

# Topical Dosage Form

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# LIQUID / SEMISOLID TOPICAL FORMULATIONS:

## 1. Liniments: (Embrocations)

- **Liniments (Embrocations)** are liquid or semisolid topical formulations designed to be applied externally by rubbing onto the skin.
- They are commonly used to relieve pain, soreness, and stiffness in muscles and joints due to their ability to stimulate blood flow and create a warming sensation on the skin.
- Here's a breakdown of the characteristics and functions of liniments:

## ❖ Formulation:

- **Emulsions or solutions:** Liniments can be emulsions (mixtures of oil and water) or solutions, where all components are dissolved in a solvent (e.g., alcohol).

## ❖ Base composition:

- **Fixed oils:** Many liniments are based on fixed oils like turpentine, olive oil, or castor oil, which act as a carrier for the active ingredients and provide lubrication for massaging the skin.
- **Soap or alcohol:** Alcohol acts as a solvent to dissolve the active ingredients and may also help cool and evaporate the liniment from the skin. Soap aids in emulsifying oils and improving penetration into the skin.

❖ **Active ingredients:** Liniments often contain substances with properties such as:

- **Analgesic:** Pain-relieving agents like methyl salicylate, which can reduce local pain.
- **Rubefacient:** These cause redness and warmth in the skin by dilating blood vessels, increasing blood flow to the area. Methyl salicylate is a common rubefacient.
- **Soothing:** Ingredients that relieve irritation or discomfort in the applied area. Ex: Menthol
- **Stimulating:** These ingredients stimulate nerve endings and increase blood flow, providing warmth and relief from muscle or joint discomfort. Ex: Clove oil

## 2. Lotions:

- Lotions are **liquid** **preparations** designed for **local application** to the skin or mucous membranes.
  - They can be **medicated** or **non-medicated**, and are typically applied **without rubbing**.
- ❖ **They serve multiple purposes:**
- Soothing and protective properties.
  - Can act as antiseptics, bacteriostatic or bacteriocidal.

- **Astringent** properties, meaning they can shrink or constrict body tissues.
- **Antipruritic agents**, which help relieve itching.

❖ Examples of lotions include:

- **Zinc calamine lotion** (for soothing skin irritations).
- **Permethrin 1% lotion** (used to treat lice).

### 3. Gels:

- Gels are semisolid preparations that are either **solutions** or **suspensions**.

#### ❖ They are:

- **Non-greasy**, meaning they don't leave an oily residue.
- **water-soluble**, which makes them easy to apply and wash off.
- Suitable for use on hairy parts of the body.

- Gels are made by dispersing the drug substance in an aqueous vehicle with gelling agents and have a protective effect on the skin or mucous membranes.

❖ **Examples:**

- **Glycerine** and **tannic acid** gel for stomatitis (inflammation in the mouth).
- **Volini** gel for pain relief

## **4. Creams:**

- **Creams** are **semisolid** preparations that have a **watery base** and are generally **non-greasy**.
- Creams can be applied to the **skin** or **mucous membranes** for therapeutic effects.
- There are two types of creams based on their emulsion type:

### **❖ Oil-in-water (O/W) creams:**

- In these, **oil droplets** are dispersed in water.
- They are lighter.
- Suitable for **hydrophilic** (water-loving) drugs.

## ❖ Water-in-oil (W/O) creams:

- In these, **water droplets** are dispersed in oil.
- They are **more moisturizing and softening** because the oil forms a barrier, locking in moisture.
- Suitable for **hydrophobic (water-repelling)** drugs.
- These creams are thicker and provide long-lasting moisture, making them ideal for **dry or irritated skin**.

## ❖ Example:

- **Betamethasone 0.05% and miconazole 2%** cream is used for treating **tinea (fungal) infections** of the skin.

## **5. Paints:**

- **Paints** are **liquid preparations** that are applied to the **skin** or **mucous membranes** for therapeutic purposes.
- They usually form a protective coating over the application area and deliver specific medicinal effects depending on their composition.

