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PRESENTATION ON

DESCRIPTIVE TOXICOLOGY

FOR THE SUBJECT

CUTM 1648 CONCEPT OF TOXICOLOGY

*SCHOOL OF FORENSIC SCIENCES
BHUBANESHWAR CAMPUS*

INTRODUCTION

- Toxicology is the discipline of science dealing with poisonous substances which on entering the body of organisms causes disturbances in their normal functioning leading to harmful effects sometimes may causes death of organisms.
- Derived from Greek word “toxikos”= poison and “logos”=study

BRANCHES OF TOXICOLOGY

- Clinical toxicology
 - Mechanistic toxicology
 - Forensic toxicology
 - Descriptive toxicology
 - Preventive toxicology
 - Environmental toxicology
- Occupational toxicology
 - Genetic toxicology
 - Predictive toxicology

FORENSIC TOXICOLOGY

- It is the branch of toxicology that deals with medico legal aspects of harmful effects of chemical on human beings.
- Forensic toxicology is the use of toxicology and other disciplines such as analytical chemistry , pharmacology and clinical chemistry to aid medical or legal investigation of death, poisoning , and drug use.

DESCRIPTIVE TOXICOLOGY

- Focuses on toxicity testing of chemicals or agents of toxicity, usually on animals and then correlated to human conditions. It provides dose-response information upon exposure to a harmful toxic agent.
- The toxicity assessment commonly involves following steps:
 - 1) Hazard Identification
 - 2) Dose-response assessment
 - 3) Exposure assessment
 - 4) Risk Characterization

HAZARD ASSESSMENT

- Determines the exposure to chemical can increase the incidents of a particular adverse health effect and determines the likelihood of occurrence in human.

It is done by:

- Hazard identification data
- Human epidemiology data
- Animal bioassay (measurement of concentration or potency of a substance by its effect on living cells or tissues)
- Supporting data

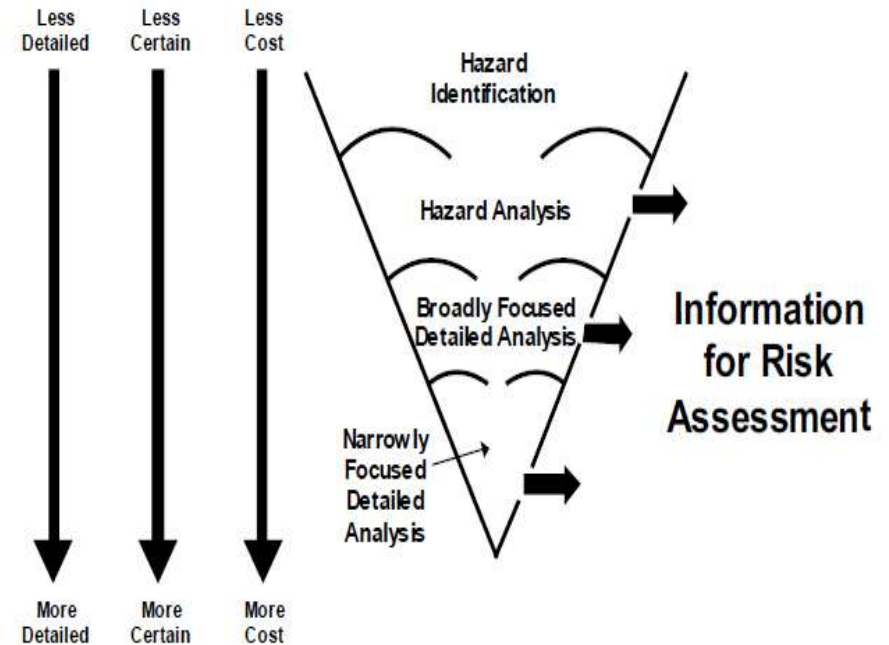
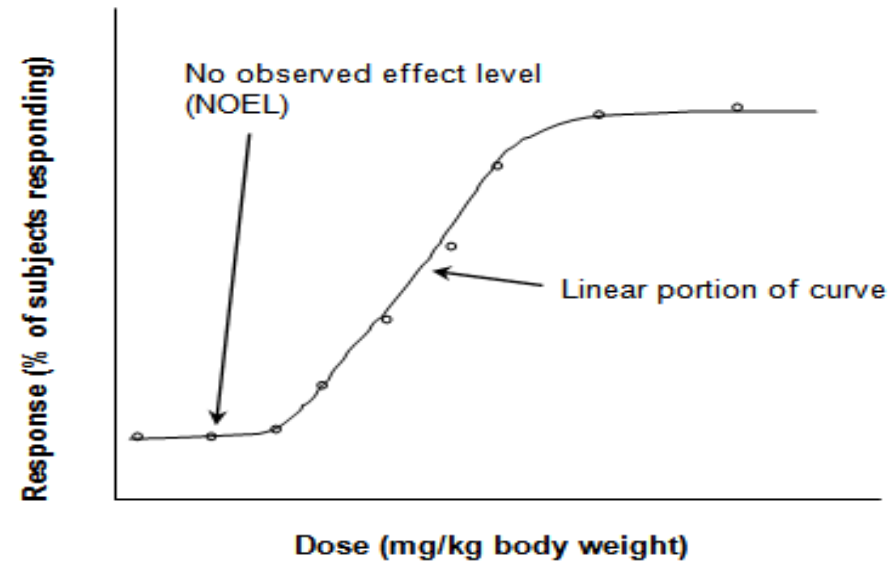


