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COMPARATIVE INVITRO RELEASE OF DICLOFENAC SODIUM GEL FROM DIFFERENT MARKETED PRODUCTS

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ABSTRACT

Diclofenac Sodium, a non steroidal anti-inflammatory agent is frequently prescribed for the long term treatment of rheumatoid arthritis, osteoarthritis and ankylosing spondylitis. The drug undergoes substantial first pass effect and only 50% of drug is available systemically. Further, the drug is known to induce ulceration and bleeding of the intestinal wall. To avoid the adverse effect, alternate routes of administration have been tried by investigators. Diclofenac Sodium, a non steroidal anti-inflammatory agent is frequently prescribed for the long term treatment of rheumatoid arthritis, osteoarthritis and ankylosing spondylitis. The drug undergoes substantial first pass effect and only 50% of drug is available systemically. Further, the drug is known to induce ulceration and bleeding of the intestinal wall. To avoid the adverse effect, alternate routes of administration have been tried by investigators. The need of the present work aim to compare the invitro release of diclofenac sodium from different marketed products. Four different marketed formulations (A, B, C, D) were studied for their permeation through the dialysis membrane. The Franz diffusion cell was used to determine the amount of the drug diffused from different formulations. The samples were analyzed spectrophotometrically at a wavelength of 276 nm. In vitro release studies were recorded for a four hour period. It was concluded that product C released high rate i.e. 86% of diclofenac sodium within 50 minutes which was also found to be economic when compared to other marketed products.

Keywords: Comparative, invitro release, diclofenac sodium Gel.

INTRODUCTION

A gel is a solid, jelly-like material that can have properties ranging from soft and weak to hard and tough. Gels are defined as a substantially dilute cross-linked system, which exhibits no flow when in the steady-state. By weight, gels are mostly liquid, yet they behave like solids due to a three-dimensional cross-linked network within the liquid. It is the crosslinks within the fluid that give a gel its structure (hardness) and contribute to stickiness (tack).

Figure 1.*Gel*

Gels consist of liquids gelled by means of suitable gelling agents. Gels comprise of homogenous preparations intended to be applied to the skin or certain mucous membranes; Gels may contain auxiliary substances such as antimicrobial preservatives, antioxidant and stabilizers. The active ingredients in gel based formulations are better percutaneously absorbed than cream or ointment bases. A gel based formulation can hold/contain more percentage of ethyl alcohol than ointment and creams.[1] Topical gel preparations are intended for skin application or to certain mucosal surfaces for local action or percutaneous penetration of medicament or for their emollient or protective action.

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Diclofenac gel has only been compared to treatment with a placebo and has not been directly compared with another topical or oral NSAID. Moreover, prices for a drug can vary quite widely based on different companies. Special formulation allows the active ingredient (Diclofenac Sodium) to be absorbed by skin around 8 times faster, comparing with another similar product in the market, and relieves inflammation and pain effectively[3]. The need of the present work aim to compare the invitro release of diclofenac sodium from different marketed products.

MATERIALS & METHODS

Material

Four marketed Diclofenac formulations [Product A-Diclofenac Gel B.P. 30 gm; volini Gel Lic. No.: MNB/08/685; Batch No.: S57211, Mfg. Date: 11/2011, Exp. Date: 10/2013, Mfg.By: SOLREX PHARMACUTICALS COMPANY (H.P) MRP Rs.69/.; [Product B DiclofenacDiethylamine BP 30 gm ;OMNI GEL, Lic. No.: M/485/08, Batch No.: Z480, Mfg. Date: 10/2011, Exp. Date: 09/2013, Mfg. By:CIPLA LIMITED, MRP Rs 61/ Sikkim and [Product C-Diclofenac Gel B.P. 30 gm; WINOGEL, Lic. No.: 20/UA/2006, Batch No.: WCC1142, Mfg. Date: 10/2011, Exp.Date: 09/2014, Mfg. By: Creative health care pvt.Ltd, MRP Rs.55/ Uttarakhand and Product D - Diclofenac Gel B.P. 30 gm; 3DGEL, Lic. No.: MNB/87/08, Batch No.: D-94, Mfg. Date: 06/2011, Exp.Date: 05/2013, Mfg.