### **❖ Types of medicinal paints:**

- **Astringent gum paint:** Used for oral care, it helps to reduce swelling in the gums or inflammation.

- **Mandl's throat paint:** Applied to the throat's mucous membrane, it contains iodine or similar agents to help relieve sore throats, inflammation, or infections by acting as an antiseptic.
- These paints typically have a **localized therapeutic action** and can stay in place for a longer duration due to their coating properties.



## 6. Ointments:

- Ointments are **semisolid preparations** with a high **oil content** (typically 80% oil and 20% water), making them **greasy**.
- They are used for **external application** and soften slightly at body temperature, which makes them easy to spread on the skin.

### ❖ They can work in different ways:

- **Epidermic** action: They act on the **skin surface** without penetrating deeply.
- **Endodermic** action: They **partially penetrate** the skin's surface (cuticle).

- **Systemic effect:** Some ointments are absorbed into the body to produce a **systemic effect**, such as **nitroglycerine ointment**, which is used for chest pain (angina).
- Ointments have an **emollient (moisturizing)** and **soothing effect** due to their oily base, and they can have additional therapeutic actions depending on the **active ingredient** (e.g., **antiseptic, antifungal**).

#### ❖ Common components of ointments:

- **Petroleum base** (e.g., paraffin) provides the oily, protective layer.

- **Preservatives** (e.g., benzoic acid) prevent microbial growth and prolong shelf life.
- **Eye ointments:** These are specially formulated for application to the **conjunctiva sac** or the **eyelid margins**.
- They often contain antibacterial, cycloplegic (for dilating the pupils), or miotic (for constricting the pupils) drugs and are designed to stay in place longer on the eye surface due to their greasy consistency.



## 7. Pastes:

- Pastes are **semisolid preparations** designed for **external application**, typically used for conditions where the skin surface is damaged or oozing, such as in **acute lesions** like **eczema**.

### ❖ Key characteristics of pastes:

- They contain **more than 10% powdered medicaments** mixed with a **non-greasy base** (e.g., glycerine, mucilage, or soap).
- Pastes are **non-greasy** and thus **washable**, making them easy to clean off.

- They are **more absorptive** than ointments, which helps in drying out moist or oozing skin conditions.
- Pastes are **less penetrating** and do not soften or macerate the skin as much as ointments do.
- Due to their higher powder content, pastes are **thicker** and tend to **stay in place** on the skin, providing a protective barrier.

❖ **Example:**

- **Magnesium sulphate paste:** Often used to treat infections, boils, or to draw out pus.



Cream



Lotion



Ointment



Gel



Paste



## **8. Drops:**

- These are specially prepared for use in eye, ear and nose. They are available in the following forms:

### **a) Eye Drops:**

- These are aqueous or oily solutions or suspensions of medicament, meant to be instilled into conjunctival sac. Hence they must be sterile and must have bacteriostatic additives to maintain sterility.
- They should be non irritant, free from filaments, particles and should not contain colour or fragrance.
- They should be discarded within 3 month from the date of the opening of bottle as specified on the label.

## ❖ General characteristics of the eye drops:

- The pH of the solution should be as near as to the human tears as possible.
- The containers are designed to preserve the sterility of the product, provide stability and protection from light when required. They should be convenient to handle and withdraw.
- The label should mention clear and complete instructions regarding the use of preparation and should indicate storage requirements to ensure full potency and the instruction to discard the content at a specified time after opening.

- Crystal formation may cause irritation and abrasions. Discard such preparation.

## **□ Method of instillation of eye drops in adults:**

1. Wash your hands
2. Do not touch the tip of the dropper opening.
3. Looking upward, pull the lower eyelid down to make a pocket.
4. Bring the dropper as close to eye as possible without touching it.

5. Put the prescribed number of drops in to the gutter
6. Close the eye and press the medial canthus gently with index finger for 2 minutes. Don't shut the eye tightly.
7. Excess fluid can be removed with a tissue paper
8. If more than one kind of eye drops are used wait for 5 minutes before instilling the next drops
9. Eye drops may cause a burning sensation for few minutes. If it lasts longer consult the doctor.

