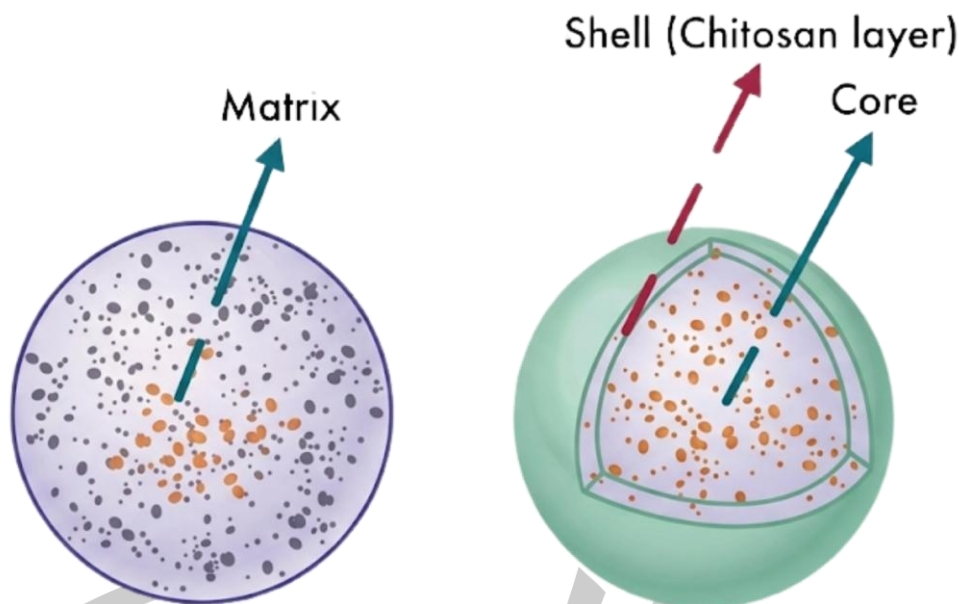


Micro Capsules / Micro Spheres

Microcapsules / Microspheres

- These are tiny particles used to carry drugs.
- Their size usually ranges from a few micrometers (μm) to a few hundred micrometers.



Microsphere Microcapsule

Difference between Microcapsules and Microspheres

- **Microcapsules:**
 - Have a core-shell structure.
 - The drug is inside a central core, and it is surrounded by a coating (polymer membrane).
- **Microspheres:**
 - The drug is uniformly distributed throughout the particle.
 - There is no separate core and shell.

Types

1. Based on structure:

- **Reservoir type (Microcapsules)** – Drug in the center, surrounded by coating.
- **Matrix type (Microspheres)** – Drug dispersed throughout the polymer matrix.

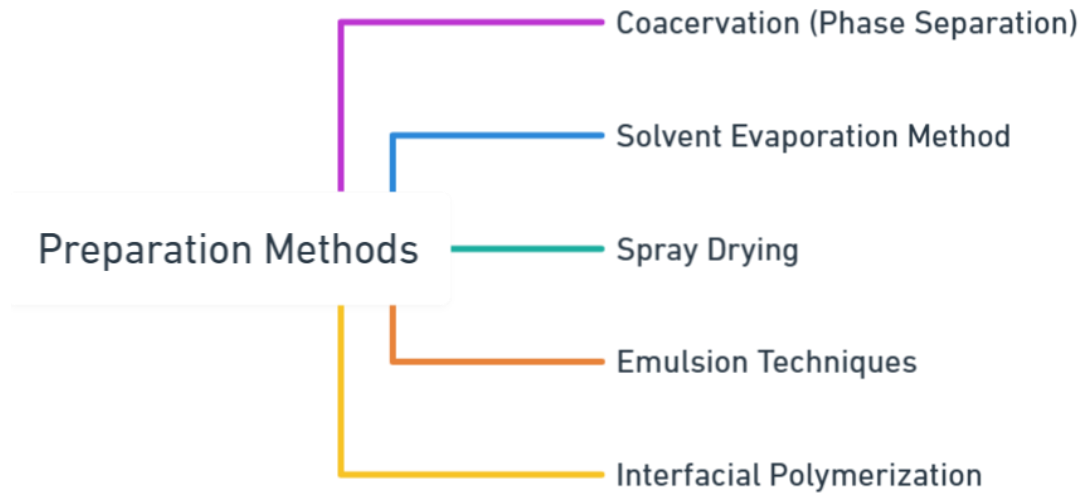
2. Based on material used:

- Natural polymers (gelatin, alginate, chitosan)
- Synthetic polymers (PLA, PLGA, polyacrylates)

3. Based on release behavior:

- Sustained release (slow drug release over time)
- Controlled release (precise control of release rate)
- Targeted delivery (drug released at a specific site)

Preparation Methods



1. Coacervation (Phase Separation)

- Polymer is dissolved in a solution.
- Drug is added.
- Another substance is added to reduce solubility of polymer → polymer separates and coats the drug.
- Used for proteins and sensitive drugs.

