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Research Article

FORMULATION AND EVALUATION OF MEFENAMIC ACID OINTMENT USING DIFFERENT PENETRATION ENHANCERS

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ABSTRACT

Background

Mefenamic acid is a non-steroidal anti-inflammatory agent. Oral administration of this drug is associated with severe gastrointestinal side effects like ulceration and gastro intestinal bleeding. The solution of this problem lies in the fact that, topically applied NSAIDs are safer than oral NSAIDs. The objective of the study was to prepare an ointment of Mefenamic Acid by using different penetration enhancers such as propylene glycol, Sodium lauryl sulphate, tween-80 and ethanol. Evaluation of the Mefenamic Acid ointment was carried out for physical appearance, pH, spreadability, extrudability, drug content and in-vitro release. Drug content was found to be uniform in all the formulations. The result shows that ointment have good consistency, Spreadability, and formulation F1 and F2 with propylene glycol and sodium lauryl sulphate respectively shows good diffusion rate than others.

Keywords: Mefenamic acid, Ointment, Penetration enhancers, Consistency, Spredability

INTRODUCTION

Mefenamic acid or 2-(2, 3-dimethylphenyl) aminobenzoic acid belongs to the Non-Steroidal Anti-Inflammatory Drugs (NSAIDS) class. It is often used to treat mild to moderate pain (analgesic), including headache, fever, dysmenorrhea, osteoarthritis, menstrual pain (pain that happen before or during a menstrual period), rheumatoid arthritis, inflammation, soft tissue and dental pain .Mefenamic acid can cause various gastrointestinal diseases such as gastrointestinal bleeding, abdominal pain ulcers , holes in the stomach or intestine. Mefenamic acid belongs to the class-II drugs according to the Bio-pharmaceutical Classification System (BCS). It has poor solubility in the pH range of 1.2- 7.5 that is why it has lower water solubility and higher permeability. The systemic half-life of Mefenamic acid is 2-4 hours. Mefenamic acid has analgesic, anti-inflammatory, and anti-pyretic activity in human clinical studies and in classical animal models. These effects are due to its dual action on PGs.

It is commonly available in the form of tablet and suppositories; there is no topical formulation of MA available in the market. This medications have a short lifespan, and some inadvertent drug absorption may happens which may cause the medication to become ineffective and therefore to decline. Thus, topical application of Mefenamic acid may reduce the dose, dosing frequency, and risk exposure. Transdermal drug delivery system offers several advantages over other more conventional routes of drug delivery. Here drug is delivered through the skin layer, which provides significant barriers for drug absorption. It avoids pre-systemic metabolism by the liver and gastro-intestinal tract degradation associated with oral drug delivery. Additional advantages of this system is, it contains large amount of aqueous component that allows for increased drug absorption and solubility as well as keeping balanced plasma concentration, decrease the dose rate, less side effect, improved patient compliance. It is also suitable for predictable, psychiatric, unconscious and vomiting patients. By formulating Mefenamic acid ointment with the help of penetration enhancers we can easily increase the rate of absorption of drug. The aim of this study was to formulate and evaluate the Mefenamic acid ointment in which propylene glycol, Sodium lauryl sulphate, tween80, ethanol were used as penetration enhancer for each of the formulations and compared with each other.

MATERIALS AND METHODS

Formulation of Mefenamic acid ointment

Firstly melt the water-immiscible components such as bees wax ,stearic acid ,Cetyl alcohol and liquid paraffin together in a water bath to 70˚C -75˚C Simultaneously, on the other side, an aqueous solution of heat-stable water soluble Components are prepared. That is Mefenamic acid, penetration enhancer (Propylene glycol 400, Ethanol, Tween 80, Sodium lauryl sulfate), Triethanolamine, propyl paraben are heated in a water bath to the same temperature as the oleaginous component. It is shown in table 1. Then, cool the aqueous phase for 5min. then oil phase is slowly added to the aqueous phase with vigorous

stirring until ointment is formed. The obtained mefenamic acid ointment is shown in Figure 1.

