

The Validated Hypoallergenic Cosmetics Rating System: Its 30-Year Evolution and Effect on the Prevalence of Cosmetic Reactions

Vermén M. Verallo-Rowell

Background: The validated hypoallergenic (vh) rating system was initiated in 1988 to try to objectively validate the “hypoallergenic” claim in cosmetics.

Objectives: To show how the system rates cosmetic hypoallergenicity and to compare the prevalence of cosmetic contact dermatitis (CCD) among users of regular cosmetics versus cosmetics with high VH numbers.

Methods: (1) Made a VH list based on top allergens from patch-test results published by the North American Contact Dermatitis Group (NACDG) and the European Surveillance System on Contact Allergies (ESSCA); (2) reviewed global regulatory, cosmetic, drug, packaging, and manufacturing practices to show how allergens may contaminate products; (3) compared cosmetic ingredients lists against the VH list to obtain the VH rating (the more allergens absent, the higher the VH rating); and (4) obtained CCD prevalence among users of regular cosmetics versus users of cosmetics with high VH ratings.

Results: (1) Two VH lists (1988, 2003) included only cosmetic allergens in the NACDG surveys, the third (2007) included cosmetic and potential contaminant noncosmetic allergens, and the fourth (2010) adds ESSCA patch-test surveys. (2) CCD prevalence is 0.05 to 0.12% (average, 0.08%) among users of cosmetics with high VH ratings versus 2.4 to 36.3% among users of regular cosmetics.

Conclusion: The VH rating system is shown to objectively validate the hypoallergenic cosmetics claim.

“Hypoallergenic” Cosmetics

The use of the term “hypoallergenic” in cosmetics was started in the 1950s by copywriters to infer that these cosmetics produced fewer allergies than other cosmetics of the same kind. This was based on quasi-medical claims such as “absence of perfume ingredients”; “natural”; “‘dermatologist-,’ ‘allergy-,’ or ‘clinically tested’”; or “safe for sensitive skin.”¹ The US Food and Drug Administration (FDA) proposed in February 1974 (and issued in June 1975) its “final regulation” on the use of the claim “hypoallergenic,” requiring scientific tests to show significantly lower rates of adverse reactions in human skin from the use of products with the “hypoallergenic” claim versus products without it. Two producers of hypoallergenic cosmetics—Almay (New York) and Clinique (New York)—challenged this rule in court with the charge that the FDA had no authority to issue it. The US Court of

Appeals for the District of Columbia decided that the regulation was invalid because “the FDA’s definition of the term hypoallergenic was unreasonable and that the Agency had not demonstrated that consumers perceive the term hypoallergenic in the way described in the regulation.”²

In a questionnaire survey of how dermatologists view the term “hypoallergenic cosmetic,” 86% responded that the concept is valuable and that they would recommend such products for atopic patients and those with fragrance or preservative allergies. However, many respondents were much less likely to do so for infants, toddlers, and elderly persons; members of different ethnic groups; those who have had cosmetic surgery; those with acne or diabetes; or those who work in occupations or environments of high allergenic risk.³ Dermatologists obviously expect better evidence of potential benefit to their patients from a cosmetic that labels itself as able to reduce cosmetic reactions.

Differential Diagnosis of Cosmetic Reactions

Cosmetic contact dermatitis (CCD) is the most common reaction to cosmetics.⁴ It is an acquired hypersensitivity from direct contact of the epidermis with allergens in the cosmetic or an accessory. Table 1⁴⁵⁻⁹ summarizes the

From the VMV Skin Research Centre + Clinics, Makati, Philippines.

