Hydrophilic matrices are popular and widely used formulation options for oral extended release (ER) drug delivery systems. The inherent characteristics of these matrices are exploited maximally by adhering to its rigorous acceptance criteria, which rely on a range of critical grades and unique drug release mechanisms, which can be utilized for modulating drug release.

The Influence of Polymer Concentration on Release of Poorly Soluble Drugs from Polyethylene Oxide Extended Release Matrices

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Purpose

Hydrophilic matrices are popular and widely used formulation options for oral extended release (ER) drug delivery systems. The inherent characteristics of these matrices are exploited maximally by adhering to its rigorous acceptance criteria, which rely on a range of critical grades and unique drug release mechanisms, which can be utilized for modulating drug release.

The study was designed to evaluate the influence of drug release from hydrophilic matrices.

Methods

Model formulations containing 15% w/w APIs with various aqueous solubility (gliclazide, 0.055 mg/mL; lamotrigine, 0.17 mg/mL; famotidine, 2.0 mg/mL; amlodipine, 1.13 mg/mL; theophylline, 1.1 mg/mL; paracetamol, 1.2 g/mL) were prepared. The polymers used were 100% PEO with molecular weight and viscosity in the range of 84% PEO, 100,000,000 Da; 84% PEO, 1,000,000 Da; 84% PEO, 100,000 Da; 84% PEO, 10,000 Da; 84% PEO, 1,000 Da; 84% PEO, 100 Da; 84% PEO, 10 Da; 84% PEO, 1 Da; 84% PEO, 0 Da. Drug release was investigated at a temperature of 37.0 ± 0.5°C with a 1,000 rpm agitator using phosphate buffer (pH 7.4) as the dissolution medium.

Results

All formulations produced low Ejection Force (NEF) and low Ejection Stress (NES) tablets with excellent mechanical strength (2-7 MPa). Aqueous solubility of the APIs had an effect on their release from the PEO ER matrices. For APIs with higher than 1 mg/mL solubility, the release rate appeared to be significantly affected by polymer concentrations above 15% w/w PEO in the formulation. For APIs with lower solubility, the release rate appeared not to be significantly affected by polymer concentrations above 15% w/w PEO in the formulation. For APIs with higher solubility, the release rate appeared to be significantly affected by polymer concentrations above 15% w/w PEO in the formulation. For APIs with lower solubility, the release rate appeared not to be significantly affected by polymer concentrations above 15% w/w PEO in the formulation.

Conclusions

• Mechanically strong ER PEO matrix tablets were produced for all formulations in this study.
• The different drug is a half-life quantity (to the literature), which is the time required for the formulation to result in reproducible zero- and first-order drug release profiles.
• The NEF and NES values were affected significantly when an increase in the polymer concentration was obtained. This phenomenon can be related to a possible enhancement in the mechanical strength of the PEO ER matrices.
• Mechanical properties were also found to be affected significantly when an increase in the polymer concentration was obtained. This phenomenon can be related to a possible enhancement in the mechanical strength of the PEO ER matrices.

References


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