**Suspensions**

Oral suspensions are oral liquids containing one or more active ingredients suspended in a suitable vehicle; suspended solids may slowly separate on standing but are easily re-dispersed.

Common pharmaceutical products that are suspensions include: otic, ophthalmic, oral, topical and inhalation suspensions.

Advantages and disadvantages of suspensions as dosage forms:

**Advantages**

- Insoluble drugs may be more palatable.
- Insoluble drugs may be more stable.
- Suspended insoluble powders are easy to swallow.
- Absorption will be quicker than solid dosage forms.
- It is theoretically possible to formulate sustained-release preparations.

**Disadvantages**

- Preparation requires shaking before use.
- Accuracy of dose is likely to be less than with equivalent solution.
- Storage conditions can affect disperse system.
- Suspensions are bulky, difficult to transport and prone to container breakages.

Classification of suspension:

1. **Suspensions containing diffusible solid.**

   They are suspensions that can be prepared by using insoluble powder, that can be wet by water readily and disperse easily throughout the vehicle (water) for long enough to ensure even distribution for each dose.

   General method for preparation:

   - Grind and mix all insoluble powder by using mortar and pestle, starting from smallest portion then to larger (ascending order- geometrical dilution).
   - Add enough amount (¼ for preparing paste, ¼ for diluting of the paste and ¼ for washing of the mortar) of vehicle gradually you get a smooth past.
• Dilute the paste and wash the mortar and pestle by using proper amount of the vehicle.
• Added enough amount of vehicle until you get desire volume.

Note:
• Add non-volatile soluble substance like sodium bicarbonate into the paste during dilution.
• Syrup and glycerin should be added into dry powder before formation of the paste.
• Dye should be added into the paste before dilution.

R, Magnesium Trisilicate Oral Suspension; Compound Magnesium Trisilicate Mixture

Magnesium trisilicate 50 g
Light magnesium carbonate 50 g (diffusible)
Sodium bicarbonate 50 g (soluble)
Concentrated peppermint emulsion 25 mL
Double strength Chloroform water 500 mL
Water q.s. 1000 mL

Use: Its use as antacid and cathartic
Dose: 10 mL three times daily

2. Suspension produced by dispersion of oil in inhalations

One class of inhalation consists of one or more volatile oil in water and to ensure uniform dispersion of the oil on shaking light magnesium carbonate, a diffusible solid, is added to adsorb some of the oil and finely subdivided the remainder. Unlike emulsification which might seem a better method of dispersing the oil, the powder does not interfere with free vaporization of the oil when the inhalation is added to water at about 65° C for use. If the quantity is not included in the formula, 1g of light magnesium carbonate for each 2 mL of volatile oil or 2g of solid should be used.
**Rx: Menthol and Eucalyptus Inhalation**

Menthol 20 g  
Eucalyptus Oil 100 mL  
Light Magnesium Carbonate 70 g  
Purified water to 1000 mL  

**Use:** Used to relieve symptoms of bronchitis and nasal obstruction in acute rhinitis or sinusitis.  

**Direction:** Add 1 teaspoonful to a pint of hot, not boiling, water and inhale the vapor when required.
3. **Suspension containing in-diffusible solid**

Solid can be regarded as in-diffusible when it cannot be wet by liquid vehicle readily and it cannot remain evenly distributed throughout the vehicle long enough to ensure the uniformity of the measured dose; e.g. acetyl salicylic acid, salicylic acid, benzoic acid, phenobarbition, and calcium carbonate.

This problem can be overcome by adding thickening agent; and amount of suspending agent is depending on the volume of the mixture.

Suspending agent: acacia is a protective colloid and has a good value as suspending agent. Its useful in mixture contain resinous tincture but less satisfactory for suspending heavy powder unless be combined with other thickening as in *compound powder of tragacanth* which contains acacia (20%), tragacanth (15%), starch (20%) and sucrose (45%). It is useful when the vehicle is liquid other than water and chloroform-water and in proportion of 2% w/v.

Compound powder of tragacanth is used for internal use and not external use, because both acacia and tragacanth oxidize readily on exposure to atmosphere that produce bad odor and cause skin shrinkage.

