

# Antipsoriatic and Antieczematic Activity of Polyherbal Developed Gel on Swiss Albino Mice

Farah Khan<sup>1</sup>, V. Nagulwar<sup>2</sup>, S. Deshpande<sup>3</sup>

<sup>1</sup>P. R. Patil Institute of Pharmacy, Talegaon, India

<sup>2</sup>Government College of Pharmacy, Amravati, India

<sup>3</sup>Priyadarshini J. L. Chaturvedi Pharmacy College, Nagpur, India

**Abstract:** Psoriasis is distinguished by hyper-proliferation and unusual differentiation of epidermal keratinocytes, lymphocyte infiltration containing mainly of T lymphocytes. Psoriasis may be treated mainly by topical and dermal route because systemic therapy or phototherapy mainly concerns with the possible tissues toxicity and sometimes result in carcinogenicity. Beyond the various presently existing management options of psoriasis, topical therapy is the most widely used. Developed gel (4.5% w/w Carbapol 934) Swiss albino mice give relevant result for treatment of psoriasis, without any tissue toxicity such as redness, erythematic in animal skin, as well as convulsion, tremor, circling, depression, hypothermia and mortality. Percent drug activity of Developed gel (4.5% w/w Carbapol 934) was found to be 19.37 % which show a significant antipsoriatic effect in comparison of standard drug Derobin® (1.125w/w) 12.90 %. Developed polyherbal gel is more effective as compared to standard drug Derobin®.

**Keywords:** Psoriasis, Derobin® (1.125w/w), Developed gel (4.5% w/w Carbapol 934)

## 1. Introduction

### Psoriasis

Psoriasis is an inflammatory skin disorder characterized by hyper proliferation and abnormal differentiation of the stratified epidermis of skin. This disease also attack on joints in several patients. However, the first-line treatment of psoriasis is performed through small molecule topical therapies e.g. dithranol (anthralin) and vitamin D analogs as calcipotriol and topical corticosteroids.(1,2,3) Psoriasis is a chronic, long life, skin disease in which body immune system is mainly responsible. It is characterized by hyper proliferation of keratinocytes .(4) Psoriasis of first type (Type I) starts at or before 40 years age whereas second type (Type II) begins after the age of 40 years. More than 75% of patients is related to Type I disease.(5) Treatment of psoriasis is totally depends on following nature of disease as Severity, cost of drug and convenience of patient, relevant co-morbidities, effectiveness, and individualization of patient response.(6)

## 2. Materials and Methods

Swiss albino mice animals were provided by authorized animal house of Priyadarshini J L. Chaturvedi Pharmacy College, Nagpur (Maharashtra, India). Developed herbal gel formulation, DEROBIN® 1.125% Vardhaman Remedies Pvt. Ltd. And psoriasis inducer IMIQUIMOD 1.25% w/w was purchased from Local drug store.

### Animal Care and Handling

The animals were carried for experiment from the authorized animal house of Priyadarshini J L. Chaturvedi Pharmacy College, Nagpur, and Maharashtra, India. All the albino mice were healthy and 25-30gm body weights. The animals were kept in air conditioning environment and temperature was maintained to 25 °C to 26 °C with

conventional laboratory food and fresh drinking water. The bedding of animals was changed every 3rd day. All animals were taken care under ethical concern as per the guidelines of CPCSEA with approval from the Institutional Animal Ethics Committee.

(RegistrationNo.648/PO/Ere/S/02/CPCS).

### In-Vitro Anti-Psoriatic Activity

#### Experimental Design

Total 16 animals were used in the present research work. Animals were divided in to three groups of five each and one as normal without any treated. The first group was control which was left untreated and the second group was standard group treated with marketed ointment (Derobin®) - 1.15% w/w. The third group was treated with developed herbal gel formulation.

