A Comparative Study of Triple-Layered Aceclofenac Matrix Tablets Formulated using Xanthan Gum and Guar Gum

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ABSTRACT

The aim of the present study was to develop sustained release, multilayered-matrix tablet of aceclofenac using natural polymers-guar gum (GG) and xanthan gum (XG) as carrier for core matrix and hydroxyl propylmethyl cellulose (HPMC K-15M), sodium carboxymethylcellulose (NaCMC) and ethyl cellulose (EC) and polyvinylpyrrolidone (PVP-K30) for preparing bottom and top layers. The formulated tablets were evaluated for uniformity of weight, drug content, friability, hardness, thickness, swelling index and in vitro drug release. The physicochemical properties of tablets were found within the limits. The physiochemical investigation showed that aceclofenac matrix tablet prepared with xanthan gum showed better dissolution profile as compared to that of guar gum. Matrix tablets of xanthan gum with 6% W/V xanthan gum (MTX1) showed the highest percent drug release (88.98%), while matrix tablets of guar gum with 6% W/V guar gum (MTG1) showed the highest percent drug release (73.89%) at the end of 8 hours in pH 6.8 phosphate buffer. Among the matrix tablet of xanthan gum MTX4 (with 24% W/V of xanthan) showed the lowest percent drug release (48.65%) and while among the guar gum tablets MTG4 (with 24% W/V of guar gum) showed the lowest percent drug release (48.65%) at the end of 8 hours. It was concluded that increasing the concentration of gum from 6% W/V to 24% W/V in the formulation decreased the amount of drug release from the tablet. The xanthan gum based matrix tablets of aceclofenac were found to be superior to that of guar gum matrix tablets for potential therapeutic uses.

KEYWORDS: Aceclofenac; matrix tablets; sustained release; xanthan gum; guar gum.

Introduction

Oral ingestion has long being the most convenient and commonly employed route of drug delivery due to its ease of administration and flexibility in the design of dosage form. There are many ways to design modified release dosage forms for oral administration and one of them is matrix tablet which prolongs and controls the release of drug that is dissolved or dispersed. In other words, matrix is defined as a well composite of one or more drugs with a gelling agent like hydrophilic polymers (Salsa et al., 1997).

Non-steroidal anti-inflammatory drugs (NSAIDs) are considered to be the first-line drugs in the symptomatic treatment of rheumatoid arthritis, osteoarthritis, ankylosing and spondylitis. Aceclofenac is a newer derivative of diclofenac with low gastrointestinal complications. On long-term administration, aceclofenac shows some adverse side effects most frequently like gastrointestinal (GI) disturbances, peptic ulceration and gastrointestinal bleeding. Moreover, it is poorly water soluble, due to which its dissolution in GI fluid is very low, which in turn adversely affect the bioavailability. The short biological half-life (about 4 hours) and dosing frequency (more than one per day) make aceclofenac an ideal candidate for developing its sustained release products (Gowda et al., 2008; Lichtenberger et al., 1995). To reduce the frequency of administration and to improve patient compliance, a once-daily sustained release formulation of aceclofenac is desirable. Matrix tablets composed of drug and polymer as release retarding material offer the most widely investigated approach in designing a sustained release system (Yeole et al., 2006; Verhoeven et al., 2006; Krishnaiah et al., 2002).

Natural gums are biodegradable and nontoxic, which hydrate and swell on contact with aqueous media, and these have been used for the preparation of dosage form. Xanthan gum, a high molecular weight extracellular polysaccharide, is a commercial product obtained by the fermentation of Xanthomonas campesteris (Gram-negative bacterium) (Yeole et al., 2006; Verhoeven et al., 2006).

Guar gum is a polysaccharide derivative glycoside linkage (galactomannan) obtained from the ground endosperm of guar plant (Cyamopsis tetragonolobus). Guar gum has been investigated as a matrix former for controlled release of. It is a nontoxic and nonirritant material. Natural polysaccharides remain undigested in the stomach and the small intestine and are degraded by the vast anaerobic microflora of the colon (Krishnaiah et al., 2002; Varshosaz et al., 2006).

Currently, the NSAIDs tablets available in the market have not yet attained the physiological goal of providing therapeutic effect over an extended period of time without gastric irritation. This approach i.e.