Absorption And Metabolism Of Xenobiotics: An Overview
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INTRODUCTION

Xenobiotics are chemicals which may be accidently ingested or taken as drugs or compounds produced in the body by bacterial metabolism. They are found in organisms but not expected to be produced or present in them, or they are chemicals found in much higher concentration than usual. Drugs such as antibodies are xenobiotics in humans because neither human body produced them nor its a part of the normal diet [1, 2]. Natural products cannot become xenobiotics if they are taken up by another organism such as uptake of natural human hormones, by fish found downstream or sewage treatment plant out falls or the chemical defences produced by some organisms as protection against predators. The term Xenobiotics is derived from the Greek word xenos (stranger) and bios (life). Xenobiotics is often used in the contest of pollutants such as dioxans and poly chlorinated biphenyls and their effect on biota because they are understood as substance foreign to an entire biological system [3].

ABSORPTION OF XENOBIOTICS,

Xenobiotics must cross the intestinal epithelium, basement membrane and capillary endothelium before they reach the blood stream. Mammals do not absorb the Xenobiotics through any special transport processes but share the same transport processes which are used absorption of nutrients. There are five possible processes of Xenobiotics transport across the intestine. They are active transport, pinocytosis, filtration through “pores”, lymphatic absorption and passive diffusion.

ACTIVE TRANSPORT

Active processes require cellular energy, food transfer of substrate across the intestine against higher concentration or electro chemical gradient. The system exists mainly for transport of natural substances (aminoacids, sugar, or bile acids).

PINOCYTOSIS

In this cell membrane forms invagination which finally close to form vesicles which contain fluid from outside the cell. Inside the cell the contents of vesicles are delivered to cytoplasm. In suckling animals this process of transport is used for macromolecules (antigenic peptide, an immunoactive protein).

FILTRATION THROUGH PORES

Both lipophilic and hydrophilic compounds may pass through holes in the cell membrane. Xenobiotics with molecular weight 100 may be absorbed through this process.

LYMPHATIC ABSORPTION

It is well known that dietary short chained fatty acids predominantly absorbed via the lymphatic system in minute droplets known as chylomicrons. These enter the thoracic duct and empty into the systemic venous blood; completely bypassing the liver. Eg: Para amino salicylic acid, tetracycline, DDT, benzpyrene and 3-methyl...
PASSIVE DIFFUSION

Passive diffusion is a major process for absorption of Xenobiotics. This process is not saturable and transfer is directly proportional to the concentration gradient and to the lipid-water partition coefficient of Xenobiotics. The higher the factors, the faster the rate of diffusion, and when concentrations are the same on both sides of membrane, movement of Xenobiotics across the membrane stops. Absorption of structurally related chemicals occurs independently; co absorption does not alter absorption rate of either chemical. The extent of lipid solubility and the ionisation of Xenobiotics influence the rate of chemicals. Many weak acids and bases are readily absorbed while highly ionised acids and bases are less readily transported. Completely ionised compounds are very slowly absorbed. The role of ionisation on absorption of chemicals is further supported by change in the rate of absorption that resulted from a change in the pH of intestinal contents. For instance raising the pH increased the absorption of bases such as quinine and aminopyrene and decreased the absorption of acid such as benzoate and salicylate.

FACTORS AFFECTING INTESTINAL ABSORPTION OF XENOBIOTICS

Factors such as diet, age, species, changes in the motility of the intestinal tract, interference with gastrointestinal content of microorganisms, changes in the rate of gastric emptying in either direction and dissolution rate of Xenobiotics can influence the intestinal absorption of xenobiotics.

METABOLISM OF XENOBIOTICS

Xenobiotics are metabolised by biotransformation or detoxification reaction. The compound that are detoxified include

1. Compounds accidently ingested like preservatives, food additives and adulterants
2. Drugs taken for therapeutic purposes
3. Compounds produced in the body and are to be eliminated. eg: Bilirubin and steroids
Phase III reactions are not very common. A typical example is further conjugation with glutathione. The Xenobiotics that enter the body are mostly drugs and they are detoxified by the enzymes concerned with drug metabolism. Induction of cytochrome P450 system may even produce unwanted effects in some persons. For example induction of ALA synthase by barbiturates will precipitate attacks in acute intermittent porphyria.

CONCLUSION

This article mainly deals with the xenobiotics, compounds which may be accidently ingested or taken as drugs or compounds produced in the body by bacterial metabolism. There was an attempt to explicit the absorption, factors affecting absorption, distribution, metabolism and excretion of Xenobiotics.

References

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