

# A Review of Topical Corticosteroids

*These pharmaceuticals are effective in treating many skin conditions.*

## Goals and Objectives

After reading this article the podiatric physician should be able to:

- 1) Appreciate the pharmacology and mechanism of action of topical corticosteroids.
- 2) Distinguish between the different vehicles of the available corticosteroids.
- 3) Describe the differences between topical steroid products related to potency.
- 4) Identify potential local and systemic side effects from topical steroid application.
- 5) Be able to select the most appropriate topical corticosteroid for a given lower extremity ailment.
- 6) Describe contact dermatitis, specifically shoe dermatitis, as related to the presenting antigens in shoes.
- 7) Recognize the most common antigens responsible for shoe dermatitis as reported in the literature.
- 8) Decide on a treatment protocol for a patient presenting with shoe dermatitis.

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An answer sheet and full set of instructions are provided on pages 262-264.—**Editor**

**By Robert G. Smith, DPM., R.Ph., C.Ped**

## Introduction

The practicing podiatric physician is quite familiar with

the unique aspect of dermatological pharmacology because of the skin's accessibility for both diagnosis and therapy. Topical corticosteroids are used

to help relieve the redness, swelling, itching, and discomfort of many skin problems. They can be extremely effective

*Continued on page 208*

## Topical Steroids...

and safe medications for those patients who present with lower extremity dermatological conditions. Calan's descriptive narrative presents topical steroids as ideal dermatological therapeutic agents, because these products satisfy three main requirements: they must be effective, must do no harm, and be acceptable<sup>1</sup>.

The podiatric physician should become familiar with the expanding armamentarium of topical anti-inflammatory products available to treat the wide range of lower extremity skin conditions. Once the podiatric physician has accomplished this task of familiarization, therapeutic outcomes can be maximized and systemic and topical adverse effects can be minimized. So that the podia-

tric physician may realize an appreciation when prescribing topical corticosteroids, a review of this topic is presented here in this article. First, a review of pharmacology, pharmacokinetics, and the side-effects of topical corticosteroids are offered as a foundation.

Secondly, a clinical discussion regarding the management of contact dermatitis, specifically shoe dermatitis and its treatment with topical corticosteroids is presented. Finally, a relative potency chart of frequently prescribed topical corticosteroids is presented.

### History

In 1951, hydrocortisone was synthesized as the first topical corticosteroid. Halogenated glucocorticoids with greatly enhanced potency were synthesized in the mid-1950s. Since this time, topical corticosteroids have been used extensively world-wide for over 50 years. Over time manufacturers of topical corticosteroids have made structural modifications to the four-ring corticosteroid backbone, attempting to enhance potency and lipid solubility<sup>2</sup>. Successful results have been produced by innovative manufacturers who have shown increased clinical efficacy by enhancing the topical corticosteroid pharmacologic activity by altering molecular structure, thus increasing stratum corneum penetration, and increasing bioavailability of these compounds

*Continued on page 209*

**TABLE 1**

## Relative Potency of Corticosteroids

Potency	Generic Names	Strengths
<b>Lowest</b>	dexamethasone sodium	0.1%
	hydrocortisone acetate	0.5%, 1%
	methylprednisolone	0.25%-1%
<b>Mild</b>	aclometasone dipropionate	0.05%
	betamethasone valerate	0.1%
	desonide	0.05%
	dexamethasone sodium	0.1%
<b>Medium</b>	clocortolone pivalate	0.1%
	desoximetasone	0.05%
	hydrocortisone butyrate	0.1%
	hydrocortisone valerate	0.2%
	triamcinolone acetonide	0.02%
	fluocinolone acetonide	0.025%
	flurandrenolide	0.05%, 0.025%
	fluticasone propionate	0.05%
	mometasone furoate	0.1%
<b>High</b>	amcinonide	0.1%
	betamethasone dipropionate	0.05%
	betamethasone dipropionate (augmented)	0.05%
	betamethasone valerate	0.1%
	diflorasone diacetate	0.05%
	desoximetasone	0.25%-0.05%
	fluocinolone acetonide	0.2%
	flucinonide	0.05%
	halcinonide	0.1%
	hydrocortisone 17-butyrate	0.1%
	triamcinolone acetonide	0.5%
	<b>Very high</b>	betamethasone dipropionate (augmented)
clobetasol propionate		0.05%
diflorasone diacetate		0.05%
halobetasol propionate		0.05%

## Topical Steroids...

from their vehicle. These invaluable topical agents have become proven mainstays of therapy for the treatment of many inflammatory skin diseases.

