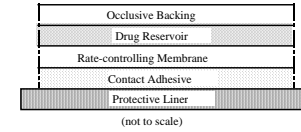


## CHAPTER 7. DESIGN OF CONTROLLED RELEASE DEVICES

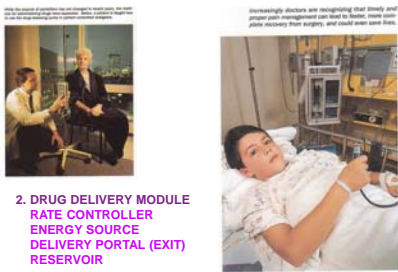
### MAJOR COMPONENTS OF CONTROLLED RELEASE DOSAGE FORMS

1. DRUG
2. DRUG DELIVERY MODULE  
RESERVOIR  
DELIVERY PORTAL (EXIT)  
ENERGY SOURCE  
RATE CONTROLLER
3. PLATFORM

### TRANSDERMAL PATCH



2. DRUG DELIVERY MODULE  
RATE CONTROLLER  
ENERGY SOURCE  
DELIVERY PORTAL (EXIT)  
RESERVOIR
3. PLATFORM



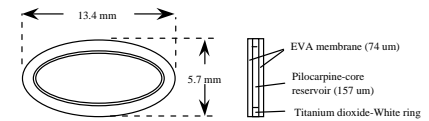
2. DRUG DELIVERY MODULE  
RATE CONTROLLER  
ENERGY SOURCE  
DELIVERY PORTAL (EXIT)  
RESERVOIR
3. PLATFORM



People using patient-controlled analgesia, such as the push-button Painsport (above), tend to give themselves smaller doses than they would receive in the every-four-hour system.

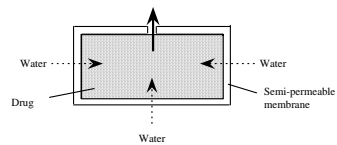
2. DRUG DELIVERY MODULE  
RATE CONTROLLER  
ENERGY SOURCE  
DELIVERY PORTAL (EXIT)  
RESERVOIR
3. PLATFORM

### OCUSERT

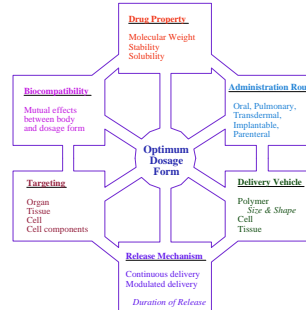


2. DRUG DELIVERY MODULE  
RATE CONTROLLER  
ENERGY SOURCE  
DELIVERY PORTAL (EXIT)  
RESERVOIR
3. PLATFORM

### ORAL OSMOTIC (OROS) SYSTEM



2. DRUG DELIVERY MODULE  
RATE CONTROLLER  
ENERGY SOURCE  
DELIVERY PORTAL (EXIT)  
RESERVOIR
3. PLATFORM



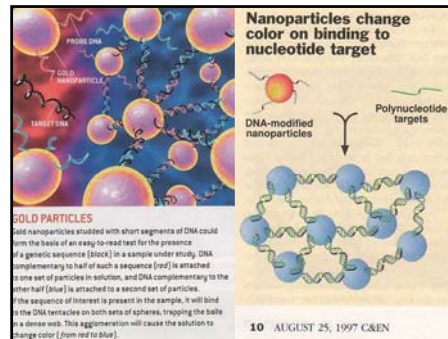
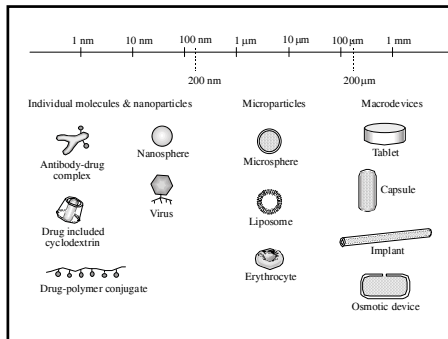
### SIZE & SHAPE OF DDS

