



SUPPOSITORIES

Madhunithya.E
Asst. Prof,
Dept of Pharmaceutics,
SNSCPMS

CONTENTS

- ✓ Introduction
- ✓ Advantages & Disadvantages
- ✓ Types
- ✓ Suppository Bases
- ✓ Method of preparation
- ✓ Evaluation





Introduction

- Suppositories are solid dosage forms intended for insertion into body cavities where they melt, soften or dissolve and exert local or systemic effect.
- Derived from latin word *supponere*, meaning “to place under”.

Let's see some concepts

- ▶ A suppository is a medicated solid dosage form generally intended for use in the rectum, vagina and to a lesser extent, the urethra.
- ▶ After insertion they melt or soften at body temperature, whereas vaginal suppositories sometimes called as pessaries, are also made as compressed tablets that disintegrate in body fluids.
- ▶ Emollients, astringents, antibacterial agents, steroids and local anesthetics are dispensed in suppository for treating local actions.
- ▶ Analgesics, antispasmodics, sedatives ,tranquillizers are dispensed in suppository for treating systemic action.

Comparison of Dosage Forms

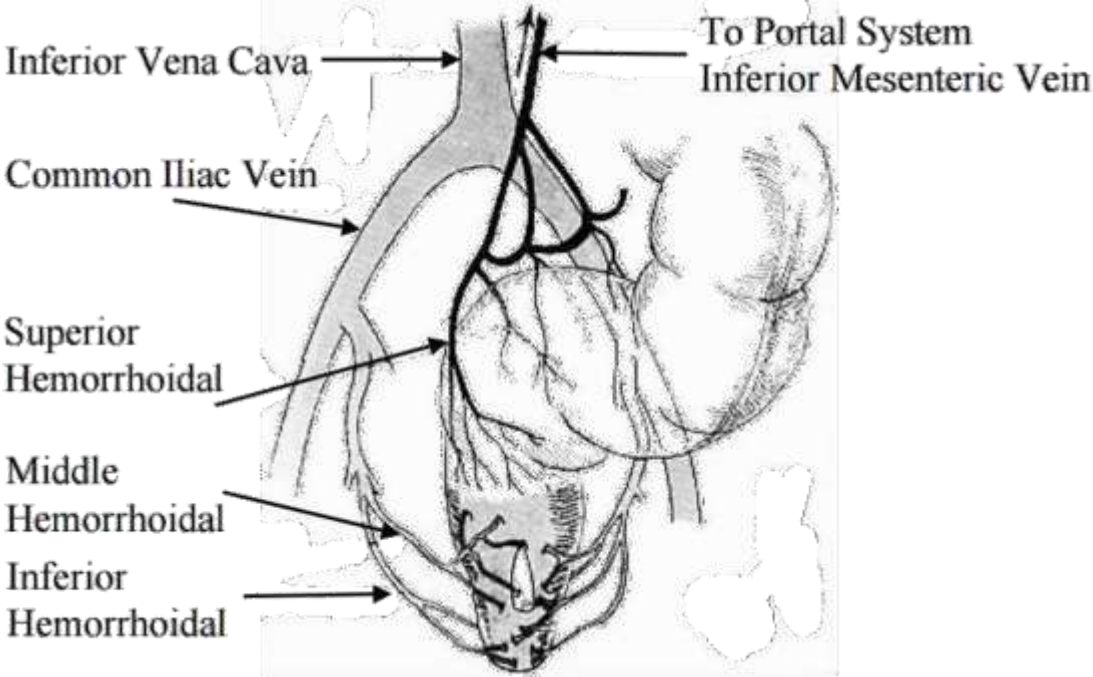
▶ **Oral Administered Dosage Forms:**

Drug → Absorption → Small Intestine → Hepatic Portal vein →
Liver → Chemical modification in liver → Reduced systemic →
Effectiveness

▶ **Rectally Administered Dosage Forms:**

Drug in rectal area → Lower hemorrhoidal(rectal) vein surrounding
the colon and rectum enters into the inferior vena cava → Bypass the
liver → 50-70% of drug absorb directly into systemic circulation

Rectal Blood Flow



Advantages of Suppositories

- Avoids first pass effect.
- Melts at body temperature.
- Both localized and systemic action.
- Easy to use for pediatric and geriatric patients.
- Administered to unconscious patient.
- Convenient for drugs that causes GI irritation, vomiting etc.

Disadvantages of Suppositories

- Irritant drug cant administered.
- Embarrassment to patients(Poor patient acceptability)
- Need to store at low temp.
- Cant easily prepared
- Cost-Comparatively expensive.
- Fluid content of the rectum is much less than that of the small intestine; this may effect dissolution rate.
- Some drug may be degraded by the microbial flora present in the rectum.

TYPES OF SUPPOSITORIES



RECTAL

Cone or torpedo shaped weighing 1-2g



VAGINAL (pessaries)

Globular, oviform, cone or wedge shaped weighing 2-8 g.

Made from glycono-gelatin or macrogol base.



