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Formulation And Estimation Of Aceclofenac Topical Emulgels

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***Abstract*—**Aceclofenac is a new non-steroidal anti-inflammatory drug (NSAIDs) having a remarkable analgesic, anti-inflammatory and anti-pyretic potential. Chemically it is named as (2-[(2,6- dichlorophenyl) amine] or phenylacetoxya acetic acid. So, this research was based on designing and formulation of topical aceclofenac emulgel with different and suitable gelling agents with different ratio of mixing and evaluation of same by following standard parameters. Firstly, preformulation studies were done to make sure the raw materials are of
quality grade. The different emulgels were formulated as Aceclofenac (API), API + Span 20, API + Tween 20, API + Carbopol 934, API + HPMC K4 M, API + Liq. Paraffin, API +Propylene Glycol, API + Menthol and API + Methyl Paraben. The emulgels were evaluated for various parameters such as physical tests, rheological properties, estimation of pH, skin irritation test, in-vitro drug release and swelling index. The different formulations of Emulgels were evaluated for their rheological properties.Formulation no. 1, 2 and 3 were analyzed at RPM 0.2. At shear stress of 165.8 for F1demonstrated the viscosity of 13950. For F2 at shear stress 170.6 the viscosity was noted as 15526. At last, for F3 at shear stress of 170.6 the viscosity was found as 14526. The in-vitrodrug release study was recorded from 0.5 hr to 8 hrs. The amount of drug was found to be 1.32mg, 1.31mg and 1.31mg in 1 gm of Emulgel formulation no. 1, 2 and 3. This research comes under the New Drug Delivery System (NDDS) that enhances the new approach infrequent **dermal** delivery of loaded Aceclofenac topical emulgel.

Intoduction

Topical delivery of the drugs implies priority for their unique feature of by-passingfirs pass metabolism for local and systemic action. Pharmaceutically solid, liquid and semisolids are preferred for topical application. Creams ointments other preparations show patientincompliance due to their greasy nature, difficult to remove from skin, staining problems and stability issues etc.To overcome all these hurdles a new formulation called Emulgel, is came into picture. Gels are the most promising formulations for topical delivery where the formulation is transparent and compose of 99% of water and 1% of gelling polymer. The hydrophobic drug is difficultto imbibe into gel because of high polarity difference between drug and gel base. Emulsion isone of the techniques to increase the solubility of hydrophobic drug.

Drug applied to the skin for their local action include antiseptics, antifungal agent, skin emollients and protectant. To increase the patient compliance and enhancing the topical delivery of hydrophobic drug, a novel formulation emulgel is evolved by merging the properties of both gel and emulsion. By formulating as emulsion the polarity difference between emulsion and gel base is reduced and enhances the solubility of the drug. Then the emulsion is immobilized in the matrix of gel base. The permeation across the skin is enhancedby addition of permeation enhancers. The emulgel formulation has many dermotogically favorable properties like thixotropic, greaseless, easily spreadable, easily removable,emollient, water soluble, non-staining, long shelf life, bio-friendly and pleasing appearance etc. The present study was involved in the formulation of Aceclofenac emulgel by usingCarbopol 934 and HPMC K4M as two emulgels and comparison of drug release profile for better formulation. Aceclofenac is a NSAID (Non-Steroidal Anti Inflammatory Drug), analog of Diclofenac, used asanalgesic and anti-inflammatory

agent to treat Rheumatoid arthritis,Osteoarthritis and Ankylosing spondylitis. It inhibits COX-II (cyclooxygenase) enzyme and prevents the production of prostaglandins there by reduces pain andinflammation.The emulgel was formulated by using Mentha oil as permeation enhancers. TheO/W emulsion was prepared and emulsion is mingled with gel base. The prepared emulgelwas evaluated for rheological properties, physical characteristics, pH, skin irritation and invitrodrug release pattern. The release profiles of two emulgels were compared.