The second suspending agent is tragacanth mucilage (12.5g tragacanth, 25mL alcohol and qs 1000mL chloroform-water) which can be use as 25% v/v. it can be used when we have water or chloroform-water.

Method of preparation:

- Using compound powder tragacanth
  1. Add in-diffusible solid in a mortar and start grinding, then add all other diffusible solid by geometrical dilution, finally add compound powder tragacanth with continuous trituration.
  2. Add ¾ of the vehicle then start trituration, until you get smooth cream.
  3. Then transfer it into a graduate cylinder then rinse the mortar and pestle and complete the volume.

- Using tragacanth mucilage.
1. Add in-diffusible solid into a mortar and start grinding, then add diffusible substance with continuous mixing.
2. Triturate the mixture with tragacanth mucilage.
3. Add half of the vehicle for dilution.
4. Complete the volume.

**R. Aspirin Suspension**

Aspirin 500 mg  
Orange syrup 1 mL  
Conc. CHCl₃ water 0.25 mL  
Water q.s. 10 mL

Because the vehicle is water so tragacanth mucilage should be used.

**R. Calamine lotion**

Calamine 150 g (astringent, antipruritic)  
Zinc oxide 50 g (astringent, antipruritic)  
Bentonite 30 g (suspending agent)  
Sod. Citrate 5 g  
Liquefied phenol 50 mL (preservative, antipruritic)  
Glycerol 50 mL  
D.W qs 1000 mL

**Procedure**: Triturate the Calamine, the Zinc Oxide and the Bentonite with a solution of the Sodium Citrate in about 700 mL of the Purified Water and add the Liquefied Phenol, the Glycerol and sufficient Purified Water to produce 1000 mL.

Sodium citrate: caused partial deflocculation of the calamine and transfer the bentonite from a gel into solution, in its absence the suspension is thicker and very difficult to pour from the bottle.
3. Suspension containing poorly wettable solids

Some solids like sulphur insoluble in water and cannot wet by water readily, so adding wetting agent is required for initial dispersion.

**R₆ Sulphur lotion**

- Precipitated Sulphur: 4 g
- Quillaia tr.: 5 mL
- Glycerol: 20 mL
- Industrial methylated spirit: 6 mL
- Calcium hydroxide solution: qs 100 mL

**R₆ Calcium hydroxide solution**

- Calcium hydroxide: 10 g
- Purified Water, freshly boiled and cooled: qs. 1000 mL

**Use:** it’s used as a treatment for acne, scabies and as a mild antiseptic.

**Procedure:** Mix the quillaia tr. IMS and glycerol and triturate the mixture with the Sulphur in a mortar.

Gradually dilute with lime water.

Note: if quillaia tr. is not available, try alcohol.
**Emulsions**

**Rx Castor oil emulsion**

Castor oil 8 mL  
Water qs 30 mL  

Castor oil is a fixed oil and is not miscible with water. To make it miscible gum acacia can be used of ratio 4:2:1 so:  
Oil: water: gum will be 8 mL : 4 mL : 2 g respectively.

**Procedure**: weight out 2g gum acacia and transfer it to the mortar. Measure 4mL water and triturate it with gum so as to form mucilage. To this add 8mL castor oil in small quantities at a time with thorough trituration after each addition. At this stage the emulsion is known as primary emulsion. Add about 10mL more of vehicle in small quantities at a time with constant trituration so as to get a homogeneous product. Then complete the volume.

**Use**: castor oil is used as purgative.

**Rx Olive oil emulsion**

Olive oil 30 mL  
Water qs 120 mL  

**Procedure** like castor oil

**Use**: can be given as a nitrogen free diet during the treatment of renal failure, also acts as mild laxative.

**Rx Liquid paraffin emulsion**

Liquid paraffin 30 mL  
Water qs 100 mL  

**Procedure**: like castor oil

**Use**: it’s used as a laxative in chronic constipation especially during pregnancy and old age.
**Rx Cod liver oil emulsion**

Cod liver oil  08  30 mL  
Syrup            12 mL  
Ferric ammonium citrate  4 g  
Chloroform       0.4 mL  
Cinnamon        qs  90 mL  

Because cod liver oil is fixed oil so we should use this ratio 4:2:1 and follow dry gum method for preparing primary emulsion.

