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Preparation of Transdermal Patch and Evaluation of Physical Parameters

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ABSTRACT

Traditional medication delivery methods, such as pills, capsules, liquids, powders, and intravenous needles, are often inefficient or invasive and can lead to undesirable side effects. A transdermal patch is a medicated adhesive patch that is placed on the skin to deliver a specific dose of medication through the skin and into the bloodstream. Often, this promotes healing to an injured area of the body. The present study of preparation of monolithic Transdermal patch from Ramipril and evaluation of different physical parameters.

Keywords : Transdermal Patch, Skin,ramapril, Permeation

I. INTRODUCTION

Perhaps the first use of transdermal can be found in ancient China, where medicated plasters were slathered on the skin and left to dry. The method was devised to allow a medication to have direct and constant contact with the skin. The first patch certified and accepted by the United States Food and Drug Administration was for a motion sickness patch. It was approved in 1979. Transdermal patches are simple to use and constitute a simple albeit efficient idea for medication delivery. One side of the patch contains the medication, which is formulated into the skin contact adhesive. It is this side of the patch which is adhered to the skin. A person's skin is his or her largest organ. It covers and protects the body, regenerates when needed, and provides limited but essential permeation

Fig 1 : Transdermal Patch

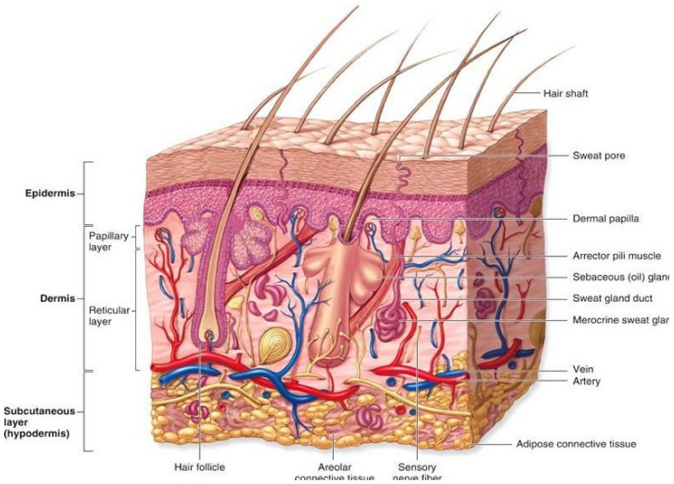

Fig 2 : Skin Layers

The skin has three layers. The first layer is called the epidermis. The epidermis is the skin's outermost layer. The second layer of the skin is called the dermis. It lies beneath the epidermis and contains connective tissue that gives the skin structure and strength. This layer of skin transmits medication from a patch into the deepest layer named as Hypodermis which contains blood vessels which also reach into the dermis and epidermis. These blood vessels are important in the transmission of medication from a patch to the bloodstream.

- **In vitro drug permeation study:-**

In vitro study was carried out to predict the delivery and permeation of the drug molecule through the skin surface in the body of the living animal. This was achieved by using a Franz diffusion cell.

- **Preparation of rat abdominal skin:-**

The male wistar rats weighing 170-190 g were sacrificed using anesthetic ether. The full thickness skin was removed from the abdominal region and abdominal hairs were removed by depilatory. The dermal side of the skin was washed thoroughly with distilled water to remove the blood vessels and adhering tissues. The skin of the test animal was then wrapped in aluminum foil and stored in freezer until further use. Prior to the experiment the skin was equilibrated for 15 minutes in the dissolution medium(phosphate buffer pH 7.4).

II. PROCEDURE

The receptor compartment of the Franz diffusion cell was filled with 65 ml of phosphate buffer pH 7.4. The contents of the diffusion cell were stirred using a teflon coated bead at a constant speed of 50 rpm on a magnetic stirrer. The isolated rat skin was mounted on the diffusion cell and the transdermal patch was placed over the skin. The temperature of the medium in the receiver compartment was maintained at 37 ± 1ºC with the water jacket. The donor compartment was kept open to maintain the exposure of system to ambient conditions. The amount of drug permeated in the receptor solution was determined by withdrawing 1 ml at hourly intervals. Each time equal volume of buffer was supplemented in the receptor compartment to maintain sink condition.

III. RESULTS

The monolithic transdermal patches of Ramipril using ethyl cellulose and polyvinyl pyrrolidone were prepared by solvent evaporation and solvent casting technique and were flexible, smooth and transparent.

- **Drug excipient interaction study:-**

The transdermal patches were also evaluated for the physical parameters

Table 1 : Physical parameters and drug content of transdermal patches

Batch codes	Physical appearance	*Weight (mg)	*Thickness (mm)	*Drug content	*Surface pH	*Folding endurance	Flatness (%)	%Swellability
F1	++	7.5 ± 0.002	0.169± 0.001	96.9 ± 0.30	6.2± 0.15	289± 0.52	100	11.7
F2	++	7.9 ± 0.050	0.172± 0.001	97.5 ± 0.10	6.9± 0.10	297± 0.01	100	14.3
F3	++	8.15 ± 0.001	0.170± 0.005	97.9 ± 0.52	6.2± 0.11	295± 0.57	100	15.3
F4	++	9.16 ± 0.001	0.172± 0.007	98.5 ± 0.11	6.8± 0.10	297± 0.15	100	17.90

++ Satisfactory; *Average of three determinations for each parameter

- ***In vitro* permeation studies:-**

The permeation study was carried out for 11 hours and maximum permeation was obtained for formulation F4 (97.46) and minimum permeation was obtained for formulation F1 (66.59). Formulation F1 contained higher proportion of Ethyl cellulose and it showed comparatively sustained release pattern. Hence for obtaining sustained release high concentration of ethyl cellulose is required.

