Formulation and in-vitro evaluation of Aceclofenac loaded topical Emulgel

Syed Abdul Khalid[1*], B.Pragati Kumar[1], T.Abhinov[2]

1. Department Of Pharmaceutics,Nimra College of Pharmacy,Vijayawada.

2. Ayaan Institute of Medical Sciences, Moinabad.

[*]Corresponding author:abdulkhalid99@gmail.com, Phone no:+91-7799178619.

ABSTRACT

Gels are a relatively newer class of dosage form created by entrapment of large amounts of aqueous or hydro alcoholic liquid in a network of colloidal solid particles. Gel formulations generally provide faster drug release compared with conventional ointments and creams. In spite of many advantages of gels, a major limitation is in the difficulty in delivery of hydrophobic drugs. So to overcome these limitations, emulgels are prepared. When gels and emulsions are used in combined form, the dosage forms are referred as Emulgels. Emulsions possess a certain degree of elegance and are easily washed off whenever desired. They also have a high ability to penetrate the skin. Emulgels for dermatological use have several favourable properties such as being thixotropic, greaseless, easily spreadable, easily removable, emollient, non-staining, water-soluble, longer shelf life, bio-friendly, transparent & pleasing appearance. Other important factor is to extend the drug release of even hydrophilic drugs by making w/o emulgel, Aceclofenac is an anti-inflammatory drug and is successfully used in the treatment for the relief of pain and inflammation in rheumatoid arthritis, osteoarthritis and ankylosing spondylitis lipophilic drug with biological half-life 4 hrs. On this contest, emulgel was formulated using carbopol 934 and CMC, liquid paraffin as oil phase, emulsifying agents like tween 20 and span 20 and propylene glycol as permeation enhancers.

Key Words: Emulgel, Gel, oils, gelling agents.

INTRODUCTION

Transdermal drug delivery system (TDDS) established itself as an integral part of novel drug delivery systems[2]. The novel Transdermal drug delivery is defined as self-contained, discrete dosage forms which when applied to the intact skin, deliver the drug through the skin at controlled rate to the systemic circulation. Transdermal medication delivers a steady infusion of a drug over an extendedperiod of time. Adverse effects or therapeutic failures frequently associated with intermittent dosing can also be avoided. Transdermal delivery can increase the therapeutic value of many drugs by avoiding specific problems associated with the drug e.g., gastro-intestinal irritation, low absorption, decomposition due to hepatic "first- pass" effect, formation of metabolites that cause side effects, short half - life necessitating frequent dosing etc.

Aceclofenac [[[2-[(2, 6-Dichlorophenyl)- amino]-acetyl]-oxy]-acetic acid is a nonsteroidal anti-inflammatory drug (NSAID). It exhibits a multifactor mechanism of action which is mediated by selective inhibition of prostaglandin E2. The most widely cited side effect of NSAIDs includes, gastrointestinal ulcer, accompanied by anaemia due to the bleeding, which is also true for aceclofenac. In order to avoid the gastric irritation, minimize the systemic toxicity and achieve a better therapeutic effect, one promising method is to administer the drug via skin.

MATERIALS AND METHODS

Formulation design for Aceclofenac emulgel preparation:

Table.1.Formulation of gel preparation (Aceclofenac 10% w/w)

Ingredients (% w/w)	F1	F2	F3	F4	F5	F6	F7	F8
HPMC K15M	0.5	0.5	0.5	0.5	-	-	-	-
Carbopol 934	-	-	-	-	0.25	0.25	0.25	0.25
Purified water	q.s	q.s	q.s	q.s	q.s	q.s	q.s	q.s

Table.2.Formulation of emulsion preparation (Aceclofenac 10% w/w)

Ingredients (% w/w)	F1	F2	F3	F4	F5	F6	F7	F8
Aceclofenac	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Light liquid paraffin	2.5	3.75	2.5	3.75	2.5	3.75	2.5	3.75
Tween 20	0.3	0.3	0.5	0.5	0.3	0.3	0.5	0.5
Span 20	0.45	0.45	0.75	0.75	0.45	0.45	0.75	0.75
Propylene glycol	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Ethanol	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25
Methylparaben	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Propylparaben	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Glutaraldehyde	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Purified water	20	20	20	20	20	20	20	20

In-vitro drug permeation study: In-vitro permeation study was carried out using keishary chein cell having capacity of 18ml volume. Egg membrane was isolated and used for the study. Pre weighed (1.5g) emulgel was spread evenly on to the egg membrane. The egg membrane was clamped between donor and receptor compartment. The receptor compartment was filled with 16ml of 5.5pH phosphate buffer maintained at 37ºC and stirred by using magnetic stirrer. The sample (2ml) was collected at suitable time intervals and analyzed for drug content by UV-Visible Spectrophotometer 1700 (Shimadzu, Japan) at 275nm after appropriate dilutions as discussed earlier. .