Dilute the syrup with about 20mL of cinnamon water to this dissolve ferric ammonium citrate. Add this solution to primary emulsion with continuous trituration then complete the volume by adding cinnamon water.

**Use:**  
1. Cod liver oil is source of vitamin A and D; it’s used as dietary supplement for infants and children to prevent the occurrence of rickets and to improve calcification of bones.  
2. Ferric ammonium citrate is added as an antianaemic drug and help in patient who are suffering from iron deficiency anaemia.

**Rx**  
Liquid paraffin  50 mL  
Vanillin       50 mg  
Chloroform    0.25 mL  
Benzoic acid solution  2 mL  
MC 20          2 g  
Saccharin sodium  5 mg  
Water          to  100 mL  

Methylcellulose 20 at a concentration of 2% acts as an emulsifying agent for the mineral oil, liquid paraffin. Benzoic acid and chloroform act as preservative and vanillin and
saccharin sodium act as flavoring and sweetening agents. The amount of saccharin sodium is not weighable and will be obtained by trituration using water as the diluent.

**Procedure:** Prepare mucilage by mixing the MC 20 with about six times its weight of boiling water and allow standing for 30 minutes to hydrate. Add an equal weight of ice and stir mechanically until the mucilage is homogenous. Dissolve the vanillin in the benzoic acid solution and chloroform, as it is more soluble in organic solvents. Add this solution to the mucilage and stir for 5 minutes. Make up the saccharin sodium trituration and stir in the appropriate volume of solution to the mucilage. Make the emulsion by adding together 50mL of liquid paraffin and 50mL of prepared mucilage with constant stirring.

**Use:** as lubricant laxative for chronic constipation.

R<sub>x</sub>

- Mineral oil 50 mL
- Span 60 qs
- Tween 40 qs
- Cherry syrup 40 mL
- Distilled water qs 120 mL

Note: required HLB for mineral oil is 12, total amount of required emulsifying agent is 5% and (HLB of span 60 is 4.7 and HLB of tween 40 is 15.6).

R<sub>x</sub>

- Castor oil 45 mL
- Tween 80 qs
- Span 20 qs
- Orange syrup qs 100 mL

Note: required HLB for castor oil o/w emulsion is 14, total emulsifier concentration is 5% and (HLB for span 20 is 8.6 and for tween 80 is 15).
Weigh tween 80 and span 20, pour castor oil into the bottle up to 45 mL, then transfer the tween and span into the bottle and agitate well to mix. Add orange syrup to the 90 mL mark, and shake well to form the emulsion.

Peppermint Oil 20 mL  
Polysorbate 20 1 mL  
Double-strength Chloroform Water 500 mL  
Purified Water, freshly boiled and cooled  
Sufficient to produce 1000 mL

What is the HLB value of a surfactant system composed of 20 g Span 20 (HLB = 8.6) and 5 g Tween 20 (HLB = 13.3)?

\[
HLB = \frac{(\text{Quantity of surfactant 1})(\text{HLB of surfactant 1}) + (\text{Quantity of surfactant 2})(\text{HLB of surfactant 2})}{\text{Quantity of surfactant 1} + \text{Quantity of surfactant 2}}
\]

\[
HLB = \frac{(20 \text{ g})(8.6) + (5 \text{ g})(13.3)}{(20 \text{ g} + 5 \text{ g})} = 9.54
\]
Oral Powders

Oral powders may be formulated as divided powders, with each dose packaged individually or undivided, as a bulk powder. Undivided oral powders are usually non-potent medicaments, such as antacids, where the accuracy by which the patient measures the dose is not critical.

Oral undivided powders are usually formulated by a simple mixture of the prescribed medicaments without the addition of other ingredients.

Oral divided powders may contain one or more active ingredients together mixed with inert diluents.