Address reprint requests to Vermén M. Verallo-Rowell, MD, VMV Skin Research Centre + Clinics (VSRCL), 117 C. Palanca Street, Legazpi Village, Makati, Philippines 1200. E-mail: vmvrmd@gmail.com

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Table 1. Types, Causes, and Diagnosis of Cosmetic Contact Dermatitis

<i>Diagnostic Test</i>	<i>Type of CCD</i>	<i>Clinical Presentation</i>	<i>Causes</i>	<i>Mechanism</i>
Patch test	Contact urticaria ⁵	Hives: wheal and flare; generalized, dyspnea, rare	Latex and/or hair dye; fragrances, botanicals, preservatives	IgE-mediated immediate-type hypersensitivity to allergens
	Irritant contact dermatitis ⁶	Stinging, burning, itching, reddening, thickening, at exposure sites only	Commonly hands soaked in detergents, cleansers, water	Nonallergic; chemicals disrupting skin barrier of epidermis leads to cytokine release; more common than allergic contact dermatitis
	Allergic contact dermatitis ⁶	Erythema, papules, vesicles at areas of allergen exposure; tend to spread	Metals, fragrance, antibiotics, preservatives, dyes, rubber (most common causes)	Allergic type IV delayed T-cell-mediated contact dermatitis
	Pigmented contact/cosmetic dermatitis ⁷	Hyperpigmentation with no evident inflammation	Fragrance, tar dyes, preservatives; common in people with darker skin	Proposed: low-dose allergens enough to cause vacuolar alteration at dermoepidermal junction but not enough to produce inflammation
Photopatch test	Phototoxic contact dermatitis ⁸	Sunburnlike erythema at areas of contact; postinflammatory hyperpigmentation often	Old or new fragrances, some sunscreens, plants, antiseptics, certain drugs	Nonallergic-like irritant contact dermatitis from UVA and visible light-irradiated photocontactants; more common than photoallergic contact dermatitis
	Photoallergic contact dermatitis ⁸	Erythema, papules, vesicles; often spread beyond areas of direct contact	Fragrance, plants/botanicals for varied uses	Allergy to photoallergens and cross-reacting chemicals; mostly to UVA, at times to visible or UVB irradiation
	Photosensitive pigmented contact dermatitis ⁹	Hyperpigmentation with no evident inflammation; melasma associated with extrafacial hyperpigmentations	Sunscreens, preservatives, antiseptics, tar dyes	Proposed: low-dose common photoallergens irradiated by low-dose UVA/VL/IR produce reactive oxygen species resulting in epidermo-dermal pigmentation and solar elastosis

CCD = cosmetic contact dermatitis; IgE = immunoglobulin E; IR = irritant reaction; IV = intravenous; UVA = ultraviolet A; UVB = ultraviolet B; VL = visible light.

definition, presentation, and pathogenesis of each of the three primary CCD types (contact urticaria, irritant contact dermatitis, and allergic contact dermatitis).

Cosmetic reactions that may be mistaken for CCD are hypopigmentation and hair or nail yellowing and breakage. Reports of acneiform eruptions and acne cosmetica from ingredients tested in rabbit ears were common just a few decades ago.^{10,11} A review of modern manufacturing practices concluded that products containing ingredients found to be comedogenic in rabbit ears are not necessarily

comedogenic in human skin. Reputable manufacturers now generally test for ingredient and product comedogenicity and acnegenicity on human skin to the point that a nongreasy non-occlusive cosmetic made by such manufacturers is unlikely to be acnegenic.¹²

Stingers (also described as hyperactive, intolerant, and irritable) were first described by Grove and colleagues.¹³ Stingers sting, burn, prickle, tingle, or cause slight pain sensations primarily on the nasolabial folds and cheeks. These symptoms are severe, but visible skin changes are

minimal. Studies of stingers versus nonstingers show stingers to be associated with transepidermal water loss, a more permeable horny layer,¹⁴ a higher density of sweat glands and hair follicles, and an elaborate network of sensory nerves.¹⁵ Causes are often found to be specific to the stinger and include toners, astringents with alcohols, and low-pH acids (ascorbic, azelaic, glycolic, kojic, and salicylic).¹⁶ In the Grove and colleagues test for stingers, lactic acid or a suspect chemical is applied with a cotton swab to a patient's cheek; after a few minutes, the substance elicits a moderate-to-severe sensation that can be measured on a point intensity scale.¹⁷