FIGURE 9.1. Levels of Hazard Evaluation and Risk Assessment

DOSE RESPONSE RELATIONSHIP

- **No observed adverse effect level (NOAEL)**
 - It denotes the level of exposure of an organism, at which there is no biologically or statistically significant increase in the frequency or severity of any adverse effects in the exposed population.

Dose-Response Curve Showing a Threshold



➤ **Lowest observed adverse effect level (LOAEL)**

- Lowest concentration or amount of a substance, which causes an adverse alteration of morphology, functional capacity, growth, development , or life span of a target organism distinguishable from normal (control) organisms of the same species and strain under defined conditions of exposure.

➤ **Acceptable daily intake**

- ADI estimated (maximum) amount of an agent , expressed on a body mass basis, to which a subject may be exposed over his lifetime without appreciable health risk.

EXPOSURE ASSESSMENT

- Exposed population (General public or selected groups)
- Types of substances (pharmaceuticals occupational chemicals or environmental pollutants)
- Single substance or mixture of substances
- Duration of exposure
- Pathways and media

RISK CHARACTERIZATION

- Review toxicity and exposure assessment output
- Quantify risks
- Combine risks across all pathways
- Assess and present uncertainties
- Consider site specific human studies
- Summarize and present baseline risk assessment characterization results

TOXICOLOGICAL TESTING

- Toxicology testing, also known as safety assessment or toxicity testing, is conducted to determine the degree to which a substance can damage a living or non living organisms.
- It is often conducted by researchers using standard test procedures to comply with governing regulations for example for medicines and pesticides.
- Stages of in vitro and in vivo research are conducted to determine safe doses of exposure in humans before a first-in-man study .Toxicology testing may be conducted by the pharmaceutical industry, biotechnology companies or contract research organizations.

➤ Broad spectrum of responses reflects toxicity

- Functional effects, such as immunological responses
- Growth inhibition
- Reproductive impairment
- Increase in cancer incidence
- Mortality

TOXICITY TESTING

- Assesses the concentration dependent hazard a chemical may present
 - Human health
 - Natural populations
- Results typically applied to
 - Approval of product use
 - Regulating allowable concentrations in the environment.

TYPES OF TOXICITY TESTING

- In Vitro (test tube)- useful in detecting potential biochemical and genetic effects.
 - Use model systems (bacteria, cultures animal cells, DNA interactions)
- In Vivo (animal)- are essential for detecting health effects
 - Acute, chronic, multi –generation
 - Experimental animals may be treated with high doses over a lifetime to evaluate potential to cause cancer
- In silicon (computer- based) – biological experiments conducted by computer models; these depend on data previously collected in other experiments

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- Molecular and cellular studies in toxicology often supplement toxicity testing results to help ascertain chemical hazard. They often unravel complex processes that underlie an adverse response.
 - Use of toxicants can help determine the function of proteins in complex networks.

IMPORTANCE OF TOXICITY TESTING

The data on acute toxicity test for various chemicals against various organisms may be valuable in following ways:

- To have an idea of toxic doses of xenobiotic for certain organisms
- Fixation of sub lethal doses for long term toxicity test
- Evolution of safe doses of those toxicants for certain organisms
- Recommendation of maximum permissible limits of those substances in the ambient air and drinking water
- Risk assessment

Private and public sectors invest in toxicity testing that aims to protect human health

- Chemical Manufacturers
- Pharmaceutical industry
- US Federal Agencies and Programs
 - National Toxicology Program (NTP)
 - Environmental Protection Agency (EPA)
 - National Institute of Environmental Health Sciences (NIEHS)
 - Food and Drug Administration (FDA)
- State and Local Government Bodies

FORENSIC IMPORTANCE

- Forensic toxicology is the analysis of biological samples for the presence of toxins, including drugs.
- This can provide key information as to the type of substances present in an individual and if the amount of those substances is consistent with a therapeutic dosage or is above a harmful level.

REFERENCE

- <https://www.slideshare.net/DnyaneshwariPande1/discriptive-toxicology>
- <https://en.wikipedia.org/wiki/Toxicolog>

THANK YOU