Nanoparticles and Nanocarriers-Based Pharmaceutical Formulations

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CHAPTER 6

Targeting Potential of Nanocarriers for Efficient Treatment of *H. Pylori* Infection

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Abstract: *Helicobacter pylori* (*H. pylori*), a prevalent human-specific pathogen, plays a key role in the development of peptic ulcer disease, gastric carcinoma, and gastric mucosa associated lymphoid tissue lymphoma. Once infected, those bacteria reside below the gastric mucosa adherent to the gastric epithelium, and entry of drugs to this target site is very difficult. The bacteria can also acquire resistance to commonly used antimicrobial drugs. Thus, an effective antimicrobial concentration cannot be achieved in the gastric mucous layer or on the epithelial cell surfaces where *H. pylori* exist and caused inefficient treatment. Such challenges have encouraged researchers into developing some therapies based on nanotechnology.

Keywords: Antibiotics, Gastro-retentive delivery system, *H. pylori*, Nanoparticles, pH responsive nanoparticles, Herbal approach, Liposomes, Lectins, Nanogels, Nanoparticulate vaccine, Mucoadhesion, Nanocarriers, Nanolipobeads, Polymeric nano-micelles, Receptor mediated targeting.

1. INTRODUCTION

The incidence of Helicobacter pylori (*H. pylori*) is found to be between 85 to 95% in developing countries such as India, Malaysia, *etc* and 30 to 50% in developed countries such as the USA, Australia, UK, *etc*. The epidemiology of *H. pylori* infection has been changed with improved sanitation and methods of eradication.

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CHAPTER 7

Gastro-retentive Nanocarriers in Drug Delivery

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Abstract: The oral route is an extremely accepted route for the administration of several drug delivery systems. This route exhibits several merits for the controlled and sustained release of different formulation types to attain enhanced therapeutic responses. Gastro-retentive nanocarriers (NCs) (GRNCs) have advantages due to their aptitude for extended retaining potential in the stomach environment and thereby elevate gastric retention and augmenting bioavailability of the drug molecules. This chapter covers various merits and demerits of gastro-retentive NCs. Further, it also discusses some gastro-retentive strategies and their applications in the therapy of various illnesses, for instance, swelling NCs, porous NCs, floating/non-floating NCs, lipid NCs, Polymeric NCs, bioadhesive NCs, and magnetic NCs, *etc.*

Keywords: Controlled drug release, Bioavailability, Drug delivery, Eudragit L100, Floating systems, Gastric cancer, Gastro-retentive carriers, Gastric retention time, Gastric emptying time, Gastrointestinal, HPMC, Ion-exchange resin, Lipids nanocarriers, Mucoadhesive nanocarriers, Magnetic nanocarriers, Polymer, Polymeric nanocarriers, Stomach, Sustained drug release, Super porous systems.

1. INTRODUCTION

Oral administration of formulations exhibits several merits such as flexibility in preparation, low price, ease of delivery, easy transport, as well as elevated patient compliance. Despite this, it is associated with some demerits like low bioavailability of drugs owing to the heterogeneity of the gastrointestinal (GI) environment, the poor gastric retention time (GRT) of the product, enzymatic actions, pH conditions of the GI tract (GIT), and surface area [1]. Furthermore, traditional drug delivery systems (DDS) have not shown great potential to combat the challenges levied by the GIT, for instance, imperfect drug release, less

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CHAPTER 9

Nanoemulsion: A Potential Carrier for Topical Drug Delivery

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Abstract: Nanoemulsions (NEs) are stable nanocarrier systems consisting mainly of oil and water, which are stabilized by surfactant with cosurfactant. Due to their typical size, nano-emulsions are transparent or translucent, and minute droplet size makes them stable against sedimentation or creaming. The nanoemulsion system may be in the form of oil-in-water (O/W) or water-in-oil (W/O). The recent literature revealed that NEs as a colloidal carrier system has been confirmed to be a valuable strategy to improve the bioavailability of topically applied drugs. NE has been proposed as a viable alternative to conventional topical dosage forms due to the ability to overcome the skin/ocular barriers faced after administration. Better permeation rate, improved therapeutic efficacy and reduction of dose, non–specific toxicity, and targeted drug delivery system can improve drug effectiveness when drugs are incorporated into NEs. In recent years, research studies have focused more on ion nanoemulsion systems using a mixture of surfactants to solve critical factors, such as solubility, stability, and drug delivery applications. This chapter outlines the recent development in nanoemulsion as a delivery system to study topical drug delivery.

Keywords: Nanocarrier, Nanoemulsion, Ocular, Skin, Topical drug delivery.

1. INTRODUCTION

Oil and water are immiscible liquids for blending two phases; the phases are miscible with the addition of the third component like an emulsifier [1]. Uniting the combination of these phases requires energy contribution to make up dissimilar contacts between water-oil systems that can restore similar phase

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