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Extended Abstract

Euro Biotechnology 2018: Single dose acute toxicology in preclinical trial: the basic step in drug discovery and development- Yilkal Belay- Makerere University

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Abstract

The dose literally refers to the amount of a substance, medicine or drug in the field of nutrition, medicine and toxicology respectively to be utilized at a particular time for certain pharmacological purposes. There is however scientific misconception about the pharmacological role of a dose in experimental toxicology in which it is considered to be the fundamental concept of toxicology that makes the poison of a chemical substance which is far from scientific reality due to the fact that the nature of a chemical substance could not be changed by simply quantification. The natural property of a chemical substance could neither be changed nor eliminated by limiting the amount of it. It is a contradiction to the scientific law of physics which states that 'matter can neither be created nor destroyed'' but rather it can be transformed into other form of matter by the use of energy. The fundamental principle of toxicology is deviated from this scientific reality by the fact that another chemical substance with different pharmacological property judged to be created from one chemical substance by quantification.

The amount of administered test material could, however, change the magnitude of pharmacological effect and length of time at which its biological effect was manifested in the biology of treated Balb c mice in the oral route. The pharmacological effect of a dose starts at the biochemical and molecular level of an organism which perhaps cause biological response at the cellular level which eventually leads to biological response at the organismal level as the reactive dose in the natural process of organism increases all of which has regulatory mechanism at each level. The biological effect of the lower dose perhaps limited at the molecular level which impacts the health of exposed organism in the long run as genetic disorders or metabolic disorders or cancer of different types depending on the site of damage introduced to the biological system. The dose, therefore, didn't eliminate the harmful property of a drug that has been administered into lab Balb c mice orally. All tested chemicals were toxic at any amount with different intensity which was computed using integrated biological responses as toxic reaction rate (r) and toxic severity (s) during the course of metabolism.

This biological approach was considered one independent and two dependent research variables, as stated below respectively, to compute toxic severity and toxic reaction rate in treated Balb c mice. The research variables used were: (1) the administered dose, (2) elapsed time for the manifestation of recognisable adverse effect in the biological system of treated Balb c mice and (3) the immune response against toxic effect of tested chemicals. The fate of pharmacological property of tested chemicals was determined by the computed result of both toxic reaction rate and toxic severity rather than by the amount of test chemicals that has been administered into the study subject. Toxic reaction rate is the proportion of administered dose of test chemical that has been elicited undesired biological responses to treated laboratory animals which was computed using mathematical formula mg/sec whereas toxic severity is the magnitude or intensity of undesired biological effect caused by the drug that has been administered into the biological process of laboratory animals which was also computed using mathematical formula, where r is toxic reaction rate, s is toxic severity, d is administered dose, t is elapsed time for adverse effect manifestation and ΔIg is change in immune response. The study showed that the toxic severity of a dose accounted for the limited lifespan of an organism whereas the toxic reaction rate accounted for the safety pharmacology of tested chemicals. The higher the administered dose into the biological process of living organism, the higher the toxic severity would be which shortens the lifespan of exposed organism. This implies that the dose doesn't determine safety but rather determines lifespan of an organism in its natural environment.

Dose of a Drug and Its Hidden Undesired Effect

Evolution showed that all living things inherited desirable and typical genetic material from their predecessors through reproduction which makes the difference between them. Today, however, there are thousands and millions of human and animal with anomalies and birth defects which might be hereditary or nonhereditary depending on the site of damage in the cell, tissue or organ system in which drug is one of the

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highest risk factors for the incidence. Therapeutic drugs such as tetracycline, valproic acid, thalidomide and warfarin have been proved to be potential teratogens after being on market for many years. There are thousands and millions of other diseases caused by chromosomal abnormalities and gene defects such as Cri du chat syndrome, Down syndrome and Achondroplasia, fragile-x syndrome respectively. The genetic changes that cause these diseases can be a whole additional chromosome or a whole missing chromosome or a change of a single base in a gene sequence. However, there is no specifically defined cause, other than speculation, about the abnormal chromosomes and defected genes which are causing these diseases. There are many chemical agents that can cause damage to cell nucleus and other cell organelles such as adverse effects of prescribed medications, poisons, environmental pollutants and recreational drugs like alcohol which are high risk factors for genetic disorders causing these diseases. In general, the drug's mode of damaging the biological structure of an organism is diverse depending on the diverse chemical nature of the drug and nature of biological component of an organism reacted to it. The damaging effect of any harmful chemical might be manifested at the biochemical, cellular or organismal level depending on the amount of administered drug. This review, however, discusses the harmful effect of a drug to the cell membrane, cell metabolism and cell nucleus, that could be either somatic or germ cells or both, each of which has different health consequences in the population.

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