Chapter e17: Skin Care and Minor Dermatologic Conditions

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CHAPTER SUMMARY FROM THE PHARMACOTHERAPY HANDBOOK

For the Chapter in the Schwinghammer Handbook, please go to Chapter 16, Dermatologic Drug Reactions and Common Skin Conditions.

KEY CONCEPTS

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1. The skin is the largest organ of the human body. It performs vital functions such as (a) protecting the body against injury, physical agents, and ultraviolet radiation; (b) regulating body temperature; (c) preventing dehydration, thus helping to maintain fluid balance; (d) acting as a sense organ; and (e) acting as an outpost for immune surveillance. Skin also has a role in vitamin D production and absorption.

2. Age-related factors affect the epidermis, dermis, and subcutis. Pediatric skin is thinner, which enhances topical drug absorption and potential drug toxicities. Neonates, particularly premature neonates, are especially susceptible due to an incomplete skin barrier. Skin of older adults is drier, thinner, and more friable, which may predispose them to external insults and loss of the skin barrier function.

3. Examination of a patient's skin involves assessing skin color (degree of pigmentation, pallor, carotenemia, jaundice), skin temperature (warm, cool, clammy), skin surface characteristics (dryness, seborrhea, turgor, excessive or reduced sweating, texture), and the degree of photoaging.

4. Signs that a mole (nevus) may be dysplastic include: size >5 mm, irregular shape, variable/different pigmentation, indistinct borders; and they may be totally flat or flat with a central elevation.

5. Skin hydration is especially important for people with dry skin conditions. This involves an appropriate daily skin care routine and adequate daily fluid intake.

6. Management of diaper dermatitis includes frequent diaper changes, air drying (removing the diaper for as long as practical), gentle cleansing (preferably with nonsoap cleansers and lukewarm water), and the use of barriers such as zinc oxide 40% ointment. After healing, a barrier such as zinc oxide 10% should be used with each diaper change as prophylaxis.

7. Due to the many negative effects and skin disorders relating to sun damage, sun protection at all times is critical, and this should be emphasized to patients, whether they are on medications with photosensitivity potential or not. Sun protection includes sunscreens, sun avoidance, shading, long sleeve clothing, and wide brim hats or hats with a flap that covers the ears and neck. Sunscreens should always be used except in infants <6 months of age.

PATIENT CARE PROCESS

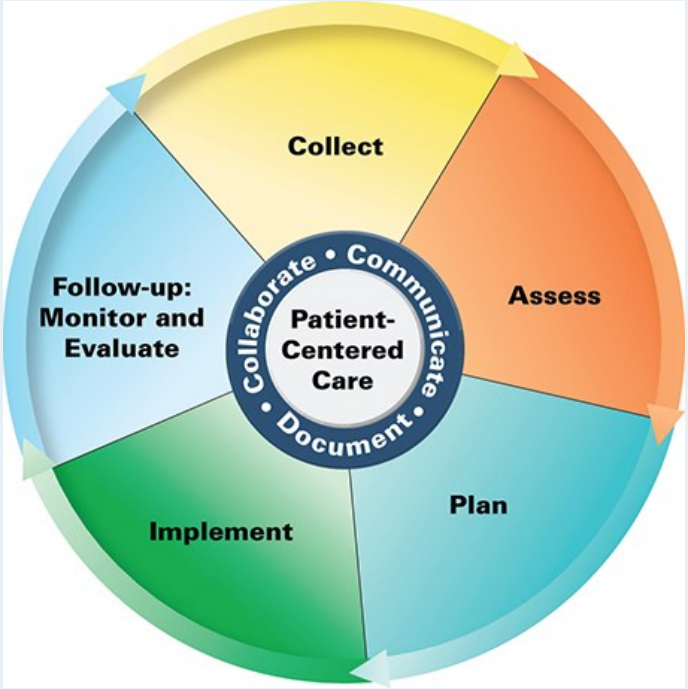
Three Patient Care Process boxes have been included in this chapter to enhance learning as follows:

1. Patient Care Process 1: Nevi

2. Patient Care Process 2: Diaper dermatitis

3. Patient Care Process 3: Sunburn

Patient Care Process for Nevi



Collect

- Patient characteristics (eg, age, sex, pregnancy status)
- Patient medical history (personal and family) for skin cancer or melanoma Size and shape of skin lesions of concern
- Recent changes in the appearance of lesions
- During patient interactions, be alert for the presence of moles or other lesions that appear to be suspicious

Assess

- Appearance of lesions (concerning features include size >5 mm, irregular shape, variable pigmentation, indistinct borders) (see Fig. e17-7)

Plan*

- Advise patients with suspicious lesions to seek dermatologic or other medical evaluation (see Chapter e121, "Drug-Induced Dermatologic Disorders" for more information on skin cancers)
- For those who report having lesions evaluated previously, advise dermatologic or other medical evaluation if the appearance has changed

Implement*

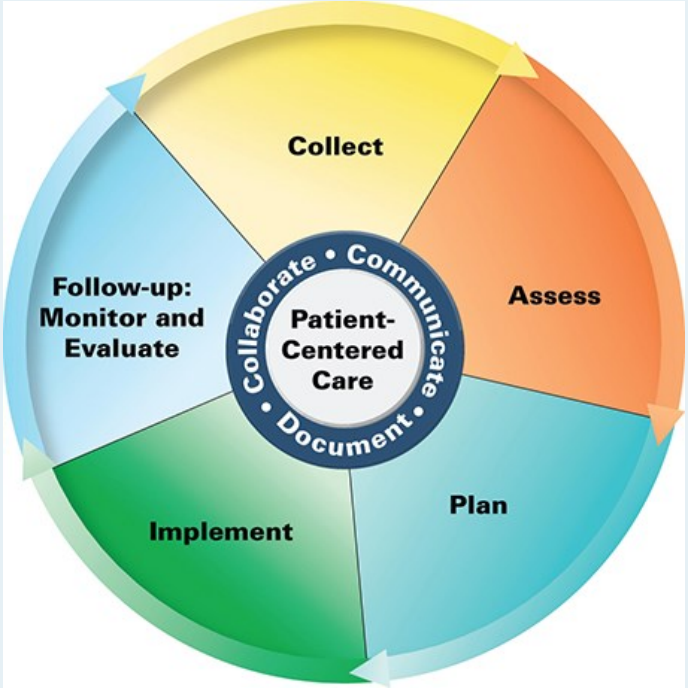
- Not applicable

Follow-up: Monitor and Evaluate

- Contact patient and/or health professional (if privacy concerns allow) to confirm dermatologic or other medical evaluations

**Collaborate with patient, caregivers, and other healthcare professionals.*

Patient Care Process for Diaper Dermatitis



Collect

- Age and sex of child/adult/elderly person
- Past history of diaper dermatitis and any complications
- Appearance of current rash and area affected
- Presence of signs of infection or severe irritation (eg, vesicles, erosions, pus)

Assess

- Parent/caregiver/patient (if adult) affect/concern about condition
- Ability to pay for medical care

Plan*

- Refer for medical evaluation if the condition is severe or signs of infection or severe irritation are present (see Chapter 119, “Atopic Dermatitis,” Chapter 133, “Skin and Soft Tissue Infections,” and Chapter 143, “Superficial Fungal Infections” for related information)
- If diaper dermatitis is not severe or infected, recommend nonpharmacologic and over-the-counter (OTC) interventions: change diapers frequently and preferably as soon as soiling occurs; air dry skin during a diaper change and for as long as practicable afterward; use nonsoap cleansers with lukewarm water to provide gentle cleaning; apply a 40% zinc oxide product during each diaper change until rash resolves; once the rash is resolved, apply a 10% zinc oxide product during diaper changes for prevention.
- Avoid the use of talcum powders due to the risk of inhalation

Implement*

- Provide parent/caregiver/patient education regarding all elements of a treatment plan

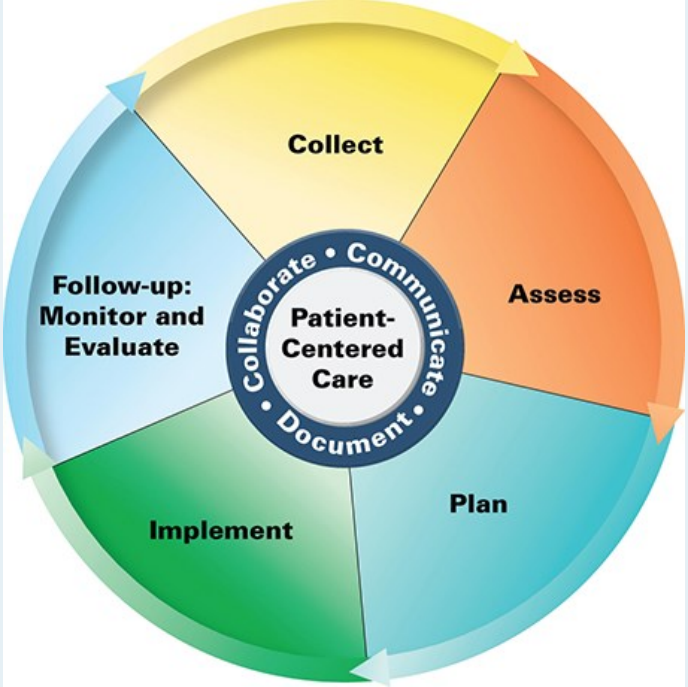
- Use motivational interviewing and coaching strategies to maximize adherence