### Definition

Topical glucocorticoids (corticosteroids) are adrenocorticosteroid derivatives incorporated into a vehicle formulated to be applied to the skin and external mucous membranes. These compounds may be the parent molecule hydrocortisone or one of its synthetic analogs that has undergone modification of the essential 4-ring steroid structure by methods described as halogenation, methylation, acetylation, esterification, or double bond induction to increase their therapeutic effect as well as reduce side effects<sup>3,5</sup>.

### Mechanism of Action

Topically-applied corticosteroids diffuse across cell membranes to interact with cytoplasmic receptors located in both dermal and intradermal cells. The primary therapeutic effects of topical corticosteroids are due to their non-specific anti-inflammatory activity. Glucocorticoids enhance or repress the transcription of genes contained in almost every cell involved in the immune and the inflammatory responses through interaction of cell receptors located in the cell membrane and its cytoplasm<sup>4,5</sup>.

The anti-inflammatory action of steroids is mediated by the action of cortisol, as it induces production of lipocortins through the glucocorticoid receptor mechanism to inhibit the activity of phospholipase A2<sup>4</sup>. This action impairs production of prostaglandins and

leukotrienes, the mediators of inflammation, through the action of cyclooxygenases on arachidonic acid<sup>4,5</sup>. When the glucocorticoid molecule augments transcription, however, the production of one group of lymphokines may be enhanced, while others may be repressed and down regulated<sup>4</sup>.

Topical corticosteroids are the drug class of choice for all inflammatory and pruritic eruptions. They are very useful in the treatment of hyperplastic and infiltrative skin disorders. In spite of their effectiveness with a wide range of skin pathologies, they are contraindicated for, and worsen the following conditions: acne vulgaris, ulcers, scabies, warts, molluscum contagiosum, and fungal infections<sup>6</sup>.

### Pharmacokinetics

The absorption of a drug into the skin is a function of the nature of the drug, the behavior of the vehicle, and the status of the skin. The amount of corticosteroid that is absorbed from the skin depends on the intrinsic properties of

the drug itself, the vehicle used, the duration of exposure, the surface area and the condition of the skin to which it is applied<sup>7</sup>. Corticosteroids tend to penetrate human skin slowly, leading to a reservoir effect<sup>5,8</sup>. The podiatric physician should recall from medical school training that steroid molecules are lipophilic and are readily transported across the blood

brain barrier. The drug's lipophilicity or hydrophilicity is one of the determinates that may affect percutaneous absorption<sup>9</sup>. Increased lipid solubility favors penetration of drugs through the skin by increasing the solubility in the lipophilic stratum corneum. Generally, permeability is inversely proportional to the thickness of the stratum corneum<sup>2,7,10</sup>. Drug absorption is increased with an increase of water content of the stratum corneum or hydration of the skin<sup>8</sup>.

The differences in rate of absorption of different topical drugs or the same drug in a different vehicle rely on three variables: the concentration of the drug in the vehicle, the partition coefficient of the drug between the stratum corneum and the vehicle, and the diffusion coefficient of the drug in the stratum corneum<sup>2,7,10</sup>. The diffusion coefficient is the extent to which the matrix of the barrier restricts the mobility of the drug. Increases in the molecular size of the drug will increase the

*Continued on page 210*

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**TABLE 2**

### Amounts for an average adult patient

ANATOMICAL AREA	TWICE DAILY	WEEK SUPPLY
Head and face	3 grams	42 grams
Upper limb	3 gram	42 grams
Trunk	9-12 grams	126-148 grams
Lower limb	6 gram	84 grams

## Topical Steroids...

frictional resistance and decrease the diffusion coefficient<sup>2,7,10</sup>.

Once the selection of a topical corticosteroid agent is considered, the podiatric physician must decide on the most appropriate delivery system; thus the choice of vehicle in a topical formulation is of great importance. A number of different vehicles are used to deliver topical medication. Among these vehicles are: gels,

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lotions, solutions, creams, and ointments. The ideal vehicle has the following characteristics: 1) it is easy to apply and remove 2) it is acceptable cosmetically 3) it is non-irritating 4) it is compatible with the active ingredient, and 5) it readily releases the active drug<sup>2,3</sup>.