Review of Literature:

Literature related with Sunscreen Preparation and evaluation:The future of pharmaceuticalproducts will be rush up with topical delivery products because of drawbacks in oral,parenteral and other routes and more patient compliance. Loading of hydrophobic drug inhydrophilic gel matrix was found a solution by emulgel. Emulgel possess excellent bioadhesion,viscosity and long term stability which will increase compliance. In this studyemulgels were prepared by using two different gel forming polymers. Two formulations wereexcellent in their elegance and performance. Both are following first order release kinetics asregression values were 0.996 and o.998. Higuchi kinetics supports that it follows diffusionbased drug release as regression value, 0.992 and 0.989. The in-vitro drug release studiesreinforced that carbopol 934 was the best polymer to formulate emulgel with 64.04 w/w ofdrug release than HPMC K4M as 57.30% w/w.The gap in the market segment needed the developement for utilisation of advanced methodolgy for human application ,we tried I workin wide range for checking its wider acceptibility ,we started wth simpler drugs like normaltopically used drugs , then progressed towards the Aceclofenac emulgel [1.5%] which can beused as anti-inflammatory and analgesic for topical delivery.

AIM:-

To Study of Formulation & Estimation of Aceclofenac Topical Emulgels

OBJECTIVE Aceclofenac is a favored COX-2 inhibitor having calming and pain-relievingpossibilities. Aceclofenac additionally focuses on the biosynthesis of glycosaminoglycan andalong these lines intervenes chondroprotective impacts. It shows more regular gastrointestinalresults like dyspepsia, stomach-throb and queasiness . Etoricoxib (another NSAID) is a COX-2 specific inhibitor having calming, pain relieving and antineoplastic possibilities. It showsless continuous frequency of gastrointestinal results, however expanded cardiovascularunfavorable occasions . It's anything but a professional medication of diclofenac and decayedeffectively under the hydrolytic medium like impartial, acidic and basic and furthermore onopenness to light. The compound is steady to oxidative pressure, temperature, and photolyticstress, in solid stateImportance of Emulgels

1) Avoidance of pre-systemic metabolism
2) Avoidance of g.i.t. incompatibility
3) Site specific
4) Better patient compliance
5) Self-administration suitability
6) Better stability
7) Controlled release

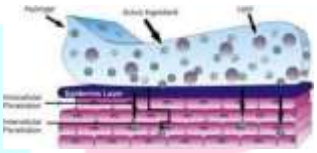
Emulsion :-

Emulsions are made by combining two or more liquids that are normally incompatible. In thissystem, the oil phase is miscible with the aqueous phase using an emulsifying agent. The useof emulsifying agents helps to stabilize emulsions. They are easy to wash off and they alsopenetrate well .

Gel:-

The word"gel"refersh to enhancing the viscosity of f liquid preparations with outchanging other properties.Gels can b eused as a thickenin gagen tand also help t oimprove ethe homogeneity and consistency of a formulation.This agent is used tocreate gelbase,which is then mixed with emulsion to create emulgel. A gel is made up of a polymerthat enlarges when exposed to fluid and possibly with in its structure.The amountof fluid entrapped in the gel determinesits rigidity.These gels are wet and smooth ,with the appearanceof being solid. These are capable of significant physical deformation,from solid-state to liquidstate.

Types of emulgel



***A)* Microemulsion :-**

Microemulsions are isotropic mixtures of a biphasic o/w systemic stabilized with asurfactant that is thermodynamically stable and optically clear. Droplets vary in size from10 to 100nm and do not coalesce. It is made up of specific amounts of oil, co-surfactant,surfactant, and water.

***B)* Nanoemulgel :-**

Nanoemulsion is transparent (translucent) oil-water dispersions that arethermodynamically stable due to surfactant and cosurfactant molecules with a globulesize range from 1nm to100 nm. When the emulsion is mixed with gel, the termNanoemulgel is used. Many drugs have higher transdermal permeation withNanoemulsion than with traditional formulations such as emulsions and gels.

TheNanoemulsion possesses enhanced transdermal and dermal delivery properties in vivoas well as in vitro. Because of its high loading capacity and small globule size, the drugeasily penetrates the skin and provides less therapeutic effect in a short period.

***C)* Macroemulsion gel :-**

Emulgel with emulsion droplet particle sizes greater than 400nm. They are physicallyinvisible, but under a microscope, the individual droplets can be seen clearly.Macroemulsions are thermodynamically unstable, but surface-active agents can help tostabilise them

Advantages of emulgel :-

1. Using water/oil/water emulsions, hydrophobic drugs can be quickly implemented
into the gel base.
2. Improved stability and load capacity.
3. Easy for production and a low-cost mechanism.
4. Avoid sonication.
5. The first metabolism is avoided.
6. Avoid gastrointestinal incompatibility.
7. Improved patient compliance.
8. Improved patient acceptability and suitability for self-medication.
9. Ability to easily terminate medication

Disadvantages of emulgel :-

1. The drug and/or excipients can lead to skin irritation in people with contactdermatitis.
2. Some medications have low permeability through the skin.
3. Possibility of allergenic reactions.
4. Larger-particle-size drugs are not easily incorporated into the skin .
5. The rationale of emulgel as topical drug delivery

Advantages of Topical Drug Delivery System

a. Avoidance of first pass metabolism.
b. Avoidance of gastrointestinal incompatibility.
c. More selective to a specific site.
d. Improve patient compliance.
e. Suitability for self medication.
f. Providing utilization of drug with short biological half life and narrow
therapeutic window.

