

HAIR STYLING DERMATITIS

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topics of the other key players, such as irritant contact dermatitis (ICD) and contact urticaria, may be explained, as history — not patch testing — can point to one of these as the correct diagnosis for the patient. It is important to note that ICD, the most prevalent form of contact dermatitis, can at times precede or be a concomitant diagnosis with ACD.^{4,5} Unlike ACD, ICD is not immune-mediated, but occurs secondary to contact with an irritating or abrasive substance. Contact urticaria (wheal and flare reaction), on the other hand, represents the least prevalent form of CD.

It is important to note that it is an immune-mediated phenomenon whose hallmark is an IgE and mast cell-mediated immediate-type hypersensitivity reaction. We acknowledge this form of hypersensitivity due to the severity of potential deleterious anaphylactic-type reactions and direct the reader to key sources.^{6,7,8}

This column highlights ACD and explores top relevant allergens, regional-based dermatitis presentations, topic-based dermatitis presentations and clinical tips and pearls for diagnosis and treatment. In this issue we discuss the large number of potential irritants and allergens encountered during a hair-dressing session.

ALLERGIC REACTIONS TO HAIR SALON PRODUCTS

Dyes

The most common potential allergen is paraphenylenediamine (PPD), which is found in most commercially available hair-dye products. These hair-dye products are divided into permanent, demi-permanent and semi-permanent product types. Hair-dye products are also defined by “lift.” Permanent dyes first lighten the ambient hair color (“lift”) using ammonia and peroxide to allow the dye to cover gray hair more effectively. Lifting or lightening the ambient (background)



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Allergic Contact Dermatitis (ACD) is an important disease that notably affects 14.5 million Americans each year.¹ The economic impact of this disease is high in terms of both patient morbidity and loss of income, school and work, not to mention significant expenditures for visits to health care providers

and for medicaments.¹

Once patch testing is performed and a culprit has been identified, education becomes the critical intervention to ensure adherence to an avoidance regimen. With allergen avoidance, remission

of the dermatitis ensues. If patients are unable to comply with the avoidance regimen, they are at risk for recurrent or sustained dermatitis or progression to a systematized presentation.^{2,3} In fact, education of the patient often begins before the diagnostic patch test is ever placed. This ensures that the patient has an appropriate understanding of potential outcomes, including his or her central role in both disease and treatment.

During the initial consultation, patients are often taught about the pathophysiology of ACD: its delayed presentation, its relationship with the immune system (sensitization to a chemical and then elicitation of a dermatitis with re-exposure), and its occurrence at any point in time, even to something that the patient has been using regularly for a short period of time or even intermittently for years. In certain cases, the

hair color makes the darker hairs closer in hue to gray hairs. The result is that gray is more effectively covered when the hair is colored. For men, this is not ideal, since most men want some gray to show through so that it does not look like they are wearing a hairpiece. Some women also prefer this type of “natural” look. Therefore, demi-permanent dyes were designed to cover most but not all gray hair and usually incorporate ethanolamine to give some “lift” and do a moderately effective job of covering gray. Semi-permanent dyes have no lift and cover gray hair minimally.⁹

PPD is a strong chemical oxidizer found in most permanent, demi-permanent and semi-permanent hair-dye products, which have been in use since the early 1900s. This is also when the first documented cases of PPD as a hairdressing allergen were reported.¹⁰ It has even been hypothesized that Oscar Wilde (1856-1900), who suffered from an unknown skin disease near the end of his life, developed ACD from PPD exposure while dying his graying hair.¹¹

In 1907, a French chemist named Eugene Schueller began using PPD in his homemade hair dye that he sold to local hairdressers. Because it was deemed safe and worked extremely well, his PPD-based hair dye gained popularity and made its way to the mass market. Schueller went on to establish his company, Societe Francaise de Teintures Inoffensives pour Cheveux. Ironically, this name means French Harmless Hair Dye Company. The company was eventually renamed L’Oreal, which is now a multinational corporation with popular hair, beauty and cleansing products found in stores around the world.¹²

PPD remains popular in hair dyes because it helps provide a natural look and permanent results. Today, more than 50% of women use or have used some form of hair dye, and recently, even men have been using hair dye more frequently.¹³ Interestingly, while PPD can be used in hair dyes, the FDA prohibits its use on skin.¹⁴ Still, many temporary tattoo artists use black henna, which contains PPD and can cause allergic reactions.¹⁵ In addition, those receiving hair dye and temporary tattoos, as well as hairdressers,

Table 1. COMMON ALLERGENS IN SALON PRODUCTS

| Category | Allergens |
|-----------------|--|
| Hair Dye | Paraphenylenediamine (PPD) Para-toluenediamine sulfate (PTDS) Ortho-nitro paraphenylenediamine Para-aminophenol Meta-aminophenol Resorcinol |
| Hair Bleach | Ammonium persulfate |
| Permanent Waves | Glyceryl thioglycolate Ammonium thioglycolate |
| Straightener | Formaldehyde |