“Validated Hypoallergenic” Rating System

The “validated hypoallergenic” (VH) rating system was initiated in 1988 to objectively rate cosmetic hypoallergenicity based on dermatologic reports of allergens causing CCD.¹⁸ The VH rating system is numerical: the higher the number, the fewer allergens in the formulation and the more “hypoallergenic” (ie, the less likely to cause CCD) the product. The system works by (1) creating a VH list from reported top allergens that elicit positive patch-test reactions and (2) comparing the ingredients list of a cosmetic against the VH list to obtain a VH rating. The VH rating is expressed as “VH” followed by a minus sign, a number that indicates the quantity of allergens absent in the ingredients list of the cosmetic, and a forward slash (/) followed by a number that indicates the total number of allergens in the current VH list. The ideal hypoallergenic cosmetic would therefore have a VH rating that would be the same as the total number of allergens in the VH list (ie, it would contain “zero” allergens). The VH list is pegged on the sequential reports of top allergens that cause contact dermatitis by two large groups concerned with patch testing: the North American Contact Dermatitis Group (NACDG), which has published its reports since 1972, and the European Surveillance System for Contact Allergies (ESSCA), which has published its reports since 2002.

Patch testing was made famous in the 1950s in London¹⁹ and by many other centers throughout Europe. By 1967, the European groups formed the International Contact Dermatitis Research Group (ICDRG), whose main goal was to provide a standardized procedure for patch-testing materials. By the 1980s, the ICDRG was able to reach its goals through extensive joint studies it initiated with many countries around the world.²⁰ The NACDG took over the task of allergen reporting in North America.²¹ The group consists of

13 dermatologists (11 from the United States and 2 from Canada) who began multicenter studies in the 1970s with a standardized list of patch-test allergens.^{22,23}

Multicenter cooperation by the working groups of the European Society of Contact Dermatitis led to the formal creation of ESSCA on October 10, 1996.²⁴ Both ESSCA and the NACDG have the following aims: (1) to recognize early the presence of (and kinds of exposure to) emerging allergens; (2) to compare reports from different countries and regions; (3) to standardize and quality-control patch testing in support of institutions involved in public health; and (4) to support postmarketing surveillance for product safety.²⁵ By January 2001, the multilingual European Standard series was distributed, mostly to European countries.²⁶ Studies conducted in 2002 to 2003 involved 10,511 study participants from 16 study centers.²⁷ In 2004, there were 11,643 participants from 31 centers,²⁸ and in 2005 to 2006, there were 19,793 participants aggregated from west, south, central, and northeast Europe.²⁹ Table 2^{29–40} lists the top allergens reported by the two groups and shows additions, omissions, and changes in concentration based on the results of preceding studies and literature reports of new allergens.

First: VH 10 Allergen List (1988–2002)

The top allergens in the first VH allergen list were collated from the results of patch-test studies using (1) the 20-allergen standard,³⁰ (2) vehicles and preservatives,³¹ and (3) cosmetics³² series of the American Academy of Dermatology as reported by the NACDG. Also analyzed were the results of a concordance study³³ done at VMV Skin Research Centre + Clinics (Makati, Philippines) on similar allergens from Chemotechnique (Malmo, Sweden) and Skin Sciences Laboratory, Inc. (Pasig, Philippines).³⁴ Of the 20 common allergens tested, 10 were considered to be present in cosmetics and made up the first VH list. With this VH-10 list, the highest possible (and most hypoallergenic) VH rating was VH-10/10 (indicating that all 10 top cosmetic allergens were absent from the product's ingredients list).

