Suppositories

Defination

- “Suppositories are solid dosage forms intended for insertion in to body cavities or orifices (Rectum, Vagina & Urethra) where they melt or dissolved & exert localized or systemic effect.”

Advantages

It avoid first pass effect.
Melt at body temperature.
It gives localized and systemic action.
It can be given to unconscious patient.
It is easy to use for pediatric and geriatric patients.
Useful to produce local effect.
Useful for rapid and direct effect in rectum.
Useful to promote evacuation of bowel
Convenient for those drug causes GIT irritation , vomiting etc.

Disadvantages

Irritant drug cant administered

Embarrassment to patients

Need to store at low temp.

Cant easily prepared

Cost-expensive.

fluid content of the rectum is much less than that of the small intestine; this may effect dissolution rate, etc.

Some drug may be degraded by the microbial flora present in the rectum.

Types of Suppositories

1. Rectal suppositories.
2. Vaginal suppositories.
3. Urethral suppositories.
4. Nasal suppositories.
5. Ear cones.

Newer Concept of Suppositries

- Tablet Suppositories
- Layered Suppositories
- Coated Suppositories
- Capsule Suppositories

Tablet suppositories

- This type of tablets prepared by compression like tablets.
- Such type of suppositories used for rectal & vaginal purposes.
- Pessaries tablet suppositories are present in almond like shape.
- Rectal tablets covered with thin layers of materials such as polyethylene glycol for protecting.

Layered Suppositories

- In that type of suppositories are contains different drugs in different layers.
- So that, incompatibility drugs can be separated from each other.
- Similarly drugs having different melting points can be incorporated to control the absorption rate.

Coated Suppositories

- In that type of suppositories contains polyethylene glycol, cetyl alcohol etc.
- Those materials controls their disintegration rate, to impart lubricant properties & to provide protection action during storage.

Capsule Suppositories

- Soft gelatin capsules of different shapes & size are prepared in that type of suppositories.
- In that type of capsule suppositories are filled with liquids, semisolids or solids.
- These type of capsules are increasing in popularity.

Suppository Bases

- Suppository bases plays important role in maintaining their shape, solidity & also play important role when inserted into the body cavity.
- There are large number of bases used but theobroma oil, glycerogelatin base & polyethylene glycol fulfill the above mentioned requirements.

Ideal Properties of Bases

- It must retain the shape and size.
- It should melt at body temperature.
- It should be non-irritant.
- It should shrink sufficiently to remove from mould.
- It should not interfere in release or absorption of drug.
- It should permit incorporation of drug.
- It should be compatible with variety of drugs.
- It should be physically stable on storage.
- It should not be soften or harden on storage.

TYPES OF SUPPOSITORY BASES

- Oily Bases or Oleaginous bases
- Water Soluble & Water miscible bases
  Or
  Hydrophilic bases
- Emulsifying/Synthetic bases

Oily Bases or Oleaginous bases

- Cocoa butter or Theobroma Oil
- Emulsified cocoa butter.
- Hydrogenated oils.

Cocoa butter or Theobroma Oil

- Cocoa butter is fat obtained from
  of Theobroma cocoa.
  - At room temperature it is a yell
    having a faint, agreeable chocol
  - Chemically, it is a triglyceride
    glycerin and one or different fat
    of oleopalmitostearin and oleod
  - It melts at 30 – 35^{0}C

Advantages

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

Disadvantages

- Rancidity.
- Stick to mould.
- Leakage from body cavity.
- Costly.
- Immiscibility with body fluid.
- Chloral hydrate or lactic acid liquefy it.

Emulsified cocoa butter or Emulsified Theobroma Oil

- Emulsified theobroma oil may be used as a base when large quantities of aqueous solutions are to be incorporated.

- 5% glyceryl monostearate, 10% lanette wax, 2-3% cetyl alcohol & 4% bees wax is recommended for emulsified theobroma oil.

