CheSSE
Chemical Safety in Science Education

Instructions in case of accidents

Module 6

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Stockholm University

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Preparation and hazard types

- Being prepared is key. Knowing where …
  - The emergency exits / escape routes are.
  - The fire alarm call points are.
  - The fire extinguishers are.
  - The emergency showers are.
  - The eyewash stations and bottles are.
  - The first aid cabinets are.
- Contingency thinking and risk assessment of hazards …
  - Chemical hazard accidents (e.g. spills on the skin or eyes, vapour inhalation etc.)
  - Physical hazard accidents (e.g. heavy equipment falling, gas cylinders unstationary etc.)
  - Electrical hazard accidents (e.g. electrocution, electrical fire etc.)
  - Biological hazard accidents (e.g. E. coli contamination, mold in petri dishes, milk protein allergic reaction etc.)

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Instructions in case of laboratory accidents

- Prepare risk assessment plans with clear instructions in case of an accident. Health and catastrophe insurance is most needed in advance.
- If an accident happens, and you're unfamiliar with the situation, then:
  - Assess the situation fast but calmly.
  - Inform a teacher even of a little accident.
  - If the room must be evacuated, stop heating if it is safe.
  - The teacher leaves the laboratory last.

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Instructions in case of laboratory accidents Emergency call to 112

- Always call the emergency number 112 whenever someone's life, health, property, or the environment is in danger.
- When making the emergency call:
  1. Tell the operator clearly what has happened.
  2. Give the exact address and town where the accident has happened.
  3. Answer the questions asked.
  4. Follow the instructions given.
  5. Only end the call after being told to do so.
  6. Instruct the professional helpers to the scene.
  7. Call again if the situation changes.

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Instructions in case of laboratory accidents: fire alarm

- Stop all heating.
- Leave the building at once. Escape routes and emergency exits are marked with green lights, signs and arrows.
  - Do not use lifts.
  - The teacher leaves the laboratory last.
- Go to the assembly point.
- Do not come back inside before it has been announced that the danger has passed.

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Instructions in case of laboratory accidents: fire (1/4)

- Do not endanger your own safety.
- Save the ones in danger.
- Warn other people present.
- Press an alarm if fire isn't detected by the smoke alarms and the fire alarm system.
- Do not hesitate to do this in case of large/uncontrollable fires.

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Instructions in case of laboratory accidents: fire (2/4)

- Restrict the spreading of the fire by:
  - closing the doors and windows
  - switching off air conditioning
  - moving hazardous materials to a safe place
  - finishing all heatings and the addition of chemicals to any mixture of substances
- Extinguish the fire with fire extinguishers.
- Guide the units of the rescue department to the target and inform them of dangers in the area.
- Ensure the safe evacuation of the area and guide people to the assembly point.

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Instructions in case of laboratory accidents: fire (3/4)

- Restrict the spreading of the fire by:
  - losing the doors and windows.
  - switching off air conditioning.
  - moving hazardous materials to a safe place.
  - finishing all heating and the addition of chemicals to any mixture of substances.
- Extinguish the fire with fire extinguishers.
- Guide the units of the rescue department to the target and inform them of dangers in the area.
- Ensure the safe evacuation of the area and guide people to the assembly point.

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Instructions in case of laboratory accidents: fire (4/4)

- Extinguish a burning person using the emergency shower, or use a fire blanket, or simply roll them on the floor.
- Use the blanket by wrapping it around the person and patting quickly against the person to extinguish the fire.

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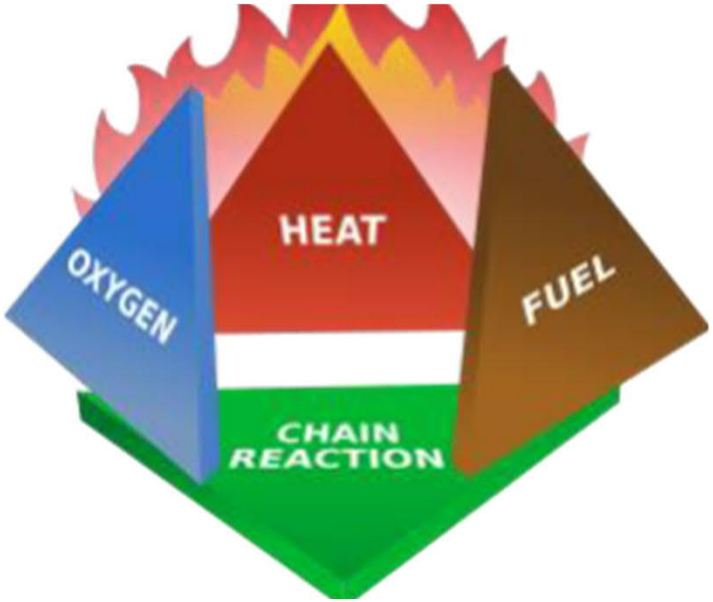
Instructions in case of laboratory accidents: fire extinguishing methods