Follow-up: Monitor and Evaluate

- Contact parent/caregiver/patient to confirm resolution
- Refer for pediatric or medical evaluation if the condition has not been resolved

**Collaborate with patient, caregivers, and other healthcare professionals.*

Patient Care Process for Sunburn



Collect

- Patient characteristics (eg, age, sex, pregnancy)
- Patient medical history (personal and family)
- Patient description of the history of burn, subjective complaints of pain, and other symptoms
- Severity of burn
- Signs of dehydration
- Symptoms of systemic involvement (eg, fever, confusion, weakness, shivering, headache, seizures)
- Symptoms of heat stroke (eg, dry, hot flushed skin with no sweating, rapid pulse, confusion, dizziness, seizures)

Assess

- Need for medical evaluation because of symptoms, possibility of advanced burn, presence of systemic symptoms, ability of the patient to manage burn, dehydration, or other complications

- Ability/willingness to pay for medical treatment options
- Emotional concerns

Plan*

- Refer for medical evaluation and care if the burn is severe, complications are present, or patient/caregiver is concerned about the condition
- Recommend therapies for rehydration as needed (see Chapter e21, "Pediatrics: Oral Nutrition and Rehydration of Infants and Children" and Chapter 164, "Assessment of Nutrition Status and Nutrition Requirements")
- To relieve pain, itch, and swelling associated with burn, recommend the application of cool compresses to burn; cool showers several times daily; drinking adequate fluids; and staying out of the sun for 1 week
- As indicated, OTC measures can be implemented: oral analgesics for pain; moisturizers for dryness and lubrication; pramoxine lotion, calamine, and colloidal oatmeal for soothing; topical diclofenac gel; oral diphenhydramine for itch and swelling
- Topical anesthetics are *not* recommended because of the increased risk of sensitization

Implement

- Provide patient education regarding all elements of the treatment plan
- Use motivational interviewing and coaching strategies to maximize adherence
- Provide information about prevention of future sunburns, including use of sunscreens on regular basis, proper application, and reapplication during periods of sun exposure, sweating, and exposure to water

Follow-up: Monitor and Evaluate

- Contact patient/caregiver in 2 to 3 days to assess resolution of sunburn
- Reinforce preventive measures in future interactions with the sun

****Collaborate with patient, caregivers, and other healthcare professionals.***

BEYOND THE BOOK

BEYOND THE BOOK

Review the anatomy and physiology of the skin as described in this chapter of *Pharmacotherapy*. Audiovisual presentations of this material are available online, including a video on the components of the skin (https://medlineplus.gov/ency/anatomyvideos/000029.htm) from the National Library of Medicine.

INTRODUCTION

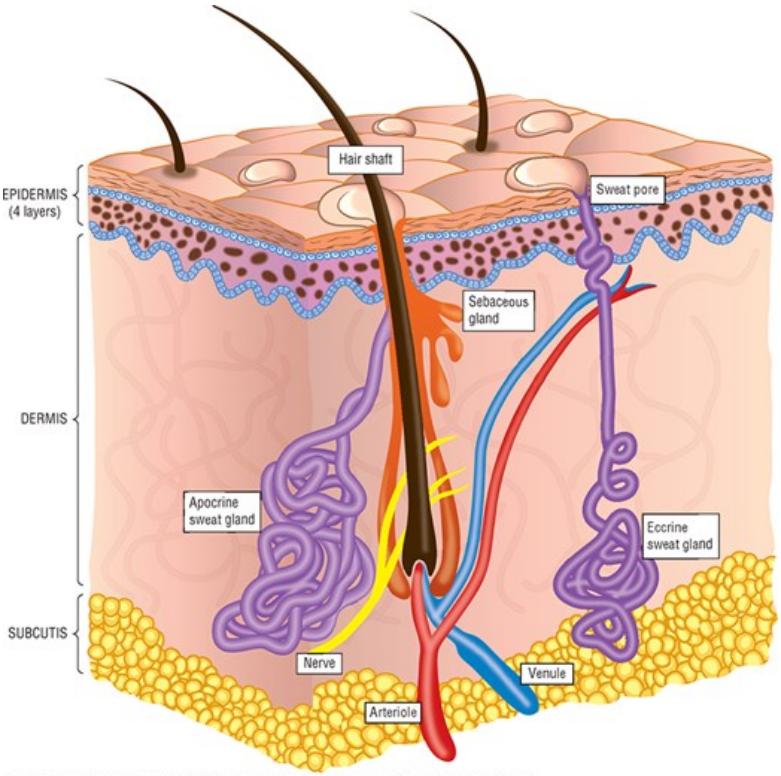
The novelist Deen Ferrell has equated skin to life: "Life is too much like skin. It molds to the core of who you are and whether you dress it up, or try to keep busy so you don't have to think about it, it doesn't go away."[1] Too often, we neglect to think about our skin or pay attention to changes on our skin that don't go away. We allow our skin to get so dry it itches, cracks, and hurts. We ignore bumps and lesions on our skin because they are often painless and always present, so we do not notice when slow or subtle changes occur, which may be innocuous—or life-threatening. It is easy to grow accustomed to something that is always there. We need to pay attention and teach our patients to pay attention.

Although not commonly thought of as such, skin is a vital organ with important functions. In fact, skin is the human body's largest organ, with an average surface area of about 1.8 m^2.[2] The organ system that includes the skin is known as *the integumentary system*.

The human skin consists of an outer epidermis and an inner dermis, with subcutaneous fat. The epidermis (in four layers) primarily provides protection from the environment and performs a critical barrier function—keeping in water and other vital substances and keeping out foreign elements. The dermis is a connective tissue layer that primarily provides resiliency and support for various skin structures and appendages such as sweat glands, sebaceous glands, hair, and nails. It also provides support for nerves and blood vessels. The subcutis (subcutaneous tissue) is a fatty layer below the dermis that helps to maintain the body temperature stable and protect bones and muscles from damage. It also allows nerves and blood vessels from the dermis to pass through and reach the muscles (Fig. e17-1). See the "Structure and Functions of the Skin" section for further discussion.

FIGURE e17-1

Layers and structures of the skin. (*Original artwork courtesy of Rebecca Law, ©2018 by R Law, all rights reserved.*)



Source: Joseph T. DiPiro, Gary C. Yee, Stuart T. Haines, Thomas D. Nolin, Vicki L. Ellingrod, L. Michael Posey: *DiPiro's Pharmacotherapy: A Pathophysiologic Approach, 12e*

Because the skin surface is readily visible, changes that are slow or subtle often go unnoticed. Slowly enlarging and evolving moles or dry skin conditions can go undetected even though such changes can be life threatening in some cases (eg, malignancy). Health professionals who have direct contact with patients should be able to distinguish between common self-treatable skin lesions and common skin lesions that must be seen and treated professionally such as melanoma and squamous cell carcinoma (for more discussion, see Chapter e121). Patients should be reminded that they need to be vigilant and report suspicious or changing lesions to their health care professionals.

Skin and soft tissue infections are discussed in Chapter 133, and drug-induced skin reactions, contact dermatitis, photoaging, skin cancers, acne, psoriasis, and atopic dermatitis in Chapters 117 to e121.

EPIDEMIOLOGY AND BURDEN OF SKIN DISEASES

It is difficult to estimate the burden of skin disease since the term is broad and somewhat ambiguous. In addition to disorders with primarily skin

manifestations such as atopic dermatitis, diseases can have multiorgan system involvement plus skin manifestations (eg, lupus erythematosus), and these conditions may not be treated by dermatologists. Furthermore, some skin disorders primarily involving the skin are usually not treated by dermatologists (eg, second- or third-degree burns) and are often excluded from estimates of the burden of skin disease. In addition, some skin conditions treated by dermatologists are not classified as such in some systems (eg, malignant melanoma is classified as an oncologic disorder by the International Classification of Diseases [ICD] and by the National Institutes of Health [NIH], although mortality data for skin diseases typically will include malignant melanoma, which is covered in Chapter 162, "Melanoma").[3]

Skin disease-related mortality is low in comparison to other types of illnesses such as cardiovascular diseases (MI, stroke), infectious diseases (HIV/AIDS), and cancers. Thus, the burden of skin disease is often overlooked or underemphasized in healthcare resource planning both nationally and globally.[4]

STRUCTURE AND FUNCTIONS OF THE SKIN

The integumentary system comprises the epidermis, dermis, and subcutaneous fat (also known as subcutis, see Fig. e17-1). The epidermis, derived from ectoderm, is further divided into four layers: *stratum basale* (basal layer), *stratum spinosum* (prickle cell layer), *stratum granulosum* (granular layer), and *stratum corneum* (horny layer). The *stratum corneum* is the outermost layer of skin and primarily is responsible for the barrier function. The epidermis is thick on the palms and soles and thin on other parts of the body, with some content variations. For example, the palms and soles contain eccrine glands but lack sebaceous glands, which are found almost everywhere else in the skin, with the highest concentration on the face and trunk. Sebaceous glands and small hair follicles together form pilosebaceous units, which originate in the dermis and have follicular ducts extending through the epidermis to the skin surface. Sebaceous glands produce sebum, a lipid-like substance.[2] (Increased production by sebaceous glands is partially responsible for acne.[5]) As mentioned earlier, the dermis provides support for sweat glands, sebaceous glands, hair, nails, nerves, and blood vessels. Subcutaneous tissue below the dermis allows nerves and blood vessels to pass through and reach the muscles (Fig. e17-1).