Second: VH 27 Allergen List (2003–2006)

In 1992 to 1994, the NACDG began to increase the number of test allergens.³⁵ Of 52 allergens first tested, 34 (65%) resulted in + patch-test reactions; 17 (50%) of those allergens produced at least one allergic reaction that was found to be clinically relevant to the present or past dermatitis. The next NACDG study, done on 50 allergens

Table 2. First to Fourth Validated Hypoallergenic Lists Based on Sequential NACDG and ESSCA Top Allergens*

VH 10 List of 20 Top Allergens, Started 1988	VH 27 List of 50 Top Allergens, Started 2003		VH 65 List of 65 Top Allergens Reported, Started 2007		VH 76 List of 70 NACDG + 6/30 ESSCA Top Allergens, Started 2010	
	1988–1998 ^{30–34}	1999–2000 ^{35–38}	2001–2002 ³⁹	2003–2004 ⁴⁰	2005–2006 ⁴¹	2007–2010 ^{41,29}
	1 Amidoamine 0.1% aq	1 Amidoamine 0.1% aqs	1 Amidoamine 0.1% aqs	1 Amidoamine 0.1% aqs	1 Amidoamine 0.1% aqs	1 Amidoamine (stearamidopropyl dimethylamine) 0.1% aqs
	2 Bacitracin 20%	2 Bacitracin 20%	2 Bacitracin 20%	2 Bacitracin 20%	2 Bacitracin 20%	2 Bacitracin 20%
	3 Balsam of Peru (<i>Myroxylon pereirae</i>) 25%	3 Balsam of Peru (<i>Myroxylon pereirae</i>) 25%	3 Balsam of Peru (<i>Myroxylon pereirae</i>) 25%	3 Balsam of Peru (<i>Myroxylon pereirae</i>) 25%	3 Balsam of Peru (<i>Myroxylon pereirae</i>) 25%	3 Balsam of Peru (<i>Myroxylon pereirae</i>) 25%
	4 Benzocaine 1%	4 Benzalkonium chloride 0.1% aqs	4 Benzocaine 5%	4 Benzocaine 5%	4 Benzocaine 5%	4 Benzocaine 5%
	5 Benzophenone-3 3%	6 Benzophenone-3 3%	5 Benzophenone-3 3%	5 Benzophenone-3 3%	5 2-Hydroxy-4- methoxybenzophenone (benzophenone-3) 10%	5 2-Hydroxy-4- methoxybenzophenone (benzophenone-3) 10%
	6 2-Bromo-2- nitropropane- 1,3-diol 0.5%	7 2-Bromo-2- nitropropane-1,3-diol 0.5%	6 2-Bromo-2- nitropropane-1,3-diol 0.5%	6 2-Bromo-2-nitropropane- 1,3-diol 0.5%	6 2-Bromo-2-nitropropane-1,3- diol 0.5%	6 2-Bromo-2-nitropropane-1,3- diol 0.5%
	7 Budesonide 0.1%	8 Black rubber mix 0.6%	7 Bisphenol F 1%	7 Bisphenol F 1%	7 Benzyl alcohol 1%	7 Benzyl alcohol 1%
	8 Carba mix 3%	9 Budesonide 0.1%	8 Black rubber mix 0.6%	8 Black rubber mix 0.6%	8 Black rubber mix 0.6%	8 Black rubber mix 0.6%
	9 Chloroxylenol (PCMX) 1%	10 Carba mix 3%	9 Budesonide 0.01%	9 Budesonide 0.01%	9 Budesonide 0.1%	9 Budesonide 0.1%
	10 Cinnamic aldehyde 1%	11 Chloroxylenol (PCMX) 1%	10 Budesonide 0.1%	10 Budesonide 0.1%	10 Carba mix 3%	10 Carba mix 3%
	11 Cobalt chloride 1%	12 Cobalt chloride 1%	11 Carba mix 3%	11 Carba mix 3%	11 Carvone 5%	11 Carvone 5%
	12 Cobalt chloride 1%	13 Cocamidopropyl betaine 1% aqs	12 Chloroxylenol (PCMX) 1%	12 Chloroxylenol (PCMX) 1%	12 Chloroxylenol (PCMX) 1%	12 Chloroxylenol (PCMX) 1%
	13 Cocamidopropyl betaine 1% aqs	14 Clobetasol-17- propionate 1%	13 Cinnamic aldehyde 1%	13 Cinnamic aldehyde 1%	13 Cinnamic aldehyde 1%	13 Cinnamic aldehyde 1%
	14 Clobetasol-17- propionate 1%	15 Cobalt chloride 1%	14 Clobetasol-17- propionate 1%	14 Clobetasol-17-propionate 1%	14 Clobetasol-17-propionate 1%	14 Clobetasol-17-propionate 1%
	15 Cobalt chloride 1%	16 Cocamidopropyl betaine 1% aqs	15 Cobalt chloride 1%	15 Cobalt chloride 1%	15 Cobalt (ii) chloride hexahydrate 1%	15 Cobalt (ii) chloride hexahydrate 1%
	16 Cocamidopropyl betaine 1% aqs	17 Cocamidopropyl betaine 1% aqs	16 Cocamidopropyl betaine 1% aqs	16 Cocamidopropyl betaine 1% aqs		

