

## **GENERAL TYPES OF TOXICOLOGY:**

- Analytical toxicology
- Applied toxicology
- Clinical toxicology
- Veterinary toxicology
- Forensic toxicology
- Environment toxicology
- Industrial toxicology

- **Analytical toxicology:**

- It is the branch of toxicology which deals with the study of detection and assay of poisonous chemicals including their metabolites that could affect the biological system.

- **Applied toxicology:**

- It is the application of new and modern methods or technologies for early detection of toxicants in the field setting or practice area.

- **Clinical toxicology:**

- It is mainly involved in the study of diagnosis and treatment of poisoning that can occur in humans.

- **Veterinary toxicology:**

- Veterinary toxicology focus in the study of diagnosis and treatment of animal poisoning including the transmission of toxin from animals to humans via milk, meat, fish, food stuff and etc.

- **Environmental toxicology:**

- It is the branch of toxicology in which study of presence of different toxicants including their metabolites and degradation products in the environment and their effects on humans and animals.

- **Industrial toxicology:**

- It is the study of selective and specific area of environmental toxicology.

## **THE MAJOR AREAS OF SPECIALIZATION IN TOXICOLOGY :**

- Mechanistic toxicology (basic biology and chemistry)
- Regulatory toxicology (rule making and compliance)
- Descriptive toxicology (testing)

## **MECHANISTIC TOXICOLOGY:**

- It is a branch of toxicology that focuses on how the cellular, biochemical, and molecular mechanisms of chemicals exert toxic effects on living organisms and how the biological system protects themselves against these adverse effects.
- It aims at identifying the molecular events that lead from initial exposure to the chemical to the ultimate manifestation of toxic injury in an organism.

## **IT ADDRESSES A NUMBER OF FUNDAMENTAL QUESTIONS.**

- How do xenobiotics enter an organism and how are they distributed and metabolized?
- How do xenobiotics interact with target molecules?
- How do xenobiotics exert their toxic effects at the molecular level?
- What are the downstream biological consequences?

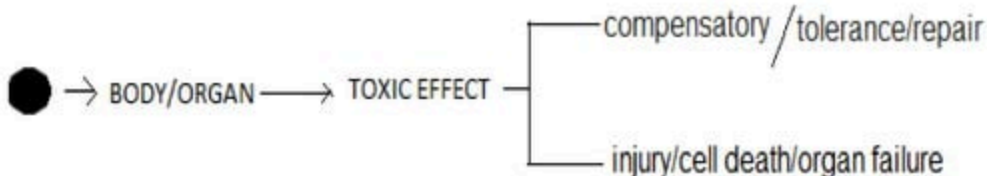
## MECHANISMS OF TOXICITY CAN BE STUDIED