Epidermal cells—keratinocytes—produce keratin, a protein network that gives epithelial cells resilience to mechanical stress. Keratinocytes begin at the *stratum basale* as box-shaped basal cells. As the cells mature, they migrate toward the surface, elongating and flattening as they divide and differentiate, ending as corneocytes in the *stratum corneum.* Corneocytes are flattened keratinocytes containing keratin tonofibrils (filaments composed of keratin and keratohyalin granules). They are often termed *dead* because they do not contain nuclei and are incapable of mitosis. Each cell covers a much larger surface area as a corneocyte compared with its basal cell origin. Overlapping corneocytes provide for the skin barrier.[2] (Note that abnormal keratinocyte activity accounts for some skin diseases. For example, psoriasis is associated with increased keratinocyte cell turnover, and acne is partially caused by abnormal keratin.[5])

Melanocytes, pigment-producing cells in the *stratum basale*, produce melanin, a yellow–brown/black pigment. Melanin granules are spread out into a protective layer in the *stratum corneum*, reducing ultraviolet (UV) penetration into the skin. UV radiation causes human skin to increase both melanin production and keratinocyte proliferation as a protective effort.[2]

The skin surface is normally covered with a hydrolipid film composed of sweat, oils (sebaceous lipids and free fatty acids), corneocytes, protein decomposition products, and transepidermal water. Some of these are natural moisturizing factors that help the skin retain water. Thus, the hydrolipid film is a permeability barrier that keeps the skin supple.[2]

Because of the presence of lactic acid and amino acids from sweat, free fatty acids from sebum, and amino acids from shedding corneocytes, human skin is normally acidic, generally with a pH of 4 to 6. Bacteria thrive in an alkaline environment. As a result, the skin also functions as a protective acid mantle against invasion by pathogenic bacteria and fungi.[2]

The dermis, derived from mesoderm, is a much thicker layer that contains nerve endings and blood vessels. It is made of collagen and elastin, which provide support for various skin structures and appendages. Eccrine (sweat) glands, hair follicles, sebaceous glands, and arrector pili muscles originate in the dermis. Apocrine (sweat) glands have a secretory coiled portion at the junction of the dermis and subcutis and a straight portion that inserts and secretes into the hair follicle. Subcutis or subcutaneous tissue (adipose tissue with nerves and blood vessels) lies beneath the dermis.[2]

Skin is also involved in regulating body temperature, preventing dehydration, acting as a sense organ, and playing a role in vitamin D production and absorption.

AGE-RELATED SKIN DIFFERENCES

2 Age-related changes in the structure and functions of the epidermis and dermis are important.

In general, pediatric skin is thinner, possibly allowing for enhanced topical drug absorption in both the rate and amount of drug absorbed. In addition, the permeability barrier function of the skin is likely not intact in the preterm baby—as genesis of the permeability barrier starts in the last quarter of gestation and only finishes just before term.[6] These factors increase the potential for drug toxicities in neonates, infants, and children. Increased topical absorption and toxicity have been reported with the use of rubbing alcohol, boric acid powders, and hexachlorophene emulsions and soaps in infants and young children. Even drugs that are not normally used topically may be systemically absorbed. For example, a theophylline gel (17 mg spread over an area 2 cm in diameter) applied to the abdomens of premature infants produced therapeutic serum theophylline concentrations.[7]

This example also illustrates the difference in the body surface area (BSA) to body weight (BW) ratio between infants and adults. An infant's BSA:BW ratio may be twice that of an adult's, resulting in higher systemic bioavailability for topical doses applied based on the surface area, even when the dose has been adjusted for BSA differences (ie, dose based on infant BSA as a percent of adult BSA).[6]

Well-hydrated, unbroken skin provides maximal protection against microbial invaders and noxious substances. Aged skin tends to be drier, thinner, and more friable, which increases its susceptibility to external insults and loss of the skin barrier function. In addition, the healing time after skin injury may be prolonged in aged skin.

Skin differences based on race and ethnicity have been reported with respect to the thickness of the stratum corneum, skin responses to topical drugs and environmental agents, and aging. These can be considered in cases of reactions to irritants such as sodium lauryl sulfate, occupational dermatitis, "stripping" of the skin when cellophane tape is removed, and pigmentation, wrinkling, and skin laxity during aging.[8–11] The interested reader is directed to the 2017 book *Dermatoanthropology of Ethnic Skin and Hair* edited by Vashi and Maibach.[12]

SKIN ASSESSMENT

3 In simple terms, examination of a patient's skin involves assessing skin color (degree of pigmentation, pallor, carotenemia, jaundice), skin temperature (warm, cool, clammy), skin surface characteristics (dryness, seborrhea, turgor, excessive or reduced sweating, texture), and the degree of photoaging.[13]

Lesion Assessment

The appearance of skin lesions can provide clues as to their causes. Where are the lesions located? Lesions may be localized (isolated), grouped, regional, generalized, symmetrical, or located in sun-exposed areas, flexural areas, extensor extremities, intertriginous areas, etc.[13] What do the lesions look like? Lesions may be categorized as macules (Fig. e17-2), papules (Fig. e17-3), nodules (Fig. e17-4), blisters (Fig. e17-5), or plaque and lichenification (Fig. e17-6). There are also other types of raised lesions (eg, horn—conical column of hyperkeratosis over a papule), depressed lesions (eg, ulcer, striae, sinus), fluid-filled lesions (eg, furuncle), and purpura/vascular lesions (eg, purpura, telangiectasia), and others. The interested reader is directed to *Fitzpatrick's Dermatology in General Medicine*.[13]

FIGURE e17-2

Macules are circumscribed, flat lesions of any shape or size that differ from surrounding skin because of their color. (*A*) They may be the result of hyperpigmentation (*a*), hypopigmentation, dermal pigmentation (*b*), vascular abnormalities, capillary dilation (erythema) (*c*), or purpura (*d*). (*B*) The clinical appearance of a drug reaction that has produced an eruption consisting of multiple, well-defined red macules of varying size that blanch upon pressure (diascopy) and are thus a result of inflammatory vasodilation. *(Reproduced with permission from Stewart MI, et al. The structure of skin lesions and fundamentals of diagnosis. In: Freedberg IM, Eisen AZ, Wolff K, et al., eds. Fitzpatrick's Dermatology in General Medicine, 6th ed. New York: McGraw Hill; 2003.)*

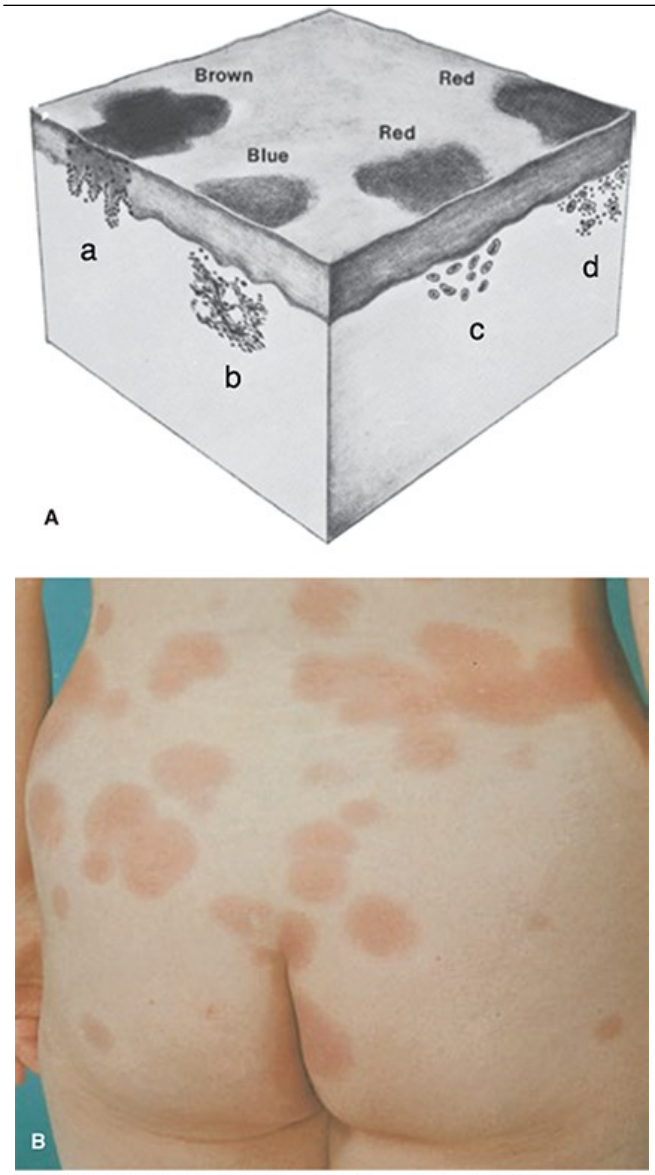


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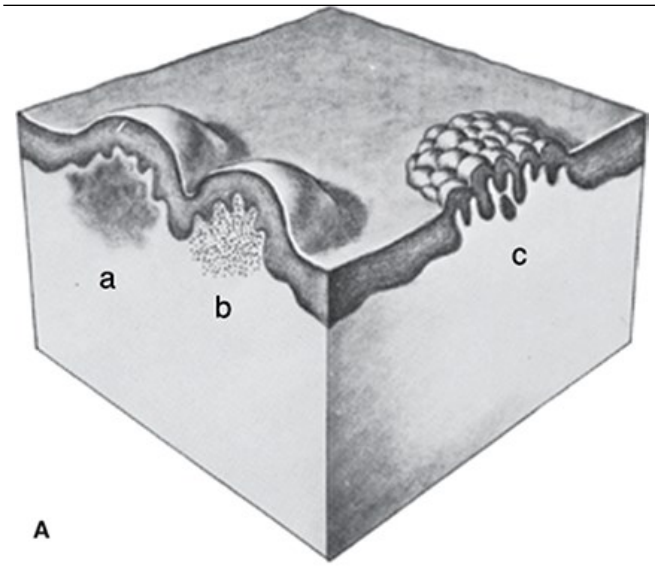
FIGURE e17-3