Table 2. PARA-TOLUENEDIAMINE SULFATE-BASED SALON PRODUCTS FREE OF PARAPHENYLENEDIAMINE²⁴

| Category | Allergens |
|---|---|
| PTDS-Based Permanent Hair-Dye Products | Goldwell Color Chic Schwarzkopf Igora Royal Wella Koleston Perfect |
| PTDS-Based Demi-Permanent Hair-Dye Products | Clairol Professional Beautiful Collection Advanced Gray Solution Goldwell ReShade for Men L’Oreal Paris Excellence to-Go 10 Minute Crème Colorant L’Oreal Richeesse Schwarzkopf Viviance Sanotint Light Wella Color Charm Demi Permanent Wella Color Touch |

cosmetologists, photographic developers, printers and textile and fur dyers, all face a potential risk of occupational contact allergy due to PPD.¹³

PPD is a prohapten that can be oxidized to a potentially allergenic hapten, either in the epidermis or the dermis layer of the skin.¹⁶ The partially oxidized intermediate state of PPD is what specifically triggers ACD in allergic individuals. Reactions are common on the scalp, upper eyelids and rims of the ears. In addition to Type IV delayed hypersensitivity, PPD has occasionally caused Type I immediate reactions and, rarely, anaphylaxis.¹³ It is also important to note that certain chemicals can potentially cross-react with PPD. Generally, compounds also containing an amino group in the para position of

their benzene ring can undergo cross reactions with PPD.¹³

Hair Bleaches

Hair bleaches also pose a contact allergy threat to some individuals. In addition to hydrogen peroxide and ammonia, many hair bleaches, designed to lighten hair color more than two shades, contain persulfates to boost the degree of lightening. Persulfates may cause contact allergy, irritant dermatitis and, occasionally, Type I reactions (including rare anaphylaxis). For individuals with persulfate allergy, it is recommended that lightening by less than two shades be achieved by using products based on hydrogen peroxide and ammonia alone.⁹

Straighteners

During chemical hair straightening procedures, individuals may react to

sodium hydroxide, a common ingredient in many curl relaxers. With a pH around 13.0, sodium hydroxide may cause severe irritant contact dermatitis rather than allergic reactions. Sodium hydroxide is referred to as a chemical relaxer because it eliminates curly hair by breaking and reforming disulfide bonds within hair proteins. Chemical relaxers are usually creams that are applied to the hair, followed by combing the hair straight. Prolonged exposure can result in hair fragility and increases the risk of irritating the scalp.⁹ While using no-lye relaxers based on guanidine carbamate may be gentler on the scalp, these products require increased preparations, such as mixing the guanidine carbamate with a cream relaxer (containing calcium hydroxide).⁹

On another note, on November 10, 2010, the people of the state of California filed for a preliminary injunction against GIB LCC, the makers of the “Brazilian Blowout,” a professional hair smoothing treatment touted to be “safe,” “without harsh chemicals” and “formaldehyde-free.” Multiple product users reported acute health problems — severe breathing difficulties, epistaxis, headaches and dermatitis — that were traceable to the release of formaldehyde gas from the smoothing solution during treatment. “The People’s product testing has revealed, however, that the Smoothing Solution contains approximately 8% formaldehyde by weight, which is in the range typical of embalming fluid... The People’s First Amended Complaint describes violations of at least five separate state laws [resulting from: (1) inclusion of high levels of formaldehyde; (2) failure to warn salon workers; (3) failure to report the presence of formaldehyde; (4) false and deceptive advertising; (5) business practices surrounding product vending].” Furthermore, Health Canada (the equivalent of the FDA) has issued a health advisory listing 11 hair smoothing products that have formaldehyde exceeding the “allowable” 0.2% range.¹⁷

Permanent Wavers

Ammonium thioglycolate, the main component of alkaline permanent wave products, is an uncommon cause of contact allergy. While “acid” permanent wave products containing glyceryl thioglycolate (pH 7.5 to 8.0) can still be

found in some hair salons and are gentler on the hair, they cause ACD more frequently than products with ammonium thioglycolate (pH 9.2 to 9.5) and generally produce a weaker wave.⁹

Although alkaline permanent waves less commonly cause contact allergy, because of their higher pH, they are a more common cause of irritant dermatitis than acid permanents. Similar to curl relaxers, thioglycolate-based wave products break disulfide bonds between cysteine residues within hair proteins. This allows the hair to be molded into the desired shape and then the permanent wave product is neutralized. Failure to fully neutralize the wave lotion can result in hair breakage, and since the waved hair is weaker, a quality conditioner should be applied following the procedure.⁹

DIFFERENTIAL DIAGNOSIS

Although there is a long differential diagnosis of potential causes of scalp inflammation, the most common conditions to be confused with contact allergy on the scalp are seborrheic dermatitis, atopic eczema and psoriasis. However, the timing of reactions occurring predictably after salon procedures strongly suggests the diagnosis of contact dermatitis. Reactions occurring the day of a procedure more likely suggest an irritant or urticarial process, while a delayed reaction is more suggestive of contact allergy.

