13 Chemical Safety and Chemical Security: A Guide to Preventing Health Hazards

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13.1 Introduction

13.1.1 Definition of Terms

13.1.1.1 Chemicals

Chemicals are substances that have a definite composition, and they can be natural, for example water, or artificial, such as sodium hydroxide. Natural chemicals are found in nature like in plants and animals, while artificial or manufactured chemicals are produced by scientists. There is actually a minimal difference between natural and artificial chemicals of a particular compound. If a chemical found in nature is synthesized in the laboratory, there is no distinctive difference between them, for example, vitamin C in oranges is the same as the manufactured one.

Some chemicals are used directly or as precursors to the manufacturing of other chemicals. For instance, phosphorus compounds are precursors for manufacturing agrochemicals and plastic additives among others. We come across artificial or manufactured chemicals in the home such as bleaches, dishwasher powders, turpentine, swimming pool cleaning liquids, weed killers, pest control products and the likes. It is important that precautions are taken while using chemicals at home.

13.1.2 Health Hazards

In the context of this work, health hazards are limited to chemical health hazards. The term 'chemical health hazard' refers to the properties of a chemical that can cause acute or chronic health problems. A chemical health hazard occurs when one is exposed to chemicals that have the potential to cause harm to health and life. Chemicals can be inhaled, ingested, swallowed, or even absorbed through the skin (Nwaichi, 2018). Acute health issues are such as burns, vomiting asphyxiation, etc., and chronic problems are cancer, liver damage and so on.

13.1.3 Chemical Safety

Chemical safety involves the protection of human health and the environment (Nwaichi, 2018) by controlling the extent of exposure to potentially hazardous chemicals. Simply put, chemical safety is protection against accidents while handling chemicals whether in the laboratory or our homes. It covers both natural and manufactured chemicals. Chemical safety activities range from

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E. O. Nwaichi (ed.), *Modernity in Health and Disease Diagnosis: The Account from STEM Women*, Sustainable Development Goals Series, https://doi.org/10.1007/978-3-031-34963-8_13

exposure situations of the chemicals in the environments to synthesis, production, transportation, use and disposal. These are all summed up in the topic 'chemical management'. The WHO in its 59th world health assembly issued resolutions and decisions (WHA 59.15, strategic 'Approach to international chemicals management', 2006) to ensure chemical safety and hence minimize hazards and accidents. Implementing a good chemical safety policy in an organization will not only save lives but also protect the environment. Laid down procedures to ensure the safety of personnel, the community and the environment are pertinent even in our homes.

13.1.4 Chemical Security

Chemical security centers on preventive measures designed to reduce the risk of deliberate removal (theft) and misuse of chemicals with the intent of committing a crime or causing harm. According to OPCW (Organization for the Prohibition of Chemical Weapons), chemical security refers to measures used to prevent deliberate releases of toxic chemicals and to mitigate the impact if such events occur. In a wider context, it also includes policies to prevent attempts to acquire toxic chemicals or chemical weapons precursors.

In essence, chemical security is concerned with:

- Prevention of terrorist attacks on industrial plants.
- Theft of chemicals with potential hazards.
- Contamination of chemicals or products and degradation (CCPS 2008).

Chemical security comprises:

- Methods or processes of identification of possible hazard.
- Risk assessment designs in handling chemicals.

A risk assessment according to Kaplan and Garrick (1981) should answer such questions as:

- What can go wrong?
- How likely is it?
- What are the consequences?

13.2 Relationship Between Chemical Safety and Chemical Security

Both chemical safety and chemical security are geared towards protecting life and the environment. They are all necessary in the research setting as well as in our homes.

13.2.1 Chemical Safety Centers on

- Preventive measures in the design and control of a chemical.
- Identifying vulnerabilities.
- Likelihood of accident and control.

For example, in the laboratory, corrosive or hazardous chemicals are labelled and kept separately or signs like 'dispose properly could cause damage to plants' placed on them.

Summarily, chemical safety depicts the likelihood of accidents, consequences and control while using chemicals.

On the other hand, chemical security is the degree of protection against the misuse of a chemical in terms of the damage it could cause to life and the environment through theft, loss or criminal activities.

Chemical security measures in a facility may include:

- Physically protecting employees (providing security services for employees).
- Safeguarding unauthorized access to get chemicals or preventing deliberate attacks (building fences, security posts, etc.)
- Safeguarding against the release of hazardous chemicals to the environment.

