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RESEARCH ARTICLE

FORMULATION AND DEVELOPMENT OF THERMO-REVERSIBLE MUCOADHESIVE INTRANASAL *IN SITU* HYDROGEL BY USING A COMBINATION OF POLYMERS

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The prolonged residence of drug formulation in the nasal cavity is of utmost importance for intranasal drug delivery. To improve the nasal retention time of Metoclopramide hydrochloride (MCP HCl), it has been formulated as in situ mucoadhesive gel by using blend of Poloxamer 407, Poloxamer 188 and carbopol 934P. The objective of this work was to improve the nasal bioavailability of antiemetic drug, MCP HCl by increasing its nasal retention time as well as by means of nasal permeation. Increase in the concentration of mucoadhesive agent enhanced the mucoadhesive force significantly. *In vitro* release of MCP HCl from the mucoadhesive system in simulated nasal fluid was influenced significantly by the properties and concentrations of carbopol 934P and showed enhanced bioavailability through its longer nasal residence time and ability to sustain the release of the drug. The *in vitro* tests performed for mucoadhesive strength and drug diffusion showed that nasal in situ gelling formulations prepared were having good mucoadhesive strength with nearly 100% drug diffusion. The formulations were evaluated for physiochemical parameter, gelation temperature, viscosity, gel strength, content uniformity mucoadhesive force, FTIR and DSC. So, this study points to the potential of mucoadhesive *in situ* nasal gel in terms of ease of administration, accuracy of dosing, prolonged nasal residence and improved nasal bioavailability.

Key words: Nasal drug delivery, Poloxamer 407, Poloxamer 188, Metoclopramide HCl.

INTRODUCTION

Migraine, the most common cause of headache, afflicts approximately 15% of women and 6% of men. A useful definition of migraine is a benign and recurring syndrome of headache, nausea, vomiting, and/or other symptoms of neurologic dysfunction in varying admixtures. Migraine can often be recognized by its activators (red wine, menses, hunger, lack of sleep, glare, estrogen, worry, perfumes, let-down periods) and its deactivators (sleep, pregnancy, exhilaration, triptans). Conventional therapies for the treatment of migraine are given by oral, parenteral or in form of nasal drops/sprays. These formulations require frequent administration due to nasal mucociliary clearance (Kasper *et al* 2005).

The nasal epithelium is a highly permeable monolayer, the sub mucosa is highly vascularized with large and fenestrated capillaries facilitating rapid absorption. Moreover, direct systemic absorption avoids hepatic first-class metabolism, gut wall metabolism and destruction in gastrointestinal tract. Owing to these merits, various nasal drug delivery systems are available for user-friendly noninvasive painless application (Patel *et al* 2010).

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