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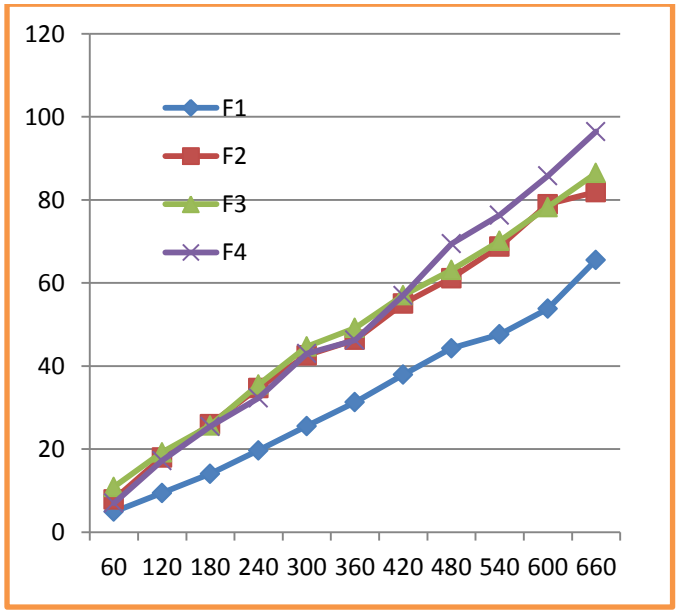

Fig 3. % Cumulative drug permeated vs time(min) for the formulations F1 –F4

Time (min)	Cumulative % of Drug permeated (F1)	Cumulative % of Drug permeated (F2)	Cumulative % of Drug permeated (F3)	Cumulative % of Drug permeated (F4)
60	4.932	7.89	10.9	6.99
120	9.415	17.99	19.2	17.2
180	14.05	25.98	25.69	25.44
240	19.69	34.7	35.53	32.28
300	25.42	44.56	44.68	42.99
360	31.28	46.32	46.15	46.23
420	37.9	55.01	59.01	56.99
480	44.25	61.12	67.09	69.42
540	47.63	68.78	70.1	76.34
600	53.76	78.95	78.23	85.78
660	66.59	81.88	8.46	97.46

- **Drug release kinetics:-**

The *in vitro* permeation data obtained for all the formulations was fitted to various kinetic models to elucidate the permeation profile. The drug permeation profile for all the formulations was found to follow zero order kinetics as evidenced by the straight line and higher regression value depicted in Figure. Thus the release rate was independent of the concentration of the drug. The kinetic models for various formulations have been shown in the table below

Table 3: Value of R^2 for different kinetic models for formulations F1-F4

Formulation Code	R^2				
	Zero order	First order	Higuchi	Korsemeyer Peppa's	n value
F1	0.985	0.866	0.866	0.982	0.119
F2	0.989	0.921	0.921	0.982	0.109
F3	0.988	0.925	0.925	0.971	0.101
F4	0.990	0.889	0.889	0.955	0.699

IV.CONCLUSION

Formulated patches were found to be smooth flexible and transparent and exhibited good physicochemical properties. The in vitro permeation study indicated increase in the permeation rate with the increase in the concentration of hydrophilic polymer and formulation F4 was found to depict maximum release as compared to other formulations. The release kinetics was found to follow zero order and non fickian diffusion. The results of evaluation studies indicated that the formulated patches of ramipril shows better compliance than conventional drug delivery system. Studies have depicted promising

results and it holds scope for further pharmacokinetic and pharmacodynamic evaluation to filter out the potential of this delivery system.

V. REFERENCES

1) Misra A.N., "Controlled and Novel Drug Delivery. In: N.K. Jain(Eds.), Transdermal Drug Delivery", New Delhi, India: CBS Publisher and Distributor. 1997. 100-101.
2) Rakesh P. Patel, Grishma Patel, Ashok Baria, "Formulation and evaluation of transdermal patch of Aceclofenac", International Journal of Drug Delivery 1(2009) 41-51.
3) Jamakandi V.G., Mulla J.S., Vinay B.L., "Formulation, characterization and evaluation of matrix type transdermal patches of a model antihypertensive drug", Asian J. Pharm., 1, 2015, 59-65.
4) V.N.L. Sirisha, P. Kirankumar, M. Chinna Eswaraiah, "Formulation and Evaluation of Transdermal Patches of Propranolol Hydrochloride", IOSR Journal of Pharmacy, ISSN: 2250-3013, Volume 2 Issue 5, Sep-Oct. 2012, PP.31-37.
5) Agrawal SS, Munjal P. Permeation studies of atenolol and metoprolol tartarate form three different polymer matrices for transdermal delivery. Ind J Pharm Sci. 2007: 535-9.

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