The podiatric physician should remember that the choice of vehicle is as important as the active ingredient. The rate of diffusion is proportional to the concentration of the drug in

the vehicle<sup>2</sup>. The different therapeutic effects observed when the same drug is compounded in different vehicles is explained by the drug's solubility within the respective vehicle<sup>2</sup>. One last parameter controlling absorption is the stratum corneum. During some disease states, the intact stratum corneum resistance to absorption is lost and absorption can be facilitated<sup>2</sup>.

In general, acute inflammation is treated with aqueous drying preparations, and chronic inflammation is treated with hydrating preparations. Lotions (a powder in a water suspension) are considered less lipophilic suspending agents<sup>2,3</sup>. Alcohol frequently is added to lotions to provide a cooling effect. Lotions are used to treat superficial dermatoses especially if there is slight oozing.

Solutions (medications dissolved in a solvent) are ideal for hairy and intertriginous areas. Solutions, gels, and sprays are products compounded as non-oil-based vehicles frequently containing alcohol and propylene glycol<sup>2,3</sup>.

Gels are semi-solid polymers containing pockets of liquid that tend to allow for greater penetration when compared to lotions. Skin irritation or burning may occur if gels are applied to acute dermatoses, erosions or fissures. Gels contain propylene glycol and carboxypolyethylene and are clear, non-greasy, non-occlusive and quick drying<sup>3</sup>.

Gels are most useful when applied to hairy areas or other areas where it is considered cosmetically unacceptable to have the residue of a vehi-

*Continued on page 211*

### TABLE 3

## Four Categories of Steroid-Induced Adverse Effects

<b>Cutaneous Changes</b>	Skin blanching from acute vasoconstriction Hypopigmentation Miliaria Rosacea, perioral dermatitis, acne Skin atrophy with telangiectasia, stellate pseudoscars, striae Delayed wound healing Hypertrichosis of face Purpura
<b>Cutaneous Infections and Infestations</b>	Folliculitis Tinea incognito Impetigo incognito Scabies incognito
<b>Eyes</b>	Glaucoma Cataracts
<b>Systemic</b>	Adrenal suppression Osteoporosis Stunted growth in children Cushingoid appearance Gastrointestinal complications Hyperglycemia and glycosuria Hypertension Central nervous system complications

## Topical Steroids...

cle remain on the skin. An advantage of using creams or oil-in-water emulsions is that they are absorbable and are vehicles that may be drying. They are the most commonly used vehicles in dermatology. Water-miscible creams may be more appropriate for moist or weeping lesions. Creams are best suited for non-irritable dermatoses<sup>3</sup>. An advantage to using oil-in-water creams is that the water evaporates to cool the skin, leaving a thin layer of the drug. Water-in-oil emulsions contain less water and are more emollient and moisturizing<sup>3</sup>.

In hot humid weather, creams are usually better tolerated. Ointment bases are compounded as either water-insoluble bases like petrolatum or water-soluble bases like polyethylene glycol<sup>3</sup>, or they can be emulsified with water. An ointment is a water-in-oil emulsion. It is noted as being the most effective hydrating agent. This particular vehicle is generally considered more potent and effective due to its occlusive nature-enhancing corticosteroid penetration<sup>3</sup>. Ointments are the most effective vehicle for treating thick, fissured, lichenified and dry, scaly eruptions<sup>2</sup>. This group of products is often used on chronic lesions and should not be used on acutely inflamed lesions. Ointments are the most occlusive and provide better delivery of medication while reducing evaporative water loss from the skin. The podiatric physician should be aware that in hot humid weather ointments, because of their occlusive nature, may cause increased perspiration, pruritus

and even folliculitis.

Both gel and ointment formulations are considered more potent than creams and lotions, because ointments and gels restrict water loss and preserve hydration of the stratum corneum<sup>3</sup>.

### Topical Corticosteroids Products

A wide variety of topical corticosteroids are available in various potencies and vehicles. The relative potency of a product depends on several factors including the characteristics and concentration of the drug and vehicle used<sup>5</sup>. Vasoconstriction assays are used to measure the relative potency of the available commercial products<sup>5</sup>. The podiatric physician should be familiar with the five classifications of relative potencies of the available products as they appear in Table 1.