VH 10 List of

VH 10 List of 20 Top Allergens, Started 1988	VH 27 List of 50 Top Allergens, Started 2003	VH 65 List of 65 Top Allergens Reported, Started 2007	VH 76 List of 70 NACDG + 6/30 ESSCA Top Allergens, Started 2010		
1988–1998 ^{30–34}	1999–2000 ^{35–38}	2001–2002 ³⁹	2003–2004 ⁴⁰	2005–2006 ⁴¹	2007–2010 ^{41,29}
		14 Cocamidopropyl betaine 0.5% aqs	17 Coconut diethanolamine 0.5%	17 Cocamidopropyl betaine 1%	16 Cocamidopropyl betaine 1%
		15 Colophony 20%	18 Colophony 20%	18 Colophony 20%	17 Coconut diethanolamine 0.5% (cocamide DEA)
12 Colophony 20%		16 Compositae mix 6%: 0.5% arnica, 2.5% German chamomile, 0.1% lactone, 0.9% parthenolide, 1% tansy, 1% yarrow	19 Compositae mix 6%: 0.5% arnica, 2.5% German chamomile, 0.1% lactone, 0.9% parthenolide, 1% tansy, 1% yarrow	20 Compositae mix 6%: 0.5% arnica, 2.5% German chamomile, 0.1% lactone, 0.9% parthenolide, 1% tansy, 1% yarrow	18 Colophony 20%
					19 Compositae mix 6%: 0.5% arnica, 2.5% German chamomile, 0.1% lactone, 0.9% parthenolide, 1% tansy, 1% yarrow
13 Diazolidinylurea 1% aqs		17 Diazolidinylurea 1% aqs	20 Diazolidinylurea 1% aqs	21 Diazolidinylurea 1% aqs	20 Desoximetasone 1%
14 Diazolidinylurea 1%		18 Diazolidinylurea 1%	21 Diazolidinylurea 1%	22 Diazolidinylurea 1%	21 Decyl glucoside 5%
		19 Dibucaine 2.5%	22 Dibucaine 2.5%	23 Dibucaine 2.5%	22 Diazolidinylurea 1%
		20 Dimethylol dihydroxyethyleneurea 4.5% aqs	23 Dimethylol dihydroxyethyleneurea 4.5% aqs	24 Dimethylol dihydroxyethyleneurea 4.5% aqs	23 Dibucaine (cinchocaine-HCl) 2.5%
		21 Disperse Blue 106 1%	24 Disperse Blue 106 1%	25 Disperse Blue 106 1%	24 DMAPA 1% aqs
		22 dl- α -Tocopherol 100%	25 dl- α -Tocopherol 100%	26 dl- α -Tocopherol 100%	25 Dimethylol dihydroxyethyleneurea 4.5% aqs
		23 dl- α -Tocopherol acetate		27 Dithiomorpholine 1%	26 Disperse Blue (124/106) 1%
15 DMDM hydantoin 1%		24 DMDM hydantoin 1%	26 DMDM hydantoin 1%	28 DMDM hydantoin 1%	27 dl- α -Tocopherol 100%

