

# Lessons Learn



Laboratory safety knowledge sharing

Sept. 2020

## 1、 What is the source of danger in the laboratory?

The source of danger refers to the source or condition that can cause personal injury, disease, property damage, damage to the operating environment, or other losses. After the analysis of the unsafe behaviors of people, unsafe conditions of objects and management defects in the laboratory, the dangerous and harmful factors in the laboratory are classified according to the cause of the accident.

1. **Physical hazards:** equipment, facility defects, protection defects, poor working environment
2. **Chemical hazards:** flammable, explosive and toxic chemicals
3. **Behavioral hazards:** operating errors, poor management

## 2. The proportion of laboratory accidents caused by human factors is 98%

- There are a wide variety of chemicals used in the laboratory, such as flammable and explosive materials and highly toxic materials, including radioactive materials, etc.
- Some experiments need to be carried out under special environments and conditions such as high temperature and high pressure or ultra-low temperature, strong magnetism, vacuum, microwave radiation, high voltage and High speed rotation
- Various harmful substances will be produced during the experiment
- The experimental equipment in operation also exists such as light, electricity, heat, rays, high-pressure gas, electromagnetic waves, etc.

The existence of the above hazards determines that a slight negligence in the work carried out around the laboratory may lead to fire, explosion, and poisoning.

**People are the subject of laboratory safety accidents**, and various environmental factors are often caused by humans. According to statistics, the proportion of accidents caused by human factors in laboratory safety accidents is 98%.

**Training and control of people participating in laboratory activities is the most important content of laboratory safety management.**

**In a word, accidents are caused by defects in the management system!**

### **3. How to ensure the safety of daily laboratory work?**

In order to ensure the safety of the daily work of the laboratory, the laboratory should carry out the hazard identification and risk assessment and the safety inspection of the laboratory work. The safety inspection should include hazard identification, risk assessment and risk control measures, personnel capabilities and health status, safety inspection of environment, Facilities and equipment, materials, work flow, etc.

Foreseeable hazards at all stages of laboratory activities, such as mechanical, electrical, high and low temperature, fire and explosion, noise, vibration, respiratory hazards, poisons, radiation, chemical and other hazards; or foreseeable hazards not directly related to the task, Such as sudden power outages in the laboratory, safety in special conditions such as earthquakes, floods, and typhoons.

### **4. How to have an Effective control of hazards?**

☞ Use of toxic and hazardous drugs in the laboratory

First of all, the most ideal way to prevent the poisoning and pollution of hazardous chemicals in the laboratory is to not use toxic, harmful, flammable, and explosive chemicals. But this is difficult to do, **so non-toxic or low-toxic chemicals can be used to replace toxic and harmful chemicals or improve the process.**

Secondly, fire and explosion accidents are the most common in laboratories. To prevent such accidents, in order to eliminate the risk factors that may cause combustion and explosion, it is necessary to keep combustible substances out of a dangerous state.

In the course of the experiment, flammable and explosive materials should be used and regulated carefully, and the flammable materials should be prevented from reacting with air or other oxidants to form a dangerous state.

Sound laboratory of various subdivision management system

To strengthen the laboratory post responsibility system, so that the various safety responsibilities are implemented to the person, clear their respective division of labor and responsibility. Establish various safety rules and regulations, such as "Drug Management System" to arrange special personnel for purchasing, registration, receiving and issuing.

The person in charge of the laboratory should manage and arrange the use of valuable and dangerous chemicals properly.

The "Instrument and Equipment Management System" All kinds of instruments and equipment in the laboratory are under the responsibility of special persons, and the person in charge should be familiar with the usage and characteristics of the instruments and equipment, and do the maintenance work so that the instruments and equipment are in normal and good condition.

The "Safe Electricity System" all laboratory personnel must be clear about the location of the total power switch and each electrical power supply in the laboratory, and turn off the power in a timely manner after the end of the experimental operation. Circuit or electrical equipment failure, must first cut off the power supply before inspection.