By: Jepspharmaceutics,Sirmour] MRP Rs.40.75/ were used for the study.

METHOD

The Franz diffusion cell was used to determine the amount of the drug diffused from different formulations[4].

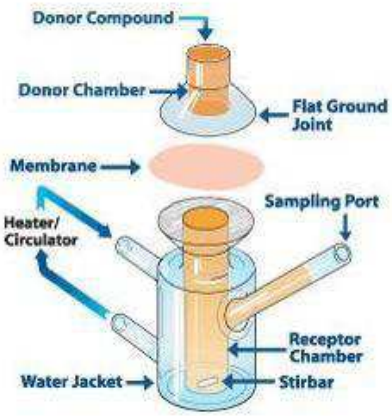

Figure 2: ***Franz diffusion cell***

In vitro release testing methods

Franz diffusion cells with a receiver compartment volume of 10 mL and effective diffusion area of 2.84 cm^2 were used to evaluate drug delivery characteristics from the eight selected compositions. A dialysis membrane (0.65 μm) was used. The receptor phase (ethanol 50 %, w/w) was continuously stirred and kept at a temperature of 32 ± 0.5°C during the experiments. One gram of gel formulation was placed in the donor compartment. At appropriate time, 1 mL of the sample was withdrawn from the receiver compartment and the same amount of fresh solution was added to keep the volume constant. Each experiment was run in four independent cells. The samples were analyzed spectrophotometrically at a wavelength of 276 nm and the concentration of diclofenac sodium in each sample was determined from a standard curve (5-30 μg. mL-1). Each data point represented the average of three determinations. In vitro release studies were recorded for 50 minutes. Previous solubility tests were made so as to ensure sink conditions for drug dissolution in the donor medium.

RESULTS AND DISCUSSION

In vitro release of Diclofenac sodium from Products:

Four different invitro release of Diclofenac formulations were studied for their permeation through the dialysis membrane. The amount of drug permeated from the preparation was estimated by UV method and the results are represented in table 1 below.

Table 1.*Standard plot values of diclofenac sodium*

S.No	Concentration (mcg/ml)	Absorbance
1	0	0
2	5	0.291
3	10	0.584
4	15	0.804
5	20	1.142
6	25	1.346
7	30	1.648

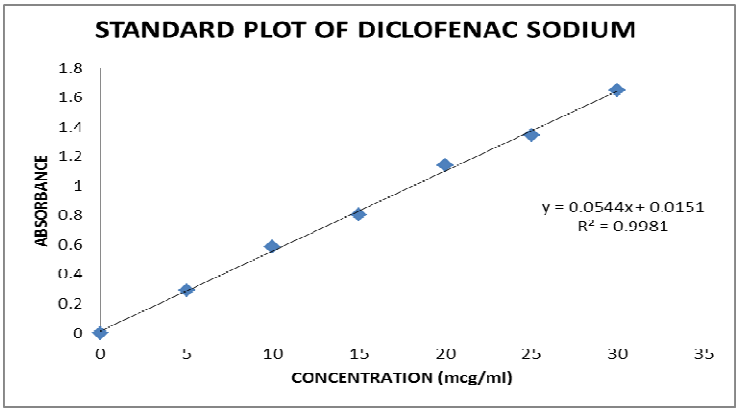

Figure 3. ***Standard plot of diclofenac sodium***

Table 2: ***Percentage Drug Release from Product-A***

S.No	Time (min)	Absorbance	Amount of drug released (mg)	% Drug Released	%Drug Unreleased	Log% Drug Unreleased
1	0	0	0	0	100	2
2	10	0.1662	1.455	14.55	85.48	1.931
3	20	0.2243	1.963	19.63	80.37	1.905
4	30	0.367	3.215	32.15	67.85	1.831
5	40	0.712	6.234	62.34	37.66	1.575
6	50	0.893	7.819	78.19	21.81	1.450