Class II dispensing balance or electronic equivalent usually is used at laboratory scale, it would be better to weigh 200 mg as minimum amount.

As the amount of the active ingredient may be less than 200 mg, diluent could be added to increase the bulk. The usual diluent used to provide ‘bulk’ is lactose monohydrate because it is inert, water-soluble, colourless, odourless and generally harmless.

Mixing of solids

Since powders do not mix spontaneously, it may be very difficult to ensure a final homogenous mixture of powders and energy must be introduced for the successful mixing of powders. This problem is increased when the proportion of one ingredient is very small.

At small scale a porcelain mortar is generally used and it should be sufficiently large to ensure enough space for adequate mixing. It should be perfectly dry before mixing dry powders.
Mixing process

1. Add the smallest (minimum amount) in to the mortar
2. Add the second ingredient in approximately the same amount that is present in the mortar, therefore doubling-up the bulk already in the mortar.
3. Continue until you add of you ingredients (this process is known as geometrical dilution).

**Example**

1. Prepare 4 sachets each containing **8 mg of propranolol**
2. Prepare mix for 5 sachets to account for manipulative losses. Therefore $5 \times 8 = 40 \text{ mg}$ of active ingredient are required
3. The minimum weighable amount of active ingredient on the balance is of 200 mg (assuming a class B balance) therefore a minimum of 200 mg propranolol can be Weighed
4. If each sachet of 8 mg active ingredient requires the addition of 192 mg lactose (200 mg minus 8 mg), how much lactose must be added to 200 mg active ingredient?
5. $192 \text{ mg} \times 200 \text{ mg}/8 \text{ mg} = 4800 \text{ mg}$ of lactose have to be added to 200 mg of the active ingredient
6. Geometrical dilution
   a. Add 200 mg propranolol in a mortar then add 200 mg lactose and start mixing (total 400 mg)
   b. For the mixed 400 mg, then added 400 mg lactose
   c. For the 800 mg powder mixture, add another 800 mg lactose and continue
### Method for wrapping the divided powder

Here the lab supervisor teaches you how to fold the paper!

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

Add the powder here

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>
Capsules

Many dosage forms including capsules and tablets are available in more than one strength. If a capsule or a tablet of higher strength is prescribed but unavailable, two capsules or tablets of one-half the strength may be dispensed. Thus, a pharmacist or a health care professional may need to administer one-half or some other portion of the tablet. A few helpful tips for such calculations are provided below:

(1) Do not break the tablets that are not scored.
(2) Enteric coated tablets are designed to resist the acidic environment in the stomach and release the medication in the small intestine. If such tablets are broken, their enteric properties may be lost. Therefore, do not break them.
(3) As a general rule, do not divide sustained/controlled release medications as they may lose their controlled release properties.

<table>
<thead>
<tr>
<th>Capsule Size</th>
<th>Volume (ml)</th>
<th>Mg of Lactose</th>
<th>Mg of Aspirin</th>
</tr>
</thead>
<tbody>
<tr>
<td>000</td>
<td>1.37</td>
<td>1340</td>
<td>1000</td>
</tr>
<tr>
<td>00</td>
<td>0.95</td>
<td>929</td>
<td>600</td>
</tr>
<tr>
<td>0</td>
<td>0.68</td>
<td>665</td>
<td>500</td>
</tr>
<tr>
<td>1</td>
<td>0.50</td>
<td>489</td>
<td>300</td>
</tr>
<tr>
<td>2</td>
<td>0.37</td>
<td>362</td>
<td>250</td>
</tr>
<tr>
<td>3</td>
<td>0.30</td>
<td>293</td>
<td>200</td>
</tr>
<tr>
<td>4</td>
<td>0.20</td>
<td>195</td>
<td>125</td>
</tr>
<tr>
<td>5</td>
<td>0.13</td>
<td>127</td>
<td>60</td>
</tr>
</tbody>
</table>

"Punch" Method of Compounding Capsules

To hand fill capsules at the prescription counter, the pharmacist generally uses the "punch" method. The ingredients are triturated to the same particle size and then mixed by geometric dilution.

