

# SAFETY FIRST

A safety, emergency and chemical  
disposal guideline for Minilab users

2020



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## INTRODUCTION

Dear Reader,

Working with and disposing of chemicals can pose risks if not properly conducted. Since the safety of our members is of utmost importance to us, we direct this safety guideline at all Minilab users. It shall provide the best possible safety practice while working with chemicals and must be printed and thus be physically present in the laboratory room, which is used for working with the Minilab.

Attached to this guideline you will find Safety data sheets (SDS) of the individual Minilab chemicals. SDSs are standardized documents that list information relating to work safety and health in the use of chemicals. They also include instructions for the safe use and potential hazards associated with a particular material or product, along with spill-handling procedures and shall serve as an additional comprehensive source of information.

This guideline was carefully prepared by Pharmacist Gesa Gnegel together with Pharmacist on Internship Robin Schreiber on behalf of Difäm. For questions and concerns, please contact [gnegel@difaem.de](mailto:gnegel@difaem.de), [haefele@difaem.de](mailto:haefele@difaem.de) or [richard.neci@epnetwork.org](mailto:richard.neci@epnetwork.org).

Special thanks to:

Dr. Roswitha Meyer: The contribution, material and knowledge she provided were essential for creating this guideline and increased the quality of the information critically. Without her support the process would have taken much longer, too.

Richard Neci Cizungu: He helped making this guideline implementable by looking for the practical aspects and correcting translations.

Tuebingen, October 2020

Robin Schreiber



Gesa Gnegel



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### Imprint:

#### **DIFÄM e.V.**

Mohlstraße 26, 72074 Tübingen

P.O. Box 1312, 72003 Tübingen

Germany

Tel.: +49 7071 704 90 13

E-Mail: [haefele@difaem.de](mailto:haefele@difaem.de)

Website: [www.difaem.de](http://www.difaem.de)

#### **Ecumenical Pharmaceutical Network**

Suite 9, Saturn Block, 4th Flr, Appartements Nine

Planets, Kabarnet Road, Nairobi

P.P. Box 749, 00606 Nairobi

Kenya

Tel.: +254 724 301755

E-Mail: [info@epnetwork.org](mailto:info@epnetwork.org)

Website: [www.epnetwork.org](http://www.epnetwork.org)

## LABORATORY SAFETY GUIDELINE

### 1. Areas of application:

This safety guideline is applicable to all laboratory rooms where the Minilab is used. All Minilab users must be familiar with the guideline. New workers must be instructed by their supervisor.

### 2. Responsibility:

The head of the institution is responsible for the safety of the staff working in the laboratory. Safety has to be ensured by appropriate measures.

The head of the institution may instruct suitable persons in writing and with a clearly defined scope of agreed duties to be carried out on their own responsibility (e.g. the lab manager).

The employees using the Minilab need to be instructed and trained by the supervisor (e.g. head of the institution or instructed lab manager) prior to taking up work. Employees must sign to confirm that they were instructed and trained by the supervisor and understood the instructions. Once trained, the employees are jointly responsible for the use of the Minilab, the use of provided safety equipment and hence safety.

### 3. Accidents:

In case of an accident, first aid should be administered immediately and, if necessary, the emergency doctor called. In case of accidental exposure to a chemical, also see section 4 of the Safety Data Sheet of the respective substance for appropriate first aid measures. The following person(s) must be notified:

\_\_\_\_\_ (supervisor) (tel.: \_\_\_\_\_)

### 4. Emergency telephone numbers (Please fill in):

Fire department: \_\_\_\_\_

Emergency doctor: \_\_\_\_\_

Responsible head of the institution or lab manager: \_\_\_\_\_

### 5. Safety equipment (cross out if unavailable):

First aid boxes: position \_\_\_\_\_

Eye wash: position \_\_\_\_\_

Fume cabinets: position \_\_\_\_\_

Fire blankets: position \_\_\_\_\_

Emergency showers: position \_\_\_\_\_

Fire extinguishers: position \_\_\_\_\_

All laboratory users must make themselves familiar with the locations of the safety equipment before beginning work.