Papules are small, solid, elevated lesions that are usually <1 cm in diameter. The major portion of a papule projects above the plane of the surrounding skin. (*A*) They may result, for example, from metabolic deposits in the dermis (*a*), from localized dermal cellular infiltrates (*b*), and from localized hyperplasia of cellular elements in the dermis and epidermis (*c*). Papules with scaling are referred to as papulosquamous lesions, as in psoriasis (see Chapter 80, "Headache Disorders"). (*B*) Clinical examples of papules. The examples are two well-defined and dome-shaped papules of firm consistency and brownish color, which are dermal melanocytic nevi. (*C*) Multiple, well-defined, and coalescing papules of varying size are seen. Their violaceous color, glistening surface, and flat tops are characteristic of lichen planus. *(Reproduced with permission from Stewart MI, et al. The structure of skin lesions and fundamentals of diagnosis. In: Freedberg IM, Eisen AZ, Wolff K, et al., eds. Fitzpatrick's Dermatology in General Medicine, 6th ed. New York: McGraw Hill; 2003:18.)*



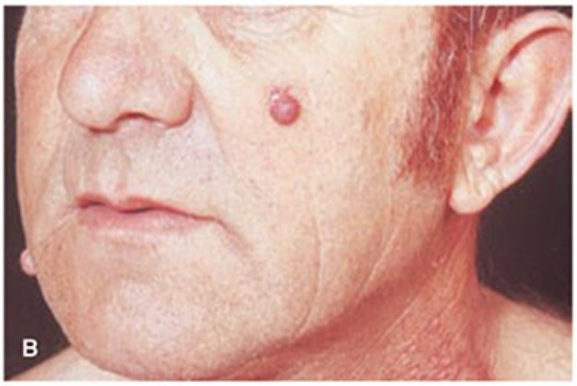


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FIGURE e17-4

Nodules are palpable, solid, round, or ellipsoidal lesions. Depth of involvement or substantive palpability, rather than diameter, differentiates a nodule from a papule. (*A*) Nodules may extend into the dermis or subcutaneous tissue (*a*) or be located in the epidermis (*b*). (*B*) A well-defined, firm nodule with a smooth and glistening surface through which telangiectasia (dilated capillaries) can be seen; there is central crusting indicating tissue breakdown and thus incipient ulceration (nodular basal cell carcinoma). (*C*) Multiple nodules of varying size can be seen (melanoma metastases). *(Reproduced, with permission, from Stewart MI, et al. The structure of skin lesions and fundamentals of diagnosis. In: Freedberg IM, Eisen AZ, Wolff K, et al., eds. Fitzpatrick's Dermatology in General Medicine, 6th ed. New York: McGraw Hill; 2003.)*

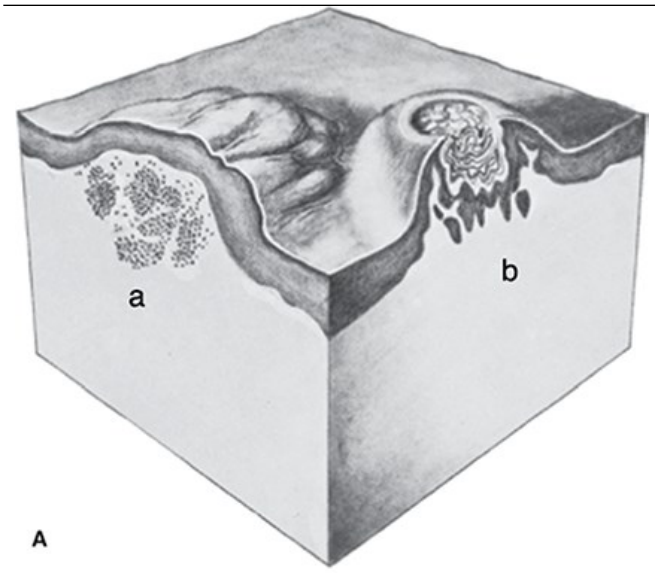

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FIGURE e17-5

Vesicles and bullae are the technical terms for blisters. While vesicles are circumscribed lesions that contain fluids, bullae are vesicles that are larger than 0.5 cm in diameter. (*A*) While subcorneal vesicles (*a*) result from fluid accumulation just below the stratum corneum, spongiotic vesicles (*b*) result from intercellular edema. (*B*) Multiple translucent subcorneal vesicles are extremely fragile, collapse easily, and thus lead to crusting (arrows). These lesions are staphylococcal impetigo. *(Reproduced, with permission, from Stewart MI, et al. The structure of skin lesions and fundamentals of diagnosis. In: Freedberg IM, Eisen AZ, Wolff K, et al., eds. Fitzpatrick's Dermatology in General Medicine, 6th ed. New York: McGraw Hill; 2003.)*

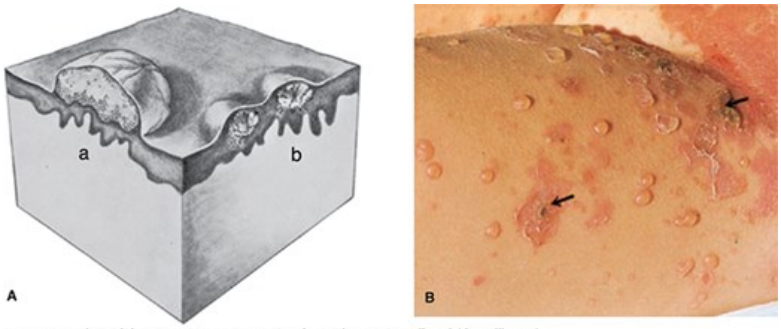
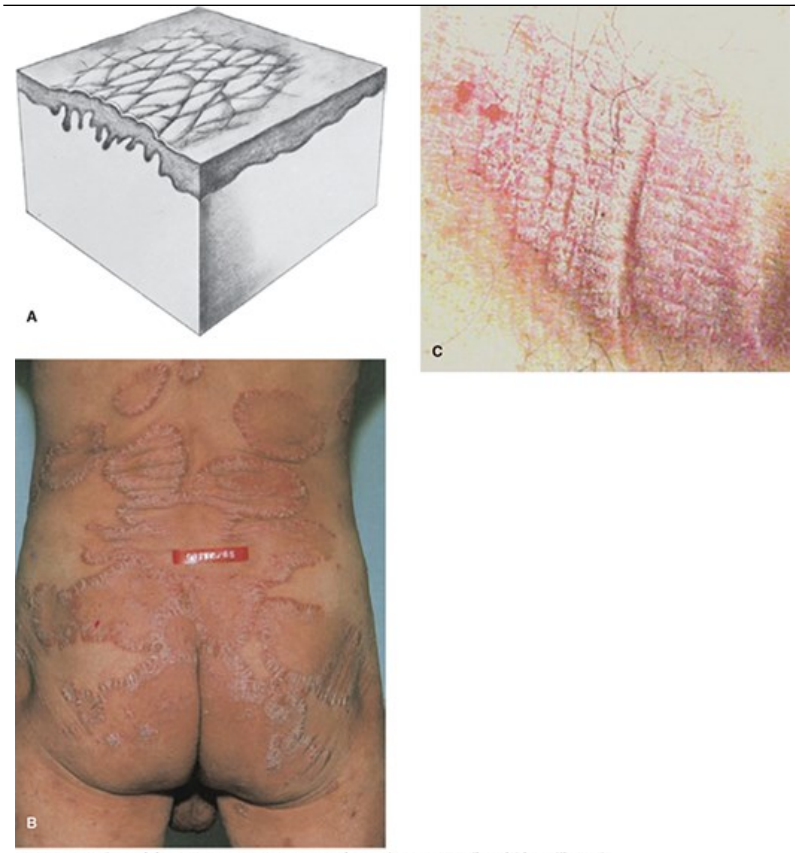