It should be noted that in some cases, generic "equivalent" products may have less vasoconstrictive activity<sup>5</sup>. This table will allow the podiatric physician, when prescribing a particular agent, to maximize therapeutic efficiency and minimize adverse effects. The podiatric physician should appreciate that topical corticosteroids have a repository effect with continuous use<sup>5</sup>.

Topical corticosteroid products described as low potency have modest anti-inflammatory effects, and are the safest agents for long-term application<sup>8</sup>. The category

depicted as medium potency products are used in moderate inflammatory dermatoses. The group of topical corticosteroids products that should be reserved for severe inflammatory dermatoses are high-potency preparations. The category known as very high-potency products are used primarily as alternatives to systemic adrenocorticoid therapy when local areas are involved. These products are used for only a short period of time on relatively small surface areas<sup>8</sup>.

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### Principles of Prescribing Topical Steroids

The podiatric physician should not prescribe a topical corticosteroid unless the diagnosis is reasonably certain. Despite the fact that these agents are topical products, ample thought must be afforded to the potential outcome to the patient when these agents are prescribed. First of all, much time should be spent identifying the underlying disorder that is being treated so that when application of the product ceases, the disorder does not return with increased vitality.

Secondly, topical steroids should be prescribed with the intention not to exceed the patient's economic budget. Clear, simple-to-follow instructions should be given to the patient. Information concerning the frequency and quantity of each application should be reinforced at the time the prescription is given to the patient.

Lastly, the podiatric physician must foster a positive physician-patient relationship by offering a concise explanation

*Continued on page 212*

## Topical Steroids...

of the intention of the prescription, mechanism of action of the drug, and common side-effects of the prescribed medication. This is an important step in improving patient communication as well as ensuring the patient's trust and compliance with the prescribed regimen.

The dose of topical corticosteroids will be different for different pathologies and should be individualized to the patient based on specific needs. The recommended frequency of application varies depending on the corticosteroid selected and the site to be treated. Inadequate prescription size is a common complaint among patients. Patients become frustrated at both the expense and inconvenience of refilling prescriptions for 15 or 30 gram tubes. To ensure a sufficient supply of topical medication is prescribed for a given patient, the podiatric physician should be familiar with the amounts recommended for each body part.

The amount required to cover the whole body surface once with a thin smear twice daily for an adult is estimated to be 30 grams, or one ounce. The average adult patient requires at least one pound of a moisturizer or topical medication to cover their body head to toe once daily for a month. Estimated amounts to be dispensed for certain specific body areas are presented in Table 2. The podiatric physician should

keep in mind the amount for lower extremities is estimated to be 6 grams twice a day and would equal 84 grams per week<sup>10</sup>. Certain body areas such

as the palmar aspect of the hands or the plantar aspect of the feet may require more frequent applications, either because these areas have thick stratum corneum or the medication is easily removed during normal activity. Once or twice daily applications are usually recommended for most preparations<sup>5</sup>.

As mentioned, more frequent application may be necessary dependent on certain factors. Maintenance therapy should consist of the lowest strength formulation that will control the problem. A reduction in application frequency should be attempted to avoid side-effects.

Occlusive dressings such as plastic wrap increase skin penetration approximately ten-fold by increasing the moisture content of the stratum corneum<sup>10</sup>. Occlusion can be very beneficial in resistant cases. Occlusive dressings, however, may lead to sweat retention and an increase in either bacterial and/or fungal infections. Podiatric physicians should be able to demonstrate the proper technique of applying an occlusive dressing to their patients.

The five-step procedure that should be explained to the patient orally as well as given to the patient as written instructions at the end of the physician-patient encounter will ensure compliance on the patient's part. The

occlusive dressing technique should begin with either soaking the area in water or washing it well. The second step is while the skin is still moist, gently rub the medication into the affected area. Then cover the area with plastic wrap or a plastic bag may be used for the feet. The edges are sealed with either tape or a bandage ensuring that the wrap adheres closely to the skin.

