International Journal of Trend in Scientific Research and Development (IJTSRD)
Volume 9 Issue 2, Mar-Apr 2025 Available Online: www.ijtsrd.com e-ISSN: 2456 – 6470

Pharmacokinetics in Homoeopathy System of Medicines

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ABSTRACT

Pharmacokinetics (PK) is actually doing the study how human or animal body interacts with administered substances inside the body till expulsion from the body as urine, stool, sweat etc. It consists of absorption, distribution, metabolism and excretion process (ADME) of the body. The absorption is the rate at which a drug enters the systemic circulation from its site of drug administration. Drug distribution is the process of distribution of drug in various organs and tissues. Metabolism of a drug is taking the drug substances as pathogen removing and energy producing, unused drug substance can easily excrete out from the body. Excretion takes part in the elimination of drug from the blood circulation system into bile, urine, feces, sweat, and air. Thus homeopathic medicine which contains few atoms of medicinal substance is very fast working in the human body by absorbing in sublingual and submandibular glands without any side effects.

KEYWORDS: *Pharmacokinetics (PK), Absorption, Distribution, Metabolism, Excretion, Pharmacokinetics in homoeopathy*

How to cite this paper: Dr. Pijush Kanti Bhattacharjee | Rohan Dey "Pharmacokinetics in Homoeopathy System of Medicines" Published in International Journal of Trend in Scientific Research and Development (ijtsrd), ISSN: 2456-6470, Volume-9 | Issue-2, April 2025, pp.797-799, URL: www.ijtsrd.com/papers/ijtsrd78499.pdf

IJTSRD78499

1. INTRODUCTION

Pharmacokinetics (PK) is the study of how the body interacts with administered substances for the entire duration of exposure. This is closely related to but distinctly different from pharmacodynamics, which examines the drug's effect on the body more closely. This field generally examines these four main parameters absorption, distribution, metabolism, and excretion (ADME) [1]-[3].

2. History

Pharmacokinetics (from ancient greek word pharmakon means "drug" and kinetikos "moving, putting in motion"). It attempts to analyze chemical metabolism and to discover the fate of a chemical from the moment that it is administered up to the point at which it is completely eliminated from the body [1]-[3]. Pharmacokinetics is based on mathematical modeling that places great emphasis on the relationship between drug plasma concentration and the time elapsed since the drug's administration.

3. Fundamental Principles of Pharmacokinetics

A. Absorption

This is the process by which a drug enters the bloodstream from its site of administration. Factors influencing absorption include the route of administration (e.g., oral, intravenous, topical), drug formulation (e.g., tablet, capsule, solution etc.), gastrointestinal motility, and the presence of food or other drugs.

B. Distribution

Once in the bloodstream, drugs are distributed throughout the body to various tissues and organs. Distribution is influenced by factors such as blood flow, tissue permeability, drug-protein binding (especially to plasma proteins like albumin), and the drug's lipid solubility. Drugs with higher lipid solubility tend to distribute more readily into fatty tissues. In Fig. 1 different pharmacokinetics parameters are shown in detail.

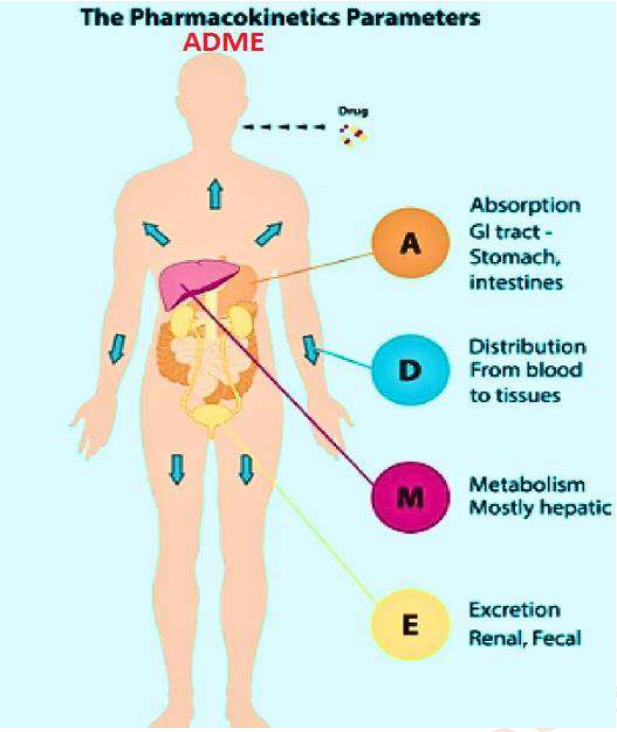

Fig. 1: Pharmacokinetics parameters.

C. Metabolism

Metabolism refers to the chemical transformations that drugs undergo in the body, primarily in the liver. The primary goal of drug metabolism is to convert drugs into more water-soluble compounds that can be easily excreted from the body. The liver enzymes responsible for drug metabolism are collectively referred to as the cytochrome P450 (CYP) system. Metabolism can either activate, deactivate, or modify the pharmacological properties of a drug.

D. Excretion

Excretion is the removal of drugs and their metabolites from the body. The kidneys are the primary organs responsible for excreting water-soluble drugs and their metabolites in the urine. Other routes of excretion include bile (into the feces), sweat, saliva, breast milk, and exhaled air. Renal function is a crucial determinant of drug excretion, and impaired kidney function can lead to drug accumulation and potential toxicity.

