Asymmetric Membrane Capsules for Delivery of Poorly Water Soluble Drugs by Osmotic Effects

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Abstract

A non-disintegrating polymeric capsule system, in which asymmetric membrane offers an improved osmotic effect, was used to deliver poorly water-soluble drugs in a control manner. The capsule wall membrane was made by a phase inversion process, in which asymmetric membrane was formed on stainless-steel mold pins by dipping the mold pins into a coating solution containing a polymeric material followed by dipping into a quench solution. This study evaluates the influence of coating formulation that was cellulose acetate (CA), ethylcellulose (EC), and plasticizer (glycerin and triethyl citrate). Results show capsule that made by CA with glycerin (formulation A), which appear in asymmetric structure and are able to release chlorpheniramine maleate (CM) in significant percentage. Two poorly water-soluble drugs of felodipine (FL) and nifedipine (NF) were selected as the model drug to demonstrate how the controlled release characteristics can be manipulated by the design of polymeric capsules with an asymmetric membrane and core formulations. Results show that sodium lauryl sulfate (SLS) is able to promote the release of FL from polymeric capsules prepared with CA with asymmetrical membrane. The addition of solubilizer, including RH40, PVP K-17, and PEG 4000 could enhance the release of FL but with an extent not being related to its solubility. Based on these results, influence of core formulation variables, including the viscosity and added amount of hydroxypropyl methylcellulose (HPMC), the added amount of SLS, and drug loading were examined on the release of NF. It was found that HPMC of 50 cps was suitable to be a thickening agent and both added amount of HPMC and SLS showed a comparable and profoundly positive effect, whereas NF loading had no influence on the drug release percent and rate. There existed a