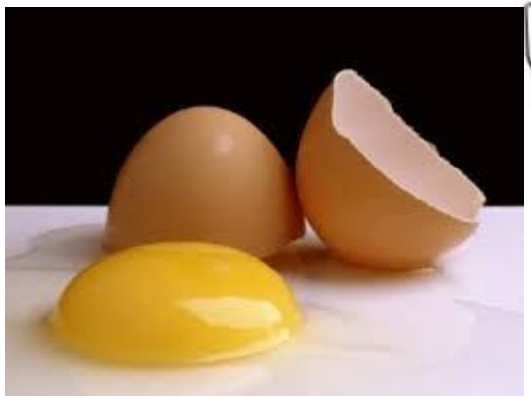
EMULSIONS

-Dr. M. Baby Mariyatra




BERGER
Murisan
PLASTIC
EMULSION
FUNGUS RESISTING WALL PAINT
Magnolia


MAYONNAISE
ITALIAN DRESSING
CLAM CHOWDER
1
2
3
4
5
6


Eucerin
NIVEA
Lotion
NIVEA
la prairie


Liquid in gas: liquid aerosol
Solid in gas: solid aerosol
Gas in liquid: foam
Liquid in liquid: emulsion
Gas in solid: solid foam
Liquid in solid: gel


50 ml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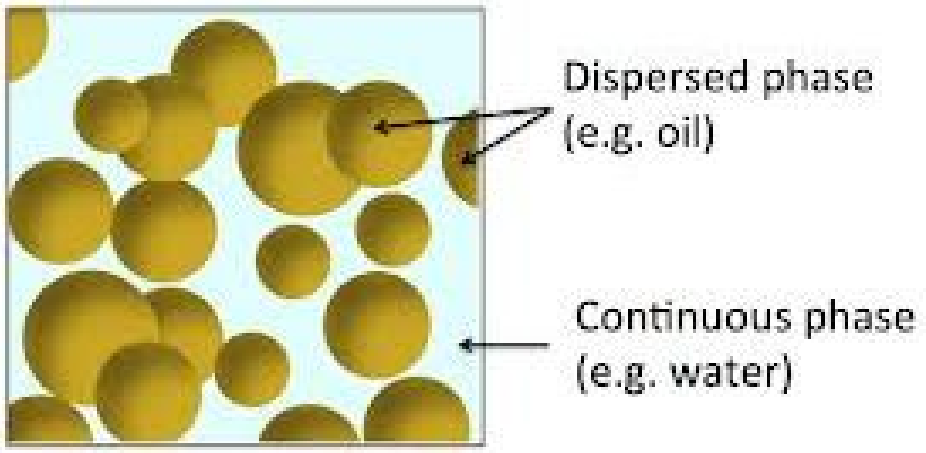
LANCOME
VISIONNAIRE

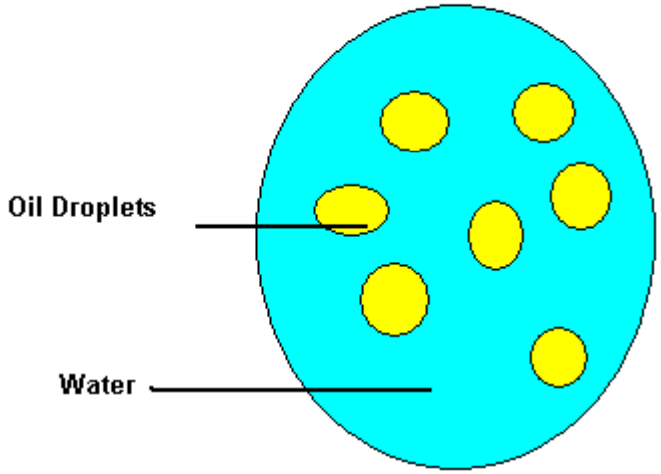
Immiscible Liquids

- Immiscible liquids do not mix together, e.g. oil floats on the surface of the water when mixed.
- If you shake oil and water together then leave them to stand, tiny droplets of oil float upwards – they join together until eventually the oil is floating on the water again
- This is not a useful property when concerned with foods which often contain both oil and water (such as salad cream) – without a binder to hold the two together they would keep separating…

