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ISSN: 2167-1052
Advances in Pharmacoepidemiology and Drug Safety

Opinion Article

Recent Advances in Circadian-Regulated Pharmacokinetics

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DESCRIPTION

Drug pharmacokinetics depends on both patient-related factors and drug chemistry. Several patient-related factors (e.g., renal function, genetic makeup, sex, age) can be used to predict pharmacokinetic parameters in populations. For example, the half-lives of some drugs, especially those that require both metabolism and excretion, can be very long in the elderly. Indeed, age-related physiological changes affect many aspects of pharmacokinetics (see Pharmacokinetics in the Elderly and Pharmacokinetics in Children).

Other factors are related to individual physiology. While the effects of some individual factors (e.g., renal failure, obesity, liver failure, dehydration) can be reasonably predicted, others are idiosyncratic and thus have unpredictable effects. Due to individual variability, drug administration has traditionally had to be based on each patient's needs by empirically adjusting dosage until treatment goals are achieved. This approach is often inadequate as it can delay optimal response or cause side effects.

Knowledge of pharmacokinetic principles helps prescribers adjust doses more accurately and quickly. The application of pharmacokinetic principles to individualize drug therapy is called therapeutic drug monitoring.

Pharmacokinetics refers to the movement of a drug in, and out of the body. The nature of an individual's response to a particular drug depends on the drug's intrinsic pharmacological properties at its site of action. Pharmacokinetics deals with the size of independent variables in pharmacology and treatment, that is, in the subject of the body's drug concentration in the biological target.

Pharmaceuticals vary from person to person, affected by age, gender, diet, environment, weight and pregnancy, patient pathology, genetic sciences, and interchangeable drugs and drugs. Pharmacotherapy is affected by factors that affect pharmacokinetics and pharmacology. Total water content, body fat percentage, muscle mass, organs, blood volume and flow, and metabolic enzymes contribute to individual differences in pharmacokinetics and ultimately use drugs. Drug metabolism can be affected by genetics. Genetic mutations can affect how drugs are metabolized in the body. We don't have time to discuss pharmacogenetic. However, this topic will be covered in another presentation.

Drug metabolism and excretion are also affected by age. For example, children may not have the well-developed liver function to metabolize drugs as extensively as adults. Some drugs may be excreted more rapidly in children, but excretion is reduced in older patients with impaired renal, hepatic, or cardiac function. Illness, infection, and inflammation can affect drug metabolism, which can increase drug half-life and duration of drug effects. Drug-drug or food-drug and drug-herb interactions can increase or decrease drug metabolism and affect the duration and potency of drug action.

Pharmacokinetic studies are typically performed in healthy volunteers or patients to study and evaluate drug-body interactions in the general population. Data from pharmacokinetic studies are very useful because they inform pharmacologists to make decisions about the appropriate design and administration of each drug. Clinical pharmacokinetics applies this information to clinical medicine to facilitate the use of the safest and most effective drug treatments for individual patients. Pharmacokinetics is an important tool in therapeutic drug monitoring to optimize drug doses and dosing intervals, identify drug-drug interactions, and minimize the risk of drug toxicity.

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Received: 29-Aug-2022, Manuscript No. PDS-22-18492; **Editor assigned:** 01-Sep-2022, PreQC No. PDS-22-18492 (PQ); **Reviewed:** 15-Sep-2022, QC No. PDS-22-18492; **Revised:** 22-Sep-2022, Manuscript No. PDS-22-18492 (R); **Published:** 29-Sep-2022, DOI: 10.35248/2167-1052.22.11.280.

Citation: Pena S (2022) Recent Advances in Circadian-Regulated Pharmacokinetics. Adv Pharmacoepidemiol Drug Saf. 11:280.