Hydrogenated Oils

- Hydrogenated oils are used as a substitute of theobroma oil.
- E.g. Hydrogenated edible oil, coconut oil, hydrogenated pea oil, stearic acids, palm kernel oil etc.

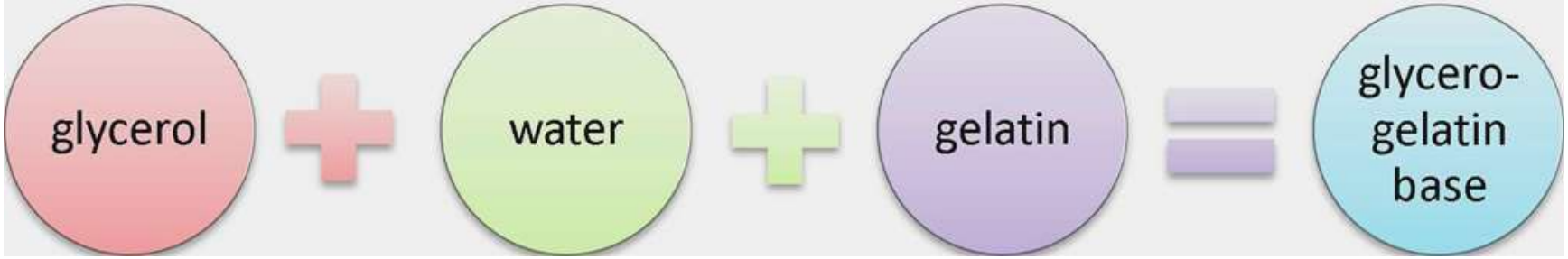
- Advantages
- Overheating does not affect the solidifying point.
- They are resistant to oxidation.
- Lubrication of the mould is not required.
- Their emulsifying & water absorbing capacity are good.

- Disadvantages
- On rapid cooling they become brittle.
- When melted they are more fluid than theobroma oil & result in greater sedimentaion of the added substance.

Water Soluble & Water miscible bases
Or
Hydrophilic bases

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

Glycero –Gelatin Bases



It is a mixture of glycerin and water which is made stiff by the addition of gelatin.

Properties:

It is colourless, transparent, translucent in nature.
It is soft to touch.
It melts at 30 – 35^{0}C.

Used for vaginal suppositories.

- **Advantages**:
  - It melt at body temperature.
  - It mix with body fluid.
  - Not rancid.
  - It can be used to prepare suppositories using boric acid, chloral hydrate bromides, iodides, iodoform opium etc.
- **Disadvantages**:
  - Difficult to prepare and handle.
  - Chance of bacterial growth.
  - Hygroscopic in nature. (become hard on drying and soft in cont with moisture)
  - Laxative in action.
  - Incompatible with tannic acid, ferric chloride etc.

Polyethylene Glycols/ Macrogols

- These are commonly known as carbowaxes & Polyglycols.
- These are available in solid, liquid or semi-solid state depending on molecular weight.
- Those polymers having the molecular weight betw. 200 to 1000 are liquids & those having M.W higher than 1000 are wax like solids.
- They are chemically stable & physiologically inert substances & do not allow the bacterial or mold growth to take place.

Advantages:

- They are chemically stable.
- Inert, Non-irritant.
- Do not allow bacterial growth.
- Physical properties changes according to molecular weight.
- Provide prolonged action.
- Do not stick to mould.
- Suppositories are clean and smooth in appearance.

Emulsifying/Synthetic bases

- Witepsol
- Massa estarinum
- Massuppol.

Advantage of Emulsifying bases

- They solidify rapidly.
- They are non-irritant.
- The lubrication of mould is not required.
- Overheating does not affect the physical properties of the base.
- They can absorb fairly large amount of water or aqueous liquids.
- The white, odourless, clean and attractive suppositories are produced.
- They are less liable to get rancid.

Disadvantage of Emulsifying bases

- They should not be cooled rapidly in a refrigerator because they become brittle.

