# CAPSULES

## 3rd WEEK

- **In pharmacy, the word «capsule» is used to describe an edible package made from gelatin or orther suitable material which is filled with medicines to produce a unit dosage, mainly for oral use.**
- **There are two types of capsules:**
  - **Hard Capsules**
  - **Soft Capsules;**

**better adjectives would be «two-piece»instead of «hard» and «one-piece» instead of «soft».**

- **The hard capsule consists of two pieces in the form of cylinders closed at one end; the shorter piece, called the «cap», fits over the open end of the longer piece, called the «body».**

# Raw Materials:

- **Similar raw materials have been used in the manufacture of both types of capsule. Traditionally both contain gelatin, water, colourants and optional materials such as process aids and preservatives; in addition, soft capsules contain various plasticizers, such as glycer,n and sorbitol.**

- **The major pharmacopoeias (European, Japanese and US) permit the use of gelatin or other suitabe material.**
- **In recent years hard capsules have been manufactured from hypromellose in order to produce a shell with low moisture content and soft capsules have been made from modified starch.**

- **Gelatin:**

- **Gelatin is still the major componenet used for capsules and replacement polymer systems need to have the same basic properties.**
- **Gelatin possesses five basic properties that make it suitable for the manufacture of capsules:**

1) It is non-toxic, widely used in foodstuffs, and acceptable for use worldwide.
2) It is readily soluble in biological fluids at body temperature.
3) It is good film-forming material, producing a strong flexible film. The wall thickness of a hard gelatin capsule is about 100 μm.
4) Solutions of high concentration, 40% w/v, are mobile at 50°C. Other biological polymers, such as agar, are not.

# Manufacture:

- **The sequence of two-piece hard gelatin capsule shell manufacture is given in the below:**

1. **Dipping**
2. **Spinning**
3. **Drying**
4. **Stripping**
5. **Cutting**
6. **Joining**

# Filling of Powder Formulations:

- **The machines for the induztrial-scale filling of hard capsules come in great variety of sahpes and sizes, varying from semi- to fully automatic and ranging in output from 5000 to 150.000 per hour.**
- **The dosing systems can be divided into two groups:**

- ***Dependent Dosing Systems:***

**These are the systems that use the capsule body directly to measure the powder. Uniformity of fill weight can only be achieved if the capsule is completely filled.**

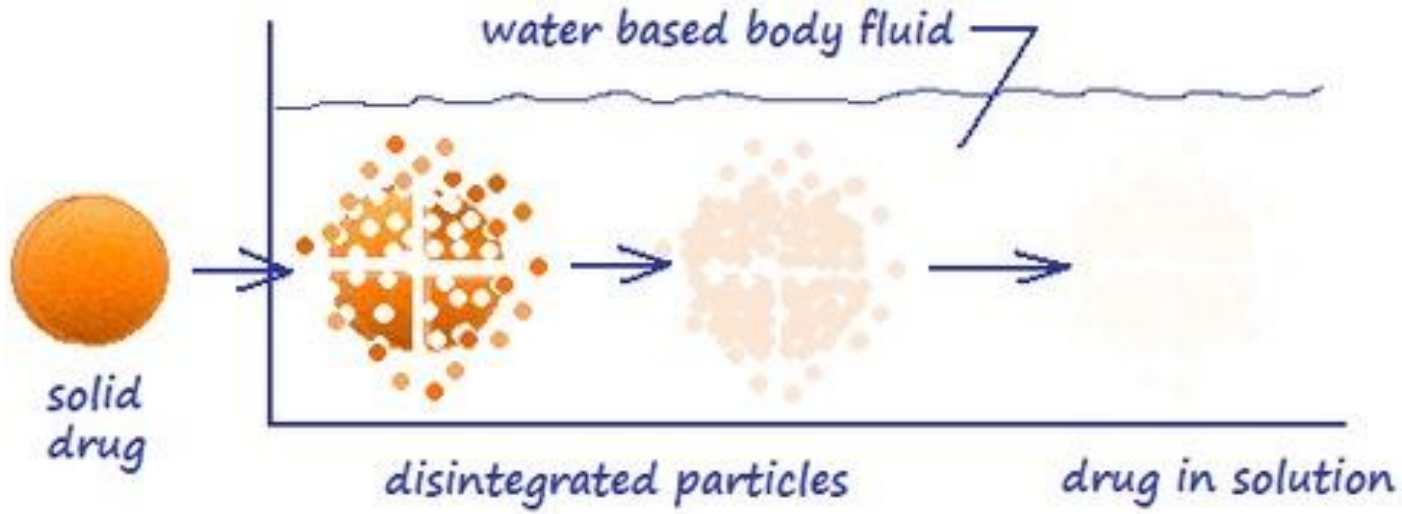
- ***Independent Dosing Systems:***

**These are the systems where the powder is measured independently of the body in a special measuring device. Weight uniformity is not dependent on filling the body completely. With this system the capsule can be part filled.**