2. Solvent Evaporation Method

- Polymer and drug dissolved in volatile solvent.
- This mixture is added to another liquid (like water).
- Solvent evaporates → solid microspheres form.
- Common for hydrophobic drugs.

3. Spray Drying

- Drug + polymer solution is sprayed into hot air.
- Droplets quickly dry and form particles.
- Fast and widely used.

4. Emulsion Techniques

- Oil-in-water or water-in-oil emulsions are formed.
- Polymer solidifies around drug droplets.

5. Interfacial Polymerization

- Two reactive monomers at interface form a polymer coating around drug.

Evaluation

A. Particle Size and Shape

- Measured using microscopy or particle size analyzer.

B. Surface Morphology

- Studied by scanning electron microscope (SEM).

C. Drug Content and Entrapment Efficiency

- Measures how much drug is actually present inside particles.

D. In-vitro Drug Release

- Determines how drug is released over time.

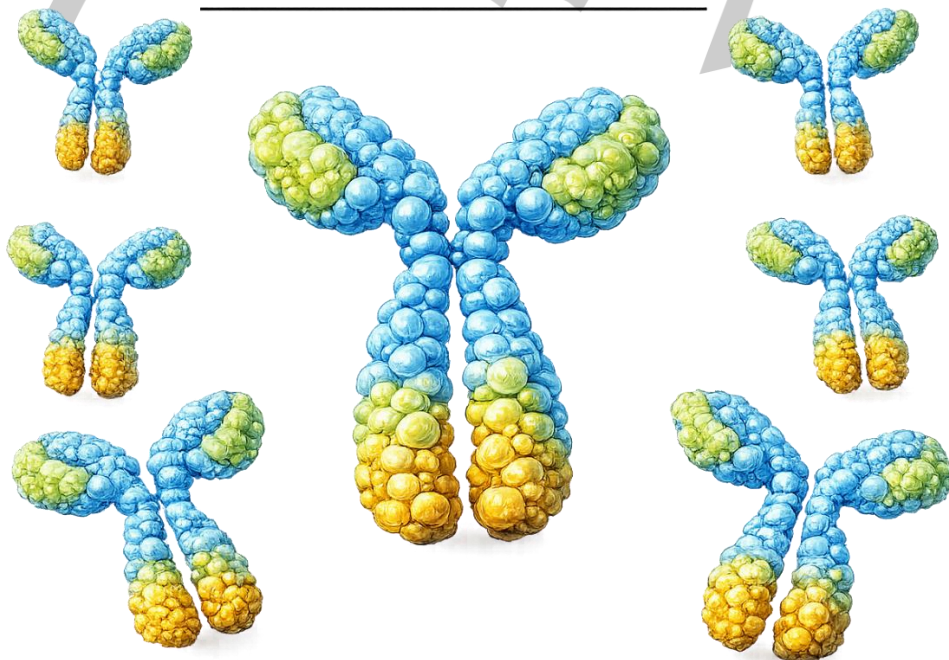
E. Stability Studies

- Checks how formulation behaves over time (temperature, humidity).

Monoclonal Antibodies

- These are antibodies that are identical and produced from a single type of immune cell.
- They recognize and bind to a specific antigen.

Monoclonal Antibodies



Preparation (Hybridoma technology)

1. Immunization

- Animal (usually mouse) is injected with antigen
- Immune system produces B-cells that make antibodies

2. Cell collection

- Spleen cells (B-cells) are collected

3. Fusion

- B-cells are fused with myeloma (cancer) cells
- This creates hybrid cells called hybridomas
- These cells can both grow continuously and produce antibodies

4. Selection

- Only fused cells survive in selective medium

5. Screening

- Hybridomas are tested for desired antibody production

6. Cloning

- Selected hybridomas are cloned to produce identical cells

7. Production

- Large-scale production of monoclonal antibodies

Immunization



Cell collection



Fusion



Selection



Screening



Cloning



Production



Applications

1. Cancer Treatment

- Target cancer cells specifically (e.g., trastuzumab).

