Formulation and evaluation of controlled-release, carrageenan-based powder formulations filled into hard gelatin capsules

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ABSTRACT

Hard gelatin capsules (HGCs) are typically used as immediate release dosage forms, however, controlled drug release can from HGCs be obtained by the application of film coating onto the capsule shells or by filling them with controlled release multi-particulates (e.g. pellets and mini-tablets).

The filling of a hydrophilic gelling polymer into the capsule is an alternative approach to the time-consuming preparation and filling of multi-particulates. Carrageenan is a linear, sulfated polysaccharide that is commonly used as a thickener in pharmaceutical formulations.

The release behavior of propranolol HCl – carrageenan powder mixtures filled into hard gelatin capsules was investigated as a function of drug – to – polymer ratio, the capsule fill weight, grade of carrageenan used. In addition, the effect of the drug release testing method (USP apparatus I or II), rotation speed, pH of the release medium and ionic strength of the release medium on drug release were investigated.

The electrostatic interaction of propranolol HCl with carrageenan was also investigated using equilibrium dialysis method to determine the binding capacity and the stability constant of the complex formed.

Viscarin GP 109 was found to provide a fast-gelling behavior with excellent controlled release properties. Drug loading and ionic strength of the medium significantly influenced drug release. Release in USP apparatus 1 was slower than that in USP apparatus 2. Propranolol HCl formed an insoluble complex with carrageenan with a high binding capacity and stability