اصدق مع نفسك

Methods of compounding emulsions:

4. Beaker Method

بستخدمها اكتر بتحضير الكريم

- When synthetic or non-gum emulsifiers (غير الـ acacia) are used, the previous methods become meaningless (لا معنى له)
- The most appropriate method for preparing emulsions from surfactants or other non-gum emulsifiers is to begin by 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.
- Both phases (i.e. beakers) are heated to approximately 70°C over a water bath (the aqueous phase should be heated to a few degree higher).
- The internal phase is then added to the external phase with stirring until the product reaches room temperature.
- The mixing of such emulsions can be carried out in a beaker, mortar, or blender.

بقسم المواد الي بدي اعمل فيها التحضيرية لقسمين (مواد ذائبة بالماء) و (مواد ذائبة بالزيت) ، بجيب 2 beaker، بحط بالاول الماء مع المواد الذائبة فيه وبالتالي الزيت والمواد الذائبة فيه ويخلط منيح ، ومن ثم بعمل لـ 2 beakers —> heated to 70C over water bath ، بيكر الماء شوي اعلى درجة الحرارة بخليها وبعدين بدي ادير احدهم على التاني بناءًا على نوع الـ emulsion (بدير الـ internal phase على الـ external phase وبحرك لحد ما أوصل لدرجة حرارة الغرفة .

بطلع معي final product مباشرة (ما بطلع معي primary product مو الي قبله)

Methods of compounding emulsions:

5. Auxiliary Methods

- Instead of, or in addition to, any of the preceding methods, the pharmacist can usually prepare an excellent emulsion using an electric mixer or blender.
- An emulsion prepared by other methods can also usually be improved by passing it through a hand homogenizer, which forces the emulsion through a very small orifice, reducing the dispersed droplet size to about 5 microns or less.
- The formulation usually is improved in both stability (because droplet size is reduced) and appearance

بستخدمها عشان احضر emulsion يكون stable او بكون محضرته بالطرق السابقة وبعدين بستخدم هاي الطريقة لأزيد الـ stability تبعته (عن طريقة انه هاي الـ devices بتصغر الـ size of dispersion phase) ، واحنا بنعرف انه الـsize of D.ph هي احد الـ factor الي ممكن اصغرها ويعطيني .stable emulsion

Milk shake mixture

اللهم صلِّ على سيدنا محمد

Methods of compounding emulsions:

6. In Situ Soap Method

- Self emulsifying emulsions
- The two types of soaps developed by this method are calcium soaps and soft soaps (olive oil soap).
- Calcium soaps are w/o emulsions that contain certain vegetable oils, such as oleic acid, in combination with limewater (synonym: Calcium Hydroxide Solution, USP).
- They are prepared simply by mixing equal volumes of the oil and limewater. The emulsifying agent in this instance is the calcium salt of the free fatty acid formed from the combination of the two entities.
- In the case of olive oil, the free fatty acid is oleic acid and the resultant emulsifying agent is calcium oleate.

احنا بنعرف انه مكونات الـ emulsion عبارة عن (oil,water, emulsifier)
لكن بهاي الطريقة راح تلاقي بس oil & water أما الـ emulsifier بتكون من تفاعلات
(أي انه الـ emulsifier بتحضر وانا بعمل بالـ emulsion غير محضر سابقًا)

تحضير الـ calcium soap = equal volume of vegetable oil

& limewater —> mixing

Vegetable oil = oleic acid

Limewater = calcium hydroxide

بيعني انه حمض وقاعدة فبتفاعلوا مع بعض وبنتجولي Ca salt of the
free acid (in this formula the E.A = Calcium oleate)

Methods of compounding emulsions: In Situ Soap Method

- A typical example of this emulsion is calamine liniment:

مكوناته

- Calamine
- Zinc oxide

→ Active ingredients

- Olive oil *
- Calcium hydroxide solution *
- qs ad 1000.0 mL

Adding ingredients to a primary emulsion:

- Solid substances (active ingredients, preservatives, colors) are dissolved and added as a solution to the primary emulsion
- Volatile ingredients (flavors, odors, or active drugs) should be added once the product has cooled if heat was used
- Small amounts of oil soluble substances may be incorporated directly into the primary emulsion
- Any substance might reduce the physical stability of the emulsion (i.e. alcohol) should be added to the near end of the process

Adding ingredients to a primary emulsion:

- Viscosity enhancers can be added to a primary emulsion to increase stability of the formulation
- The enhancers should be miscible in the external phase of the emulsion
- o/w → hydrocolloids (miscible in water)
- w/o → viscous oils, fatty alcohols, or fatty acids (miscible in oil)

Adding ingredients to a primary emulsion:

- When all agents have been incorporated, the emulsion should be transferred to a calibrated vessel, brought to final volume with water, then homogenized or blended to ensure uniform distribution of ingredients.

بس احط كل المواد واخلطهم منيح بنقل التحضيرية على cylinder عشان اضيف water or oil (حسب الـ external phase) لحد ما أوصل لل final volum ، وبرجع بخلط لأتأكد انه صار uniform

لا حول ولا قوة إلا بالله

Adding ingredients to a commercially prepared emulsion

- With w/o emulsions:
- If an aqueous soluble material to be added, excess emulsifier must be present
- For those w/o emulsion that do not have excess emulsifier, additional emulsifier may have to be added
- An aqueous solution may be added using a pill tile and spatula, but some may require heat

بالعادة الـ commercially emulsion بكون يحتوي على excess of emulsifier ، ليه ؟ عشان لما اضيف aqueous فيجي هاد الـ emulsifier بيحط فيه وبعمله على شكل droplets

في حال مافي excess فعادي انا بضيف emulifier

Adding ingredients to a commercially prepared emulsion

- With w/o emulsions:
  - Oils and insoluble powders can be incorporated directly into the external phase using a tile and spatula
  - If a large amount of insoluble powder is being added a levigating agent (i.e. mineral oil) may be necessary that should be miscible with oil phase

بجيب الـ powder وبضيف عليه نقط oil —> فبتكون
معي شكل متل العجينة هاي العملية اسمها levitation
عشان يصير miscible in oil

Adding ingredients to a commercially prepared emulsion

- With o/w emulsions:

- Levigating agents for aqueous insoluble substances should be water miscible as glycerin, propylene glycol, polyethylene glycol, or alcohol
- If heat is used to incorporate → work quickly → be careful not to evaporate (تبخر) water from the product → stiff
- In many commercial o/w emulsions, sufficient emulsifying agents is already present in the preparation to accommodate the added oils or powders (استيعاب)

Formulation of emulsion

Other formulation additives

Buffers → ما بتتفاعل مع المكونات التانية

- The inclusion of buffer might be necessary to maintain chemical stability or ensure physiological compatibility.
- However, electrolytes addition affects flocculation and stability of emulsions.

Density modifiers → It found in stock equation → كلما كان الفرق أقل كلما كانت الـ Stability أفضل

- If the density of the two phases is the same, then stability is increased.
- Minor modifications for density of aqueous phase of emulsion can be done by incorporating sucrose, dextrose, glycerol or propylene glycol.

* الـ Density تبعت الـ oil حتى كمان بقدر اتحكم فيها، فبتحكم بـ Density of aq phase

Formulation of emulsion

Other formulation additives

! تقليل الـ water evaporation من الـ emulsion خلال الـ storage

٤ تقليل الـ water evaporation الـ لـ skin لما احط ماده الـ emulsion عليها .

* غالبًا توجد بالكريم *

Humectants → مُرطب

- These materials can be added for emulsions to reduce water evaporation, either from the packaged (1) product when the closure is removed or from the (2) surface of skin.
- E.g. Glycerol, polyethylene glycol and propylene glycol.

Flavors, colors and perfumes

- These may alter the physical characteristics of emulsions

* بناءً اعلم نقرر شو احط من صهدل الـ additives .