Grouping and treatment of animals

Group I : Control

Group II : Standard (Derobin® ointment, 1.15% w/w) Topical,

Group III: Test group (Developed herbal formulation)

Hairs were removed from the 10% of the body surface area from dorsal area of the back portion of all the test animals by using hair remover cream. Psoriasis was induced by a single 80 mg of topical application of inducer IMIQUIMOD 1.25% w/w containing 4mg of main drug applied continuously 14 days on dorsal area of the back portion of all the test animals.(7) After 7 days of application there was presence of granular layer in the shaved area of skin which after a period of time was transformed in psoriatic lesion. After the induction of psoriasis animals were treated with respective dose of standard (Derobin® ointment, 1.15% w/w) and test formulation once daily, for 14 days to evaluate the therapeutic effect. During this period, animals were visualized daily to record the symptomatic effect and the photographs of every animal were taken from each group. Two hours after the last treatment the animals were

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sacrificed using deep ether anesthesia by cervical dislocation, and the sections of skin were cut from each group and stored in 10 % formalin in saline. Transverse sections of about 5  $\mu\text{m}$  thickness were prepared by microtome and stained with hematoxylin-eosin dye for histological examination.

### 3. Evaluation parameters for Anti-psoriatic activity

#### I. Measurement of Percent Orthokeratosis (OK)

An antipsoriatic drug that targets the epidermis is a compound that restores skin homeostasis by suppressing keratinocyte hyper proliferation, abnormal differentiation, or both. The granular layer is greatly reduced or almost absent in epidermis of psoriatic lesions. This parakeratosis condition is one of the most important hall marks of psoriasis. Granular layer formation around the epidermis is known as orthokeratosis condition. The main principle behind the mouse tail test is conversion of parakeratosis to orthokeratosis. Percent orthokeratosis in those parts which normally have a parakeratotic differentiation was quantified measuring the length of the continuous granular layer (A) and the length of the scale (B) and expressed as a percentage of total number of scales region per section.

$$\% \text{ OK} = \frac{\text{Length of Continuous granular layer (A)} \times 100}{\text{Length of scale (B)}}$$

OK = Orthokeratosis

#### II. Measurement of Epidermal thickness (ET)

It was obtained by measuring the distance between the dermal-epidermal borderline and the beginning of the horny layer. Five measurements per animal were made in every 10 scales and the mean of the different animals was calculated. The change in epidermal thickness of standard and formulated gel treated group was then calculated.

$$\% \text{ ET} = \frac{\text{ET of treated group} - \text{ET of control group} \times 100}{100 - \text{ET of control group}}$$

ET = Epidermal thickness

#### III. Measurement of Drug activity

Drug activity is calculated by the percentage increase of orthokeratotic regions.

$$\% \text{ Drug activity} = \frac{\text{Mean OK of Treated group} - \text{Mean OK of Control group} \times 100}{100 - \text{Mean OK of Control Group}}$$

OK = Orthokeratosis

#### Histological examination of mouse skin

Developed herbal gel showed considerable change in epidermal thickness compared to control group's animals. Granular layer of the epidermis is more reduced in psoriatic lesions. Parakeratotic condition is seen in the skin which is one of the hallmarks of psoriasis (8). Formation of granular

layer in the region of the epidermis is known as orthokeratosis state as shown in following Figures. The key theory following the mouse tail test is alteration of parakeratosis condition to orthokeratosis. Drugs which shows their mechanism of action with multiple mechanisms in the treatment of psoriasis is more significant than other drugs performing by one solitary mechanism. This is for the reason that psoriasis is a recurring chronic inflammatory skin disorder by way of manifold pathogenic factors & etiologies.(9) The following figures are showing the epidermal thickness changes in normal, control, standard and test groups mice skin as shown in histology Figures 1,2,3 and 4 respectively.

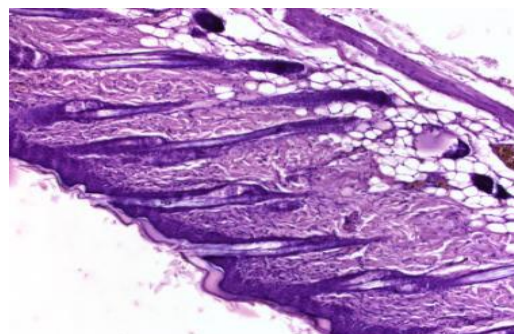


Figure 1: Normal Skin (Without any treatment)

