

Al-Rasheed University/ Collage of  
Pharmacy

# Introduction to toxicology

by:

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# Introduction to Toxicology

- Toxicology is the study of the adverse effects of chemical or physical agents on living organisms.
- A toxicologist is trained to examine and communicate the nature of those effects on human, animal, and environmental health. Toxicological research examines the cellular, biochemical, and molecular mechanisms of action as well as functional effects such as neurobehavioral and immunological, and assesses the probability of their occurrence. Fundamental to this process is characterizing the relation of exposure (or dose) to the response.

- Risk assessment is the quantitative estimate of the potential effects on human health and environmental significance of various types of chemical exposures (e.g., pesticide residues on food, contaminants in drinking water).

# The professional activities of toxicologists

The professional activities of toxicologists fall into three main categories:

- Descriptive
- mechanistic
- regulatory

## *A mechanistic toxicologist*

- is concerned with identifying and understanding the cellular, biochemical, and molecular mechanisms by which chemicals exert toxic effects on living organisms. The results of mechanistic studies are very important in many areas of applied toxicology. Mechanistic data may be very useful in demonstrating that an adverse outcome (e.g., cancer, birth defects) observed in laboratory animals is directly relevant to humans.

- For example, the relative toxic potential of organophosphate insecticides in humans, rodents, and insects can be accurately predicted on the basis of an understanding of common mechanisms (inhibition of acetylcholinesterase) and differences in biotransformation for these insecticides among the different species.

## *A descriptive toxicologist*

- is concerned directly with toxicity testing, which provides information for safety evaluation and regulatory requirements. The appropriate toxicity tests in cell culture systems or experimental animals are designed to yield information to evaluate risks posed to humans and the environment from exposure to specific chemicals.

## *A regulatory toxicologist*

- has the responsibility for deciding, on the basis of data provided by descriptive and mechanistic toxicologists, whether a drug or other chemical poses a sufficiently low risk to be marketed for a stated purpose or subsequent human or environmental exposure resulting from its use

- The Food and Drug Administration (FDA) is responsible for allowing drugs, cosmetics, and food additives to be sold in the market according to the Federal Food, Drug and Cosmetic Act (FFDCA). The U.S. Environmental
- Protection Agency (EPA) is responsible for regulating most other chemicals according to the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA).

# Other specialized areas of toxicology

- In addition there are other specialized areas of toxicology such as
- Forensic.
- Clinical.
- Environmental toxicology and Ecotoxicology.