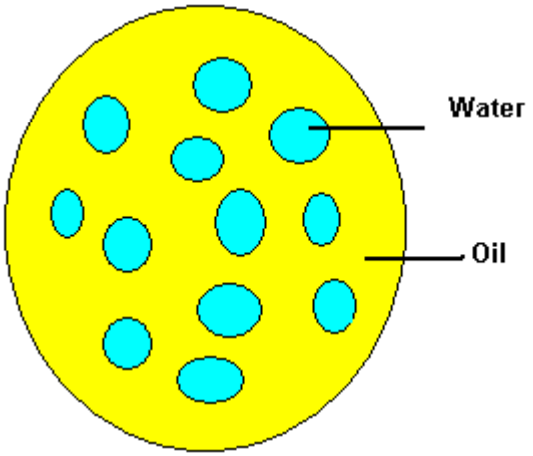
Emulsions

Definition: It is thermodynamically unstable system consisting of at least two immiscible liquid phases one of which is dispersed as globules (the dispersed phase) in the other liquid phase (the continuous phase) stabilized by presence of emulsifying agent.

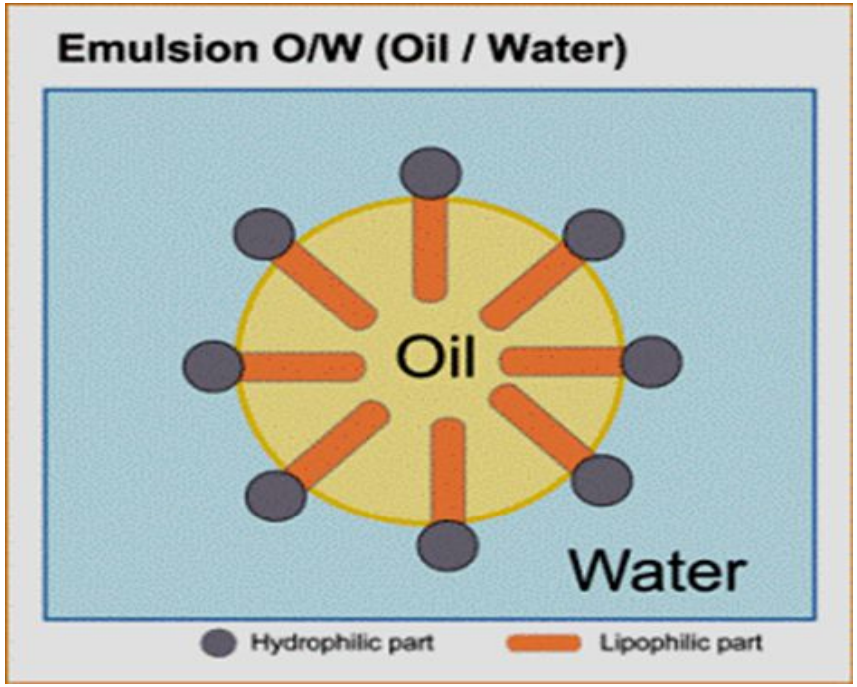


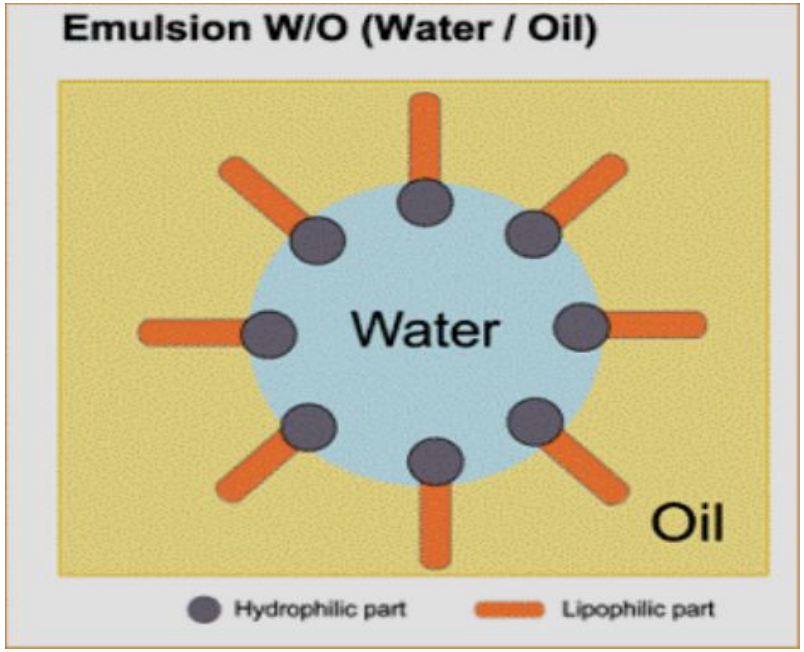


(O/W) emulsion



(W/O) emulsion