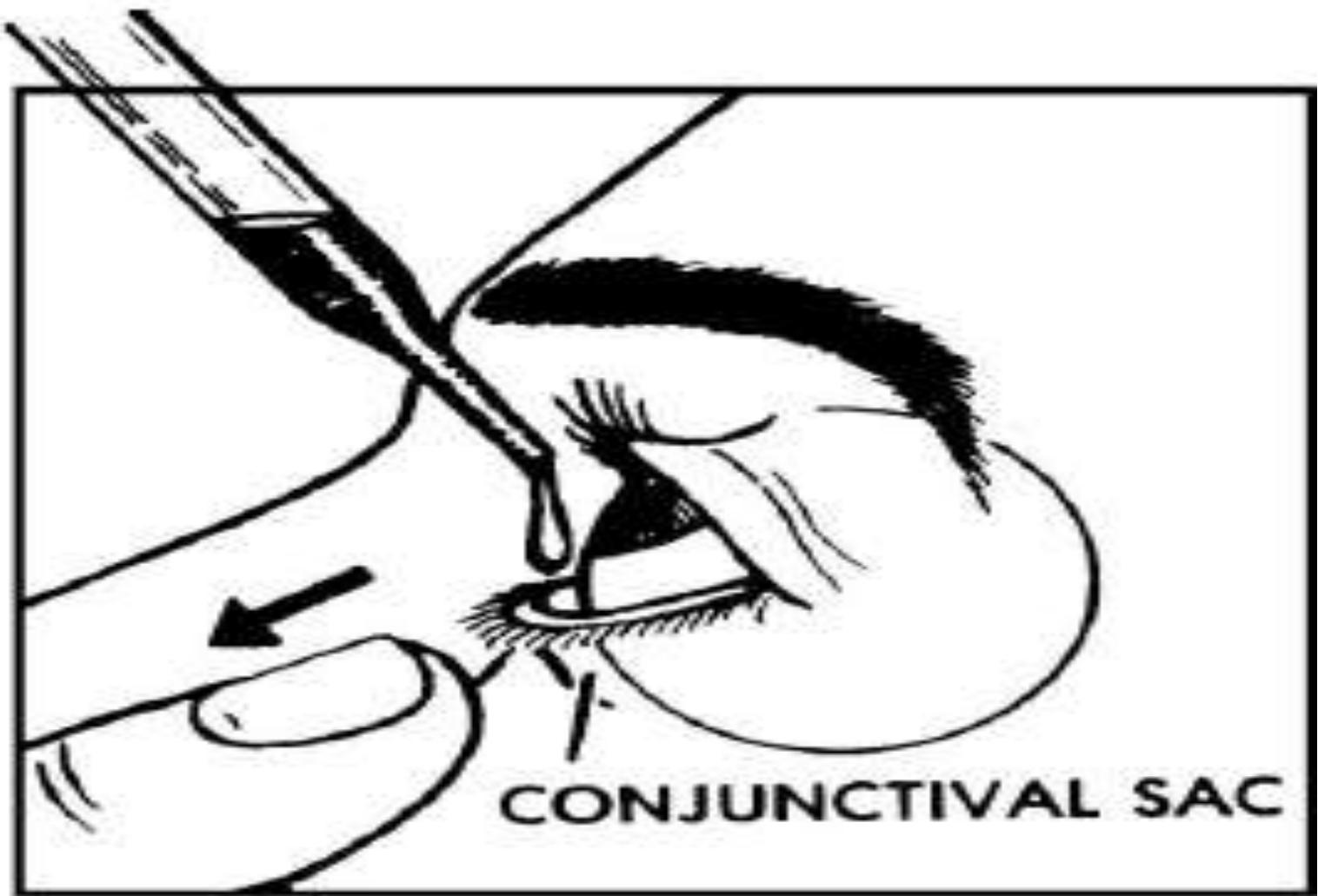


Fig: Method of instillation of eye drops

## When instilling eye drops in children

1. Let the child lie on back with head straight and eyes closed.(Keeping their eyes closed reduces the chance of them being startled or blinking when the drops are applied, making the process smoother.)
2. Drop the prescribed amount of drops in the corner of the eye.(Administering the eye drops in the inner corner of the eye (near the nose) allows gravity to help the drops flow into the eye as the child opens their eyes).
3. Keep the head straight
4. Remove the excess fluid