## 6. Visitors in the laboratory:

Visitors are NOT allowed in the laboratory rooms since no liability exists for persons not employed by the institute. Conducting teachings or trainings in the laboratory rooms is possible after a safety briefing of trainees and students.

## 7. Personal protection:

**Important:** For pregnant or breastfeeding women it is prohibited to enter the laboratory at any time!



### a. Eye protection

**Safety glasses** must always be worn in the laboratory.

Preferably, use safety glasses with side shields. They provide protection from chemical splashes that might injure your eyes.

### b. Respiratory protection

**Masks (e.g. surgical)** must always be worn in the laboratory. Alternatively, fume cabinets can be used.

Though masks do not prevent from vapor, they prevent from breathing in droplets, aerosols, and dust as well as from chemical splashes entering the mouth.

### c. Physical protection

**Laboratory coats** and **gloves** must be worn.

Laboratory clothing must be made of a material that will not melt when heat is applied (e.g. cotton). Closed, long-sleeved, high-necked gowns, made of solid material are to be worn for skin protection. Contaminated items of clothing must immediately be taken off and aired.

Laboratory gloves (Nitril or Latex) provide protection from skin hazards. Keep in mind that chemicals can cause bad burns and lead to poor-healing wounds.

### d. Other

Do NOT use sandals and short trousers or skirts. Legs and feet must be covered for their protection, too. It is recommended to wear closed non-slip shoes.

## 8. Fire protection

On the outbreak of fire, the supply of gas, electricity and air should be cut off immediately. Smaller fires may be suffocated by blanketing with a wet towel. Larger fires must be fought using fire extinguishers.

Burning clothes may be extinguished with the help of the emergency showers, or better, by using a fire blanket thrown over the person (and under certain conditions by rolling on the floor).

Always remember your own safety: Burning chemicals may explode or generate toxic gases.

## 9. Supply connections (gas, water, electricity):

All laboratory users are required to familiarize themselves with the mechanisms to turn off gas, water and electricity.

Ideally, the laboratory should be equipped with an exclusive electrical protection circuit/fuse to facilitate switching off in case of fire.

Main power off:            position \_\_\_\_\_

Main water off:            position \_\_\_\_\_

Main gas off:              position \_\_\_\_\_

## 10. Ventilation of laboratory rooms:

If fume cabinets are unavailable, Minilab work may only be carried out in well ventilated rooms, e.g. by opening the windows during working hours. Contamination of the laboratory room must strictly be avoided.

## 11. Storage and labelling:

All containers in which chemicals are stored must be clearly and durably labelled. They should be unbreakable, placed on a stable shelf and must not be above shoulder height. Storage of chemicals in corridors, stairways or hallways is forbidden.

Keep containers tightly closed in a dry and well-ventilated place. Containers, which have been opened must be resealed carefully and kept upright to prevent leakage. Store in cool place and protect from direct sunlight.

The substances must be stored so that they do not pose a risk to human health or the environment. The bottles and containers used for the storage must be correctly labelled.

You will find further information in the section "Correct labelling of bottles and containers".

## 12. Behaviour in work areas:

Laboratory rooms are work rooms and not common rooms. People are not permitted to stay in the laboratories, if they do not work there. Each user is responsible for cleanliness and orderliness of the laboratory.

Individual access to a work area does not rule out the possibility that others may be using the same work area at the same time. In this case, mutual consideration, restriction to the necessary workspace and observation of cleanliness and orderliness are especially important.

Prior to the use of equipment, it is absolutely necessary that the appropriate operating instructions are understood, or introductory guidance obtained. Damaged or defective equipment should be reported immediately

After the completion of work, the work area and apparatus should be cleaned and the chemicals used must be returned to the chemical cabinet.

Before leaving the laboratory room, gas and water taps should be shut off, electronic equipment other than those that run continuously (e.g. drying cabinets, refrigerators and freezers) must be turned off, the lights switched off and the laboratory locked.

Disposal of chemical waste resulting from work must be carried out by the user, according to the regulations.

(See the procedures for the collection of special waste in "Collecting waste for disposal").

Questions should be directed to the laboratory personnel.

## 13. Pipetting by mouth must be avoided completely:

Pipette balls or pumps must be used, when dispensing liquid.