Table 2. Continued

VH 10 List of 20 Top Allergens, Started 1988	VH 27 List of 50 Top Allergens, Started 2003		VH 65 List of 65 Top Allergens Reported, Started 2007		VH 76 List of 70 NACDG + 6/30 ESSCA Top Allergens, Started 2010	
	1988–1998 ^{30–34}	1999–2000 ^{35–38}	2001–2002 ³⁹	2003–2004 ⁴⁰	2005–2006 ⁴¹	2007–2010 ^{41,29}
	16	DMDM hydantoin 1% aqs	25 DMDM hydantoin 1% aqs	27 DMDM hydantoin 1% aqs	29 DMDM hydantoin 1% aqs	
	17	Epoxy resin 1%	26 Epoxy resin 1%	28 Epoxy resin 1%	30 Epoxy resin 1%	29 Epoxy resin 1% (bisphenol A) 1%
	18	Ethyl acrylate 0.1%	27 Ethyl acrylate 0.1%	29 Ethyl acrylate 0.1%	31 Ethyl acrylate 0.1%	30 Ethyl acrylate 0.1%
2. Ethylenediamine dihydrochloride 1%	19	Ethylenediamine dihydrochloride 1%	28 Ethylenediamine dihydrochloride 1%	30 Ethylenediamine dihydrochloride 1%	32 Ethylenediamine dihydrochloride 1%	31 Ethylenediamine dihydrochloride 1%
	20	Ethyleneurea/ melamine formaldehyde resin 5%	29 Ethyleneurea/melamine formaldehyde resin 5%	31 Ethyleneurea/melamine formaldehyde resin 5%	33 Ethyleneurea/melamine formaldehyde resin 5%	
3. Formaldehyde 2.0% aqs	21	Formaldehyde 1% aqs	30 Formaldehyde 1% aqs	32 Formaldehyde 1% aqs	34 Formaldehyde 1% aqs	32 Formaldehyde 1% aqs
	22	Fragrance mix I 8%	31 Fragrance mix I 8%	33 Fragrance mix I 8%	35 Fragrance mix I 8%	33 Fragrance mix I 8%
	23	Gluteraldehyde 1%	32 Gluteraldehyde 1%	34 Gluteraldehyde 1%	36 Gluteraldehyde 1%	34 Fragrance mix II 14%
	24	Glyceryl thioglycolate 1%	33 Glyceryl thioglycolate 1%	35 Glyceryl thioglycolate 1%	37 Glyceryl thioglycolate 1%	35 Gluteraldehyde 1%
			34 Hydrocortisone-17- butyrate 1%	36 Hydrocortisone-17- butyrate 1%	38 Hydrocortisone-17- butyrate 1%	36 Glyceryl thioglycolate 1%
	25	Imidazolidinylurea 2%	35 Imidazolidinylurea 2%	37 Imidazolidinylurea 2%	39 Imidazolidinylurea 2%	37 Hydrocortisone-17- butyrate 1%
	26	Imidazolidinylurea 2% aqs	36 Imidazolidinylurea 2% aqs	38 Imidazolidinylurea 2% aqs	40 Imidazolidinylurea 2% aqs	38 2-Hydroxyethyl methacrylate 2%
	27	Iodopropynyl butyl carbamate 0.1%	37 Iodopropynyl butyl carbamate 0.1%	39 Iodopropynyl butyl carbamate 0.1%	41 Iodopropynyl butyl carbamate 0.1%	39 Imidazolidinylurea (Germall 115) 2%
			38 Jasmine absolute 2%	40 Jasmine absolute 2%	42 Iodopropynyl butyl carbamate 0.5%	40 Iodopropynyl butyl carbamate 0.5%
					43 Jasmine absolute 2%	41 Jasmine absolute 2%

