CHARACTERIZATION OF DOSAGE FORM AND PENETRATION DICLOFENAC SODIUM WITH MICROEMULSION SYSTEM IN HPMC 4000 GEL BASE

by Esti Hendradi

Submission date: 09-Jan-2019 11:42AM (UTC+0800)
Submission ID: 1062409338
File name: Bukti_C-43_f.pdf (1.34M)
Word count: 1144
Character count: 6201

Proceeding
The 1st International Conference
on Pharmaceutics & Pharmaceutical Sciences

ICPPS 2014

CHARACTERIZATION OF DOSAGE FORM AND PENETRATION DICLOFENAC SODIUM WITH MICROEMULSION SYSTEM IN HPMC 4000 GEL BASE

(Microemulsion W/O with rasio use of surfactant Span 80 – Tween 80 : Cosurfactan Ethanol 96% = 6:1)

Esti Hendradi, Pharmaceutics Department of Faculty of Pharmacy Universitas Airlangga, Surabaya, Indonesia esti_hendradi@yahoo.com; **Tutiek Purwanti,** Pharmaceutics Department of Faculty of Pharmacy Universitas Airlangga, Surabaya, Indonesia; **Karina Wahyu Irawati**, Pharmaceutics Department of Faculty of Pharmacy Universitas Airlangga, Surabaya, Indonesia

INTRODUCTION

Diclofenac is NSAID that has activated as antiinflammation, analgesic and antipyretics (Schuelert, 2011). Diclofenac sodium has partition coefficient of 13.4 (Hasan et.al.2005) which means diclofenac sodium has a partition in oil a higher amount than in the water. By usage two phases to diclofenac sodium like emulsion, diclofenac sodium can dispersed in the initial phase oil and water. But emulsion has thermodynamically unstable (Allen, 1997). So that, needed a system more stable for dispersion of diclofenac sodium to produce a more effective preparation, namely microemulsion system.

The characteristics of microemulsion are stable in thermodynamics, transparent, low viscosity, and have high solubilisasion so that it can increase bioavailability drugs in the body (Santos et al., 2008). To overcome the low viscosity of microemulsion by adding hydroxi propyl methyl cellulose (HPMC). The aim of this study was to observe characterization dosage form and penetration of diclofenac sodium in microemulsion system which contained ratio surfactant Span 80-Tween 80 an cosurfactant ethanol= 6:1.

METHODS

Material

Diclofenac sodium (PT. KIMIA FARMA), soybean oil (Sime Draby Edible Product Limited), Span 80 and Tween 80 (Croda), ethanol 96% (Merck), HPMC 4000 (Cosmetic Grade) (Dow Chemical Pacific), aquadem (PT Widatra Bhakti), propyleneglycol (BASF SE, Germany).

Preparation of Microemulsion and emulsion

The composition of microemulsion and emulsion system in table 1.

Preparation of Emulsion

Emulsion was made by mixing Span 80 and soybean oil as oil phase. As water phase was aquadem and Tween 80. Diclofenac sodium was added in the water phase and oil phase was 2% and 3%, respectively. Mixed the system using magnetic stirer 500 rpm for 30 minutes.

Preparation of Microemulsion

Span 80, Tween 80, soybean oil, surfactant and cosurfaktant were mixed using magnetic stirrer 100 rpm for 15 minutes. Added aquadem and mixed 100 rpm, 15 minutes.Then, added diclofenac sodium into the system mixed at 150 rpm for 60 minutes.

Table 1. Formula of microemulsion and emulsion W/O type of diclofenac sodium

Material	Consentration (%)(b/b)	
	Microemulsion	Emulsion
Diclofenac sodium	5.00	5.00
Span 80	38.00	7.70
Tween 80	12.83	2.86
Etanol 96%	8.47	-
Soybean oil	33.74	64.41
Aquadem	1.95	20.03

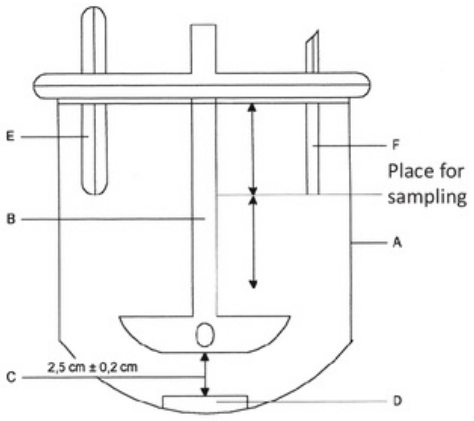
Material	Consentration (%)(b/b)
HPMC 4000	1.5
Propyleneglycol	5
Aquadem	93.5

Table 2. Componen HPMC 4000 gel

Preparation of Microemulsion and emulsion diclofenac sodium in HPMC gel
The concentration of diclofenac sodium of Microemulsion and emulsion in HPMC gel was made 1%. Weigh the microemusion or emulsion that contained 1% diclofenac and added in to HPMC gel and mixed.

Evaluation
Organoleptic Evaluation
Organoleptic evaluation carried out visually includes examining the color, odor, and consistency. The evaluations performed on microemulsion and emulsion of diclefenac sodium.
Determination of Droplet Size Distribution
Examination of the size and distribution of the microemulsion droplet size was performed with a submicron Delsa™ Nano Particle Size and Zeta Potential Dynamic Light Scattering. The droplet of emulsion of diclofenac sodium was determined using microscope.

