- Student Name:Tayyab
- Student ID: 14077
- Course Title: General Pharmacology
- Department: AHS
- Programme: Radiology 6th Semester
- Instructor: Mam Nadra
- Date:22/08/2020

QNO1.Enumerate various routes of drug administration, explain parenteral routes in detail.

Drug Administration Routes

A route of administration in pharmacology and toxicology is the path by which a drug, fluid, poison, or other substance is taken into the body. Routes of administration are generally classified by the location at which the substance is applied. Common examples include oral and intravenous administration.

Enteral/gastrointestinal

Administration through the gastrointestinal tract is sometimes termed enteral or enteric administration (literally meaning 'through the intestines'). Enteral/enteric administration usually includes oral (through the mouth) and rectal (into the rectum).

Rectal Route

The rectal route is an effective route of administration for many medications, especially those used at the end of life.

Topical Route

The definition of the topical route of administration sometimes states that both the application location and the pharmacodynamics effect thereof is local.

Oral Route

The oral route is generally the most convenient and costs the least. However, some drugs can cause gastrointestinal tract irritation.

Oral administration is often denoted "PO" from "per os", the Latin for "by mouth".

The bioavailability of oral administration is affected by the amount of drug that is absorbed across the intestinal epithelium and first-pass metabolism.

Local Route

By delivering drugs almost directly to the site of action, the risk of systemic side effects is reduced.

Skin absorption (dermal absorption), for example, is to directly deliver drug to the skin and, hopefully, to the systemic circulation.

Parental Route

The parenteral route is any route that is not enteral (par- + enteral).

Parenteral administration can be performed by injection, that is, using a needle (usually a hypodermic needle) and a syringe, or by the insertion of an indwelling catheter.

The term injection encompasses intravenous (IV), intramuscular (IM), subcutaneous (SC) and intradermal (ID) administration.

The term injection encompasses intravenous (IV), intramuscular (IM), subcutaneous (SC) and intradermal (ID) administration.

Intravenous (IV)

Intravenous is a method of administering concentrated medications (diluted or undiluted) directly into the vein using a syringe through a needleless port on an existing IV line or a saline lock.

Intramuscular (IM)

Intramuscular injection, often abbreviated IM, is the injection of a substance directly into muscle.

The intramuscular injection is quick in the way it releases the drug into the human body, and it's less painful than others. It's also a good alternative for people who can't take drugs orally. With an intramuscular injection, the muscular tissue can be reached, and absorption is quicker, reduced by about 20 minutes.

Parenteral administration generally acts more rapidly than topical or enteral administration, with onset of action often occurring in 15–30 seconds for IV, 10–20 minutes for IM and 15–30 minutes for SC. They also have essentially 100% bioavailability and can be used for drugs that are poorly absorbed or ineffective when they are given orally. Some medications, such as certain antipsychotics, can be administered as long-acting intramuscular injections. Ongoing IV infusions can be used to deliver continuous medication or fluids.

QNO2. What does water compartment means, explain its types in detail.

Fluid Compartments

The human body and even its individual body fluids may be conceptually divided into various fluid compartments, which, although not literally anatomic compartments, do represent a real division in terms of how portions of the body's water, solutes, and suspended elements are segregated. The two main fluid compartments are the intracellular and extracellular compartments. The intracellular compartment is the space within the organism's cells; it is separated from the extracellular compartment by cell membranes.

About two thirds of the total body water of humans is held in the cells, mostly in the cytosol, and the remainder is found in the extracellular compartment.

The extracellular fluids may be divided into three types: interstitial fluid in the "interstitial compartment" (surrounding tissue cells and bathing them in a solution of nutrients and other chemicals), blood plasma and lymph.

In the "intravascular compartment" (inside the blood vessels and lymphatic vessels), and small amounts of transcellular fluid such as ocular and cerebrospinal fluids in the "transcellular compartment".

The interstitial and intravascular compartments readily exchange water and solutes but the third extracellular compartment, the transcellular, is thought of as separate from the other two and not in dynamic equilibrium with them.

Intracellular Compartment

The intracellular fluid, also known as cytosol, is all fluid contained inside the cells. It is the matrix in which cellular organelles are suspended. The cytosol and organelles together compose the cytoplasm. The cell membranes are the outer barrier. In humans, the intracellular compartment contains on average about 28 litres of fluid, and under ordinary circumstances remains in osmotic equilibrium. It contains moderate quantities of magnesium and sulphate ions.

In the cell nucleus the fluid component of the nucleoplasm is called the nucleosol.