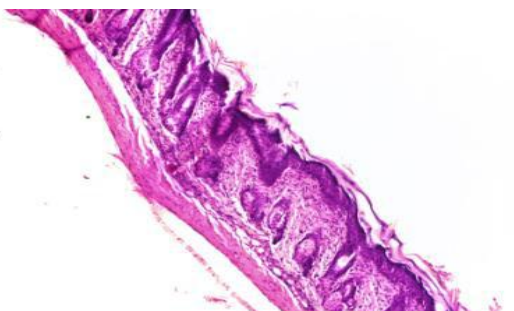


Figure 2: Control group (Induction)

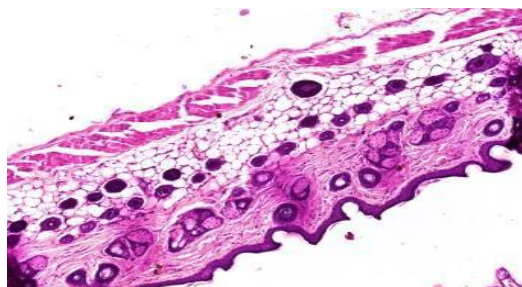


Figure 3: Standard gel (Derobin Ointment 1.15%)



Figure 4: Test group (Developed Herbal Gel)

#### 4. Result and Discussion

Developed gel has increased the orthokeratotic regions by  $40.33 \pm 5.09$  %, in comparison to control group. The standard drug Derobin® showed the increase the orthokeratotic regions by  $35.54 \pm 0.94$  % as shown in Table 1 and Figure 5.

Developed gel has decreased the epidermal thickness  $45.63 \pm 4.45$  % while standard drug decreases the epidermal thickness  $47.39 \pm 1.67$  % as shown in Table 1 and Figure 6.

Percent drug activity of developed gel was found to be 19.37 % which show a significant antipsoriatic effect in comparison of standard drug Derobin® 12.90 % as shown in table 1.

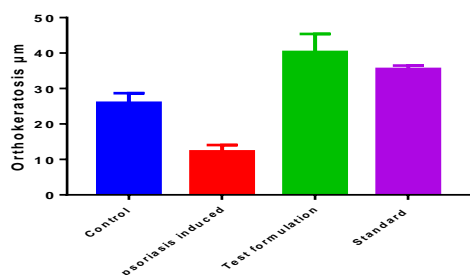


Figure 5: % of orthokeratosis

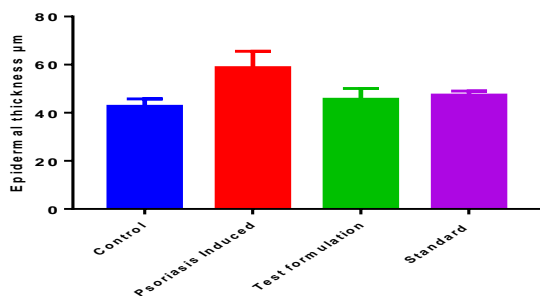


Figure 6: % of epidermal thickness

Table 1: Results of animal study on mice

Sr. No.	Groups	Degree of orthokeratosis %	Epidermal thickness(um)	% Drug Activity
1	Normal skin (Untreated)	$25.99 \pm 2.70$	$42.69 \pm 3.07$	-
2	Control (induction)	$12.28 \pm 1.78$	$58.78 \pm 6.80$	-
3	Test group (developed gel)	$40.33 \pm 5.09$	$45.63 \pm 4.45$	19.37%
4.	Standard group (Derobin ointment)	$35.54 \pm 0.94$	$47.39 \pm 1.67$	12.90%

#### 5. Conclusion

Percent drug activity of developed polyherbal gel was found 19.37 % which showed more significant antipsoriatic and antieczematic effect in comparison of standard drug Derobin® which was found 12.90 %. And it is found that developed polyherbal gel is more effective as compared to standard drug Derobin®.

#### 6. Future Scope

The formulated polyherbal gel showed more significant antipsoriatic and antieczematic effect as compared to standard formulation Derobin ointment. So the product can be patented and formulated commercially which will be beneficial for the patients suffering from psoriasis and eczema.

#### 7. Acknowledgement

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