Types Of Emulsions

Based on dispersed phase:

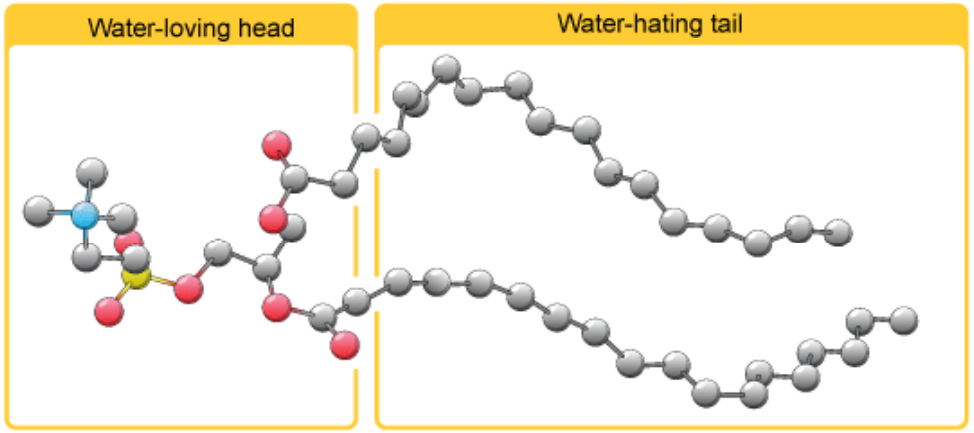
- Oil in Water (O/W): Oil droplets dispersed in water.
- Water in Oil (W/O): Water droplets dispersed in oil.
- Multiple emulsion (O/W/O) or (W/O/W): Ex. Water in Oil in water (W/O/W): Water in Oil emulsion dispersed in water.

Based on size of liquid droplets:

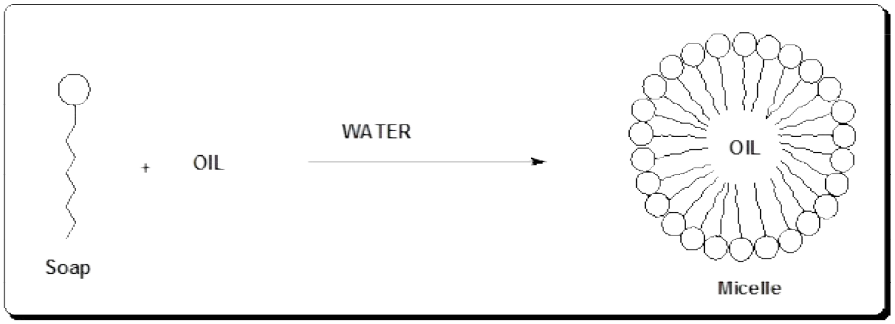
- 0.2 – 50 mm Macroemulsions
- 0.01 – 0.2 mm Microemulsions