Broadly speaking, chemical safety aims at precautions taken during the intentional use of a chemical. Chemical security further highlights possible unintentional use or misuse of the chemical that can be of danger to life and the environment while soliciting measures to guard against such activities. As an analogy, a researcher working with ammonium chloride wears personal protective clothing (PPE) and observes all labo-

ratory rules (intentional use) in chemical safety. Safeguarding ammonium sulphate from getting into the wrong hands (unintentional use) is chemical security.

A proactive approach to effective chemical safety may include such steps as:

(a) Identification of chemicals being handled or stored. All chemicals available should be labelled properly; identified and separately stored according to their hazard levels; likewise, risk assessment of each chemical should be recorded. For example, in a laboratory, inflammable chemicals should be stored away from others with labels clearly showing so. In the home, used bottles of other chemicals should be re-labelled.
(b) Hazard prevention and controls.
A record of the hazard levels of each chemical should be explicitly stated with possible control measures. This will give information to anyone in case of an emergency. Knowledge about chemical hazards should be shared with all involved.
(c) Workers in any organization should be trained regularly on how to handle chemicals. Training and educating staff are critical to maintaining safety.
(d) Safety efforts should be reviewed periodically to access the effectiveness of safety programs.

13.2.2 Conflict Between Chemical Safety and Chemical Security

Information on chemical safety can constitute a chemical security risk. In the laboratory, chemical safety measures require that every chemical should be labelled and separately stored to identify hazardous ones. Everyone should have knowledge of this information. Labels identifying these chemicals can also be targets for theft risk and misuse. Aqua Regia, a concentrated chemical of three concentrated acids, is often labelled and separately stored. An employee or even thieves can get access to this chemical for the wrong purposes. Displayed labels easily attract attention and such chemicals are susceptible to theft or misuse. Those who attacked people with acid baths identified the acid through the labels.

Sharing knowledge about a chemical can expose other uses of the chemical which can inspire security risk.

13.2.3 Resolution of Conflict Between Chemical Safety and Chemical Security

The conflict between chemical safety and chemical security can be resolved by observing chemical management best practices.

A chemical management system ensures:

- Proper compliance with safety, environmental and food safety policies.
- Chemical procurement and purchasing.
- Safe storage, handling and use of chemicals.
- Disseminating information about hazardous chemicals to the community in compliance with laid down regulations, having MSDS (Material Safety Data Sheet).
- Preventing exposure of workers and the environment to chemicals.
- Proper waste disposal.

13.3 Why Chemical Safety and Chemical Security Awareness?

Chemical safety and chemical security awareness have become necessary because of recent happenings around us. Every day we are exposed to thousands of artificial chemicals; a report by the European Environmental Agency (2020) attributes estimates of about 6% of the world's disease burden and 8% of deaths to chemicals. Unauthorized and misuse of chemicals by criminals have resulted in several casualties: the bombing of factories, schools, oil installations or pipelines; fire outbreaks; insurgency and militancy; acid baths; deliberate food poisoning; etc., were traced to the use of chemicals. Also, explosives and Improvised Explosive Devices (IEDs) made from chemicals have found to be

used in these attacks. As a result, various countries have promulgated laws to protect the use of chemicals to forestall these criminal acts. The Nigerian Senate passed the 'Chemical weapons prohibition Bill' on Wednesday, 21 May 2018, and placed some chemicals on the prohibition list.

Some of them are:

- Ammonia sulphate.
- Potassium sulphate.
- Urea.
- Hydrogen peroxide.
- Hexamine.
- Urea-formaldehyde.
- Sulphur powder.
- Ammonia powder.
- Nitroglycerine.
- Sodium chlorate.
- Liquid ammonia.

(Source: http://www.opcw.org/index.html)

Many scholars have observed and reported deficiencies in the observation of chemical safety and chemical security in our environment. Research institutions and homes are places where ignorance and negligence have caused a lot of chemical health hazards (Youssef, 2018). Educational and research institutions are slower in implementing safety and security programs than the industries; this situation has been reported in many forums. Walters et al. (2017) observed deficiencies in Trinidad's institutions, particularly in the areas of hazard identification and emergency response. The prevalence of chemical hazards among laboratory workers in some public universities in Lebanon was assessed by Nasrallah (2022). Regular training on laboratory safety measures is essential to ensure health and safety. In some laboratories, chemicals are abandoned and some are not properly stored. Laboratories are supposed to have adequate light and running water, and in some of our tertiary institutions this is not the case. There is an unsatisfactory level of chemical safety and chemical security awareness in school laboratories. There has to be more awareness, change in attitude, and standard practices among tertiary and secondary students on chemical safety in the laboratory. Employees are often exposed to chemical compounds on numerous occupational settings, and yet there are significant gaps in knowledge and scare preparedness in adherence to safety procedures. Employers and heads of institutions must enforce measures to ensure chemical safety and chemical security. Simple laboratory guidelines will be given in this write-up.

