

**Pharm D III Year**  
**3.6: Pharmaceutical Formulations**  
**Unit: LIQUID DOSAGE FORMS**

**EMULSIONS**

**Definition:**

Emulsions are defined as two phase system in which one phase is dispersed in another phase with the help of emulsifying agents.

**Types of Pharmaceutical Emulsions:**

Pharmaceutical Emulsions are of two types. They are as follows:

1. **O/W Type:** In this emulsion oil is dispersed phase and in small globules dispersed in continuous phase i.e. water.
2. **W/O Type:** In this emulsion water is dispersed and dispersed as small globules in continuous phase i.e. oil.

**Advantages of Emulsions:**

1. Water being in expensive ingredient is used in preparation of emulsion along with oil.
2. The therapeutic ability as emulsion of drug is increased.
3. Any oily drug as emulsion, its spreading property is increased.
4. The absorption of drug is better as emulsion.
5. In emulsion, oil, if it has unpleasant taste or odour, it can be masked in this dosage form.
6. Bioavailability is improved in emulsion as dosage form.

**Emulsifying Agents:**

1. **Natural Agents:**

These are obtained from vegetable sources: These natural agents as emulsifying agents are: tragacanth, agar, pectin and cholesterol.

Animal sources: Egg yolk, gelatine, casein, cholesterol and wool fat.

2. **Colloidal Clays:**

The components with the finally divided solids may be used as emulsifying agents.

Examples are: Aluminium silicate (Bentonite) and Magnesium aluminium silicate (Vegan). These emulsifying agents are generally for external preparation.

### 3. **Synthetic Agents:**

These are some synthetic emulsifying agents. Eg. Anionic, cationic, non-ionic and ampholytic sodium dodecylsulfate, benzalkonium chloride, PEG 400 monostearate and long chain amino acid derivatives are their examples respectively. Something in addition to emulsifying agent viscosity builders such as glycerine is also used.

Emulsion can be used for both internal and external purposes.

### **Identification of Emulsion Type:**

Dye soluble in either water or oil. Both can be used for identification of emulsion type. One phase will be coloured under observation in microscope. This way we can identify o/w or w/o types of emulsion.

### **Preparation of Emulsion:**

Internal phase is converted in small droplets and then it is dispersed in continuous phase. The ingredients which are to be incorporated in dissolved in phase in which it is soluble. There are four ways to prepare which are as follows.

#### 1. **Adding dispersed phase into continuous phase:**

An excess of continuous phase is taken in composition to dispersed phase and mixed together with the help of emulsifying agent. Remaining of continuous phase is added later on.

#### 2. **Addition of continuous phase (water) to the dispersed phase (oil):**

After further addition of water to the dispersed phase (oil). After further addition of water, phase inversion may take place and O/W type of emulsion is formed.

#### 3. **Ointments and Cream Preparation:**

Oil soluble material are dissolved and melted in this phase and water soluble material are dissolved in water and warmed and then both phases are mixed while stirring. Ointments and creams are generally prepared by this method.

#### 4. **Alternate mixing of both phases in Emulsifying agents:**

Oil soluble material are added to a portion of oil and mixed to rest of oil soluble emulsifying agents with stirring, and then the same quantity of water containing water soluble emulsifying agents is mixed with stirring until the emulsion is formed. This method may be used for soap preparation.

**Micro emulsion:**

These are translucent and do not separate. Sometimes they may be transparent. It is difficult sometimes to separate micro emulsions from micellar solutions. Droplets may be in nano size range.

**Equipments used in preparation of Emulsion formulations:**

1. **Mechanical Mixers:** Propeller type mechanical mixes can be used for the preparation of emulsion in Industry.
2. **Homogenisers:** For satisfactory emulsion, sometimes impeller type of homogenisers is used.
3. **Colloidal Mill:** There are rotor and stator in colloidal mill moving at a speed of 2000tp 1800 rpm. All the companies may have different type of colloidal mill working on the same principle.
4. **Agitators:** For low costly oils this method of shaking or agitation is used for emulsion preparation. Laboratory shaking apparatus may be used for small scale manufacture.
5. **Ultrasonic Devices:** Ultra sonic vibrator may be used for production of emulsion. This method is not suitable for large scale production of Emulsion.
6. **Micro-fluidizer:** For producing very fine particle this instrument is used. This process of micro-fluidizer is having advantage of no contamination and ease of production.