

Unit - IV

SUPPOSITORIES

- Suppositories are solid dosage form of medication for insertion into body cavities other than mouth.
- They may be inserted into rectum, vagina or nasal cavity.
- The medicament is incorporated into the suppository base and the product is formulated in such a way that they will either melt or dissolve in the body cavity fluid to release the medicament.
- Suppositories are available in different shapes, sizes and weights.
- They are used to produce local, systemic and mechanical action.

Advantages

- These can be easily administered to children, old persons and to unconscious patients who cannot swallow the drug easily.
- These are inserted into body cavity to produce local effect of the medicament incorporated in the base.
- These are inserted into the rectum to promote evacuation of the bowel.
- Suppositories are unit dosage form of drugs.
- These are convenient mode of administration of drugs which irritate gastro-intestinal tract, cause vomiting and destroyed in the acidic pH of gastric juice of stomach.

Disadvantages

→ The amount of drugs cannot be administered by this route.

→ Suppositories cause embarrassment to the patient, when a drug is administered by inserting a suppository into a body cavity.

→ The suppositories are required to be stored at low temperature (10° to 20°C).

Hence suppositories are required to be stored in a refrigerator, which is costly for poor patients.

→ Suppositories cannot be prepared easily.

Types of Suppositories

① Rectal suppositories

→ These are meant for introduction into the rectum for their systemic effect.

→ These are generally made from theobroma oil and are available in various sizes to meet the needs of infants, children & adults.

→ Usually available in weight about 1-2g.

→ They are either cone or torpedo shaped.

② Vaginal suppositories

- These are meant for introduction into the vagina.
- These are also known as pessaries and are larger than rectal suppositories.
- They are may be conical, rod-shaped or wedge shaped & usually available in weight about 4-8g.
- Mainly used for their local action on the vagina.
- Nowadays, vaginal tablets and vaginal capsules are also available which has substituted the vaginal suppositories.

③ Nasal suppositories

- These are meant for introduction into the nasal cavity and are also known as nasal bougies.
- These are similar to urethral suppositories.
- These are thin and cylindrical in shape, and are always prepared with glycerogelatin base.
- Nasal suppositories are about 9-10 cm long and weight about 1.0g.

④ Urethral suppositories

- These are meant for introduction into the urethra and are also known as urethral bougies.
- These are thin, long and cylindrical forms rounded at one end to facilitate insertion.
- Their weight varies from 2 to 4 g.
- These are very rarely used.

⑤ Ear cones

- These are meant for introduction into the ear and are also known as aurinaria.
- These are thin, long and cylindrical and weight about 1g.
- Usually prepared with theobroma oil and are rarely used nowadays.

Suppository Bases

The various types of suppositories bases are used to prepare suppositories, so that they can retain its shape and firmness during storage and administration.

An ideal suppository base should have the following properties

- (i) It should melt at body temp^r or dissolve or disperse in body fluids.
- (ii) It should keep its shape when being handled.
- (iii) It should release the medicament readily.
- (iv) It should be non-toxic and non-irritant to the mucous membrane.
- (v) It should be stable on storage.
- (vi) It should be compatible with large numbers of drugs.
- (vii) It should be stable if heated above its melting point.
- (viii) It should be easily mouldable by pouring or cold compression.

Classification of Suppository Bases

① Fatty Bases.

② Water soluble and water miscible bases.

③ Emulsifying bases.

① Fatty Bases

Designed to melt at body temperature.

Example ; Theobroma oil (cocoa butter)

④

Theobroma oil

→ It is a yellowish-white solid with an odour of chocolate.

→ It is a mixture of glyceryl esters of different unsaturated fatty acids.

Advantages

→ A melting range of $30-36^{\circ}\text{C}$ (solid at room temp^r but melts in the body).

→ Readily melted on warming, rapid setting on cooling.

→ Miscible with many ingredients.

→ Non-irritating.

Disadvantages

→ It shows the phenomena of polymorphism i.e., when theobroma oil is melted and cooled, it gets solidified into different crystalline forms depending upon melting temp^r, rate of cooling and size of the mass.

→ It becomes rancid and melts in warm weather.

→ It has a tendency to stick the sides of the mould when solidified.

- The leakage from body cavities on melting can take place.
- It is relatively costly.
- It is immiscible with body fluids.

B) Synthetic Hard Fat

→ As a substitute of theobroma oil, a number of hydrogenated oils.

eg- hydrogenated edible oil, arachis oil, coconut oil, stearic and a mixture of oleic and stearic acids are recommended.

Advantages

- Their solidifying points are unaffected by overheating.
- They have good resistance to oxidation because their unsaturated fatty acids have been reduced.
- Their emulsifying and water absorbing capacities are good.
- No mould lubricant is required because they contract significantly on cooling.
- They produce colorless, odourless and elegant suppositories.

Disadvantages

- ① They should not be cooled in refrigerator because they become brittle if cooled quickly.
- ② They are more fluid than theobroma oil when melted and at this stage sedimentation.

