**Course Title** **General pharmacology**

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**Q.1/Enumerate various routes of drug administration**

**Explain Parenteral routes in detail.**

**Ans/ Various Routes Of Drug Administration:**

A/ Enteral

B/ Parenteral

C/ Others

**Explain Parenteral Routes:**

**Parenteral Routes:**

Parenteral drug administration means any non-oral means of administration,but is generally interpreted as relating to injecting directly into

the body, bypassing the skin and mucous membranes.The common parenteral routes are intermuscular, subcutaneous and intravenous.

**Advantage:**

*Can be used for drugs that are poorly absorbed, inactive or ineffective if given orally

*The IV route provide immediate onset of action.

*The intramuscular and subcutaneous routes can be used to achieve slow or delayed onset of action.

*Patient concordance problem can be avoide.

**Advantage:**

*Staff need additional training and assessment.

*Can be costly.

*Can be painful.

*Aseptic technique is required.

Parenteral administration require an appropriate Injection technique. If performed incorrectly for example using the wrong size needle or cannula it can cause damage to nerves, muscle and vasculature and may adversely affect drug absorption.

## Intracellular And Subcutaneous:

In general,IM And SC injection of drug establishes a deposit or depot that will be released gradually into the systematic circulation. The Drug formation will influence the period over which it is released,for example, the formation of antipsychotic agent such as flupentixol in oil allows them to be administered once a month or every three months

## Intravenous:

The IV route carries the greatest risk of any route of drug administration. By administrati directly into the systematic circulation,either by direct injection or infusion, the drug is instantaneously distributed to its sites of action. The routes of administration can be complex and confusing, information to be garthered on administration rates and compatibilities with other IV solutions,as will as the use of programmable infusion devices.

**Q.2/ What does water compartment means Explain it's types in detail.**

**Ans:Water compartment:**

The total body **water** space consists of the intracellular fluid (ICF) and extracellular fluid (ECF)**compartments**. The volume of distribution ($V_d$) is that volume into which a drug distributes in the body at equilibrium.

## Types Of Water Compartment:

- **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.

- **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, or where any significant fluid collection is physiologically nonfunctional.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.

**Q.3/**

**Part 2/ What does total body clearance means.**

**Ans: <u>Total body clearance:</u>**

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**).

**Part 1/ What are drug elimination stages. Explain briefly**

**<u>Ans : Drug Elimination Stages:</u>**

**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.

## Stages Of Drug Elimination:

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.