FIGURE e17-6

(*A*) Plaque is a mesa-like elevation that occupies a relatively large surface area compared with its height above the skin surface. (*B*) Well-defined, reddish, scaling plaques can coalesce to cover large areas of the back and buttocks, with some regression in the center as is common in psoriasis (see Chapter 118). (*C*) Lichenification, a thickening of the skin and accentuation of skin, can result from repeated rubbing. It develops frequently in patients with atopy and occurs in eczematous dermatitis and other conditions associated with pruritus. Lesions of lichenification are not as well-defined as most plaques and often show signs of scratching, such as excoriations and crusts. *(A & B: Reproduced, with permission, from Stewart MI, et al. The structure of skin lesions and fundamentals of diagnosis. In: Freedberg IM, Eisen AZ, Wolf K, et al., eds. Fitzpatrick's Dermatology in General Medicine, 6th ed. New York: McGraw-Hill, 2003; C: Reproduced, with permission, from Amit G, et al. Structure of Skin Lesions and Fundamentals of Clinical Diagnosis. In: Wolf K, et al., eds. Fitzpatrick's Dermatology in General Medicine, 7th ed. New York: McGraw Hill; 2008.)*



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Some skin conditions may be manifested by more than one type of lesion. For example, patients with acne vulgaris may present with macules, papules, nodules, or a combination of these. Another example is psoriasis—the most common type is plaque psoriasis noted by discrete, well-defined plaques; however, there are other types of psoriasis such as guttate or erythrodermic with varying lesions. Wheals developing as a result of a drug reaction may present as papules or plaques. In contrast, some skin conditions present with a characteristic lesion. For example, lichenification is a thickening of the skin usually caused by chronic rubbing or scratching and can be seen in patients with chronic pruritus or atopic dermatitis.

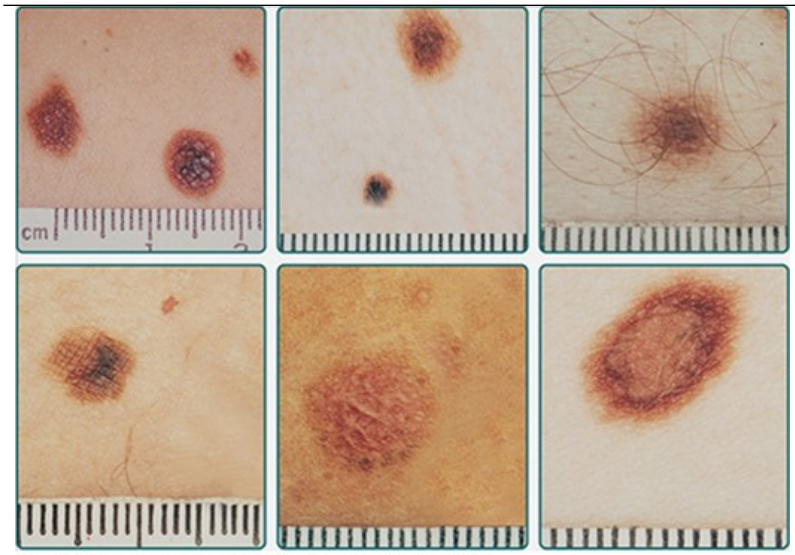
Moles (Nevi)

Freckles and moles are common—sometimes a particularly well-placed mole may be seen as a beauty mark. The dark side is that atypical moles, also known as dysplastic nevi, are risk markers for melanoma.

4 Signs that a mole (nevus) may be dysplastic include: size >5 mm, irregular shape, variable/different pigmentation, indistinct borders, and they may be totally flat or flat with a central elevation[14] (Fig. e17-7).

FIGURE e17-7

Dysplastic nevi. (Reproduced with permission from Grichnik JM, et al. Atypical (dysplastic) melanocytic nevi. In: Goldsmith LA, Katz SI, Gilchrest BA, et al., eds. Fitzpatrick's Dermatology in General Medicine. 8th ed. New York, NY: McGraw Hill; 2012.)



It must be emphasized that dysplastic nevi—which are often readily identifiable—are precursors *only* for melanomas. Other types of skin cancers may be much less obvious, and may even appear benign. For example, Merkel cell carcinoma—which occurs mostly in sun-exposed areas of older men—may look benign or acneiform in more than 50% of cases, with many lesions so minor that they do not appear to warrant a diagnostic biopsy; unfortunately, the mortality rate is high (close to 50%) since there are often metastases at the time of diagnosis. For a brief discussion of skin cancers, refer to Chapter e121.

SKIN CARE BASICS

It should not be surprising that skin health is related to overall health. Exercise and adequate sleep along with maintaining a healthy, well-balanced diet are key factors. Ample daily fluid intake and regular use of moisturizers are important for skin hydration.

Our skin normally contains 10% to 20% water by weight. If skin hydration drops below 10%, the following may occur: (1) the stratum corneum becomes brittle and may crack more easily; (2) mild inflammation and impaired cell maturation may occur; (3) foreign invaders may penetrate the skin more easily; and (4) chapping may result.

For skin cleansing, soapless cleansers may be preferable to soap because they may cause less irritation. Repeated and frequent exposure to soap or other cleansers that cause cumulative irritation (eg, with surfactants and emulsifiers) can result in irritant contact dermatitis. Cleansing too frequently can cause dry skin.

Hydration and Moisturizers

5 Skin hydration is especially important for people with dry skin conditions. Ideally though, an appropriate daily skin care routine should be followed by everyone. This should preferably include the following activities[15]:

- Using fragrance-free moisturizers *ad lib* throughout the day. Large quantities can be used—especially in those with dry skin conditions such as atopic dermatitis. There are no firm recommendations regarding the appropriate amount or dosing frequency of moisturizers.
- Bathing in lukewarm water (never hot) for about 5 minutes once daily. Adding a capful of emulsifying oil may help the body retain moisture; baths are better than showers for moisturizing. Avoid prolonged hot bathing.
- After bathing or showering, the skin should be lightly towel dried (pat to dry, avoid rubbing or brisk drying).[16]
- Applying moisturizer (fragrance-free) while the skin is still moist or slightly damp (within 3 minutes of towel drying).[17] Some fragrance-free moisturizers include Aveeno Moisture Cream, Cetaphil, Neutrogena Hand Cream, and Vanicream. Lotions may be used on the scalp and other

hairy areas and for mild dryness on the face, trunk, and limbs; creams are more occlusive than lotions; ointments are the most occlusive and can be used for drier, thicker, or more scaly areas.[17] Occlusive moisturizers are the best since they capture transepidermal water loss by providing a layer of oil on the skin surface, increasing the moisture content of the stratum corneum.

- Using nonsoap skin cleansers may cause less skin irritation. Lipid-free and fragrance-free skin cleansers may be particularly advantageous (eg, Cetaphil Gentle Skin Cleanser, Free and Clear Liquid Cleanser, Spectro Jel for sensitive problem-prone skin). Aquanil, Dove, Neutrogena, and pHisoderm sensitive-skin products have also been recommended as low-irritant products, and some are lipid-free.
- Minimizing the use of astringents and alcohol-containing cosmetics or cleansing products including lotions, swabs, and wipes (they may be drying).

Nutrition

Malnourishment can cause a patient to become immunocompromised, which may adversely affect the ability of the skin to act as a barrier. Nutritional deficiencies can cause skin problems, including dry skin. For example, essential fatty acid deficiency can cause a dry, scaly rash as well as other issues including poor wound healing, hair loss, and biochemical abnormalities (eg, hyperlipidemia, elevated triene:tetraene ratio, elevated liver function tests).[18]

Scents and Fragrances

There are approximately 2,500 fragrance chemicals. Why so many? Most consumer products often need several specific fragrances to mask the odor of ingredients in the product—to enhance consumer appeal. Fragrance ingredients are either natural or synthetic.

As health professionals, it is important to be aware of the allergic potential of fragrances and scents. In particular, there is an important distinction between *fragrance-free* and *unscented* products. A *fragrance-free* product does not contain synthetic chemicals whereas an *unscented* product only has the fragrance portion of the product removed (ie, it may still contain synthetic chemicals, and these may be allergenic).[19] Thus, where available, fragrance-free products are preferred.

Of the 2,500 chemicals, only 26 are considered sufficiently common allergens, and if products containing them were sold in the European Union (EU), those chemicals would have to be identified and listed as ingredients on the product labels. There are another 20 chemicals that are under consideration by the EU for listing but are not yet required. Unfortunately, elsewhere in the world—including in the United States and Canada—there are no requirements for identification and labeling.