Water Soluble & Water Miscible Bases

A Glycero-Gelatin Base

- This is a mixture of glycerol and water made into a stiff jelly by adding gelatin.
- It is used for the preparation of jellies, suppositories and pessaries.
- To avoid incompatible reactions, any one of the two types of gelatin are used as suppository base.

① Type-A or Pharmagel-A

(Acidic in nature & used for acidic
drugs having p_{so} electric point 7-9)

② Type-B or Pharmagel-B

[Alkaline in nature & used for alkaline
drugs having p_{so}-electric point 4.7 to 5.0]

Disadvantages

Glycerogelatin base suppositories are less commonly used than the fatty base suppositories because —

- (i) Glycerol has laxative action.
- (ii) They are more difficult to prepare & handle.
- (iii) They are hygroscopic, hence must be carefully stored.
- (iv) Incompatible with many drugs such as tannic acid, ferric chloride, gallic acid etc.

B) Soap-glycerin suppositories

→ In glycerogelatin base, the gelatin is replaced with either curd soap or sodium stearate which makes the base sufficiently hard to prepare good quality of suppositories.

→ Soap also helps in the evacuation action of glycerin.

→ Disadvantage: They are very hygroscopic.

Therefore, the suppositories prepared with this base must be protected from atmosphere and wrapped in waxed paper or tin foil.

C) Polyethylene glycols

→ They are commonly known as carbowaxes or polyglycols or macrogols.

→ The physical character of these carbowaxes varies according to the molecular weight.

→ The macrogols having molecular weight less than 1000 are liquids and those with molecular weight higher than 1000 are wax like solids.

Advantages

→ Chemically stable, non-irritant.

→ Do not allow the bacterial or mould growth to take place.

→ They provide prolonged action because they do not melt in the body cavity but dissolve slowly for a long time.

→ They do not stick to the side of the mould.

Disadvantages

→ Hygroscopic, incompatible with certain drugs like tannis, phenols etc.

③ Emulsifying Bases

These are synthetic bases and a number of proprietary synthetic bases are available in the market. Some of these are described as under:—

① Witepsol

They consist of triglycerides of saturated vegetable acids (chain length C12 to C18) with varying proportions of partial esters.

② Massa Esterium

This is another range of bases, consisting of a mixture of di-, tri- and mono-glycerides of saturated fatty acids with chain lengths of C11 to C17.

③ Massupol

It is the mixture of di-

It consists of glyceryl esters mainly of lauric acid, to which a small amount of glyceryl monostearate has been added to improve its water absorbing capacity.

Advantages over cocoa butter

→ Over heating does not alter the physical characteristics.

→ They do not stick to the mould. They do not require previous lubrication of the mould.

→ They solidify rapidly.

→ They are less liable to get rancid.

→ They can absorb

Manufacturing of Suppositories

Moulds

→ The suppository and pessary moulds are made of metals and have four, six or twelve cavities.

→ By removing a screw, they can be opened longitudinally for lubrication, extraction of the suppositories and cleaning.

→ The nominal capacities of the common moulds are 1g, 2g, 4g and 8g.

Displacement value

The volume of a suppository from a particular mould is uniform but its weight will differ with the density of the base.

Defination

It is the quantity of the drug that displaces one part of the base. eg- zinc oxide.

Calculation of displacement value

Formula for calculation of the amount of base required in each mould.

$$\text{Amount of base required for each suppository (gm)} = \frac{\text{Capacity of each mould (gm)} \times \text{Dose of drug (gm)}}{\text{Displacement value of drug}}$$

Preparation of Suppositories

① Rolling method

→ It is an ancient method of preparing the suppositories.

→ The suppository base is rolled and then desired shape is given with the hand.

→ The method is not used nowadays.

② Hot process or fusion method

→ This method is commonly used in the preparation of suppositories for dispensing purposes.

→ The suppository base is melted, the medicament is incorporated in it and filled in lubricated mould.

→ On cooling, suppositories are formed which are removed from the suppository mould.

③ Cold compression method

→ The method is useful for thermolabile and insoluble drugs because heating and stirring of the base with medicament is not required.

→ The various steps involved in this method are as under:-

① Cocoa butter is grated.

② The ingredients are mixed with an equal quantity of grated cocoa butter.

③ Add the remaining amount of grated cocoa butter.

④ While calculating the amount of cocoa butter to be incorporated with the medicaments, allowances are made for unavoidable wastage during the preparation.

B)

→ The compression of the prepared mass is done on hand or power-operated compression machines.

→ The mass and the compression cylinder of the machine may be chilled to prevent heat of compression from making the mass too fluid.

Packaging and Storage

→ Suppositories are usually packed in tin or aluminium, paper or plastic.

→ Poorly packed suppositories may give rise to staining, breakage or deformation by melting.

→ Both cocoa butter and glycerinated gelatin suppositories stored preferably in a refrigerator.

→ Polyethylene glycol suppositories stored at usual room temperature without the requirement of refrigeration.