Table 2. Continued

VH 10 List of 20 Top Allergens, Started 1988	VH 27 List of 50 Top Allergens, Started 2003	VH 65 List of 65 Top Allergens Reported, Started 2007				VH 76 List of 70 NACDG + 6/30 ESSCA Top Allergens, Started 2010
		1999–2000 ^{35–38}	2001–2002 ³⁹	2003–2004 ⁴⁰	2005–2006 ⁴¹	2007–2010 ^{41,29}
1988–1998 ^{30–34}						
	28 Lanolin 30%	39 Lanolin 30%	41 Lanolin 30%	44 Lanolin 30%	42 Lanolin 30%	
					43 <i>Lavandula angustifolia</i> oil (lavender oil) 2%	
		40 Lidocaine 15%	42 Lidocaine 15%	45 Lidocaine 15%	44 Lidocaine-HCl 15%	
					45 D-Limonene 3%	
					46 Majantol 5%	
	29 MCI/MI 100 ppm				47 MCI/MI 100 ppm aqs	
	30 MCI/MI 100 ppm aqs	41 MCI/MI 100 ppm aqs	43 MCI/MI 100 ppm aqs	46 MCI/MI 100 ppm aqs		
	31 Mercapto mix 1%	42 Mercapto mix 1%	44 Mercapto mix 1%	47 Mercapto mix 1%	48 <i>Mentha piperita</i> oil (peppermint oil) 2%	
	32 Mercaptoben- zothiazole 1%	43 Mercaptobenzothiazole 1%	45 Mercaptobenzothiazole 1%	48 Mercaptobenzothiazole 1%	49 Mercapto mix 1%	
	33 MDBGN/PE 0.4%	44 MDBGN/PE 0.4%	46 MDBGN/PE 2.5%	49 MDBGN/PE 2.5%	50 Mercaptoben- zothiazole 1%	
					51 Methyldibromoglutaronitrile phenoxyethanol (MDBGN/ PE) (Euxyl K 400) 2%	
	34 MDBGN/PE 2.5%	45 MDBGN/PE 2.5%				
	35 Mixed thioureas 1%	46 Methyl methacrylate 2%	47 Methyl methacrylate 2%	50 Methyl methacrylate 2%	52 Methyl methacrylate 2%	
		47 Mixed thioureas 1%	48 Mixed thioureas 1%	51 Mixed thioureas 1%	53 Mixed dialkyl thioureas 1%	
4. Neomycin sulfate 20%	36 Neomycin 20%	48 Neomycin 20%	49 Neomycin 20%	52 Neomycin 20%	54 Neomycin 20%	
5. Nickel sulfate 2.5%	37 Nickel sulfate 2.5%	49 Nickel sulfate 2.5%	50 Nickel sulfate 2.5%	53 Nickel sulfate 2.5%	55 Nickel sulfate 2.5%	
					56 Oleamidopropyl dimethylamine 0.1%	
	38 N'-Isopropyl-N- phenyl paraphenylen- ediamine 0.1%					
	39 Paraben mix 12%	50 Paraben mix 12%	51 Paraben mix 12%	54 Paraben mix 12%	57 Paraben mix 12%	

