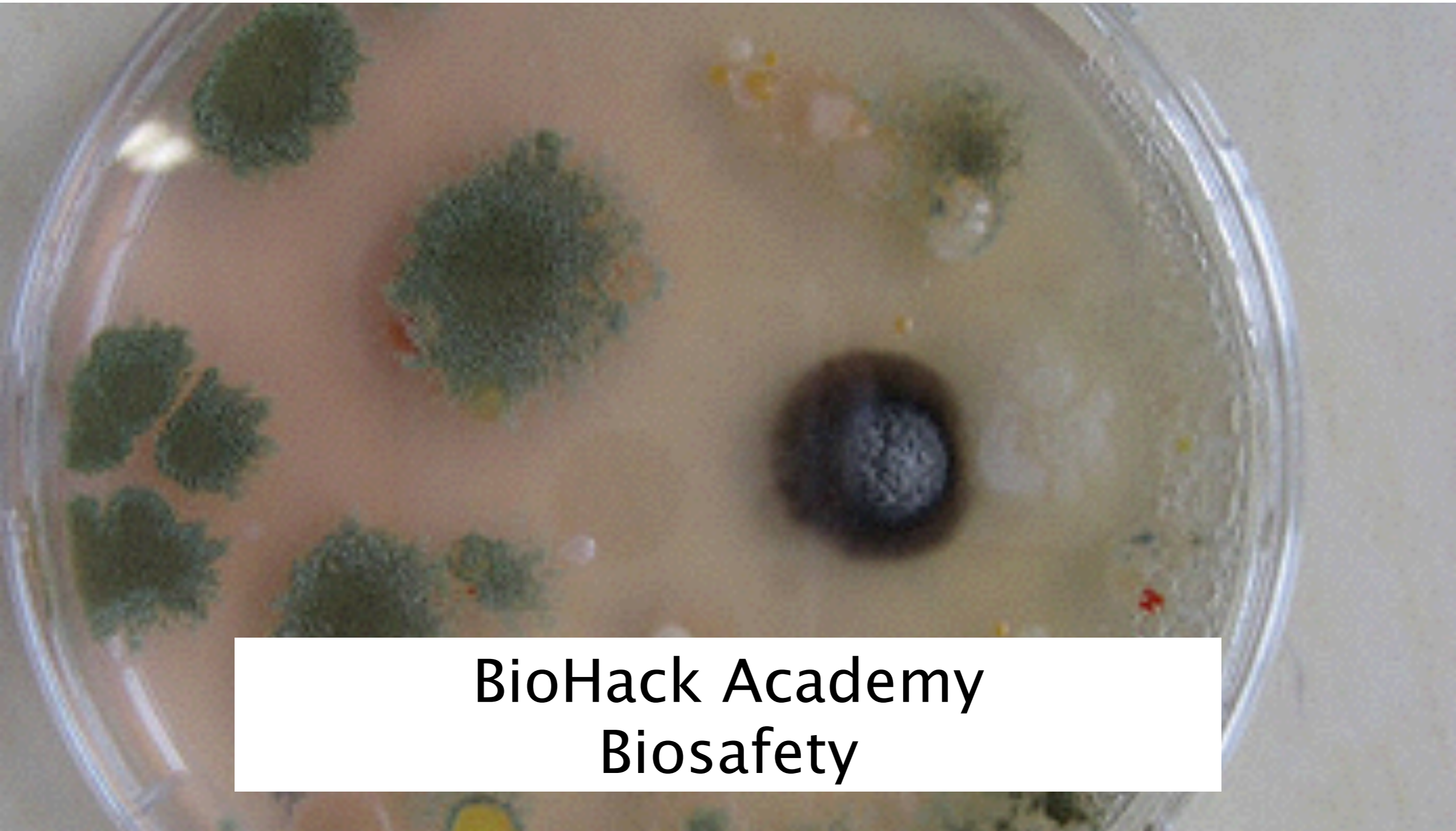




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**BioHack Academy  
Biosafety**