Sweetening agents

" مثلًا لو هو internal use فبحط flavoring

بس لو external use ما بكون بحاجة وهكذا "

استغفر الله العظيم ❤

Flavoring emulsions → بختاره بناءًا على الـ external phase

- Select it based on the external phase
- Flavoring oil can be mixed with emulsifier or with a water miscible solvents as glycerin or ethanol

لانه لو كان بالـ internal phase فهو على الفاضي ما راح احس بطعمه

Formulation of emulsion

Other formulation additives

Antioxidants → كتير مهم بالـ emulsion

- Rancidification of oils → produce unpleasant odor and taste (oxidation of oil)
- Antioxidants are added for the protection of the oily phase and the included drugs.
- The efficiency of antioxidant depends on:
  - compatibility with other ingredients
  - its oil/water partition coefficient (مثلا لو بدي AntiO يكون شغال بالزيت فلازم ذائبيته تكون بالزيت أعلى من الماء)
  - the extent (حدى) of its solubilization within micelles of the emulgent
  - its sorption onto the container or closure ⇒ Sorption —> adsorption (hold on surface)

هل يذوب في الـ droplets تاعت الـ external phase أو بالـ emulsion

- Ascorbic acid, Butylated hydroxyanisole, Butylated hydroxytoluene, l-tocopherol

Preservatives

- Aqueous phase support growth of M.O (Microorganisms)
- Microbes produce changes in emulsion's appearance, cause discoloration and development of gases and odors and change in viscosity
- Microbes may also decompose nonionic and anionic surfactants and other additives as glycerin, gum, and hydrocolloids
- Fungistic and bacteriostatic preservatives
- The most widely used preservatives in emulsions include: benzoic and sorbic acids, and their salts, p-hydroxybenzoic acid esters, chlorocresol, phenoxyethanol, bronopol, quaternary ammonium compounds and organic mercurials

Formulation of emulsion

Other formulation additives

Preservatives

- The desirable properties of a preservative suitable for an emulsion include:
  - High water solubility (low oil in water partition coefficient) because the growth of microorganisms occurs in the aqueous phase.
  - A wide spectrum of activity against bacteria and fungi.
  - Bactericidal rather than bacteriostatic activity
  - Compatibility with container and other ingredients
  - Stability and effectiveness over a wide range of temperatures and pH.
  - Freedom from toxic, irritant or sensitizing activity.

ذائبيته بالماء أعلى من الزيت

بأثر على الفطريات والبكتيريا

Bacteriostatic = stopping growth of bacteria

Bactericidal = killing bacteria

كيف احدد نوع الـ emulsion :

Tests to identify the type of emulsion

There are several tests that may be performed to identify the type of emulsion that has formed:

- ***Electrical conductivity***: o/w emulsions conduct electric current whereas w/o emulsions do not.

توصيل الـ emulsion للكهرباء

- ***Dilution with water***
- ***Use of dyes***
- ***Drop test***

سبحان الله وبحمده

Determining type of emulsion:

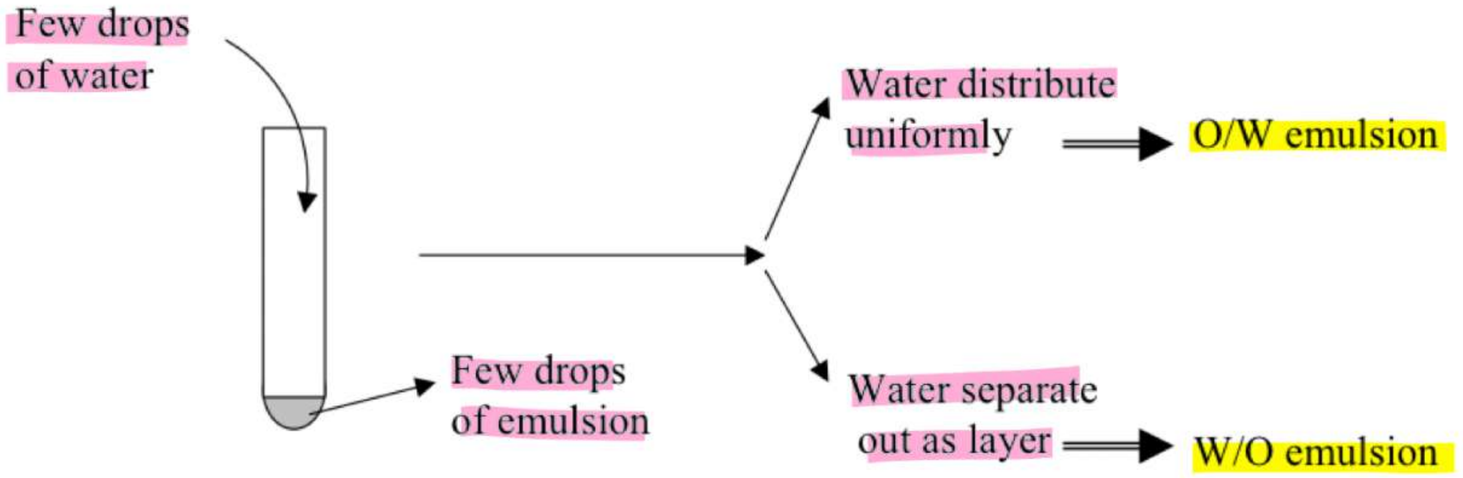
2. Dilution test

- based on the solubility of external phase:

- o/w emulsion can be diluted with water.

- w/o emulsion can be diluted with oil.

بجيب few drops of emulsion in test tube وبحط عليه مثلًا few drops of water لو توزع بشكل موحد ف نوعه O/W بس لو انفصل وعمل طبقة فبكون W/O



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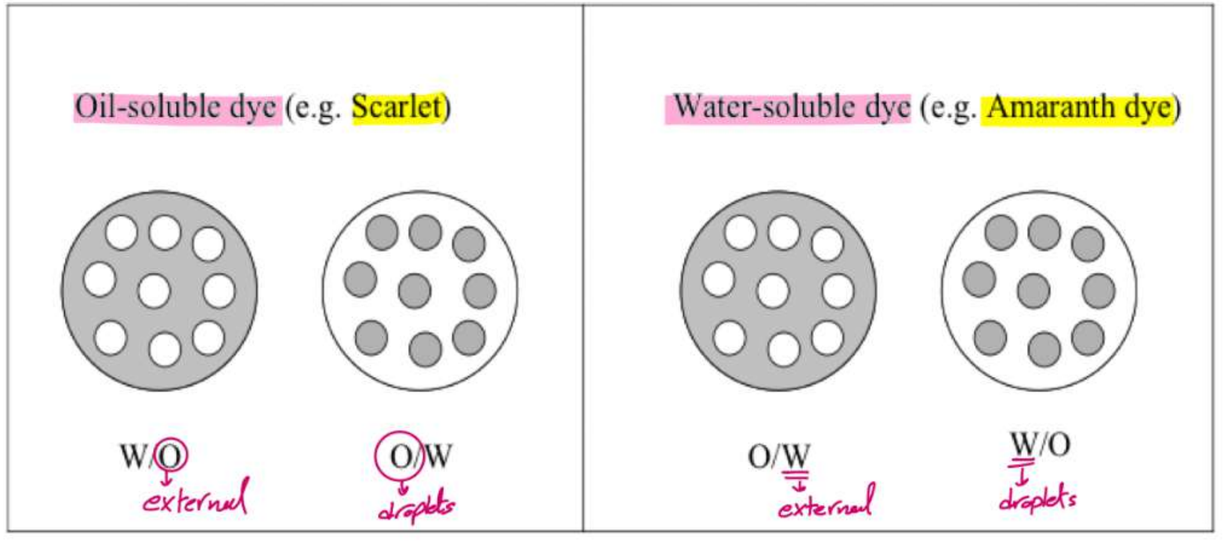
faculty.ksu.edu.sa/13042/Documents/**EMULSIONS**.doc

Determining type of emulsion:

3. Dye test:

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



Determining type of emulsion:

4. Drop test:

- Put a drop of the formulation on the surface of water
- If the drop spreads out, the emulsion is an o/w emulsion because the external phase is miscible with water
- If the drop stays as a drop or "balls up", it is a w/o emulsion

Factors that affect the choice of emulsion type?

