parabens, PPD, isothiazolinones, and fragrances (Table 1; see Table 2, Supplemental Digital Content, http://links.lww.com/DER/A7).

In addition to PPD, many common allergens are found in hair-dye kits, such as propylene glycol, parabens, benzyl alcohol, and isothiazolinones. Furthermore, whereas approximately 10% of all individual products contained methylchloroisothiazolinone/methylisothiazolinone or methylisothiazolinone, isothiazolinones were found in at least 1 product in 40% of all kits tested. Although it is known that PPD is commonly found in black hair dyes, we here demonstrate that PPD is prevalent in brown and blonde hair dyes as well. Consumers cannot avoid PPD in common commercial hair-dye kits by avoiding black hair dye and selecting a brown or blonde dye kit. Surveyed hair-dye users in Denmark reported symptoms consistent with contact dermatitis at rates higher than expected based on PPD patch testing, suggesting that a more complete epidemiological picture of allergic contact dermatitis problems related to ingredients is needed.[4] Hair-dye kit selection was designed to maximize the number of unique products and to be comparable with prior studies. The authors believe our sample is representative, but because we did not survey all available hair-dye kits, sampling bias is possible, particularly among exotic colors, which were underrepresented. In addition to hair-dye compounds such as PPD, clinicians must consider fragrances and preservatives as potential causes of allergic contact dermatitis in patients suspected of having hair dye–related dermatitis. Continued surveillance of common allergens in consumer products is essential to patch testers for accurate and effective patient education and avoidance.

Dathan Hamann, MD
Division of Dermatology
Department of Internal Medicine
The Ohio State University, Columbus
dathanhamann@gmail.com

Patrick Kishi, MD
College of Medicine
University of Arizona, Phoenix

Carsten R. Hamann, MD
Department of Dermatology and Allergy
University of Copenhagen
Herlev and Gentofte Hospital
Hellerup, Denmark

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Improving the Diagnosis of Allergic Contact Dermatitis Using Patch Test With Gloves

To the Editor:

The diagnosis of allergic contact dermatitis due to gloves may be hampered by scarce availability of label information and by a spectrum of clinical investigation often limited to the main rubber additives. Contact allergy caused by gloves typically depends on chemicals involved in the production process, which are similar for both latex and synthetic rubber gloves such as neoprene and nitrile. Among these additives, there are accelerators used to speed up rubber vulcanization, antioxidants, and plasticizers.[1] When one suspects hand dermatitis secondary to use of gloves, the patch test with the European baseline series represents the first step of the identification of the causal agent. Unfortunately, the method allows the testing of the main rubber additives only, excluding other chemical substances contained in gloves, which can be also responsible for delayed-type allergy skin reactions. In these situations, the use of additional selected substances or series should be recommended. However, the choice of correct allergens to be tested is made difficult by the scarce availability of gloves' label information. Moreover, label information may not reflect the actual chemical composition of the final product because of chemical changes occurring in the vulcanization process.[2] A possible way to overcome this limitation and to better define the diagnosis of hand contact dermatitis is to test the glove as it is. There are no available data yet, but this approach is recommended by the EU-COST Action StanDerm TD 1206,[3] a European-founded project on the Development and Implementation of European Standards on Prevention of Occupational Skin Diseases.

We analyzed data from workers referred to our clinic because of hand dermatitis during the period of 2011 to 2015 who were patch tested with extended European series, rubber series,[1] samples of gloves used in the workplace, and samples of alternative standard vinyl gloves (2 × 2 cm), applied on the skin of the patients for 48 hours. Skin reactions +, ++, and +++ at day 3 were considered allergic. All data were stored on an Excel data sheet (Microsoft, Redmond, Washington), and the statistical analysis was made using STATA 13.1 (StataCorp LLC, Texas). Continuous data were