## Importance of safety

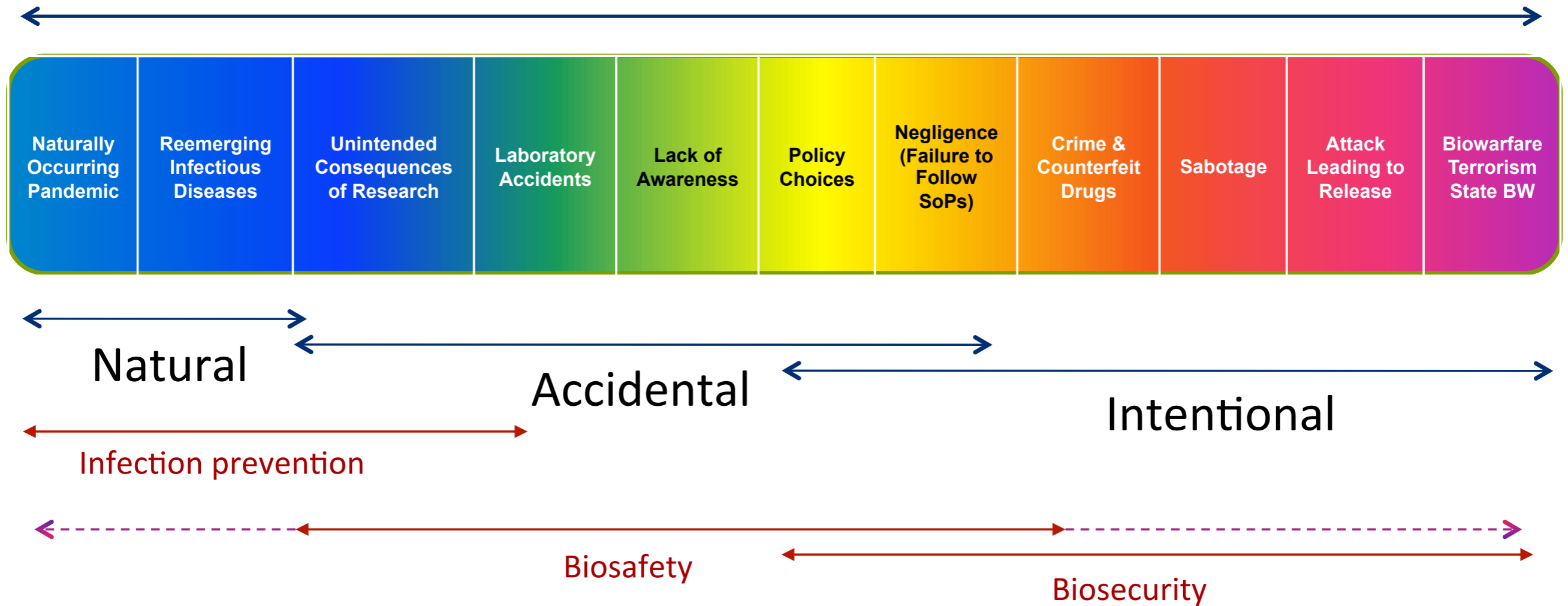
Safe procedures protect:

1. The environment
2. Your colleagues
3. Yourself



# Spectrum of Risk

Biological risks can be seen as a spectrum:

