

Practice 11.2.

Liquid paraffin emulsion
Emulsio olei paraffini

Liquid paraffin		12 ml
Arabic gum		4 g
Mint juice	q.s.	50ml

Preparation A:

The required amount of primer emulsion water is added to the powdered arabic gum and the gum is converted into mucilage. The liquid paraffin is then added gradually and with stirring. When the primer emulsion is formed, it is stirred for another 2-3 minutes and the remaining mint juice is added and the desired volume is completed.

Preparation B

Liquid paraffin is added to the powdered arabic gum and mixed. According to 3: 2: 1 (oil: water: emulsifier) ratio emulsion water is added. Till characteristic emulsion sounds, mixture is mixed up quickly. The desired volume is completed by gradually adding the remaining mint juice.

Questions:

- 1- What is the pharmaceutical form of the prepared preparation? Write the emulsion type according to the inner and outer phases.
- 2- What is the difference between methods A and B? Write the names of both methods. Which of the two methods makes the emulsion easier to prepare?
- 3- For what purpose is this emulsion used?
- 4- Do you wash your mortars with water? Write why.

12. SEMISOLID DOSAGE FORMS

Semisolid preparations for cutaneous application are intended for local or transdermal delivery of active substances, or for their emollient or protective action. They are of homogeneous appearance. Semi-solid preparations for cutaneous application consist of a simple or compound base in which, usually, one or more active substances are dissolved or dispersed.

Semisolid dosage forms are classified at the European Pharmacopoeia (EP 5) as follows:

- Ointments,
- Creams,
- Gels,
- Pastes,
- Poultices,
- Medicated Plasters.

12.1. Ointments

An ointment consists of a single-phase oily base in which solid or liquid active substances may be dispersed or dissolved.

12.2. Creams

Creams are multiphase preparations consisting of a lipophilic phase and an aqueous phase and also an emulsifying agent.

Creams are basically classified in two types

W/O creams which are known as Lipophilic creams

O/W creams which are known as Hydrophilic creams

12.3. Gels

Gels consist of liquids which are gelled by means of suitable gelling agents.

Lipophilic Gels (Oleogels) are preparations whose bases usually consist of liquid paraffin with polyethylene or fatty oils gelled with colloidal silica or aluminium or zinc soaps.

Hydrophilic Gels (hydrogels) are preparations whose bases usually consist of water, glycerol or propylene glycol gelled with suitable gelling agents such as starch, cellulose derivatives, carbomers and magnesium-aluminium silicates.

Emulgel is a special type of gels and it is a two-phase system. Emulgels contain an oil phase in a hydrogel. They are usually o/w type emulsions.

12.4. Pastes

Pastes are semi-solid preparations for cutaneous application containing large proportions of finely ground powder which is dispersed in the base.

12.5. Poultices

Poultices consist of a hydrophilic heat-retentive base in which solid or liquid active substances are dispersed. They are usually spread thickly on a suitable dressing and heated before application to the skin.

12.6. Medicated Plasters

Medicated plasters are flexible preparations containing one or more active substances. They are intended to be applied to the skin. They are designed to maintain the active substance(s) in close contact with the skin such that these may be absorbed slowly, or act as protective or keratolytic. Medicated plasters consist of an adhesive base, which may be coloured, and one or more active substance which was spread as a uniform layer on an appropriate support made of natural or synthetic material.

Semisolid preparations essentially consist of two parts:

- One or more active substances
- A base (vehicle) for dissolving or dispersing the active substance

The base may consist of natural or synthetic materials and may be a single or multi-phase system.

A good semi-solid base should have following features:

- It should be compatible with active substance
- It should be easily prepared
- It should be easy to clean
- Its melting point should be close to the body temperature
- It must be stable
- It should not be toxic / irritant to the skin/mucosa
- It should be able to deliver the active substance to skin

12.7. Classification Of Semisolid Bases (USP 27- NF 22)

- 1- Hydrocarbon (Oleaginous) bases
- 2- Absorption bases
 - Anhydrous absorption bases
 - W/O type absorption bases
- 3- O/W type Emulsion bases (water removable bases)
 - O/W type bases
- 4- Water soluble bases

Hydrocarbon (Oleaginous) bases

They are immiscible with water

They have no water absorption features

They are insoluble in water

They inhibit the water loss from the skin by forming a water-proof film (they act as an occlusive dressing).

They leave a greasy feeling when apply to the skin

Cleaning and washing with water is very difficult for these type of bases

Example: Petrolatum, White petrolatum, Wax

Absorption bases

They can keep water in their structures without changing their physical properties (consistency, etc.).

They are preferred when the active ingredient is liquid or in case of treatment of wounds.

They are divided into two subgroups.

