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Q1:Enumerate various routes of drugs administration ,explain parenteral routes in detail?

Ans: Routes of drug administration:

1. Take by mouth (orally)
2. I.v through vains
3. I.m throuch muscle
4. Place under the toung are sublingually....or b/w the gums or cheeks (buccal)
5. Insert into the rectum(rectally) or vigina (virginally)
6. Route through nose (nasally)
7. Transdermally is to inject through dermal or skin.

Part B) Parenteral route:

The parenteral route is any rote that is not enternal .its administration can be performed by injection that is using needle and a syringe or by catheter.

Locations of parenteral route include

- **Centeral nerve system**

a) **Epidural**(injection into the epidural space)e.g epidural anesthesia

- intracerebral (into the cerebrum) administration by direct injection into the brain. Used in experimental

research of chemicals and as a treatment for malignancies of the brain. The intracerebral route can also interrupt the blood brain barrier from holding up against subsequent routes.

b) **intracerebroventricular** (into the cerebral ventricles) administration into the ventricular system of the brain. One use is as a last line of opioid treatment for terminal cancer patients with intractable cancer pain. epicutaneous (application onto the skin). It can be used both for local effect as in allergy testing and typical local anesthesia, as well as systemic effects when the active substance diffuses through skin in a transdermal route.

c) extra-amniotic administration, between the endometrium and fetal membranes
d) nasal administration (through the nose) can be used for topically acting substances, as well as for insufflation of e.g. decongestant nasal sprays to be taken up along the respiratory tract. Such substances are also called *inhalational*, e.g. inhalational anesthetics.
e) intra-arterial (into an artery), e.g. vasodilator drugs in the treatment of vasospasm and thrombolytic drugs for treatment of embolism
f) intra-articular, into a joint space. It is generally performed by joint injection. It is mainly used for symptomatic relief in osteoarthritis.
g) intracardiac (into the heart), e.g. adrenaline during cardiopulmonary resuscitation (no longer commonly performed)

h) intracavernous injection, an injection into the base of the penis
i) intradermal, (into the skin itself) is used for skin testing some allergens, and also for mantoux test for tuberculosis
j) intralesional (into a skin lesion), is used for local skin lesions, e.g. acne medication
k) intramuscular (into a muscle), e.g. many vaccines, antibiotics, and long-term psychoactive agents. Recreationally the colloquial term 'muscling' is used.
l) Intraocular administration
m) intraocular, into the eye, e.g., some medications for glaucoma or eye neoplasms
n) intraosseous infusion (into the bone marrow) is, in effect, an indirect intravenous access because the bone marrow drains directly into the venous system. This route is occasionally used for drugs and fluids in emergency medicine and pediatrics when intravenous access is difficult.
o) intraperitoneal, (infusion or injection into the peritoneum) e.g. peritoneal dialysis
p) intrathecal (into the spinal canal) is most commonly used for spinal anesthesia and chemotherapy
q) Intrauterine
r) intravaginal administration, in the vagina
s) intravenous (into a vein), e.g. many drugs, total parenteral nutrition
t) Intravesical infusion is into the urinary bladder.
u) intravitreal, through the eye
v) Subcutaneous (under the skin. This generally takes the form of subcutaneous injection, e.g.

with insulin. Skin popping is a slang term that includes subcutaneous injection, and is usually used in association with recreational drugs. In addition to injection, it is also possible to slowly infuse fluids subcutaneously in the form of hypodermoclysis.

w) transdermal (diffusion through the intact skin for systemic rather than topical distribution), e.g. transdermal patches such as fentanyl in pain therapy, nicotine patches for treatment of addiction and nitroglycerine for treatment of angina pectoris.

x) perivascular administration (perivascular medical devices and perivascular drug delivery systems are conceived for local application around a blood vessel during open vascular surgery).

y) transmucosal (diffusion through a mucous membrane), e.g. insufflation (snorting) of cocaine, sublingual, i.e. under the tongue, sublabial, i.e. between the lips and gingiva, nitroglycerine, vaginal suppositories.

Q2:what does water compartment means,explain its types in detail?

Ans: 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.[3] 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.

