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Role of Polysaccharides in Colon-Specific Drug Delivery

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Oral colon delivery has gained wide interest not just for the treatment of local diseases of the colon, such as inflammatory bowel disease (IBD) or Crohn's disease, but also as a reliable approach for peptide and protein drug delivery (1). Owing to the distal location of the colon in the gastrointestinal (GI) tract, an oral colon-specific drug delivery system must withstand the conditions in the upper GI tract and should rapidly release the drug upon entry into the colon.

The slow movement of material through the colon allows the presence of a large microbial population, much greater than that in the stomach or small intestine. These bacteria produce a wide range of reductive and hydrolytic enzymes, many of which are not present in the upper GI tract (2). Therefore, taking susceptibility to degradation by colonic enzymes into consideration, different natural or synthetic polymers have been employed in approaches such as prodrugs, hydrogels, matrices, and biodegradable coating materials. These polymers protect the drug from the conditions in the upper GI tract and undergo degradation via cleavage by colonic microbial enzymes, thus enabling drug release in the colon environment.

A large number of polysaccharides are resistant to degradation by gastric and intestinal bacteria and are specifically hydrolyzed by colonic microbial flora; thus, they show potential for use as colon-specific drug delivery systems (3). Naturally occurring polysaccharides originate from plants (pectin, inulin and guar gum), animals (chitosan and chondroitin sulfate), algae (alginates), or bacteria (dextran). They are inexpensive, non-toxic, and have varied structures and properties. Furthermore, because of their safety and biocompatibility characteristics, these polysaccharides have also been widely used as excipients in the pharmaceutical industry.

The problems typically encountered with polysaccharides are their high water solubility and poor film-forming property, which can lead to premature drug release from polysaccharide-based systems at off-target sites. Several methods have been used to overcome these obstacles. One way of decreasing the solubility of polysaccharides is to make them more water-resistant and yet enzymatically degradable by using derivatives such as calcium-bound pectin (4). The other approaches are based on combining polysaccharides with other insoluble film-forming polymers that limit the hydration of polysaccharides and thus inhibit premature drug release. In this respect, various polymers such as ethyl cellulose and polymethacrylates (5) have been used. The formation of polyelectrolyte complexes with an anionic (pectin) and a cationic polysaccharide (chitosan) was successfully assessed (6). Most recently, a combination of a polysaccharide-based system and the other colonic delivery systems such as pH- and time-dependent polymers have been the broad direction of interest because of the significant advantages of site-specificity of drug release in the colon. and owing to the various benefits of naturally occurring polysaccharides.

References

1. Maroni A, Del Curto MD, Zema L, Foppoli A, Gazzaniga A. Film coatings for oral colon delivery. *Int J Pharm.* 2013;**457**(2):372–94.
2. Patel M, Amin A. Recent trends in microbially and/or enzymatically driven colon-specific drug delivery systems. *Crit Rev Ther Drug Carrier Syst.* 2011;**28**(6):489–552.
3. Vandamme T. The use of polysaccharides to target drugs to the colon. *Carbohydr Polym.* 2002;**48**(3):219–31.
4. Das S, Ng KY. Colon-specific delivery of resveratrol: optimization of multi-particulate calcium-pectinate carrier. *Int J Pharm.* 2010;**385**(1-2):20–8.
5. Sande SA. Pectin-based oral drug delivery to the colon. *Expert Opin Drug Deliv.* 2005;**2**(3):441–50.
6. Hagesaether E, Hiorth M, Sande SA. Mucoadhesion and drug permeability of free mixed films of pectin and chitosan: an in vitro and ex vivo study. *Eur J Pharm Biopharm.* 2009;**71**(2):325–31.