

  
Ministry of Health

The Tashkent Pharmaceutical institute

# SELF STUDY

Theme: Classification of ointment bases

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## CLASSIFICATION OF OINTMENT BASES

Ointment bases can be classified according to composition and general characteristics. The ointment base or vehicle may or may not be therapeutically active.

It may

be used without active ingredients if only protection or emollient properties are

desired. Ointment bases fall into one of these classes: oleaginous, absorpti

on, emulsion, or water-soluble.

**a. Oleaginous Ointment Bases.** Oleaginous ointment bases include not only

vegetable oils and animal fats, but also hydrocarbons derived from petroleum. Because

of their nature, oils and fats become rancid and foul smelling on exposure to the

atmosphere and to light. Preservatives and antioxidants are necessary ingredients in

these bases. The hydrocarbon bases may include liquid petrolatum to lower viscosity or

white wax to raise it. White Ointment, USP is

a typical combination of hydrocarbons.

(1) Petrolatum (Vaseline). Petrolatum is a tasteless, odorless, yellowish, greasy solid with a melting point between 38 Celsius (C) and 60 C. White

petrolatum is decolorized petrolatum. It

is used more frequently than yellow petrolatum.

Petrolatum is very stable, very compatible with most substances, and emollient to the

skin. The consistency can easily be varied by the incorporation of mineral oil (liquid

petrolatum) or white wax. Petrolatum-

type ointment bases are more stable than

vegetable- or animal-

type bases. However, all of these bases are greasy. The degree

to which they release the incorporated medication is questionable. They are able to

absorb only very small amounts of water, unless treated with cholesterol.

(2) Jelene (Plastibase). Jelene, a mixture of hydrocarbons in the liquid and

wax ranges, has a jelly-like consistency. It is better than petrolatum in many respects.

It maintains its consistency over a wide range of temperature without additives. It

releases medication more reliably and provides a better appearing ointment

(3) Silicones. Silicones, polymers of silicon and oxygen, make good ointments for protecting the skin from moisture

**One of the primary considerations in preparing pharmaceutical ointments is the properties of different types of ointment base. The types of ointment bases used as vehicles for drugs are selected or designed for optimum delivery of the drugs and also to contribute emolliency or other quasi-medicinal qualities. Ointments properties vary since they are designed for specific uses, ease of application or extent of application. The purpose of the lab was to learn the difference between different types of ointment bases. In this experiment, we learned how to measure the ability of each ointment base to incorporate solvents using purified water, alcohol and glycerin. Introduction:**

**Ointments are semisolid preparation intended for external application to skin or mucous membrane. Ointments are mainly composed of medication and base. An ointment base plays an important role because it serves as the vehicle and function as the carrier of the medicinal agents in the product. The quality of an ointment base affects the overall quality of an ointment, the release rate of the medication and the absorption rate into the body. According to the physical characteristics, ointment bases are classified into four categories, oleaginous bases, emulsion base, absorption base and water-soluble base.**

**Materials:**

- \* Purified water
- \* Alcohol
- \* Glycerin
- \* Cold cream
- \* Petrolatum
- \* PEG ointment
- \* Anhydrous lanolin
- \* White ointment
- \* Hydrophilic petrolatum
- \* Hydrophilic ointment

**Procedure:**

1. Calibrate the dropper with purified water, alcohol and glycerin. Record the drops used to fill 3ml of each of the solvent.
2. Measure 3g of each of the ointment base.
3. Slowly add until ointment stop uptake the solvents.
4. Calculate how much solvent can be incorporated to each ointment.

**Results 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

Each ointment base type has different physical characteristics and therapeutic uses based upon the nature of its components. The following table summarizes the composition, properties, and common uses of each of the five types. For more information consult *Remington's*.

### SUMMARY CHART: PROPERTIES OF OINTMENT BASES

	Oleaginous Ointment Bases	Absorption Ointment Bases	Water/Oil Emulsion Ointment Bases	Oil/Water Emulsion Ointment Bases	Water-miscible Ointment Bases
Composition	oleaginous compounds	oleaginous base + w/o surfactant	oleaginous base + water (< 45% w/w) + w/o surfactant (HLB $\leq 8$ )	oleaginous base + water (> 45% w/w) + o/w surfactant (HLB $\geq 9$ )	Polyethylene Glycols (PEGs)
Water Content	anhydrous	anhydrous	hydrous	hydrous	anhydrous, hydrous
Affinity for Water	hydrophobic	hydrophilic	hydrophilic	hydrophilic	hydrophilic
Spreadability	difficult	difficult	moderate to easy	easy	moderate to easy
Washability	nonwashable	nonwashable	non- or poorly washable	washable	washable
Stability	oils poor; hydrocarb	oils poor; hydrocarb	unstable, especially	unstable, especially	stable

	ons better	ons better	alkali soaps and natural colloids	alkali soaps and natural colloids; nonionics better	
Drug Incorporation Potential	solids or oils (oil solubles only)	solids, oils, and aqueous solutions (small amounts)	solids, oils, and aqueous solutions (small amounts)	solid and aqueous solutions (small amounts)	solid and aqueous solutions
Drug Release Potential*	poor	poor, but > oleaginous	fair to good	fair to good	good
Occlusiveness	yes	yes	sometimes	no	no
Uses	protectants, emollients (+/-), vehicles for hydrolyzable drugs	protectants, emollients (+/-), vehicles for aqueous solutions, solids, and non-hydrolyzable drugs	emollients, cleansing creams, vehicles for solid, liquid, or non-hydrolyzable drugs	emollients, vehicles for solid, liquid, or non-hydrolyzable drugs	drug vehicles
Examples	White Petrolatum, White Ointment	Hydrophilic Petrolatum, Anhydrous Lanolin, Aquabase™, Aquaphor®, Polysorb	Cold Cream type, Hydrous Lanolin, Rose Water Ointment, Hydrocream™, Eucerin®,	Hydrophilic Ointment, Dermabase™, Velvachol®, Unibase®	PEG Ointment, Polybase™

\*Varies depending upon specific content of the ointment base and the relative polarity of the drug(s) incorporated. This table refers more generally to the release of a typical nonelectrolyte (primarily lipophilic) drug.