- **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 liters. 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,[5][6] or where any significant fluid collection is physiologically nonfunctional.[7] 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 humor, the vitreous humor, the cerebrospinal fluid, the serous fluid produced by the serous membranes, and the synovial fluid produced by the synovial membranes are all transcellular fluids. They are all very important, yet there is not much of each. For example, there is only about 150 mL of cerebrospinal fluid in the entire central nervous system at any moment. All of the aforementioned fluids are produced by active cellular processes working with blood plasma as the raw material, and they are all more or less similar to blood plasma except for certain modifications tailored to their function. For example, the cerebrospinal fluid is made by various cells of the CNS, mostly the ependymal cells, from blood plasma.

Q3:what are drug elimination stages explain briefly?

Ans: Drug elimination is the removal of drugs from the body.

All drugs are eventually eliminated from the body. They may be eliminated after being chemically altered (metabolized), or they may be eliminated intact. Most drugs, particularly water-soluble drugs and their metabolites, are eliminated largely by the kidneys in urine. Therefore, drug dosing depends largely on kidney function. Some drugs are eliminated by excretion in the bile (a greenish yellow fluid secreted by the liver and stored in the gallbladder).

Drug elimination in the urine

Several factors, including certain characteristics of the drug, affect the kidneys' ability to excrete drugs. To be extensively excreted in urine, a drug or metabolite must be water soluble and must not be bound too tightly to proteins in the bloodstream. The acidity of urine, which is affected by diet, drugs, and kidney disorders, can affect the rate at which the kidneys excrete some drugs. In the treatment of poisoning with some drugs, the acidity of the urine is changed by giving antacids (such as sodium bicarbonate) or acidic substances (such as ammonium chloride) orally to speed up the excretion of the drug.
The kidneys' ability to excrete drugs also depends on

- Urine flow
- Blood flow through the kidneys
- The condition of the kidneys

Kidney function can be impaired by many disorders (especially high blood pressure, diabetes, and recurring kidney infections), by exposure to high levels of toxic chemicals, and by age-related changes. As people age, kidney function slowly declines. For example, the kidneys of an 85-year-old person excrete drugs only about half as efficiently as those of a 35-year-old person.

In people whose kidney function has declined, the "normal" dosage of a drug that is eliminated primarily through the kidneys may be too much and may cause side effects. Therefore, health care practitioners sometimes must adjust the drug dosage based on the

amount of decline in the person’s kidney function. People with impaired kidney function require lower drug doses than those with normal kidney function.

Health care practitioners have several ways to estimate the decline in kidney function. Sometimes they base an estimate solely on the person’s age. However, they can get a more accurate estimate of kidney function by using the results of tests that measure the level of creatinine (a waste product) in the blood and sometimes also the urine. They use these results to calculate how effectively creatinine is removed from the body (called creatinine clearance—see Kidney Function Tests), which reflects how well the kidneys are functioning.

Drug elimination in the bile

Some drugs pass through the liver unchanged and are excreted in the bile. Other drugs are converted to metabolites in the liver before they are excreted in the bile. In both scenarios, the bile then enters the digestive tract. From there, drugs are either eliminated in feces or reabsorbed into the bloodstream and thus recycled.

If the liver is not functioning normally, the dosage of a drug that is eliminated primarily by metabolism in the liver may need to be adjusted. However, there are no simple ways to estimate how well the liver will metabolize (and thus eliminate) drugs like there are for kidney function.

Other forms of drug elimination

Some drugs are excreted in saliva, sweat, breast milk, and even exhaled air. Most are excreted in small amounts. The excretion of drugs in breast milk is

significant only because the drug may affect the breastfeeding infant (see Drugs That Should Not Be Taken While Breastfeeding). Excretion in exhaled air is the main way that inhaled anesthetics are eliminated.

B)What does total body clearance means?

Ans: **Total body clearance**

In pharmacology, clearance is a pharmacokinetic measurement of the volume of plasma from which a substance is completely removed per unit time. ... Thus, total body clearance is equal to the sum clearance of the substance by each organ (e.g., renal clearance + hepatic clearance + lung clearance = total body clearance).