Chemicals are used every day in our homes—cleaning fluids, paints, glues, pesticides and even medicines. Lack of awareness of chemical safety in homes also resulted in many avoidable domestic accidents. In the home environment chemical safety and chemical security awareness also needs some emphasis to ensure healthy homes. With thousands of chemicals in the local market and many more introduced to us each day, awareness is obligatory. Farmers and their families who are constantly in contact with farm chemicals are apparently ignorantly suffering from acute and chronic effects of small quantities of chemicals they come across daily. Are you observing necessary precautions at home? Do you know that all cleaning agents are chemicals and are harmful? What about spraying pesticides to kill that cockroach or any vermin? Prevention is better than cure.

13.4 Some Common Use Chemicals and their Health Hazards

Chemical health hazards may be acute in which case the effect is felt within hours or even days of occurrence or chronic when it takes a while to manifest symptoms of an illness. Sources of contact with these chemicals may be through inhalation, swallowing or absorption through the skin. Table 13.1 shows examples of common chemicals and possible hazards they can cause while in use.

Table 13.1 Chemicals and possible health hazards

S/N	Chemical	Place used	Likely hazard
1	Acids	Laboratory	Burns, death on ingestion
2.	Ammonium sulphate	Food companies, fertilizers, air conditioners, fire extinguishers, etc.	Long-time use can cause acidification of soil, skin irritation and affect breathing when inhaled
3.	Sulphur powder	For skin irritation, acne and sumac infections	Causes diarrhoea when ingested
4.	Isocyanides	Used as paint additives	Destroys the immune system
5.	Chloroform	A precursor to many refrigerants	Tumours in the liver and kidney
6.	Methanol	Manufacture of pharmaceutical products	Blindness and lethal even in small amounts
7.	Sniper (pesticide)	Used locally to kill cockroaches and other insects	Highly poisonous when ingested. Kills even animals that eat the dead insects
8.	Hypo (bleach solution)	Used as a cleaning agent or for bleaching white fabric	

13.5 Who Is Vulnerable to Chemical Health Hazards?

Everyone is vulnerable to chemical health hazards and attacks. Vulnerability simply refers to a state of being weak or helpless in a situation. Someone who is vulnerable is weak and without protection, as a result, they can be easily hurt physically or emotionally.

Hazardous chemicals are present in the air and in consumables both at the workplace and the home. According to the WHO Director-General, during the Ministerial Dialogue held on 7 July 2021, at the Berlin Forum on Chemicals and Sustainability: Ambition and Action Towards 2030, deaths due to hazardous chemicals worldwide rose from 1.56 million in 2016 to two million in 2019. The report further highlighted that the world experiences daily deaths of between 4270 and 5400 due to unintentional exposure to chemicals.

One major source of death due to hazardous chemicals is lead poisoning. Lead is used to enhance the quality of some paints. The WHO Director-General also reported that most of the deaths especially unintentional poisoning are among children and young adults who are more vulnerable (WHO webinar 2022).

Employees at chemical factories and laboratories are vulnerable to a lot of hazards as they are exposed to chemicals for longer times. Such chemicals include detergents, paints, cleaning agents, etc (OPCW conference 2019).

The home setting is vulnerable too. A simple illustration of vulnerability at home is keeping alcohol (spirit) where there are underaged children. The likely hazard here is that the children may get access to it, get drunk and be intoxicated. Alcohol or alcoholic beverages should be stored out of reach of children who are vulnerable to the hazard of its dangers. A child who is always sent to buy a cigarette for the parent(s) is vulnerable to the use of cigarettes or other drugs (SDG 3).

13.6 Vulnerability Assessment

It is important to recognize vulnerabilities and do whatever is necessary to reduce or eliminate risks.