Determination of conductivity
Determination of conductivity was measured using conductometer to microemulsion and emulsion preparation.
Penetration of diclofenac sodium from the preparation
The penetration of dicofenac sodium from microemulsion gel through Wistar rat skin membrane was determined by dissolution test for 8 h. The gel microemulsions of diclofenac sodium (in cell diffusion) were placed respective in the dissolution chamber (Figure 1). All in vitro penetration were performed at 100 rpm, with each medium of dissolution (phosphate buffer saline pH 7.4 ± 0.05 at temperature 37 ± 0.5°C) was 500 mL. The samples withdrawn at different time intervals were analyzed for drug content using Spectrophotometer Double Beam UV-VIS Recording UV 160 A (Shimadzu). The result was analyzed by statistic programmed of using Independent sample t-Test with degree of confident 95% (α = 0.05).



A :Diffusion chamber contain PBS pH 7.4
C: Distance from paddle to diffusion membrane
D: Diffusion cell
E: Thermometer
F: Sample holder

Figure 1. Apparatus 5-paddle Over Disk (TheUnited States Pharmacopeia Convention, 2002)

Penetration of diclofenac sodium was calculated using equation 1

$$J = \frac{dM}{S.dt} \qquad (1)$$

Where
J : flux
M : mass of compound (gram)
S : surface area of barier/membrane (cm2)
t : time (minute/hour)

RESULTS AND DISCUSSION

The appearance system of microemulsion and emulsion shown in Figure 2 and Table 3. In this figure showed that microemulsion was clear and the emulsion was not clear.

A B

Figure 2. The appearence of microemulsion (A) and emulsion (B)

Table 3. The organoleptics, droplet size and conductivity microemulsion and emulsion of diclofenac.

Observation	Microemulsion of diclofenac sodium	Emulsion of diklofenac sodium
Organoleptics Consistency Color Smell	 Transparent fluid Yellow No smell	 Viscous liquid White No smell
Droplet size	117.2617 nm	1.04 µm
Conductivity	0.40 ± 0.01 µS	0.92 ± 0.01 µS

The droplet size of microemulsion smaller compared with the droplet of emulsion of diclofenac. The results of conductivity test showed both of microemulsion and emulsion of diclofenac 0,40 ± 0,01 µS and 0,92 ± 0,01 µS, respectively. It means both the emulsion type were W/O.

Table 4. The spread diameter and pH of microemulsion and emulsion of diclofenac.

Observation	Microemulsion of diclofenac sodium	Emulsion of diklofenac sodium
Spread diameter	7.7± 02 cm	12.73 ± 02 cm
pH	6.33 ± 002	6.33 ±0.02

Each data represents the mean ± S.D. of 3 determinations

The data of spread diameter of microemulsion of diclofenac was lower than emulsion of diclofenac but the pH of two preparations were same. In this research the penetration of diclofenac from emulsion preparation was not done because the stability of emulsion of diclofenac only 2 hours. The flux of diclofenac from microemulsion preparation shown in table 5.

Table 5.Flux of diclofenac from microemulsion preparation

Replication	Flux of diclofenac sodium ($\mu g/cm^2$/minutes)
1	0.24
2	0.18
3	0.24
Mean± SD	0.22 ± 0.03
% KV	16.25 %

The permeability of rat skin to diclofenac shown in table 6.

Table 6. The permeability of rat skin to diclofenac sodium

Replications	Permeability of rat skin to diclofenac sodium(cm/minute)
1	2.18×10^{5}
2	1.63×10^{5}
3	2.21×10^{5}
Mean± SD	$2.01 \times 10^{5} \pm 3.27 \times 10^{-6}$
% KV	16.25 %

CONCLUSION

1. Characteristics of microemulsion system in gel base HPMC 4000 showed thicker consistency than emulsion system in gel base HPMC 4000. Different system gave no effect on pH but gave effect on spread diameter of zero load.
2. Penetration flux in microemulsion system in gel base HPMC 4000 was 0.22 ± 0.03 µg/cm2/minute and permeability of membrane was 2.01 x 10-5 ± 3.27 x 10-6 cm/minute.

REFERENCES

Allen, L. V., Jr., 1997. The art and Technology of Pharmaceutical Compounding, Washington DC: American Pharmaceutical Association, p.173-185, 209.

Hasan, S. M., Ahmed, Tasneem., Talib, Nasira., Hasan, Fouzia., 2005. Pharmacokinetic Of Diclofenac Sodium In Normal Man, Pakistan Journal of Pharmaceutical Sciences Vol. 18, No.1, January 2005.

Santos, A.C. Watkinson, J Hadgraft, dan M.E. Lane. 2008. Application of Microemulsions in Dermal and Transdermal Drug Delivery . Journal Skin Pharmacol Physiology 2008; 21: 246-259.

Schuelert, Niklas., Russsell, Fiona A., McDougall, Jason. 2011. Topical Diclofenac In The Treatment Of Osteoarthritis Of The Knee. Journal Orthopedic Research and reviews 2011:3., p.1-8

CHARACTERIZATION OF DOSAGE FORM AND PENETRATION DICLOFENAC SODIUM WITH MICROEMULSION SYSTEM IN HPMC 4000 GEL BASE

ORIGINALITY REPORT

11%	11%	0%	0%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	alumni.unair.ac.id Internet Source	8%
2	doaj.org Internet Source	2%
3	journal.unair.ac.id Internet Source	1%

Exclude quotes	Off	Exclude matches	Off
Exclude bibliography	On		