Lastly, the dressing is left in place for at least 6 hours or overnight. Care must be taken that the dressing is not left in place for greater than 12 hours in a 24 hour period or that this technique is not used with very high potency topical corticosteroids<sup>5</sup>. Several hours of occlusion are all that is necessary to increase potency. Therefore, relatively short periods of occlusion are clinically useful. Occluded areas and certain areas of the body that include the face and flexures are more prone to the development of side-effects<sup>12</sup>. If corticosteroids must be used on the face or flexures, hydrocortisone should be used to reduce the probability of side effects.

In deciding to prescribe these medications the podiatric physician must weigh the risks of adverse effects against the benefit of these medications. When used properly, these medications have not been shown anecdotally to cause problems in humans during pregnancy. Studies on birth defects have not been done in humans. On the other hand, studies in animals have shown that topical corticosteroids, when applied to the skin in large amounts or used for a long time

*Continued on page 213*

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## Topical Steroids...

have the potential for causing birth defects<sup>13</sup>.

Topical corticosteroids have not been reported to cause problems in the babies of nursing mothers when used properly. The podiatric physician should keep in mind that potent corticosteroids have been placed in specially formulated bases that maximize their release and potency. Mixing of these preparations with other bases or vehicles may reduce their potency, thus affecting their action and causing therapeutic failures.

### LidaMantleHC

One option the podiatric physician may elect when mixing two commercial products is to select to prescribe the combination product LidaMantleHC lotion. This prescription topical product is the combination of Lidocaine HCL3% and hydrocortisone acetate 0.5% cream or lotion available from Doak Dermatologics, a subsidiary of Bradley Pharmaceuticals, Inc. It is the only prescription therapy available that combines the anti-inflammatory power of hydrocortisone with the anesthetic lidocaine in a unique, healing base that maintains normal skin pH balance and protects against harmful bacteria. This formulation is smooth, easily spreadable, and well-suited for application over large areas. It helps deliver rapid relief of itch, pain, inflammation of eczema and dermatitis.

The sophisticated method of delivering corticosteroids topically for symptomatic treatment is not void of producing adverse effects. Topical corticosteroids are no different from other medications; they have

the potential of causing adverse reactions. Some steroid-induced adverse effects are grouped into four categories: cutaneous changes, cutaneous infections and infestations, eye effects, and systemic effects. These categories are further described in Table 3.

### Shoe Dermatitis

In the United States, contact dermatitis is exceedingly common, accounting for one of the top ten causes for patient visits to their primary care physician. Most cases of contact dermatitis are easily treated. Shoe dermatitis is a common type of contact dermatitis. Misdiagnosis of this condition can lead to disability. The podiatric physician must conduct an organized and detailed evaluation of the patient with foot lesions to ensure a proper diagnosis and treatment. Children are susceptible to shoe dermatitis. Any child who presents with an atypical or persistent foot rash should be evaluated for footgear-induced dermatitis. Shoe dermatitis is caused by contact of the foot

with shoes or due to the chemicals used during manufacture and finishing of shoes.

Shoes are manufactured from a vast range of potentially sensitizing chemicals. Identifying all the constituents of a shoe or of leather is im-

possible because shoes are manufactured all over the world.

Historically, leather and dyes caused most shoe dermatitis in the 1930s and

1940s<sup>14</sup>. By the 1950s and 1960s, rubber allergens became the most common identifiable cause of dermatitis of the foot<sup>14</sup>. Shoe dermatitis is a type of contact dermatitis that may occur if a person is sensitive to the rubber or elastic compounds in shoes, form inserts, or elastic glues used to bind shoe components. Specifically, the chief causes are the thermo-

plastic or rubber boxed toes, and the cements and dichromates used in tanning, dyes, anti-mildew agents, formaldehyde, and nickel eyelets or nickel arch supports. Rubber remains a common cause of shoe dermatitis, especially with preservative antioxidants as monobenzyl hydroquinone. This also may cause hypopigmentation of the skin<sup>15</sup>.

Contact dermatitis from non-rubber adhesives are chiefly synthetic resin adhesives which can sensitize. Vegetable gums such as karaya, acacia, and tagacanth are sensitizers, while glues made from cotton or collodion are not sensitizers. Shackleford and Belsito demonstrated that rubber components were the most common allergens contributing to the etiology of allergic-appearing foot dermatitis<sup>16</sup>. Belisito, further presents that the continued and increased frequency with which rubber components act as causative allergens in shoe dermatitis is a reflection of their continued use. The combination of the impermeable nature of most athletic shoes increases the probability that perspiration will cause skin penetration of rubber allergens and an increased exposure and sensitization to these materials<sup>17,18</sup>.