## 14. Working with flammable materials:

These Minilab chemicals are flammable:

**Acetic acid, Acetone, 1-Butanol, Ethyl acetate, Methanol, Toluene.**

The heating of flammable materials without constant supervision is totally forbidden.

When working with flammable material in thin walled containers, they must be protected against breakage or while using them placed in safety basins filled with non-burnable adsorption material, e.g. dry sand, and large enough to absorb the complete contents of the containers.

## 15. Laboratory-specific instructions and limitations of this guideline:

In case this guideline deviates from national regulations or guidelines, the national regulation or guideline apply. Additional laboratory-specific instructions are to be followed.

It is recommended to update already existing work place safety policies according to this Minilab guideline. If such a work safety policy is not existing yet, the new development is urgently needed.

Date and city name,

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Signature of the head of the institution

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Signature of the lab manager

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Signatures of the trained employees

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Sources:










-Meyer, Roswitha (Physikalisch-Technische Bundesanstalt) (2018), Chemical Waste Management for Laboratories, 1<sup>st</sup> edition, Braunschweig, Germany.

-Deutsche Gesetzliche Unfallversicherung (DGUV) (Jedermann-Verlag GmbH), Working Safely in Laboratories – Basic Principles and Guidelines, 2<sup>nd</sup> Edition, Berlin, Germany



## CORRECT LABELLING OF BOTTLES AND CONTAINERS

### a. Hazard symbols and their meaning:

<p>Health hazard</p>  <ul style="list-style-type: none"> <li>- Carcinogen</li> <li>- Mutagenicity</li> <li>- Reproductive Toxicity</li> <li>- Respiratory Sensitizer</li> <li>- Target Organ Toxicity</li> <li>- Aspiration Toxicity</li> </ul>	<p>Flame</p>  <ul style="list-style-type: none"> <li>- Flammables</li> <li>- Pyrophorics</li> <li>- Self-Heating</li> <li>- Emits Flammable Gas</li> <li>- Self-Reactives</li> <li>- Organic Peroxides</li> </ul>	<p>Exclamation Mark</p>  <ul style="list-style-type: none"> <li>- Irritant (skin and eye)</li> <li>- Skin Sensitizer</li> <li>- Acute-Toxicity (harmful)</li> <li>- Narcotic Effects</li> <li>- Respiratory Tract Irritant</li> <li>- Hazardous to Ozone Layer</li> </ul>
<p>Gas Cylinder</p>  <ul style="list-style-type: none"> <li>- Gases Under Pressure</li> </ul>	<p>Corrosion</p>  <ul style="list-style-type: none"> <li>- Skin Corrosion/Burns</li> <li>- Eye Damage</li> <li>- Corrosive to Metals</li> </ul>	<p>Exploding Bomb</p>  <ul style="list-style-type: none"> <li>- Explosives</li> <li>- Self-Reactives</li> <li>- Organic Peroxides</li> </ul>
<p>Flame Over Circle</p>  <ul style="list-style-type: none"> <li>- Oxidizers</li> </ul>	<p>Environment (Non-Mandatory)</p>  <ul style="list-style-type: none"> <li>- Aquatic Toxicity</li> </ul>	<p>Skull and Crossbones</p>  <ul style="list-style-type: none"> <li>- Acute Toxicity (fatal or toxic)</li> </ul>

### b. Labelling correctly:

**Important:** When re-using containers, that previously contained other substances and were therefore already labelled, you must carefully clean the container, blacken the old label and replace it by a new one that describes the new substance/s. Two different labels on one container declaring different contents are unacceptable!

It is mandatory that the label contains the following information:

- Name of the ingredients (Drawn chemical structures do not replace the name of the ingredient)
- In mixtures the names of all ingredients and their proportions
- Hazard symbol consistent with the correct classification of the chemicals contained (found in the Safety Data Sheet or on the original bottle of the chemical)
- An expiry date, if applicable.

## STORAGE OF MINILAB CHEMICALS

Acids, bases and organic solvents should be stored respectively separated from each other to prevent chemical reactions in case of leakage. This separation can be achieved by placing the chemicals in collection trays with a minimum height of 20cm.