The powder is placed on a powder paper or ointment slab and smoothed with a spatula to a height approximately half the length of the capsule body. The base of the capsule is held vertically and the open end is repeatedly pushed or "punched" into the powder until the capsule is filled; the cap is then replaced to close the capsule. Each filled capsule is weighed using an empty capsule as a counterweight. Powder is added or
removed until the correct weight has been placed in the capsule. The filled capsule is tapped so that no air spaces are visible within the contents.

The simplest method by which a capsule may be kept free of moisture during compounding is to wash the hands well, dry them, and keep the fingers dry by stripping a towel through the cleansed fingers until warmth is felt.

An alternative method is to use the base of one capsule as a holder for other bases during the filling operation. The capsules do not come in contact with the fingers.

The surest method of protecting the capsule is to wear finger cots or rubber gloves.
**Semisolid dosage forms**

Ointments are the soft semisolid preparations meant for external application to the skin or mucous membrane, they usually contain a medicament or medicament dissolved, suspended or emulsified in the base. Ointments are used for their emollient and protective action to the skin. They may also be used as vehicle or bases for the topical application of medicinal substances.

Ointments bases are oleaginous bases, absorption bases emulsion bases and water soluble basis.

And it can be prepared by:

1. **Trituration method.** Powder the medicament if already not in fine powder. Triturate it with a small amount of base on an ointment slab with a stainless steel spatula with long blade. Incorporate this to the rest of the base thorough trituration until uniform. If liquids are also to be incorporated, pestle and mortar should be used for the purpose.

2. **Fusion method:** when an ointment bas contains a number of solid substances. Melt them in decreasing order of their melting points to avoid over-heating of low melting point substance. Add the medicament to the melted bases and stir thoroughly until the mass cools down and a homogenous product is formed. If any liquid or aqueous substance is also to be incorporated, that must be heated to about the same temperature as the melted bases. After mixing the tow portions they should be stirred uniformly and thoroughly until a homogenous mass is obtained. Rapid cooling should be avoided.

If dilution or mixing of different concentration of ointment is required we should follow allegation method that has been clarified in the following example.
Ointment Bases

There are five (5) classes or types of ointment bases which are differentiated on the basis of their physical composition. These are:

- oleaginous bases
- absorption bases
- water in oil emulsion bases
- oil in water emulsion bases
- water soluble or water miscible bases

Oleaginous Base (White Ointment)

White Wax 5%
White Petrolatum 95%

Procedure for Preparation:

a) Melt the white wax on a hot plate. No need to heat beyond 70 - 75°C
b) When the wax has completely melted, add the petrolatum and allow the entire mixture to remain on the hot plate until liquefied.
c) Following liquefication, remove from heat and allow the mixture to congeal. Stir the mixture until it begins to congeal.

Absorption Base

Cholesterol 3%
Stearyl Alcohol 3%
White Wax 8%
White Petrolatum 86%

Procedure for Preparation:

a) Melt the stearyl alcohol, white wax, and petrolatum together on a hot plate.
b) Add the cholesterol to the mixture; stir until completely dissolved.
c) Remove the mixture from the hot plate and stir until congealed.
**W/O Emulsion Base (Cold Cream type base)**

- White wax 12%
- Cetyl Esters Wax (or Spermaceti) 12.5%
- Mineral Oil (Sp Gr = 0.9) 56%
- Sodium Borate 0.5%
- Water 19%

Procedure for Preparation:

a) Melt the white wax and spermaceti on a hot plate.
b) Add the mineral oil to this mixture and bring the temperature to 70°C.
c) Dissolve the sodium borate in water.
d) Heat the sodium borate solution to 70°C.
e) When both phases have reached the desired temperature, remove both phases from the hot plate and add the aqueous phase slowly and with constant stirring to the oil phase.
f) Stir briskly and continuously until congealed.