URETHRAL BOUGIES

Thin pencil shaped and pointed at one end.

Male bougies - 4g and 100-150 mm.

Female bougies - 2g and 60-75mm.



NASAL

Thin pencil shaped with pointed ends.

1.2 g and 9-10 mm long.



EAR CONES

Pencil shaped.

Ideal Properties of Suppository Bases

- ▶ Easy to mould
- ▶ Should not adhere to the mould
- ▶ Retain its shape when handled
- ▶ Release any medicament readily
- ▶ Non-toxic and non irritant
- ▶ Dissolve/Disperse in body fluids
- ▶ Compatible with all medicaments
- ▶ Melt at body temperature
- ▶ Stable on storage
- ▶ Stable above its melting point



Types of Suppository Bases

Oleaginous/ Fatty bases

- ▶ Cocoa butter (Theobroma oil)
- ▶ Emulsified Theobroma oil.
- ▶ Hydrogenated oils.

Hydrophilic bases (Water soluble and miscible)

- ▶ Glycero-gelatin base.
- ▶ Soap-glycerin base.
- ▶ Polyethylene glycol.

Emulsifying/Synthetic bases

- ▶ Witepsol
- ▶ Massa estarinum
- ▶ Massuppol.

Fatty or Oleaginous bases

Cocoa butter (Theobroma oil) :

Cocoa butter is fat obtained from the roasted seed of *Theobroma cocoa*.

Properties

- ▶ At room temperature it is a yellowish, white solid having a faint, agreeable chocolate like odour.
- ▶ Chemically, it is a triglyceride (combination of glycerin and one or different fatty acids) primarily of oleopalmitostearin and oleodistearine.
- ▶ It melts at 30 - 35C,

Fatty or Oleaginous bases

Advantages

- ▶ Melting just below the body temperature.
- ▶ Maintaining its solidity at usual room temperatures.
- ▶ Readily liquefy on heating and solidify on cooling.

Disadvantages

- ▶ Exhibits marked polymorphism.
- ▶ Rancidity.
- ▶ Sticks to mould.
- ▶ Leakage from body cavity.
- ▶ Costly.
- ▶ Immiscibility with body fluid.
- ▶ Chloral hydrate or lactic acid liquefy it.

Fatty or Oleaginous bases

Hydrogenated oils/Triglycerides

- ▶ Hydrogenation of various vegetable oils such as arachis oil, cotton seed oil, coconut oil, palm oil etc.
- ▶ Used as substitute for theobroma oil because it has advantages like:
 - ✓ They are resistant to oxidation.
 - ✓ Lubrication of mould is not necessary.
 - ✓ Colorless and odourless suppositories can be prepared.

Water soluble/ water miscible bases:

Glycero-gelatin base:

- ▶ It is a mixture of glycerin and water which is made stiff by the addition of gelatin.
- ▶ The suppositories can dissolve or disperse in the body fluids and release the drugs.
- ▶ Type-A Gelatin and Type-B Gelatin.

Disadvantages:

- ▶ Hygroscopic
- ▶ Bacterial growth.
- ▶ Incompatibility – Tannic acid, ferric chloride and gallic acid.
- ▶ Physiological action – Laxative.

Water soluble/ water miscible bases:

Soap-Glycerin suppositories:

- ▶ In glycero-gelatin suppositories the gelatin is replaced with sodium stearate or curd soap.
- ▶ Hygroscopic.

Polyethylene glycols/Macrogols:

- ▶ Water soluble polymers available from mwt of 200 to 8000.
- ▶ Available in different consistencies from liquids, semi solids and solids.

Advantages:

Chemically stable

Non irritant

Free from bacterial growth.

Dissolves slowly in body fluids

Free from sticking.

Emulsifying Bases

Witepsol:

- ▶ Triglycerides of saturated vegetable fatty acids with varying percentages of partial esters.
- ▶ A small amount of Bees wax is added as hardening agent.
- ▶ Should not be cooled rapidly because it may leads to brittle suppositories.
- ▶ Proper lubrication is necessary.

Emulsifying Bases

Massa estarinum

It is a mixture of mono, di and tri glycerides of saturated fatty acids having the formula $C_{11}H_{23}COOH$ to $C_{17}H_{35}COOH$.

It is a white brittle almost odourless and taste less solid with a MP of 33.5 to 35.5 ° c.

Massuppol

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



PREPARATION OF SUPPOSITORIES

PREPARATION OF SUPPOSITORIES

Suppositories are prepared by any of the following methods:

- ▶ **Hand Rolling method**
- ▶ **Hot process or Fusion method.**
- ▶ **Cold compression method**

SUPPOSITORIES MOULDS



SUPPOSITORIES MOULDS CAPACITY



1 gm



2 gms



4 gms



8 gms



Lubrication of mould

- ▶ Lubrication of the mould is necessary in case of theobroma oil and glycerinated bases.
- ▶ The lubricant can be applied on to the inner surface of the mould using a brush or swab made of gauze.
- ▶ Excessive lubrication of the mould is avoided by draining and keeping in inverted position on neat surface.

