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Review

Raft forming system—An upcoming approach of gastroretentive drug delivery system

Vipul D. Prajapati *, Girish K. Jani, Tohra A. Khutliwala, Bhumi S. Zala

Department of Pharmaceutics, S.S.R. College of Pharmacy, Sayli-Silvassa Road, U.T. of Dadra and Nagar Haveli-396230, India

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ABSTRACT

In recent era various technologies have been made in research and development of controlled release oral drug delivery system to overcome various physiological difficulties such as variation in gastric retention and emptying time. To overcome this drawback and to maximize the oral absorption of various drugs, novel drug delivery systems have been developed. Gastroretentive drug delivery system is facing many challenges which can be overcome by upcoming newly emerging approach i.e. raft forming system. The purpose of writing this review is to focus on recent development of stomach specific floating drug delivery system to circumvent the difficulties associated with formulation design. Various gastroretentive approaches that have been developed till now are also discussed. The present study provides valuable information & highlights advances in this raft forming system. This review attempts to discuss various factors like physiological factors, physicochemical factors and formulation factors to be considered in the development of the raft forming system. Different types of smart polymers used for their formulation have also been summarized. The review focuses on the mechanism, formulation and development of the raft forming system. This review also summarizes the studies to evaluate the performance and application of these systems. The study finally highlights advantages, disadvantages, and marketed preparation of the raft forming system.

Contents

* Corresponding author at: Department of Pharmaceutics and Pharmaceutical Technology, SSR College of Pharmacy, Sayli-Silvassa Road, Sayli, Silvassa, U.T. of Dadra and Nagar Haveli-396230, India. Tel.: +91 9824284159; fax: +91 260 2681104.
E-mail address: vippra2000@yahoo.com (V.D. Prajapati).

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1. Introduction

The purpose for designing any drug delivery system is to deliver the drug directly to the site of action to achieve and maintain the desired drug concentration in the body. Over the past few years attention has been focussed on development of controlled and sustained drug delivery systems. Extensive research has been carried out in designing of sustained drug delivery systems. Various drug delivery systems are used for maximum therapeutic efficacy and reduction in the side effects of the drug. Among the various routes oral route became the most preferred, promising and effective route for the administration of therapeutic agents, because of its numerous advantages like low cost of therapy, ease of administration, flexibility in formulation, delivery of drugs for longer period of time and its better bioavailability which leads to higher level of patient compliance. Approximately 50% of the drug delivery systems available in the market are oral drug delivery system [1].

It is clear from the recent research and patent literature that there is an increased interest in novel dosage forms that are retained in the stomach for a prolonged and predictable period of time [2]. Gastroretentive drug delivery system (GRDDS) is one of the novel approaches in this area. Oral controlled release dosage forms are the most commonly acceptable formulations but still offer highest attention in the area of novel drug delivery systems [3].

Drugs that are easily absorbed from the gastrointestinal tract (GIT) and have short half-lives are eliminated quickly from the systemic circulation. Frequent dosing of these drugs is required to achieve suitable therapeutic activity. To avoid this limitation, the developments of oral sustained-controlled release formulations are an attempt to release the drug slowly into the GIT and maintain an effective drug concentration in the systemic circulation for a long time. After oral administration, such a drug delivery would be retained in the stomach and release the drug in a controlled manner, so that the drug could be supplied continuously to its absorption sites in the gastrointestinal tract [4]. Therefore, a system is necessary to be designed that permits longer gastric residence which will extend the time within which drug absorption can occur in the small intestine.

To formulate a site-specific orally administered conventional controlled release dosage form, it is desirable to achieve prolong gastric residence time by the drug delivery system. GRDDS is the system in which a drug can remain in the gastric region for several hours in order to prolong its gastric residence time. Rapid gastrointestinal transit of conventional GRDDS can prevent complete drug release at gastric region and reduce the efficacy of the administered dose of drugs as the majority of drugs are absorbed in the stomach or the upper part of the small intestine [6,7]. To overcome this limitation, a modified GRDDS is preferred (Fig. 1).

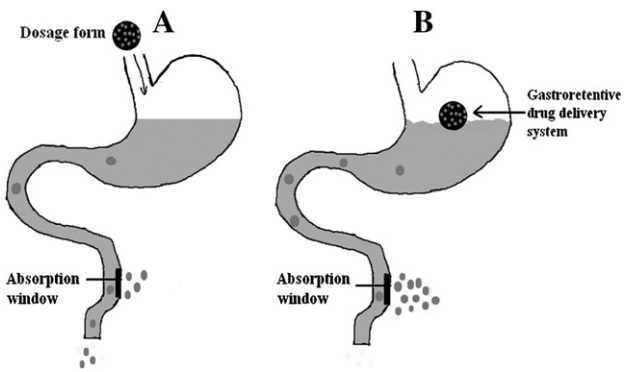

Fig. 1. Drug absorption in: (A) conventional dosage form and (B) the gastroretentive drug delivery system.