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*Continued on page 214*

## Topical Steroids...

Finally, Freeman presents results from an observation of 55 patients with chronic foot dermatitis<sup>19</sup>. Rubber was the commonest allergen, followed by chromate, p-teritary-butylphenol-formaldehyde resin and colophony. All anatomical parts of the feet were affected, except the interdigital areas. Freeman's observation of 87.5% of patients improving, or the resolution of shoe dermatitis was attributed to successfully finding suitable footwear secondary to patch testing that identified the causative antigen. To assist patients with foot dermatitis that does not respond to treatment, it is imperative that the podiatric physician should order patch testing to exclude shoe allergy<sup>19</sup>.

The most common site first involved with shoe dermatitis is the dorsal surface of the big toe and on the insteps, which later spreads by extension to the other toes and the dorsal foot<sup>15</sup>. Skin lesions may be acute, presenting as erythematous, or vesiculation and oozing<sup>15</sup>. The symptoms of shoe contact dermatitis can range from mild, itchy rash to severe itching, swelling, and small blisters. Chronic lesions are dry and lichenified and in severe cases, open sores may present and can result in secondary bacterial infections. An important diagnostic parameter of shoe dermatitis is the presence of normal skin not in contact with shoes between the eczematous areas.

The detection of the type of skin sensitizer of shoe dermatitis is by patch test<sup>15</sup>. Patches contain some common aller-

gens that are known to cause contact dermatitis. After the patch is removed, the podiatric physician can check for a reaction over a few days.

If the patient indeed tests positively for shoe contact dermatitis, the podiatric physician must instruct the patient to stop wearing the shoes causing the reaction. Treatment of shoe dermatitis should first consist of avoidance of the sensitizer once known. The avoidance of re-dyed shoes is an important

consideration. Patients with shoe dermatitis can use special types of shoes prepared from non-sensitizing substances. Stockings made of absorbent cotton should always be worn. Mid to high potency topical corticosteroids may benefit patients with chronic cases of shoe dermatitis to relieve itching and heal the rash as long as the offending type of footwear is avoided and a diagnosis of tinea pedis is excluded<sup>20</sup>.

### Conclusion

The goal of this article was to assist the podiatric physician when prescribing topical corticosteroids for ailments of the lower extremities by presenting differences in potencies, appropriate therapeutic uses, and side effects of various available steroid products. Glucocorticoids are invaluable topical agents in treating a variety of inflammatory conditions

that affect the skin. These agents should be used with caution in any patient in order to avoid untoward effects. A review of pharmacology, pharmacokinetics, and side-effects of topical corticosteroids has been offered. The podiatric physician should remember the potency level of the corticosteroid used should be selected based on the responsiveness of the dermatologic condition. Secondly, a clinical discussion regarding shoe dermatitis and its treatment

with topical corticosteroids has been offered. A relative potency chart of frequently prescribed topical corticosteroid strengths, as well as dosing guidelines for topical agents, was presented. It is the intention of this author that this chart be used by podiatric physicians to select the most appropriate topical corticosteroid to treat lower extremity dermatitis. ■

### References:

- <sup>1</sup> Calnan CD: Use and abuse of topical steroids, *Dermatologica* 152 (Suppl. 1), p 247-251, 1976.
- <sup>2</sup> Guzzo CA, Lazarus GS, Werth VP *Dermatological pharmacology*. In: The pharmacological basis of therapeutics 9th ed., Hardman JG, Limbird LE, Gilman AG, eds. McGraw-Hill, NY, NY, p. 1593-1616, 2001.
- <sup>3</sup> Guidelines of care for the use of topical Glucocorticosteroids American Academy of Dermatology Association-Practice Management <http://www.aadassociation.org/Guidelines/topical-glu.html> accessed January 23, 2005.
- <sup>4</sup> Sivakumar MR. Corticosteroids in neurology [http://www.thamburaj.com/corticosteroids\\_in\\_neurology.htm](http://www.thamburaj.com/corticosteroids_in_neurology.htm). Accessed March 13, 2005.
- <sup>5</sup> Anti-inflammatory Agents Corticosteroids, Topical In Drug Facts and Comparisons Novak CH eds et al., St

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***An important diagnostic parameter of shoe dermatitis is the presence of normal skin not in contact with shoes between the eczematous areas.***

***If the patient indeed tests positively for shoe contact dermatitis, the podiatric physician must instruct the patient to stop wearing the shoes causing the reaction.***

**EXAMINATION**

*See instructions and answer sheet on pages 262-264.*

**Topical Steroids...**

Louis MO p1633-1642 2005.