S.No	Base	Lubricant
1	Cocoa butter	Soft soap 10 g Glycerin 10 g Alcohol 90 % 50 ml
2	Glycero-gelatin	Liquid paraffin or Arachis oil
3	Emulsifying base	No lubricant is used

Calibration of mould

- ▶ The calibration of the mould is necessary, because the size of the suppository from a mould remains same, but the weight varies.
- ▶ This is due to the differences in the densities of bases and medicaments.
- ▶ Calibration is done by preparing a set of suppositories using the base, weighing the suppositories and then finding the average mean.
- ▶ This will indicate the true capacity of the mould.

Displacement value

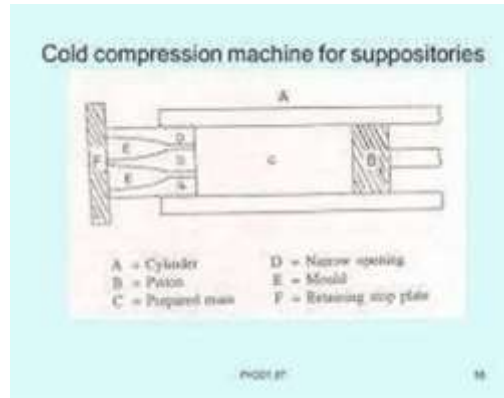
- ▶ The quantity of the drug which displaces one part of the base.
- ▶ The volume of a suppository from a particular mould is uniform but its weight will vary because of the differences in the densities of the base with the medicaments.
- ▶ The moulds are calibrated for the individual base to know the exact volume of the base required but displacement value is considered when the base is mixed with medicament.
- ▶ In order to prepare suppositories of accurate weight from an individual mould, the differences in the densities of base and medicament is taken into consideration.

Method of preparation

- ▶ Clean and lubricate the mould.
- ▶ Melt the 2/3 rd of the base in china dish using heat and stir well.
- ▶ Add the powdered medicament to the base and mix well.
- ▶ Warm the china dish for a few seconds with stirring.
- ▶ Pour the melted mass into cavities of mould and keep on ice bath.
- ▶ Remove the excess mass with sharp knife or blade.
- ▶ Open the mould, collect the suppositories, wipe off neatly and wrap in a wax paper.

Cold compression method

- ▶ This method is useful for thermolabile and insoluble drugs as it does not involve heating and stirring of the base.
- ▶ The method is not suitable for suppositories in which glycerogelatin base or any other base which involves melting.
- ▶ Use of Hand or power operated compression machines.





EVALUATION OF SUPPOSITORIES

Evaluation of suppositories

Suppositories are evaluated for the parameters like:

- ✓ Visual examination
- ✓ Weight variation test
- ✓ Melting range
- ✓ Liquefaction time
- ✓ Content uniformity test
- ✓ Dissolution test

Visual examination

Each suppository is placed vertically and examined visually for the

- Specified shape,
- Equal distribution of colour,
- Dispersion of colour,
- Migration of API to the surface.

The surface of the prepared suppositories is observed for

- Dullness,
- Cracks,
- Dark regions,
- Air bubbles, Holes etc.,



Weight variation test

- ▶ As the suppositories are unit dosage forms, they are evaluated for the uniformity of weight.
- ▶ 10 suppositories are taken and weighed individually and noted as individual weight.
- ▶ Total weight of suppositories determined and the average weight of suppositories is calculated.
- ▶ Then % deviation of weight of each suppository with the avg weight is determined using the formula:

$$\% \text{ Deviation} = \frac{\text{Individual weight} - \text{Average weight}}{\text{Average weight}} \times 100$$

- ▶ The % deviation should not be more than or less than 5 %

Melting range

- ▶ Melting range of the suppository is the temperature range where the suppository starts melting to the temperature where it melts completely.
- ▶ The release rate of the suppositories is related to the melting point.
- ▶ A number of techniques are available
 - Open capillary tube method
 - U- tube
 - Drop point method

Liquefaction time

- ▶ Liquefaction time refers to the time taken by the suppository to become soft at the maximum temperature.
- ▶ This can be determined by suppository penetration test apparatus.
- ▶ It consists of a glass cylinder with a stage to place the suppository, and the glass rod is placed over the suppository.
- ▶ The total assembly is placed in a glass cylinder and is immersed in a water bath of 37° c.
- ▶ The time taken for the glass rod to reach bottom of the cylinder is noted as liquefaction time for the suppositories.



Content uniformity

- ▶ To ensure dose to dose uniformity, the content uniformity test is performed on suppositories.
- ▶ The test is based on the assay of individual content of the API in a number of suppositories.
- ▶ 10 to 20 number of suppositories are taken and analysed using suitable analytical methods to know the API content.
- ▶ The same is checked with standard limits prescribed in the official books.

Dissolution test

- ▶ Dissolution gives the information about the % of drug release vs time periods.
- ▶ Tablet dissolution test apparatus is used.

Two types of dissolution apparatus

- Rotating paddle apparatus
- Rotating basket apparatus.

