

Hazards **خطر** and Risks **مخاطرة**



United Nations

Safety and health at work – A human right

The right to safety and health at work is stated in the United Nations Universal Declaration of Human Rights, 1948, which states:

Everyone has the right to work, to free choice of employment, to just and favourable conditions of work

(Article 23)

International Labour Organization

(ILO) منظمة العمل الدولية

The **International Labour Organization** is a United Nations agency whose mandate is to advance social and economic justice through setting international labour standards.

Founded in October **1919** under the League of Nations, it is the first and oldest specialised agency of the UN.



International
Labour
Organization

Occupational Safety and Health (OSH)

Occupational safety and health (OSH) is generally defined as the science of the **anticipation, recognition, evaluation** and **control** of **hazards** arising **in** or **from** the workplace that could impair the health and well-being of workers, taking into account the possible impact on the surrounding communities and the general environment.

The scope of occupational safety and health has evolved gradually and continuously **in response to social, political, technological and economic changes.**

In recent years, **globalization** of the world's economies and its repercussions have been perceived as the **greatest force for change in the world of work**, and consequently in the **scope of occupational safety and health, in both positive and negative ways.**

Hazard and Risk

Hazard is the potential of a substance to cause damage

-e.g; Toxicity is the hazard of a substance which can cause poisoning

Risk is a measure of the probability that harm will occur under defined conditions of exposure to the hazard

*(If there can be **no exposure** to a hazard, no matter how dangerous (hazardous) it may be, there is no risk of harm)*

HAZARD

Anything that can cause harm (eg. a chemical, electricity, ladders, etc)

RISK

How great the chance that someone will be harmed by the hazard

Hazard and Risk

The relation of risk to hazard is expressed as;

$$R = f (H \times E) = f (H \times D \times t)$$

Risk = R

Function = f

Hazard = H

Exposure = E

Dose = D

Time = t

Hazard and Risk

EXAMPLE

Chemicals which pose only a small hazard but to which there is frequent or excessive exposure may pose **as much** risk as chemicals which have a high degree of hazard but to which only limited exposure occurs

Hazards

Physical Hazards

- Noise
- Vibration
- Radiation(Ionizing radiation / non-ionizing radiation)
- Thermal environment (Heat / cold)
- Pressure

Hazards

Chemical Hazards

- Particles, fumes, and fibres
- Metals and metalloids
- Inorganic gases
- Organic solvents and compounds

Hazards

Biological Hazards

- Human tissue and body fluids
- Microbial pathogens (in laboratory settings)
- Genetically modified organisms
- Animals and animal products
- Organic dusts

Hazards

Mechanical and ergonomics Hazards

- Lifting and handling
- Posture وضعية أثناء العمل
- Repetitive work
- Mechanical hazards

Hazards

Psychosocial Hazards

- Organizational psychosocial factors
- Violence and aggression
- Shift and night work
- Long working hours
- Time zone changes

Study Designs Used in Environmental and Occupational Health

- **Descriptive studies** provide information for setting priorities, identifying hazards, and formulating hypotheses for new occupational risks.
- **Etiologic studies** can be used to show exposure-effect relationships

Study Designs Used in Environmental and Occupational Health

Ecologic study design **دراسة بيئية**

- Studies which correlate environmental factors' exposure to mortality and morbidity rates
- Based on large populations in order to calculate (r)

Study Designs Used in Environmental and Occupational Health

Cross-sectional study design

Case-Control study design

Toxicologic Concepts Related to Environmental and Occupational Health

- Dose-response
- Threshold
- Latency
- Synergism

Dose - Response

The dose–response relationship is the measurement of the relationship between the dose of a substance administered and its overall effect (the response)

(The response on the human being could be physiological or pathological or both)

The relationship is studied using the dose-response **curve**

Dose - Response

A dose response curve records the percentage of a population showing a given quantal كمي (all or nothing) response such as death when each individual member of the population is subjected to the same dose of toxicant (reflecting a given exposure).

(mainly used for expressing the association of exposure to a **chemical** or **toxic substance** upon an organism)

READINGS on the Dose-Response Curve

Lethal Dose LD

e.g; LD₅₀ is the median dose associated with the death of **50%** of the population

Effective Dose ED

Effective dose is a dose quantity in the International Commission on Radiological Protection system of radiological protection.

The sievert (symbol: Sv) is a derived unit of ionizing radiation dose in the International System of Units (SI) and is a measure of the health effect of low levels of ionizing radiation on the human body.