- They are not very viscous on melting, so the medicaments incorporated with the base settle down rapidly.

Witepsol

- They consist of triglycerides of saturated vegetable fatty acid with varying percentage of partial esters.
- A small amount of beeswax is added for use in hot climate.
- It should not be cooled rapidly as it become brittle and fracture.
- Lubrication is required.

Massa Estarinum

- It is a mixture of mono, di and triglycerides of saturated fatty acids.
- It is a white, brittle, almost odourless and tasteless solid.
- It has a m.p. 33.5 to 35.5^{0}C.
- They are available in various grades but grade B is commonly used in dispensing.

Method of preparation

- Hand rolling.
- Fusion method.
- Cold compression.

Hand Rolling

- It is the oldest and s
  suppository preparation
  when only a few supp
  prepared in a cocoa butt
- It has the advantage
  necessity of heating the
- A plastic-like mass
  triturating grated coco
  ingredients in a mortar.

- The mass is formed into a ball in the palm of the hands, then rolled into a uniform cylinder with a large spatula or small flat board on a pill tile.

- The cylinder is then cut into the appropriate number of pieces which are rolled on one end to produce a conical shape.

- Effective hand rolling requires considerable practice and skill.

Fusion Method

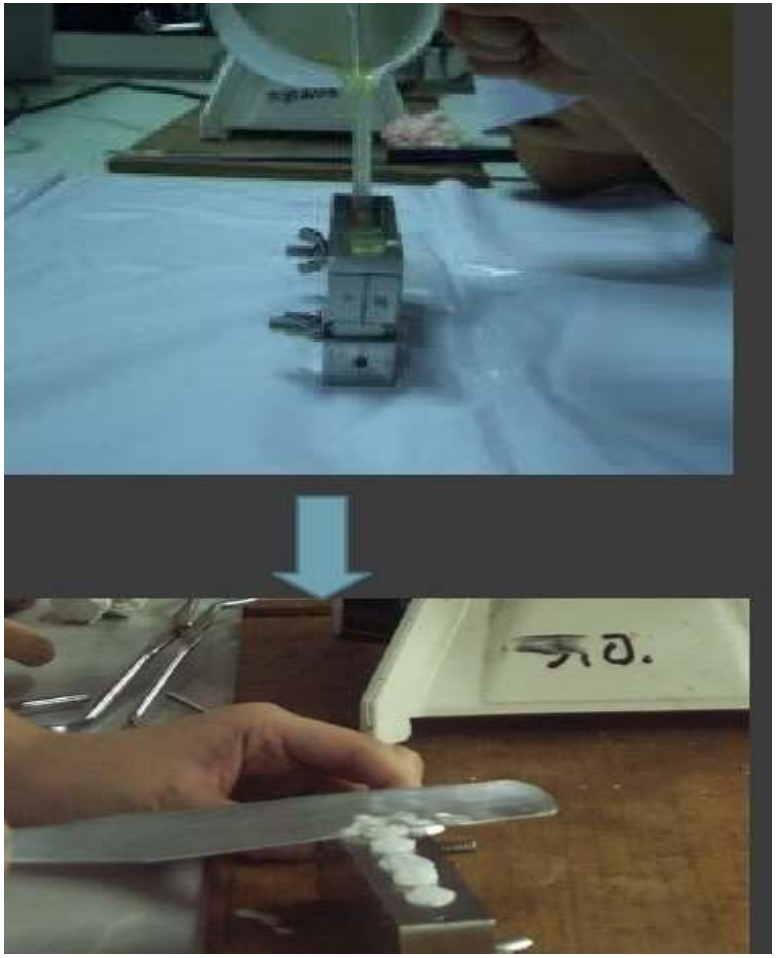
1. Melting the suppository base
2. Dispersing or dissolving the drug in the melted base.
3. The mixture is removed from the heat and poured into a suppository mold.
4. Allowing the melt to congeal
5. Removing the formed suppositories from the mold.

