

Laboratories that handle chemicals and biological samples are potentially hazardous places.

In recent years, there has been an increasing appreciation of the importance of safe working practices in industry, for both health and environmental reasons. This awareness has led to greater stress on issues such as safety documentation, staff training, and risk assessment.

Employers have a responsibility to provide the necessary protective clothing and equipment, and they are required to provide training in safe working practices.

If safe working practices are in place, the probability of serious injury to yourself, your colleagues, and members of the public should be greatly reduced.

SAFETY OFFICERS

It is important to appoint a safety officer or officers for each department. These people will take on the responsibilities of introducing and maintaining safety procedures. Nevertheless, safety is the responsibility of all staff in the laboratory.

SAFETY MANUAL

There should be a comprehensive safety manual that covers all aspects of safe working practices for the whole department.

All staff members must read the manual and sign a declaration to indicate that they have understood it.

Copies should be kept with the safety officers and also made available in places that are easily accessible to all members of the staff.

SAFETY MEASURES: UNIVERSAL PRECAUTIONS

The system of universal precautions requires that any danger of infection from any source will be avoided or minimized by good working practices.

All blood samples, blood products (including plasma-based reagents and kits), and other human body materials should be regarded as posing a possible danger of infection.

The fullest possible protective measures should always be taken when working with any material.

No other classification of risk should be made. All body fluids and materials other than blood, whether collected or brought into the unit for testing or any other purpose, should be handled with the same care as that given to blood.

The Laboratory

The laboratory should always be clean and tidy. Paperwork should be kept separate from laboratory testing areas. Try not to use the laboratory for storage of bulk items. Try to ensure that everyone participates in keeping the laboratory orderly.

Protective Clothing

Everyone who enters the laboratory, including visitors, should wear a laboratory coat. They should immediately replace the coat if it becomes contaminated.

Disposable Gloves

Many people do not like to use gloves, but every sample handled in the laboratory is potentially hazardous. Gloves should always be worn when handling toxic material.

Gloves and coats will obviously not protect against a needlestick-type accident, but they will prevent, for example, HIV positive serum or a toxin coming into contact with any cuts or abrasions on your skin.

Always replace gloves immediately if they are broken or punctured.

Eye Washing

Many infections can be easily acquired by contact with the mucous membranes of the eyes.

Wash your eyes immediately with lots of cold running water if contact with a possible infectious material may have occurred.

Sharps

Sharps, in the form of needles and broken glass, present a great danger: use a sharp box capable of containing sharps without being punctured.

There have been cases of workers becoming infected as a result of needlestick injuries.

Aerosols

Avoid all practices in the open laboratory that may cause splashing or the release of airborne droplets or dust.

Operations that cause aerosols must always be carried out in a suitable fume cupboard, and safety glasses must be worn.

All spills should be cleaned up immediately, using bleach or a neutralizing agent as necessary.

Toxic and Flammable Substances

Toxic or flammable materials must always be contained within a fume cupboard or suitable safe box.

Electrical Equipment

Take special care with any equipment that uses liquids, such as electrophoresis tanks and water baths.

Always leave installation, servicing, and repairs to qualified personnel.

Personal Possessions and Behaviour

Never take personal items, such as pens, bags, and combs, into the laboratory.

Avoid bringing your hands into contact with your face or mucosae (eyes, nose, and mouth) while in the laboratory but if you must do this, always wash your hands first.

Food, cigarettes, and cosmetics must never be brought into the laboratory.

Never mouth a pipette.

Always wash hands thoroughly before leaving the laboratory.

Accidents

All accidents should be reported immediately and should be recorded in an accident book kept by the unit Safety Officer. This is particularly important in relation to needlestick injuries. In these situations, follow local hospital systems for recording and reporting, along with any locally recommended or mandated actions.

THE CONTROL OF SUBSTANCES HAZARDOUS TO HEALTH (COSHH)

This legislation, used in U.K. laboratories, is a useful guide in identifying risks and hazards.

Hazard and Risk

The hazard presented by a substance is its potential to cause harm. The risk from that substance is the likelihood of its harming someone under the actual conditions of use.

Identification of Hazards

The identification of hazards is an essential prerequisite of risk assessment. The time spent in identifying the hazards will vary according to the substance.

Risk Assessment

Consider the following facts:

- the hazards
- the conditions of use
- the amounts to be used
- the likely routes or sites of exposure (inhalation, ingestion, skin, or eyes)

The outcome of the risk assessment will determine:

- the storage conditions
- the handling procedures
- the disposal procedures
- the requirement of monitoring and health surveillance
- the emergency procedures

Risk assessment must be reviewed annually and updated if necessary.

See figures 3.1 and 3.2, below, for examples of how to record information for risk assessments, in these cases using the COSHH procedure.

The purpose of this form is to identify the hazards and control measures associated with equipment used in a particular procedure. Only staff documented as competent should perform any procedure, and they should perform that procedure only after reviewing the health and safety documentation related to that particular test.

Figure 3.1. COSHH for prothrombin time and APTT-based clotting factor assay

**COSHH Ref. No. Assays 1
Lab. Ref. One-Stage II, V, VII, VIII, IX, X, XI and XII Assay**

Title of Procedure/Experiment:

Substance	Approx. Qty	Hazard Identified
Glyoxaline (imidazole) buffer, contains (see**)	<5 ml	Harmful if ingested.
**Imidazole	3.4 g/l	Corrosive: causes burns. Harmful if inhaled, ingested, or absorbed through skin. Irritating to eyes.
**Sodium chloride	5.85 g/l	Irritating to eyes and lungs. Avoid skin contact.
Factor-deficient plasma	1 ml	Risk of infection
Thromboplastin	2 ml	Low risk
APTT Reagent	2 ml	Low risk
0.025M calcium chloride	5 ml	Low risk
Owren's buffer	<500 ml	Contains barbitone. Harmful if swallowed. May cause sensitization by contact to skin or inhalation.
Coagulation analyser wash solution 1	<50 ml	Causes burns: harmful to eyes, skin, etc. Do not mix with other disinfectants. Corrosive. Contact with combustible materials may cause fire. Contact with acid liberates toxic gas. Reacts violently with ammonium salts; organic solvent – explosive risk.
Coagulation analyser wash solution 2	<50 ml	Contains 0.16% hydrochloric acid and detergent. Irritant: may harm eyes and skin.
Standard/control/patient plasma	<1000 µl	Risk of infection.

Figure 3.2. COSHH for factor XIII assay

Title of Procedure/Experiment:		
Substance	Approx. Qty	Hazard Identified
Activator reagent: bovine thrombin; clot inhibitor (0.01 G GLY-PRO-ARG-ALA-AMIDE); calcium chloride; hexadimethrine bromide (40mG); bovine albumin; bicine buffer (100M m/l); and 2.5 mg sodium azide	5 ml vial	Contains sodium azide: highly toxic if absorbed through skin or ingested. May cause heritable genetic damage. Reacts explosively with certain metals.
NADH reagent: 2 mg NADH; bovine albumin and 2.5 mg sodium azide	5 ml vial	Contains sodium azide: highly toxic if absorbed through skin or ingested. May cause heritable genetic damage. Reacts explosively with certain metals.
Detection reagent: synthetic peptide; glycine ethylester (7 mg); alpha ketoglutarate (13.5 mg); bovine albumin; HEPES buffer; and 5 mg sodium azide	5 ml vial	Contains sodium azide: highly toxic if absorbed through skin or ingested. May cause heritable genetic damage. Reacts explosively with certain metals.
Standard/control/patient plasma	<1000 µl	Risk of infection.