**b) Ear drops :** They are drug solutions to be instilled in ear with dropper, e.g. gentamicin ear drops.

- The container capacity of such preparations is usually 10 to 15 ml. The containers are available as plastic squeeze bottles or glass dropper bottles with dropper cap.

## **Method of instillation of ear drops**

1. Warm the ear drop bottle by keeping in the hand or the armpit for several minutes. Do not use hot water tap or heater.
2. Tilt the head sideways or lie on one side with affected ear upwards.

3.Gently pull the ear lobe to expose the ear canal.

4.Instill the number of drops prescribed

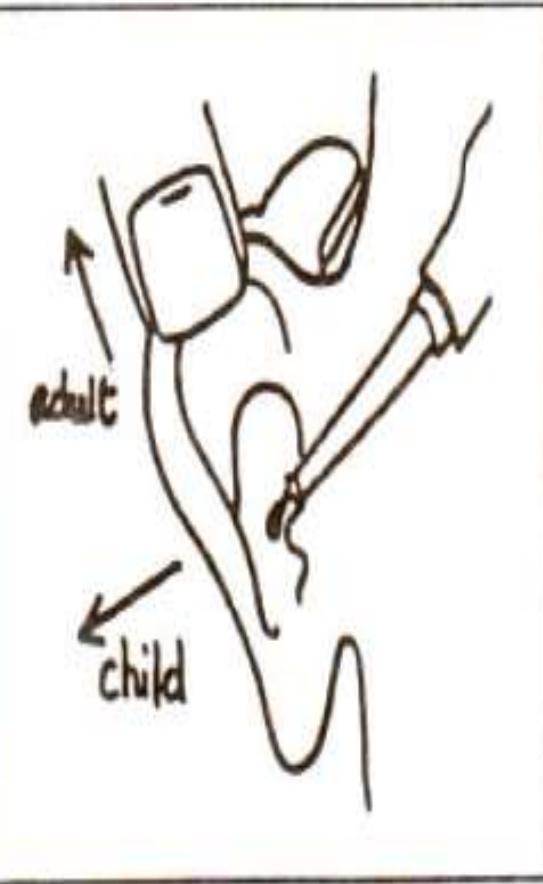
5. Wait for five minute before turning to the other ear

6. Plug the ear canal with cotton wool if recommended by manufacturer.

- It's normal for ear drops to cause a brief sensation of warmth or tingling.
- However, if there is persistent burning or stinging, it may indicate a reaction to the medication or an underlying issue. If this occurs, it's important to consult a healthcare provider.



Step 1



Steps 2 and 3



Step 6

Fig: Method of instillation of ear drops

### **c) Nasal drops:**

- These are drug solutions suitable for instillation in to the nose. Nasal drops are often used as **decongestants** (to relieve nasal congestion) or **local haemostatics** (to reduce bleeding). An example of nasal drops is **Xylometazoline**, which helps relieve nasal congestion.

### **□ Method for instillation of nasal drops:**

1. Blow the nose
2. Sit and tilt head backwards or lie down with a pillow under the shoulders. Keep the head straight.
3. Insert the dropper one centimetre into the nostrils.