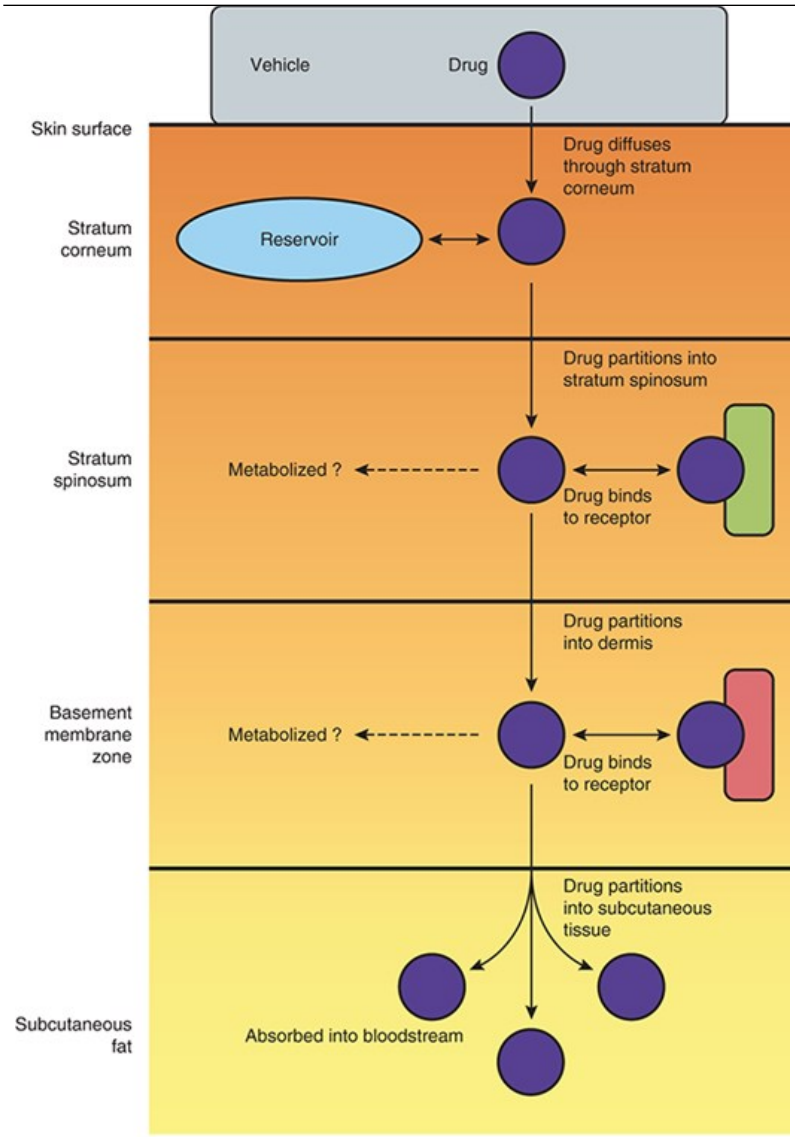
Label identification would allow a consumer to avoid products containing known allergens. It is possible for patients to be patch tested to identify their specific allergens as these 46 chemicals are commercially available for patch-testing purposes. However, determining the clinical relevance of a positive patch test requires considerable judgment and is often demanding.[20] An exception would be the person who uses a fine fragrance (perfume) and develops a reaction—the product to avoid would be easily identifiable since the reaction would occur at the exact spots (eg, behind the ears) where the perfume was applied. However, perfumes are usually composed of more than one ingredient, complicating identification.

Absorption Through the Skin: General Principles and Relevant Factors

When it comes to percutaneous absorption, human skin is a complex series of diffusion barriers.[21] This affects drug absorption through the skin (Fig. e17-8).[21]

FIGURE e17-8

Factors influencing drug absorption through the skin into the bloodstream. (Adapted from Katzung BG. Basic & Clinical Pharmacology. 14th ed. New York, NY: McGraw Hill; 2018.)



Source: Joseph T. DiPiro, Gary C. Yee, Stuart T. Haines, Thomas D. Nolin, Vicki L. Ellingrod, L. Michael Posey: *DiPiro's Pharmacotherapy: A Pathophysiologic Approach, 12e*

The percutaneous absorption process had been described as a 10-step (10-factor) process[6] and later expanded to 15 factors,[22,23] with additional factors still being delineated (Table e17-1).

TABLE e17-1

Steps in the Process of Percutaneous Absorption

1. Release from vehicle: Varies with solubility in vehicle, concentration, pH, and other factors	
2. Kinetics of skin penetration: Influenced by anatomical site, degree of occlusion, intrinsic skin condition, age of patient, concentration of dosing solution, surface area dosed, frequency of dosing, p postabortion parameters, and other factors	
3. Excretion kinetics	
4. Tissue disposition	
5. Substantivity to skin	
6. Wash effects: Wash resistance and wash enhancement	
7. Rub effects: Rub resistance and rub enhancement	
8. Transfer: To skin, clothing, and inanimate surfaces	
9. Exfoliation	
10. Volatility	
11. Binding: All layers	
12. Anatomical pathways	
13. Lateral spread	
14. Vascular perfusion	
15. Cutaneous metabolism	

Data from Reference 22.

Key points related to percutaneous absorption include the following:

1. Absorption rate varies at different anatomical skin sites—in general, faster if hair follicles are present in large numbers and slower if the stratum corneum is thick.[22]
2. In regard to absorption of environmental toxins, the head and face are areas of higher skin absorption.[22]
3. The outer layer of skin is lipid in nature; thus, lipophilic drugs and lipophilic environmental toxins are absorbed faster.[22]
4. The partition coefficient of a drug or environmental toxin is a useful predictor of drug absorption through the skin.[22]
5. Drugs given systemically can be excreted via the eccrine gland and this is based on their partition coefficients and their p*K*s. Basic drugs with high partition coefficients and p*K*s close to sweat pH are more readily excreted and can accumulate on the skin in significant amounts.[22]
6. The stratum corneum can act as a “reservoir” for topical drugs and environmental toxins. Hence, they are not always easily removed by

conventional "decontamination" methods (ie, soap and water).[22]

7. Vehicles and occlusion affect topical drug absorption. For a given thickness of stratum corneum at a specific anatomical site, a drug's stratum corneum:vehicle partition coefficient determines its absorption rate.[22]

DRY SKIN—ISSUES AND CARE

Dry skin, also known as *xerosis*, is a common condition associated with various factors including environment (winter, dry climates), occupation (jobs that involve frequent handwashing such as nursing or hair styling), aging, or malnutrition. It is a nonspecific symptom for many systemic and dermatologic diseases. Appropriate skin care to maximize skin hydration as discussed above is especially important for those with dry skin.

Extremely dry skin can be accompanied by inflammation and is known as *dermatitis*. Atopic dermatitis and psoriasis are dermatologic conditions with extremely dry skin that must be managed proactively. Skin cracks and fissures can occur, increasing the likelihood of secondary bacterial infections (most commonly *Staphylococcus*). Refer to Chapter 119, "Atopic Dermatitis," and Chapter 118, "Psoriasis," for further discussion.

Pruritus

When dry skin is accompanied by itching, also known as *pruritus*, this needs to be appropriately managed. Be cognizant that pruritus is a hallmark symptom of atopic dermatitis. Nonpharmacologic measures such as cotton gloves for infants and children to minimize scratching/excoriations are useful. Sedating antihistamines such as diphenhydramine may reduce nighttime scratching and promote more restful sleep when taken at bedtime.[17,24] These may be useful for patients with significant sleep disruption due to itch.

Topical antihistamines should be avoided due to their potentially irritant or sensitizing effects. However, prescription-requiring topical calcineurin inhibitors tacrolimus and pimecrolimus are effective anti-itch agents when there is inflammation. Management of pruritus is discussed in detail in Chapter 119.

DIAPER DERMATITIS

Diaper dermatitis, more commonly known as diaper rash, is traditionally seen in infants, although the condition may also be seen in adults who wear diapers for incontinence. It is an acute inflammatory dermatitis affecting the buttocks, genital, and perineum regions that are covered by the diaper. The rash is erythematous, and severe rashes may have vesicles or oozing erosions. The rash may be secondarily infected by *Candida* species (most commonly *Candida albicans*) and present with confluent red plaques, papules, and pustules, with early maceration of anal mucosa and perianal skin. The rash generally spares inguinal skin folds except for *Candida* diaper rashes, which almost always involve the inguinal folds.

6 Management of diaper dermatitis includes frequent diaper changes, air drying (removing the diaper for as long as practical), gentle cleansing (preferably with nonsoap cleansers and lukewarm water), and the use of barriers. Zinc oxide has astringent and absorbent properties and provides an effective barrier. Formulations with higher zinc oxide concentrations (40%) can be used for treatment.

After the diaper rash is resolved, lower concentration zinc oxide products (10%) should be used regularly with each diaper change for prophylaxis. Petrolatum also provides a water-impermeable barrier but has no absorbent ability and may trap moisture; thus, these products are less suitable. Commercial diaper wipes containing fragrance or alcohol should be avoided. Talc (talcum powder) should be avoided due to the risk of inhalation—corn starch is a safer alternative.

Patients with candidal (yeast) diaper rash should be treated with a topical antifungal agent which is then covered by a barrier product—always apply the antifungal agent first. Imidazoles are the treatment of choice for this type of diaper rash. After the rash subsides, the antifungal agent should be stopped and the barrier product continued to prevent a recurrence.

In severe inflammatory diaper rashes, a low-potency topical corticosteroid (hydrocortisone 0.5%-1%) may be used for short periods of 1 to 2 weeks.

If the rash does not respond after a week of recommended therapies, if there is increase in pain or inflammation during therapy, if deep ulcerations are present (ie, severe rashes), or if systemic signs or symptoms are present (eg, fever, diarrhea, skin lesions elsewhere in the body), there should be a referral for pediatric or medical evaluation. (For related information, see other chapters as noted in the patient care process below.)