13.6.1 What Are the Areas of Vulnerability?

13.6.1.1 In our Homes, Vulnerabilities May Include

1. Purchase of chemicals from illegal sources. Cleaning agents, fuels and medicines are common chemicals used in the home. Most of these products are not registered by relevant control agencies. Purchasing from such avenues leaves the home vulnerable to chemical health hazards. Locally produced disinfec-

tants and cleaning solutions can be sources of vulnerability to chemical health hazards in the home. Due to poor economic conditions, some people are prone to patronize these products. They really pose threats to health.

2. Improper information about the other uses of the chemical.
   Some chemicals have dual uses. They would have bought it for a particular purpose, but other uses of the chemical can make it a chemical security risk.
3. Use of adulterated chemicals.
   Many adulterated chemicals are all over the market. Several cases have been reported where kerosene explosions occurred due to adulterated products. Kerosene is the main source of cooking and lighting especially for the majority of poor citizens as an alternative to electricity and gas. In Southern Nigeria, the oil-producing area of Nigeria, illegal refineries (clamped down by the government of the country) have contributed to a lot of kerosene explosions (Olugbenga 2005). Many unregistered pharmacies also proliferate our environment; medicines should be purchased in only reputable drug stores. The rural communities in Nigeria are vulnerable to patronizing quakes as drug vendors. The local authorities (Local Government Health office) can minimize or eliminate this risk. Premium Motor Spirit (PMS) or petrol and diesel are products often adulterated which presents risks. Apart from vehicles, both products are also used in electricity generators.
4. Carelessness on the part of users to storage and disposal.
   Carelessly storing chemicals can be a vulnerability risk in the home. Sometimes chemicals are transferred to other containers that bear different labels. In one of our discussion forums, a lady reported how she stored a cleaning solution in an empty Sprite bottle and her child mistook it for water and drank it. An early intervention saved the situation. Another child drank kerosene kept in the kitchen at the reach of a toddler who also ingested the substance. Serious health emergencies are often recorded when chemicals are carelessly kept in the home.
5. Disposing of used or unwanted chemicals also poses vulnerability risk. I had an experience in which I used pesticides to kill cockroaches and disposed of the dead ones just on the field in my backyard. A few days later I observed all the free-range chickens I keep were either dead or sick. From investigation, I realized they consumed the cockroaches killed by the pesticide. That was a careless disposal resulting in a chemical health hazard.
6. Other family members are not aware of chemicals in the home.
   When other family members are not aware of a new chemical in the home, it can be a vulnerability risk. A woman who produces 'Hypo' (the name for locally made bleaching solution in Nigeria) used a bucket that looks like the bucket for storing drinking water in their home. Her daughter dipped her cup into the bucket to quench her thirst. If Mummy had informed the family members, that casualty would have been averted.

The following guides are pertinent to forestall vulnerability risk:

Taking inventory of all the household chemicals used in the home and their proper storage systems. This calls for reading the label on containers of all chemicals purchased. Everyone should form this habit so as to avoid possible hazards. Some chemical products are best kept in the refrigerator, some in the freezer, and some on the shelf or cupboard. Medicines are also chemicals; vulnerability assessment includes keeping them out of the reach of unauthorized persons. Most chemical products will have directions for use on the container as well as dangers in applications. Identify the likely hazard and risks involved in using any chemical product.

One should also be informed about first aid activities to apply in case of emergency and assess how likely such hazard can happen and the consequences.