بناءًا على شو بختار الـ emulsion

الـ drug طعمه سيء وبذوب بالزيت فبختار اني اعمل o/w emulsion وبضيف flavouring agent عشان اخفي الطعم السيء بزيادة

- Oil-soluble drug is prepared in o/w emulsion since its solubility and its taste can be masked by adding flavoring agents to the aqueous phase
- Parental
  - For intravenous (IV) injection " i.v." o/w emulsion is the only type could be used.
  - For intramuscular (IM) injection "i.m." both o/w and w/o types of emulsion could be used. Water-soluble drug can be prepared in w/o emulsion to get prolonged action (depot therapy) → بكون بدي مفعولها بطيء عشان تضل لفترة أطول بكون الـ drug بالـ internal phase
- Topical application:
  - Semisolid emulsions are called creams and lotions
  - Creams are semi-solid or highly viscous liquid emulsions intended for application to the skin
  - w/o or o/w

Factors determining type of emulsion

شو العوامل الي بتحدد نوع الـ emulsion

There are several determinants of the type of emulsion produced, including:

1) phase volume of the internal phase: volum ratio

- Assuming that the internal phase is composed of spheres → the maximum volume that may be occupied by the internal phase is 74%.

- This is termed the *critical value* and is dependent on the droplet size (1) range and shape (2).

Critical value :
O/W —> 74% volume of oil
W/O —> 40% volume of water

- Interestingly, although the above description holds true for o/w emulsions, the critical value for w/o emulsions is markedly lower (about 40%).

لو زادت كمية الماءعن 40% فبتصير o/w بدل من w/o

أقل بشكل ملحوظ

Factors determining type of emulsion

2) the chemical properties of the film surrounding the internal phase (HLB value). → نوع الـ emulsifier

3) viscosity of the internal and external phases.

- In general, if the viscosity of one phase is preferentially increased, there is a greater chance of that phase being the external phase of the emulsion.

الي اله لزوجة أعلى بكتير من التاني فهو بكون external phase والي لزوجته اقل هو الـ internal phase

emulsion قوام الـ

Emulsion consistency

- For an externally applied product a wide range of emulsion consistencies can be tolerated from low viscosity lotions and liniments (packaged in flexible plastic containers) to semisolids (creams).

(Low —> semisolid)

- Creams are usually packed into collapsible tubes (plastic or aluminum) or in jars (metal, glass or plastic).

Collapsible

Jar

Emulsion consistency

Factors that affect the viscosity of emulsion:

- ***Volume concentration of the dispersed phase***: As the concentration of the dispersed phase increases, the apparent viscosity of the emulsion increases. طردية
- ***Particle size of the dispersed phase***: The apparent viscosity of emulsion can be increased by reduction in globule size عكسية
- ***Viscosity of the continuous phase***: A direct relationship exists between viscosity of emulsion and viscosity of the continuous phase. طردية
- ***Viscosity of the dispersed phase*** طردية
- ***Nature and concentration of emulsifying system***

- Hydrophilic colloids as emulsifying agents will increase the viscosity of the continuous phase of an o/w systems leading to increase in emulsion viscosity. تأثيره على الـ External phase الي راح يأثر على viscosity of emulsion
- Surfactants that cause flocculation will cause increase in viscosity of emulsion.

Packaging

- Tight containers to avoid loss of water
- Tubes, pumps, squeeze bottles, jars
- If it is liquid:

→ enough room for shaking → ما اعبي العلبة بالكامل عشان اخلي وسع فيها لاقدر اعمل shaking

→ Large opening bottle for easy pouring

Microemulsion

- Self reading page 403

الحمد لله ، هذه التفاريغ لوجه الله تعالى

بتمنى تكون بتلبي احتياجكم، ادعولنا ♥

Batoo!

Do it by yourself

- **Estimate what type of emulsion will be formed for the following formulation and justify your answer using no more than two lines?**

Formula	
Mineral oil	150 ml
Anhydrous Lanolin	5 ml
Span 80	10 ml
Water q.s.	250 ml