

NURSING STUDIES

2nd Year

PHARMACOLOGY : Introductory SessionDefinitions:

Pharmacology is the study of drugs, their origin, chemical structure, preparation, administration, actions, metabolism and excretion.

Therapeutics is the use of drugs in the treatment of disease.

For each drug, you must be able to construct a profile:-

- (1) The preparation.
- (2) The group to which the preparation belongs.
- (3) The preparation's mode of action.
- (4) Modes of administration and dosage schedule.
- (5) Metabolism and excretion.
- (6) Clinical usage.
- (7) Side-effects: any important interactions with other drugs.
- (8) Effects of over-dosage and their treatment.
- (9) Contraindications and precautions.

The Administration of Drugs

(1) Oral - by mouth:

- (a) Tablets; drug is mixed with an inert base and coated with sugar and a coloured substance.
- (b) Capsules; drug contained within a gelatine and coloured capsule which is digested in the stomach so that the drug is liberated.

Bioavailability: how much of the dose of a drug is active pharmacologically. This depends on -

- (i) absorption in the intestine
 - (ii) the coating of the drug
 - (iii) the presence or absence of food
 - (iv) the rate of gastric emptying - usually about 20 minutes.
- (c) Linctus: the drug is contained in sugar syrup.
 - (d) Mixture: several drugs dissolved in water or other solvent.
 - (e) Emulsion: two liquids mixed together so that one is dispersed through the other.

Drugs absorbed through the intestine are carried by the portal vein to the liver where detoxification begins. The products of detoxification are called metabolites; these are excreted by the body, in the urine, or, rarely, exhaled via the lungs.

(2) Injections:

- (i) Intravenously - very rapid action - immediate.
- (ii) Intramuscularly - moderately rapid - 10 minutes.
- (iii) Subcutaneously) absorption about 15 minutes - useful
- (iv) Intradermally) for very potent drugs (adrenaline) or immunisation.

(3) Rectal administration:

- (i) suppositories
- (ii) capsules
- (iii) enemata.

(4) Inhalations:

- (i) may act only on the lung tissue.
- (ii) may be absorbed to give systemic effect through lung tissue.

(5) Local applications:

- (i) lotions
- (ii) liniments
- (iii) ointments
- (iv) creams
- (v) poultices.

Dosage of Drugs

Dosage varies with :

- (i) route of administration
- (ii) age of patient
- (iii) size and weight of patient; dose/kg. body weight.
- (iv) general health.

Distribution and Elimination

The plasma half life is the time taken for the plasma concentration of a known dose of a drug to halve in value. The plasma half-life reflects the breakdown and excretion rates of a drug.

Distribution:

A drug in the bloodstream may be -

- (i) in solution in the plasma.
- (ii) bound to protein molecules; only the unbound portion of the drug is pharmacologically active.

The concentration of a drug in the bloodstream depends on:

- (i) the dose
- (ii) the route of administration: intravenous injection produces a rapid rise in blood concentration; oral administration gives a slow rise with a lower peak; intramuscular injection lies between the two.

- (iii) Distribution :
- (a) the drug may be confined to the bloodstream
 - (b) may diffuse into the extracellular fluid
 - (c) may enter cells
 - (d) may fix onto cell membranes.

The more widely a drug is distributed throughout the body fluids, the lower the concentration will be.

- (iv) Elimination :
- The faster the rate of elimination, the faster the blood level falls.
- (a) The liver detoxifies drugs by means of enzymes. Liver enzymes can be increased or decreased by certain drugs (for example, alcohol and the barbiturates can induce enzyme production which allows detoxification to proceed faster. Liver damage will inhibit the ability to detoxify drugs.
 - (b) Drugs may be excreted unaltered via the kidney into the urine. e.g. ampicillin. Such antibiotics are therefore useful in the treatment of urinary tract infections.
 - (c) The metabolites or breakdown products are excreted by the kidney into the urine. Excretion is delayed if renal damage is present.
 - (d) Some drugs may be excreted via the lungs, e.g. alcohol, some volatile anaesthetics.

Factors influencing drug administration

- (1) The time taken for a drug to act is determined by the route of administration.
- (2) The blood level and therapeutic effectiveness depend on the dose, route of administration and rate of elimination.
- (3) Duration of effect depends on the rate of elimination. Drugs that are excreted rapidly require more frequent dosages. Drugs that are excreted slowly need repeat dosages less often. Some drugs require a 'loading-dose' before therapeutic effectiveness is achieved.

A Drug - Profile

- (1) The Preparation: Diazepam.
(Atensine, Sedapam, Valium).
- (2) The group : the benzodiazepines.
- (3) Mode of action:
An anxiolytic, anti-convulsant, and central muscle-relaxant; effects mediated through the central nervous system, such as the limbic system.

(4) Administration and dosage:

Oral: Tablets, capsules and syrup.

2 mgs., 5 mgs. and 10 mgs. doses.

Total dosage will depend on age and disorder being treated.

Iv.) ampoules - 10 mgs.
Im.)

Can also be administered per rectum.

(5) Metabolism and excretion:

Broken down in liver; metabolites excreted in the urine.
Some of these metabolites are metabolically active.

(6) Clinical usage:

Anxiety states, premedication in dentistry, epilepsy,
control of muscle spasm in tetanus, intravenous sedative
in operative procedures.

(7) Side-Effects:

Thrombo-phlebitis following intravenous injection.

Hypotension)

Apnoea) Central respiratory and cardiac depressions.

Drowsiness)

Headache (due to long-acting metabolites - 36 hours).

Potentiated by alcohol.

(8) Affects of Over-Dosage:

Usually not fatal if taken alone.

In combination with other drugs, particularly alcohol,
may produce hypo-tension, coma, and apnoea.

Treatment is by gastric lavage and conservative.

(9) Contra-indications and Precautions:

Impairs judgment, particularly driving and operating machinery.

Can cause dependency, both physiological and psychological.

Can cause confusion in the elderly.

October 11th .

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