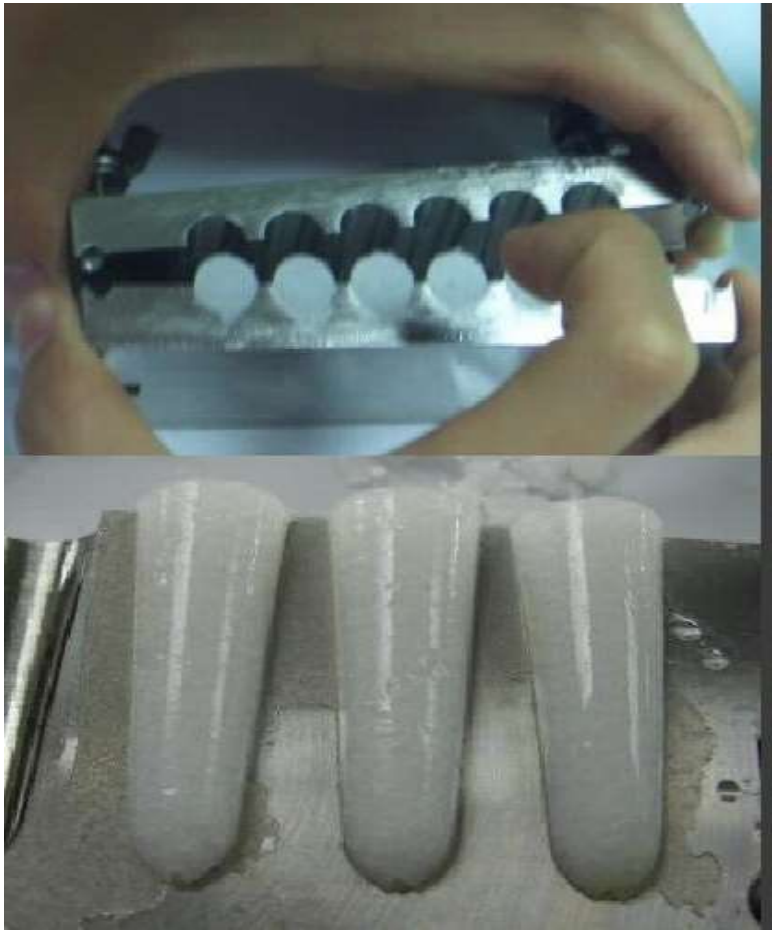
- The fusion method can be used with all types of suppositories and must be used with most of them.

- Small scale molds are capable of producing 6 or 12 suppositories in a single operation.

- Industrial molds produce hundreds of suppositories from a single molding.

