Pharmaceutical Technology II

3rd Stage Pharmacy Students

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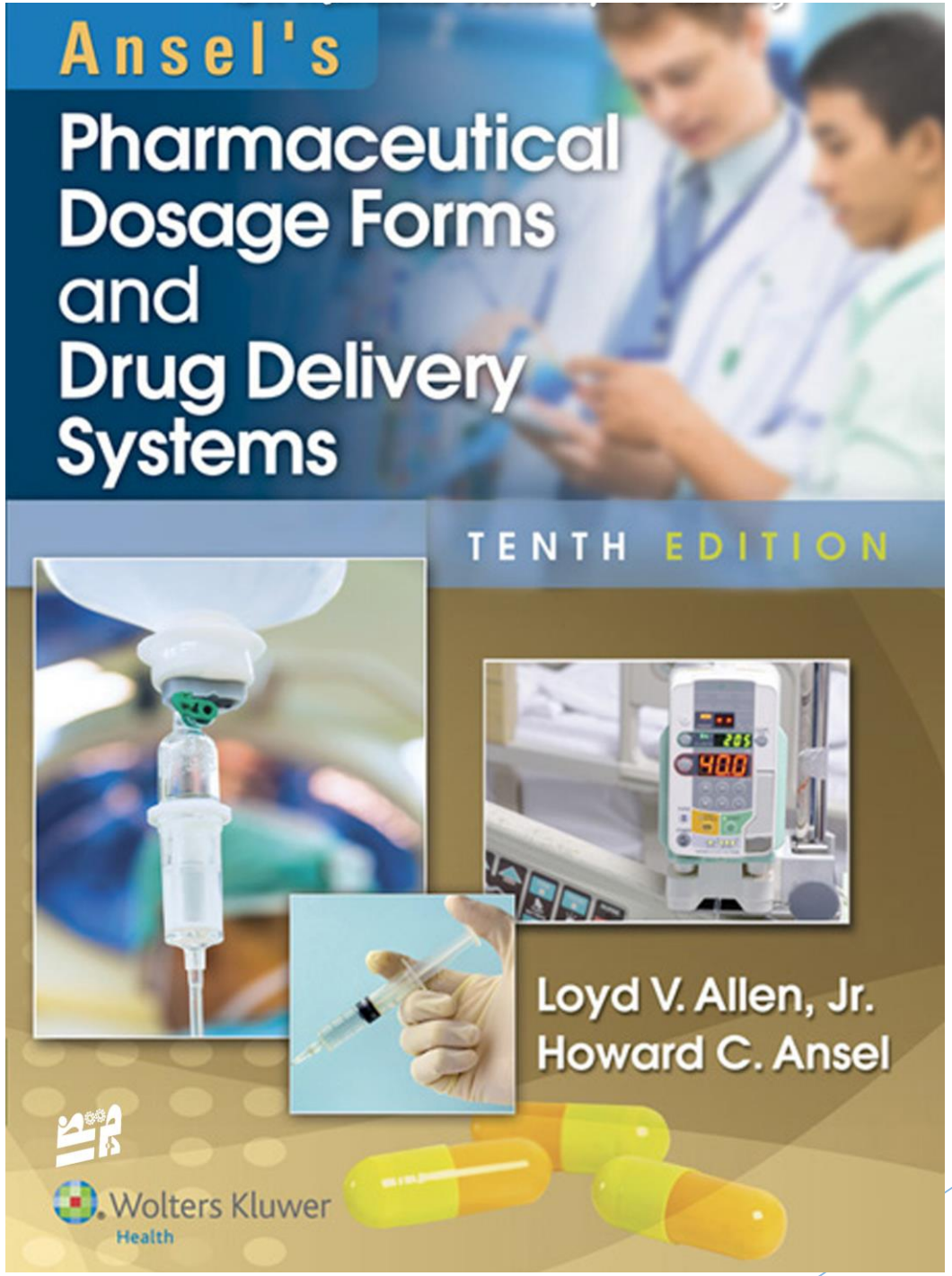
Ansel's
Pharmaceutical Dosage Forms and Drug Delivery Systems
TENTH EDITION
Loyd V. Allen, Jr.
Howard C. Ansel
Wolters Kluwer
Health

ANSEL'S PHARMACEUTICAL DOSAGE FORMS AND DRUG DELIVERY SYSTEMS

TENTH EDITION

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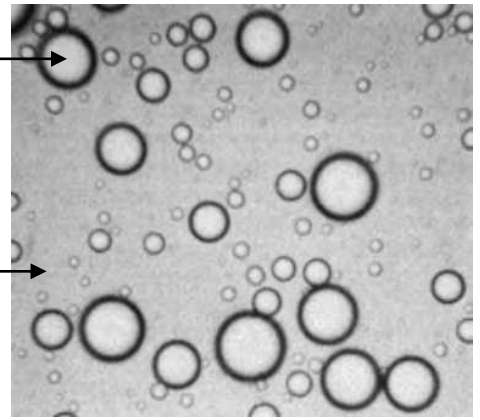
Pharmaceutical Technology II Syllabus:

- Emulsions
- Lotions, liniments
- Semisolids (creams, ointments and gels)
- Transdermal patches
- Suppositories
- Powders
- Capsules
- Pharmaceutical incompatibilities

Emulsions

An emulsion may be defined as a preparation consisting of two immiscible liquids usually water and oil, one of which is dispersed as small globules in the other.