**O/W Emulsion Base (Hydrophilic Ointment)**

- Sodium Lauryl Sulfate 1%
- Propylene Glycol (SP Gr = 1.035) 12%
- Stearyl Alcohol 25%
- White Petrolatum 25%
- Purified Water 37%

Procedure for Preparation:

a) Melt the stearyl alcohol and white petrolatum on a hot plate.
b) Heat this mixture to 70°C.
c) Dissolve remaining ingredients in water and heat the solution to 70°C.
d) Add the oleaginous phase slowly to the aqueous phase, stirring constantly.
e) Remove from heat and stir the mixture until it congeals.
**Water Soluble Base**

Polyethylene Glycol 400 (SP Gr = 1.12)  
60%

Polyethylene Glycol 3350  
40%

Procedure for Preparation:

a) Melt the PEG 400 and Carbowax 3350 on a hot plate.

b) Warm the mixture to about 65°C.

c) Remove from the hot plate and stir until congealed.

**Example 1:** In what proportion should a 20% coal tar ointment be mixed with white petrolatum (diluent) to produce a 2% coal tar ointment?

<table>
<thead>
<tr>
<th>Column 1</th>
<th>Column 2</th>
<th>Column 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>20%</td>
<td>2%</td>
<td>2 parts of 20% ointment</td>
</tr>
<tr>
<td>0%</td>
<td></td>
<td>18 parts of white petrolatum</td>
</tr>
</tbody>
</table>

**Answer:** 2:18

**Example 2:** In what proportion should a 10% and 4% zinc oxide ointments be mixed to prepare a 6% ointment?

<table>
<thead>
<tr>
<th>Column 1</th>
<th>Column 2</th>
<th>Column 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>10%</td>
<td>6%</td>
<td>2 parts of 10% ointment</td>
</tr>
<tr>
<td>4%</td>
<td></td>
<td>4 parts of 4% ointment</td>
</tr>
</tbody>
</table>

**Answer:** 2:4

**Example 3:** A physician ordered 20% monobenzone (Benoquin®) ointment to be used for the temporary bleaching of hyperpigmented skin. In what proportion may 25%, 10%,
and 5% monobenzone ointments be mixed in order to prepare an ointment of the desired concentration?

\[
\begin{array}{c|c|c}
\text{Column 1} & \text{Column 2} & \text{Column 3} \\
\hline
25\% & 10 + 15 = 25 \\
10\% & 20\% & 5 = 5 \\
5\% & 5 = 5 \\
\end{array}
\]

\[25:5:5\]

**Rx Calamine ointment**

Calamine powder \(15\) g  
White soft paraffin \(85\) g  

Procedure: trituration method  

Use: calamine has a mild astringent action of the skin and is used in ointments to relieve discomfort of dermatitis.

**Rx Sulphur ointment**

Sulphur \(10\) g  
Simple ointment prepared with white soft paraffin \(90\) g  

Procedure: trituration method  

Use: sulphur ointment is used as fungicidal ointment and is also used in scabies and right worm infestation.

**Rx Zinc oxide ointment**

Zinc oxide \(15\) g  
Simple oint. \(85\) g  

Procedure: trituration method  

Use: zinc oxide is used in ointments as a mild astringent for the skin, as a soothing and protective application in eczema.
**Rx whitfield’s ointment**

Salicylic acid 3 g  
Benzoic acid 6 g  
Emulsifying oint. 91 g  

**Procedure:** trituration method  
**Use:** as a fungicidal.

---

**Rx Emulsifying ointment**

Emulsifying Wax 300 g  
White Soft Paraffin 500 g  
Liquid Paraffin 200 g  

**Procedure:** melt together and stir until cool

---

**Rx Emulsifying wax**

Cetostearyl Alcohol 800 g  
Macrogol Cetostearyl Ether (22) 200 g  

**Procedure:** melt together and stir until cool

---

**Rx Cold Cream**

White Beeswax 10 g  
Liquid paraffin 30 g  
Borax 0.5 g  
Water 9.5mL  

Grate the beeswax, melt it with liquid paraffin and raise the temperature to 70°C.  
dissolve the borax in the water and heat the solution to 70°C then gradually add the  
solution to the melted mixture and stir.  

