



waag society

institute for art, science and technology

# (Bio-) safety in “de Waag”

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# Importance of safety

- Safe procedures protect:
  1. The environment
  2. Your colleagues
  3. Yourself



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# Intro biosafety

- Biosafety
- Risk groups
- Safe workpractices  
‘SMT’ – rules
- GMO and the Dutch law  
notification with min lenM

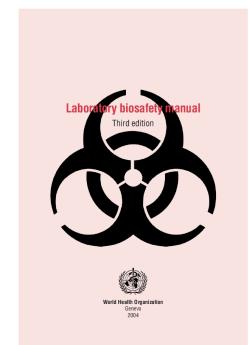


# Biosafety

- Definition from WHO:

“Laboratory Biosafety” is the term used to describe the containment principles, technologies and practices, that are implemented to prevent unintentional exposure to pathogens and toxins or their accidental release into the environment.

WHO LBM III [2004]  
Chap 9





# Definition of a biological agent

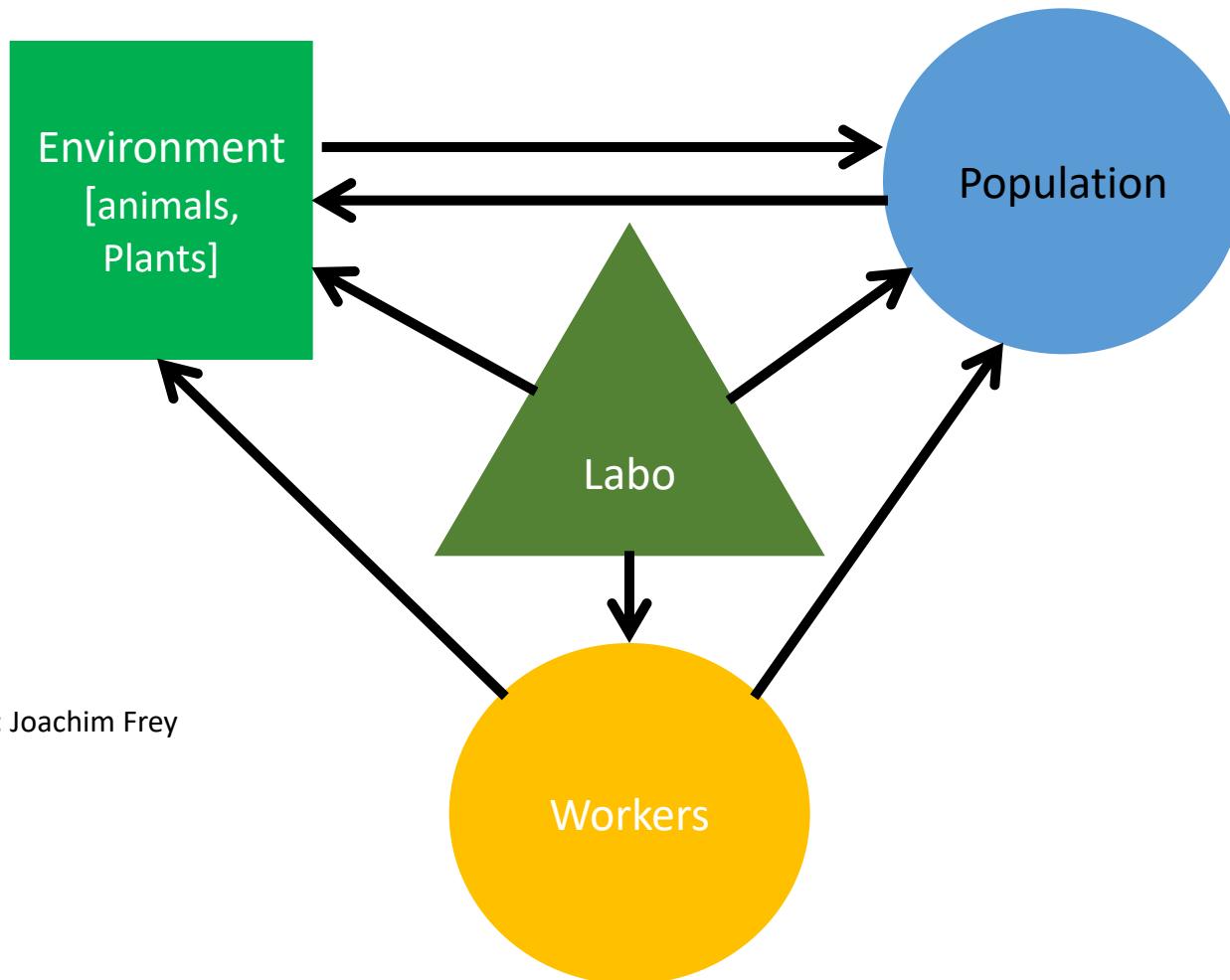
“Any micro-organism, including genetically modified, cell culture or endoparasite”