Tray 1: Acids - this tray must be made of **plastic**

→ Place Acetic acid, Hydrochloric acid and Sulphuric acid in this tray.

Tray 2: Bases - this tray must be made of **plastic**

→ Place Ammonia solution in this tray.

Tray 3: Organic solvents - this tray must be made of **metal**

→ Place Acetone, 1-Butanol, Ethyl acetate, Methanol and Toluene in this tray.

### Storage of stocks and larger amounts of chemicals:

Laboratory rooms must not be used as storage rooms for chemicals stocks. The average amount of chemicals needed in one week can be kept at the minilab workplace. Stocks and larger quantities have to be kept separately in a chemical storage room (which is not the medicines storage room). There is no need to keep more than 1L of each chemical in the Minilab laboratory! Large amounts of chemicals in a laboratory are a risk to all employees.

Only if special safety cabinets, designed for the storage of chemicals, are used for storage, larger quantities of chemicals may be kept in the laboratory.

(Security cabinet position: \_\_\_\_\_)

### Special storage precautions for flammable materials:

The following substances in the Minilab are flammable:

**Acetic acid, Acetone, 1-Butanol, Ethyl acetate, Methanol, Toluene.**

Any spontaneously, self-inflammable or explosive compound must be stored apart. Do not store self-inflammable or explosive compounds in a fridge!

## TRANSPORT OF CHEMICALS

When transporting containers containing chemical substances, make sure that they are completely sealed to prevent leakage. Avoid overheating which could lead to ignition or explosion. Put the containers in a position where they cannot fall or break at any time.

Keep the bottles and containers in collecting trays for transport. The trays for storing acids have to be made of plastic, for storing organic solvents use metal trays.

Do not transport the chemicals in your private car. Try to find a licensed chemical transporter or ask a chemical supplier to transport your goods.

## DISPOSAL

Working with waste means taking on responsibility. The producer of waste is responsible for its final disposal.

The following section provides an overview of chemical disposal.

However, this does NOT replace reading and following the safety instruction for each individual substance you work with.

**In case of doubt, you may always contact [gnegel@difaem.de](mailto:gnegel@difaem.de) or [haefele@difaem.de](mailto:haefele@difaem.de).**

### Disposing correctly:

1<sup>st</sup> choice: The first choice for disposal is always to return chemical waste to a licensed disposal company. Contact the supplier of chemicals or any research/bigger laboratory (e.g. university, governmental or private laboratories) to inquire the availability of a disposal service. This service may incur cost.

2<sup>nd</sup> choice: If the above-mentioned disposal option is not feasible, you can contact a nearby cement factory: Furnaces used for the production of cement are designed and operated so that the parameters required for the destruction of chemical waste (including hazardous chemicals) are achieved. In many countries, cement companies are officially licensed to perform the destruction of certain hazardous wastes.

3<sup>rd</sup> choice: If there are no other options available, you may dilute your chemicals with the water hazard class WHC 1, 1:10; and WHC 2, 1:100 with water and dispose it in the sewage. Mixtures receive the WHC classification of the highest class from the ingredients (e.g., a mixture with compound A (WHC 1) and B (WHC 2) receives WHC 2). Table 1 (see next page) informs you about the water hazard classes of the Minilab chemicals.

### Additional Information:

- The complete usage of chemicals prevents the production of waste.
- You may reuse residues of chemicals for other purposes (e.g. Acetic acid for cleaning sanitary facilities or methanol for cleaning vessels and laboratory glassware), if the safety of the persons in contact with the substances is ensured and the substances are used correctly for each purpose.

## Water hazard class (WHC):

Water and environment protection is essential for the health of the population, for the preservation of natural resources and as a prerequisite for economic development. To this end, water bodies must be protected as part of the natural balance and as a habitat for animals and plants. Water management must avoid impairment of the ecological functions of water for the public good and the benefit of every individual.

