

## REVIEW ARTICLE

### ROLE OF TOPICAL THERAPY IN DERMATOLOGY: A REVIEW

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**ABSTRACT:** Topical therapy is an important modality in the management of skin diseases. In topical therapy there is an intimate contact between drug and target tissue and risk of systemic side effect is minimal. Choice of topical medication depends on morphology, site, character, stage of lesion. The effects are multiple-it gives soothing, protection, dryness in weeping lesions, keratolytic, antibacterial, antifungal and penetrating effects. In the era of proprietary preparations knowledge of topical therapy is not significantly accounted and this may lead on to ineffective management of diseases. Dermatologists in many situations are not taking in to account the knowledge of ingredients in some of the preparations and importance of pharmacological effects of the preparations and their bases, so that the end effects of the prescription is not fully obtained.<sup>1</sup> In this scenario a basic knowledge of the ingredients of the topical preparations, selection of sites of application, the preparation of the site, the timing and the area of application should be chosen with great care. Hence a review of this modality of treatment is absolutely essential.<sup>2</sup>

**KEYWORDS:** Topical therapy, Trans epidermal penetration, Incorporation.

**INTRODUCTION:** Topical therapy plays an important role in the management of dermatological conditions. Proper selection of the vehicle, the form of medication and correct method of application is important.<sup>3</sup> The effectiveness depends on chemical action, physical properties, form of medication, manner of application and removal from skin. Choice of medication depends on morphology, character, stage, site of the lesion. Specific effects like soothing, drying, keratolytic, penetrating effects are produced by these topical therapy agents.

The doctor must provide his patients a well-chosen formulated preparation and also inform the patient when and how to use it. Patient should be informed about the beneficial as well as possible side effects. To do this correctly the physician must have full information about the pharmaceutical aspects of the therapy and take time to explain the treatment carefully to his patient.<sup>4</sup>

A sincere attempt is done to discuss the various aspects of topical therapy in a precise manner. Some of the ingredients included in the text are not being used in the present day preparation as treatment modalities but they still have relevance in hospital ward situations.

**STEPS TO BE DONE BEFORE APPLICATION OF TOPICAL MEDICATIONS:** Before application of topical medication the lesion and skin around should be cleaned. Non irritating methods like soap and water wash or physiological saline can be used.

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### **In chronic lichenified lesions:**

1. Scrubbing the lesion with hot water and soap.
2. Application of oil and keratolytic ointments.
3. Macerating and occlusive hot dressings.
4. Macerating and keratolytic adhesive plasters.
5. Soap less cleaning with benzene or soapless detergents.
6. Direct painting with strong keratolytic agents like acids.
7. Mechanical scraping with pumice stones.
8. Surgical removal.

### **COMPOSITION OF TOPICAL MEDICATIONS:** It is composed of

1. Vehicle/ Base.
2. Active drug.

### **VEHICLE/ BASE:** Medicine in which active drug is brought in contact with the skin.<sup>5</sup>

Ideal vehicle should have the following properties;

1. Easy to apply and remove.
2. Non-toxic, pharmacologically inert.<sup>6</sup>
3. Homogenous, chemically stable.
4. Bacteriostatic, cosmetically accepted.

### **PRESERVATIVES USED IN TOPICAL THERAPY:** Used to prevent contamination and biological decomposition of fat.

Agents are;

1. Paraamino benzoic acid.
2. Sorbic acid.
3. Propylene glycol.

### **AGENTS ENHANCING DRUG PENETRATION:**

1. Propylene glycol.
2. Salicylic acid.
3. Dimethylsulfoxide.

### **Drug penetration depends upon;**

1. Nature of the vehicle and active ingredient.
2. Their lipid water coefficient.
3. Use of accelerants.
4. Method of application.
5. Nature of skin disorders.

### **DOSAGE OF APPLICATION:** Penetration and clinical effects depend on the total amount of drug applied and the actual amount of drug in active contact with the skin.

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**Frequency:** bland preparation are applied frequently, active preparations are applied once or twice daily, steroids applied on alternate days due to their reservoir effect.

- Thick layer of cream/ ointment-0.005-0.01mm.
- Thin layer of cream/ ointment- 0.05- 1mm.

### **BASIC MATERIALS IN TOPICAL THERAPY:<sup>7</sup>**

1. Monophasic- Powders, grease, liquids
2. Biphasic- Powder + cream= ointment based preparation like greasy paste powder+ liquid=water based preparations drying paste, shake lotion cream + liquid= emulsion (W/O cream, O/W cream).
3. Triphasic Powder+ grease+ liquid= cooling paste, cream paste.

### **PROPERTIES REQUIRED FOR CREAM:<sup>8</sup>**

1. It should melt at or above body temperature.
2. It should be stable to light and heat.
3. Non irritating.

**POWDERS:** They are organic or inorganic materials applied to intact skin. It has cooling and astringent action. They absorb moisture, reduce friction and provide surface protection.

