DESIGN AND EVALUATION OF NOVEL IBUPROFEN GEL AND ITS PERMEABILITY STUDIES

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ABSTRACT

The objects of this study were to develop the topical usage of ibuprofen gel and evaluate the permeability status of the prepared gel. Ibuprofen gel was prepared by incorporation of mustard oil and ethanol for improving the ibuprofen release in the topical preparation at different ratio low, medium and high concentration. In general marketed ibuprofen gel, ointment or creams contain ibuprofen alone but in our formulation ibuprofen added in ethanol along with mustard oil. It acts as a rubefacient and counter-irritant and better relief from body ache. In vitro permeability study was carried out for ibuprofen incorporated gel and drug content was estimated by UV-Spectroscopy. Batch III shown the maximum permeation when compare to the Batch I and Batch II. The percentage release of ibuprofen release for three batches of prepared gel was 84.5, 85.3, and 91 respectively.

Key words: Ibuprofen, Permeability, Gel, Mustard oil.

INTRODUCTION

Ibuprofen is a potent non-steroidal anti-inflammatory drug for effective treatment of acute and chronic arthritis, body pain, and head ache etc., therefore most of the non-steroid research work focus on ibuprofen transdermal preparation, which prevent the oral side effect like gastric mucosal damage, may lead to ulcer formation in gastrointestinal track, renal failure and prolonged site of action (Agyralides, 2004; Al-Saidan, 2004). Compared to other NSAID marketed formulation, ibuprofen is poor in permeability and difficult to achieve the therapeutic concentration in blood plasma (Chang, 1997). The extensive studies of drug release have revealed that the active ingredients in gel based formulation are better percutaneous absorption than cream or ointment base. Ibuprofen may a chance to get precipitate due to poor permeability. In addition to this permeability problem of ibuprofen can be solved by mixing with high ethanol concentration up to 70% in the gel preparation. Generally gel based formulation hold more percentage of ethyl alcohol than ointments and creams. Krishniah et al., 2004 proved that transdermal drug containing up to 70% alcohol were reported no sigh of skin irritation produced when applied to human. Besides that addition of mustard increases the viscosity of the gel makes permeability faster in the topical skin due to the increase the occlusive nature of the prepared gel, it has anti-fungal, rubefacient and counter-irritant properties (Uzma sitara, 2008; Mohammed ali, 2008). The study reveals that mustard oil has antibacterial, anti microbial and anti inflammatory activity. Recently, so many topical ibuprofen gel, creams, ointment were introduced in different percentage of drug content (5%, 10%, and 15%) which gives the better release but our prepared ibuprofen gel releases rapidly because of presence of ethanol and mustard oil incorporation.

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MATERIALS AND METHOD

Material needed for this preparation was collected from the following laboratory and pharmaceutical company. Ibuprofen (Sigma laboratory), Boric acid (High tech lab), Carbopol (tablet India), ethanol (Sigma)

PREPARATION OF GEL

Novel ibuprofen gel was prepared by mixing 10% w/w Carbopol, deionizing water and ethanol (30%, 50%, 70%), these two acts as a solvent. After completing hydration of Carbopol, 10% w/w ibuprofen and 5% w/w mustard oil were added to the hydrated Carbopol and stirred well. Finally water was added to make up to total weight of 100 gm. Three different batches of ibuprofen gel were prepared by using different concentration of ethanol (30, 50, and 70%) in the gel preparation.

PERMEABILITY EXPERIMENT

Preparation of dissolution medium (pH 7.2 buffer solution):

0.5 gm of disodium hydrogen phosphate and 0.3 gm of potassium di hydrogen phosphate was dissolved in sufficient amount of distilled water and the volume was made to one litre (1000 ml with distilled water). The prepared solution was counter checked for pH using a pH meter (Elico India).

IN-VITRO STUDY OF DRUG RELEASE

The rate of drug release of prepared formulation of ibuprofen was determined by using mice membrane as rate controlling membrane used in this study. The hairless skin was obtained from mice, which is tied on one side of the two side open tube. The tube was immersed in beaker containing 250 ml of pH 7.2 phosphate buffer solution, which act as a receptor side.

Accurate quantity of sample was transferred to the donor compartment and was kept open to atmospheric exposure to simulate real condition. The receptor fluid was maintained at 37± 1°C and kept agitated using magnetic stirrer. 5 ml sample was withdrawn at predetermined time from the receptor compartment over a period of 5 hours. The same quantity of fresh buffer solution is replaced in to the donor compartment after every sampling, and the drug content of the sample was determined by UV-Spectrophotometer at 221 nm.

RESULT AND DISCUSSION

Our study reveals that ibuprofen permeability increases depends upon the concentration of ethanol present in the gel preparation. In figure 1, Batch III shows high percentage of ibuprofen release when compare to the other two preparations in the graph. Krishnaiah et al reported ibuprofen drug release was enhanced by addition of high concentration of alcohol, Aukunuru et al revealed that ibuprofen release increases depends upon the concentration of alcohol present in the ibuprofen ointment. Yun-Seok Rhee et al reported that ibuprofen release improved based on the concentration of ethanol in ibuprofen gel, Matthew Roberts et al previously reported influencing of ethanol on aspirin release from hypromellose matrices. S C Dinda and J Vijaya ratna found that plant oil increase the permeability nature of the gel and ointment preparation. Mustard oils are well known for their pungent odor and for centuries
have been used for cooking and for their medicinal properties. The isothiocyanate components of mustard oils have recently gained attention because of their potential for inhibiting carcinogenesis. Moreover, isothiocyanates react readily with the amino-groups of proteins on human skin and mucosal surfaces. In our study, ibuprofen permeability was increased by ethanol as well as mustard oil. Mustard oil increases the viscosity of the gel makes permeability faster in the topical skin due to the increase the occlusive nature of the prepared gel. Moreover, addition of mustard oil in the gel preparation would improve the permeability of gel by react with the amino-groups of proteins on human skin due to the presence of constituent isothiocyanate.

Our result also supports the same, Ibuprofen release of prepared gel batches was 84.5, 85.3, and 91 respectively, because of high concentration of ethanol present in the batch III gel preparation penetrate more in the mice skin in the dissolution medium.

CONCULTION
Our study reveals that ibuprofen gel permeation depends upon the ethanolic content and mustard oil present in the gel preparation. High ethanolic content of batch 3 severely affect the kinetic and drug release because of that dissolution profile of batch 3 curve reached maximum in the graph.

REFERENCES