Safety Fire Prevention System" There are more flammable and volatile chemicals in the laboratory, as well as electric furnaces and ovens, etc. Improper use or operation

is very likely to cause a fire, and fire-fighting facilities should be equipped in the laboratory, etc

#### 5. Improve the safety operating procedures of the laboratory

1. Flammable and explosive materials must be stored in a safe place;
2. To enter the laboratory must wear laboratory clothes and personal protective equipment;
3. When handling toxic, harmful, irritating or corrosive substances, you must wear targeted protective clothing and protective gloves;
4. In the experiment, the operating procedures should be followed strictly according to the prescribed procedures and steps (for example, when diluting concentrated sulfuric acid, the concentrated sulfuric acid must be slowly added to the water, rather than adding water to the concentrated sulfuric acid);
5. Volatile substances must be handled in a fume hood;
6. Work waste liquid generated in the laboratory should be properly handled under the guidance of the person in charge of safety (especially highly toxic or strong carcinogen);
7. Do not dispose of waste medicines at will, but collect them by special personnel for unified disposal

#### 6. What you need to do

1. New recruits must understand the laboratory safety and sanitation system, and must understand the placement and use of fire extinguishers, and the way to escape in an emergency.
2. Smoking is strictly prohibited in the laboratory, and the wire connecting the instrument must use sheathed wire or fancy wire. The laboratory must not spit, throw debris, or make loud noises.

3. Laboratory facilities and medicines should be placed reasonably, and flammable and explosive chemicals should not be placed near ovens, water baths and other heat sources. When using steel cylinders, the position must be fixed, and if it is a flammable gas, there should be a fire prohibition sign on the laboratory door.

4. The drugs used in the laboratory must be strictly classified and discharged. The flammable, explosive, and highly toxic reagents must be limited and stored separately. Special personnel should keep them properly. The flammable and explosive reagents that require refrigeration should be stored in an explosion-proof refrigerator.

5. Highly toxic, valuable medicines and precious metal products must be stored in a safe and kept by two people to implement the "five pairs" management requirements. The specific requirements can be found in GB15603-1995 "General Rules for the Storage of Commonly Used Chemical Dangerous Goods".

6. Regardless of the concentration of the chemical, wash the skin after contact with the chemical, and wash your hands before leaving the laboratory.

7. When operating laboratory instruments and equipment, the operating procedures must be strictly followed;

8. After the work is over, check the indoor water, electricity, gas, doors and windows, etc., to ensure safety before leaving.

9. There are many causes of explosion accidents in laboratories. The most common one is to mix chemicals randomly.

The mixture of oxidizing agent and reducing agent will explode when heated, rubbed or impacted.

Before each new chemical drug is used, it is necessary to understand the physical properties, chemical properties, toxicity, safe use and handling methods of the drug. For the experiments of highly toxic, flammable, explosive and toxic chemicals, two or more personnel must be present before they can be carried out, and safety

precautions for possible accidents and dangers must be taken seriously.

Strictly do a good job in receiving, using, and registering and storing highly toxic and dangerous goods.

10. Special personnel must be present and concentrated during the experiment process. The experimenters must not leave their posts at will. If they need to leave the scene for a short time (such as within half an hour), they must ask other staff to handle it temporarily;

When encountering abnormal phenomena in the experiment, necessary measures must be taken in time to ensure the safety of the experiment;

When encountering an abnormal phenomenon in the experimental equipment, the experiment must be terminated in time, further inspections, and the hidden dangers can be eliminated before the experiment can be continued.

If it is really necessary to conduct experiments overnight, the person in charge of each project shall report to the laboratory director for registration and record.

Reagents sprayed or splashed on the skin during the experiment should be cleaned immediately, and the injured should be moved to a safe and ventilated place as soon as possible, and warning signs should be set up on the scene until the accident is properly handled to prevent the situation from expanding and spreading, and report the experiment at the same time. The person in charge of the office and the school emergency team shall take further treatment and seek medical treatment if necessary.

11. At the end of the experiment, the water, electricity, gas, etc. must be turned off in time, and the instrument must be cleaned, and the desktop must be kept tidy and safe before leaving.

12. The treatment of the three wastes in the laboratory should be strictly implemented in accordance with the provisions of the Provisional Regulations on Environmental Protection.

13. Dispose of the "three wastes" in strict accordance with the regulations. It is

strictly forbidden to pour waste liquid into the water tank. The waste liquid should be treated separately or recycled, or collected and handed over to a qualified environmental protection hazardous waste treatment company for disposal.

14. Do not pile laboratory debris in corridors and pedestrian passages. If the laboratory does not meet the discharge requirements, the inorganic and organic waste liquids that need to be treated should be poured into the waste liquid bucket, marked with the name of the toxic substance, and covered with hand.

15. The experimenter must have an understanding of the types of accidents that may occur in their work and the rescue measures, so that they can take timely measures in the event of an accident.

16. In the event of an accident in the laboratory, it must be reported in writing to the laboratory director and technical supervisor in order to understand the situation in a timely manner and take measures without concealment.

*Nothing we do is worth getting hurt for !*