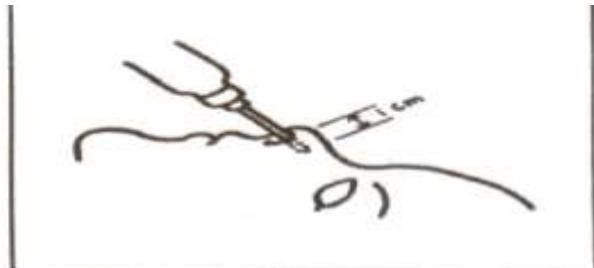
4. Apply the number of drops prescribed

5. Immediately afterward tilt head forward (head between knees).

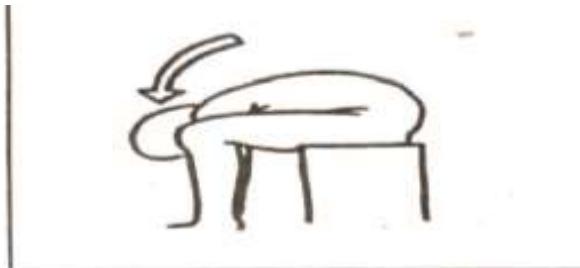
6. Sit up for few seconds .The drops will then drip into pharynx.

7. Repeat the procedure for the other nostril, if necessary

8. Rinse the dropper with boiled water.



Steps 2 and 3



Step 5

Fig: Method of instillation of nasal drops

## **9. Aerosols:**

- An **aerosol** is a colloidal system that consists of very fine solid or liquid particles dispersed in a gas. This dispersion allows for the delivery of medication or other substances in a form that can be inhaled or applied to surfaces.

### **□ Advantages:**

- Rapid action
- Systemic toxicity is less (safe)
- No gastric irritation or pain

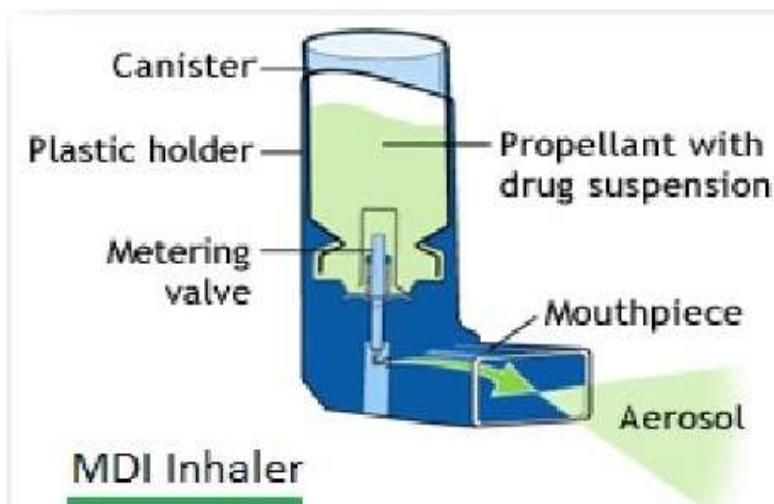
- No contamination with foreign particles and no effect of moisture or air on the drug.
- Bypasses first pass metabolism

## **Disadvantages:**

- Amount of drug reaching the site may be insufficient
- Proper training of patient is needed for its use

## a. Metered dose inhaler (MDI):

- It is compact, portable and self-contained units that deliver fixed quantity of drug when a trigger or the top of the device is pressed.
- Good synchronization is required with deep inspiration and release of drug.
- It can sometimes lead to over dosage if patient takes more puffs.



## **b. Metered dose inhaler with spacer:**

- This modification is made to overcome some drawbacks of metered dose inhaler. Drug is released into the spacer from which the patient can inhale. Hence strict synchronization is not required between release of drug and inhalation.
- Deposition of drug in posterior pharynx is less as compared to metered dose inhaler. This makes the device more effective even when ventilation is impaired.
- Dose of the drug delivered is much larger than metered dose inhaler.
- It is less portable and there are chances of overdosage.



