

REVIEW ARTICLE

Development of Mucoadhesive Microsphere for Colon Delivery

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ABSTRACT

The aim of present study was to develop Mucoadhesive Microsphere with Deflazacort as a model drug for Ulcerative colitis of Colon. Microspheres are small spherical particles with diameter in micrometer range(1 μ m to 1000 μ m). Mucoadhesive Microspheres provide prolong residence time at the site of absorption and facilitate firm contact with the mucous lining and thus improves the therapeutic performance of the drug. Deflazacort is a drug used for the treatment of Ulcerative Colitis, Crohn's disease, Leukaemia. Microsphere delivery of Deflazacort by coating it with polymer chitosan and cross linked with Glutraldehyde improves the bioavailability of the drug. The objective of this study is to protect the drug from prior degradation by converting it into microspheres and thus achieve sustained release of the drug and to have maximum therapeutic effect.

Keywords: Mucoadhesive Microsphere, Deflazacort, Sustained release, Therapeutic effect.

INTRODUCTION

Microspheres are small spherical particles with diameter in the micrometer range and sometimes referred as Microparticles. When adhesion is restricted to the mucous layer lining of the mucosal surface it is termed as Mucoadhesion. Mucoadhesion offers prolonged residence time at the site of absorption, localization of the drug delivery system at a given target site, increase in drug concentration gradient due to the intestine contact of the particle with the mucosal surface. Development of adhesive bond between polymer and biological membrane or its coating can be achieved by two ways: initial contact between the surfaces or formation of secondary bonds due to non covalent interaction. Mucoadhesives must interact with mucin layer during the process of attachment. Mucins are synthesized by goblet cells and special exocrine glands with mucin cells acini. There are atleast two main targets which could be used for anchoring of delivery system through mucoadhesive in the GIT, the mucosal tissue and mucosal gel layer. The mucos layer is the first surface encountered by particulate system and its complex structure offers many opportunities for the development of adhesive interaction with small polymeric particles either through non specific or specific interaction between complimentary structures. Due to all

above advantages Microsphere delivery is an better choice for drug delivery in colon.

Colon specific diseases are not efficiently managed by oral delivery system,because most orally adminsterd drugs are absorbed before arriving in the colon. Therefore,colon specific drug delivery system which can deliver the drug to the lower gastrointestinal tract without releasing them in the upper GI tract,can be expected to increase the patient compliance.The representatives of colon specific diseases are Inflammatory bowel disease (IBD), including Ulcerative colitis and Crohn's disease, Irritable bowel syndrome(IBS), Constipation, Colorectal carcinoma. Inflammatory bowel disease (IBD) is a group of inflammatory condition of colon and small intestine. The major types of IBD are ulcerative colitis and crohn's disease. Ulcerative colitis is a form of inflammatory bowel disease (IBD), is a serious chronic inflammatory disease of large intestine and rectum characterized by repeated episodes of abdominal pain and fever. Crohn's disease is a disease that causes inflammation, or swelling and irritation of any part of the gastrointestinal tract(GIT). The part most commonly affected is the end part of the small intestine called ileum.Symptoms are similar to that of Ulcerative colitis.Crohn's disease is also named as ileitis or enteritis.The main difference between Ulcerative

colitis and Crohn's disease is location and nature of inflammatory changes.

Deflazacort is a drug of choice in Ulcerative colitis with proven anti inflammatory and immunosuppressive effect. Deflazacort is a corticosteroid that works by acting within cells to prevent the release of certain chemicals that are important in the immune system. These chemicals are involved in producing immune and allergic responses, resulting in inflammation by decreasing the release of these chemicals in a particular area, inflammation is reduced. Deflazacort has a shorter biological half life of 1.1-1.9 hr. Thus by using deflazacort microspheres half life is increased and provide sustained release of drug for longer duration and thus bioavailability problems associated with oral administration is also improved.

Microsphere offers several potential advantages over traditional method of administration, drug release rate can be modified according to need, controlled release system provide protection of drug that are otherwise rapidly destroyed by the body, controlled release system can increase the patient comfort and compliance by replacing frequent doses. Microspheres are biocompatible, can provide high bioavailability and are capable of sustained release for longer periods.

METHOD OF PREPARATION

1. Preparation of chitosan microspheres:

Chitosan microspheres was prepared using emulsion method employing glutaraldehyde as a crosslinker. Chitosan solution (4% w/v) was prepared in 5% aqueous acetic acid solution in which the drug was previously dissolved and dispersed in liquid paraffin (1:1 mixture of light and heavy) containing span80 (1% w/v). This dispersion was stirred using a specially fabricated stainless steel half moon paddle stirrer and glutaraldehyde saturated toluence solution (1ml to 3ml) was added with stirring. The string was continued for 4hr, then microspheres are centrifuged, wash two times with hexane and acetone and dried in vacuum dessicator for 48hrs.

2. Coating of chitosan microspheres:

Chitosan microspheres were coated with Eudragit S100 using oil in oil solvent evaporation method. Chitosan microspheres (50mg) were dispersed in 10ml of coating solution prepared by dissolution of 500mg of Eudragit S100 in ethanol:acetone (2:1) to give 5:1 (coat:core) ratio. This organic phase was then poured in 70ml of light liquid paraffin containing 1% w/v of span80. This system was maintained under agitation speed of 1000 rpm at room temperature

for 3 hrs to allow for the evaporation of solvent. Finally, the coated microspheres were filtered and washed with n-hexane and dried in dessicator.

CONCLUSION

This microsphere approach facilitates accurate delivery of drug to the target site, reduced drug concentration at the sites other than target organ or tissue, protection of labile compound before and after administration and prior to appearance at the site of action, provides sustained release and increase therapeutic effect. This novel drug delivery system offers vital role in various diseases.

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