SUN DAMAGE—ISSUES AND PREVENTION

Sunburn is a common skin condition that most people have experienced. Unfortunately, even one blistering sunburn before the age of 18 years will nearly double the lifetime risk of melanoma.[25,26] Having five or more blistering sunburns between ages 15 and 20 increases the risk of melanoma by 80% and the risk of nonmelanoma skin cancers by 68% in one study.[25,27] Thus, healthcare professionals who interact with the general public should promote the use of sunscreens and appropriate sun protection (eg, wide-brimmed hats, long-sleeve clothing) for everyone. In particular, patients on medications that can cause photosensitivity should be counseled to take sun precautions. Sun protection (ie, the use of sunscreens) should be year round—even on overcast days—as ultraviolet (UV) rays can penetrate the ozone layer, clouds, and windows.

UV radiation is associated with accelerated skin aging (photoaging) and skin cancers (eg, malignant melanoma, basal cell carcinoma). Skin should be constantly protected from UV damage by the use of sunscreens that block *both* UVA and UVB, with a sun protection factor (SPF) of 30 or higher. Sunscreens should be applied 20 minutes before sun exposure/heading outdoors and reapplied after sweating or swimming. UV rays can reflect off water and snow and some UV bands can penetrate through glass windows.

The UV spectrum is divided into three major bands with differing wavelengths: UVA (320-400 nm), UVB (290-320 nm), and UVC (270-290 nm). UVA is minimally filtered by the ozone layer, penetrates more deeply into the skin (dermis), and is responsible for most of the phototoxic reactions with drugs and chemical substances. Both UVA and UVB may cause photoaging, immunosuppression, and skin cancers. UVB is ~90% filtered by the ozone layer and, unlike UVA, does not penetrate through glass. However, UVB is the most active component for causing erythema (sunburn), with the greatest UV intensity between 10:00 am and 4:00 pm. A therapeutic benefit of UVB is the promotion of vitamin D synthesis in human skin. UVC is not of concern as it is 100% filtered out by the ozone layer.

Refer to Chapter e121, “Dermatologic Drug Reactions, Contact Dermatitis, and Common Skin Conditions” for further information on photoaging and skin cancers.

Risk Factors for Sun Damage

1. The UV index is a numeric system that rates the amount of UV rays reaching the earth’s surface at any specific time at a specific location. The higher the UV index, the greater the exposure risk and hence sun damage. Factors affecting the UV index include: the time of day, the season, the altitude and latitude of the location, the integrity of the ozone layer, and whether there is land cover.
2. The amount of melanin present in a person’s skin impacts susceptibility to sunburn over a given exposure period.
3. SPF is nonlinear—using an SPF 60 sunscreen does not mean one can stay out in the sun twice as long as using an SPF 30 sunscreen before burning.
4. The cumulative sun exposure over a person’s lifetime is a risk factor for both photoaging and skin cancers.
5. Also mentioned earlier, one severe sunburn before age 18 doubles the lifetime risk of skin cancers (Table e17-2).

TABLE e17-2

Ultraviolet Index and Risk of Sunburn

Ultraviolet Index	Risk	Estimated Time for Person with Light Skin to Burn
0-2	Minimal	1 hour
3-4	Low Moderate	<20 minutes
5-6	High Extreme	<15 minutes
7-9	Low	<10 minutes
≥10	Extreme	<5 minutes

Data from Reference 28.

Sunburn

A sunburn is an acute dermatological reaction to excessive exposure to sunlight. As the UV rays penetrate the epidermis, an inflammatory reaction occurs, resulting in swelling of the endothelium and leakage of RBC from capillaries. The skin reddening peaks at 12 to 24 hours after sun exposure, then melanogenesis begins over the next 2 to 3 days, resulting in increased melanin in the epidermis and the appearance of a tan.

CLINICAL PRESENTATION

CLINICAL PRESENTATION: SUNBURN

Clinical presentation of sunburn may include erythema, skin tenderness/pain, itching, and/or edema. In more severe cases, there may be blisters, fever, chills, weakness, and shock. For 1 to 2 days after a sunburn, watch for signs of improvement/deterioration and refer to a physician if symptoms worsen or if there are signs of a secondary infection.

Prevention and Treatment of Sunburn

7 Due to the many negative effects and skin disorders relating to sun damage, sun protection at all times is critical, and this should be emphasized to patients, whether they are on medications with a photosensitivity potential or not.

Nonpharmacologic Means of Sun Protection

1. Limiting time in the sun, especially between 10 am and 4 pm
2. Wearing protective clothing
    a. Wide-brimmed hats
    b. Long pants
    c. Long-sleeved shirts (dark, loose-fitting, tightly woven)
    d. Sunglasses

e. Sun protective clothing/UV absorbing agents

3. Avoiding tanning salons
4. Staying in the shade
5. Minimizing sun exposure if taking phototoxic or photoallergic medications

Sunscreens

Sunscreens "protect" against both sunburn and tanning, minimize UV-induced immunosuppression and skin aging, minimize the development of actinic keratosis while promoting the regression of existing lesions, and reduce the incidence of squamous cell carcinoma and malignant melanomas. Regular sunscreen use for the first 18 years of life could potentially decrease the lifetime risk of skin cancer by 80%—as mentioned earlier, one blistering sunburn before age 18 years almost doubles the lifetime risk of melanoma, and having five or more blistering sunburns between ages 15 and 20 years increased the risk of melanoma by 80% and nonmelanoma skin cancers by almost 70% in one study.[25–27]

There are two types of sunscreens: *organic* sunscreens act by absorbing UVA or UVB rays and thus blocking transmission to the epidermis; *inorganic* sunscreens act by reflecting and scattering UVA and UVB rays. Organic sunscreens are also known as chemical sunscreens and include substances such as para-aminobenzoic acid, or PABA, and/or other chemicals. Inorganic sunscreens—titanium dioxide or zinc oxide—are known as mineral sunscreens. These products used to be opaque (white on the skin), but many formulations now contain microfine particles that are transparent and cosmetically appealing. Products may be white upon application, but the color quickly disappears. This distinction is important. There is growing evidence fueling concerns that the chronic use of organic sunscreens may cause toxicity, since absorption occurs. The United States Food and Drug Administration (FDA) is assessing the risk and may issue new guidances.

In addition to the SPF (which should be 30 or higher as discussed), two other important characteristics to note when recommending a sunscreen are whether it is *broad spectrum* (ie, protects against UVA and UVB) and the *substantivity* of the sunscreen. Substantivity refers to the adherence of chemicals to the stratum corneum and determines the ability of a sunscreen to remain effective during prolonged exercising, sweating, or swimming. Substantivity may be a property of the active ingredients, the vehicle, or both. A water/sweat resistant sunscreen should retain efficacy for 40 minutes of water immersion and a water/sweat resistant sunscreen should retain efficacy for 80 minutes. (Remember to consider the time spent in the water as part of the total time spent in the sun.)

Patient-specific factors to note when recommending a sunscreen are the patient's skin type, level of physical activity, tanning history (if any), any known adverse reactions to sunscreen agents, and their preference (if any) for gels, creams, lotions, or sticks. Spray sunscreens carry a risk of inhalation and are not recommended, especially in children. The Canadian Dermatology Association (CDA) recommends that sunscreens should be noncomedogenic, hypoallergenic, nonirritating, and fragrance-free.

There is also a theoretical concern that sunscreen use may affect vitamin D production, since it is dependent on skin exposure to UVB. However, in practice, people may use inadequate sunscreen quantities, may not cover all sun-exposed skin, or may not reapply sunscreen regularly enough, so some vitamin D production still generally occurs.[27,29] The Institute of Medicine (IOM) recommended the same vitamin D intake irrespective of sunscreen use, setting the Recommended Dietary Allowance (RDA) for vitamin D based on minimal sun exposure[28] (ie, ensuring adequate vitamin D without the sun). This recommendation is followed in the United States[27] and Canada.[29]

SPECIAL PATIENT POPULATIONS

Sunscreen Use in Children

It cannot be emphasized enough the importance of sun protection to avoid even one sunburn in a child. As mentioned earlier, children who have a single blistering sunburn are twice as likely to develop skin cancer later in life, regardless of total exposure.[25,26] Always use an SPF 30 or greater broad-spectrum sunscreen and ensure that the most vulnerable areas (eg, nose, shoulders if not covered by clothing) are protected using an inorganic sunscreen.

The only exception to the routine use of sunscreens is in infants younger than 6 months of age.[30] As discussed earlier, neonatal skin (especially premature neonates) is less mature compared to adults, and neonates and infants have a higher BSA:BW ratio compared with older children and adults. For those reasons, exposure to chemicals in sunscreens may be much greater, increasing the risk of toxicity from the sunscreen.[30] Several nonpharmacologic alternatives are available for protecting babies from the sun. The best option is to avoid being in the sun at all—as much as possible, keep babies in the shade or shaded (eg, use a stroller cover). The American Academy of Pediatrics (AAP) suggests dressing infants in lightweight long pants, long-sleeved shirts, and brimmed hats that shade the neck to prevent sunburn—baseball caps are inadequate as they do not shade the neck and ears.[30]

The following are "sun safety tips for infants" younger than 6 months from the FDA.[31]

- Keep your baby in the shade as much as possible.
- Consult your pediatrician before using any sunscreen on your baby.
- Make sure your child wears clothing that covers and protects sensitive skin. Use common sense; if you hold the fabric against your hand and it is so sheer that you can see through it, it probably does not offer enough protection.
- Make sure your baby wears a hat that provides sufficient shade at all times.
- Watch your baby carefully to make sure he or she doesn't show warning signs of sunburn or dehydration. These include fussiness, redness, and excessive crying.
- If your baby is becoming sunburned, get out of the sun right away and apply cold compresses to the affected areas.
- Hydrate! Give your child formula or breast milk if you're out in the sun for more than a few minutes. Remember that infants are at much greater risk of overheating and dehydration. Store any liquid formula in a cooler per the product instructions.