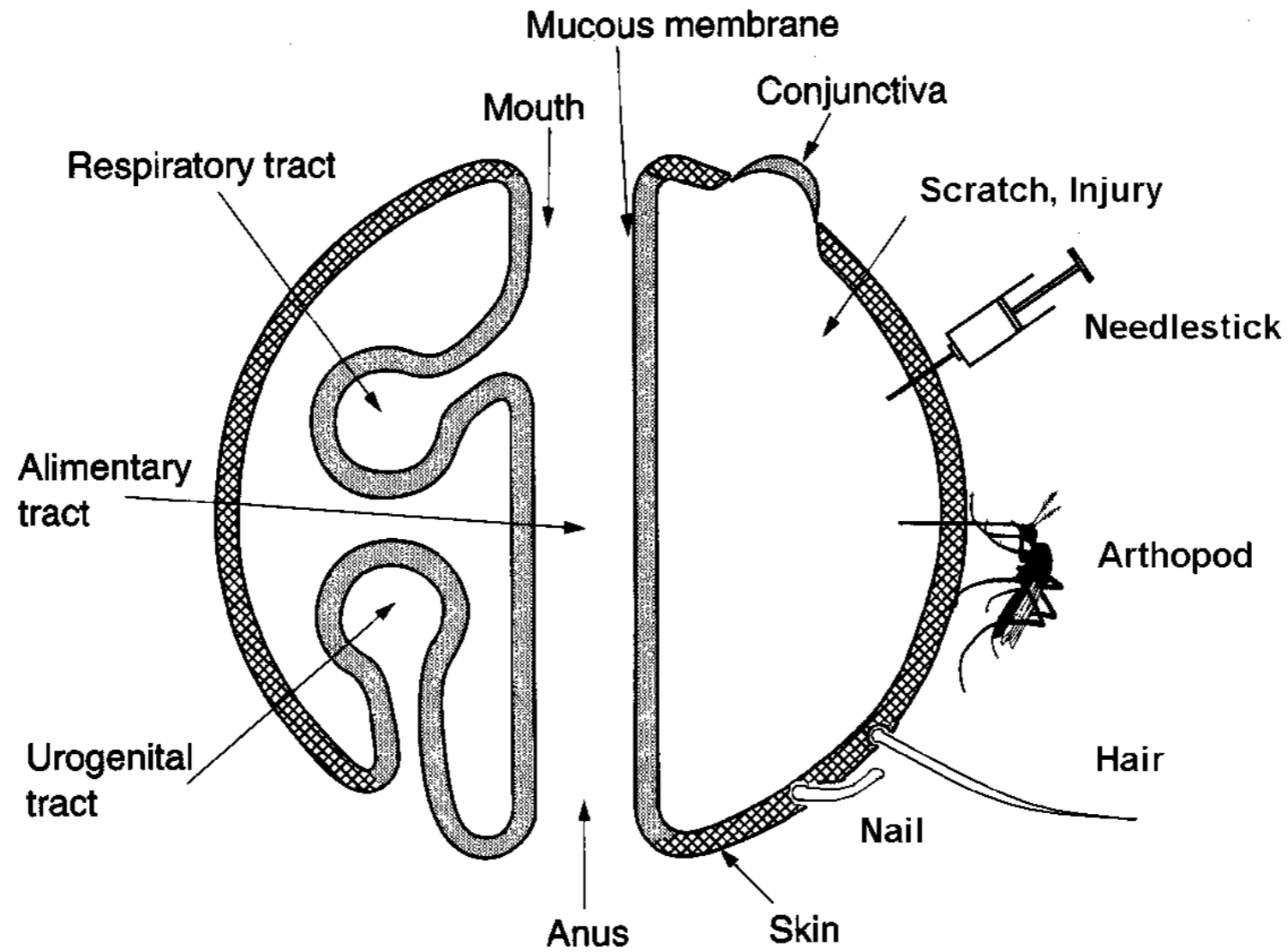


By courtesy of Tim Trevan, ICLS



# Ways of infection

Exposure, sources and routes of infection 41



*Figure 2.1* Routes of infection: the body's portals of entry of microbes. (From Mims, 1982, by permission of Academic Press)



# Please note

- Only non-pathogenic microbes are used in the Academy
- Wash your hands before and after experimenting
- Do not eat or drink next to the microbes







# Contamination in the lab

- Bio safety level number indicates the level of regulations that are in place to prevent contamination.
- Types of organisms allowed per level:
  - 1) Well characterized non pathogenic organisms to humans
  - 2) Micro organisms with high infection doses, and known cures
  - 3) Micro organisms with low infection doses, and known cures
  - 4) Micro organisms with extremely low infection doses, severe disease and no cure