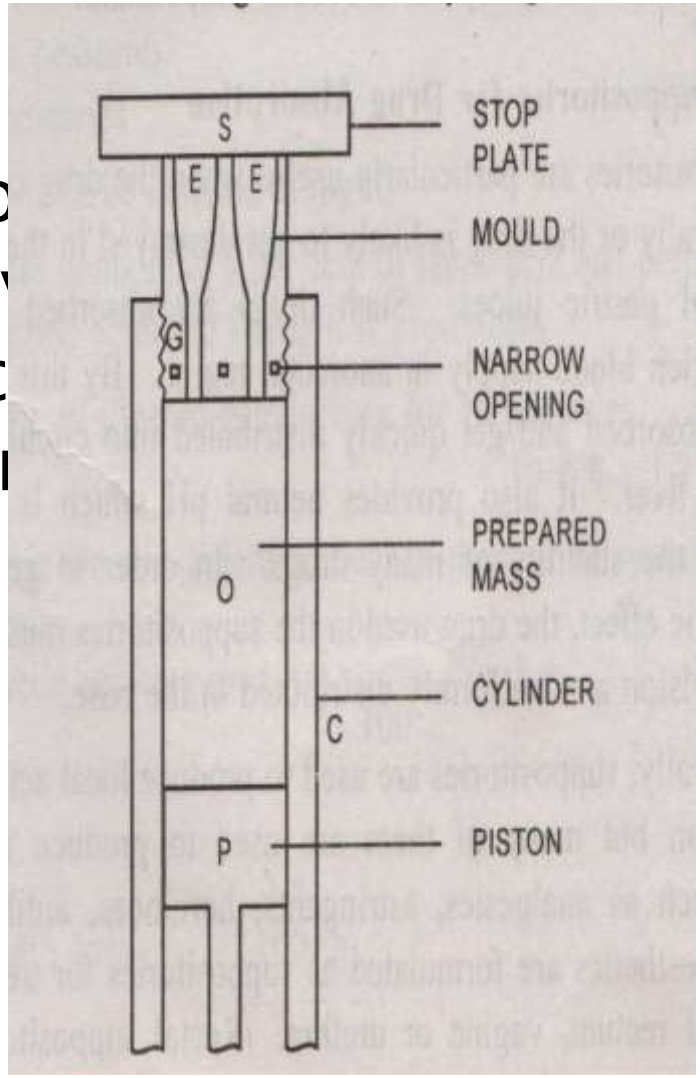
Fusion Method





Cold Compression moulding

- Compression molding is preparing suppositories fro of grated suppositor medicaments which is forc compression mold usi making machines.
- The suppository base ingredients are combine mixing.



- The friction of the process causing the base to soften into a past-like consistency.
- On a small scale, a mortar and pestle may be used (preheated mortar facilitate softening of the base).
- On large scale, mechanically operated kneading mixers and a warmed mixing vessel may be applied.
- In the compression machine, the suppository mass is placed into a cylinder which is then closed.
- Pressure is applied from one end to release the mass from the other end into the suppository mold or die.

- When the die is filled with the mass, a movable end plate at the back of the die is removed and when additional pressure is applied to the mass in the cylinder, the formed suppositories are ejected.

- The end plate is returned, and the process is repeated until all of the suppository mass has been used.

Displacement Value

- Def^{n} :- “The quantity of the drug which displaces one part of the base is known as displacement value.”

Determination of displacement value

e.g. Determination the displacement value of a medicament in theobroma oil suppositories containing 40% medicament, prepared in 1 gm mould. The weight of 10 suppositories is 14.66 gm.

Solution:

1. Wt.of 10 suppo. Cont. theobroma oil alone prepared in 1 gm capacity mould=1 x 10=10 gm
2. Wt.of 10 suppo. Cont. 40% of medicament = 14.66gm
3. Amt. of theobroma oil present = 60/100 x 14.66=8.79 gm
4. Amt. of medicament present = 40/100 x 14.66= 5.86 gm
5. Amt. of theobroma oil displaced by 5.86 gm of medicament = 10 – 8.79 = 1.20 gm

So,

Displacement value of medicament = 5.86/1.20 = 5 (Approx.)

Packaging and storage

- Suppositories are usually packed in tin or aluminum, 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.

Evaluation of Suppositories

1. Uniformity of weight test:
2. Melting Range test:

- Macro-melting range: measures the time it takes for the entire suppository to melt when immersed in a constant temperature (37^{0}C) water bath.
- Micro-melting range: is the melting range measured in capillary tubes for the fat base only.
- The apparatus used for measuring the melting range of the entire suppository is a USP tablet disintegration apparatus.
- The suppository is completely immersed in the constant temperature water bath, and the time for the entire suppository to melt or dispense in the surrounding water is measured.

3. Liquefaction or Softening Time Test

- This test is performed on rectal suppositories to determine the softening time of the suppositories.
- During this test a glass rod is placed on the suppository held in U-tube of the apparatus immersed in const.temp. water bath.
- The time taken for the rod to pass through the suppository is recorded.

4. Dissolution Test

- Same apparatus available for these tests on tablet.

THANK YOU