Sun Protection During Pregnancy and Breastfeeding

Nonpharmacologic means is the management of first choice for women who are pregnant or breastfeeding. This includes sun avoidance in addition to protective clothing and shade. If using a sunscreen, both chemical and physical sunscreens are considered safe in pregnancy and lactation; however, care must be taken that an infant's skin does not come into contact with the treated mother's skin at any time (eg, while carrying or nursing the infant).[31]

CONCLUSION

Skin is vital for survival and must be cared for. Hydration—including appropriate skin moisturization and adequate oral fluid intake—is important for skin health. Appropriate sun care that avoids *all* blistering sunburns will reduce lifetime skin cancer risk—this needs to begin at birth. However, sunscreens should not be applied to babies younger than 6 months old because of potentially increased chemical toxicity—they should be protected by other means such as sun avoidance and shading. Suspicious moles/nevi should always be investigated to minimize the risk of melanoma—if in doubt, refer the patient.

ABBREVIATIONS

AAP	American Academy of Pediatrics
BSA	body surface area
BW	body weight
CDA	Canadian Dermatology Association
EU	European Union
FDA	United States Food and Drug Administration
ICD	International Classification of Diseases
IOM	Institute of Medicine
NIH	National Institutes of Health
RDA	recommended dietary allowance
SPF	sun protection factor
UV	ultraviolet
UVA	ultraviolet A
UVB	ultraviolet B
UVC	ultraviolet C

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SELF-ASSESSMENT QUESTIONS

1. Which of the following statements best describe the primary function of the epidermis?
   A. Provides support for skin structures such as sweat glands
   B. Allows blood vessels to pass through and reach the muscles
   C. Provides protection from the environment
   D. All of the above statements are correct.
2. The skin surface is normally covered with a hydrolipid film. Which of the following statements about the hydrolipid film is/are *correct*?
   A. It acts as a permeability barrier.
   B. It contains protein decomposition products.
   C. It contains transepidermal water.
   D. All of the above statements are correct.
3. Which of the following is *true* about the skin in an infant compared with adults?
   A. Infant skin is less predisposed to external insults than adult skin.
   B. Infant skin contains less moisture than adult skin.
   C. Infants absorb a greater proportion of topical drugs than adults.

D. All of the above statements are correct.

4. Healthy skin is dependent on:

   A. Exercise

   B. Sleep

   C. Fluid intake

   D. Diet

   E. All of the above choices are correct

5. Bullae are also known as:

   A. Macules

   B. Papules

   C. Nodules

   D. Blisters

6. Application of sunscreens during childhood and adolescence is important for:

   A. Reducing the incidence of actinic keratosis but not lifetime risk of skin malignancies.

   B. Reducing the lifetime risk of skin malignancies but not incidence of actinic keratosis.

   C. Reducing the incidence of actinic keratosis and lifetime risk of skin malignancies.

   D. Reducing the incidence of neither actinic keratosis nor lifetime risk of skin malignancies.

7. Which of the following characterizes aged skin?

   A. Greater friability

   B. Prolonged healing time

   C. Less hydrated

   D. All of the above choices are correct.

8. Signs that a mole (nevus) may be dysplastic include:

   A. Size >5 mm

   B. Irregular shape

   C. Variable pigmentation

   D. All of the above choices are correct.

9. If skin hydration drops below 10%, all of the following may occur *except*:

   A. Skin cracks more easily

B. Foreign elements penetrate more easily

C. Skin cells mature more easily

D. Mild inflammation

10. Essential fatty acid deficiency may manifest as:

A. Dry scaly rash

B. Impaired wound healing

C. Hair loss

D. All of the above choices are correct.

11. How do fragrance-free products differ from unscented products?

A. They do not differ—the two terms are synonymous.

B. Unscented products refer to personal toiletries such as talcum powder, whereas fragrance-free products refer to general household products such as candles.

C. Fragrance-free products have the fragrance portion of the product removed, whereas unscented products do not contain synthetic chemicals.

D. None of the above statements is correct.

12. Key points relating to percutaneous absorption include the following *except*:

A. Absorption rate is faster if hair follicles are present in large numbers.

B. Hydrophilic drugs and hydrophilic environmental toxins are absorbed faster than lipophilic substances.

C. The stratum corneum can act as a “reservoir” for topical drugs and environmental toxins.

D. The partition coefficient of a drug or environmental toxin is a useful predictor of percutaneous absorption.

13. The most common cause of an infected diaper rash is:

A. *Candida* spp.

B. *Staphylococcus aureus*

C. *Streptococcus vaginalis*

D. *Haemophilus influenzae*

14. Appropriate strategies for sun protection include all of the following *except*:

A. Limiting time in the sun, especially between 10 am and 4 pm

B. Wearing sun-protective clothing (such as wide-brimmed hats)

C. Staying in the shade

D. Using tanning salons rather than sun tanning

15. Appropriate management strategies for diaper dermatitis include all of the following *except*:

A. Air drying

B. Cleansing with a nonsoap cleanser and warm water

C. Using zinc oxide as a barrier cream

D. Using hydrocortisone 2.5% cream as prophylaxis

SELF-ASSESSMENT QUESTION-ANSWERS

1. **C.** As described in the introduction of this chapter, the four layers of the epidermis provide protection from the environment and perform a critical barrier function.

2. **D.** All of the listed statements are correct descriptions of the hydrolipid film. This is discussed further in the "Structure and Functions of the Skin" section.

3. **C.** As described in the "Age-Related Skin Differences" section, infant skin is thinner than that of adults, increasing the potential for drug toxicities secondary to increased topical absorption. Furthermore, the BSA:BW ratio in infants may be twice that of an adult's, resulting in higher systemic bioavailability for topical doses applied based on BSA. This is discussed further in the "Age- related and Ethnicity-Related Skin Differences" section.

4. **E.** As discussed in the "Skin Basics" section, skin health is related to overall health. Exercise and adequate sleep along with maintaining a healthy, well-balanced diet are key factors. Ample daily fluid intake and regular use of moisturizers are important for skin hydration.

5. **D.** As shown in Fig. e17-5, vesicles and bullae are the technical terms for blisters. Vesicles are circumscribed fluid-containing lesions of any size; bullae are vesicles with diameters larger than 0.5 cm.

6. **C.** Sunscreens "protect" against both sunburn and tanning, minimize UV-induced immunosuppression and skin aging, minimize the development of actinic keratosis while promoting the regression of existing lesions, and reduce the incidence of squamous cell carcinoma and malignant melanomas. Regular sunscreen use for the first 18 years of life could potentially decrease the lifetime risk of skin cancer by 80%—a single episode of blistering sunburn before age 18 almost doubles the lifetime risk of melanoma, and having five or more blistering sunburns between ages 15 and 20 years increased the risk of melanoma by 80% and nonmelanoma skin cancers by almost 70% in one study.

7. **D.** The "Age-Related Skin Differences" section describes characteristics of aged skin, including all of these factors. Aged skin tends to be drier, thinner, and more friable, which increases susceptibility to external insults and loss of the skin barrier function. In addition, the healing time after skin injury may be prolonged in aged skin.

8. **D.** These factors are all correct descriptors of a possibly dysplastic nevus, as described in the "Skin Assessment" section.

9. **C.** The "Skin Care Basics" section describes these effects of depleted hydration in skin: (1) the stratum corneum becomes brittle and may crack more easily; (2) mild inflammation and impaired cell maturation may occur; (3) foreign invaders may penetrate the skin more easily; and (4) chapping may result.

10. **D.** All of these sequelae can result from a deficiency of essential fatty acids, as described in the Nutrition subsection of this chapter.

11. **D.** A fragrance-free product does not contain synthetic chemicals, whereas an unscented product only has the fragrance portion of the product removed (ie, it may still contain synthetic chemicals, and these may be allergenic). Fragrance-free products are preferred to unscented ones. This topic is discussed in the "Scents and Fragrances" section.

12. **B.** Because the skin is made of lipids, absorption of lipophilic drugs and toxins occurs more rapidly than absorption of hydrophilic agents. Key points related to percutaneous absorption are discussed in the "Absorption Through the Skin"" section.

13. **A.** Diaper rash may be secondarily infected by *Candida* species and present with confluent red plaques, papules, and pustules, as discussed in the "Diaper Dermatitis" section.

14. **D.** Both tanning salons and sun tanning should be avoided. Nonpharmacologic strategies for sun protection are discussed in the "Prevention of Sun-Induced Skin Disorders" section.

15. **D.** As discussed in the "Diaper Dermatitis" section, lower concentrations of hydrocortisone cream (0.5%-1%) can be used to treat diaper rash but only in severe cases and for limited periods of time (1-2 weeks).