#### **They are of two types;**

1. Inorganic- zinc oxide, titanium oxide, talc, bentonite, calamine.
2. Organic- starch powder, methyl cellulose.

**CREAMS:** Acts as an emollient, protection, hydrating agent.

There are three types –true fat oils, waxes, mineral cream.

**LIQUIDS:** They evaporate from skin surface. They exert cooling, soothing to the skin. Alcoholic solutions have astringent and antiseptic action.

**Examples:** Purified water, glycerine, glycerol, chloroform, ethanol, lime water- it contains 15% solution of calcium hydroxide.

### **USUAL FORMS OF TOPICAL THERAPY:**

1. Baths.
2. Wet dressings.
3. Poultices.
4. Powders.
5. Lotions.
6. Emulsions.
7. Tinctures.
8. Ointments.
9. Pastes.
10. Fixed dressings.

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11. Plasters.
12. Direct application of chemicals/ physical agents.

**1. BATHS:** It is the best method of applying medication to the entire skin surface.

Different types of baths;

1. Cleaning bath.
2. Medicated bath.

**a) CLEANING BATH:** Used to remove dirt, crust, scales. Water at 95-100 degree F temperature with non-irritating plain white soap used. After thorough soaping and washing, the soapy water must be completely removed by careful and repeated rinsing. Topical remedies are applied immediately after bath. Shampoos are used to clean the scalp.

**b) MEDICATED BATH:** They have the following effects.

1. Soothing
2. Anti-inflammatory effect
3. Specific effects of active ingredients- anti sclerotic, anti-parasitic, anti-eczematous, macerating and soothing effect.

**STARCH BATH:** Action is anti-pruritic and soothing. Indicated in generalised itchy scaly condition.

**POTASSIUM PERMANGANATE BATH:** Action- disinfection – by oxidising effect, dries up exudating areas, astringent, anti-fungal effect.

**Indication:** In exudating vesicular, bullous eruption, pyodermas.

On keeping the solution it will change colour to yellowish brown forming manganese dioxide and the solution becomes useless.

**COAL TAR BATH:** Have direct action on the granular layer by release of lysosomes followed by mitotic stimulation. Tar and UV light decrease DNA synthesis. They have keratoplastic and anti-pruritic effects.

**Indications:** Psoriasis, eczema, Generalised itchy dermatosis.

**Adverse Effects:** Tar sensitivity, Photosensitivity, Pyodermas, Carcinogenicity.

**2. WET DRESSINGS:** Most useful forms of dermatological treatment.

**ACTIONS:**

1. Remove adherent crusts and debris and acts as a very good cleansing agent.
2. Maintain drainage of infected areas.
3. Acts as an effective vehicle for local application of heat and cold.
4. Useful in producing maceration and thereby keratolytic action.
5. Anti-pruritic and analgesic action.

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6. Soothing and anti-inflammatory action.
7. Tend to open blisters and bring medication to the bases of eroded/ulcerated areas.

**INDICATION:** Eczema, acute swollen inflamed exudative lesions.

**Solutions Used:** fresh milk, physiological saline, liquor aluminium subacetate in ration 1:10 or 1:20 in water, potassium permanganate 1:4000 or 1: 8000 solution freshly prepared (Condys bath), silver nitrate 0.1 to 0.5%, (Thiersch's solution), magnesium sulphate solution.

### METHODS OF APPLICATION:

1. Hot and open.
2. Cold and open.
3. Hot and closed.
4. Cold and closed.

### PRECAUTIONS:

1. Do not use gauze or cotton.
2. Wet dressing should be kept neat and frequently changed.
3. Do not wet more than one third of the body surface at one time since it will produce chilling.
4. Do not pour the solution over the cloth which will result in maceration.
5. After removal of wet dressing apply ointments and bland oil.

**3. POULTICE:** They are usually applied hot. They supply more or less constant moist heat. It is a soft semisolid substance for external application which stimulates the skin surface and alleviates inflamed area by supplying medication in presence of moisture and heat.

**Examples:** Boric acid- starch poultices.

### INDICATION:

1. In treatment of boils and abscess.
2. In impetigo to remove debris and crusts.

**METHOD:** 1 table spoon of boric acid and starch is mixed with 2 tablespoon of cold water to make a thick paste which this added 8 times of boiling water for the starch to get hydrolised. Stir the liquids till jelly is formed. Little glycerine is added to prevent fast drying.

**4. DUSTING POWDER:** Contain mixture of two or more substances in fine powdered form free from grittiness. Normally applied on normal skin as a preventive or protection to reduce friction and moisture.

Used in the treatment of intertriginous areas.