TABLE 1. Patch Test Results

	Male (n = 31)	Female (n = 52)	Total (N = 83)
	n (%)	n (%)	n (%)
Standard patch test +	20 (64.5)	37 (71.1)	57 (68.7)
Rubber haptens +	8 (25.8)	8 (15.4)	16 (19.3)
Thiuram mix 1% pet (dipentamethylenethiuram disulfide 0.25%, tetraethylthiuram disulfide 0.25%, tetramethylthiuram disulfide 0.25%, tetramethylthiuram monosulfide 0.25%)	3 (9.7)	4 (7.7)	7 (8.4)
Carba mix 3% pet (1,3-diphenylguanidine1.0%, zinc dibutyldithiocarbamate 1.0%, zinc diethyldithiocarbamate 1.0%)	7 (22.6)	6 (11.5)	13 (15.7)
2-Mercaptobenzothiazole 1% pet	1 (3.2)	0 (0)	1 (1.2)
Mercapto mix 2% pet (N-cyclohexylbenzothiazyl sulphenamide 0.5%, mercaptobenzothiazole 0.5%, dibenzothiazyl disulfide 0.5%, morpholinylmercaptobenzothiazole 0.5%)	1 (3.2)	0 (0)	1 (1.2)
Black rubber mix 0.6% pet (N-isopropyl-N-phenyl-4-phenylenediamine 0.2%, N-cyclohexyl-N-phenyl-4-phenylenediamine 0.2%, N, N-diphenyl-4-phenylenediamine 0.2%)	0 (0)	1 (1.9)	1 (1.2)
Vinyl haptens +	2 (6.4)	0 (0)	2 (2.4)
Epoxy resin/bisphenol A 1% pet	1 (3.2)	0 (0)	1 (1.2)
Formaldehyde 1% aq	1 (3.2)	0 (0)	1 (1.2)
Leather haptens + potassium dichromate 0.5% pet	8 (25.8)	4 (7.7)*	12 (14.5)
Prick latex +	2 (6.4)	7 (13.4)	9 (10.8)
Gloves patch +	9 (29.0)	8 (15.4)	17 (20.5)
Latex N+/N tested	0/4 (0)	1/8 (12.5)	1/12 (8.3)
Nitrile N+/N tested	2/11 (18.2)	4/29 (13.8)	6/40 (15.0)
Neoprene N+/N tested	0 (0)	3/4 (75.0)	3/4 (75.0)
Other rubber N+/N tested	3/8 (37.5)	0/4 (0)	3/12 (25)
Vinyl N+/N tested	2/10 (20.0)	3/31 (9.7)	5/41 (9.8)

*$P < 0.05$.

summarized using mean and SD; difference between means was tested using *t* test, whereas the difference between categorical data was tested by the χ^2 statistics. A $P < 0.05$ was considered significant. All subjects were patients undergoing patch testing for diagnostic purposes and gave informed consent.

We studied 83 workers (63% female) represented by health care workers (49.4%), mechanics (16.9%), bricklayers (7.2%), hairdressers (6%), and bakers and food handlers (4%).

Fifty-seven had at least one positive patch test in the European series. Seventeen (20.5%) had at least one positive delayed skin reaction to 1 or more glove samples (9 ++ and 8 +), and only 9 of them (10.8%) developed a positive reaction to rubber series. Another 7 subjects (8.4%) developed a reaction to rubber series but were negative to glove test (Table 1).

Discrepancy between rubber series and glove test positivity can be related to the low sensitivity of patch test with gloves or to the presence of new additives in gloves. The chemical analysis of gloves would permit a more precise evaluation of this topic.[4]

Our study suggests that, when one suspects glove-related allergic contact dermatitis, patch test should be integrated with pieces of gloves used by the worker and by an alternative glove. Latex gloves can be tested, but only after the exclusion of a type I hypersensitivity. This approach allows the increase in sensitivity of patch test and gives important information to patients on protective gloves to use. Moreover, a more precise labeling of gloves with additive contents in the final product will help dermatologists and occupational physicians to choose the right gloves for workers.[5]

