



Maintenance of Certification-CME Review

Allergic contact dermatitis

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Release Date: July 1, 2014**Expiration Date:** June 30, 2016**Estimated Time to Complete:** 60 minutes**Target Audience:** Physicians involved in providing patient care in the field of allergy/asthma/immunology**Learning Objectives:**

At the conclusion of this activity, participants should be able to:

- Describe the clinical and pathophysiologic presentation of allergic contact dermatitis
- Define the appropriate use of testing modalities to identify causative agents in allergic contact dermatitis
- List common sources where the common allergens that cause allergic contact dermatitis are found

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Clinical Vignette

A 35-year-old woman with a history of atopic dermatitis (AD) presents with a 2-year duration of patchy, pruritic facial rash that involves both cheeks, the upper and lower eyelids, the left side of her neck, and around her lips. She reports changing to all natural botanical cosmetics. She is a hairdresser but does not notice a difference in the rash at home or at work. Previous hand dermatitis had been controlled with the use of vinyl gloves at work. Her hobbies consist of reading and jogging. A thin-layer rapid use epicutaneous test (T.R.U.E Test) result was positive to balsam of Peru (BOP) and quaternium 15. Despite avoidance of these allergens by reading cosmetic labels, she continued to have breakthrough lesions. She reports that tomatoes made her breakout on both buttocks and axilla, but a recent skin prick test result to tomatoes was negative.

A subsequent patch test, including an expanded cosmetic panel and personal products, had a 2+ reaction to Fragrance Mix II (FM-II), BOP, and quaternium 15, all deemed to have probable relevance. She strictly adhered to a list of safe products from a database for 2 months with some improvement but would still break out occasionally on the buttocks and axillary area. Because systemic contact dermatitis (SCD) was suspected, a low-BOP diet was prescribed, and the patient had marked improvement after 1 month.

Definition

Contact dermatitis is defined as an inflammation of the skin that results from direct contact of a substance with the surface of the skin. The 2 main types are irritant contact dermatitis (ICD) and allergic contact dermatitis (ACD). The most common form is ICD, which occurs when substances, such as solvents or other chemicals, irritate the skin directly after exposure, resulting in red, often more painful than itchy, patches on the involved skin areas.¹ This reaction occurs without a prior immunologic sensitization. In contrast, ACD results from a type IV hypersensitivity reaction. On first exposure, a substance penetrates the skin surface, is processed by antigen-presenting cells, and then is carried to the regional lymph nodes, where they are introduced to T cells. Allergen-specific T cells then proliferate. On subsequent exposures, circulating memory T cells home to the skin, recognize the antigen, and induce an immunologic cascade, resulting in pruritic dermatitis. This reaction usually takes 8 to 48 hours but can occur as early as 2 to 3 hours after a subsequent exposure and can appear up to 96 hours after contact with the allergen.²

Diagnostic Approach

The diagnosis of ACD requires a comprehensive history, including an occupational and social history, current and past

profession, hobbies (Table 1), disease course, seasonal variation, response to treatment, presence of pruritus, and a history of AD. Patients who had AD as a child have a 3-fold increase in the risk of hand eczema (which may be either ICD or ACD).³ Patients with AD who are not responding to therapy (flares with treatment, no response to treatment, or flares when they try to discontinue treatment) or who have unusual distributions should be suspected of having ACD. Most importantly, ACD is almost always pruritic but can also cause stinging, burning, or pain. Lastly, it is important to explain to the patient that ACD can occur with chemicals (cosmetics) that they may have used for years and that even occasional exposure may still elicit a reaction.⁴

A physical examination should identify the location(s) of the dermatitis and morphologic features of the lesions. ACD lesions typically are pruritic, erythematous plaques that develop into vesicles and sometimes tense bullae. In chronic cases, the skin appears pink-red, dry, fissured, and lichenified and can often be confused with AD.⁵ Particularly high-yield locations for ACD include eyelids, face, lips, hands, dorsal feet, upper back, and proximal and lateral parts of the arms. Each distribution confers an increased risk for a specific allergen. Interestingly, the latest North American Contact Dermatitis Group data list the most common body locations of contact dermatitis as scattered or generalized distribution on the hands and face (Table 2).⁶

Eyelid Dermatitis

ACD is the most common cause of periorbital and eyelid dermatitis.⁷ ACD should be considered if the lesion itches and extends beyond the eyelid and an ectopic allergen source (ie, nail polish) if one eyelid is worse than the other. Some common products that cause eyelid dermatitis are shampoo, conditioners, soap, hand moisturizer, and nail cosmetics. Frequently reported allergens were formaldehyde, nickel, BOP,⁸ and gold.⁹

Facial and Neck Dermatitis

The main differential diagnoses for peripheral face (preauricular, submental, or jawline) dermatitis are ICD, seborrhea, and ACD. The products most likely to cause an ACD in this area are shampoos, conditioners, and facial cleansers. In contrast, the products most likely to cause a central facial dermatitis (cheeks, forehead) are makeup and moisturizers. Personal care products, preservatives, and fragrances represent the most common relevant allergens in those diagnosed as having ACD of the face. ACD that affects the lateral aspect of the neck is most likely secondary to perfumes or colognes and nail cosmetics.¹⁰