- Clearing (the removal of fuel): burning material is removed from the target.
- Cooling (the removal of heat): the temperature of the burning target is lowered so that the fire will go out.
- Smothering (the removal of oxygen): the oxygen supply of the fire is prevented.
- Inhibition (breaking the chain reaction): the chain reaction required by the burning is chemically stopped.



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Instructions in case of laboratory accidents: fire extinguishing methods

- Smother with a saucepan lid, big vessel or a fire blanket.
- Cool with water, this is suitable for extinguishing fibre-like materials (a wood, paper, textiles etc.) and water-soluble fluids.
  - You may use emergency safety showers for burns from heat and chemicals.
- Notice that water is not a right choice for burning fat/oil or electrical fire!
- Use a portable fire extinguisher (smother + cool)

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Instructions in case of laboratory accidents: fire extinguishing methods

- The CO_2 fire extinguishers are a good choice for extinguishing electrical fires and fluid fires.
- The extinguishing effect of CO_2 is based mainly on smothering but it also cools burning material.
  - CO_2 is very cold when discharged from the extinguisher (about -75 ºC).
  - Because it is a gas, it doesn't leave any sticky residues.
- Carbon dioxide fire extinguishers are not allowed in professional kitchens and industry for extinguishing cooking oils/fats. The oil/fat can catch fire again and the high pressure can splash the burning oil/fat around.

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Instructions in case of laboratory accidents: fire extinguishing methods

- Powder fire extinguishers (e.g. ammonium sulfate, ammonium phosphate, sodium hydrogencarbonate) can be used for extinguishing almost fires of any kind.
  - The extinguishing effect is a combination of cooling, inhibition and smothering.
  - The fine dust of the extinguisher spreads wide and it is laborious to clean.
  - The powder also destroys electrical apparatuses.

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Instructions in case of laboratory accidents: fire extinguishing methods

- Foam fire extinguishers are mainly water based with a foaming agent. They can be used for extinguishing almost any kind of fires but they are not as efficient as powder fire extinguishers.
  - The extinguishing effect is a combination of cooling, inhibition, and smothering.
  - The foam is easy to clean.

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Instructions in case of laboratory accidents: fire extinguishing methods

- Fire classes that have been marked on fire extinguishers.
  - A) Solids such as wood, paper and textiles.
  - B) Liquids and oils.
  - C) Gases.
  - D) Metals.
  - F) Cooking oils/fats.
- The suitability of the fire extinguisher on electrical fires is marked, for example, this way: “Warning U ≤ 1000 V, safety distance 1 m”.

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Instructions in case of laboratory accidents: fire extinguishing methods

- How to tell apart foam extinguishers and CO_2 extinguishers?

Small nozzle = foam

Big nozzle = CO_2

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Instructions in case of laboratory accidents: first aid instructions

- Take the victim from the danger area but do not move them if it is not necessary.
- First aid is given by the person that is the most qualified.
- Call the emergency number 112.
- Support the breathing by placing the victim in the recovery position. If the victim is conscious, a half-sitting position is the best.
- If the patient is not breathing normally, start chest compressions immediately.
- Finnish Red Cross: https://www.redcross.fi/learn-first-aid/first-aid-instructions

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Instructions in case of laboratory accidents: chemical exposures

- Check materials safety data sheet (SDS/MSDS).
  - Check OVA https://www.ttl.fi/ova/ (only in Finnish).
- Call the Poison Information Center: +358 800 147 111. The call is free of charge.
  - Open 24 hours a day
- Take the patient to the doctor.
- Call the emergency number 112 if the situation is serious.

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Instructions in case of laboratory accidents: toxic/corrosive substance on the skin (1/2)

- Take off contaminated clothing.
- Immediately rinse skin with water (if the substance is corrosive, rinse for at least 30-60 minutes).
- Find out the need for further action from the SDS or from the Poison Information Center.
- If severe pain or burns develop, or the skin becomes inflamed, take the patient to the doctor.