13.6.1.2 In a Research or Laboratory Facility

1. Chemical logos are not properly placed on chemicals. Labels are used to identify chemicals, but once they are in a container it is difficult to place that chemical. It is therefore of utmost importance that such labels be properly fixed on the container. Imagine a scenario where you have distilled water and a dilute acid, both in an unlabelled container, there is the likelihood of mistaking one for the other.
2. Transporting chemicals through students, commercial passengers or personal vehicles.
   Often times we take for granted this area of vulnerability assessment. One should be very mindful of how chemicals are transported. We find in some of our laboratories how students are allowed to purchase their own chemicals for research work when actually chemicals should be issued to them by laboratory staff. The usual response is 'we ran out of stock'. From the part of the world where I come from this is almost a norm but seriously against laboratory best practices. Students may not have the full information on how to handle such chemicals while transporting them to the laboratory. Again misuse, diversion and even accidental spilling or other forms of mishap can occur. Some even use commercial passenger vehicles during this process.
3. Security operatives are not trained on chemical safety/security to enforce chemical security measures.
   A security agent who is not trained to recognize chemicals and their hazard levels may not be aware when that chemical is stolen from a facility he protects. It means therefore that the lack of training on chemical security and general science education (Nwaichi et al. 2021) makes security operatives and other workers, even the facility itself, vulnerable to chemical health hazards. It will be interesting to investigate how many security personnel in our tertiary institutions have such awareness and education. This could be a time bomb ticking.
4. Inadequate protection of the laboratory and facilities against theft and loss.
   We should make sure laboratories are protected against both inside and outside theft. An inside theft is when chemicals are removed by workers who have access to them and outside theft is from an external source. Vulnerability assessment procedures must be put in place to militate against theft and loss of lives (SDG 3).
5. Working with a disgruntled staff that could steal or sell chemicals for a pittance.
   Even though human beings are insatiable, an underpaid staff like we find in some research laboratories can hardly be controlled. A hungry man is an angry man; where there are security lapses, a disgruntled employee will be ready to sell chemicals not minding the after-effect of their actions. Therefore, employers in these facilities must consciously guide against dissatisfaction among staff (SDG 3).
6. Purchase of chemicals from illegal distributors.
   This is also a vulnerability risk that should be checked. Illegal distributors are vanguards of fake and substandard chemicals. Their products may be cheap but not achieve the purpose of purchase. Some may even cause death.
7. Insufficient information on chemicals used.
   Not having sufficient information about the chemical used is a vulnerability risk. For instance, petrol is a chemical that is inflammable near any flame or fire, and a researcher who is ignorant of this is at risk of a fire accident. Some chemicals are to be kept in dark places not to be exposed to sunlight and so on.

13.7 World Concern for Chemical Safety and Chemical Security

In order to live in a world free of chemical weapons and safe usage, the Organisation for the Prohibition of Chemical Weapons (OPCW) was created on 29 April 1997 with 193 member

states. The goal is 'to prevent chemistry from ever again being used for warfare thereby strengthening international security'. OPCW cooperates with the chemical industry to educate and reach out to society about chemical safety. To this end in Nigeria, the United States Department of State's Chemical Security Program (CSP) in conjunction with associations like the Chemical Society of Nigeria (CSN) holds workshops and training for researchers, industrialists, and manufacturers to create awareness and sensitization in chemical safety and chemical security (Nigerian Regional ChemicaSecurity Workshop 2018; Chemical Security and Vulnerability Assessment and Security Plan Development Workshop 2020).

13.7.1 How do Chemicals Get to Society?

(a) Importation.
Chemical importation is controlled by various countries under their regulatory bodies. In Nigeria, this is achieved through proper and strict monitoring by the regulating body National Food and Drug Administration Control (NAFDAC). Their control covers:
- Issuing permit for the importation of all categories of chemicals.
- Listing of all chemical importers and marketers.
- Inspection of storage facilities when chemicals are imported.

(b) Illegal local manufacturers.
Illegal manufacturers still find their products into society beating all regulatory controls. The unsuspecting consumer suffers the effects of any substandard product. In Nigeria, there are many local manufacturers of household chemicals who are not NAFDAC approved even though the law forbids them. All chemicals sold should have a NAFDAC registration number. But how many do have them? The ignorant society patronizes them.

(c) Industries.
Most chemical industries are licensed to import their raw material. They become avenues where chemicals get into society. Fraudulent practices still bring some of these chemicals into the open market.

(d) Universities and research institutes.
Universities and research institutes are legally permitted to import chemicals. Laboratory chemicals are consumables in these places. Sometimes these chemicals may find their way into the wrong hands in society.

(e) Theft and insincerity among authorized users.
Theft of chemicals can occur at the point of importation without the knowledge of the legal importers, or it could be theft in their storage facility. Chemicals can also be brought into society through authorized end users. Sincerity among employees is another avenue where hazardous chemicals get into the society.

(f) Diversion of chemicals.
Sometimes genuinely imported chemicals are diverted to other sources. Despite efforts by regulatory bodies, industrial and laboratory chemicals are being diverted to purposes for which approval was not obtained.

In summary, chemicals for safety and security concerns may be imported for a genuine purpose by authorized importers, industries, and research institutes. Insincerity among authorized users can divert such chemicals to society. Illegal local manufacturers are also sources of distribution of chemicals of concern. Some of them are dual-use chemicals that are even in homes.