- Infectious Substances  
Substance known or which is reasonably expected to contain pathogens
- Pathogens are microorganisms (including bacteria, viruses, rickettsiae, parasite, fungi, and other agents such as prions), which can cause disease in humans or animals



# Risks inside& outside the Labo

- Contained use



Courtesy: Joachim Frey



# Biological agents and risks

The danger of a biological agent is influenced by numerous factors such as:

- Pathogenicity
- Spread to the community
- Infective dose
- Availability of effective therapeutic treatment or vaccine



# Ways of infection

Exposure, sources and routes of infection 41

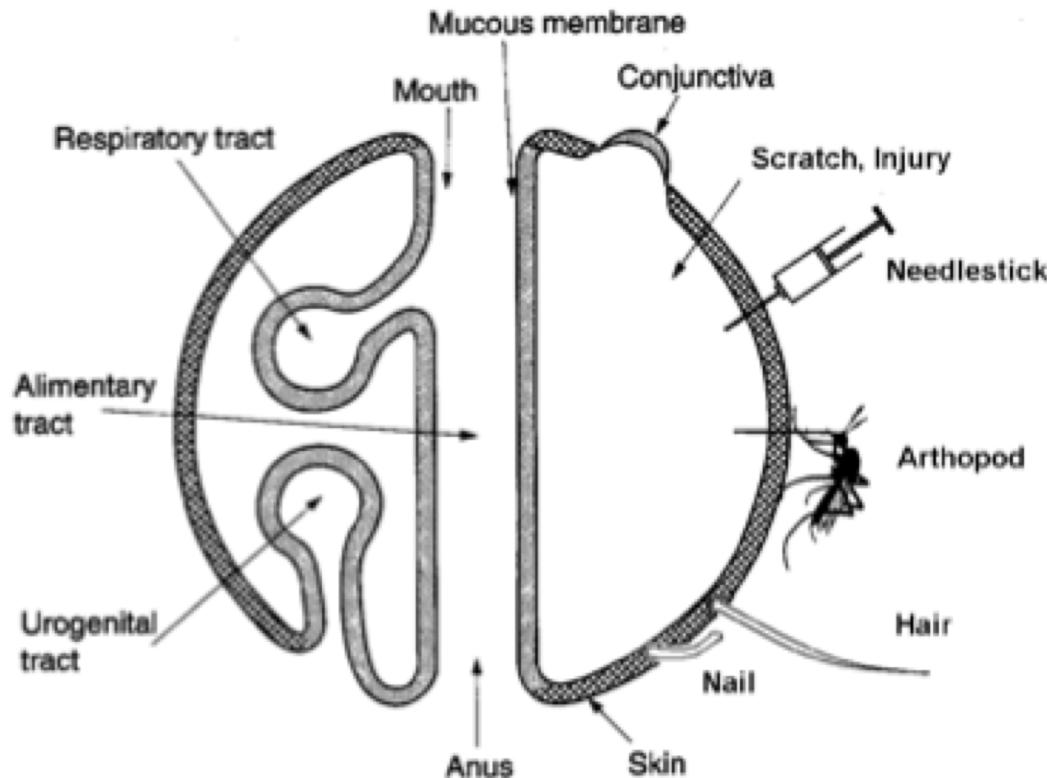


Figure 2.1 Routes of infection: the body's portals of entry of microbes. (From Mims, 1982, by permission of Academic Press)