Table 1
History taking in the evaluation of allergic contact dermatitis

Evaluation	Variables
Demographics	Age, sex, race, ethnicity
Family medical history	Allergic rhinitis, asthma, eczema
Personal medical history	History of atopic dermatitis or other allergic disease, existing medical conditions, implantation of medical devices, including implants, braces, crowns/bridges, stents, or fillings
Occupational history	Current job title, job description, regular and occasional chemical exposures, materials used at work, location of employment, length of time at current job, previous employment, symptoms at work
Dermatitis-specific history	Onset of rash: date and/or duration, initial areas affected, severity, type, pattern and progression of eruption, previous treatment (physician and self-treatment modalities) Current: areas affected, severity, when does the rash occur, worsen or improve (during workweek, after weekend)
Sports/hobbies	Types of activities, frequency, equipment or materials used, symptoms with sports or hobbies
Personal care	Hand-washing frequency and type of soap, use of cosmetics and other common personal care products (deodorant, lotion, perfumes, toothpaste, nail polish, mouthwash, shampoo, conditioner)
Jewelry and tattoos	Number of body piercings, types of jewelry and frequency of use, history of permanent, temporary, or henna-based tattoo, symptoms with jewelry or tattoos

Table 2

Common allergen and sources based on location of dermatitis

Location of dermatitis	Common allergen	Common sources
Lip	Nickel, fragrance mix I and II, <i>Myroxylon pereirae</i> /BOP	Toothpaste, lip balms, cosmetics, and personal products
Eyelid	Nickel, BOP, formaldehyde	Shampoo, conditioners, hand soap, hand moisturizer and nail cosmetics
Face	Nickel, kathon, fragrance	Peripheral face: Shampoo, conditioners, facial cleansers Central face: make-up, moisturizers, jewelry
Hands	Nickel, rubber components (thiuram mix, PPD mix, carba mix, MBT mix)	Hairstyling products, hand soaps, moisturizers, OTC or prescription topical medicaments, gloves
Feet	Rubber components	OTC or prescription topical medicaments and footwear
Axilla	Fragrance mix I and I, preservatives	Shaving products, antiperspirant or deodorant
Neck	Nickel, fragrance mix, BOP, PPD (hair dye), glyceryl thioglycolate (permanent wave solutions), tosylamide/formaldehyde resin (nail enamel products)	“Run-off” of hair or facial products or ectopic transfer of allergens from the hands, such as those in nails products; nickel from jewelry, perfume, or cologne

Abbreviations: BOP, balsam of Peru; MBT, mercaptobenzothiazole; OTC, over the counter; PPD, paraphenylenediamine.

Lip Dermatitis

Lip dermatitis could be caused by ICD, ACD, or AD. There is an increased suspicion of ACD if the dermatitis violates the vermilion border, and toothpaste, lip balms, and cosmetics are the products most implicated. Fragrance mix, *Myroxylon pereirae* or BOP, and nickel were the most common relevant allergens. In addition, of 75 patients with allergic contact cheilitis, 27 (26%) had relevant positive patch test reactions to allergens not on the North American Contact Dermatitis Group series, with cosmetics and lipstick as the predominant personal products,¹¹ emphasizing the need to perform a patch test with the patients' personal products.

Hands and Feet Dermatitis

The differential diagnosis for hand dermatitis includes dyshidrosis, pompholyx and chronic vesicular dermatitis, psoriasis, ICD, and ACD. The most common products to cause allergic hand dermatitis include hairstyling products, hand soaps (especially in public restrooms), moisturizers, medicaments, and gloves. The relevant allergens in hand ACD are nickel and rubber components (thiuram mix, paraphenylenediamine mix, carba mix, and mercaptobenzothiazole mix).¹² The pattern of foot dermatitis due to ACD varies according to the patient's footwear. Dermatitis on the dorsum of the feet should raise suspicion for ACD, and it rarely affects the webs of the toes, instep, and flexural creases. Over-the-counter or prescription topical medicaments, shoes, and rubber are the most likely sources of ACD in this location.

Patch Testing

Patch testing remains the criterion standard for the diagnosis of ACD. It has led to an improved quality of life, identification of relevant allergens, and early resolution of symptoms.¹³ In 1995, the Food and Drug Administration approved the thin-layer rapid use epicutaneous test (T.R.U.E. Test), which now contains 35 antigens or mixes plus a negative control. However, there is increasing concern that the limited number of allergens in this test will result in missed relevant allergens. Several studies have underscored this concern; one showed that the test would completely identify all clinically relevant allergens in only one-fourth of the patients, and 25% of patients would not have any of their allergens detected, with 47% being partially evaluated.¹⁴ A multicenter review of patch testing for ACD in allergy practices found that positive allergens would have been missed in 12.5% of patients when evaluating with 29 allergens alone from the thin-layer rapid use epicutaneous test, whereas 25.6% would be partially evaluated.¹⁵ A more recent study suggests that exclusive reliance on the thin-layer rapid use epicutaneous test panel of 36 chambers as opposed to an extended panel of 70 antigens or more can miss detection of sensitization to approximately 26.7% of antigens.⁶ In particular, FM-II and some rubber allergens are commonly missed when the thin-layer rapid use epicutaneous test is used alone. In addition, patch testing to