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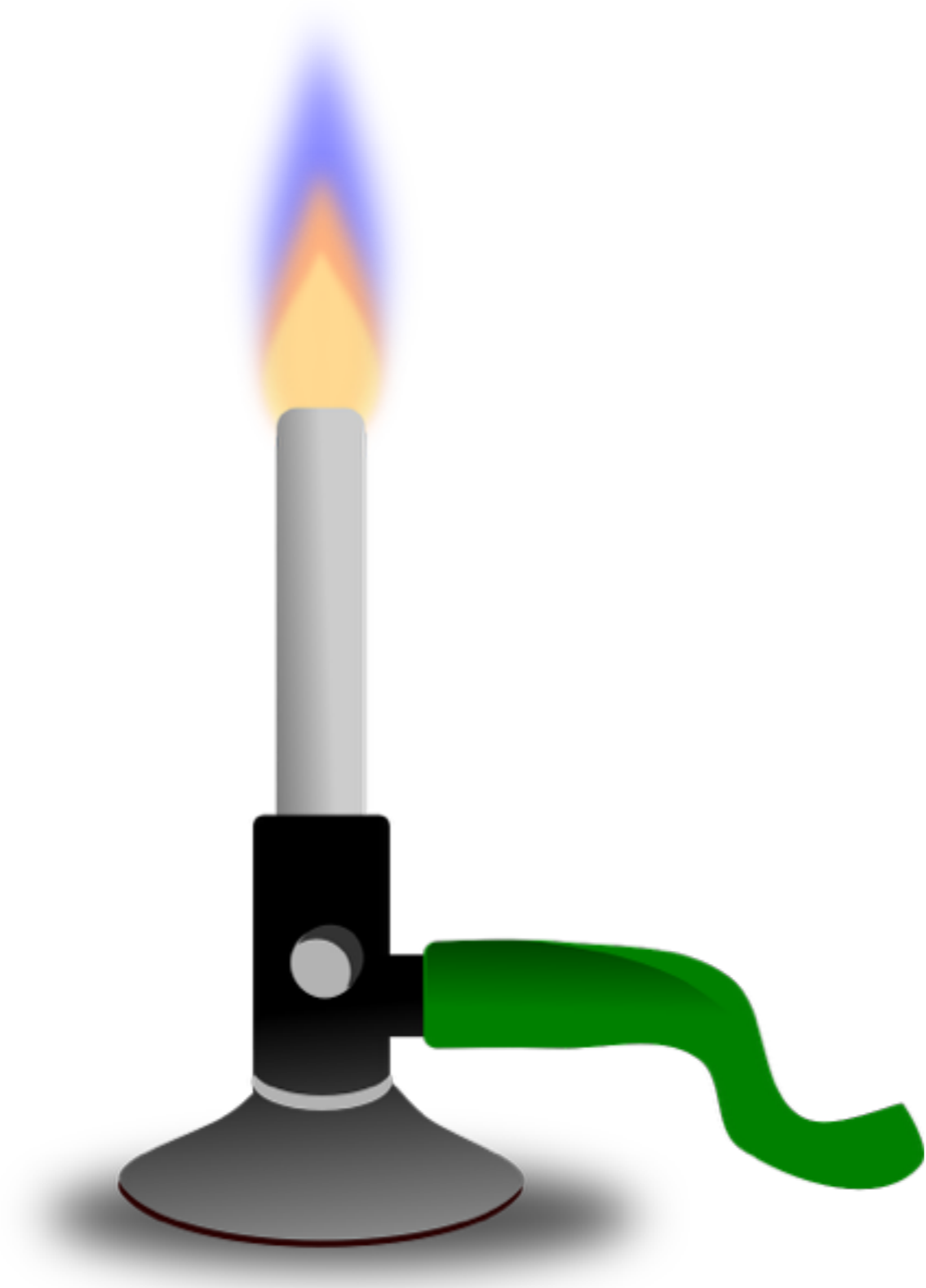
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# Personal Protection

Equipment for protection yourself



Working sterile







# Personal Protection

These items are recommended in the lab







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# Chemicals



# Label everything

- Use labels on everything!!
- You are the only one who knows what is in the container
- Labels must consist of:
  - Content
  - Date
  - Name



# Global Harmonized System Labels

Familiarize yourself with the meaning of these symbols:



Explosive



Flammable



Oxidizing



Skin  
Irritation



Pollution



Corrosive



Compressed





# NFPA safety diamond

NFPA diamonds are often used as well




## NFPA Rating Explanation Guide

### HEALTH HAZARD

- 4 = Can be lethal
- 3 = Can cause serious or permanent injury
- 2 = Can cause temporary incapacitation or residual injury
- 1 = Can cause significant irritation
- 0 = No hazard

### FLAMMABILITY HAZARD

- 4 = Will vaporize and readily burn at normal temperatures
- 3 = Can be ignited under almost all ambient temperatures
- 2 = Must be heated or high ambient temperature to burn
- 1 = Must be preheated before ignition can occur
- 0 = Will not burn