Fig: Metered Dose Inhaler with spacer

## Method of using inhaler-

1. Shake the inhaler
2. Remove the cap
3. Check the Dose Counter
4. Stand or sit up straight
5. Hold the inhaler
6. Seal your lips
7. Press the inhaler
8. Inhale deeply.
9. Hold Your Breath
10. Breathe out slowly through your mouth or nose

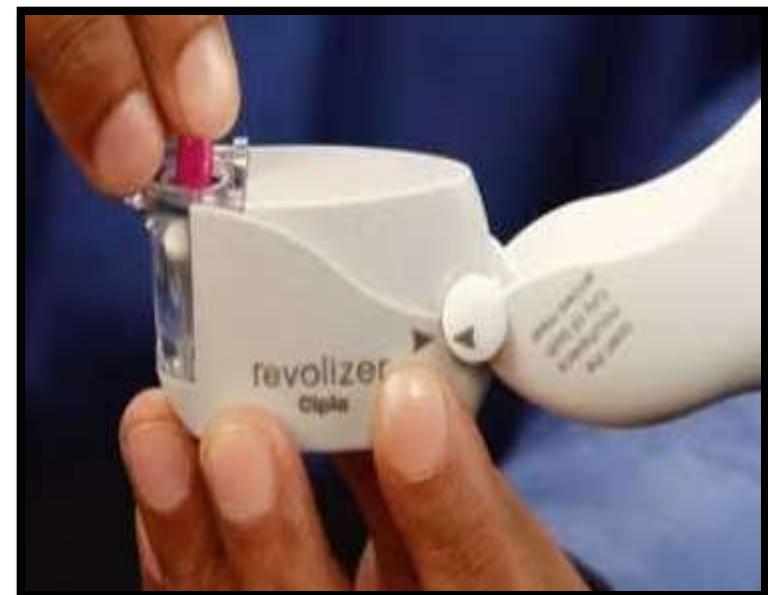
## c. Nebuliser:

- A **nebuliser** is a medical device designed to convert liquid medication into a fine mist or aerosol that can be inhaled directly into the lungs.
- This method of drug delivery is particularly useful for patients with respiratory conditions, especially when other methods (like metered dose inhalers) may not be effective.
- Dose of the drug delivered is much larger than metered dose inhaler. It is less portable and there may be chances of over dosage.



#### **d. Spinhaler /Rotahaler:**

- It is a specialized device to administer drugs like sodium cromoglycate. Drug is supplied as fine powder in a capsule. Two small pins are provided in spin inhaler.
- When activated the pins pierce the capsule to release the drug particles that are inhaled by the patient. It may not require perfect synchronization as needed for MDI.



## 11. Enemas:

- **Enemas** are liquid preparations for **rectal administration** and are classified into two types:

### Evacuation Enema:

- Used to cleanse the bowel before surgery or radiography.
- Typically prepared by dissolving soap in **600 ml of water**.
- Market preparations may contain **Docusate sodium (125 mg)** in **50 ml**.

### Retention Enema:

- Contains medications for local or systemic effects.
- The volume is usually **100-120 ml**.
- An example is **prednisolone enema** for treating **ulcerative colitis**.

# Solid Topical Dosage Form

1. **Dusting powder:** Powders intended for external use e.g. boric acid, neosporin powder.
2. **Plasters:** Plasters are solid adhesive preparations applied to protect, soothe, provide mechanical support and to lessen pain. They also bring medicament close to the skin e.g. plaster of Paris.
3. **Pellets:** These are sterile spheres formed by compression of the drug. They are implanted subcutaneously as depot preparations. e.g. DOCA (deoxycorticosterone acetate) pellets.



## 4. Medicated Devices:

- **Stents:** These are peripheral or coronary stent placed into narrowed, diseased peripheral or coronary arteries known as **drug eluting stent (DES)**. The drug is slowly release to decrease cell proliferation e.g. paclitaxel, sirolimus drug eluting stent.
- **Implants:** These devices have a large depot of the therapeutic agent intended for the controlled release over longer periods of time i.e. several days to years. e.g. progesterone implants.
- **Intrauterine device (IUD):** It is a contraceptive device, often 'T'-shaped, containing either copper or Levonorgestrel, which is inserted into the uterus.

**THANK YOU**