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Instructions in case of laboratory accidents: toxic/corrosive substance on the eye (2/2)

- Always wear safety goggles in the laboratory!
- Immediately rinse the eye with plenty of water for about 15 minutes (if the substance is corrosive, rinse for at least 20-30 minutes).
  - Remember the eyewash stations and eye wash bottles!
- If rinsing is not performed before going to the doctor's, the eye may already be damaged when you get there.
- Find out the need for further action from the SDS or from Poison Information Center.
- Take the patient to the doctor.

Instructions in case of laboratory accidents: toxic/corrosive substance in the eye

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Instructions in case of laboratory accidents: ingested toxic substance

- Rinse mouth and remove substance from the mouth.
- Do not induce vomiting.
- If the person has ingested petroleum products or corrosive substances, do not induce vomiting or give activated charcoal under any circumstances because these actions worsen the situation.
- Find out the need for further action from the SDS or from Poison Information Center.
  - Give activated charcoal if you are advised to do so.
- Take the patient to the doctor.

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Instructions in case of laboratory accidents: inhaled poison

- Move victim into fresh air.
  - Be careful that you don’t inhale the poison yourself! (e.g. cyanide poisoning)
- Place the victim into a resting position, preferably into a half-sitting position.
- Find out the need for further action from the SDS or from Poison Information Center.
- Take the patient to the doctor.

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Instructions in case of laboratory accidents: special instructions to some chemicals (1 / 2)

- Bromine (Br_2):
- Br_2 is very toxic and corrosive
  - Evaporates easily already at room temperature, boiling point is 59 °C
  - Always handle bromine in the fume hood, use gloves, lab coat and safety goggles
- If you get bromine on your skin, rinse with plenty of water or sodium thiosulfate solution ($Na_2S_2O_3$), if that's available
  - The thiosulfate reduces bromine into bromide ions
  - If Br_2 spills onto the floor, it can be cleaned either with a thiosulfate solution or Na_2CO_3-solution
- Always see a doctor after Br_2 exposure!

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Instructions in case of laboratory accidents: special instructions to some chemicals (2/2)

Phenols:

- Rinse the skin immediately with the water solution of polyethylene glycol 400.
  - If there is no solution available, rinse with plenty of water for at least 15 minutes.
  - The person who assists the wash has to wear safety gloves.
- Take the victim to the doctor.

Cyanides:

- Break a 0,2 ml amyl nitrite ampoule into any piece of cloth. Give the patient the cloth to be breathed in.
- Half a minute of amyl nitrite is continuously given after which a break of half a minute is taken.
- Repeat three times (max. 6 ampoules). If available, give 100% O2.
- Take the victim to the doctor.

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Instructions in case of laboratory accidents: wounds

- Stop visible bleeding by applying pressure to the wound.
- Clean the wound under cool running water.
- Cover the wound with a protective bandage or plaster (small wounds).
- Go to the doctor if the wound is large/deep or is infected later.
- If the bleeding is big, stop the bleeding by applying direct pressure over the wound with fingers or by hand.
  - Lay the severely bleeding victim down.
  - If bandages are at hand, apply a pressure bandage over the wound.
  - Call the emergency number 112 if necessary.

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Instructions in case of laboratory accidents: shock

- Shock refers to a situation where the bloodstream in the tissues is insufficient.
- Shock can be caused, for example, by the loss of blood, dehydration, allergic reaction etc.
- The symptoms are pale skin and cold sweat, restlessness and later incoherence
  - Person might feel thirsty.
- First aid:
- Set the person lying down.
  - Call the emergency number 112.
  - Cover the person to avoid loss of heat.
  - Give any other necessary first aid according to the symptoms.
  - Do not offer anything to eat or drink.

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Instructions in case of laboratory accidents: burns

- Cool the burn immediately with cool water for approximately 10 minutes.
  - If the injured area is extensive, be sure not to cool too much.
  - You can use emergency showers for this.
- Do not break blisters.
- A burn can be covered lightly using a clean bandage.
- Medical care is needed if the burn is, for example, extensive, on the face, mucous membranes, in the respiratory tracts, caused by electricity, a chemical substance, radiation, or steam.

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Instructions in case of laboratory accidents: accidents involving electricity

- Switch off the current (main breaker or room) and loosen the victim from the device without endangering yourself.
- Check the breathing of the victim and start resuscitation if necessary.
- Take the patient to the doctor or call the emergency number 112 if necessary.

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Conclusions

- Preparation for safe lab work is the best safety insurance.
- Remember that the dose makes the poison, and any given chemical can be hazardous
  - If there is too much of it!
  - If it is in the wrong place!
  - If the timing is wrong!
- Personal protective equipment will not remove the need to understand one's work and the chemicals being used, and general careful planning of laboratory work!

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