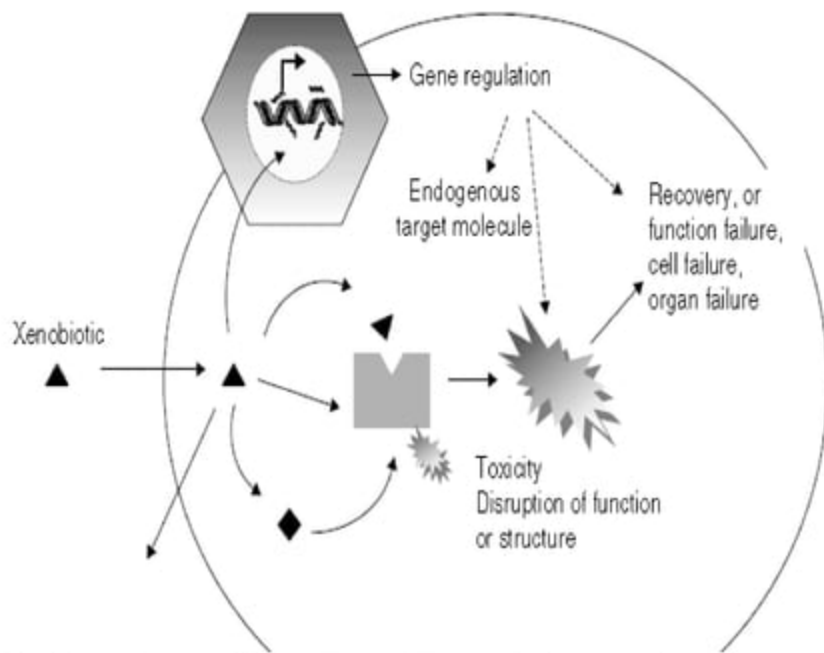


2.



3.





*Toxicokinetics: mechanisms of uptake, distribution, metabolism, elimination*

*Toxicodynamics: primary interaction with target molecule (specific/random)*

*Effector mechanisms*

*Biological response: mechanisms of defense, tolerance, repair, or active promotion of cell demise*

## **DEEPER UNDERSTANDING OF SUCH MECHANISMS WILL HELP US TO:**

- Extrapolate data better.
- Improve risk assessment of potentially toxic chemicals for human safety .
- Improve risk assessment for environmental pollutants, chemicals in the workplace.
- Improve risk assessment for synthetic and naturally occurring hazardous compounds in food or in drinking water.

# UNLEADED GASOLINE

- It's a complex mixture of organic chemicals.
- Causes tumors in kidney of male rats.
- Active substance "*tert*-butyl alcohol".
- binding with specific protein  $\alpha_2$ u-globulin (protease inhibitor )

## **REGULATORY TOXICOLOGY:**

- It consists of collecting, processing and evaluating incidents, distribution, and control of diseases towards the protection of health against harmful toxicants.
- It supports the development of standard protocols and new testing methods.
- Its aim is to control production and use of dangerous materials to prevent adverse effects on human health and the environment.

## **NATIONAL AND INTERNATIONAL COLLABORATION IN REGULATORY TOXICOLOGY**

- These standards are implemented worldwide for sustainable development with the goal of improving the quality of life for all people.
- A number of international bodies and authorities promote the sound management of chemicals at national and international level. They are:
  - ICH
  - WHO
  - FDA
  - OECD

# QUALITY ASSURANCE IN REGULATORY TOXICOLOGY

- Reliable data are essential for the assessment and evaluation of the toxicological characteristics of chemical substances
- Data reliability is closely linked with the minimization of errors and mistakes in the generation of data.
- These objectives can be reached by the implementation of appropriate Quality Assurance (QA) systems.
- An important part of such systems is Quality Management (QM).

## **REGULATORY TOXICOLOGISTS**

- Help governments to formulate regulations and put them into practice.
- They help to minimize the risk presented by chemicals which may be hazardous to human health and the environment.
- They evaluate data from all branches of toxicology
- With their help not only we understand the health hazards posed by a chemical, but also how these translate into health risks.
- They help to enhance and safeguard the health of the public.

## **IMPORTANCE OF GUIDELINES IN REGULATORY TOXICITY STUDIES:**

- Prevent duplication of clinical trials in humans .
- Ensure SAFETY, EFFICACY and QUALITY of medicines .
- Minimize the use of animal testing.
- Provides the definite parameters of evaluation.
- Provides a roadmap to prepare a study protocol.
- Increase international harmonization of technical requirements to ensure that safe, effective, and high quality medicines are developed.
- Supports economic growth, raise living standards, maintain financial stability and contribute to growth in world trade

## **DESCRIPTIVE TOXICOLOGY:**

- It is concerned directly with toxicity testing, which provides information for safety evaluation and regulatory requirements.
- Focuses on toxicity testing of chemicals, usually on animals and then correlated to human conditions.
- It provides dose-response information upon exposure to a harmful toxic agent.
- The results from the toxicity testing are typically applied to approval of product use and regulating allowable concentrations in the environment.



• **THANK YOU!!**