#### A. NANOPARTICLES

#### B. MICROPARTICLES

LIPOSOMES  
RED BLOOD CELLS, PLATELETS  
SYNTHETIC POLYMER MICROPARTICLES  
PHARMAZOME, MICROSPONGE

#### C. MACRODEVICES



**MICROENCAPSULATION**

- A. COACERVATION (=PHASE SEPARATION)
  - SIMPLE & COMPLEX COACERVATION
- B. SOLVENT EVAPORATION & EXTRACTION
- C. INTERFACIAL CROSSLINKING
- D. INTERFACIAL POLYMERIZATION
- E. HOT MELT MICROENCAPSULATION
- F. SPRAY DRYING
- G. SPARY COATING

**MICROENCAPSULATION**

- A. COACERVATION (=PHASE SEPARATION)
  - SIMPLE & COMPLEX COACERVATION
- B. SOLVENT EVAPORATION & EXTRACTION
- C. INTERFACIAL CROSSLINKING
- D. INTERFACIAL POLYMERIZATION
- E. HOT MELT MICROENCAPSULATION
- F. SPRAY DRYING
- G. SPARY COATING

**A. SIMPLE COACERVATION (=PHASE SEPARATION)**

1. AQUEOUS POLYMER SOLUTION (GELATIN, ANY WATER-SOLUBLE POLYMER)
2. ADD STRONGLY HYDROPHILIC SUBSTANCE (NON-SOLVENTS TO GELATIN: ETHANOL, ACETONE. OR SALTS: SODIUM SULFATE → DEHYDRATION (DESOLVATION) OF GELATIN)

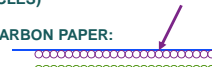
- FORMATION OF GELATIN-RICH PHASE IN WATER (SEPARATION OF GELATIN FROM WATER)

PROTEIN PURIFICATION: SALTING OUT (PURIFICATION OF FIBRINOGEN BY GLYCINE)

**A. COMPLEX COACERVATION**

1. AQUEOUS POLYMER SOLUTION (GELATIN, ANY WATER-SOLUBLE POLYMER)
2. ADD ANOTHER POLYMER OF OPPOSITE CHARGE (ELECTROSTATIC INTERACTIONS) GUM ARABIC OR GUM ACACIA (POLYANIONS)

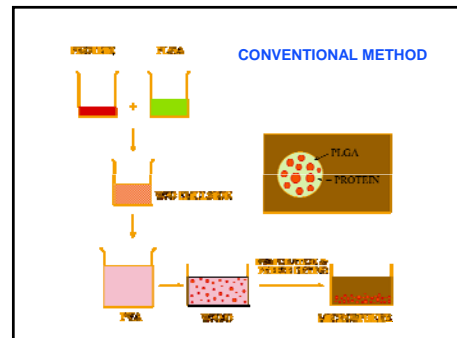
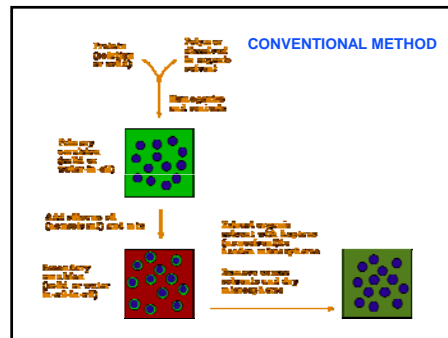
- FORMATION OF COMPLEX COACERVATION (1-10 μm MICROPARTICLES)

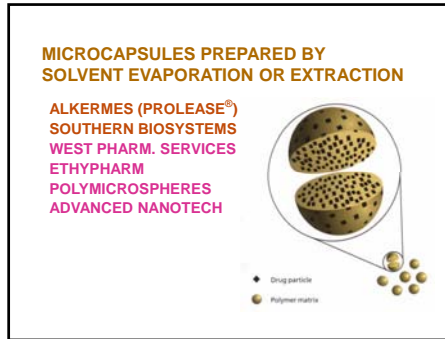
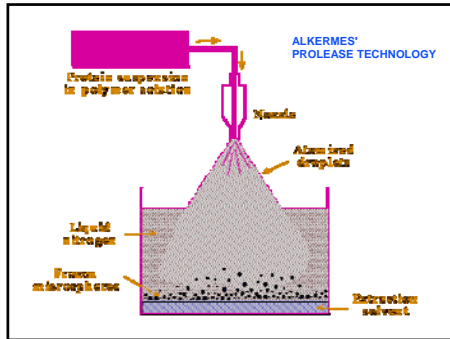
1940-50: CARBONLESS CARBON PAPER: 

