Ministry of Health of the Russian Federation

Volgograd State Medical University

Department of Pharmaceutical and Toxicological Chemistry

SAFETY IN THE CHEMISTRY LABORATORY

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The chemistry laboratory has the potential to be very dangerous. This is why it is extremely important that you follow all safety guidelines when you are in the laboratory. Always adhere to the following safety guidelines:

1. ***Wear eye protection.*** Chemicals can cause serious damage to your eyes, including blindness. Safety glasses must be worn to prevent chemicals and other hazardous substances from coming in contact with your eyes. Goggles offer the best protection and are particularly recommended to guard against splashes and explosions. Protective goggles must be worn when working with concentrated acids and alkalis.
2. ***Dress appropriately for a lab.*** The less skin that is exposed, the better! Lab coats are recommended to protect clothing. Hair that is longer than shoulder length must be tied back.
3. ***Wear appropriate gloves.*** Gloves are required at all times when you are handling chemicals and items that have been exposed to chemicals. Protective gloves must be worn when working with concentrated acids and alkalis.
4. ***Keep the lab clean and neat.*** Avoid cluttering the lab bench or hood. Clutter can lead to spills, so return items promptly to their proper locations. Promptly notify the instructor of any spills and clean them up as instructed. Spills must be cleaned up as soon as possible to prevent others from exposure to the spilled chemical. Inform the instructor of any conditions that seem unsafe.
5. ***Perform only authorized experiments.*** Unauthorized experimentation may expose you and your lab mates to unforeseen hazards.
6. ***Do not work alone.*** Always have someone present in the laboratory that knows what to do in the event of an emergency.
7. ***Treat all laboratory reagents as if they are hazardous.*** Often, not all hazards are known about a chemical you may be working with, so always use maximum precautions. If you spill a chemical on your skin, immediately rinse it with water, and then notify your instructor. Always wash your hands thoroughly with soap or detergent before leaving the laboratory, even if you wear gloves. Appropriate labels on the reagent bottles will often indicate special hazards.
8. ***Do not bring food, drinks, or cosmetics into the laboratory.*** Eating, drinking, or applying cosmetics in the laboratory can introduce toxic or corrosive chemicals into your system. You particularly want to avoid any contamination to your mouth or eyes.

9. ***Immediately report all incidents to the instructor.*** The instructor will best know how to handle the situation and may also use the information you provide to help other students avoid a similar difficulty.
10. ***Be familiar with the experiment before beginning the lab.***
11. ***Read the label carefully.*** Only use the correct chemicals in the proper concentrations. The wrong chemical or concentration could result in a violent reaction.
12. ***Ask "dumb" questions.*** If you are not sure about how to properly perform a procedure or handle a chemical, ask your instructor.

ISSUES SPECIFIC TO PARTICULAR EXPERIMENTS

Depending on the specific experiment that you will be performing, you may need to take additional safety precautions. The following are common experiment-specific issues that you may need to be aware of:

1. ***Never pipet by mouth.*** Many organic chemicals are toxic or corrosive.
2. ***Carefully inspect glassware*** for damage. Broken glassware may cause cuts, and chipped or cracked glassware may break and spill its contents unexpectedly.
3. ***Use caution when heating reactions.*** Avoid open flames whenever possible. Bumping can cause hot liquid to spray out of its flask. A closed system should not be heated because the resulting increase in pressure may cause an explosion that propels reagents or pieces of glass. Always ensure that an opening is present when heating a reaction. Do not heat any distillation pot to dryness because overheating could cause the remaining residue to detonate.
4. ***Handle hot objects with caution.*** Hot glass, metal, or sand is often indistinguishable from cool glass, metal, or sand. Cautiously touch objects that have been heated before handling them.
5. ***Do not directly sniff the contents of a container.*** If you must examine the odor of a reagent, gently waft vapors from the container toward your nose.
6. ***Do not use open flames in the presence of flammable materials.*** Organic solvents such as acetone, diethyl ether, and petroleum ether are not only extremely flammable but also produce flammable vapors. Use a flameless heat source whenever possible.
7. ***Prepare acid solutions carefully.*** Dilute acids should be prepared by slowly adding the concentrated acid to a larger volume of water. The water dissipates the evolved heat and prevents localized boiling that may cause the contents of the flask to spray.

RESPONDING TO INCIDENTS IN THE ORGANIC CHEMISTRY LABORATORY

In addition to following all of the above safety precautions, you must be familiar with how to handle an incident in the laboratory and be willing to assist others in emergencies. If you are the first to notice an incident or hazard in the laboratory, you should immediately alert your instructor and others that may be in harm's way. An incident that seems minor may be much more serious than you think, and your instructor is the best person to evaluate the situation.

The following are incidents that you may encounter in the chemistry laboratory:

1. ***Broken glass and other sharp objects. Properly dispose of broken glass.*** Use a hand brush and dustpan to collect the pieces, and do not attempt to use your hands, even if you are wearing gloves.
2. ***Spilled mercury.*** Inhalation of mercury vapors can be extremely hazardous. If a mercury thermometer is broken, step back from the work area. Immediately notify your instructor and anyone working in the vicinity. Your instructor will use special techniques to collect the spilled mercury.
3. ***Cuts.*** For minor cuts, wash the affected area using soap then inform your instructor. If the injury does not stop bleeding on its own, apply gentle pressure with a clean paper towel or bandage. Go to the Health Center if you suspect a cut may be deep, the wound continues to bleed, or it is possible that chemicals have gotten into the wound.
4. ***Burns.*** Hold the burned area under cool running water for 10 to15 minutes or until the pain subsides, then inform your laboratory instructor.
5. ***Chemical spills.*** In the event of a reagent spill, immediately notify the instructor and anybody working in the vicinity. If the spilled chemical is flammable, remove all ignition sources, heat sources, and equipment that could produce a spark.
6. ***Chemical spills on a person.*** Deal promptly with reagent spills because many organic chemicals are fat-soluble and can be absorbed through your skin. Remove any affected clothing and then wash the area with running water for 10 to 15 minutes. Wash with soap or detergent to completely remove the reagent.
7. ***Fires.*** Many solvents and chemicals used in the chemistry laboratory are highly flammable, and a fire may occur in the laboratory. If a fire does occur, step back from the fire and then immediately notify the instructor and anybody working in the vicinity. Move flammable materials away, and turn the equipment off or remove it from the vicinity of the fire. If possible, contain small fires by placing a beaker over the fire to smother it. Some small fires, such as alcohol fires, may be allowed to burn out. If a fire

spreads to a larger area of the bench, the instructor or other authorized persons will direct you to evacuate the laboratory and the building.

8. ***Fire on a person.*** The proper response to a fire can make the difference between loss of clothing or, in extreme cases, loss of life. If your hair or clothing catches on fire, stop where you are, drop to the floor, and roll to smother the flames. When the flames are extinguished, remove any smoldering fabric and hold burned areas under cool running water for 10 to 15 minutes until the pain subsides. If your neighbor catches on fire, assist them to help beat out the flames using a laboratory coat or fire blanket.

References &Additional Resources

1. Hill, R. H.; Finster, D. C. Laboratory Safety for Chemistry Students; John Wiley & Sons, Inc.,Hoboken, NJ,2010.
2. Lehman, J.W. The Student's Lab Companion: Laboratory Techniques for Organic Chemistry, 2nd ed.; Prentice Hall: Upper Saddle River,NJ, 2008; pp 10-26.