- ALK = Alkaline
- ACID = Acidic
- COR = Corrosive
- OX = Oxidizing
-  = Radioactive
-  = Reacts violently or explosively with water
-  = Reacts violently or explosively with water and oxidizing

- 4 = May explode at normal temperatures and pressures
- 3 = May explode at high temperature or shock
- 2 = Violent chemical change at high temperatures or pressures
- 1 = Normally stable. High temperatures make unstable
- 0 = Stable

### SPECIAL HAZARD

### INSTABILITY HAZARD

*This chart for reference only - For complete specifications consult the NFPA 704 Standard*



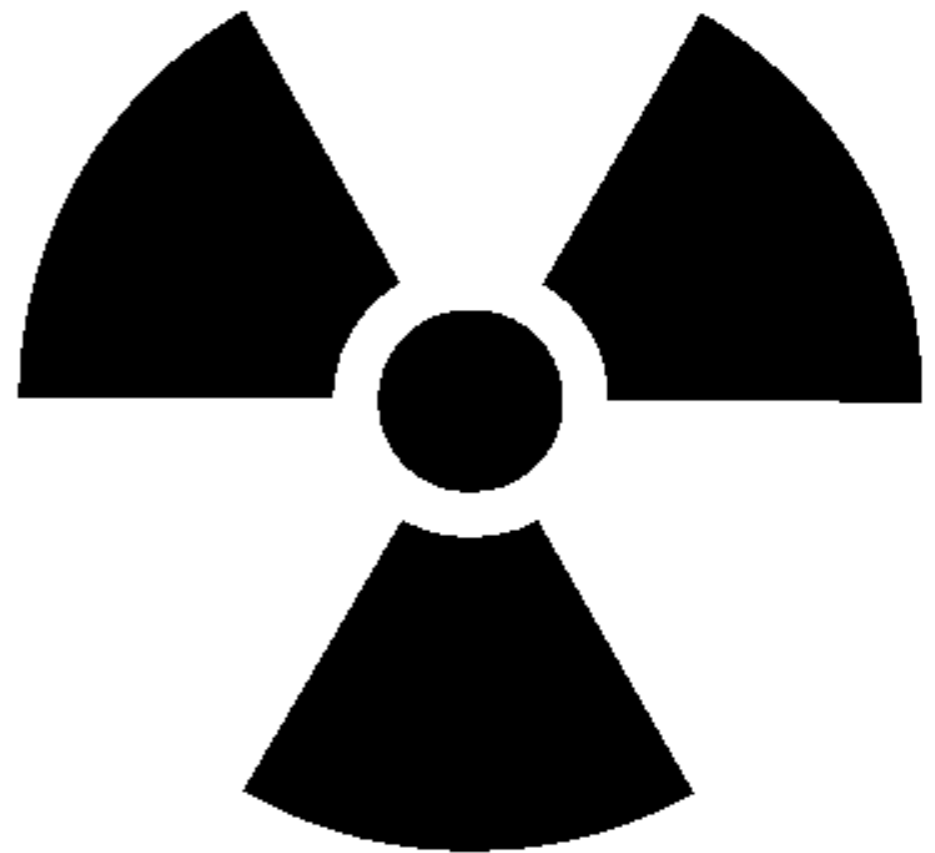
# Special labels

Do not bring anything with such label to the lab

**BIOHAZARD**



**DANGER**



**RADIOACTIVE  
MATERIAL**



# MSDS

- Material Safety Data Sheets come with every chemical and contain information about all safety aspects such as:
  - Procedures for safe handling
  - Physical Data
    - Melting point
    - Boiling point
    - Toxicity
    - Reactivity
  - Storage
  - First aid procedure
- Read the MSDS before you use any chemical!





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# Waste Disposal



# Waste disposal

- Think of how to dispose of things before you bring it into the lab





# Biological Waste

You are responsible for killing anything you grow:

- Kill of any culture with 10% hypochlorite bleach
  - Incubate for 24h before disposal
- Clean any used surface and object with 70% ethanol (red capped bottles)
- Autoclave for 20 minutes





# Broken glassware

- Do NOT dispose in the normal trash bin
- Special “broken glass” container
- Use broom to clean up, because you can easily cut yourself





# Chemical waste

- Check what is allowed to store in the lab with the labmanager
- Check what is allowed to go down the sink with the labmanager
- Do NOT mix / bomb guide:
  - Concentrated Acids and Bases
  - Oxidizers and Flammables
  - Water reactive substances and aqueous solutions
  - Cyanides and acids => cyanide gas
  - Bleach and acids => chloride gas
- Search for reactivity on the internet!
- Read the MSDS before using a chemical!



