SNS COLLEGE OF PHARMACY AND HEALTH SCIENCES

COIMBATORE-641035

NOVE L DRUG DELIVERY SYSTEM (BP706T)

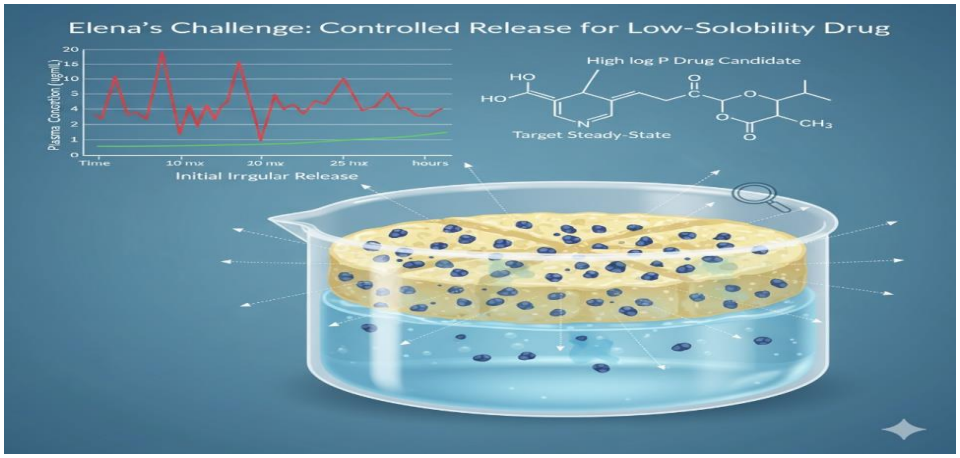
UNIT 1

CASE STUDY PUZZLES

Case Study Puzzle 1: The Mysterious Release Profile

Scenario. Elena is developing a controlled release tablet for a painkiller drug with low water solubility. The drug candidate has a short half-life and requires steady plasma levels over 12 hours to avoid peaks and troughs that cause side effects. She considers diffusion-based systems but notices irregular release in initial tests. Upon checking, the drug's partition coefficient (log P) is high, and it's formulated with a hydrophobic polymer matrix.

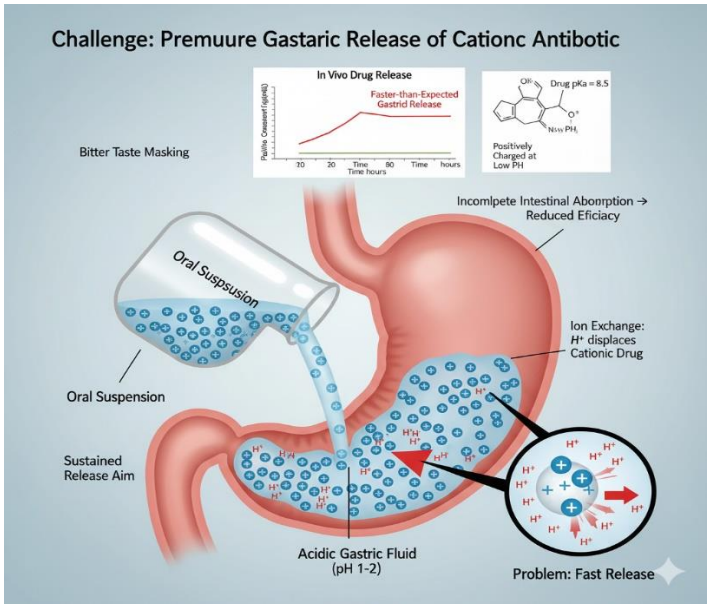
Puzzle Question: Why might the release be irregular, and how could switching to a dissolution-based approach or adjusting the polymer resolve this? Relate this to the physicochemical properties of the drug and the rationale for controlled release.



Case Study Puzzle 2: The Ion Exchange Enigma

Scenario: A pharmaceutical company is designing an oral suspension for a cationic antibiotic using ion exchange resins. The system aims to mask bitter taste and provide sustained release in the GI tract. However, in vivo tests show faster-than-expected release in the stomach, leading to incomplete absorption and reduced efficacy. The drug has a pKa of 8.5 and is positively charged at low pH.

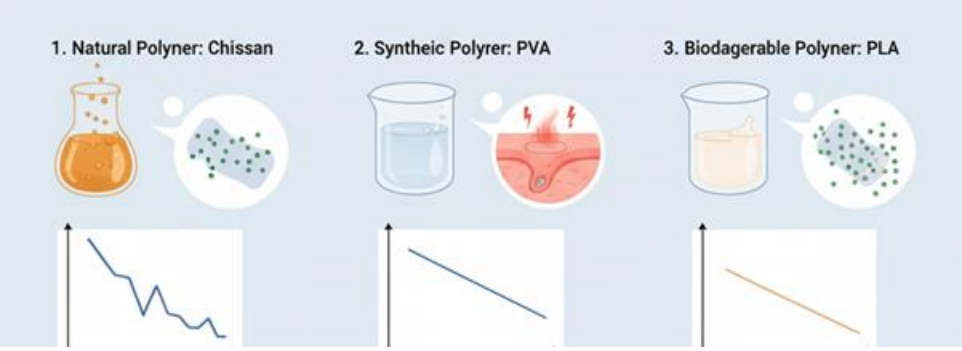
Puzzle Question: What principle is at play causing the premature release, and how can biological properties of the drug or resin selection improve the formulation? Discuss advantages and disadvantages of ion exchange systems..



