

Chapter 6

Treatment of Skin Diseases

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Dermatological treatments are largely divided into external application of drugs, systemic therapies (oral administration of drugs, injections), physical therapies, laser therapies and surgical therapies. Among these treatments, topical therapies are the most important treatments in dermatology. Physical therapies, including irradiation and warming/cooling of affected sites, are also frequently applied. It is essential for dermatologists to have full knowledge of various therapies and combinations of effective treatments.

A. Topical therapies

Topical therapies involve the application of a topical agent on affected sites of skin. Topical agents are compounds of a main agent and a vehicle (base). The main agent acts on lesions, whereas the vehicle acts supplementarily to increase absorption of the agent.

The horny cell layer in the outermost layer of skin is water-repellant and dense. It prevents water from evaporating from the body, which means it is the strongest barrier for the topical agent to overcome (i.e., the rate-controlling step). The water-repellant horny cell layer generally has a thin sebum membrane on the surface that also functions as a barrier. The site below the granular cell layer is characterized by hydrophilicity and ready absorption of agents.

- Topical agents more readily permeate places where the horny cell layer is thin, such as the face and scrotum, than places where the horny cell layer is thick, such as palms and soles (Table 6.1).
- The smaller the molecular weight of an agent, the more efficiently the agent is absorbed. Generally, substances whose molecular weight is 1,000 or more do not permeate normal skin.
- The absorption of a topical agent increases at a site whose horny cell layer is injured by erosion, ulceration or the like. Oleaginous ointments are fairly slow to show effects on these types of lesions.
- A topical agent's absorption tends to increase with duration of contact. This characteristic is taken advantage of in occlusive therapy.

The type of vehicle and the consistency of main agent are chosen according to the conditions and site of the eruption. Various vehicles and main agents and their characteristics and application on eruptions are described here briefly.

a. Vehicles for topical agents

Vehicles help main agents permeate the skin. The agents have various actions, including hydration, cooling, lubrication, drying (removal of exudate), protection, softening, purification, and itch

Table 6.1 Relative absorption rate of topical steroids by skin region (forearm=1).

Region	Relative absorption rate
Plantar area	0.1
Palms	0.8
Flexor side of forearm	1
Back	1.7
Scalp	3.5
Axilla	3.6
Cheek	13
Scrotum	42

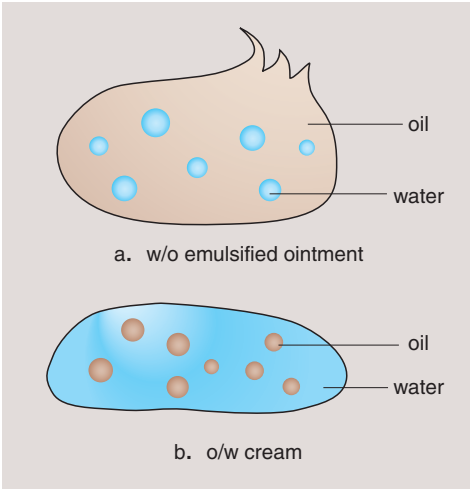


Fig. 6.1 Illustration of water in-oil (w/o) emulsified ointment and oil in-water (o/w) cream.

a: W/o emulsified ointment. Water granules are dispersed in oil by emulsion. b: O/w emulsive cream. Oil granules are dispersed in water.

Vaseline, Petrolatum

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Vaseline (petrolatum) is a semisolid compound that is refined from petroleum. It is often used as a vehicle for topical agents. It comes in yellow and white, the latter being yellow Vaseline that has been bleached. There is no essential difference between the two.

relief. A vehicle can be applied without a main agent in many cases. Vehicles should be non-stimulating, colorless and scentless, stable (non-denaturing), able to retain the main agent evenly, moderately viscous, appropriately firm, and moderately absorbable.

The same main agent may be mixed into various vehicles for various types of topical agents with different applications (**Figs. 6.1** and **6.2**, **Table 6.2**). Typical vehicles and their characteristics are listed below with brief explanations.

1. Ointments

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Ointments are the most frequently used topical agents. They are less stimulative than other vehicles and are highly protective. They are transparent or translucent semisolids.

1) Oleaginous ointments

Various oils such as olive oil, vaseline, paraffin, and plastibase are the most frequently used vehicles for oleaginous ointments. These ointments are free of water, absorb little water, and are insoluble in water. They are also called water-repellant ointments. The vehicle itself protects and softens the skin and works as an anti-inflammatory. Oleaginous ointments are the least stimulative, and are applied on all kinds of eruptions.

(Examples: white petrolatum, zinc oxide ointment, various steroids)

2) Emulsified ointments

These are water-in-oil ointments containing emulsifiers such as polyethylene glycol. Because of the cooling sensation they bring with application, emulsified ointments are commonly called cold creams. They are more protective and less sticky than creams (see below) and are easily washed off with water. They are mostly applied on dry lesions.

Table 6.2 Characteristics of vehicles.

