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Pharmaceutics

CHAPTER 7

Novel Drug Delivery Systems



ENGLISH CHAPTER NOTES

DIPLOMA IN PHARMACY

NOVEL DRUG DELIVERY SYSTEMS

A Drug Delivery System is a formulation or device that delivers a therapeutic substance into the body.

Conventional systems

- Examples: tablets, capsules, injections and ointments.
- These are effective for many purposes but may have limitations.



Tablet



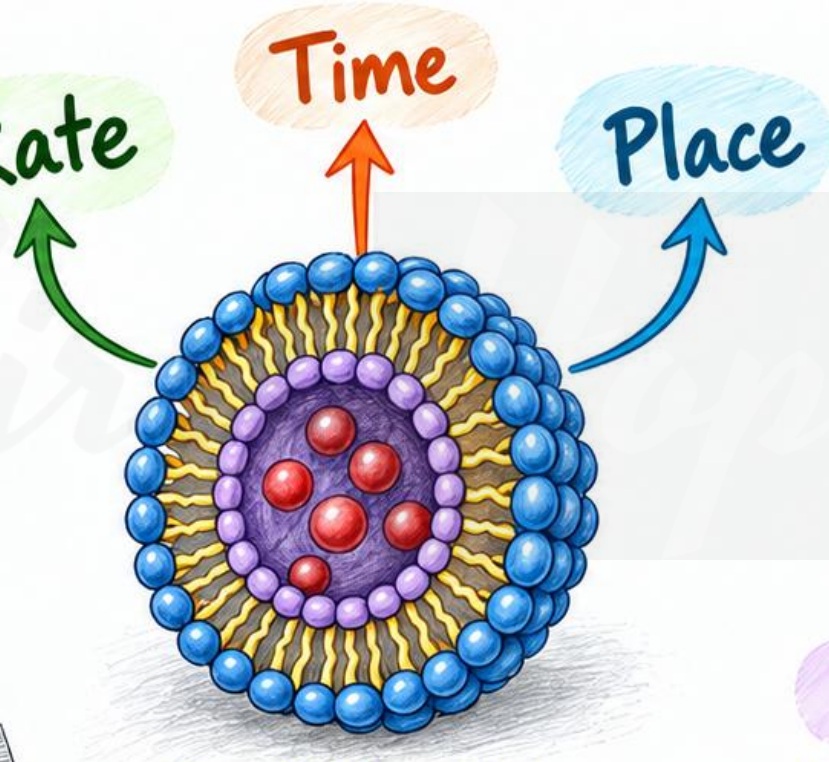
Capsule



Injection



Ointment



Drug Delivery System (formulation or device)

Why NDDS?

- Control the rate and timing of drug release.
- Deliver drug to an intended site more effectively.
- Improve solubility, bioavailability or stability where needed.
- Support convenient administration and patient adherence.

Key idea

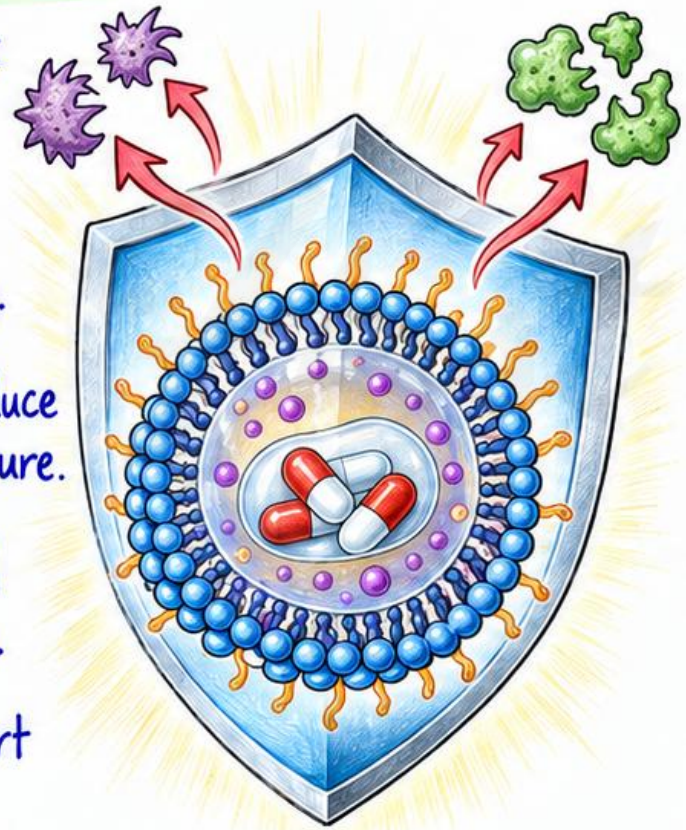
- Match delivery design to the drug and therapeutic purpose.
- Novel design aims to improve performance; benefit must be demonstrated, not assumed.