<sup>6</sup> Robertson DB, Maibach HI: Topical corticosteroids, *Semin Dermatol* 2, p 238, 1986.

<sup>7</sup> Franz, TJ. Kinetics of Cutaneous Drug Penetration. *Int J Dermatol* 1983 22 499-505.

<sup>8</sup> Han NH, Nowakowski PA, and West D. Acne and Psoriasis Dermatologic Disorders In *Pharmacotherapy: A pathophysiologic Approach* 4th edition Dipro et al 1999 1489-1504.

<sup>9</sup> Drake LA, Dinehart SM, Farmer ER, et al . Guidelines of care for the use of topical glucocorticosteroids. *Am Acad of Dermol* 35 p615-619 1996.

<sup>10</sup> Tang YM, Su R. Principles of prescribing topical preparations and topical steroids. Chapter 41, In *Handbook of Dermatology & Venerology*. <http://www.hkmj.org.hk/skin/steroids.htm>

<sup>11</sup> Maibach HI. In vitro percutaneous penetration of corticosteroids in man and unresolved problems in the efficiency. *Dermatologica* 1976 162 (Supple) 1 : 11

<sup>12</sup> Bond CA *Dermatotherapy In Young LY and Koda-Kimble MA Applied Therapeutics: The clinical use of drugs* 6th edition Applied therapeutics, Inc Vancouver, WA 1995 36-1, 36-21.

<sup>13</sup> Briggs G, Freeman RK, Yaffe SJ. Hydrocortisone In *Drugs in Pregnancy and Lactation* 6th ed Lippincott Williams & Wilkins Philadelphia 2002 662-670/h

<sup>14</sup> Cronin E. Shoe

dermatitis. *Br. J Dermatol* 1966; 78: 617-25.

<sup>15</sup> Principles of pediatric Dermatology Chapter 26 Skin Sensitization due to other irritants [www.drnhijazy.com/english/chapters/chapter26.htm](http://www.drnhijazy.com/english/chapters/chapter26.htm) accessed April 24, 2005.

<sup>16</sup> Shackelford KE, Belsito DV. The etiology of allergic-appearing foot dermatitis: a 5 year retrospective study. *J Am Acad Dermatol* 2002; 47: 715-721.

<sup>17</sup> Roberts JL Hanifin, JM. Athletic shoe dermatitis *JAMA* 1979 241 275-277

<sup>18</sup> Belsito DV Common shoe allergens undetected by commercial patch testing kits: dithiodimorpholine and isocyanates *Am J Contact Dermatitis* 14 (2-June) 2003 95-96

<sup>19</sup> Freeman S. Shoe dermatitis *Contact Dermatitis* May 36 (5) 1997 247-251.

<sup>20</sup> Meffert JJ. Photo Quiz-May 1, 1998-American Academy of Family Physicians [www.aafp.org/aafp/980501ap/photoqz.html](http://www.aafp.org/aafp/980501ap/photoqz.html) accessed April 24, 2005.

*Patients with shoe dermatitis can use special types of shoes prepared from non-sensitizing substances.*

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- 1) Which is not a process of modification of the essential 4-ring steroid structure to increase therapeutic effects?
  - a) halogenation
  - b) acetylation
  - c) triple band induction
  - d) esterfication
  
- 2) The anti-inflammatory action of steroids mediated by the action of cortisol induces production of
  - a) leukotrienes.
  - b) lipocortins
  - c) prostaglandins
  - d) red blood cells
  
- 3) Generally, permeability of a topical substance is \_\_\_\_\_ proportional to the thickness of the stratum corneum.
  - a) inversely
  - b) directly
  - c) indirectly
  - d) constantly
  