Table 1. Composition of Ointment

SL.NO	Ingredients	F1	F2	F3	F4
1	Mefenamic acid	0.10%	0.10%	0.10%	0.10%
2	Triethanolamine	0.75%	0.75%	0.75%	0.75%
3	Propyl paraben	0.00%	0.00%	0.00%	0.00%
4	Propylene glycol 400	0.52%	—	—	—
5	Sodium lauryl sulphate	—	0.52%	—	—
6	Tween 80	—	—	0.52%	—
7	Ethanol	—	—	—	0.52%
8	Bees wax	2.93%	2.93%	2.93%	2.93%
9	Stearic acid	3%	3%	3%	3%
10	Cetyl alcohol	0.36%	0.36%	0.36%	0.36%
11	Liquid paraffin	0.60%	0.60%	0.60%	0.60%

Figure 1. Preparation of mefenamic acid ointment

EVALUATION PARAMETERS

Estimation of Mefenamic acid λmax of pure Mefenamic acid in 7.4 pH buffer

An absorption maxima of Mefenamic acid was determined using7.4 Ph buffer. Solutions ranging from 10 µg/ml -50 µg/ml were scanned from 200–400nm using UV spectrophotometer. The absorption maxima were found to be 279 nm. Beer's range was found to be in the range from 0 - 20 µg/ml. Calibration curve for pure Mefenamic acid in 7.4 pH buffer.

Preparation of standard stock solution

100 mg of Mefenamic acid was accurately weighed and taken in a 100ml volumetric flask. The drug was dissolved and diluted to volume with buffer to obtain final concentration of concentrations range of 5 µg/ml, 10 µg/ml, 15 µg/ml and 20 µg/ml for mefenamic acid. The absorbance of these solutions was measured at 279 nm by UV spectrophotometer, using 7.4 pH buffer as blank. The absorbance value were plotted against concentration to obtained the standard graph and it is shown in Figure 2.

Physicochemical determination of Mefenamic acid ointment

To check out the appropriateness of Mefenamic acid ointment for topical usage and its physicochemical features were elaborated as given under.

pH

pH scales for Mefenamic acid ointment calculated by means of a titrated pH scale. Report shown in table 2.

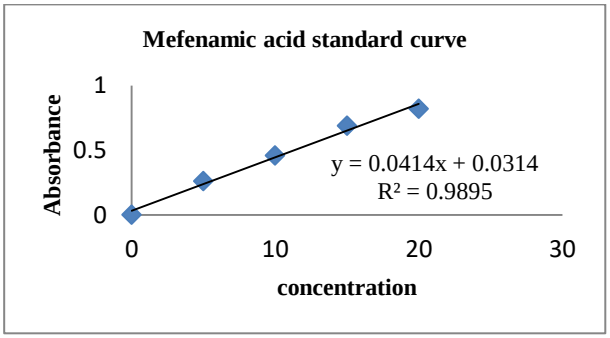

Figure 2. Mefenamic acid standard curve

Table 2. Physical parameters of ointment formulations

Formulation	pH	Homogeneity	Texture & appearance
F1	6.71	Good	Smooth & White
F2	6.85	Good	Smooth & White
F3	6.82	Good	Smooth & White
F4	6.74	Good	Smooth & White

Spreadability

The spread of all preparations was inspected by calculating the diameter of the formation of 0.5 g subsequent to compression between 2 glass slices of 10 g. Report shown in table no 3.

Table 3. Physical parameters of ointment formulations

Spreadability (g/cm/s)	Drug content (%)	Skin irritancy
5.2	87.42	Nil
5.3	90.11	Nil
5.1	89.43	Nil
5.3	87.25	Nil

Consistency

The consistency of Mefenamic acid ointment was assessed by conical protrusion procedure. In this technique, cone is connected to a 10 cm attaching rod which was dropped in centre of the ointment-filled cup for the sake of finding ointment consistency; the over 50 seconds distance covered is recorded.

Homogeneity

Visual surveillance was applied to examine out homogeneity of the ointment. Narrow transparent glass tubes were filled with ointment and seen under light to look for any lumpy entities. Report shown in table 2.

Drug content

10 mg content of each sample was liquefied, stirred in 100 ml of methanol solvent that has been filtered and examined using a

visible UV calibrated SM in order to measure the quantity of Mefenamic acid in the ready ointments. The fractions of Mefenamic acid were determined. Report shown in table no 3.