Borax soaps are generally made by the interaction of borax and free acid in beeswax.
Cream prepared with Sorbian ester.
Sorbitan mono-oleart  6 g
White beeswax       3 g
White soft paraffin  36 g
Liquid paraffin     15 g
Purified water freshly
Boiled and cooled   40 g

Rx Compound Zinc paste
Zinc oxide          250 g
Starch              250 g
White soft paraffin 500 g
**Suppositories**

Suppositories are special shaped solid dosage form of medicament for insertion into body cavities other than mouth. They may be inserted into rectum, vagina or urethra. These products are so formulated that after insertion, they will either melt or dissolve in the cavity fluids to release the medicament. Suppositories vary in shapes, size and weight. Generally suppositories weighing 1-2 g are prepared. The bases used for the preparation of suppositories include cocoa butter, glycerol gelatin and soap glycerin.

Displacement value: since the volume of suppositories from a particular mould remains same but its weigh varies due to the variation in densities of medicaments and the base with which the mould was calibrated. To get a product of uniform and accurate weight, allowance must be made for the change in densities of the mass due to added drugs. For this purpose the displacement value of the medicament is taken into consideration. Displacement value may be defined as the quantity of the drug which displaces one part of medicament.

\[ R_x \]

Boric acid \( 200 \text{ mg} \)
Theobroma oil \( \text{q.s.} \)

Prepare 8 suppositories.

DV of boric acid = 1.5
Use 1 g mould

Instead of 8 we make calculation for preparing 10 suppositories.

- Each mould will occupy by 1 g of theobroma oil, so we need 10 g of TO for preparing 10 suppositories.
- Total amount of BA require: if 200 mg for each supp. So we need \((200 \times 10) \, 2000 \text{ mg}\)
- DV of boric acid is 1.5 which occupy just 1 part of TO; so: \(2g \times 1/1.5= 1.3 \text{ g}\)
- 10 g of TO – 1.3 g = 8.7 g total amount of TO.

**Use**: it used as antibacterial and antifungal
Rx

Prepare 4 suppositories; each contains 300mg bismuth subgallate and glycerol as a base.

DV of bismuth subgallate = 3 and use 1 g mould

- Total amount of bismuth subgallate = 300 x 5 = 1500 mg
- Total amount of glycerol = 5 x 1 = 5 g, but glycerol is 1.2 times denser than theobroma oil; so: 1.2 x 5 = 6 g of base.
- DV = 1.5 x 1 / 3 = 0.5 g
- 6 g – 0.5 g = 5.5 g of base

If 12 cocoa butter suppositories containing 40% zinc oxide weigh 17.6 grams, what is the displacement value of zinc oxide? Assume that the suppositories are made in a 1 g mold.

Given weight of 12 suppositories with zinc oxide = 17.6 g
Weight of zinc oxide in the suppositories = (40/100) × 17.6 = 7.04 g
Weight of cocoa butter in the suppositories = (60/100) × 17.6 = 10.56g
Theoretical weight of 12 suppositories without zinc oxide = 12 g
Cocoa butter displaced by 7.04 g of zinc oxide = 12 – 10.56 = 1.44
Displacement value of zinc oxide = (7.04/1.44) = (X/1); X = 4.89

General method for preparing suppository: Using 12 cavity molds, a quantity of vehicle known to be insufficient is added to the correct amount of drug for 12 suppositories. The mixture is poured into the mold, leaving one or two cavities unfilled; the excess is scraped off after congealing and returned to the pouring dish; a little more pure vehicle is added, melted together with the excess of drug-vehicle mixture, and poured into the unfilled cavities. More pure vehicle is added in the same way until all 12 holes are correctly filled. After removing the hardened suppositories from the molds, they are again melted, mixed and poured. Since actually a slight excess is poured into each cavity and some mass adheres to the pouring vessel, less than 12 suppositories are obtained on the final pouring.
The second method is called double casting.

1. Mix all of the drug with a portion of the base and use the mixture to partially fill each of the suppository mold cavities.

2. Use plain base to overfill each cavity.

3. Let cool, then remove excess base from top of mold. Remove suppositories, remelt, and recast to evenly distribute the drug.