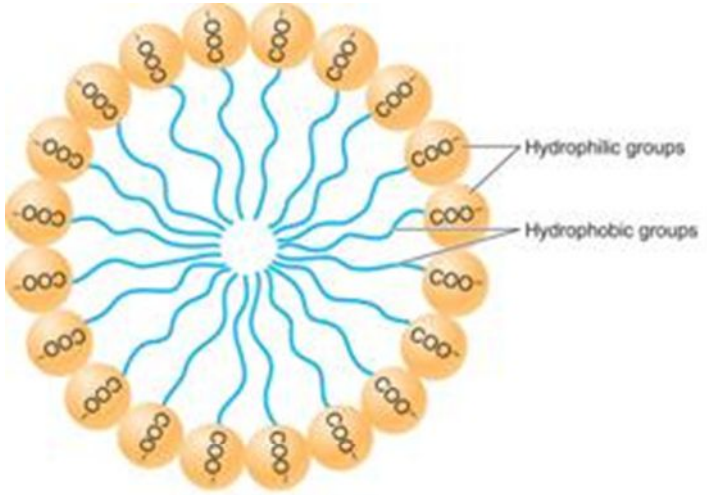
Emulsifier

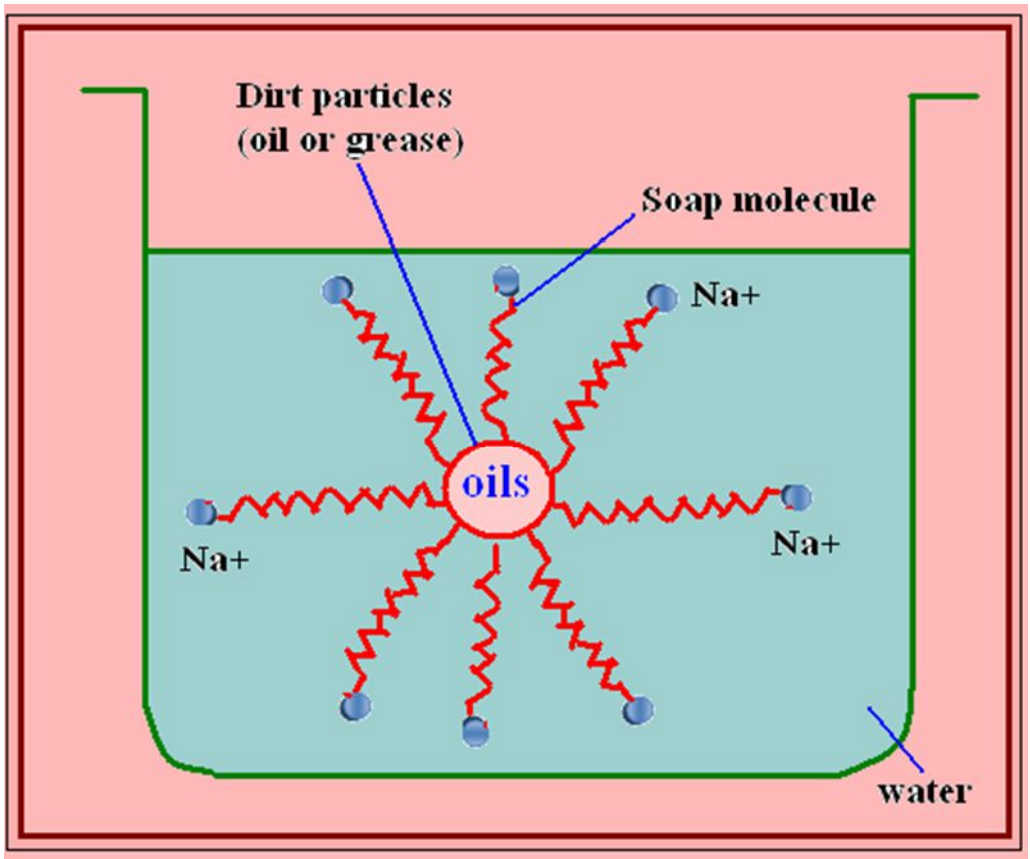
- Emulsifiers are molecules that have two different ends:
  - A hydrophilic end (water-loving or polar) that forms chemical bonds with water but not with oils
  - A hydrophobic end (water-hating or non-polar) that forms chemical bonds with oils but not with water
- The hydrophilic 'head' dissolves in the water and the hydrophobic 'tail' dissolves in the oil
- In this way, the water and oil droplets become unable to separate out – the mixture formed is called an emulsion



