Handling chemical substances

A brief overview for students of Faculty of Medicine

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People who handle chemical substances as part of their employment or studies, must be acquainted with:

- hazardous properties of chemical substances,
- the rules of protecting health and the environment from their harmful effects,
- the principles of pre-medical first aid.

Handling chemical substances

Study material available in IS:

Principles of Fire Protection and Safe Handling of Chemicals
Editors: Jaromír Literák, Barbora Loučková, Jiří Příhoda, MU 2017,
pages 8 - 40

Legal standards

- Regulation (EC) No. 1272/2008 of the European Parliament and of the Council focusing on classification, labelling, and packaging of substances (CLP)
- Act No. 350/2011 Coll., on chemical substances and mixtures
- Act No. 205/2020 Coll., which amends Act No. 258/2000 Coll. on the protection of public health

Terminology

Hazard classes - for the classification of physical, health or ecological hazards of a certain chemical substance.

Hazard category - specifies the nature and severity of the hazard.

Each hazard class and category is assigned:

- **hazard statements** (H-phrases).
- **precautionary statements** (P-phrases).
- **hazard pictogram** (symbol)
- **signal word** - the word "danger" refers to more serious hazards; the word "warning" refers to a less serious hazard category

Hazard classes: physical hazard (16), health hazard (10), environmental hazard (2)

1. explosives
2. flammable gases
3. aerosols
4. oxidising gases
5. gases under pressure
6. flammable liquids
7. flammable solids
8. self-reactive substances
9. pyrophoric liquids
10. pyrophoric solids
11. self-heating substances
12. emitting flammable gases with water
13. oxidising liquids
14. oxidising solids
15. organic peroxides
16. substances corrosive to metals

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17. acute toxicity
18. skin corrosion/irritation
19. serious eye damage
20. respiratory / skin sensitizer
21. germ cell mutagenicity
22. carcinogenicity
23. reproductive toxicity
24. specific organ toxicity (single exposure)
25. specific organ toxicity (repeated exposure)
26. aspiration hazard

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27. aquatic toxicity
28. ozone layer hazard

Hazard pictograms

Explosive

Flammable

Oxidizing

Compressed gas

Corrosive

Toxic

Harmful

Health hazard

Environmental hazard

In handling chemical substances, it is the responsibility of everyone to observe:

- hazard symbols
- hazard statements
- precautionary statements
- protection of human health
- protection of the environment

Hazard statements - They are intended to form a set of standardized phrases about the hazards of chemical substances

https://en.wikipedia.org/wiki/GHS_hazard_statements

Precautionary statements - They are intended to form a set of standardized phrases giving advice about the correct handling of chemical substances

https://en.wikipedia.org/wiki/GHS_precautionary_statements

Signal word

"Danger" or "Warning"

are used to emphasize hazards and indicate the relative level of severity of the hazard, assigned to a hazard class.

Some lower-level hazard categories do not use signal words.

H-Phrases	P-Phrases
H200–H299 Physical hazards	P100–P199 General statements
H300–H399 Health hazards	P200–P299 Prevention
H400–H499 Environmental hazards	P300–P399 Response (if something)
	P400–P499 Storage
	P500–P599 Disposal

Preparations with hazard pictograms may be used in the household environment

Examples:
- detergents
- cleaning agents
- sprays
- pool chemicals
- DIY supplies
- etc.

NaOH

HCl

NaClO

8% CH_3COOH

Rules for handling chemical substances

General rules for Masaryk University

- approved by Regional Hygiene Administration
- available at https://provoz.rect.muni.cz/cs/cebe/chemicke-latky (Czech only)
- *Principles of Fire Protection and Safe Handling of Chemicals*, Editors: Jaromír Literák, Barbora Loučková, Jiří Příhoda

Specific rules for particular departments

- hazardous properties of chemical substances,
- the rules of protecting health and the environment from their harmful effects,
- the principles of pre-medical first aid.

Persons handling chemical substances are required to observe

- hazard pictograms
- signal words
- H-Phrases
- P-Phrases
- **specific rules for substances classified as:**
  - corrosive,
  - toxic for target organs, category 1,
  - carcinogenic, category 1 or 2,
  - mutagenic, category 1 or 2,
  - reproductive toxicants, category 1A or 1B,
  - acutely toxic, category 1 or 2.

highly hazardous substances

The list of highly hazardous substances shall be stored in an electronic database and must be continuously updated. The update period cannot be longer than one year.

Packaging and labelling of chemicals

The packaging of the chemical or mixture is equipped with a label which contains the following information:

- name, address and telephone number of the supplier,
- amount of substance or mixture in the package,
- product identifiers,
- any required hazard warning symbols,
- any required signal word,
- any standard hazard phrases,
- any precautionary phrases,
- any additional information necessary.

Conditions for handling highly toxic substances

Class: acute toxicity

Category: 1 or 2

Chemical substances and mixtures classified of acute toxicity, category 1 or 2 must be stored in lockable rooms secured against theft and entry of unauthorised persons. Mutual harmful effects or misplacement of stored substances must be eliminated as well as leakage into the environment including danger to individuals.

The consumption of substances and mixtures classified as hazardous under acute category 1 or 2 must be recorded. These records must be kept separately for each substance and must include data on the quantity received and released, inventory status including the name of the person to whom the chemical or mixture was given. Records shall be kept for at least 5 years after the stock has been completely exhausted.

Who is qualified for handling highly toxic substances?

University graduates who:

- have completed a university degree in general medicine, dentistry, pharmacy, veterinary medicine,
- have obtained a university degree in the field of chemistry, biology, ecology,
- have obtained a university degree in the field of toxicology.

Persons who:
have successfully passed a professional proficiency test and possess a certificate of professional competence authorising them to handle chemical substances classified as highly toxic

Accidents with chemical substances

Inhalation:

- move the victim into the fresh air, do not let the victim walk!
- rinse out mouth or nose with water
- if the situation warrants, call an ambulance

Contact with eyes:

- immediately rinse eyes with flowing water, open eyelid (even by force)
- from the inner corner of the eye outward
- if needed, remove contact lenses
- call an ambulance

Contact with skin:

- remove the affected clothing, rinse the affected area with a flow of tepid water
- cover burned parts of the skin with sterile bandage
- if the situation warrants, call an ambulance

Accidents with chemical substances

Ingestion:

- **highly toxic substances -** apply charcoal in water, induce vomiting
- **toxic substances -** apply charcoal in water
- **corrosives -** drink cool water (200 – 500 ml), do not induce vomiting
- seek medical attention as soon as possible
- in case of uncertainty on how to proceed, contact Toxicology Information Centre, Prague

Chemical waste disposal

- Only water-miscible chemicals may be poured into the sink and only in quantities which do not pose any risk to rivers or to the water sewage system such as water-soluble solvents up to 0.5 litres (diluted at least 10 times),

- Acids and hydroxides (diluted 30 times, pH should remain within 6.5 - 8.5). Corrosives, acids and hydroxides may only be poured into sink while the water faucet runs.

- Water-immiscible solvents which are toxic, flammable and explosive, concentrated acids and hydroxides and compounds releasing toxic or irritant fumes on contact with water, and heavy metal solutions cannot be poured into the sink.

- Each workplace shall arrange for waste disposal through a company that the deals with the disposal of chemical waste.

Safety data sheet (SDS)

- it is intended to provide workers with procedures for handling that substance in a safe manner,
- includes information such as physical data (melting point, boiling point, flash point, etc.), toxicity, health effects, first aid, reactivity, storage, disposal, protective equipment, and spill-handling procedures.
- SDS formats can vary from source to source within a country depending on national requirements.