NDDS: BENEFITS AND CHALLENGES

Delivery improvements bring additional development and quality responsibilities.

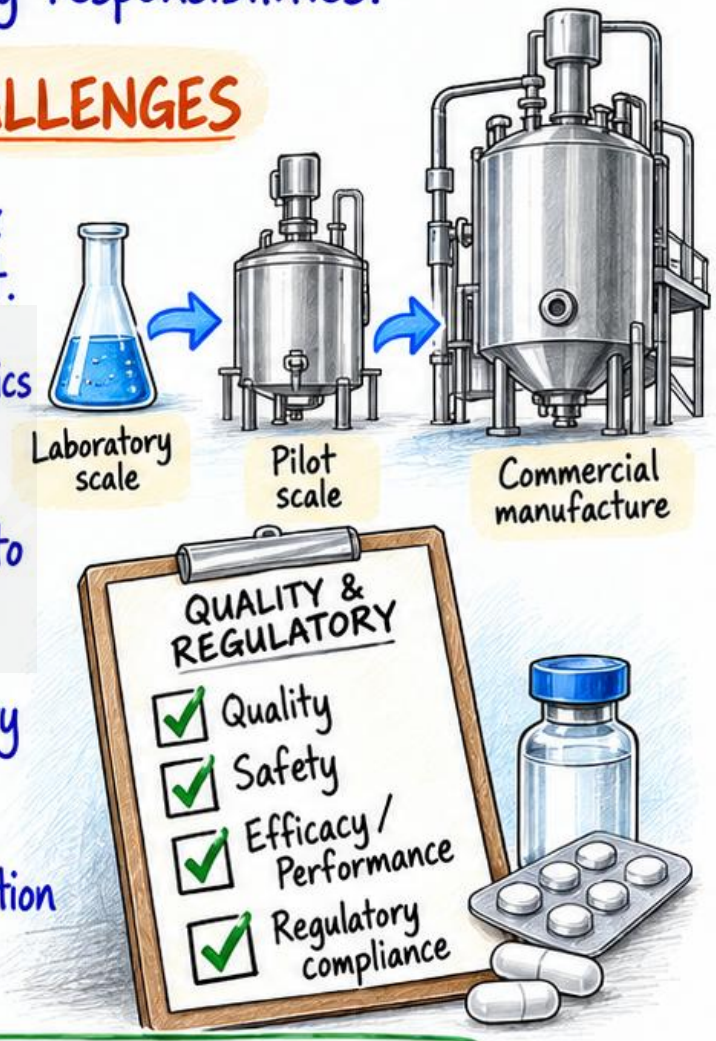
POTENTIAL BENEFITS

- Improved availability of poorly soluble drugs.
- Sustained release can reduce dosing frequency.
- Suitable targeting may reduce unwanted systemic exposure.
- Protection against chemical or enzymatic degradation.
- Convenient use can support adherence.



