

FIG. 1 Classification of different types of gastro-retentive drug delivery systems.

be formulated as GRDDS. Drugs such as corticosteroids and mesalazine are selectively released in the colon. Their formulation as GRDDS will conversely affect these drugs by increasing their residence time in the stomach, thus causing a delay in reaching the colon and delaying their therapeutic action (Fig. 2) [22]. Fig. 2 represents different GRDDS in the stomach.

Various strategies have been employed to formulate GRDDS that have been classified and discussed in the following sections.

2.1. Floating Systems

Floating systems or the low-density systems are the most prominent GRDDS. The density of the system is lower than the density of the gastric contents, due to which it causes buoyancy in the gastric fluid. As the name suggests, the system floats in the stomach [23].

Two distinct mechanisms can be attributed to the buoyant nature of these systems, namely effervescent systems and noneffervescent systems, based on their gas production. Fig. 2 represents the various mechanisms involved in the gastroretention of drug delivery systems.

2.1.1. Effervescent systems

Effervescent systems are based on gas generation or use of volatile liquids. In the case of gas-generating systems,

effervescent agents such as carbonates and bicarbonates react with the gastric acids or the acids in formulation such as citric acid and tartaric acid, resulting in generation of CO_2 gas. This gas is entrapped in the matrix and provides instant support for floating. Furthermore, the presence of entrapped gas in polymeric matrix alters

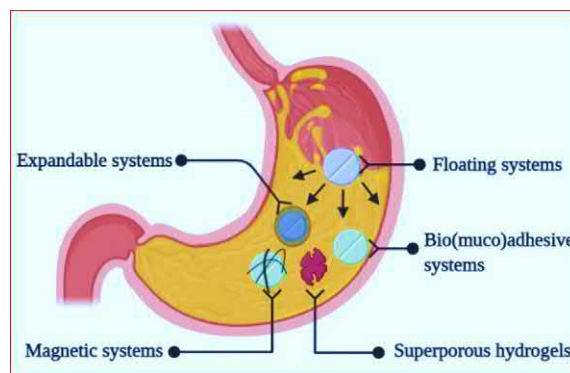


FIG. 2 Mechanism of release of drug by various gastro-retentive drug delivery systems. (From C.M. Lopes, Catarina Bettencourt, Alessandra Rossi, Francesca Buttini, Pedro Barata, Overview on gastroretentive drug delivery systems for improving drug bioavailability. *Int. J. Pharm.* 510(1) (2016) 144–58.)