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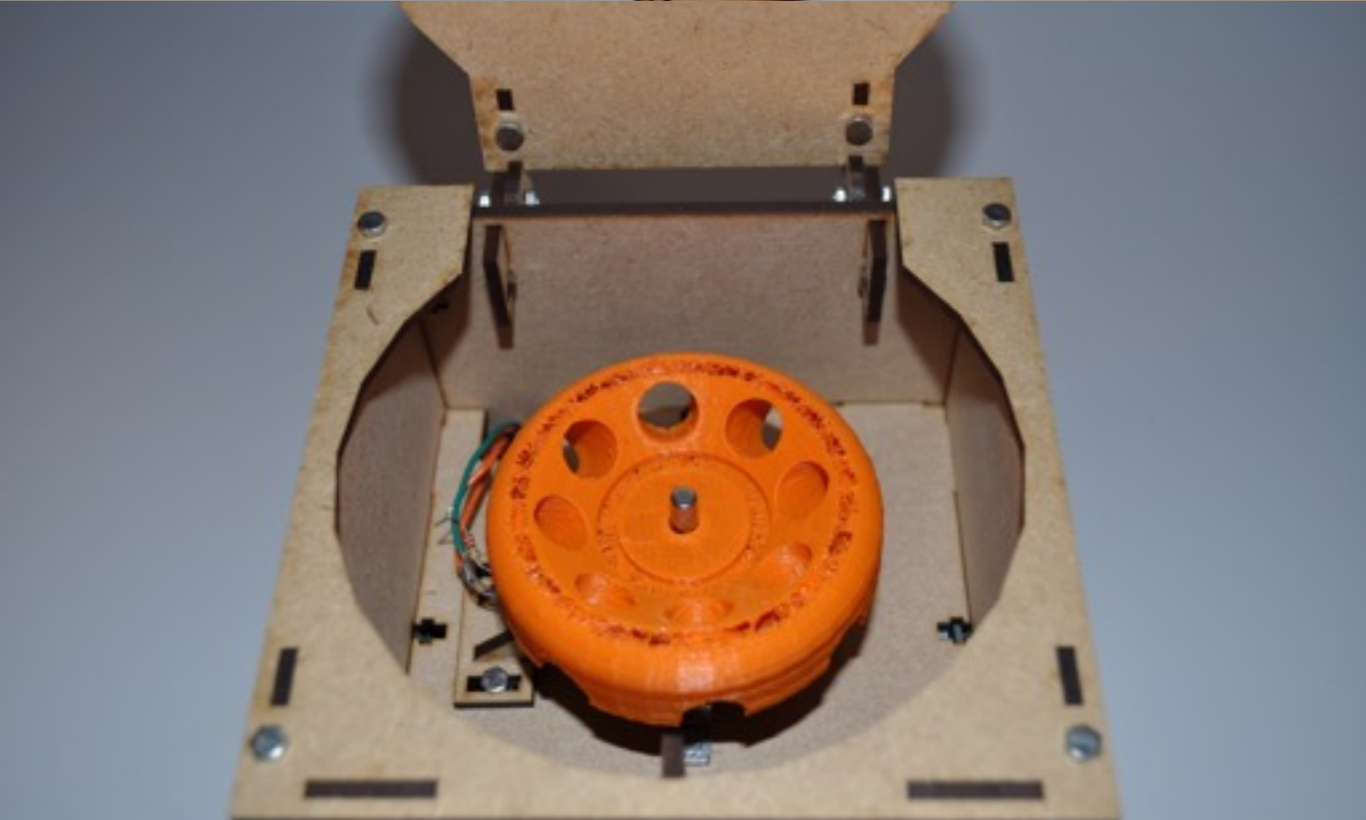
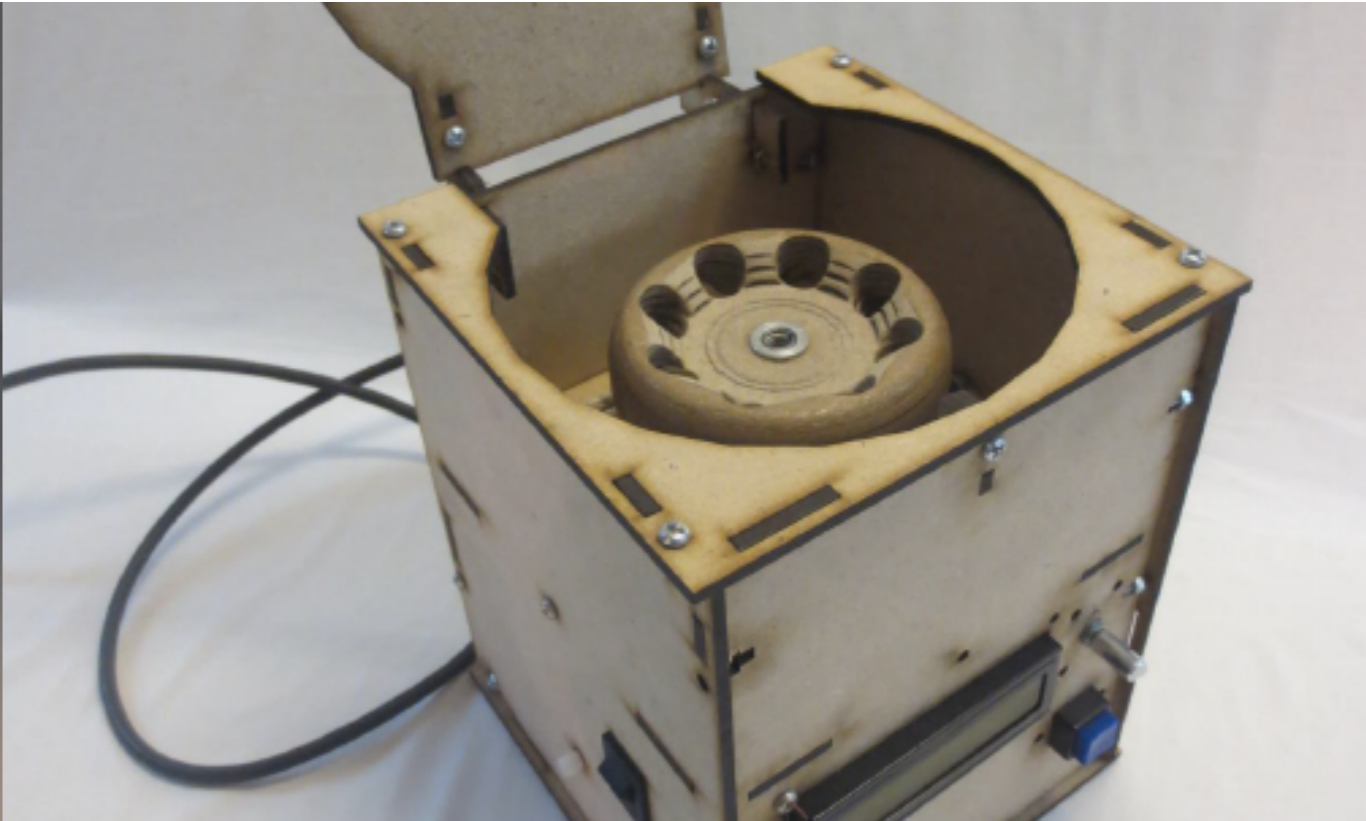
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# BioHacker Ethics





# Responsibility?







# DIYBio Code of Ethics

## **Transparency**

Emphasize transparency and the sharing of ideas, knowledge, data and results.

## **Safety**

Adopt safe practices.

## **Open Access**

Promote citizen science and decentralized access to biotechnology.

## **Education**

Help educate the public about biotechnology, its benefits and implications.

## **Modesty**

Know you don't know everything.

## **Community**

Carefully listen to any concerns and questions and respond honestly.

## **Peaceful Purposes**

Biotechnology must only be used for peaceful purposes.

## **Respect**

Respect humans and all living systems.

## **Responsibility**

Recognize the complexity and dynamics of living systems and our responsibility towards them.

## **Accountability**

Remain accountable for your actions and for upholding this code.





# Fear







# Errorarium - Adam Zaretsky







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