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"A REVIEW ON FLOATING DRUG DELIVERY SYSTEM"

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ABSTRACT:-

Oral delivery of drugs is by far the most preferable route of drug delivery due to the ease of administration, patient compliance and flexibility in formulation, etc. from immediate release to site-specific delivery, oral dosage forms have really progressed. Floating Delivery will provide advantages such as the delivery of drugs with narrow absorption window in the small intestinal region. Also, longer residence time in the stomach could be advantageous for local action in the upper part of the small intestine, for example treatment of peptic ulcer disease. Furthermore, improve bio availability is expected for drugs that are absorbed readily upon release in the GI tract.

Keywords: Floating Delivery, patient compliance, narrow absorption window, improve bio availability.

1. Introduction

Gastric retention will provide advantages such as the delivery of drugs with narrow absorption window in the small intestinal region. Also, longer residence time in the stomach could be advantageous for local action in the upper part of the small intestine, for example treatment of peptic ulcer disease. Furthermore, improve bio availability is expected for drugs that are absorbed readily upon release in the GI tract. These drugs can be delivered ideally by slow release from the stomach. Many drugs categorized as once a day delivery have been demonstrated to have sub optimal absorption due to dependence on the transit time of the dosage form, making traditional extended release development challenging. Therefore, a system designed for longer gastric retention ill extend the time within which drug absorption can occur in the small intestine. Certain types of drugs can benefit from using gastric retentive devices. These includes (a) drugs locally acting in the stomach (b) drugs having a narrow absorption window in the stomach (c) that are unstable in the intestinal or colonic environments, (d) have low solubility at high pH values[1].

2 FACTORS AFFECTING GASTRIC RESIDENCE TIME OF FDDS[2]

a) Formulation factors

i) Size of tablets

Retention of floating dosage forms in stomach depends on the size of tablets. Small tablets are emptied from the stomach during the digestive phase, but large ones are expelled during the house keeping waves. Floating and nonfloating capsules of 3 different sizes having a diameter of 4.8 mm (small units), 7.5 mm (medium units), and 9.9 mm (large units), were formulated and analyzed for their different properties.

ii) Density of tablets

Density is the main factor affecting the gastric residence time of dosage form. A buoyant dosage form having a density less than that of the gastric fluids floats, since it is away from the pyloric sphincter, the dosage unit is retained in the stomach for a prolonged period.

iii) Shape of tablets

The shape of dosage form is one of the factors that affect its gastric residence time. Six shapes (ring tetrahedron, cloverleaf, string, pellet, and disk) were screened in vivo for their gastric retention potential.

iv) Viscosity grade of polymer

Drug release and floating properties of FDDS are greatly affected by viscosity of polymers and their interaction. Low viscosity polymers (e.g., HPMC K100 LV) were found to be more beneficial than high viscosity polymers (e.g., HPMC K4M) in improving floating properties.

3 Based on the mechanism of buoyancy FDDS can be Classified into[3]

A. Single Unit Floating Dosage Systems

- a) Effervescent Systems (Gas-generating Systems)
- b) Non-effervescent Systems

B. Multiple Unit Floating Dosage Systems

- a) Non-effervescent Systems
- b) Effervescent Systems (Gas-generating Systems)
- c) Hollow Microspheres

C. Raft Forming Systems.

4 TYPES OF FLOATING DRUG DELIVERY SYSTEMS[4]

Various approaches have been pursued to increase the retention of an oral dosage form in the stomach. These systems include:

A. Floating systems

B. Bioadhesive systems

C. Swelling and expanding systems

D. High density systems and

E. Modified systems

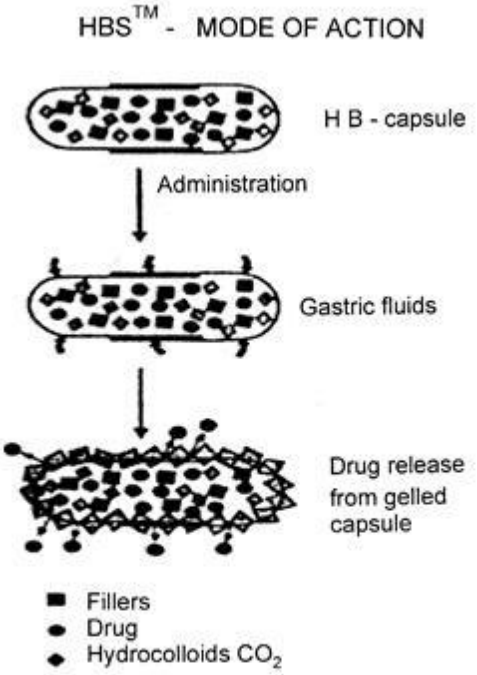

Fig. 1 Working principle of the hydrodynamically balanced system within the gel structure.

5 Advantages of Floating Drug Delivery Systems[4]

Floating dosage systems form important technological drug delivery systems with gastric retentive behavior and offer several advantages in drug delivery. These advantages include:

1. Floating dosage forms such as tablets or capsules will remains in the solution for prolonged time even at the alkaline pH of the intestine.
2. FDDS are advantageous for drugs meant for local action in the stomach eg: Antacids

3. FDDS dosage forms are advantageous in case of vigorous intestinal movement and in diarrhea to keep the drug in floating condition in stomach to get a relatively better response.
4. Acidic substance like aspirin causes irritation on the stomach wall when come in contact with it hence; HBS/FDDS formulations may be useful for the administration of aspirin and other similar drugs.
5. The FDDS are advantageous for drugs absorbed through the stomach eg: Ferrous salts, Antacids. Improved drug absorption, because of increased GRT and more time spent by the dosage form at its absorption site.
6. Controlled delivery of drugs. Minimizing the mucosal irritation due to drugs, by drug releasing slowly at controlled rate.
7. Treatment of gastrointestinal disorders such as gastroesophageal reflux.
8. Ease of administration and better patient compliance.
9. Site-specific drug delivery.

6 Application of floating drug delivery system[5]

1. Enhanced Bioavailability:

The bioavailability of riboflavin CR-GRDF is significantly enhanced in comparison to the administration of non-GRDF CR polymeric formulations. There are several different processes, related to absorption and transit of the drug in the gastrointestinal tract, that act concomitantly to influence the magnitude of drug absorption.

2. Sustained drug delivery:

Oral CR formulations are encountered with problems such as gastric residence time in the GIT. These problems can be overcome with the HBS systems which can remain in the stomach for long periods and have a bulk density <1 as a result of which they can float on the gastric contents. These systems are relatively larger in size and passing from the pyloric opening is prohibited.

3. Site specific drug delievery systems:

These systems are particularly advantageous for drugs that are specifically absorbed from the stomach or the proximal part of the small intestine .The controlled, slow delivery of drug to the stomach provides sufficient local therapeutic levels and limits the systemic exposure to the drug. This reduces side effects that are caused by the drug in the blood circulation. In addition, the prolonged gastric availability from a site directed delivery system may also reduce the dosing frequency. Eg: Furosemide and Riboflavin.

4. Absorption enhancement:

Drugs which are having poor bioavailability because of site specific absorption from the upper part of the GIT are potential candidates to be formulated as floating drug delivery systems, there by maximizing their absorption.

5. Minimized adverse activity at the colon:

Retention of the drug in the HBS systems at the stomach minimizes the amount of drug that reaches the colon. Thus, undesirable activities of the drug in colon may be prevented. This Pharmacodynamic aspect provides the rationale for GRDF formulation for beta lactam antibiotics that are absorbed only from the small intestine, and whose presence in the colon leads to the development of microorganism's resistance.

6. Reduced fluctuations of drug concentration:

Continuous input of the drug following CRGRDF administration produces blood drug concentrations within a narrower range compared to the immediate release dosage forms. Thus, fluctuations in drug effects are minimized and concentration dependent adverse effects that are associated with peak concentrations can be prevented. This feature is of special importance for drugs with a narrow therapeutic index.

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