



A PATH BREAKING METHOD FOR DERMAL ABSORPTION OF DRUGS

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ABSTRACT

Aim: To develop a method for studying the dermal absorption of topical preparations.

Method: Multi-level filter paper based method was employed for the present study. The method was developed in house. The permeation of the dermatological products from top layer to bottom layer was evaluated and the presence of active principles was confirmed using UV lamp. *S.aureus* was used to check the molecular size similarity of the active principle.

Results: The dermal absorption of the actives was greater from ointment base when compared to cream base.

Discussion: The greater dermal absorption of actives from ointment base coupled with the greater retention time of the ointment support the ointment base to be the best vehicle for delivering fat soluble herbal drugs. The present study also highlights the scientific credibility, reliability, ease of use, cost advantage of multilayered filter paper method developed by us for testing the dermal absorption of topical drugs.

Conclusion: The present study undoubtedly established the reliability and reproducibility of the method.

Key words: Dry skin, Dermal absorption, cream, Lippu ointment, Permeation

INTRODUCTION

Since the treatment of various skin diseases got conceptualized the use of various delivery/dispensing systems also got evolved. The dermal delivery of drugs depends largely on the dispensing method which is otherwise called as base. The base can be either liquids (aqua base, lotion or oil) or solid bases like cream or ointment.¹ Depending upon the polarity, stability and particle size suitable bases are selected and used. However, the chosen base whether helps in the faster absorption of the actives by the skin is often left notional than established scientifically. When the purpose of the preparation is meant for action on the surface of the skin base should be chosen in such a way to increase the holdup time of the actives than enabling their faster absorption or metabolism.^{2,3} There is no comprehensive and reproducible method is available to evaluate the real time delivery kinetics of drugs from various bases.⁴ Due to lack of such method most of the topical preparations are made with rationale than any scientific confirmation. The above challenge in AYUSH industry is much more because most of the ISM industries conveniently bend their intelligence to the ancient texts and so called empirical evidences of the ancient wisdom. Present study deal with path breaking method for the evaluation of dermal absorption of topical drugs that was devised by me at Dr. JRK's Research and Pharmaceuticals Pvt Ltd, Chennai. Further the study also highlights the scientific prudent of the company in developing and validating its drugs.

MATERIALS AND METHODS

Simulation of skin equivalence to study dermal absorption of Pungan extract

The Lippu ointment, the Proprietary Siddha Medicine of Dr. JRK's research and Pharmaceuticals Pvt Ltd was used for the present study. Lippu ointment contains 4 % liposomal extract of *Pongamia pinnata*. For the present study we have used Lippu

ointment as well as a cream, a simple water based cream was prepared with 4% of liposomal extract of *Pongamia pinnata*. The extent of delivery of the base and the actives was studied by embedded, over laid filter paper method. We have used Watt man no. 1 filter paper with thickness of 180 μm . The filter paper was cut into 5 cm^2 and kept one above the other and created a role of 10 filter paper pack. This pack was kept in a petri dish. To keep the space between the petri dish and paper, glass rods were used. 5 such sets were maintained in duplicate for the experiment. On the top of the filter paper 1 gm of the cream and ointment were placed separately. A gentle pressure was applied to spread the product over the top paper. The petri dish was closed and incubated at 37⁰c for 1 hour.

After 1 hour the filter papers from the respective pack was removed and check for the number of filter paper that had received the product from top to bottom order. Each filter paper was further studied for the presence of Pungan extract by UV florescence method.

Live particle model to cross verify the probable particle size of Pungan extract

We have used *S.aureus* culture for the experiment. In brief we have mixed 10⁵ CFU per gram of the cream and ointment and 1 gm of the cream and ointment were separately tested for the microbial permeation through the filter pack as described above.

The cutaneous residency of cream and ointment

The filter paper used (10 numbers) for the experiments were weighed and the initial weight was noted. After application of 1 g of cream or ointment and incubating for 1 hour at 37⁰ c the final weight of the paper was taken and the total weight of the paper+ the cream or ointment was calculated to establish the rate of residency of the respective products.

RESULT

Permeation of *Pongamia pinnata* extract in skin equivalent model

No. of filter papers	Permeation of <i>Pongamia pinnata</i> extract from cream and ointment / 1hour			
	Cream		Ointment	
	Cream penetration	Presence of <i>Pongamia pinnata</i> extract	Ointment penetration	Presence of <i>Pongamia pinnata</i> extract
1	+	+	+	+
2	+	+	+	+
3	+	-	+	+
4	+	-	+	+
5	+	-	+	+
6	+	-	-	-
7	+	-	-	-
8	-	-	-	-
9	-	-	-	-
10	-	-	-	-

+→presence -→absence

Permeation of live particles in skin equivalent model

No. of filter papers	Permeation of <i>S. aureus</i> from cream and ointment / 1hour			
	Cream		Ointment	
	Cream penetration	Presence of <i>S. aureus</i>	Ointment penetration	Presence of <i>S. aureus</i>
1	+	+	+	+
2	+	+	+	+
3	+	+	+	+
4	+	+	+	+
5	+	+	+	+
6	+	+	-	-
7	+	+	-	-
8	-	-	-	-
9	-	-	-	-
10	-	-	-	-

+→presence -→absence

The cutaneous residency of cream and ointment

Cream		Ointment	
Initial weight of paper (10 No)+ 1 gm cream	Final weight of filter paper	Initial weight of filter paper (10 no) + 1 gm ointment	Final weight of filter paper
11 gm	10.3	11	10.8

DISCUSSION

The present study has undoubtedly established the importance of effective delivery of drugs. The complete therapeutics of any topical preparation can be achieved only if the base is chosen wisely. In the present study we have clearly established that the liposomal extract of *Pongamia pinnata* extract (Pungan) was greater from ointment base than from an aqua base cream.

We have used a path breaking technology to evaluate the dermal absorption. We have constructed filter paper model by arranging the filter paper one above the other in a column of 10. When the cream and ointment were placed we found that the permeation of the cream base from top to bottom was higher but we could not establish the presence of pungan. This may be due to the possible wetting property of the cream and that would have resulted in the water from the cream leaching down till near the last paper.

However, pungan was not present in most of the papers. In the case of ointment, the presence of pungan could be established in all the papers viz-a-viz., extent of permeation of the ointment. This strongly supports that only ointment base is ensuring the better delivery of pungan than the aqua based cream. Another technical question also we had raised about the permeation of

pungan Vs the moisturization benefit claimed for Lippu ointment.

Our separate experiment on cutaneous residency of cream and ointment has revealed that the presence of ointment was greater when compared to cream. This might be due to the possible evaporation of water from the cream as the cream was formulated with near 70% water. Although the therapeutic value of pungan is not clearly understood but our present experiment clearly showcases the astute formulation wisdom and the level of scientific understanding that has gone in the formulation of Lippu ointment.

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