- 4) All are variables that impact the rate of absorption of topical agents from the stratum cornea except:
  - a) the concentration of the drug in the vehicle
  - b) the partition coefficient of the drug in the skin
  - c) the diffusion coefficient of the drug in the stratum corneum
  - d) the dye contained in the topical formulation
  
- 5) Select the correct treatment preparation
  - a) Lotions to treat deep dermatoses
  - b) Solution to treat dermatoses of non-hairy area
  - c) Ointment to treat thick, fissure, dry eruption of the feet
  - d) Cream to treat thick fissure, dry eruption of the feet

- 6) Relative potency of available commercial topical steroids is measured by:
  - a) vasodilation assays
  - b) vasoconstriction assays

*Continued on page 216*

# EXAMINATION

(cont'd)

- c) vagal-vasodilation assays  
d) vaso-vagal dilation assays
- 7) Mrs. Smith is diagnosed with a dermatitis of both lower extremities. The podiatrist should write a twice daily prescription amount for \_\_\_\_\_ for a 2 week supply:  
a) 60 grams  
b) 30 grams  
c) 168 grams  
d) 15 grams
- 8) Occlusive dressings such as plastic wrap increases skin penetration approximately \_\_\_\_\_ fold by increasing the moisture content of the stratum corneum.  
a) twenty  
b) ten  
c) one hundred-fold  
d) five-fold
- 9) If corticosteroids must be used on the face or flexures, then \_\_\_\_\_ should be used to reduce the probability of side-effects.  
a) Hydrocortisone  
b) Halobetasol  
c) Flucinonide  
d) Flucinolone
- 10) Identify the adverse effect of topical corticosteroids that is not among the systemic category?  
a) Osteoporosis  
b) Hypopigmentation  
c) Gastrointestinal complications  
d) Hyperglycemia and glycosuria
- 11) Historically, what item was identified as the most common causative agent responsible for shoe dermatitis by the 1950s and 1960s ?  
a) Leather  
b) Dyes  
c) Rubber  
d) Kit-skin
- 12) Bethamethasone valerate is rated as having relative potency of \_\_\_\_\_  
a) Low  
b) Mild  
c) Medium  
d) High
- 13) The most common site first involved in a presentation of shoe dermatitis is \_\_\_\_\_  
a) the lateral aspect of the 5th digit)  
b) the plantar aspect of the heel  
c) the dorsal surface of the hallux  
d) the 3rd and 4th interspace of each foot
- 14) Shoe dermatitis skin lesions may present as all of the following except  
a) erythematous  
b) vesiculation and oozing  
c) dry and lichenified  
d) subcutaneous nodules
- 15) The detection of the type of skin sensitizer of shoe dermatitis is accomplished by a \_\_\_\_\_  
a) tissue culture  
b) patch test  
c) scratch test  
d) blood sample
- 16) An ideal dermatological agent as described by Calan satisfies three main requirements:  
a) effective, must do no harm, and be acceptable  
b) economical, effective, and do no harm  
c) economical, must do no harm, and be ineffective  
d) effective, non-acceptable, do no harm, economical
- 17) Topical corticosteroids are contraindicated and worsen the following conditions:  
a) puritic eruptions  
b) hyperplastic skin disorders  
c) infiltrative skin disorders  
d) acne vulgaris, ulcers, scabies, warts, molluscum contagiosum, and fungal infections
- 18) Select the incorrect statement regarding ointment vehicles:  
a) is most effective for treating thick, fissured, lichenified, dry scaly eruptions  
b) the most occlusive  
c) is often used on chronic lesions  
d) is defined as a powder in a water suspension
- 19) Identify the most appropriate matched paired of lesion type and vehicle for treatment for a week:  
a) Thick fissured, lichenified, dry scaly eruptions on plantar surface of each foot: Cream 6 gram tube  
b) Acutely inflamed lesions on bilateral anterior legs: Ointment 3 gram tube  
c) Lesions of superior medial malleoli covered with hair: Gel, 84 gram tube  
d) Chronic deep dermatoses on right heel: 10 mL of a lotion
- 20) Alcohol is frequently added to \_\_\_\_\_ to provide a cooling effect.  
a) Creams  
b) Lotions  
c) Gels  
d) Ointments

**SEE INSTRUCTIONS  
AND ANSWER SHEET  
ON PAGES 262-264**