EMULSIFICATION - CLEANING ACTION OF SOAP







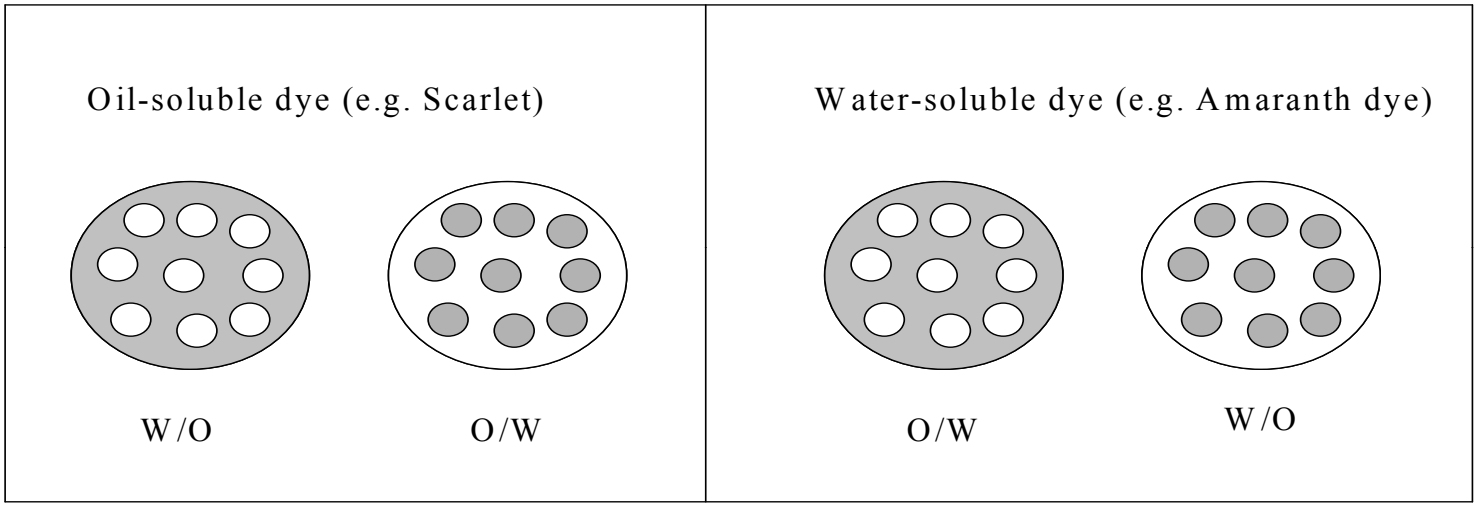
Micelle formation

Identification of Emulsions

1) DYE TEST:

- ✓ Water-soluble dye will dissolve in the aqueous phase.
- ✓ Oil-soluble dye will dissolve in the oil phase.