# SOLID DISPERSIONS

# What is Solid Dispersion?

- **Solid dispersions are not a dosage form such as a tablet, granule or capsule.**
- **It is a process for appropriately changing some properties of the drug.**
- **Systems in which a drug having poor solubility is dispersed in an inert carrier having good solubility as a solid form is referred to as "Solid Dispersion".**




**When a solid dosage form is taken orally by the oral route,**

- **Disintegrated**
- **Dissolved**
- **Absorbed**

# To increase the solubility of a drug;

- The medium pH can be adjusted.
- The solvent medium can be changed.
- The salt form of the drug can be formed.
- Particle size can be reduced.
- Mixing process can be applied.
- Surfactants may be added to the solvent medium.

**The main purpose of the solid dispersion is to increase the solubility of a poorly soluble drug in the solvent system. Thus absorption is achieved.**

**This new compound formed; is a mixture of a good solubilising carrier and a poorly solubilized active agent in a solvent media. In this way the solubility of the active substance is increased.**

Six kinds of solid dispersions are found according to their preparation techniques.

1) Eutectic mixtures
2) Solid solutions
3) Glass solutions and glass suspensions
4) Precipitation of the active substance in amorphous state into a crystalline formed carrier
5) The formation of a new compound / complex through an interaction between the drug and the carrier
6) Systems that carry these 5 possibilities together

# SOLID SOLUTIONS

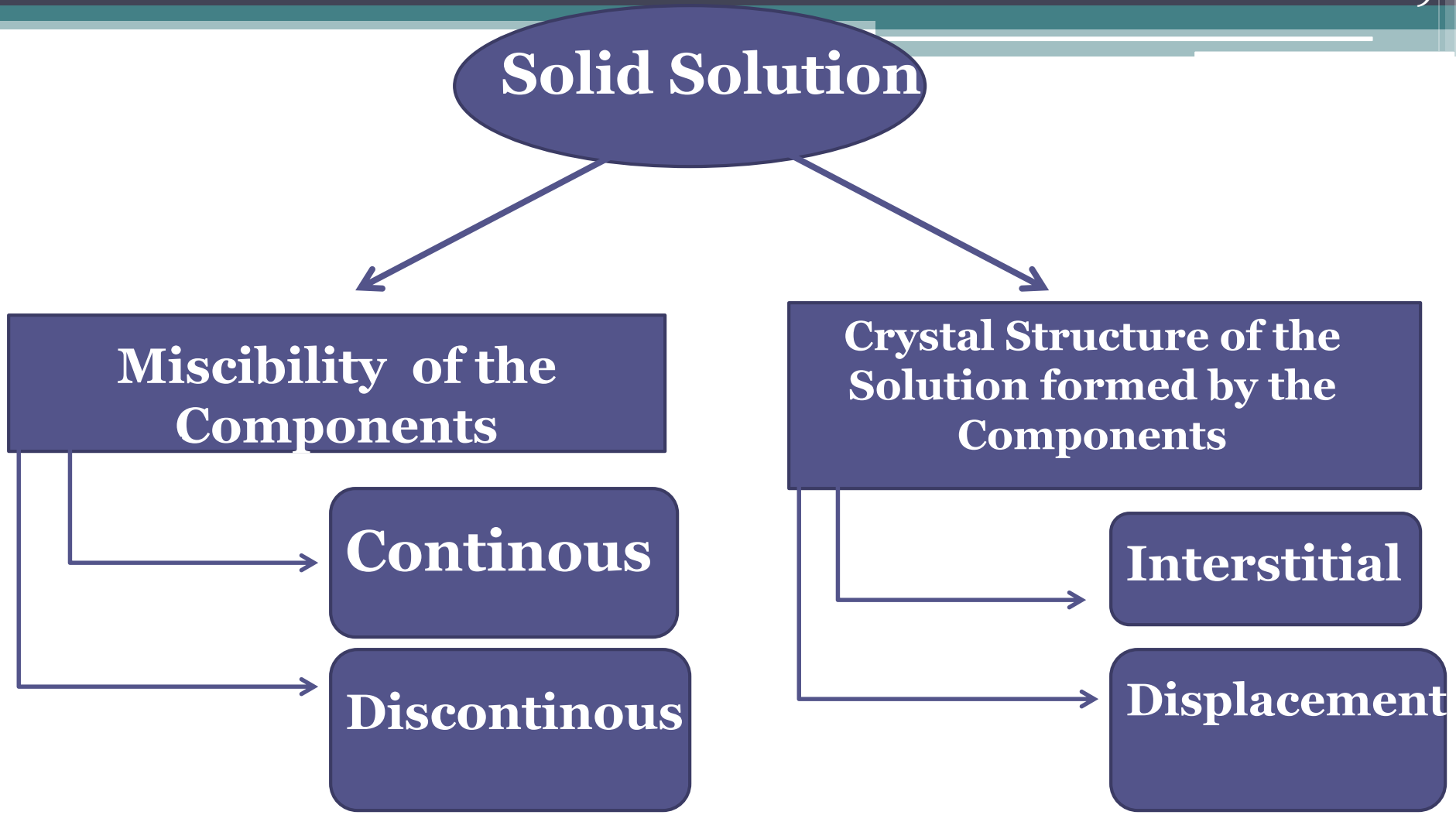
**The main goal in preparing the solid dispersion is to reach a solid solution. Solid solutions; are a system in which one solid forms a single phase by dissolving together in another solid. That is, systems in which a solid solubility is in a solid solvent.**