Disadvantages of Topical Drug Delivery System

a. Skin irritation on contact dermatitis.
b. Possibility of allergenic reactions.
c. Poor permeability of some drug through skin.
d. Drug of large particle size are not easy to absorb through the skin

MATERIALS AND METHODS

1. Experimental Requirements

The following are the Equipment, Instrument, and Materials that were used for theformulation and evaluation of Druga.

Aceclofenac, carbopol 934, Tween 80, Span 80, Propylene glycol, ethanol,clove oil, Methyl paraben.

b. Digital balance, magnetic stirrer, Spectrophotometer, compound microscope,Dissolution test apparatus, pH meter.

Preformulation Studies

Preformulation studies are performed for the improvement of Emulgel before theinitiation of plan advancement, and the significant objective of the investigation is tocreate or foster steady, safe, and restoratively powerful and effectual dose frames thatare essentially identified with the portrayal of the physicochemical properties of themedication substance. The major aim of the pre-formulation studies before productdevelopment are:a. To establish the important physicochemical nature & characteristics of the drug.

b. For the determination of drug compatibility with different excipients used in theformulation.

Characterization of Aceclofenac

For pre-formulation studies, the micronized form of Aceclofenac was subjected tophysical tests.

4. Drug – Excipients Compatibility Studies

For the selection of suitable additives or excipients while developing a pharmaceuticalformulation it's necessary*to* check the drug- excipients compatibility

Method of Preparation

-Process 1

· Aceclofenac was mixed with various excipient used in the study in the ratio as given intable 0.0, then filled in glass vials along with low-density polyethylene stopper with holesin the stopper and subjected to a different condition like room temperature,60˚C and 2-8˚C for four weeks. After the completion of the specified period, blends were tested fortheir physical change and moisture content.

A Preparation of Emulsion

. -**Preparation of Aqueous Phase**: The aqueous phase of the emulsion was prepared by
dissolving Tween80 in purified water.

· **Preparation of Oil Phase**: Methyl Paraben and Propyl Paraben were dissolved inpropylene glycol where asdrug was dissolved in ethanol and both solutions weremixed with the aqueous phase. Both the oily and aqueous phases were separatelyheated

to75ºc. Then the oil phase was added to the aqueous phase with continuousstirring until cooled to room temperature.

· **Preparation of Gel**: The gel bases were prepared by dispersing differentconcentrations of polymers in distilled water separately with constant stirring at amoderate speed using mechanical

MANUFACTURING PROCESS

The preparation method of emulsion was same. Gel was prepared by dissolving 1gm ofCarbopol 934 and HPMC K4M separately in purified water (50 ml) with constant stirring atoptimum speed by mechanical stirrer. The pH was adjusted by TEA (triethanolamine) to 6-6.5.The emulsion was prepared by following method, the Oil phase was prepared by dissolvingspan 20 in liquid paraffin. Then the drug was added to the above mixture. The aqueous phasewas prepared by dissolving Tween 20 in purified water. Methyl paraben was dissolved inpropylene glycol separately and this mixture was added to above mixture with constantstirring. Both oil and aqueous phases are heated to 70-80°C. Then oil phase is added toaqueous phase with constant stirring until to get cooled to temperature to form emulsion withconstant stirring

Evaluation Parameter of Emulgel

1 Physical tests

The prepared Emulgel was found optimum in terms of their color, grittiness, appearance& viscosity

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2 Rheological Study

The consistency was dictated by utilizing Brooke field viscometer DV II+ Pro, a coneand plate kind of viscometer with axle no 52. The instrument was collected and roomtemperature was kept up with at 25°C all through try. The emulgel whose consistencywas to be estimated was weighed about 0.5 gm and set in plate and shut. Then the spindleis allowed to run and the viscosity was measured at 0.2 rpm.