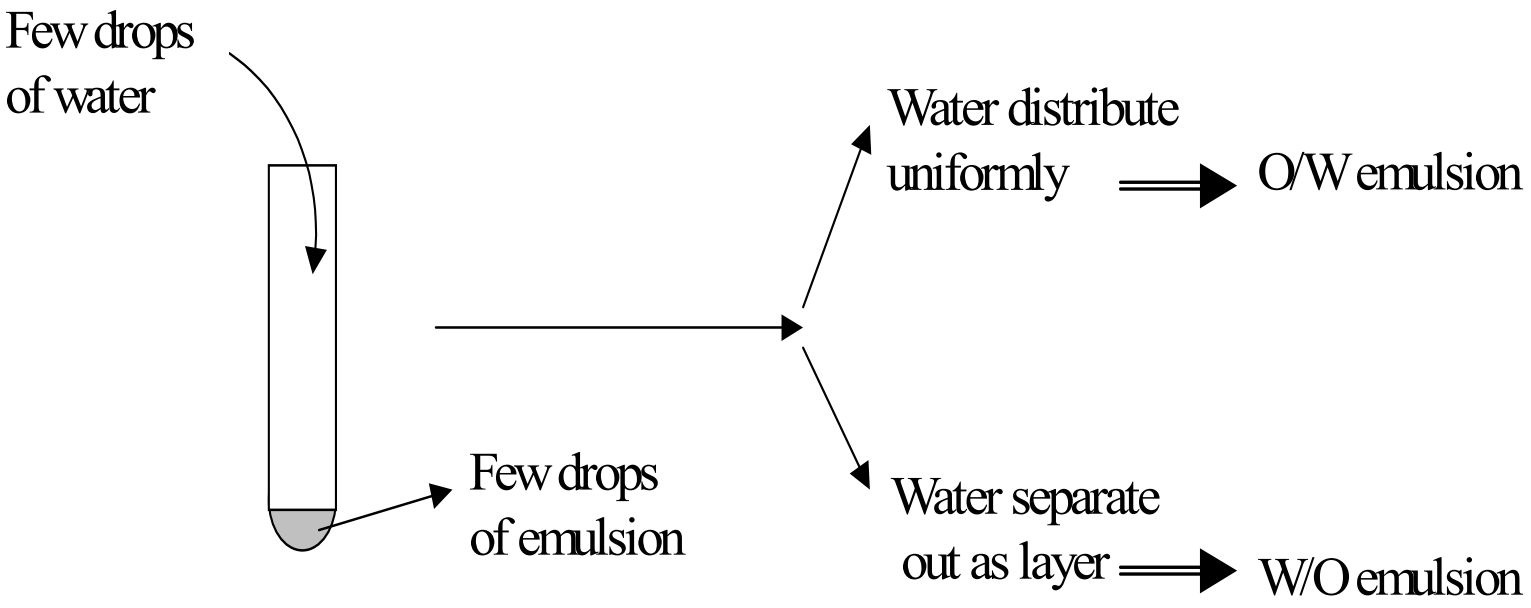
Microscopic View



2) Dilution test:

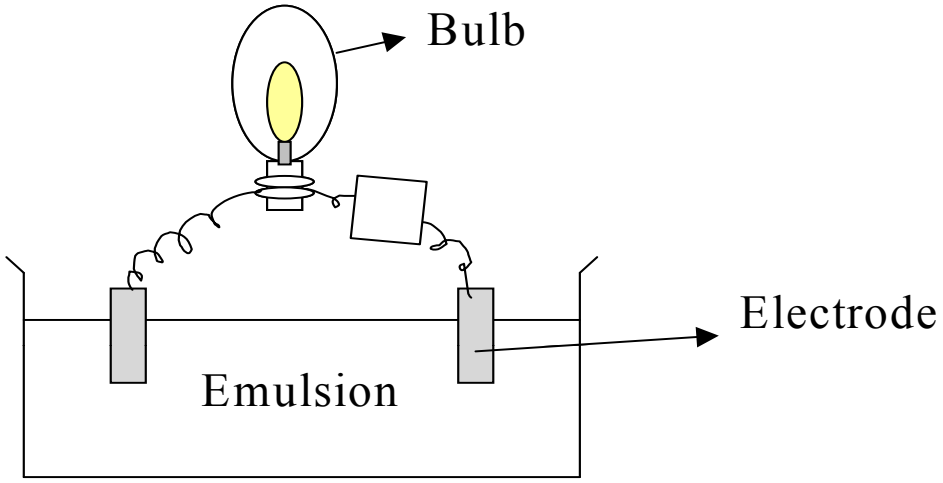
Based on the solubility of external phase of emulsion.

- ✓ O/W emulsion can be diluted with water.
- ✓ W/O emulsion can be diluted with oil.



3) Electrical Conductivity test:

- ✓ As we know water is good conductor of electricity whereas oil is non-conductor. Therefore, continuous phase of water runs electricity more than continuous phase of oil.



- ➢ Bulb glows with O/W
- ➢ Bulb doesn't glow with W/O

3) Fluorescence test:

- ✓ Oils give fluorescence under UV light, while water doesn't.
- ✓ Therefore, O/W emulsion shows spotty pattern when observed under UV.
- ✓ while W/O emulsion fluoresces.