Anhydrous absorption bases

They contain no water but they are capable of absorbing water in a quantity that twice of their own weight.

Less occlusive than the hydrocarbon bases

They have good emollient property

It is difficult to wash from the skin

Example: Anhydrous lanolin

W/O type absorption bases

They have water in their formulation since they are W/O type emulsions. However, they can also keep a certain amount of water which is added later.

They are good emollients

They leave a greasy feeling when apply to the skin

They are insoluble in water

They can not be diluted with water

Example: Cold Cream (USP 21 - NF 16)

O/W Type Emulsion Bases (Water removable bases)

They can be washed with water and they can be removed easily from skin or clothes.

They can be diluted easily with water or aqueous solutions.

They do not leave a greasy feeling when apply to the skin

They do not have occlusive effect

Example: Hydrophilic Ointment (USP 27 – NF 22)

Water soluble bases

They are water soluble and washable

They have no greasy feeling when they apply to the skin

They have no occlusive effect

They do not have any oily content

Example: Polyethylene glycol ointment (USP 27 - NF 22)
Glycerin ointment

Semisolid dosage forms contains:

Active ingredients

Bases

Antimicrobial preservatives,

Antioxidants

Stabilizing substances,

Viscosity enhancers,

Penetration enhancers,

Fragrances

12.8. Preparation Methods Of Semisolid Dosage Forms

Preparation method depends on the type of bases and the physicochemical structure of active substances.

1- Preparation at room temperature

Preparing at room temperature is used if the bases are semisolid at room temperature In this process, mortar is used. This method is preferred for preparing ointment type magistral preparations.

The materials should have enough softness to mix in the mortar like petrolatum.

If the active substance is insoluble in water, alcohol or other solvent which does not harm the skin, the entire fine powdered active substance is homogeneously mixed with a small amount of the bases. This mass is then geometrically diluted with the residue of the bases.

If the active substance dissolved in a solvent such as water or alcohol, this solution is first added to the base, then the other ingredients are added and mixed.

The materials should have enough softness to mix in the mortar like petrolatum.

If the active substance is insoluble in water, alcohol or other solvent which is harmless to the skin, the entire fine powdered active substance is homogeneously mixed with a small amount of the base. This mass is then geometrically diluted with the residue of the base.

If the active substance dissolved in a solvent such as water or alcohol, this solution is first added to the base, then the other ingredients are added and mixed.

2- Melting Method

If the bases are solid at room temperature or the bases contain solid and semisolid materials together, melting method should be preferred. It is also possible to use this method if the active substance is soluble in the molten bases.

In this process, the base materials which have high melting point like paraffin or wax are melted in a porcelain dish using a water bath, then the other ingredients are added. Finely powdered solid active substance is added to the melted mixture and it is mixed continuously until it reaches the room temperature.

In emulsion type formulations, the ingredients that form the oil phase and the water phase are separated and they are heated to 70-72 °C using a water bath. The water phase is added to the oil phase and stirred until it cools at room temperatures.

12.9. Controls On Semisolid Dosage Forms

- 1- Homogeneity control
- 2- Physical control
- 3- Rheological control
- 4- pH control
- 5- Sterility control (for ophthalmic semisolids)
- 6- Weight control
- 7- Microbiological control
- 8- In vitro release of active substance
 - a- Qualitative Methods
 - Chromatographic method
 - Agar gel method
 - b- Quantitative Methods
 - Methods with membrane
 - Methods without membrane
- 9- In vivo assays

12.11. Packaging Of Semisolid Dosage Forms

Semisolids are generally kept at;

In glass or plastic jars

In squeezable metal or plastic tubes

Tubes are preferred because the semi-solid preparation does not allow contact with air and microorganisms.

These packages must be sealed tightly. If the preparation contains water or volatile compounds, it should close hermetically.

Label color of the semisolid preparation which is prepared at the pharmacy must be RED.

12.12. Storage Of Semisolid Dosage Forms

Semisolid dosage forms should be stored at room temperature (25°C). It should not be kept at temperatures above 30°C. It should not be stored in the refrigerator unless there is a specific warning for the formulation.

Practice 12.1.

Simple Ointment (BP 1999)

Unguentum Simplex

Petrolatum (soft paraffin)	850 g
Anhydrous lanoline (Wool Fat)	50 g
Hard paraffin	50 g
Cetostearyl alcohol	50 g

Equal amounts of cetyl alcohol and stearyl alcohol are mixed in order to obtain cetostearyl alcohol. Other ingredients are added into the porcelain dish and melted together on the water bath. It is stirred until it become homogenous on the water bath. After that the mixture is continuously stirred until it get cold.

Questions:

1. For what purposes is this ointment used?
2. What is the role of cetostearyl alcohol in this formulation?