The formation and stabilisation of an emulsion is made possible by the incorporation of a third substance 'the emulsifying agent'

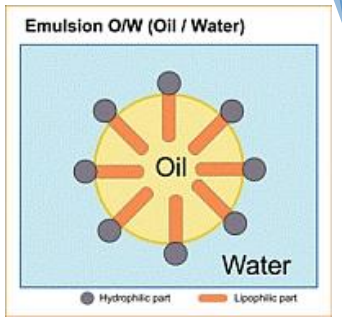


Mineral oil in water emulsion

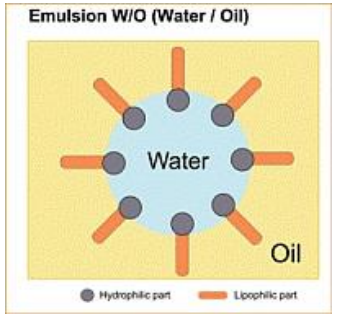
The dispersed phase is referred to as the internal phase and the dispersion medium as the external or continuous phase.

Two distinct types of emulsions may exist:

1. A product in which oil is dispersed as globules in water (o/w)



2. Water is dispersed as globules in the oil phase (w/o)



Purpose of Emulsions and of Emulsification

- The process of emulsification enables the pharmacist to prepare relatively stable and homogeneous mixtures of two immiscible liquids.
  (i.e. The reason for emulsification centres around the desirability of administering both aqueous and oil soluble substances in the same mixture).
- For orally administered emulsions, the o/w emulsion permits the palatable administration of distasteful oil by dispersing it in a sweetened flavoured aqueous vehicle.

(i.e. masking the disagreeable taste and oily sensation which often accompany the oral administration of a drug. Flavouring agents may be added to the external aqueous phase of the emulsion to increase the palatability.

- It permits the administration of a liquid drug in the form of minute globules rather in bulk.

  The reduced particle size of the oil globules may render the oil more digestible and more readily absorbed (more effective in its task) for example, the increased efficacy of mineral oil as a cathartic when in the emulsified form.

Based on the use to which they may be put, emulsions are divided into two groups:

1. Emulsions for internal use (orally or by I.V. injection)

2. Emulsions for external use (skin or mucous membrane)

Orally Administered Emulsions:

Pharmaceutical emulsions which are given orally are of (o/w) type.

Intravenous Injection of Emulsions

Parenterally administered emulsions require special care during manufacture, the choice of the emulsifying agent, the size and the uniformity of the globules are critical in preparations for intravenous use.

The preparation of emulsions for injection involves the formation of a coarse emulsion which is then homogenised, collected and sealed in sterile flasks and autoclaved. Finally the product is tested for sterility and for globule size e.g. (Vitamin A and vitamin K and some sex hormones).

Emulsions for External Application:

Both o/w and w/o emulsions may be applied to the surface of the skin and the mucous membranes. By the process of emulsification it is possible to produce a lotion or a cream that has the proper consistency, spreads well over an affected area and washed easily, does not stain clothing and is attractive to patient.

Emulsions to be applied to the skin may be o/w or w/o depending on the nature of the therapeutic agent, condition of skin and the desirability for an emollient or tissue softening effect.

Medicinal agents that irritate the skin are less irritating in the internal phase of an emulsion than in external phase.

A w/o emulsion can be applied more evenly because the skin is covered with a film of sebum and this surface is more readily wetted by oil than by water. In addition, w/o emulsion is also more softening to the skin because it resists drying out and removal by contact with water

Theories of emulsification

1. **Surface tension theory**

The use of emulsifiers lower the interfacial tension of the two immiscible liquid, reducing the repellent force between the liquids and diminishing each liquid's attraction for its own molecules. Thus, the surface active agent facilitates the breaking up of large globules into smaller ones which then have a lesser extent to coalesce.

2. **Oriented-wedge theory**

It assumes monomolecular layer of EA curved around a droplet of the internal phase of the emulsion.

3. **Plastic or interfacial film theory**

It places the EA at the interface between the oil and water, surrounding the droplet of the internal phase as a thin layer of film adsorbed on the surface of the drops. The film prevents contact and coalescing of the dispersed phase.

It is unlikely that a single theory of emulsification can explain the means by which the EAs promote emulsion formation and stability. More than one theory plays a part, for example lowering of the interfacial tension is important in the initial formation of emulsion but the formation of a protective wedge of molecules or film of emulsifier is important for continued stability.