personal products has increased value, especially in facial, eyelid, lip, and hand dermatitis. A reasonable rule of thumb to use when testing with nonstandardized antigens is that agents applied to normal skin and left on (eg, makeup, moisturizer, lipstick, sunscreen, perfumes, and topical medications) can be tested “as is.” Wash-off products (eg, soap, shampoo, cream rinses) may be diluted to 1:100 to 1:10. A material safety data sheet should be reviewed, and only physicians with expertise should test household (ie, detergents) and industrial products. Recommended patch test concentration and vehicles could be found in *Patch Testing* by Anton C. De Groot.¹⁶

Systemic Contact Dermatitis

SCD occurs when a topically sensitized individual develops an acute dermatitis (baboon syndrome, dermatitis at sites of previous allergen exposure, such as spots with previous positive patch test results, and dyshidrotic hand eczema) after a systemic exposure to that allergen or cross-reacting allergens. The most common causes of SCD include metals, such as mercury, nickel, and gold; medications, including aminoglycoside antibiotics, corticosteroids, and aminophylline; and plants and herbal products from the Compositae and Anacardiaceae plant families and BOP.¹⁷ Avoidance diets are an effective treatment and should be used if SCD is suspected in a patient who is not responding despite adequate avoidance of contact allergens.

Treatment

Treatment of ACD includes identification of the causative allergen and appropriate education on avoidance of the relevant contact allergen(s). If identifying allergens in cosmetics is currently relevant, asking the patient to avoid them by reading labels is usually difficult, intimidating, and unsuccessful because allergen names are long, are difficult to spell, and have numerous complex synonyms. To improve adherence,^{18,19} 2 computer-generated databases are currently available in the United States that list products that are free of the allergens that the patient is allergic to and can safely use. They are the Contact Allergen Management Program of the American Contact Dermatitis Society (www.contactderm.org) and Mayo Clinic's Contact Allergen Replacement Database (www.AllergyFreeSkin.com).

Conclusion

Distribution is the key to the diagnosis of ACD. A facial rash that involves the periorbital areas and eyelids is commonly due to ACD caused by fragrances, the most common sensitizers in cosmetics. However, facial ACD also occurs secondarily to ectopic transfer of the allergen to the face by the hands from other regions of the body.

ACD is common in patients with AD. ACD should always be considered in patients with AD because the 2 dermatologic conditions often coexist in the same patient.²⁰ AD is associated with an

impaired skin barrier and therefore is likely to increase absorption of topically applied chemicals and enhance risk of subsequent sensitization. AD patients also tend to use more topical medications and therefore have more cumulative skin exposure to topical products that contain fragrances.

Patch testing is the criterion standard for the diagnosis of ACD. When evaluating ACD from cosmetics and personal care products, which contain considerable numbers of chemical ingredients, consider that the most common causes are due to a few important chemical classes, including fragrances, preservatives, excipients, nickel, and sun blocks.

Preservatives and antibacterials are important cosmetic allergens. Preservatives tend to be grouped into 2 broad categories: formaldehyde releasers and nonformaldehyde releasers.²¹ Our patient had a positive patch test result to quaternium 15 and was advised to avoid all formaldehyde/formaldehyde releasers. Providing a list of safe products free of these allergens is a major part of her treatment.

An expanded panel, including the patient's personal products, can identify clinically relevant allergens. Exclusive reliance on the thin-layer rapid use epicutaneous test antigen panel as opposed to an extended panel can miss detection of sensitization to clinically relevant antigens,⁶ especially for facial, eyelid, and lip dermatitis. FM-II is not included in the current thin-layer rapid use epicutaneous test and was therefore missed in our patient. Recent evidence suggests that standard FM-I and BOP will detect approximately 60% to 70% of fragrance-allergic individuals at best.

Foods that can cause ACD and also have the ability to cause SCD when ingested include nickel and flavoring agents, such as BOP, oil of cinnamon, and vanilla. Our patient had contact sensitization to BOP. It has been reported that approximately half of patients with a positive patch test result to *Myroxylon pereirae* (BOP) who followed a low-BOP diet had significant improvement of their dermatitis. Foods to avoid in a balsam-restricted diet include citrus fruits, flavoring agents, spices (cinnamon, cloves, vanilla, curry, allspice, anise, ginger), spicy condiments, flavored tea and tobacco, chocolate, certain cough medicines, ice cream, spiced soft drinks, and tomatoes and tomato-containing products.

The mainstay of treatment of ACD involves avoidance of relevant allergens confirmed by positive patch test results. Use of commercially available resources will help to improve adherence of allergen avoidance and patients' quality of life.

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