

RESEARCH AND REVIEWS: JOURNAL OF PHARMACOLOGY AND TOXICOLOGICAL STUDIES

Review on Toxicological Studies

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Review Article

Received: 22/05/2016

Accepted: 28/05/2016

Published: 04/06/2016

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Keywords: Toxicology, Carcinogenicity, Intravenous, Biological, Epidemiology

INTRODUCTION

The role of Toxicology in any research work is similar to the epidemiology to provide relevant health effects data. Toxicology can provide cause-effect relationship for biological plausibility [1-5], and can create exposure-dose-response profiles. These toxicological studies are useful since epidemiological study can give statistical data of health outcomes and some metrics of exposure, but these epidemiological studies cannot establish cause-effect relationship between exposure and response [6-11].

TYPES OF TOXICOLOGICAL STUDIES

1. Acute Toxicity Study
2. Sub-Acute Toxicity Study
3. Chronic Toxicity Studies
4. Irritation Study
5. Allergic Sensitization
6. Reproductive Toxicity
7. Carcinogenicity
8. Mutagenicity
9. Biocompatibility Study

10. Ecotoxicology Studies

11. Supplementary toxicity Studies

Acute toxicity study

This study gives the data in regards to the probable health risks which are prone to happen, if patients are exposed to a unit dose of a drug substance. This can resolve the level of utilization of that particular drug substance. It also plays main role as a basis for classification, labeling & original statistics on the process of toxic actions of a drug. There are various route of exposure for acute toxicity and which include Oral, Dermal, Inhalation, Intravenous, Intraperitoneal, etc [11-26].

Sub-Acute toxicity study

This study gives a clear idea about harmful effects which are provoked by frequent exposure and elapsed effect which may cause by cumulative effect of the drug substances on the tissues or other biochemical procedures [27-31]. It also helps to provide the concentration of the intact usage of a drug substance or any medical compound. Routes of exposure for Sub acute toxicity are Oral, Dermal, Inhalation, Intravenous, Intraperitoneal; etc. but the period of exposure may vary from 14 days to 90 days.

Chronic toxicity studies

Chronic toxicity study is done to explain the description of a drug substance in a mammalian species taking extended and repeated exposure [31-46]. The routes of administration are similar to which the human are exposed to that precise medical compound.

Irritation study

The surface impacts of a chemical on the skin and the mucous membrane is essential as a result of unexpected drug interaction is always a probability [46-58], thus to analyses any such kind of effects the methods include "Irritation to mucous membrane, Primary skin Irritation" are performed.

Allergic sensitization

Repeated introduction of a test substance can initiate the immunological system that can be initiated by earlier introduction and the reaction might be portrayed by different external factors like erythema & edema. This study gives data in regards to the refinement of the immune system towards a specific compound [58-69].

Reproductive toxicity

Numerous chemicals can impact the fertility and reproduction, regularly in an insidious way with no obvious indications of toxicity. Fertility of males & females can be influenced or adverse effects for developing embryo or fetus may result because of the exposure of chemical substances [70-81]. Keeping in perspective the strength of mankind and in addition its progeny the Segmental and Two/Three Generation studies are conducted. These studies deal about basic reproductive performance of males & females, Teratogenicity, Effect on lactating dams and pups.

Carcinogenicity

Carcinogenicity test is carried out to verify or examine any neoplastic lesions occurred due to any of the compound when exposed for a prolonged duration [81-86].

Mutagenicity

Adverse effects provoked by any drug substance on the genetic material of the cells i.e. DNA, or by modifying its composition or role validated by *In-Vitro* method of Ame's test and *In-Vivo* method of Rodent Dominant lethal study, Micronucleus study [86-91].

Biocompatibility study

To confirm the harmful effects caused by any of medical devices as well the impacts by leachables, the accompanying studies are performed:

***In-Vivo* method:** Systemic/Intracutaneous toxicity/Implantation

***In-Vitro* method:** Cytotoxicity

ecotoxicology studies

Impacts occurred due to different chemical substances on the beneficial organisms in the nature can be examined by doing Bee toxicity, Fish toxicity, Toxicity to birds, Toxicity to Daphnia testes [91-93].

Supplementary toxicity Studies

There are some supplementary studies to examine the toxicity of drug substance or combined effects of various chemicals in toxicological studies. These studies include Neurotoxicity studies on Egg laying hens, Synergism & Potentiation [94].

Toxicity testing of new compounds is essential for drug development process. The preclinical toxicity testing on various biological systems reveals the species-, organ- and dose- specific toxic effects of an investigational product. The toxicity of substances can be observed by (a) studying the accidental exposures to a substance (b) *in vitro* studies using cells/cell lines (c) *in vivo* exposure on experimental animals [95].

Toxicological is a branch of science to address the potential hazardous effects of chemicals like Medicine, hunting, warfare, suicide, homicide. Toxicological tests are needful in drug development to prove the new drugs are safe by initial administration to human and then later by doing clinical trials. Toxicological study is accomplished using relevant animal models and validated procedures [96].

Toxicologist must know about the worldwide guidelines for safety assessment and in addition traditional and nontraditional toxicology models. The particular toxicology profile comprises of safety pharmacology, hereditary toxicology, acute and chronic toxicology, Sub chronic toxicology, pharmacokinetic studies, reproductive and developmental toxicology, and an assessment of cancer-causing potential [97-100].

Pharmaceutical Toxicology describes the system and requirements of pre-clinical safety strategies for new drugs. Medicinal toxicology strategy is to analyse, management and prevention of harming and other antagonistic effects

because of prescriptions, occupational and ecological toxicants, and biological agents. Risk assessments can be made by comparison of toxic doses in test species with predicted therapeutic dose in man.

GENERAL PRINCIPLES IN TOXICITY STUDIES

1. All studies conducted should comply with the good laboratory practice.
2. Studies should be conducted by well trained, experienced and qualified staff members
3. The equipment used to conduct the toxicological studies should be standardized and calibrated.
4. While doing the task related to toxicology method in laboratory, proper Standard operating procedures should be followed.
5. All the documents of toxicological reports should keep safely for minimum of 5 years after the product released into market.

Local toxicological studies are required when the drug administered by special route in humans other than oral route. There are various types of local toxicological studies like dermal toxicity studies, dermal photo-toxicity studies, vaginal toxicity studies, Rectal tolerance studies, Ocular toxicity studies, Parenteral drugs and Inhalation toxicity studies.

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