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Assignment : Discuss in details factors affecting drug metabolism

Drug metabolism is the metabolic breakdown of drugs by living organisms, usually through specialized enzymatic systems. More generally, xenobiotic metabolism (from the Greek xenos "stranger" and biotic "related to living beings") is the set of metabolic pathways that modify the chemical structure of xenobiotics, which are compounds foreign to an organism's normal biochemistry, such as any drug or poison. These pathways are a form of biotransformation present in all major groups of organisms, and are considered to be of ancient origin. These reactions often act to detoxify poisonous compounds (although in some cases the intermediates in xenobiotic metabolism can themselves cause toxic effects). The study of drug metabolism is called pharmacokinetics.

Drugs can be metabolised by many different pathways and many factors can determine which pathway is used by which drug and to what extent a particular drug is biotransformed by a particular pathway. These factors range from the species of organism studied to the environment in which that organism lives. The factors affecting drug metabolism will be split into internal (i.e. physiological and pathological) factors and external factors (i.e. diet and environment). These are, of course, purely arbitrary divisions and much interaction exists between the various factors (hormonal, sex and age influences)

Internal Factors:

Various physiological and pathological factors can also affect drug metabolism.

* Physiological factors that can influence drug metabolism include age, individual variation (e.g., pharmacogenetics), enterohepatic circulation, nutrition, intestinal flora, or sex differences. In general, drugs are metabolized more slowly in fetal, neonatal and elderly humans and animals than in adults.
* Pathological factors can also influence drug metabolism, including liver, kidney, or heart diseases. Drug metabolism also affects multidrug resistance in infectious diseases and in chemotherapy for cancer, and the actions of some drugs as substrates or inhibitors of enzymes involved in xenobiotic metabolism are a common reason for hazardous drug interactions.
* Genetic variation (polymorphism) accounts for some of the variability in the effect of drugs. With N-acetyltransferases (involved in Phase II reactions), individual variation creates a group of people who acetylate slowly (slow acetylators) and those who acetylate quickly, split roughly 50:50 in the population of Canada. This variation may have dramatic consequences, as the slow acetylators are more prone to dose-dependent toxicity.
* Species
* Hormones: One's hormone can also affect their drug metabolism.

External factors:

* Diet:

One's diet can also affect drug metabolism in the body. Drug metabolism often converts lipophilic compounds into hydrophilic products that are more readily excreted. How we eat can have a lasting impact on our metabolism. To stay alive and functioning, your body has to carry out millions of chemical processes, which are collectively known as your metabolism. Your metabolism can play a role in weight gain by influencing the amount of energy your body needs at any given point. Excess energy is then stored as fat.

* Environment:

Your type of environment can also affect your drug metabolism.

Cytochrome P450 monooxygenase system enzymes can also vary across individuals, with deficiencies occurring in 1 – 30% of people, depending on their ethnic background.

* Dose, frequency, route of administration, tissue distribution and protein binding of the drug affect its metabolism.

In silico modelling and simulation methods allow drug metabolism to be predicted in virtual patient populations prior to performing clinical studies in human subjects. This can be used to identify individuals most at risk from adverse reaction.