Vehicle		Characteristics	Drawbacks	Target skin lesions
Ointment	Oleaginous	Least irritating, superior in skin protection	Greasy feeling, not water absorbant	Any skin lesion
	Emulsified	Less greasy than oleaginous ointment, readily penetrates the skin	Less protective, contact dermatitis may occur due to adjunct materials	Lichenified lesions, nodules, etc.
Cream		Readily penetrates the skin, feels soothing after application	More irritating than ointments, contact dermatitis may occur due to adjunct materials	Chronic hypertrophic lesions, acute-phase lesions with slight oozing
Lotion		No greasy feeling, easy to apply to the scalp	Irritant, possible to overuse	Ecematous lesions on the scalp
Tape		Strong protective effect and drug penetration	Unable to apply to wet lesions and scalp, possible to cause folliculitis and miliaria	Nodules, lichenified lesions

2. Creams



Creams, also called oil-in-water emulsive vehicles, are semi-solid mixtures of oil suspended in water containing emulsifiers. Creams are less sticky than ointments, and the color disappears when they are applied thinly (vanishing cream). Since they do not stain clothes, creams are readily accepted by patients, and compliance with application is ensured. However, they may be irritating, and less protective than ointments. Although creams are useful for erythema and papules, they should not be used on eroded or moist sites.

3. Lotions



Lotions are liquids (usually water) with an agent mixed in. When applied topically, the liquid evaporates, bringing cooling, astringent and protective effects. The agent remaining on the skin acts pharmacologically. In addition to water, the following are often used as liquid vehicles for lotions: alcohol, propylene glycol, glycerin, and zinc oxide oil (a 1:1 mixture of zinc oxide and olive oil). Some lotions require shaking prior to application. They are known as shake lotions.

1) Emulsive lotions

Emulsive lotions are emulsions of oil in water. They are more permeable in skin than are shake lotions (see below). They are used for non-moist lesions and are often applied on the hairy scalp.

(Examples: various steroid lotions)

2) Shake lotions

Shake lotions are liquids with powdered agents mixed in. The powder settles, so these need to be shaken before use. When applied, a cool sensation is produced as the liquid evaporates; shake lotions are effective on lesions that are accompanied by fever and evaporable moisture, such as erythema and papules. They are unsuitable for intensely exudative lesions, such as erosions, because they may cause irritation.

(Examples: sulfur camphor lotion)

3) Other topical agents

Tinctures: agents dissolved in alcohol or in alcohol and water

Aerosols: vaporized liquid agents

4. Gels



Gels are transparent agents that are solid to semisolid. Gelatine is dissolved in water or acetone, yielding a gelatinous product.

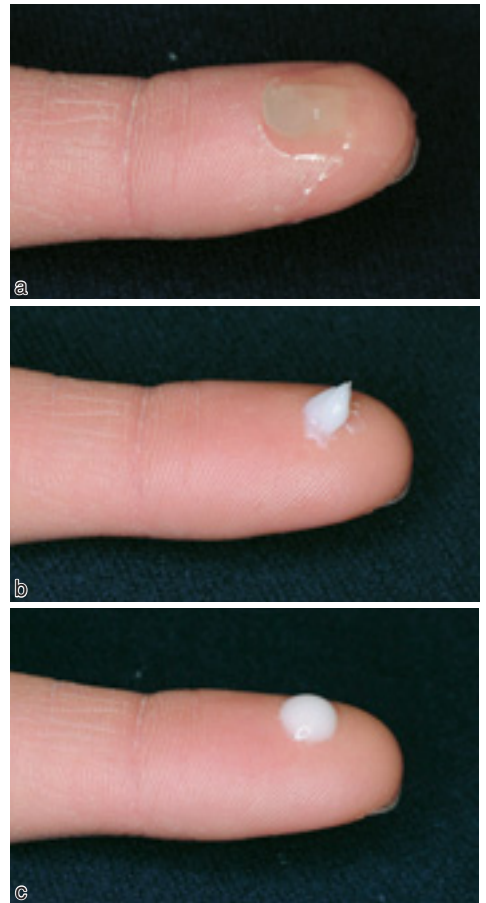


Fig. 6.2 Topical agents with various vehicles.

a: Oleaginous ointment. b: Cream. c: Lotion.

Ointments



“Ointment” in dermatology usually refers to an oleaginous ointment. However, some water-in-oil emulsive creams (cold cream) and oil-in-water creams (vanishing cream) may also be regarded as “ointments” by patients. Care should be taken in prescribing ointments and in explaining their use to patients.

After application, it dries to become a thin adhesive film on the skin. Gels with high solvent content are called jellies. These are used on mucous membranes to protect lesions from friction.

5. Powders

The main ingredients of powders are zinc oxides, talc (magnesium silicate), and starches. Powders dry affected sites by absorbing moisture. They also cool the skin, reduce friction, and smooth the skin surface. They are effective in preventing miliaria and intertrigo.

6. Liniments

Liniments are mixtures of water and zinc oxides, phenol or glycerin. They dry fast on the skin. They are effective in cooling the skin and relieving itching. Carbolic acid liniments are used for erythema and papules of, for instance, varicella; however, they must be avoided for lesions with moist surfaces, because of their water solubility.

7. Pastes

Pastes are highly viscous mixtures of oil-based substances and microparticles of powder. In this they resemble oleaginous ointments; however, pastes contain more powder than oleaginous ointments do.

8. Plasters

Plasters are cloth, paper, or plastic film spread with topical agents. One example is 30% salicylic acid plaster. They are applied to lesions such as callus and clavus (**Fig. 6.3**). Adhesive plasters containing steroids are also useful. Adhesive plasters with nitroglycerine or fentanyl are used for systemic administration in non-dermatological medical departments, utilizing the transdermal absorption of the skin.

9. Other vehicles for topical agents

These include compresses, soaps, shampoos and bath additives.

b. Main topical agents

The main agents are the components that have therapeutic effects on skin. Frequently used main agents are listed below.

1. Corticosteroids (steroid)



The main purpose of steroid topical application is to fight



Fig. 6.3 30% salicylic acid plaster.