2. Autoimmune Diseases

- Used in rheumatoid arthritis, psoriasis.

3. Diagnostic Tools

- Used in pregnancy tests, ELISA tests.

4. Targeted Drug Delivery

- Deliver drugs directly to diseased cells.

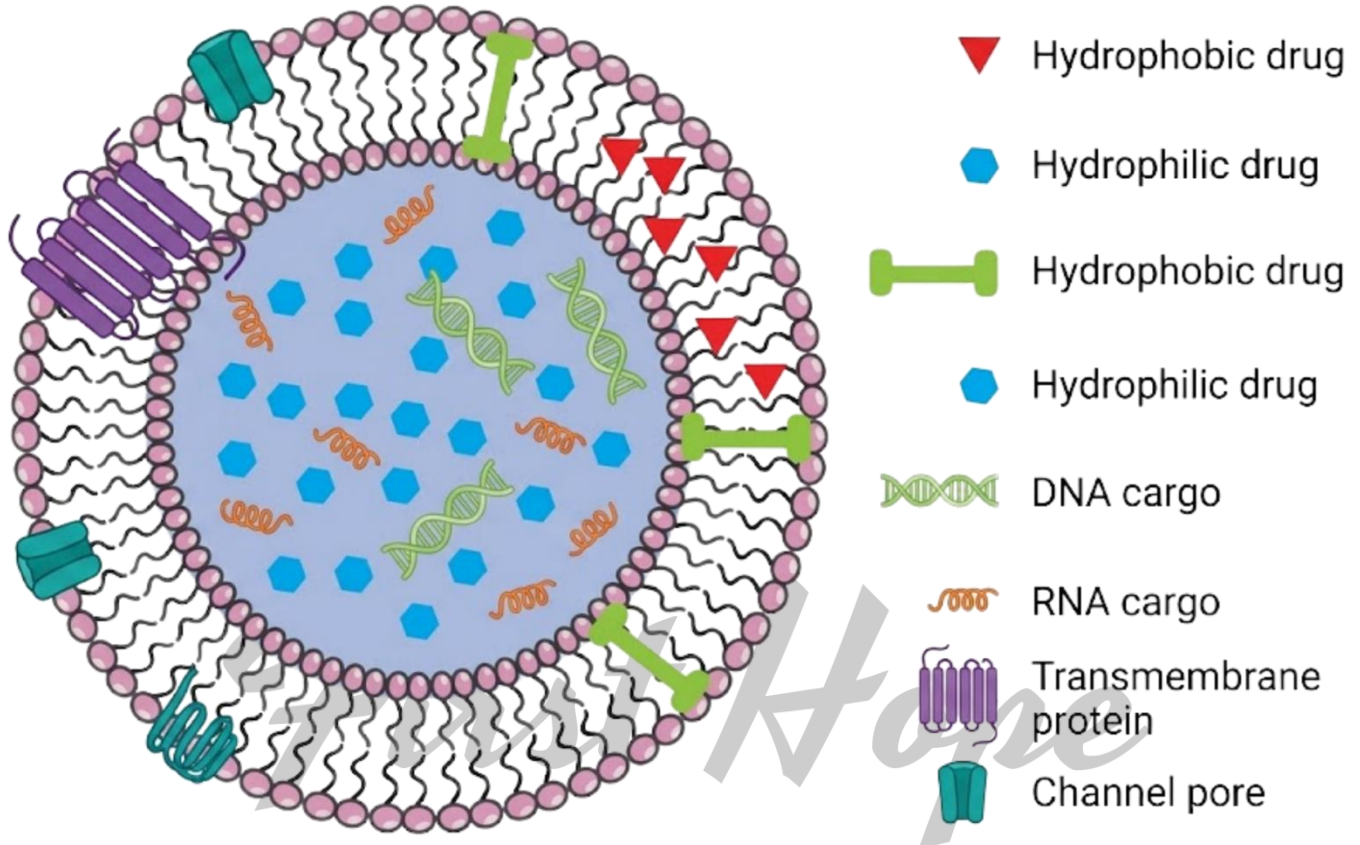
5. Infectious Diseases

- Used in viral infections (e.g., COVID-19 therapies).

Niosomes

Basic idea

- Niosomes are vesicles formed from non-ionic surfactants and cholesterol.
- They are similar to liposomes but more stable and cheaper.



Structure

- Bilayer structure
- Hydrophilic drugs are trapped inside the aqueous core
- Lipophilic drugs are embedded in the bilayer

Preparation Methods



1. Thin Film Hydration Method



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