**The optimum condition required for solid dispersions is to reach solid solids.**

**WHY ???**

## Because;

**In solid solutions, the active substance is dispersed in the solid solvent in the molecular size, and when contacted with the dissolution medium, the solubility is increased as it is dispersed in the molecular size in the dissolution medium.**


Solid Solution
Miscibility of the Components
Continous
Discontinous
Crystal Structure of the Solution formed by the Components
Interstitial
Displacement

## ***KEY FEATURES OF AN IDEAL CARRIER :***

- **Do not react with the active substance,**
- **The solubility in the dissolution medium must be quick and very fast,**
- **It must be physiologically inert,**
- **It should not be toxic,**

# Classification of the Carriers

1. **Polymer Group Carriers:**

It is the easiest group to work and has high stability.

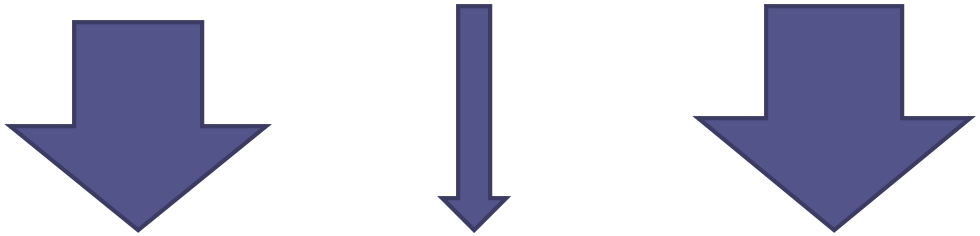
- **PVP:**

**It is soluble in organic solvents, especially in water and alcohol. So it is a good carrier. As the molecular size of the polymer increases, the ability to make solid dispersions improves.**

## ❖ PEG:

**It is inert and very soluble in water. There are 5 types approved by the USP for use in pharmaceutical manufacturing. These are;**

**PEG 400, 600, 1500, 4000, 6000.**



**LIQUID SEMI-SOLID SOLID**

## These polymer based carriers are

- Methyl Cellulose (MC)
- Hydroxy Ethyl Cellulose (HEC)
- Hydroxy Propyl Methyl Cellulose (HPMC)
- Hydroxy Propyl Methyl Cellulose Phthalate (HP55)
- Cyclodextrins
- Poylacrylates and Methacrylates (Eudragit)

## 2. Candy Carriers:

They are used to obtain glass solutions.

- **Sorbitol**
- **Mannitol**
- **Glucose**
- **Dextrose**
- **Lactose**

## 3. Acide Structured Carriers:

- Citric acid
- Succinic acid

## 4. Urea:

It is the end product of the human protein mechanism and is non-toxic. It is very soluble in water.

## 5. Surfactants:

They are effective in increasing wettability and increasing solubility.

- **Tween**
- **Sodium laury sulphate**
- **Bile salts (cholic acid, deoxycholic acid)**
- **Cholesterol**