

HAZARDOUS MATERIALS



INTRODUCTION

TOXIC SUBSTANCES HAZARDOUS SUBSTANCES



Dr. Bassem ElAli

2

TOXIC SUBSTANCES

- The toxicity of a substance is its ability to cause harmful effects. These effects can strike a single cell, a group of cells, an organ system, or the entire body.
- A toxic effect may be visible damage, or a decrease in performance or function measurable only by a test.
- All chemicals can cause harm. When only a very large amount of the chemical can cause damage, the chemical is considered to be relatively non-toxic. When a small amount can be harmful, the chemical is considered toxic.



Dr. Bassem ElAli

3

TOXIC SUBSTANCES

- ❑ The toxicity of a substance depends on three factors:
 - its chemical structure,
 - the extent to which the substance is absorbed by the body, and
 - the body's ability to detoxify the substance (change it into less toxic substances) and eliminate it from the body.



HAZARDOUS SUBSTANCES

WHAT'S THE PROBLEM?

- Many used chemicals or produced in the workplace can be hazardous to your health.
- Exposure can lead to cancers and other diseases. The skin condition known as 'dermatitis' can also be caused by contact with hazardous substances.
- It is estimated that there are 2,200 deaths in Australia each year due to past occupational exposures to hazardous substances, including asbestos.



What are Hazardous Substances?

- Hazardous substances are chemicals and other substances that can affect your health, causing illness or disease.
- Solvents, pesticides, paints, adhesives, petroleum products, heavy metals or any other substance that is hazardous to health and is used or produced at work.



How can you tell if a substance you use at work is hazardous?

- The substance concentration - cause health effects.
- The substance must be labeled appropriately.
- Material Safety Data Sheet (MSDS) including health effects, instructions for safe use and storage and what to do in an emergency.
- Look on the label for the words "hazardous", "warning", "poison", "dangerous poison", "harmful", or "corrosive", or other advice about specific health effects.



7

How can you tell if a substance you use at work is hazardous?

- Your employer must make the MSDS for a hazardous substance readily accessible to you.
- In the absence of information such as label and MSDS, you should assume a substance to be hazardous.
- Where an exposure standard exists, the concentration of that substance in the air at work must be kept below the prescribed level.



8

HOW DOES IT AFFECT ME?

Hazardous substances can get into your body in different ways.

- by breathing in the substance (inhalation);
- absorption through the skin (dermal);
- accidental swallowing (ingestion), for example by eating or smoking with contaminated hands.



9

HOW DOES IT AFFECT ME?

Health effects may be:

- Acute, resulting from a short-term (usually high) exposure or
- Chronic, resulting from long-term (often low level) exposure over a period of time.
- Chronic effects may not occur for many years - they are hard to predict in advance and when they do occur it may be hard to identify what caused them.



WHAT NEEDS TO BE DONE?

- Your employer must take action to prevent your exposure to hazardous substances at work.
- to ensure that exposure is adequately controlled in order to minimize risks to your health.
- As an employee you have the responsibility to work safely using the control measures provided.



To ensure that you can work safely you have the right to be provided with information and training on any hazardous substances to which you may be exposed.

This should include:

- advice about health hazards,
- reading labels on containers,
- how to access the MSDS,
- emergency procedures,
- incident reporting and first aid.



PRACTICAL SOLUTIONS

➤ **Elimination:**

Using a less hazardous substance, or a less hazardous form or process (using a water-based paint instead of a chemical solvent-based paint).

➤ **Isolation:**

Separating hazardous substances from the people (locating operators in a separate air-conditioned control room away from hazardous fumes).



➤ **Engineering Controls:**

Using machinery, equipment or processes which minimize contamination (using local exhaust ventilation to remove hazardous fumes).

➤ **Safe Work Practices:**

Having procedures about how to do the job safely (requiring authorization to operate systems and restricting access to hazardous areas).



➤ **Personal Protection Equipment (PPE):**

Wearing protective equipment (respirators, gloves or eye protection).

➤ **Monitoring and health surveillance:**

To monitor the amount of the substance. If your exposure is approaching unsafe levels, immediate action should be taken.

Health surveillance means the monitoring of your health to identify health effects from exposure to a hazardous substance.



Routes of Exposure

How can chemicals enter the body?

- Inhalation
- Skin Absorption
- Injection
- Ingestion

Routes of entry	Importance	
	At home	At work
Ingestion	Most important	Least important
Skin contact	Of moderate importance	Of moderate importance
Inhalation	Least important	Most important

MEASURES OF EXPOSURES

- Threshold limit value (TLV)
- Permissible Exposure Limits (PEL)
- Time-Weighted Averages (TWA)
- Ceiling Levels (C)



Threshold Limit Value (TLV)

- *Threshold limit value (TLV)* – the level of concentration to which the worker could be exposed during the entire workday without significant harm.
- The TLV varies drastically with the toxicity of the contaminant and every toxic substance has its own TLV.



Threshold Limit Value (TLV)

- TLV is an 8-hour time-weighted average (TWA) believed to be the average concentration to which most workers can be exposed during an 8-hour workday, day after day, without harmful effects.
- TLV (STEL) is a 15 minutes "short term exposure limit".
- Ceiling (C) is a maximum concentration never to be exceeded



Permissible Exposure Limits (PEL)

- Since the OSHA-published list assumed a regulatory character, the term *permissible exposure limit* (PEL) was used to distinguish between the OSHA-prescribed level and the ACGIH term "TLV".



Time-Weighted Averages (TWA)

- The TWA is a computed weighted average concentration over an 8-hour shift.
- Concentrations of air contaminants change over time and that it is sometimes permissible for a workplace concentration to exceed the threshold limit value (TLV).
- During the workday the exposure is sufficiently lower than the TLV, such that the average exposure for the work shift is lower than the specified level.



Ceiling Levels

- A "**ceiling**" value, sometimes abbreviated **C** or **MAC** (*maximum acceptable ceiling*) is an exposure limit that should never be exceeded.
- **STEL** (*short-term exposure limit*) is recognizing the danger of acute exposures, but allowing short excursions above a level that, on an eight-hour shift basis, would clearly be hazardous.
- The **STEL** states a maximum concentration permitted for a specified duration, usually fifteen minutes.



PELs and STELs for some Hazardous Materials

Substance	8-hour time weighted average	Acceptable ceiling concentration	Acceptable maximum peak above the acceptable ceiling concentration for an 8-hr shift	
			Concentration	Maximum duration
Benzene	10 ppm	25 ppm	50 ppm	10 minutes
Carbon disulfide	20 ppm	30 ppm	100 ppm	30 minutes
Carbon tetrachloride	10 ppm	25 ppm	200 ppm	5 min. In any 4 hrs
Hydrogen sulfide	-	20 ppm	50 ppm	10 min. Once only if no other meas. exp. Occurs.