• **IDEAL OINTMENT BASE:**

- According to **BEELER**, ideal ointment base should have following physicochemical properties:

1. **Stability**
2. **Neutral in reaction**
3. **Non greasy**
4. **Non degreasing**
5. **Non irritating**
6. **Nondehydrating**
7. **Non hygroscopic**
8. **Water removable**
9. **Compatible with all medicaments**
10. **Free from odors**

Although ointment bases can be classified in many ways, the simplest one based on composition is as follows:

- A. Oleaginous bases.
- B. Absorption bases.
- C. Emulsion bases.
- D. Water-soluble (hydrophilic) bases.

**A. Oleaginous bases**

Salient characteristics of these bases are:

- i) they are anhydrous,
- ii) they are hydrophobic (do not absorb water readily),
- iii) they are insoluble in water, and
- iv) they are not removable by water.

These are the earliest ointment bases which consisted of vegetable and animal fats as well as petroleum hydrocarbons. A list of commonly used materials has been given here although in practice still a larger number of materials are used.

Oleaginous bases are expected to provide a film, which resists soap and water yet readily removable by solutions of surfactants. This can possibly be achieved by emulsifying the silicones or other hydrophobic film formers so that when the protective ointment is properly applied, an invisible protective film is left on the skin. Film forming agents are exemplified by polyvinylpyrrolidone, polyvinyl alcohol and the cellulose derivatives.

## **B. Absorption bases**

The term absorption as applied here implies the hydrophilic or water absorbing properties of the base and not the absorption of medicaments from the bases. These bases are generally anhydrous but capable of absorbing several times their own weight of water ultimately forming w/o type of emulsions.

Absorption bases vary in their composition and are usually mixtures of animal sterols with petrolatum. Eucerin and Aquaphor are the commercial bases consisting of combination of cholesterol and/or other suitable lanolin fraction with white petrolatum. Anhydrous absorption bases can also be formulated by the addition of lipophilic surfactants to petrolatum and anhydrous water-removable bases can be formed by the addition of hydrophilic surfactants to petrolatum. Some important formulae of absorption ointment bases are given below.

Absorption bases were primarily developed so as to have a product to which water or an aqueous solution of medicinal substances could be easily added. These bases are usually highly compatible with the majority of drugs used topically. The limited popularity of absorption bases however is attributed to their greasiness.

## **C. Emulsion bases**

These may be either o/w or w/o type emulsions.

### **(a) Water-in-oil type emulsion (Hydrophobic ointment):**

The w/o type emulsion bases such as lanolin and cold cream are used as emollients. The aqueous phase hydrates the skin and the oily phase forms an occlusive covering which prevents loss of water by evaporation. Emulsion bases also serve as vehicle for medicaments such as sulphur, ammoniated mercury, balsam of peru, zinc oxide etc. The main drawback of w/o emulsion bases is their greasy and sticky nature and therefore they are less popular than o/w type of bases.

Earlier cold creams consisted of oil (40 to 70%), wax or spermaceti (5 to 15%), and water (20 to 35%). Thus a large proportion of water was loosely held in the water- in-oil mixture. More stable creams were later formulated

employing borax which formed the sodium soap by reacting with the fatty acids present in the beeswax.

Presently cold creams are also formulated by employing non-ionic surfactants alone or in combination with beeswax. When cold creams are applied, slow evaporation of the water causes a pleasant cooling sensation and hence these creams are given the name 'cold creams'. A simple formula for borax-beeswax cold cream is as follows.

#### **(b) Oil-in-water ointment (Hydrophilic Ointment):**

Oil in water type emulsion bases are used as vehicles for medicinal agents. Water being in the external phase they are easily removed with water alone from skin and linen. They are non-grease and non-sticky. Vanishing creams are often used as cosmetics.

The vanishing type of cream bases contain a large proportion of water which may be as high as 80% and this seems to account for the high release of medicaments from such bases. Vanishing creams essentially contain about 20% stearic acid (triple pressed) and a part of it is reacted with alkali to form soap in-situ. About 5 to 10% glycerin is also included in the formulation as humectant which can be substituted either partially or wholly by propylene glycol. The typical sheen of vanishing cream is due to stearic acid.

Truly speaking, vanishing cream should be regarded as dispersion and not an emulsion. Two simple formulae for vanishing cream are given below.

#### **D. Water-soluble bases:**

These bases are prepared from mixture of low and high molecular weight polyethylene glycols which range in their consistency from liquids to solids. Their water solubility is due to the presence of many polar groups and other linkages. They are non-volatile, unctuous, inert and possess the ability to form an emollient surface. They neither hydrolyse and deteriorate nor support mould growth.

Medicaments like benzoic and salicylic acids, phenol, tannic acid, bacitracin etc. have a solubilizing effect on bases consisting of high molecular weight polyethylene glycols. Although the diffusion of medicaments through such bases occurs readily yet the percutaneous absorption is very little. Some formulae for water-washable ointments containing polyethylene glycols are given below.