The Water hazard class (WHC) is a substance specific classification to categorize the hazardousness to water. It is divided into the following classes:

- Not hazardous to water
- WHC 1: Slightly hazardous to water
- WHC 2: Clearly hazardous to water
- WHC 3: Strongly hazardous to water

Table 1: Chemical categories and water hazard classification of the chemicals used in the Minilab:

<b>Chemicals used in Minilab</b>	<b>Chemical category</b>	<b>Water hazard class (WHC)</b>
Acetic acid	Acid	WHC 1
Acetone	Organic solvent	WHC 1
Ammonia solution	Base	WHC 2
Ethyl acetate	Organic solvent	WHC 1
Iodine	Inorganic solid substance	WHC 2
Magnesium chloride	Inorganic solid substance	WHC 1
Methanol	Organic solvent	WHC 2
Sodium chloride	Inorganic solid substance	WHC 1
1-Butanol (=n-Butanol)	Organic solvent	WHC 1
Ninhydrin	Organic solid substance	WHC 1
Hydrochloric acid	Acid	WHC 1
Sulphuric acid	Acid	WHC 1
Toluene	Organic solvent	WHC 2

## Collecting waste for disposal:

If you make use of a licensed disposal service (as recommended as choice 1), contact the service provider to inquire about his requirements and preferences for collection and separation of chemical waste.

If not agreed differently, the chemical waste can be stored as mixtures in containers or bottles taking account of the information in section "Storage of substances".

Sort the waste into the group solid, aqueous or organic waste:

### - Solid waste

Minilab chemicals described as "inorganic solid substance" or "organic solid substance" in table 1, pure or as mixtures of solids.

**- Aqueous waste** (Acids, bases and neutral)

Minilab chemicals described as “acid” or “base” in table 1, pure or as mixtures containing nothing but acids, bases, water and solid substances.

Try to neutralize the pH value. (Do not add water to acid but acid to water. The first approach leads to an exothermic reaction and the liquids heat up fast.)

**- Organic waste.**

Minilab chemicals described as “organic solvents” in table 1, pure or as mixtures with any other Minilab chemical.

Try to neutralize the pH value.

## DANGEROUS REACTIONS, WHEN MIXING

<b>Chemical</b>	<b>Mixed with:</b>
Acetic acid	- Concentrated Sulphuric acid: Explosive - Ammonia solution 25%: Violent reaction
Acetone	- Sulphuric acid: Risk of ignition
Ammonia solution 25%	- Iodine: Explosion hazard
1-Butanol	- Concentrated Sulphuric acid: Exothermic reaction (mixture heats up)
Ethyl acetate	- Hydrochloric acid: Violent reaction - Concentrated Sulphuric acid: Violent reaction - Ammonia solution: Violent reaction
Hydrochloric acid	- Concentrated Sulphuric acid: Explosives - Water: Exothermic reaction (mixture heats up fast, when adding acid to water)
Iodine	- Ammonia solution 25%: Explosion hazard
Magnesium chloride	- Concentrated Sulphuric acid: Exothermic reaction (mixture heats up)
Methanol	- Concentrated Sulphuric acid: Exothermic reaction (mixture heats up)
Ninhydrin	- Concentrated Sulphuric acid: Exothermic reaction (mixture heats up) - Hydrochloric acid: Exothermic reaction (mixture heats up)
Sulfuric acid	- Acetic acid: Explosive - Hydrochloric acid: Explosive - Water: Exothermic reaction (mixture heats up fast, when adding acid to water) - Acetone: Risk of ignition - 1-Butanol: Exothermic reaction (mixture heats up) - Ethyl acetate: Violent reaction - Magnesium chloride : Exothermic reaction (mixture heats up) - Methanol: Exothermic reaction (mixture heats up) - Toluene: Exothermic reaction (mixture heats up)
Toluene	- Concentrated Sulphuric acid: Exothermic reaction (mixture heats up)

# APPENDIX:

## Safety data sheets of all substances

A Safety data sheet (SDS) is a standardized document, which provides important information about substances and is structured as follows:

1. Identification of the substance
2. Hazards identification
3. Information on ingredients
4. First aid measures
5. Firefighting measures
6. Accidental release measures
7. Handling and storage
8. Exposure controls/Personal protection
9. Physical and chemical properties
10. Stability and reactivity
11. Toxicological information
12. Ecological information
13. Disposal considerations
14. Transport information
15. Regulatory information
16. Other information (Additional and detailed)