

of the total volume. If the disperse phase exceeds this, the stability of the emulsion is questionable. As the concentration of the disperse phase approaches a theoretical maximum of 74% of the total volume, phase inversion is more likely to occur.

### Summary of the problems encountered by emulsions

A summary of the problems encountered by emulsions is given in the key points box.

### General method

The theory of emulsification is based on the study of the most naturally occurring emulsion, milk. If examined closely, milk will be seen to consist of fatty globules, surrounded by a layer of casein, suspended in water. When a pharmaceutical emulsion is made, the principal considerations are the same. The object is to divide the oily phase completely into minute globules, surround each globule with an envelope of suspending agent (e.g. Acacia BP) and finally suspend the globules in the aqueous phase (Figure 4.1).

As with other liquid preparations for oral use, emulsions will have in the formulation a vehicle containing added flavouring or colourings as required. There is also the need for a preservative, which is usually chloroform, in the form of Double Strength Chloroform Water BP. In addition an emulsion will also need an emulsifying agent (or emulgent).

### Continental and dry gum method

Although emulsions may be made by a variety of methods (for example, using methylcellulose gum in the preparation of Liquid Paraffin Emulsion BP: see Example 4.4 below), extemporaneously prepared emulsions for oral administration are usually made by the continental or dry gum method, where the emulsion is formed by mixing the emulsifying gum (usually Acacia BP) with the oil which is then mixed with the aqueous phase. The only differences between the continental and dry gum methods are the proportions

## KeyPoints

### Summary of the problems encountered by emulsions

#### Creaming

Separation of the emulsion into two regions, one containing more of the disperse phase.

*Possible reasons for problem*

- lack of stability of the system.
- product not homogeneous.

*Can the emulsion be saved?*

The emulsion will reform on shaking.

#### Cracking

The globules of the disperse phase coalesce and there is separation of the disperse phase into a separate layer.

*Possible reasons for problem:*

- incompatible emulsifying agent
- decomposition of the emulsifying agent
- change of storage temperature.

*Can the emulsion be saved?*

The emulsion will not reform on shaking.

#### Phase inversion

From oil-in-water to water-in-oil or from water-in-oil to oil-in-water.

*Possible reason for problem*

- amount of disperse phase greater than 74%.

*Can the emulsion be saved?*

The emulsion will not reform on shaking.