13.7.2 Dual-Use Chemicals

Dual-use chemicals are chemicals that can be used for both beneficial and harmful purposes (Douglas et al. 2014). Examples are:

(a) Dimethyl methyl phosphate (DMMP) is a flame retardant used for furniture, buildings, upholstery making, and in the electrical industry. This chemical is a chemical agent nerve precursor.
(b) Pesticides/rodenticides. These are used to get rid of pests and rodents in our environment and homes. They can be poisons to us too.
(c) Hydrogen peroxide, (H_2O_2), finds use in the recipe for sanitizers. Sanitizers are important chemicals in 'the new normal' in our world today. Do you know that (H_2O_2) is a dual-use chemical used in the manufacture of explosives?

In our homes, we come across common dual-use chemicals and chemical products such as:

(a) Hypo (bleach solution).
(b) Insecticides, pesticides, and rodenticides.
(c) Sniper.
(d) Ammonium nitrate (fertilizer).
(e) Camphor balls.

All these are beneficial to us in the home but at the same time, they can be harmful. Hence proper management and handling is very important (www.csp-state.net).

13.8 Guides to Preventing Health Hazards

Some useful guides to help reduce/eliminate chemical health hazards are as follows:

(a) In the Laboratory.
    1. Purchase chemicals from legal and approved distributors.
    2. Ensure proper storage of chemicals.
    3. Keep chemicals away from the wrong persons.
    4. In the laboratory regularly keep charts of chemicals dispensed so as to identify loss.
    5. Organize chemical safety and chemical security awareness training for staff, students, and security personnel in tertiary institutions.
    6. Always use Personal Protection Equipment (PPE).
    7. Be aware of the dual-use properties of chemicals.
    8. Properly dispose of any chemical waste.
(b) At Home.
    1. Always label home-used chemicals properly. Salt and granulated sugar have the same appearance, differentiate them by labelling their containers.
    2. Make sure rodenticides and pesticides are not kept near food or food materials. When rodents or insects are killed make proper disposal of them by digging a hole; they could be poison to other animals in the environment if carelessly disposed of.
    3. Let everyone in the home know about the dangers of dual-use chemicals available in the home.
    4. Do not take chemicals (hazardous or not) out of their original containers. If you must, properly label the container or inform family members.
    5. Always wash your hands or parts of your body with soap and water after using chemicals.
    6. When you buy chemicals, read the labels, for there are usually directions for use and warnings about their hazardous nature.
    7. Keep chemicals out of the reach of children. For older children explain the dangers of hazardous chemicals to them.
    8. Keep chemicals in original containers, if you must switch containers, please label them properly.

13.9 Some Useful First Aid Tips to Apply in Chemical Hazard Emergencies

The tips or information given in Table 13.2 are intended to serve as first aid before visiting a medical facility.

Table 13.2 First aid in chemical hazard emergencies

S/N	Type of emergency	First aid treatment
1.	Skin or eye contact	Flush with water copiously until irritation subsides. Do not rub, wipe, or apply any medication to the affected area.
2.	Burns	Wash off the chemical with water until it is completely removed. You can cover with a clean bandage or gauze. Do not apply pressure on the burned skin. Visit a medical facility immediately for further treatment.
3.	Inhalation	Move out from the area where the fumes are and get fresh air immediately. If the person is unconscious, those around should provide cardiopulmonary resuscitation (CPR).
4	Ingestion	Make the person expel what is in the mouth as much as possible. Give milk or water before medical help arrives. If it is at home, some traditional old method advice is that the person be given palm oil which aids the person expel any remnant inside.
5	Poisoning	Lime juice or vinegar can be used to neutralize ingested poison. Palm oil is recommended in this case too.
6.	Acid ingestion	The victim should be given milk or water if conscious enough before medical help. Note the type of acid, its concentration, and the volume probable swallowed. Acid can be neutralized in the mouth by rinsing with water and fluoride paste.
7.	Other solutions	Identify the type of solution and use large volumes of water to rinse affected parts.

13.10 Conclusion

There is poor adherence to chemical safety and chemical security best practices in laboratories as well as our homes. Health is wealth, so many health hazards can be avoided by observing chemical safety and chemical security practices. In a technology-laden world, everyone comes across chemicals whether one is a scientist or not, for sure we all live in homes. Have we bothered about the security of the chemicals used? How many persons have access to them for other purposes apart from the intended use? Since chemicals are used in one form or the other by everyone, we are all vulnerable and must strive to maintain a safe environment and live healthy lives. We can be our brother's keeper by reporting illegal manufacturers to the relevant controlling agencies in our countries. The precautionary saying is 'better safe than sorry'.

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