4) Cobalt Chloride test:

- Principle:
- Cobalt Chloride solution is used for identification of Emulsion. It is water soluble so it changes colour when encountered by O/W emulsion.

Procedure:

Filter paper is Dipped in Cobalt Chloride and then in Emulsion.

Filter paper changes its color from blue to Pink

- Result:

Emulsion is O/W otherwise not.

Preparation Of Emulsions

Methods of Preparation Of Emulsions:

- Commercially, emulsions are prepared in large volume mixing in tanks and refined and stabilized by passage through a colloid mill or homogenizer.

- ✓ 1) Dry Gum Methods
- ✓ 2) Wet Gum Methods
- ✓ 3) Bottle Method
- ✓ 4) Beaker Method.
- ✓ 5) In situ Soap Method.

DRY GUM METHOD FOR PREPARATION OF EMULSIONS:

- Dry gum method is used to prepare the initial or primary emulsion from oil, water, and a hydrocolloid or "gum" type emulsifier.

Procedure

(4 parts oil, 2 parts water, and 1 part Emulsifier).

- Procedure: Take mortar, 1 part gum is lexivigated with the 4 parts oil until the powder is thoroughly wetted; then the 2 parts water are added all at once, and the mixture is vigorously triturated until the primary emulsion formed is creamy white and produces a "crackling" sound as it is triturated.

- Active ingredients, preservatives, color, flavors are added as a solution to the primary emulsion.

- When all agents have been incorporated, the emulsion should be transferred to a calibrated vessel, brought to final volume with water.

Wet Gum Method

(Oil 4 parts + Water 2 parts + Emulsifier 1 parts)

Procedure: In this method, the proportions of oil, water, and emulsifier are the same (4:2:1), but the order and techniques of mixing are different. The 1 part gum is triturated with 2 parts water to form a mucilage; then the 4 parts oil is added slowly, in portions, while triturating. After all the oil is added, the mixture is triturated for several minutes to form the primary emulsion. Then other ingredients may be added as in the continental method. Generally speaking, this method is more difficult to perform successfully, especially with more viscous oils, but may result in a more stable emulsion.

Bottle Method

- This method may be used to prepare emulsions of volatile oils, Oleaginous substances of very low viscosities.
- This method is a variation of the dry gum method.
- One part powdered acacia (or other gum) is placed in a dry bottle and four parts oil are added. The bottle is capped and thoroughly shaken. To this, the required volume of water is added all at once, and the mixture is shaken thoroughly until the primary emulsion forms.

Beaker Method

- The most appropriate method.
- Dividing components into water soluble and oil soluble components.
- All oil soluble components are dissolved in the oily phase in one beaker and all water soluble components are dissolved in the water in a separate beaker.
- Oleaginous (oily nature) components are melted and both phases are heated to approximately 70°C over a water bath. The disperse phase is then added to the continuous phase with stirring until the product reaches room temperature.

In situ Soap Method:

- Two types of Soaps developed by this Methods:

1) Calcium Soaps

2) Soft Soaps

Calcium Soaps:W/O type Emulsions. E.g. Oleic acid + Lime water. Prepared by simple mixing of equal volumes of Oil and Lime water.

- ✓ Emulsifying agent used is Calcium salt of free fatty acids. E.g. Olive Oil + Oleic acid (FAA) = calcium Oleate.

Advantage: O/W is used frequently on dry skin and sun burned skin.

Pharmaceutical applications of emulsions:

- They can mask the bitter taste and odor of drugs,
  e.g. castor oil, cod-liver oil etc.
- They can be used to prolong the release of the drug thereby providing sustained release action.
- Essential nutrients like carbohydrates, fats and vitamins can all be emulsified and can be administered to bed ridden patients as sterile intravenous emulsions.
- Emulsions provide protection to drugs which are susceptible to oxidation or hydrolysis.
- Intravenous emulsions of contrast media have been developed to assist in diagnosis.
- Emulsions are used widely to formulate externally used products like lotions, creams, liniments etc.

THANK YOU

Acknowledgements: Internet Sources