3 Measurement of pH

The pH was recorded using the digital pH meter under ambient & standard conditions .pH of the gel was determined using digital pH meter. About 1.0 gm of gel was stirred in

distilled water till uniform suspension effected. The volume was made upto 50ml and pHof the solution was measured.

4 Skin Irritation Test

For this study, 4 rats were used. Animals were removed for their skin hairs and thenapplied the emulgel to check the irritation if happens.

RESULTS AND DISCUSSION

Evaluation of Emulgel Formulation

Physical Examination

Emulgel formulations were observed for physical examinations as follows

Color : Yellowish white

Consistency : Viscous

Appearance : Glossy

Grittiness : No

Rheological Properties of Emulgel

The different formulations of Emulgels were evaluated for their rheologicalproperties.Formulation no. 1, 2 and 3 were analyzed at RPM 0.2. At shear stress of 165.8 forF1 demonstrated the viscosity of 13950 . For F2 at shear stress 170.6 the viscosity wasnoted as 15526. At last, for F3 at shear stress of 170.6 the viscosity was found as 14526.By exhibiting such viscosity strengths, all the formulation were found as suitable emulgelhaving the optimum level of rheological properties.

pH Estimation

The pH was estimated for different preparations as belowMentioned

Skin Irritation Test

The rats were explored with formulation no. 1, 2 and 3 for 24 hours. During their time ofexposure, all the rats were examined for harmful effects such as inflammation, redness andirritation at any part of the rat's skin.

Swellig Index

Aceclofenac emulgels showed swelling index ranging from 15.92 to 30.08%, whichwas found to be satisfactory. The results of the swelling index are reported

Extrudability Study

The force required to extract out the elements of creams wich are filled insidethe tube ,gives value for ,extrudability .For Aceclofenac its found to be

Drug Content Determination

The amount of drug was found to be 1.32mg, 1.31mgand 1.31mg in 1 gm of Emulgel formulation no. 1, 2 and 3

Drug Content Determination

SR.NO	**Formulation(1 gm)**	**Drug Content (1gm)**
1	**F1**	**1.32**
	F2	**1.31**
	F3	**1.31**

Particle size analysis

This study was done for optimized formulation of aceclofenac emulgel. The procedureinvolves dilution of 1 g of emulgel with distilled water which was observed under highresolution Biovis Particle Size Analyzer and the average size of the particles were measuredin microns.

Spreadability

An ideal topical gel should possess a sufficient spreading coefficient when applied or rubbedon the skin surface. This was evaluated by placing about 1 g of formulation on a glass slide.Another glass slide of the same length was placed above that, and a mass of 500 g was put onthe glass slide so that the gel gets sandwiched between the two glass slides and spreads at acertain distance. The time taken for the gel to travel the distance from the place of its positionwas noted down. Spreadability was determined by the following formula.

CONCLUSION

Emulgel of all set of batches were evaluated after thepreparation for several pre-prescribed pharmacopeial and in-house standards andparameters Physical Examination, Rheological Study and Measurement of pH.Future of pharmaceutical sciences of drug design and developmentwill focus on the topical delivery systems because of huge drawbacks in oral, parenteral/ otherroutes showing high patient compliance. Ability of loading of hydrophobic drug in thehydrophilic gel matrix was found a solution by the development of Emulgel. Emulgel containsthe excellent bio-adhesion, optimum viscosity with long-term stability. In this study, Emulgelwere prepared by using two different gel forming polymers. Two formulations (out of three) wereexcellent in their elegance and absorption. In-vitro drug release test demonstrated that Carbopol-934 was the best polymer to formulate Emulgel with 64.04% w/w of drug release than HPMCK4Mas 57.30% w/w. Aceclofenac (emulgel) can be used as anti-nociceptive & antiinflammatoryfor topical delivery. Aceclofenac Emulgel was successfully formulated andevaluated for authentic and selective parameters. Emulgel better enhances the topical delivery of
even poorly soluble drugs like aceclofenac.

REFERENCES

1. Archana G L, M. Sadanandam, Nalini Shasthry, Ch. Anil Kumar Preparation andEvaluation of Aceclofenac Topical Emulgels. Journal of Scientific Research inPharmacy, 2014; 3(1): 12 – 15.

2. Gokani Preet N, Mittal Maheshwary, Pragnesh Patani. Formulation development andevaluation of Aceclofenac loaded Emulgel. International Journal of Sciences & AppliedResearch, 2019; 6(4): 06-15.