4. Different Theories on Pharmacokinetics

A. Physical Concepts

The Clathrate model, based on dielectric and differential scanning calorimetric measurements, suggests that medicinal properties can be transferred to a solvent during homeopathic dilution, with clathrate structures possibly replicating themselves similarly to crystal growth, leading to the observed oscillation in effectiveness of homeopathic solutions.

Matsumoto proposed that cell-surface proteins might be activated by the hydration-shell structure of molecules, and the interaction between these proteins and clathrate-like hydrate microcrystals formed during homeopathic dilution could be a key molecular mechanism for the biological responses to homeopathic medicines [4]-[5].

B. Biological Models

I. In Vitro Models

1. **Hormesis Effect:** Van Wijk and Wiegant's research at the University of Utrecht demonstrated that low doses of toxic substances (arsenite and cadmium) or physical stress (heat) could enhance self-recovery mechanisms in human fibroblasts by increasing the production of heat shock proteins (hsp70), suggesting homeopathic remedies might stimulate cellular recovery specifically in damaged cells.

2. **Molecular and Cellular Responses:** Studies indicate that homeopathic remedies might affect cellular processes by interacting with cell surface proteins, potentially altering mRNA levels for heat shock proteins and triggering recovery responses at the genetic level [1]-[5].

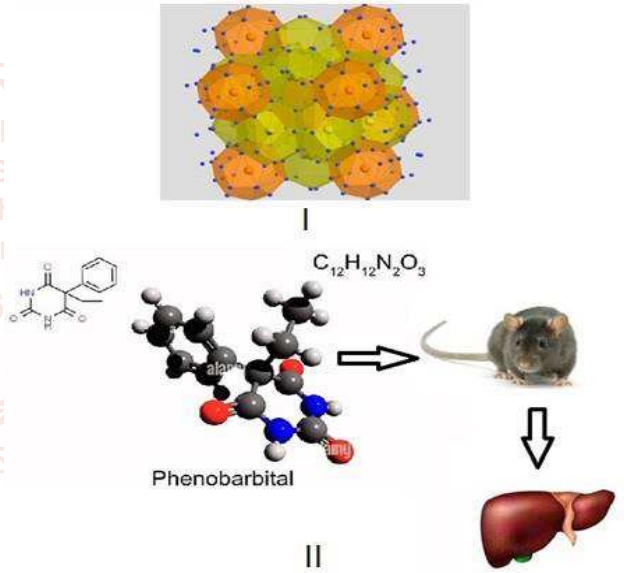

Fig. 2: (I) In vitro model and (II) in vivo model of Pharmacokinetics.

II. In Vivo Models

1. **Efficacy in Mammalian Models:**

Roberfroid: They found that 9C Phenobarbital could reduce hepatocarcinoma formation in rats induced by 2-Acetylamoinofluorene, although the mechanism was not elucidated. Biswas and Khuda-Bukhsh: They demonstrated that potentized Chelidonium could protect against p-DAB-induced hepatocarcinoma in mice, with potential mechanisms involving modulation of tumor-marker enzymes and other cytogenetical parameters [4]-[5].

2. **Arsenic and Cadmium Studies:**

Khuda-Bukhsh's Research: Extensive studies showed that potentized Arsenic Alb could reduce arsenic-

induced genotoxicity in mice. This was evidenced by changes in chromosomal aberrations, enzyme activities, and histopathological studies.

Datta: Potentized Cadmium Sulph was found to reduce cadmium-induced genotoxicity in mice, with higher potencies showing greater efficacy.

3. Neurochemical and Immune Responses:

Sukul's Findings: Increased levels of serotonin and dopamine metabolites in the mouse hypothalamus were observed following homeopathic treatment, suggesting action through the autonomic nervous system.

Bentwitch's Study: Demonstrated that specific immune responses could be transferred between mice using high dilutions of KLH (keyhole limpet hemocyanin). In Fig. 2 in vitro and in vivo models of pharmacokinetics are delineated.

III. Other Notable Studies

Banik and Khuda-Bukhsh: Reported positive effects of ultra-low doses of Ginseng on cytogenetical and hematological parameters in Xirradiated mice.

Anti-Clastogenic Effects: Studies showed that potentized Arnica Montana, Ruta Graveolens, and Hypericum could reduce genotoxic effects induced by ultrasonic sound waves and other stressors in mice.

Aguejouf: Demonstrated that homeopathic dilutions of acetylsalicylic acid (aspirin) had potent antithrombotic effects in rats with experimentally induced thrombosis.

5. Conclusion and Pharmacokinetics in Homoeopathy

The homeopathic mode of treatment often encourages use of drugs at such ultra-low doses and high dilutions that even the physical existence of a single molecule of the original drug substance becomes theoretically impossible [1]-[5]. An overview of some interesting scientific works on homeopathy has been presented with due emphasis on the state of information presently available on several aspects of the molecular mechanism of action of the potentised homeopathic drugs. Actually homoeopathic medicine contains few atoms of the medicinal substance. After administering the homoeopathic medicine, these few atoms of the homeopathic medicine are immediately absorbed by the sublingual and submandibular glands (i.e., salivary glands), hence the homoeopathic medicine will not reach upto liver or excretory system as a whole. The absorption, metabolism and excretory functions of the homoeopathic drug are done by the sublingual and submandibular glands, the rest amount vehicle of the drug, i.e., alcohol or globule (cane sugar) is excreted as per normal procedure after duly metabolized by liver and circulatory systems. Therefore, homoeopathic medicine is acting in human or animal body very fast without any major side effects.

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