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## **ACTION:**

1. Cooling effect.
2. Prevent friction.

## **INDICATION:**

1. In hyper hydrosis.
2. As a prophylactic in superficial fungal infections.

## **Examples:**

1. Talc + zinc oxide- coolent, absorbent, astringent.
2. Aluminium acetate+ salicylic acid- anti prespirant.
3. Powdered methanol- coolent, anti pruritic.
4. Powdered sulphur- anti parasitic.
5. Nystatin powder- anti candidial.
6. Neomycin powder- anti bacterial.

**5. LOTIONS:** They are aqueous solutions usually containing an insoluble suspended matter applied externally without friction. They produce soothing action. Addition of alcohol had drying and cooling effect. They are applied using a brush. About 4-6 oz is applied to cover the entire surface of an adult.

### **Two types of lotion;**

1. Shake lotion- water based lotion with powder as the main ingredient.
2. Milk lotion- contain small proportion of fat globules in water.

## **INDICATION:**

1. Wide spread dermatosis.
2. Generalised eczema.

**CONTRAINDICATION:** Should not be used in intertrigenous areas and hairy areas.

**DISADVANTAGES:** Irritant and drying effect, ingredient getting deposited on the skin, systemic absorption in children.

**Examples:** Calamine lotion- contains a) prepared calamine – 15g b) glycerine 5g c) zinc oxide 5g d) water to 100ml.

Paint is a type of lotion which has anti-bacterial, anti monilial effect Example: gentian violet paint

**COLLODIONS:** Are liquid preparations of cellulose nitrate in organic solvents like ether. They evaporate and leave a thin film which can hold medicaments. They are protective in minor cuts and wounds and are water repellents.

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**6. EMULSIONS:** It is a system of two immiscible liquids in which one is in a fairly divided state and is held in suspension in such a manner that the globules do not coalesce when mixture is at rest. This is called dispersed or internal phase.<sup>9</sup>

The liquid in which the dispersed phase is suspended is called continuous or external phase.<sup>10</sup>

Two types;

1. Oil in water called vanishing cream- when water evaporated, little oil is left on the skin.
2. Water in oil- cold creams- evaporation of water produces cooling effect.

Emulsifying agents are substances which help emulsification stable.

**Examples:** Starch, Soap, Wool fat.

**LINAMENTS:** A type of emulsion in which more than two substances are incorporated in oily or alcoholic medium for external use. They are usually applied with friction. They contain counter irritants and astringents.

**7. TINCTURES:** They are liquid preparations made by extracting active principals from vegetable/animal substances by using appropriate mixture of solvents.

**Examples:** Tincture iodine- has antiseptic, anti-fungal properties.

**White field tincture:** Anti-fungal, Keratolytic.

**Tar tincture:** Used in psoriasis, hypertrophic lichen planus.

**Podophylline Tincture:** Used in condyloma acuminata.

**Sunscreen Tincture:** In photo sensitive dermatitis.

**8. OINTMENTS:** They are the oldest preparations in topical therapy and still the most generally used.<sup>11</sup> They are soft semi solid preparations in which medicaments are incorporated in a greasy base of animal, vegetable, mineral or synthetic origin. Mineral bases are preferred as they will not become rancid. Synthetic bases can be drying and irritant to the skin.<sup>12</sup>

Fatty substances which constitute the base of ointments can be divided into three categories.<sup>10</sup>

1. Animal and vegetable fats and oils.
2. Natural mineral grease and oil.
3. Synthetic preparations.

### FUNCTIONS:

1. Remove the stratum corneum and help subsequent penetration of medicaments.
2. Ointments bring medications into intimate contact with the surface of lesion.
3. Acts as emollients and lubricants.
4. Enable the physician to use the therapeutic agents which are fat/oil soluble and water soluble to use for treatment.

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## INDICATIONS:

1. Subacute and chronic conditions [diseases of the scalp].
2. seborrhoeic dermatitis.
3. Psoriasis.
4. Eczema [dry].

**CONTRA INDICATIONS:** In oozing lesions, in hairy areas

**CREAM:** Are ointments containing emulsifying agent to which water is added. It produces cooling, loose exudates.<sup>12</sup> It is an excellent vehicle for application of medicaments. It has low viscosity and hence spread more easily and lowest surface tension.<sup>13</sup>

**9. PASTES:** Semisolid preparations which consist of grease in which are suspended insoluble fairly dispersed powders. Ordinary pastes contains equal parts of suspended powder and greasy vehicle. They are thicker, drier more solid and less penetrating than ointments. Ingredient is more active than ointment than in paste.<sup>4</sup>

**ACTION:** Protection, soothing.

## ADVANTAGE OVER OINTMENT:

1. Paste may not irritate the skin.
2. Paste absorbs secretions, less penetrating.
3. Paste can be used in acute lesions.
4. Does not require dressing or bandage.