Extracellular Compartment

The interstitial, intravascular and transcellular compartments comprise the extracellular compartment. Its extracellular fluid (ECF) contains about one-third of total body water.

Extracellular has 3 compartments: They are

Intravascular compartment

The main intravascular fluid in mammals is blood, a complex mixture with elements of a suspension (blood cells), colloid (globulins), and solutes (glucose and ions). The blood represents

both the intracellular compartment (the fluid inside the blood cells) and the extracellular compartment (the blood plasma). The average volume of plasma in the average (70 kg) male is approximately 3.5 litters. The volume of the intravascular compartment is regulated in part by hydrostatic pressure gradients, and by reabsorption by the kidneys.

Interstitial compartment

The interstitial compartment (also called "tissue space") surrounds tissue cells. It is filled with interstitial fluid, including lymph. Interstitial fluid provides the immediate microenvironment that allows for movement of ions, proteins and nutrients across the cell barrier. This fluid is not static, but is continually being refreshed by the blood capillaries and recollected by lymphatic capillaries. In the average male (70 kg) human body, the interstitial space has approximately 10.5 litres of fluid.

Transcellular compartment

The third extracellular compartment, the transcellular, consists of those spaces in the body where fluid does not normally collect in larger amounts, or where any significant fluid collection is physiologically non-functional. Examples of transcellular spaces include the eye, the central nervous system, the peritoneal and pleural cavities, and the joint capsules. A small amount of fluid, called transcellular fluid, does exist normally in such spaces. For example, the aqueous humour, the vitreous humour, the cerebrospinal fluid, the serous fluid produced by the serous membranes, and the synovial fluid produced by the synovial membranes are all transcellular fluids.

QNO.3 (1) What are drug elimination stages, explain briefly ?

Drug Elimination

Drug elimination is the sum of the processes of removing an administered drug from the body.

In the pharmacokinetic ADME scheme (absorption, distribution, metabolism, and excretion) it is frequently considered to encompass both metabolism and excretion. Hydrophobic drugs, to be excreted, must undergo metabolic modification making them more polar. Hydrophilic drugs, on the other hand, can undergo excretion directly, without the need for metabolic changes to their molecular structures.

Pharmacokinetics

Pharmacokinetics can be simply described as the study of 'what the body does to the drug' and includes:

- The rate and extent to which drugs are absorbed into the body and distributed to the body tissues
- The rate and pathways by which drugs are eliminated from the body by metabolism and excretion
- The relationship between time and plasma drug concentration.

Four Phases of Pharmacokinetics

The main processes involved in pharmacokinetics are absorption, distribution, and the two routes of drug elimination, metabolism and excretion. Together they are sometimes known by the acronym

'ADME'. Distribution, metabolism and excretion are sometimes referred to collectively as drug disposition.

Absorption

Absorption is the process by which drugs enter the body. Given by any route other than intravenously, drug molecules must cross tissue membranes (e.g. skin epithelium, subcutaneous tissue, gut endothelium, capillary wall) to enter the blood.

Distribution

Distribution is the process by which drugs move around the body. After entering the blood, drug molecules must cross capillary walls to enter the tissues, reach cell membranes and enter cells.

Metabolism

Metabolism is the process by which drugs are chemically altered to make them sufficiently water-soluble for excretion in urine or faeces (via the biliary tract). Metabolism occurs in a variety of body organs and tissues, but chiefly in the liver, gut wall, kidney and skin.

Excretion

Excretion is the process by which drugs leave the body. Drugs that are sufficiently water-soluble will be excreted unchanged in the urine. Lipid-soluble drugs must be modified to water-soluble metabolites before excretion via the kidney or into the intestine via the bile.

(2)What does total body clearance means

Total body clearance

The total body clearance or total plasma (blood) clearance (CL) is commonly defined as the. volume of plasma (blood) completely cleared of drug per unit time (1, 2).

Drug Clearance

Drug clearance can be defined as the plasma volume in the vascular compartment that is cleared of drug per unit of time. Total clearance gives an indication of drug elimination from the central compartment without reference to the mechanism of this process. For drugs that are eliminated by first-order kinetics, clearance is constant.

Renal Clearance

Clearance by the kidneys is called renal clearance, and that by all other organs is referred to as nonrenal clearance. The latter most often represents clearance by the liver.

Total Clearance

Total clearance is the sum of all body clearances. The same factors that determine renal and hepatic elimination of drugs affect drug clearance.

PAPER END .....