SNS COLLEGE OF ALLIED HEALTH SCIENCES

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DEPARTMENT : PHYSICIAN ASSISTANT

COURSE NAME : PHARMACOLOGY

UNIT : DRUG INTERACTIONS

TOPICS : DRUG INTERACTION, EXCRETION, PLASMA HALF LIFE

DRUG INTERACTIONS

- When two drugs are given together, a drug intearction occurs. The pharmacological effects of one drug are potentiated or diminished by another drug. This is due to the interaction at pharmacokinetic or pharmacodynamic level.

- If the administration of two or more drugs produces a pharmacological response that is greater than that which would be expected by the individual effects of each drug together, the drugs are said to be acting synergistically. If one drug diminishes the action of another, it is said to act antagonistically.

- Drug interaction may be synergistic or antagonistic (explained earlier along with synergism/antagonism).

- Drug interactions may be beneficial or harmful:

- Beneficial: For example, the use of a CNS stimulant such as caffeine with an antihistamine that may cause drowsiness as one of its side effects may be a useful drug interaction; the caffeine acts only to counteract the unwanted side effect (drowsiness) of the antihistamine without altering its intended pharmacological action.

- Harmful: The use of an antacid with the antibiotic tetracycline would be likely to result in an undesirable drug interaction. Antacid forms a chemical complex with the tetracycline, thereby rendering it incapable of being absorbed into the bloodstream.

- Drug interactions may occur at any step in the passage of a drug through the body during its administration, absorption, distribution, metabolism, or excretion. Interactions may also take place at the receptor site of a drug. Drugs may interact with foods, laboratory test sub- stances and environmental pollutants.

EXCRETION

Excretion is the process of removing a drug or its metabolites from the body. Drugs and their metabolites may be eliminated from the body in several different ways. Such as in

- Urine
- Feces
- Exhaled air
- Saliva
- Sweat
- Tears
- Breast Milk

Urine or Renal Excretion

- The substances which are made water soluble after biotransformation can be easily excreted through this route. The nephron is a basic renal unit.

- Three mechanisms of renal excretion operate simultaneously at the nephron level.

These mechanisms are

Glomerular filtration: The drug/metabolites/ sub stances, which are smaller in size than the glomerular capillary pores are easily filtered through the glomerulus and reach the proximal tubules. The protein bound drug and bigger molecules cannot be filtered through the glomerulus. Hence, excretion depends upon glomerular filtration rate.

Tubular reabsorption (selective): The highly lipid soluble drugs are reabsorbed from the proximal tubules. The ionization of a drug also affects this process.

Tubular secretion: Certain drugs and natural metabolites are actively secreted in the tubule for the purpose of excretion.

We can say that:

Net Renal excretion = (glomerular filtration + Tubular secretion) - Tubular reabsorption

FECES

Both the unabsorbed fraction of a drug and the drugs excreted through bile, are excreted in feces. Example: Erythromycin, OCPs, Ampicillin etc

EXHALED AIR

The volatile liquids and gases are excreted through this route. Example: Alcohol and anesthetic gases.

SALIVA, SWEAT AND TEARS

Lithium and some heavy metals are excreted through this route.

BREAST MILK

More lipid soluble and less protein bound drug are excreted through this route.

Example: Tetracycline, Methotrexate, Indomethacin, etc.

PLASMA HALF LIFE

The plasma half-life (t½) of a drug is the time taken for its plasma concentration to be reduced to half of its original value.

- After 1st t½-50% drug is eliminated.
- After 2nd t½-75% (50 +25) drug is eliminated.
- After 3rd t2-87.5% (50+25+ 12.5) drug is eliminated.
- After 4th t2-93.75% (50 + 25+ 12.5+ 6.25) drug is eliminated.

Half-life of some drugs

- Aspirin 4 hr
- Digoxin 40 hr
- Azithromycin >50 hr
- Digitoxin 7 days
- Doxycycline 20 hr
- Phenobarbitone 90 hr

Clinical implications of plasma half-life

Knowledge about the plasma half-life is an important factor which guides us to:

- Determine the frequency of drug administration
- Duration of drug action
- Time of excretion.

ASSESSMENT

- What is Drug interaction ?
- What all are the Clinical implications of Plasma half life ?