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Research Article

Evaluation of Drug Release from Carboxymethyl Starch-Xanthan Gum-HPMC Matrix

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Abstract

The use of hydrophilic polymers from natural origin. Especially the polysaccharides have been the focus of current research activity in the design of matrix device due to their non toxic, biocompatible, biodegradable nature and broad regulatory acceptance. A large number of polysaccharides such as Carboxymethyl starch, Xanthan gum, Hydroxy propyl methyl cellulose (HPMC), Sodium Alginate etc. have been used as hydrophilic matrices to investigate release behavior of drug. In order to enrich this resources, there is a quest for new polysaccharide owing to their diverse chemical composition and functional groups are amenable to chemical modification and thus tailor made polymeric matrices are obtained which which can be used to modulate oral drug release. The objective of this study is to characterize Verapamil hydrochloride loaded matrix dosage form using hydroxy propyl methyl cellulose (HPMC), xanthan gum, corn starch as rate retarding polymer. Dosage forms were prepared using different polymers along with drug Verapamil hydrochloride. Carboxymethylation was performed. Drug release was evaluated in simulated gastric media. Addition of xanthan gum significantly retarded the burst release of drug. The retardation of drug release was found to be dependent upon the concentration. The formulation composed of HPMC K4M and CS ([illegible]) followed super case transport i.e. swelling controlled, purely relaxation controlled drug delivery.

Keywords: Verapamil HCl, Natural gums, xanthan gum, HPMC, sustained release

INTRODUCTION

The oral route is the most common route for drugs that have a "small absorption window in the gastrointestinal tract (GIT)". For drugs with an absorption window in the GIT, it is essential that drugs are not delivered significantly beyond the desired site of action or absorption. Regulated release systems are also developed to accomplish this purpose. These drug delivery systems monitor not only the rate at which the drug is released over time (temporary control), but also the place from which the drug is distributed (spatial control) [1].

Many of these managed delivery systems use hydrophilic polymer matrices that provide the delivery of sparingly soluble drugs with useful levels of control. These matrices do not provide adequate control over the rate of drug release for soluble drugs, especially for highly soluble drugs, but instead result in a release that approximates first-order kinetics. That is, the release rate is an inverse function of the elapsed time's square root. With this release pattern, in the acidic atmosphere of the body, much of the medication in the matrix is always released within the first hour [2]. The retention of the drug delivery system in the body & the rate at which the drug is released is very critical for drugs such as controlling its rate of release from the dosage type is to grow a polymer matrix capable of swelling and erosion in the acidic stomach environment to form a hydrodynamically balanced mass swelled but erodible [3]. It is expected that the swelling of the polymer matrix will result in low density mass from, such as in situ forming hydrogel and continuous erosion will cause a constant delivery rate of the drug from the matrix [4].

In the current investigation for the engineering of the polymer matrix, pH independent swellable and erodible HPMC K4M and pH based swellable carboxymethylated Locust bean gum (CLBG) or Tamarind Seed gum (CTSG) were used. LBG is a galactomannan of high molecular weight that has a straight chain of mannose units connected to this linear chain of galactopyranose units. It is a neutral, non gelling polysaccharide that requires high temperatures and intense agitation to dissolve fully in water. It is needed to heat LBG to about 80-85 °C for full hydration in an aqueous medium. A disordered, fluctuating, random coil conformation is adopted by dissolved LBG [5,6]. Pseudoplasticity is present in the LBG solution (shear-thinning behaviour), which at enhanced shear rate shows reduced viscosity and "can form a weak gel network with concentrations as low as 0.5%" [7]. The FDA classifies it as GRAS and uses it for its properties of [illegible]