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Monica Santarossa, MD
Francesca Larese Filon, MD
Clinical Unit of Occupational Medicine
Department of Medical Sciences
University of Trieste
Trieste, Italy
santarossamonica@gmail.com

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Comparison of Contact Allergens in Bar Soaps and Liquid Body Washes

To the Editor:

Allergic contact dermatitis (ACD) describes a delayed classic T-cell–mediated (type IV) hypersensitivity immune response to external substances that contact the skin. This often manifests as pruritus, erythema, and vesiculation that may progress to lichenification, xerosis, and fissuring.[1] Identification and avoidance of specific allergens are key to adequate management and care.[1] Although previous studies have investigated the presence of numerous contact allergens in cleansing products,[2] limited research on the contact allergens of specific formulations of cleansing products currently exists. We aim to identify the difference between the number and types of contact allergens found in bar soaps versus liquid body washes.

We examined the top 50 bar soaps and 50 body washes listed on Amazon.com, sorting by "relevance" and filtering by "avg. customer review 4 stars and up" on October 6, 2016. Ingredient lists were almost entirely obtained from Amazon.com, but a few were collected from Target.com, Walgreens.com, and specific product Web sites. Allergens were selected from the American Contact Dermatitis Society core allergen series,[3] with the expertise of a coauthor. χ^2 and Fisher exact tests were used to compare allergens in bar soaps versus body washes.

*Co–first authors.

Address reprint requests to Cory A. Dunnick,MD, University of Colorado School of Medicine, 1665 Aurora Ct, Mailstop F703, Aurora, CO 80045. E-mail: cory.dunnick@ucdenver.edu.

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Liquid body washes had far more preservative and surfactant allergens compared with bar soaps ($P < 0.001$, Table 1). No differences in fragrances existed between bar soaps and body washes.

Of the preservatives studied, methylisothiazolinone, quaternium-15, sodium benzoate, methylchloroisothiazolinone/methylisothiazolinone, DMDM hydantoin, phenoxyethanol, and iodopropynyl butylcarbamate were particularly prevalent in body washes compared with bar soaps. Of the surfactants studied, cocamidopropyl betaine and alkyl glucosides were ubiquitous in body washes and rarely seen in bar soaps. Polyethylene glycol was found in 38% of body washes but only in 8% of bar soaps (Table 1).

A number of the most common contact allergens identified by the American Contact Dermatitis Society have been identified in soaps and cleansers[3]; however, studies investigating these allergens in bar soaps and body washes are limited. Our study revealed a significantly higher number of preservative and surfactant allergens in body washes versus bar soaps.

In recent years, bar soap sales have fallen by 2.2% despite a 2.7% rise in overall bath and shower product sales. Consumers younger than 65 years are primarily responsible. For example, only one third of consumers aged 25 to 34 years are willing to wash their face with bar soap compared with 60% of those older than 65 years.[4] Potential explanations for this include the perceived inconvenience of storing bar soaps and the perceived uncleanliness of using them. However, in a study of 16 participants who washed their hands with bar soaps inoculated with gram-negative bacteria, none of the participants had detectable levels of bacterium on their hands after washing.[5]

Limitations include an inability to specify fragrances in all products because product labels are not required to report specific fragrance compounds. Second, ingredients obtained from retailers such as Amazon.com may be subject to error, although we limited this risk by cross-checking ingredient lists found on other Web sites.

Because ACD often creates a treatment challenge, health care providers will benefit from an improved understanding of potential ingredients in products commonly associated with the condition. The use of bar soaps instead of body washes may alleviate symptoms and improve quality of life in some patients with ACD.

*Julia A. Siegel, MD**
University of Massachusetts Medical School
Worcester

*Jessica S. Mounessa, MD**
Robert P. Dellavalle, MD, PhD, MSPH
Cory A. Dunnick, MD
University of Colorado School of Medicine
Aurora