Regulation of agents that can cause cancer

In the absence of data in humans to the contrary, chemicals which can induce cancer in experimental animals are regulated as if they could induce cancer in humans

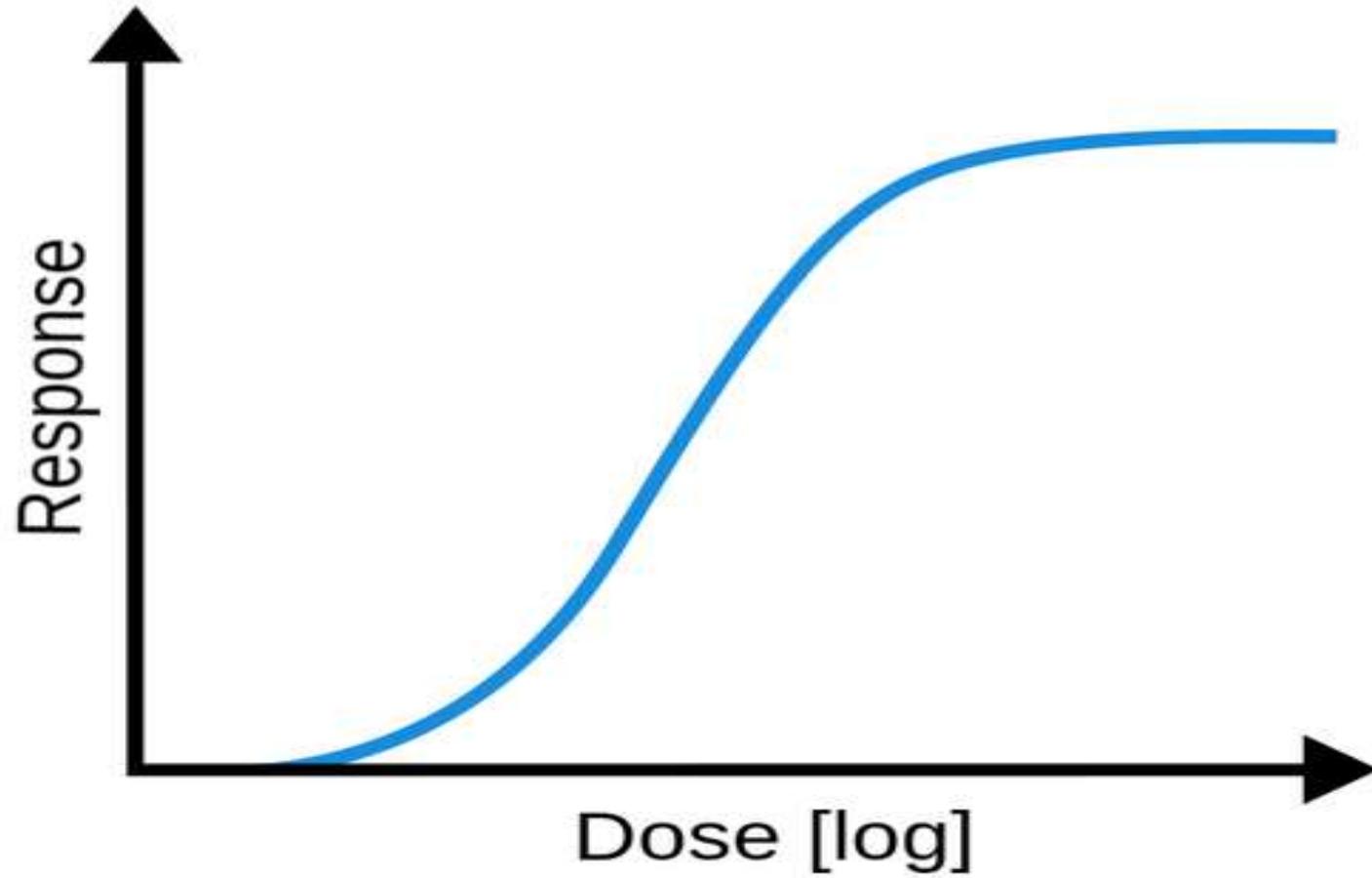
There is a generally held assumption that there is no threshold for safe exposure to substances which may cause cancer by mutation of the genetic information in DNA.

This may not be the case but it ensures that regulatory levels are set very far below those which might carry a significant risk.

Toxic Dose TD₅₀

The calculated dose of a chemical introduced by a route other than inhalation, that would cause a specific toxic effect in 50% of a defined experimental animal population

Dose Response Curve



Safe Exposure Levels

Important regulatory “safe” exposure levels are those for **food or water Tolerable Daily Intake (TDI)**

The Tolerable Daily Intake is an **estimate** of the daily intake of a chemical contaminant which can **occur over a lifetime without appreciable health risk**.

The concept of a “TDI” generally applies to **unavoidable and undesirable contaminants of food or water** which have no useful purpose.

The term “tolerable” is intended to signify **permissibility مسموح** rather than **acceptability مقبول**

Threshold

عتبة

The lowest dose at which a particular response may occur

Yet there is no evidence that subthreshold level do not produce health effect

Latency **كامن**

The **time period** between **initial** exposure and **a measurable response**

Latency can range from seconds (acute toxic agents) to years (mesothelioma)

The long latency of health events in environmental research makes the detection of hazards difficult (**confounding**)

Synergism التآزر

A situation in which the combined effect of several exposures is greater than the sum of the individual effects

Example: Study conducted among asbestos insulation workers demonstrated a synergistic relationship between asbestos and smoking in causing lung cancer