Diffusion study

Modified apparatus of cellophane membrane was used to study the in vitro release of ointment formulation. Before using cellophane membrane, it should be soaked in a dissolution medium and it is tied to one end of a glass cylinder (open at both the ends). The dissolution medium was filled with a phosphate buffer (pH 7.4). The ointment was placed into this assembly. The cylinder was connected to a stand and suspended in diffusion medium. The medium was kept at room temperature and stirred at 100 rpm using magnetic bead. The test was taken place for about 6h. For every hour, 5 ml was withdrawn with aliquots, and it is going to be filled with equal volume of receptor medium. The sample was diluted and measured through 'UV visible spectrophotometry process. The diffusion graph is shown in is shown in Figure 3.

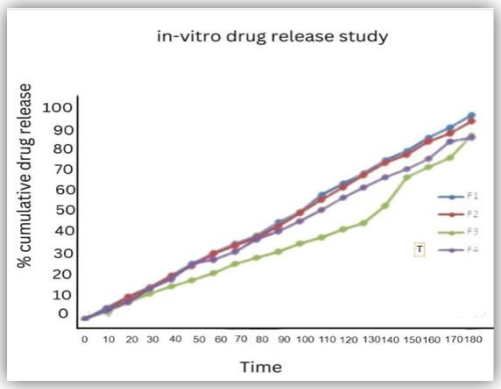

Figure 3. Graph of %CDR of In vitro drug release

CONCLUSION

All the formulation had a good homogeneity with white colour appearance and smooth texture. pH of all formulations was found in range 6.71 to 6.85, with-in the prescribed limit and lies in the normal pH range of skin as given in table 5. Ointment consistency, Homogeneity and spreading capability is also good shown in table 5. The drug content of Mefenamic acid was in the range of 87.13 % to 90.11% shown in table 5. The discharge of Mefenamic acid from the transdermal formulation, and its release through the membrane shown in table 6.The prepared Mefenamic acid ointment with different penetration enhancer showed good result in all the evaluation parameter like pH, consistency, spreadability, drug content and diffusion study. All the four formulations has shown good spreadability, drug content. Among these F1 and F2 shown better diffusion rate than others. Therefore for better patient compliance and appropriate dose frequency Mefenamic acid topical ointment formulation in combination with proper concentrations of convenient permeation accelerators thus may encourage more investigation and assurance towards designing dermal dosage forms.

REFERENCES

1. Khan, Y., S. U. Jan, and R. Gul. "Formulation and evaluation of Mefenamic acid ointment using penetration enhancer." *Int. J. Curr. Pharm.* Res 12.6 (2020): 114-118.
2. Kumar, Ravi. "Formulation and Evaluation of Mefenamic Acid Solid Dispersion Using Different Carriers" *World J. Pharm. Res.*11.15 (2022).
3. Songkro, Sarunyoo. "An overview of skin penetration enhancers: penetration enhancing activity, skin irritation potential and mechanism of action." *Songklanakarin j. sci. technol.* 31.3 (2009).
4. Rodríguez Cruz, I., et al. "Physical penetration enhancers: an overview." *Curr. Technol. Increase Transdermal Deliv. Drugs; Bentham Sci. Publ.: Sharjah United Arab Emir.* 2 (2016): 3-34.
5. Pathan, Inayat Bashir, and C. Mallikarjuna Setty. "Chemical penetration enhancers for transdermal drug delivery systems." *Trop. J. Pharm. Res.* 8.2 (2009).
6. Carrer, Victor, et al. "Effect of propylene glycol on the skin penetration of drugs." *Arch. dermatol. res.* 312.5 (2020): 337-352.
7. Pandey, Anushree, et al. "Role of surfactants as penetration enhancer in transdermal drug delivery system." *J Mol Pharm Org Process Res* 2.113 (2014): 2-7.
8. Akhtar, N., et al. "Penetration enhancing effect of polysorbate 20 and 80 on the in vitro percutaneous absorption of lascorbic acid." *Trop. J. Pharm. Res.* 10.3 (2011).
9. Rowe, Raymond C., Paul Sheskey, and Marian Quinn. "Handbook of pharmaceutical excipients." *Libros Digit.-Pharm. Press*, 2009.

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