Adapted by Per Staugaard 2008



# Aerosols





# Biological risk groups

- European Economic Community (DIRECTIVE 93/88/EEC, Oct. 1993)
- (1) **Group 1** biological agent means one that is unlikely to cause human disease;
- (2) **Group 2** biological agent means one that can cause human disease and might be a hazard to workers; it is unlikely to spread to the community; there is usually effective prophylaxis or treatment available;
- (3) **Group 3** biological agent means one that can cause severe human disease and present a serious hazard to workers; it may present a risk of spreading to the community, but there is usually effective prophylaxis or treatment available;
- (4) **Group 4** biological agent means one that causes severe human disease and is a serious hazard to workers; it may present a high risk of spreading to the community; there is usually no effective prophylaxis or treatment available





# Bio-Occupational Health strategy

- Source
- Technical measures
- Organization
- Hygiene
- PPE
- Vaccination
- Post exposition prophylaxis



# Bio-Occupational Health strategy

- Change material: safer strain [biological containment]
- Technical measures
- Organization
- Hygiene
- PPE
- Vaccination
- Post exposition prophylaxis



# Bio-Occupational Health strategy

- Change material: safer strain [biological containment]
- Containment
- Organization
- Hygiene
- PPE
- Vaccination
- Post exposition prophylaxis



# Bio-Occupational Health strategy

- Change material: safer strain
- Containment
- Training, SOPs, access control
- Hygiene
- PPE
- Vaccination
- Post exposition prophylaxis



# Bio-Occupational Health strategy

- Change material: safer strain
- Containment
- Training, SOPs, access control
- Hand wash: prevent spreading in environment
- PPE
- Vaccination
- Post exposition prophylaxis



# Bio-Occupational Health strategy

- Change material: safer strain
- Containment
- Training, SOPs, access control
- Hand wash: prevent spreading in environment
- Coat/gown, gloves, glasses, respirator, . . .
- Vaccination
- Post exposition prophylaxis



# Bio-Occupational Health strategy

- Change material: safer strain [biological containment]
- Containment
- Training, SOPs, access control
- Hand wash: prevent spreading in environment
- Coat/gown, gloves, glasses, respirator, . . .
- Vaccination : necessary & sufficient
- PEP: very much dependant on organism



# Safe Microbiological Techniques

- Doors and windows be closed during all work
- Workspace be kept clean and tidy
- Decontamination of work area after work
- Cleaning directly after a spill
- All personnel be trained [qualified]
- Dedicated and suitable working clothes
- No jewellery on hands and arms
- Nails be kept short
- No loose hair
- No open shoes
- No mobile telephones
- No eating and drinking on the lab
- No contact between hands and face
- Hands be washed after work
- No pipetting by mouth
- Avoid aerosol formation
- Glassware and equipment be disinfected
- Transport of contaminated materials in closed containers
- Administration kept separately from microbiological work





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# Personal Protection

Equipment for protection yourself



# Safe Behaviour

- Safe techniques ['golden rules']
- Signed agreement
- Follow the instructions



# Wash your hands!

Remember, before and after experiments:

- Wash your hands
- Even after wearing gloves



Arlington County - CC-BY-SA-2.0



# 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



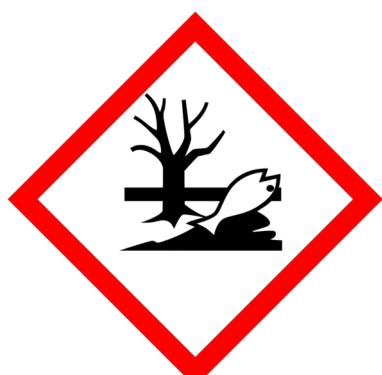
Flammable



Oxidizing



Skin  
Irritation



Pollution



Corrosive

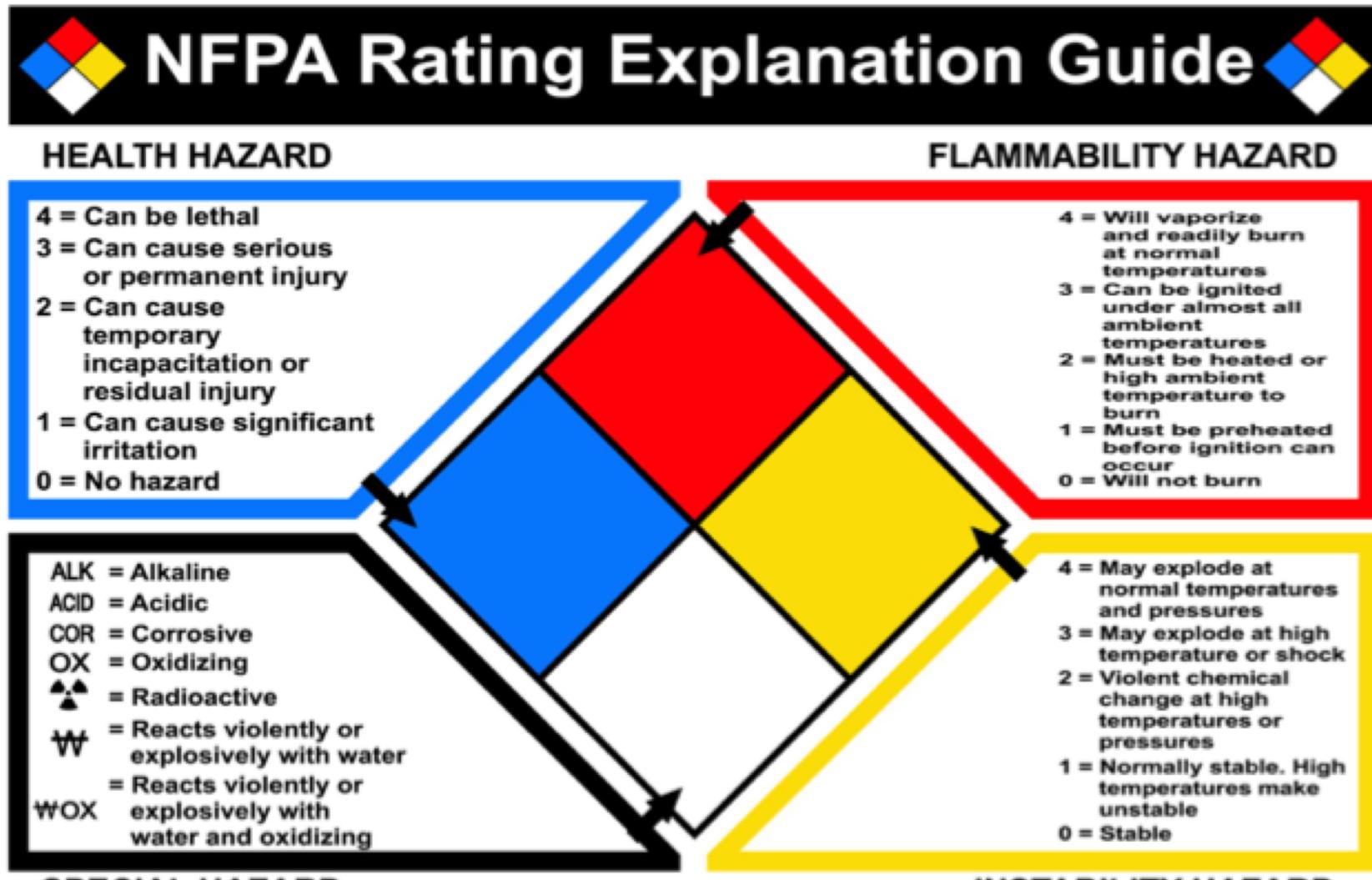


Compressed



# NFPA safety diamond

NFPA diamonds are often used as well



*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 [including PPE]
  - 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 materials : disposed in special bin “infective material”
- Decontamination by heat : boiling or even autoclaving



# Biological Waste

You are responsible for killing anything you grow:

- Kill off any culture with 10% hypochlorite bleach (freshly prepared)
  - 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!

# GMO & legislation

- Eu directive  
2009/41/EG ‘contained use of GMO’
  - Translated into national legislation
    - Wet milieugevaarlijke stoffen
    - Besluit GGO revised 2013 – operational march 2015
    - Regeling GGO
  - Obligatory permit or notification
    - Waag society obtained the first S-I ‘permit’
    - BVF [ biosafety officer] as supervisor



# History

- 2009: plans to organize a course for the public
- Request for GMO Permit  
even for relatively safe work ; no success
- 2013: exhibition in GEM  
permit request : procedure halted by ministry
- 2014: exhibition in Naturalis  
permit obtained [although late]
- 2013 change in the law: S-I
  - Easier for educational institue to obtain permit
  - Only for lowest risk processes