COSHH: Control of Substances Hazardous to Health

Module 1

ROYAL SOCIETY OF CHEMISTRY

Health & Safety Essentials

Registered charity number 207890

Assessing hazard & risk in the UK university chemistry laboratory

To protect people's health, the risks arising from work-related exposures to hazardous substances need to be assessed BEFORE any work is started. Controls need to be put in place and monitored to make sure they are maintained and are suitable and sufficient.

Objective:

After studying this module, you will understand the need to conduct risk assessments, how this applies to all laboratory activities, and the principles underlying the Control of Substances Hazardous to Health Regulations 2002 (COSHH Regulations).

What is COSHH?

In the UK, hazardous chemicals in the laboratory are subject to the 'Control of Substances Hazardous to Health Regulations 2002 (COSHH)'. COSHH applies to all workplaces and covers a range of substances. Risk assessments are required whenever workers are exposed to hazardous substances in order to control the risk of ill health as a result of the exposure.

What do I need to do?

You MUST make a 'suitable and sufficient' assessment of the risk to the health of any individual created by the work, and the steps necessary to control the risks arising from ANY hazardous activities involving chemical and biological substances.

Everyone associated with the activity has a role to play in assessing risk in a laboratory but those in supervisory positions must be familiar with COSHH and actively involved in implementing it, even if they are not actually performing experimental work.

What's the difference between hazard and risk?

Hazard:
In relation to a substance, the intrinsic property of that substance that has the potential to cause harm (injury or damage) to the health of a person.

Risk:
The likelihood (probability) that the hazard will cause actual harm under the circumstances.

Question: For a hazardous substance, what are the intrinsic properties of that substance that are related to its hazard potential?

Answer: *The intrinsic properties of a substance that make it hazardous are its physical and chemical properties, which include its volatility, flammability, toxicity, particle size, state (solid, liquid, gas) and corrosive nature.*

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For example, a substance may be flammable and toxic; its hazard potential depends on the way we handle the material, how it is released into the environment, how we come into contact with it, its route of entry, and its effect on the body.

Hazardous substances include:

- Substances used directly in work activities
- Substances generated during work activities
- Naturally occurring substances

Potential for exposure depends on:

- Quantity – how much is being used/produced, i.e., the dose (exposure over time Small/Medium/Large)
- Physical properties – its physical form as a solid, liquid, or gas (volatility/dust – Low/Medium/High)
- Method – open bench, fume cupboard, totally enclosed, etc. (affects routes of entry into the body)
- Frequency of exposure – hourly, daily, weekly, monthly, occasionally
- Cumulative or sequential effects (its absorption, distribution, metabolism and excretion in the body)

Routes of exposure

The three main routes of entry into the body are ingestion, inhalation and absorption via the skin. Injection is another route of entry, and it is more likely to be a cause of a needle stick injury.

Ingestion – Possible causes in industry and laboratories include mouth pipetting, swallowing inhaled dust, smoking or eating without washing your hands or touching protective clothing with hands that contaminated with dust or chemicals.

Inhalation – Particles small enough to be inhaled into the lungs and or then deeper into the body can cause not only a local effect (respiratory irritation) but systemic effects in the body such as central nervous system effects (dizziness, nausea and narcosis).

Absorption – It can occur through contact by vapour or liquid with exposed skin. It can also occur through the use of incorrect glove material, allowing the substance to penetrate through the gloves and into the body via skin absorption.

Physical form

The toxic effects of a substance depend on its physical form, the dose, the route of entry and its method of absorption, distribution, metabolism and excretion from the body.

Solids – When ground or crushed, dusts can be inhaled or injected, or contaminate the skin.

Liquids – Can be swallowed or contaminate the skin.

Gases, vapours, fumes, mists, aerosols – Can all be inhaled, or contaminate the skin.

The hazard property of the substance is independent of the amount of substance present (for example, sulfuric acid [H_2SO_4] is corrosive whether you are handling 5ml or 5 litres).

The level or severity of harm is considered together with the likelihood of exposure when undertaking a risk assessment.

For a chemical to cause harm, an individual must be exposed to its hazardous properties in concentrations likely to be harmful to health or the environment. This means that during handling of the material, if the likelihood of exposure to a hazardous chemical is extremely low or unlikely, then the risk associated with that chemical will also be very low.

Both hazard and exposure must be considered before the risk can be adequately assessed and suitable controls defined.

Risk = Hazard x Exposure
We use the "x" symbol to show that if the hazard is low (or zero) or the likelihood of exposure is low (or zero), then the risk is also low (or zero).

In relation to the exposure of an employee to a substance hazardous to health, this refers to the likelihood that the potential for harm to the health of a person will be realised under the conditions of use and exposure. It also considers the extent of that harm.

Risk assessments

A risk assessment related to the use and handling of hazardous substances seeks to answer four questions:

1. What adverse health effects could occur if an individual were to be exposed to hazards?
2. How much of the substance is in use, and how could people be exposed to it?
3. Who could be exposed to the risk, what is the magnitude of the risk and how often are they in danger of being exposed?
4. What needs to be done to prevent or control the risk?

Risk assessments are not "one-off" activities; they must also:

- be reviewed at regular intervals, (we recommend at least every year)
- be reviewed if there is reason to suspect that the previous risk assessment is no longer valid
- be reviewed if there has been significant change to the work, personnel or circumstances to which the assessment relates
- be reviewed if monitoring shows that it is necessary
- be reviewed after an accident or incident, or if new information comes to light
- take account of vulnerable individuals; for example, consider pregnant employees, employees with disabilities/ illnesses such as epilepsy and those inexperienced in the working environment

The assessments should ideally be signed (not a legal requirement but good practice) by those individuals who are completing the task, area supervision, and any other persons that are affected by the activity.

A laboratory risk assessment entails a careful examination of what, in the laboratory, could cause harm to people's health. It is NOT about:

- preventing teaching or research work from being undertaken or
- producing piles of paperwork or box ticking