DEVELOPMENT CHALLENGES

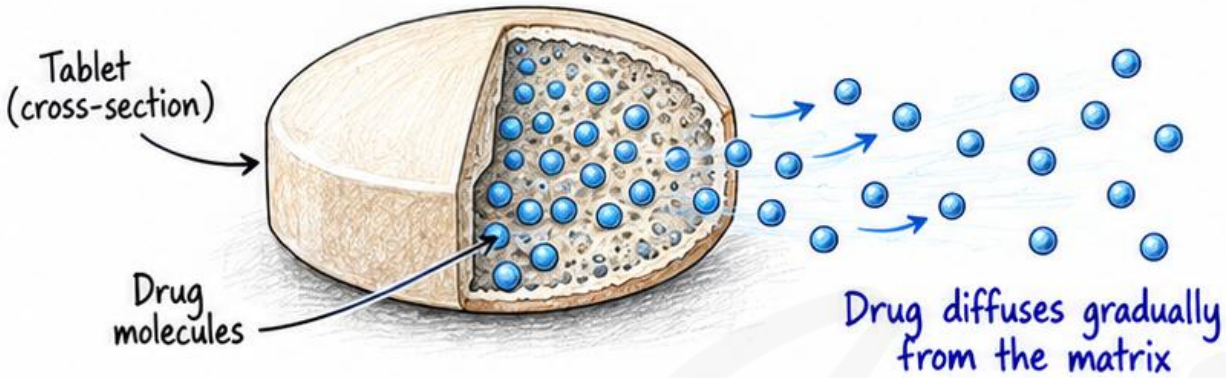
- Higher costs and complex manufacturing equipment.
- Stability problems with biologics or nanocarriers.
- Scale-up from laboratory to commercial manufacture.
- Product-specific regulatory and quality evaluation.
- Patient variability in absorption and response.

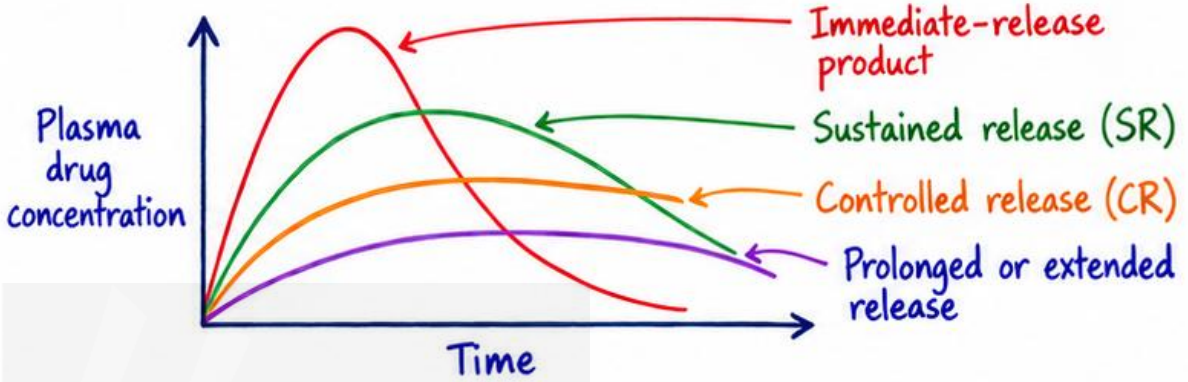


★ A sophisticated carrier is useful only if quality, safety and actual performance are established.

MODIFIED AND CONTROLLED RELEASE

These formulations change drug release compared with immediate-release products.





Sustained release: SR

- Release drug slowly over an extended period.
- Example: diclofenac sodium SR tablets.



Controlled release: CR

- Design more specifically controls the release pattern.
- Example: nifedipine extended-release systems.



Prolonged or extended release

- Extend the duration of drug delivery or action.
- Example: theophylline extended-release tablets.



Important distinction

- Terminology overlaps between products.
- Not every system releases at a perfectly constant rate or produces constant plasma concentrations.
- Read the actual release design and product instructions; the abbreviation alone is insufficient.