**Example:** zinc paste –zinc oxide 25gm, starch 25gm, Vaseline 50gm.

**10.FIXED DRESSING:** Bandages impregnated with material which hardens and stiffens. So that dressing assures their character of more or less of a flexible cast.

## ACTION:

1. Excludes the effect of external irritants.
2. Gives support to skin and structure beneath.
3. Useful in varicose complexes of legs-ulcers and eczema.

**11.PLASTERS:** Are masses which will adhere to the skin and there by fix a piece a cloth, dressing etc.<sup>12</sup>

**ACTION:** Occlusive, macerating bring medicaments into close and persistent contact with the surface.

**INDICATION:** Callosities, corn, plantar warts.

**Example:** Salicylic acid plasters –keratolytic.



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**12. DIRECT APPLICATION OF CHEMICALS:** In some situations chemicals are not incorporated into a vehicle but are applied directly into the skin.

**EXAMPLE:**

1. Podophylline 15-20% in alcohol or tincture benzene-used in treatment of condyloma accuminata.
2. Phenol 99.9% carbolic acid-produces chemical cauterisation.
3. Trichloroacetic acid saturated solution
4. Mono and dichloro acetic acid.
5. Silver nitrate solution 5-10% -astringent and antiseptic action.
6. Copper sulphate crystals- destroy granulation tissue.
7. Sodium/potassium hydroxide 30-50% -removes hyperkeratosis.
8. Cantharidine 0.7% solution in acetone water-treatment of plantar warts.

**OCCLUSIVE THERAPY:** Covering treated skin areas with vapour impermeable plaster films such as polythene resulting in increased transepidermal penetration and absorption of the applied compound and enhancement of their effects.<sup>12</sup> Thus absorption of corticosteroids is increased from 10-100 times.

**HAZARDS:**

1. Increase the chance of local infection-bacterial and candidal especially when applied over acute eczematous or exudative lesions.<sup>14</sup>
2. Increase absorption will precipitate cutaneous side effects, both local and systemic earlier.
3. Sometimes uncomfortable to the patients.
4. Urticaria is produced sometimes.

So the process of occlusion therapy should be limited to 12 hours/ day to minimise side effects.<sup>15</sup>

**AGENTS CAUSING ALLERGIC/ HYPERSENSITIVE REACTIONS:**

1. Local anaesthetics- benzocaine, propylene glycol.<sup>12</sup>
2. Mercuricals.
3. Formalin and its derivatives.
4. Tars- coal tar.
5. Resorcin, other phenolic agents.
6. Drugs used as colouring agents-in preparation of cosmetics.
7. Perfumes used in topical medications, oil of rose, winter green oil, thymol.
8. Disinfectants – picric acid, iodine.
9. Anti-bacterial agents- sulphonamides, penicillin.
10. Bleaches- monoleuzyl ether of hydroquinone.

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## CHOICE OF TOPICAL THERAPY IN VARIOUS DERMATOSIS:

### 1. Acute inflammatory oozing lesions:

First choice is wet dressing-anti-inflammatory action, allow drainage of secretion.

If difficulty to apply then in the descending order.

Shake lotion > paste > emulsion > cold creams.<sup>16,17</sup>

### 2. Sub-acute and chronic dermatosis- less inflamed.

First choice – shake lotion- anti-inflammatory, easy to apply, allow drainage of secretion<sup>12</sup>

Disadvantage- less penetrating

### 3. Dry, scaly, thickened, deeper lesions:

First choice – ointments- remove crusts and scales, penetration, can incorporate many medicaments.<sup>12</sup>

Disadvantages- drying, less penetrating.

Other- paste, emulsion, lotions.

### 4. Generalised widespread eruptions:

First choice- shake lotions- easily applied

Disadvantage- too drying, not enough soothing

Others- emulsions, ointments

## CONCLUSIONS: Following points are considered as fundamental in topical therapy:

- 1) Whenever possible the diagnosis should be made at the earliest and as far as possible it should be precise so that correct therapy can be ensured.
- 2) Properly selected topical medication are often the least forms of treatment in cases of unknown etiology.<sup>15</sup>
- 3) Choice of topical therapy is largely determined by the presenting morphological, characters, shape and site of lesion.
- 4) When a topical preparation is not giving effect to a patient, stop its use at once and try the find out the cause.<sup>12</sup>
- 5) Action of topical remedies will often depend on the mode of application and removal. Hence the physician must give adequate and proper instructions to the patient or the attendant and should demonstrate exactly the correct method of use, application and removal of each preparation.
- 6) Topical medication is selected according to the characteristics of the lesion to produce specific effects
  - a) Use minimal number of applications.
  - b) Frequent observation on the effects of medicaments will be necessary to prevent adverse effects and also to adjust and modify the treatment.<sup>14</sup>
  - c) Do not change to a newer remedy as long as dermatosis is improving satisfactorily under the old one.

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