In-vitro drug release kinetics: In-vitro drug release mechanism was determined by using PCP DISSO V2 software. Depending upon R and k values obtained from different models, the best-fit model was selected.

RESULTS AND DISCUSSION

Table.3.In-Vitro Drug permeation data % cumulative drug release data for F1 to F8

Time (hrs)	F1	F2	F3	F4	F5	F6	F7	F8
0	0	0	0	0	0	0	0	0
1	5.17	5.56	4.10	5.18	6.01	3.94	8.80	5.76
2	12.02	8.61	7.25	7.93	13.42	6.15	16.51	7.51
3	16.54	13.25	10.93	12.45	25.08	9.37	29.72	11.05
4	25.16	19.13	12.28	17.62	32.75	11.20	38.64	16.54
5	33.47	26.58	23.68	26.01	38.62	22.46	47.38	25.93
6	41.31	34.40	28.41	32.85	45.27	25.34	55.13	30.24
7	49.67	42.79	33.06	42.56	56.91	29.81	63.02	38.85
8	58.46	49.83	37.12	46.42	62.84	34.65	70.61	40.69
9	60.02	52.32	42.62	49.83	68.56	40.65	77.54	45.65
10	68.32	59.82	49.53	52.64	76.85	46.74	83.45	52.25
11	74.60	63.25	53.62	57.45	80.25	50.15	90.05	55.48
12	76.77	69.53	60.31	62.06	84.32	58.09	98.86	63.42

The drug release kinetics was studied with in-vitro drug permeation data for all the formulations F1 to F8 and results were stated in the table, the best fit model for selected formulation F7 were found to be Zero order model with Non-Fickian diffusion.

CONCLUSION

Aceclofenac is categorized as anti-arthritic drug and is successfully used in the treatment of arthritis. Aceclofenac is a lipophylic anti-arthritic drug with biological half life 4hrs with oral bioavailability 60-70%. Aceclofenac causes severe gastrointestinal related toxicities associated with oral administration. So to overcome this problem it was alternatively developed for topical route of administration. Aceclofenac maximum wavelength is determined by UV-Visible spectrophotometer using 6.8 pH phosphate buffer and was detected to be 275 nm. Aceclofenac emulgel was

formulated using light liquid paraffin as oil phase and emulsifying agents tween 20 and span 20 for emulsion and incorporated into gel using CMC and carbopol 934 polymers in different ratios. The optimized formulation F7 showed a shear thinning with thixotropic property with better spreadability, viscosity and in-vitro permeability compared to other formulations. In the study it was observed that the concentrations of tween20 spann 20 and light liquid paraffin has shown effect on viscosity, spreadability and in-vitro drug permeability. Increased amount of liquid paraffin showed suppress activity of tween 20 and span 20. The surface morphology of the optimized formulation was observed by Scanning Electron Microscopic study. Thus Aceclofenac emulgel which could increase the drug permeability across the skin and fast release of the drug could be successfully achieved.

REFERENCES

Advanced Research Journals4/70-71. Black Well HB, AL 30100Copyright@arjournals.org 2009-2011.

Alaa Mohammad Abdel Azim. Glucosamine sulphate transdermal gels: An alternative route for drug delivery. Int J Pharm Res Dev 2012; 3(11): 102-113.

Ana Amelia M Lira, ElizangelaASester, Andre Luis M Carvalho, Ruth R Strattmann, Miracy M Albuquerque, Almir G Wanderley, et al. Development of lapachol topical formulation: anti-inflammatory study of a selected formulation. AAPS Pharm Sci Tech. March 2008; 9(1): 163-168.

AnantKetkar, VinayPatil, Paradkar AR. PCP Disso V2.08.Pune.

Ankur Jain, PiyushaDeveda, Naveen Vyas, JitendraChauhan, HemantKhambete, Sanjay Jain. Development of antifungal emulsion based gel for topical fungal infections. Int J Pharm Res Dev 2011; 2 (12): 18-25.

Ankush I Shembale, Dipak K Borole, Rajesh T Lohiya. Useful permeation enhancers for transdermal drug delivery: A review. Int J Pharma Res Dev 2010; 2(5):1-6.

ArunachalamA et al. Transdermal drug delivery systems: A review. Current Pharma Res 2010; 1(1): 70-81.

Bhavsar JD, Brahambhatt VG, Patel MR, Patel KR, Patel NM. Review article: Novel approaches in semisolids. Int J Pharm World Res 2011; 2(1): 1-22.