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Formulation and Evaluation of Colon Targeted Drug Delivery

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Abstract: *Every day, advancements are being made in the area of colon-specific drug delivery systems. Extensive research is currently being conducted in this field, as this method is not only effective for targeting medications needed for treating colon-related diseases such as Crohn's disease and ulcerative colitis, but it also serves as a promising site for both local and systemic delivery of peptides, proteins, and various therapeutic drugs, including anti-asthmatic, antihypertensive (such as Isosorbide, Cyclosporine, and Desmopressin), and anti-diabetic agents. The colon, being the final segment of the gastrointestinal tract (GIT), has gained significant attention for its role in drug delivery for both local and systemic applications.*

To successfully achieve colon-targeted drug delivery, it is essential to protect the drug from degradation, release, and absorption in the upper sections of the gastrointestinal tract, ensuring a controlled or abrupt release in the proximal colon. This system focuses on delivering drugs to the lower part of the GIT, primarily the large intestine, which is crucial for those medications that are typically inactivated in the upper regions of the GIT. For optimal site-specific and time-dependent drug delivery to the colon, the combination of two or more strategies is often favored over single approaches, particularly due to the limited success of traditional methods, leading to a preference for newly developed techniques.

The oral route is widely regarded as the most convenient method for administering medications to patients. Upon oral intake, conventional dosage forms typically dissolve in the gastric or intestinal fluids and are subsequently absorbed in these areas of the gastrointestinal tract (GIT). The extent of absorption is influenced by the physicochemical characteristics of the drug. This presents a significant limitation in scenarios where targeted delivery of medications to the colon is necessary or when a drug must be shielded from the harsh conditions of the upper GIT. Administering drugs orally to the colon is particularly beneficial for treating colonic diseases such as ulcerative colitis, Crohn's disease, carcinomas, and infections, as it allows for high local concentrations while reducing side effects associated with drug release in the upper GIT or unnecessary systemic absorption. The colon is abundant in lymphoid tissue, and the uptake of antigens into the mast cells of the colonic mucosa facilitates rapid local antibody production, enhancing the efficacy of vaccine delivery.

There is growing interest in the colon as a site for improving the bioavailability of poorly absorbed drug molecules. The colon is considered to have a less hostile environment compared to the stomach and small intestine, characterized by reduced diversity and intensity of activity. Furthermore, the colon offers a longer retention time and shows a strong response to agents that promote the absorption of poorly absorbed drugs. In addition to retarding or targeting dosage forms, effective colonic drug delivery could serve as a crucial foundation for the colonic absorption of orally administered, undigested, unchanged, and fully active peptide drugs. Given that the large intestine is relatively devoid of peptidases, such specialized delivery systems have a promising opportunity to achieve adequate drug absorption following oral administration..

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