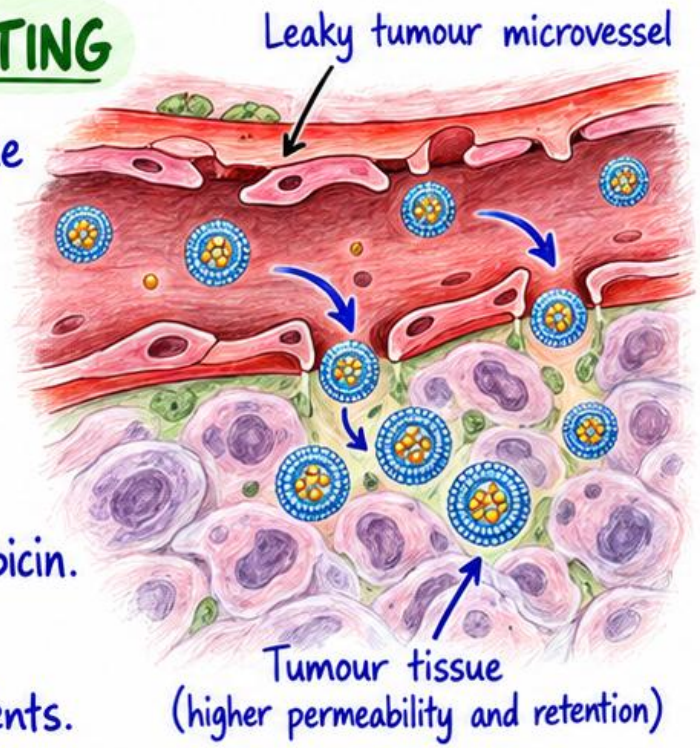


TARGETED DRUG DELIVERY

Targeting aims to favour delivery to a selected tissue, cell or receptor.

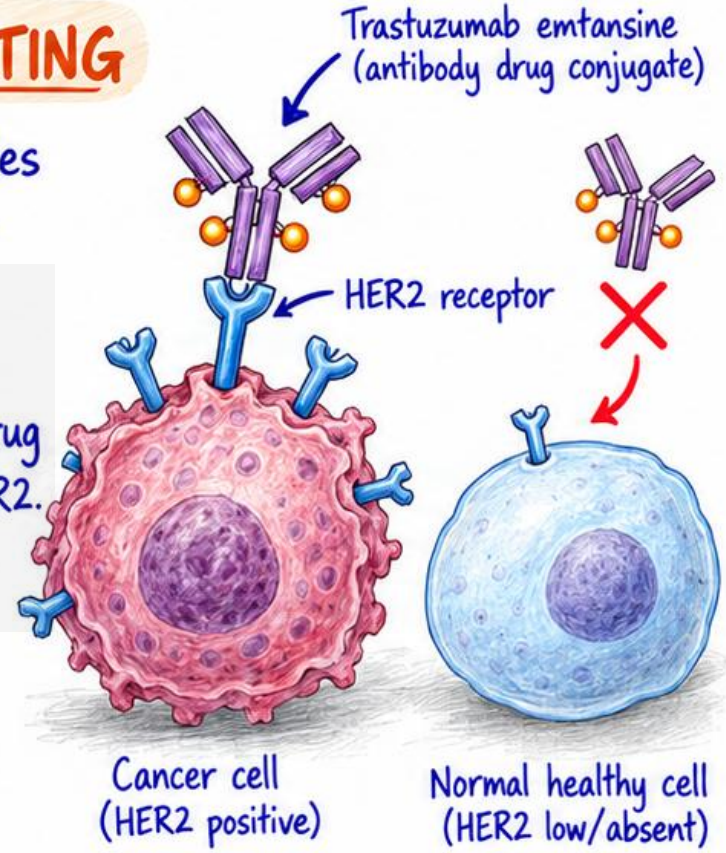
1. PASSIVE TARGETING

- Uses physiological or tissue properties rather than a specific binding ligand.
- Tumour permeability and retention may influence carrier accumulation.
- Example: liposomal doxorubicin.
- The EPR effect varies between tumours and patients.



2. ACTIVE TARGETING

- Uses ligands or antibodies that recognize suitable targets.
- Example: trastuzumab emtansine, an antibody-drug conjugate directed at HER2.



3. LIMITATIONS

- Target access, binding and drug release all affect performance.
- Targeting does not eliminate all off-target exposure or adverse effects.

★ Passive accumulation and active molecular recognition are different approaches.

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