Table 3: ***Percentage Drug Release from Product-B***

S.No	Time (min)	Absorbance	Amount of drug released (mg)	% Drug Released	%Drug Unreleased	Log% Drug Unreleased
1	0	0	0	0	100	2
2	10	0.1994	1.745	17.45	82.55	1.916
3	20	0.3223	2.822	28.22	71.78	1.856
4	30	0.510	4.465	44.65	55.35	1.743
5	40	0.739	6.470	64.70	35.3	1.547
6	50	0.983	8.607	86.07	14.0	1.146

Table 4: ***Percentage Drug Release from Product-C***

S.No	Time (min)	Absorbance	Amount of drug released (mg)	% Drug Released	%Drug Unreleased	Log% Drug Unreleased
1	0	0	0	0	100	2
2	10	0.570	0.499	4.30	95.7	1.980
3	20	0.2001	1.752	15.1	84.9	1.928
4	30	0.316	2.766	23.8	76.2	1.881
5	40	0.586	5.131	44.2	55.8	1.746
6	50	0.708	6.199	53.43	46.57	1.668

Table 5: ***Percentage Drug Release from Product-D***

S.No	Time (min)	Absorbance	Amount of drug released (mg)	% Drug Released	%Drug Unreleased	Log% Drug Unreleased
1	0	0	0	0	100	2
2	10	0.570	0.499	4.30	95.7	1.980
3	20	0.2001	1.752	15.1	84.9	1.928
4	30	0.316	2.766	23.8	76.2	1.881
5	40	0.586	5.131	44.2	55.8	1.746
6	50	0.708	6.199	53.43	46.57	1.668

Table 6: ***Comparative percentage drug release from marketed products A, B, C, D.***

S.No	Time (min)	Percentage of drug released from different Products			
		A	B	C	D
1	0	0	0	0	0
2	10	6.59	14.55	17.45	4.3
3	20	16.17	19.63	28.22	15.1
4	30	25.73	32.15	44.65	23.8
5	40	50.79	62.34	64.7	44.2
6	50	66.23	78.19	86	53.43

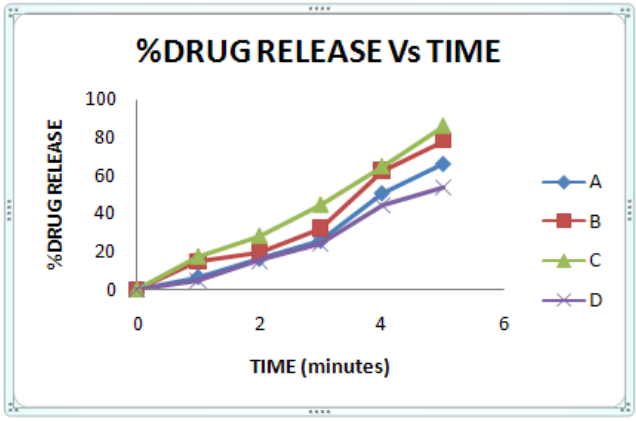

Figure 4. ***Percentage drug release of Diclofenac sodium from four different marketed products.***

DISCUSSION

The objective of the study is to carry out the comparative invitro release of diclofenac sodium gel from different marketed products. The Franz diffusion cell was used to determine the amount of the drug diffused from different formulations. In-vitro release studies were carried out upto 50 minutes. After the time period the % of drug released by A was found to be 66.23 and the % of drug released by B was found to be 78.19 and the % of drug released by C was found to be 86 and the % of drug released by D was found to be 53.43.

The order of release of the drug from various gel formulations was as follows:

Product C > Product B > Product A > Product D.

It was concluded that product C released high rate i.e. 86% of diclofenac sodium within 50 minutes which was also found to be economic when compared to other marketed products.

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