3. Grau M, J Guasch, J L Montero, A Felipe, E Carrasco, S Julia. Pharmacology of thepotent new non-steroidal anti-inflammatory agent aceclofenac. Arzneimittelforschung,1991; 41(12): 1265-76.

4. Kumar Davinder, Jasbir Singh, M. Antil, V. Kumar. Emulgel- Novel Topical DrugDelivery System- A Comprehensive Review. IJPSR, 2016; 7(12): 4733-4742.

5. Pani P C Sathya Keerthi, C Haranath, C Suryaprakash Reddy, A Chaitanaya Kumar, MKiran Kumar, D Rushi Kumar Reddy, V Umapathi, B Yamuna, R Raviprakash Reddy.Emulgel: A Novel Approach for Enhancing Topical Delivery of Aceclofenac, 2014;2015(1): 1-5.

6. Patel Japan, Brijesh Patel, Hardeepsingh Banwait, Kaushal Parmar, Manish Patel, 2011.

7. Formulation And Evaluation of Topical Aceclofenac Gel Using Different Gelling Agent.International Journal of Drug Development and Research, 3(1): 156-164.

8. P. Vijaya Bhanu, Development and optimization of novel diclofenac emulgel for topicaldrug delivery, International Journal of Comprehensive Pharmacy, 2011, vol.2, pg. no 1-4.

9. Hemanth khambete, Gellified emulsion for sustain delivery of itracanazole for topicalfungal diseases, International Journal of Pharmacy and Pharmaceutical sciences, 2010,vol.2, and pg.no. 104-112. [3]Ankur Jain, A novel formulation for topical delivery ofhydrophobic drugs, International Journal of Pharmacy and Pharmaceutical sciences2013,pg.no. 12-16.

10. Sheefali mahat, Formulation and characterization of benzyl peroxide jellified emulsion,Scintia Pharmaceutica, 2012, pg.no. 1-40. [5]Ankur Jain, Development of antifungalemulsion based gel for topical fungal infections, Indian Journal of PharmaceuticalResearch and Development, 2011, pg.no. 18- 25.

11. Yehia I. Khalil, preparation and evaluation of physical and rheological properties ofclotrimazole emulgel, Iraqui Journal of Pharmaceutical Sciences, 2011, vol.2, pg.no. 19-25.

12. Singla Vikas, Penetration enhancers; A novel strategy for enhancing transdermal drugdelivery, International research Journal of Pharmacy, 2011, pg. no. 32-36.

13. Shital sonawane ,A Emulgel Review: Topical Drug Delivery SystemA Emulgel Review:Topical Drug Delivery System ,2020 IJCRT | Volume 8, Issue 10 October 2020.

14. Anuradha A Sawant, S.K. Mohite. Formulation and Evaluation of Itraconazole Emulgelfor Topical Drug Delivery. Asian J. Pharm. Tech. 2015; Vol. 5: Issue 2, Pg 91-96. doi:10.5958/2231-5713.2015.00014.8Z

15. Shah2013EmulgelAT, title={Emulgel: A Topical Preparation for Hydrophobic Drugs},author={Arpan A. Shah and Kamal M. Kamdar and Rushabh Shah and Rajesh A.Keraliya}, year={2013} }

16. Ajazuddin, Alexander A, Khichariya A, et al. Recent expansions in an emergent noveldrug delivery technology: Emulgel. Journal of Controlled Release : Official Journal ofthe Controlled Release Society. 2013 Oct;171(2):122-132.
DOI:10.1016/j.jconrel.2013.06.030. PMID: 23831051.

17. Kamlesh wadher ,Design, Formulation and Evaluation of Topical NimesulideEmulgel,International Journal of ChemTech Research CODEN (USA): IJCRGG, ISSN:0974-4290, ISSN(Online):2455-9555 Vol.11 No.10, pp 52-59, 2018

18. Suyash Ingle, Varsha Tegeli, Baburao Chandakavate, Vinod Matole, Onkar Kirdak,Ganesh Gophane, Shivraj Tonape, Avinash Birajdar, Saurabh Nangare, Sagar adlinge,Swaminath Ramanshetti, Kuldeep Yadav, Akhil Patil, Ashwini Khare, Sneha Ubale,Vaishnavi Dulange, Bhavana habib, Jyoti Mittha. A Brief Review Onemulgel – A NovelTopical Drug Delivery System. Res. J. Pharma. Dosage Forms and Tech.2021