SCRATCH-N-SNIFF SCENT STRIPS

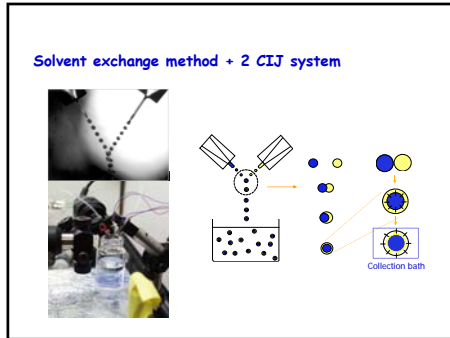
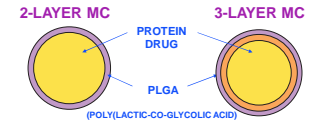
**MICROENCAPSULATION**

- A. COACERVATION (=PHASE SEPARATION)
  - SIMPLE & COMPLEX COACERVATION
- B. SOLVENT EVAPORATION & EXTRACTION
- C. INTERFACIAL CROSSLINKING
- D. INTERFACIAL POLYMERIZATION
- E. HOT MELT MICROENCAPSULATION
- F. SPRAY DRYING
- G. SPARY COATING





**NEW METHOD OF MAKING MICROCAPSULES: SOLVENT EXCHANGE METHODS**



- MICROENCAPSULATION**
- A. COACERVATION (=PHASE SEPARATION) SIMPLE & COMPLEX COACERVATION
  - B. SOLVENT EVAPORATION & EXTRACTION
  - C. INTERFACIAL **CROSSLINKING**
  - D. INTERFACIAL POLYMERIZATION
  - E. HOT MELT MICROENCAPSULATION
  - F. SPRAY DRYING
  - G. SPARY COATING

- MICROENCAPSULATION**
- A. COACERVATION (=PHASE SEPARATION) SIMPLE & COMPLEX COACERVATION
  - B. SOLVENT EVAPORATION & EXTRACTION
  - C. INTERFACIAL **CROSSLINKING**
  - D. INTERFACIAL POLYMERIZATION (**NYLON**)
  - E. HOT MELT MICROENCAPSULATION
  - F. SPRAY DRYING
  - G. SPARY COATING

- MICROENCAPSULATION**
- A. COACERVATION (=PHASE SEPARATION) SIMPLE & COMPLEX COACERVATION
  - B. SOLVENT EVAPORATION & EXTRACTION
  - C. INTERFACIAL **CROSSLINKING**
  - D. INTERFACIAL POLYMERIZATION
  - E. HOT MELT MICROENCAPSULATION (**WAX**)
  - F. SPRAY DRYING
  - G. SPARY COATING

- MICROENCAPSULATION**
- A. COACERVATION (=PHASE SEPARATION) SIMPLE & COMPLEX COACERVATION
  - B. SOLVENT EVAPORATION & EXTRACTION
  - C. INTERFACIAL **CROSSLINKING**
  - D. INTERFACIAL POLYMERIZATION
  - E. HOT MELT MICROENCAPSULATION
  - F. **SPRAY DRYING**
  - G. SPARY COATING

- MICROENCAPSULATION**
- A. COACERVATION (=PHASE SEPARATION) SIMPLE & COMPLEX COACERVATION
  - B. SOLVENT EVAPORATION & EXTRACTION
  - C. INTERFACIAL **CROSSLINKING**
  - D. INTERFACIAL POLYMERIZATION
  - E. HOT MELT MICROENCAPSULATION
  - F. SPRAY DRYING
  - G. **SPARY COATING**