TOP ALLERGENS IN SALON PRODUCTS

PPD, found in most permanent, demi-permanent and semi-permanent hair dyes, remains the most common salon allergen causing ACD. Additional, less common allergens in hair dyes that can be found on the “hair-dye tray” at many contact dermatitis referral centers include para-toluenediamine sulfate (PTDS), ortho-nitro paraphenylenediamine, para-aminophenol, meta-aminophenol and resorcinol (**See Table 1**). Allergens such as glyceryl thioglycolate and ammonium persulfate can be found in acid permanent wave products and hair bleaches, respectively.

PRACTICAL ASPECTS OF PATCH TESTING

Patch testing is often necessary to identify the relevant allergen(s) respon-

sible for contact allergy. The North American Standard Series includes some allergens found in hair salon products¹⁸; however, supplemental trays are needed to more thoroughly test for contact allergy to these types of products.¹⁹ Supplemental trays also include constituents and cross-reactors of likely allergens and increase the chance of provoking relevant positive reactions.²⁰

It is important to realize also that some reactions to salon products are not caused by the active ingredients but instead by preservatives, fragrances or other vehicle ingredients. Therefore, testing patients with suspected contact allergy to potential vehicle ingredients is recommended. Also, it is important to be aware that allergic reactions may also be caused by the shampoos, conditioners and styling products used at the hair salon.

PEARLS OF TREATMENT: EVERY DOSE COUNTS

As alluded to in the preface, one may be exposed to, and subsequently sensitized to, a contact allergen such as PPD for days to years before demonstrating the clinical picture of ACD. With each exposure, there is an increasing risk of reaching a point at which the immune system meets its metaphorical “threshold” and subsequent exposures may lead to elicitation of a cutaneous response, such as scalp dermatitis.^{4,21} Just as repeated contact over time led to this immune response, repeated avoidance of the majority of exposures over time will be required to induce remission.

Avoidance of specific allergens in personal care products is the treatment of choice for contact allergy, but can prove to be a tedious task. Luckily, there are programs available to aid in this endeavor. Both the Contact Allergen Management Program (CAMP), a service offered through the American Contact Dermatitis Society (ACDS),²² and the Contact Allergen Replacement Database (CARD), developed by Mayo Clinic,²³ enable a provider to enter a patient’s known contact allergens and produce a “shopping list” of products void of those particular chemicals. Such programs also have the ability to exclude cross-reactors.

Some sources, however, require avoidance creativity and/or finding alterna-

tives. Identification of acceptable alternative products is, therefore, essential in order to obtain clinical improvement.

Individuals with contact allergy to PPD may consider using newer PPD-free hair dye products, based on paratoluenediamine (PTDS). Recently, many manufacturers have started to use PTDS instead of PPD in select permanent and demi-permanent hair coloring products. These PTDS-based products are cosmetically elegant and work equally well compared to those containing PPD. However, since PTDS and PPD are closely related ingredients, it is possible that individuals allergic to PPD may also be allergic to PTDS.²⁴ Individuals allergic to PPD who wish to use PTDS-based products should be patch tested for PTDS (and preferably a complete hair-dye series) prior to use.

Recently, a retrospective study was conducted that examined whether individuals allergic to PPD could tolerate PPD-free hair dyes based on PTDS. Patch test results since 2004 showed that out of 35 individuals allergic to PPD, 20 patients (57%) tested negative to PTDS and the other allergens in the hair-dye series. It was therefore postulated that these individuals would be likely to tolerate PPD-free permanent and demi-permanent hair dyes containing PTDS.²⁴ Although it is possible that patients may experience cross-reactions to PPD due to the chemical similarities between PPD and PTDS, all 10 PPD-positive, PTDS-negative patients in this study who subsequently used one of the newer PTDS-based hair dyes tolerated these products.²⁴ Therefore, a significant number of individuals allergic to PPD will benefit from the existence of these new PTDS-based products (See Table 2).

For patients allergic to both PPD and PTDS, alternative products free of both of these chemicals are available but are less than optimal. Clairol Natural Instincts Loving Care, for example, is a semi-permanent azo dye that provides no lift. A small number of individuals allergic to PPD will cross-react with azo dye products. For men, Grecian Formula for Men is a PPD/PTDS-free lead oxide for darkening gray hair. Additionally, Goldwell Elumen is a salon hair dye containing basic dyes. A tradeoff does exist, however. While these products are less likely to cause contact al-

lergy, they are generally not as cosmetically elegant as products containing PPD and PTDS and cover gray hair less effectively.

Finding alternatives for contact allergy to other salon products is typically easier. Individuals allergic to persulfates in hair bleach can use persulfate-free products, which lighten hair less than 2 shades. Persons allergic to glyceryl thioglycolate in acid permanent wave products will usually tolerate alkaline permanent waves, based on ammonium thioglycolate.

If patch testing demonstrates allergy to salon shampoo, conditioner or styling products, the American Contact Alternatives Group (ACAG) has published comprehensive information on available alternative products, as well as the ACAG Alternatives Charts (which are available on the American Contact Dermatitis Society website: www.contactderm.org). ■

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