an oleaginous ointment base. This concept is used in the preparation of ophthalmic ointments. Eucerin is a 50% W/O emulsion.

Lanolin, USP, (anhydrous lanolin) obtained from the wool of sheep (*Ovis aries*), is a purified waxlike substance that has been cleaned, deodorized, and decolorized. It contains not more than 0.25% water. Additional water may be incorporated into lanolin by mixing. *Modified Lanolin, USP*, is lanolin processed to reduce the contents of free lanolin alcohols and any detergent and pesticide residues.

Water-Removable Bases

Water-removable bases are oil-in-water emulsions commonly called creams. Because the external phase of the emulsion is aqueous, they are easily washed from skin and are often called water-washable bases. They may be diluted with water or aqueous solutions. They can absorb serous discharges. Hydrophilic Ointment, USP, is an example of this type of base.

Hydrophilic Ointment, USP, has the following formula for 1,000 g:

Ingredient	*Amount (grams)*
Methylparaben:	0.25
Propylparaben:	0.15
Sodium lauryl sulfate:	10.00
Propylene glycol:	120.00
Stearyl alcohol:	250.00
White petrolatum:	250.00
Purified water:	370.00

The stearyl alcohol and white petrolatum are melted together at about 75°C. The other agents, dissolved in the purified water, are added with stirring until the mixture congeals. Sodium lauryl sulfate is the emulsifying agent, with the stearyl alcohol and white petrolatum constituting the oleaginous phase of the emulsion and the other ingredients the aqueous phase. Methylparaben and propylparaben are antimicrobial preservatives.

Water-Soluble Bases

Water-soluble bases do not contain oleaginous components. They are completely water washable and often referred to as greaseless. Because they soften greatly with the addition of water, large amounts of aqueous solutions are not effectively incorporated into these bases. They mostly are used for incorporation of solid substances. Polyethylene glycol (PEG) ointment, NF, is the prototype example of a water-soluble base.

Polyethylene Glycol Ointment, NF, PEG is a polymer of ethylene oxide and water represented by the formula $H(OCH_2CH_2)nOH$, in which n represents the average number of oxyethylene groups. The numeric designations associated with PEGs refer to the average molecular weight of the polymer. PEGs having average molecular weight below 600 are clear, colorless liquids; those with molecular weight above 1,000 are waxlike white materials; and those with molecular weight in between are semisolids. The greater the molecular weight, the greater the viscosity. The NF lists the viscosity of PEGs ranging from average molecular weight of 200 to 8,000.

The general formula for preparation of 1,000 g of PEG ointment is

PEG 3350:	400 g
PEG 400:	600 g

Combining PEG 3350, a solid, with PEG 400, a liquid, results in a very pliable semisolid ointment. If a firmer ointment is desired, the formula may be altered to contain up to equal parts of the two ingredients. When aqueous solutions are to be incorporated into the base, substitution of 50 g of PEG 3350 with an equal amount of stearyl alcohol is advantageous in rendering the final product firmer.

Selection of the Appropriate Base

Selection of the base to use in the formulation of an ointment depends on careful assessment of a number of factors, including the following:

- Desired release rate of the drug substance from the ointment base
- Desirability of topical or percutaneous drug absorption
- Desirability of occlusion of moisture from the skin