Case Study Puzzle 3: Polymer Predicament

Scenario: In a lab, students are formulating a transdermal patch for a hormone drug using polymers. They test three: a natural polymer like chitosan, a synthetic one like PVA, and a biodegradable one like PLA. The patch must release the drug steadily over 7 days, but with chitosan, release is too fast; with PVA, it's consistent but skin irritation occurs; with PLA, it's slow but incomplete.

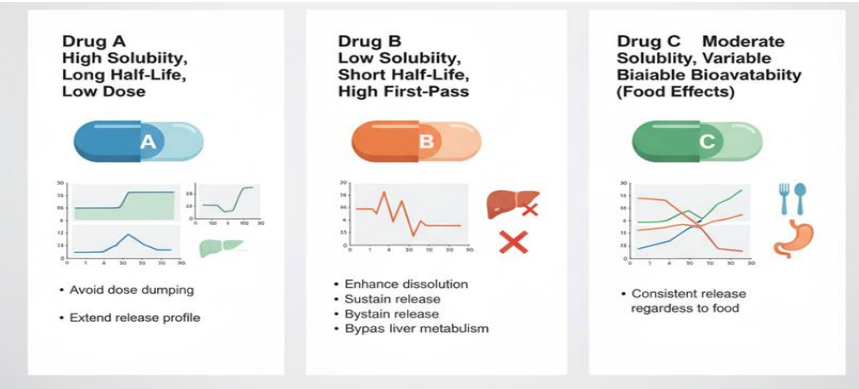
Puzzle Question: Classify these polymers, explain their properties leading to these issues, and suggest an optimal polymer application for controlled release, including advantages.



Case Study Puzzle 4: Drug Selection Dilemma

Scenario: A biotech firm evaluates three drugs for controlled release capsules: Drug A (high solubility, long half-life, low dose); Drug B (low solubility, short half-life, high first-pass metabolism); Drug C (moderate solubility, variable bioavailability due to food effects). They need to avoid frequent dosing and improve compliance.

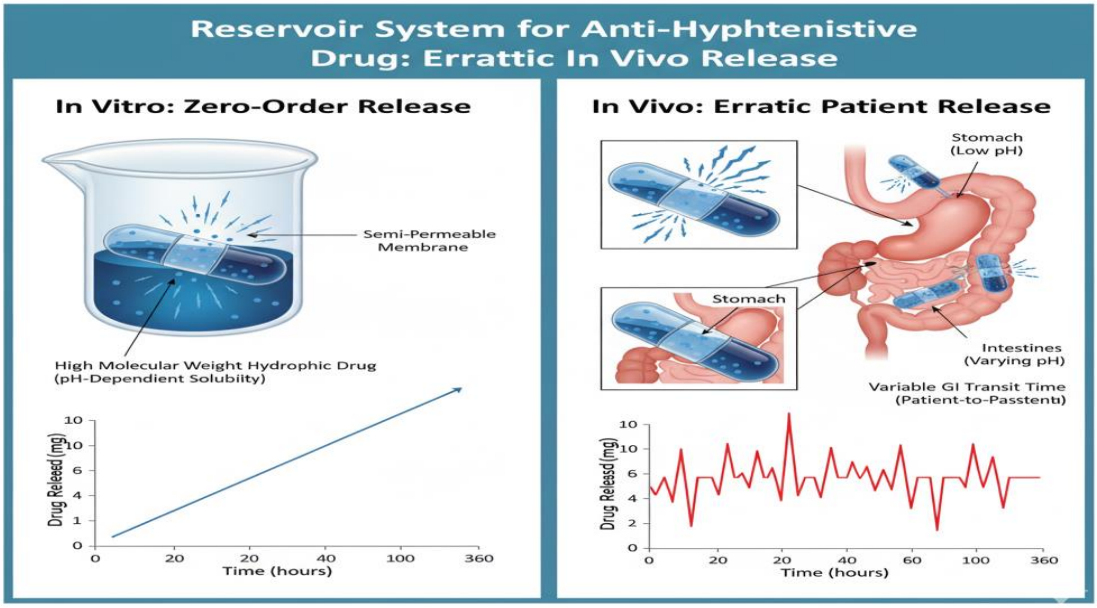
Puzzle Question: Which drug is the best candidate for controlled release, and why, based on physicochemical and biological properties? Outline disadvantages if the wrong one is chosen.



Case Study Puzzle 5: The Diffusion Riddle

Scenario: A reservoir system is designed for an anti-hypertensive drug using a semi-permeable membrane. In vitro, release is zero-order, but in patients, it's erratic. The drug has high molecular weight and is hydrophilic, with pH-dependent solubility. GI transit time varies among patients.

Puzzle Question: Identify the approach (diffusion-based) flaw, relate to biological properties, and propose a fix using polymers or ion exchange hybrid.



ANSWERS