VH 10 List of
20 Top

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1988–1998 ^{30–34}	1999–2000 ^{35–38}	2001–2002 ³⁹	2003–2004 ⁴⁰	2005–2006 ⁴¹	2007–2010 ^{41,29}
6. p-Phenylene- diamine 1%	40 p-Phenylene- diamine 1%	51 Phenoxyethanol 1%	52 p-Phenylenediamine 1%	55 p-Phenylenediamine 1%	58 p-Phenylenediamine 1%
7. Potassium dichromate 0.5%	41 Potassium dichromate 0.25%	53 Potassium dichromate 0.25%	53 Potassium dichromate 0.25%	56 Potassium dichromate 0.25%	59 Potassium dichromate 0.25%
					60 Propolis 10%
	42 Propylene glycol 30% aqs	54 Prilocaine 2.5%	54 Propylene glycol 30% aqs	57 Propylene glycol 30% aqs	61 Propylene glycol 30% aqs
	43 p-tert-Butylphenol formaldehyde resin 1%	56 p-tert-Butylphenol formaldehyde resin 1%	55 p-tert-Butylphenol formaldehyde resin 1%	58 p-tert-Butylphenol formaldehyde resin 1%	62 p-tert-Butylphenol formaldehyde resin 1%
8. Quaternium-15 2%	44 Quaternium-15 2%	57 Quaternium-15 2%	56 Quaternium-15 2%	59 Quaternium-15 2%	63 Quaternium-15 2%
	45 Sesquiterpene lactone mix 0.1%	58 Sesquiterpene lactone mix 0.1%	57 Sesquiterpene lactone mix 0.1%	60 Sesquiterpene lactone mix 0.1%	64 Sesquiterpene lactone mix 0.1%
	46 Sodium gold thiosulfate 0.5%	59 Sodium gold thiosulfate 0.5%	58 Sodium gold thiosulfate 0.5%		65 Shellac 20% alc
			59 Tea tree oil (oxidized) 5%		66 Tea tree oil (oxidized) 5%
		60 Tetracaine 1%	60 Tetracaine 1%		
9. Thimerosal 0.1%	47 Thimerosal 0.1%	61 Thimerosal 0.1%			
10. Thiuram mix 1%	48 Thiuram 1%	62 Thiuram 1%	61 Thiuram 1%	61 Thiuram 1%	67 Thiuram 1%
	49 Tixocortol-21- pivalate 1%	63 Tixocortol-21-pivalate 1%	62 Tixocortol-21-pivalate 1%	62 Tixocortol-21-pivalate 1%	68 Tixocortol-21-pivalate 1%
	50 Tolsylamide/ formaldehyde resin 10%	64 Tolsylamide/ formaldehyde resin 10%	63 Tolsylamide/ formaldehyde resin 10%	63 Tolsylamide/formaldehyde resin 10%	69 Tolsylamide/formaldehyde resin 10%

Table 2. Continued

VH 10 List of 20 Top Allergens, Started 1988	VH 27 List of 50 Top Allergens, Started 2003	VH 65 List of 65 Top Allergens Reported, Started 2007			VH 76 List of 70 NACDG + 6/30 ESSCA Top Allergens, Started 2010
		1999–2000 ^{35–38}	2001–2002 ³⁹	2003–2004 ⁴⁰	2005–2006 ⁴¹
1988–1998 ^{30–34}					2007–2010 ^{41,29}
				64 Triamcinolone acetone 1%	
				65 Ylang ylang oil 2%	65 Ylang ylang oil 2%
			65 Ylang ylang oil 2%		70 Ylang ylang oil (<i>Cadanga odorata</i>) 2%
					71 Clioquinol 5.0%
					72 Lyrall (hydroxyisohexyl 3-cyclohexene carboxaldehyde) 5.0%
					73 Mercapto mix (only CBS, MBTS, MOR) 1.0%
					74 Methylidibromoglutaronitrile + 2-phenoxxyethanol 1.0%
					75 IPPD 0.10%
					76 Primin 0.01%
		out = 3	out = 7	out = 3	NACDG 65 in 15
		in = 18	in = 7	in = 3	ESSCA 30–24
					(in NACDG) = 6
					VH 76 of 76
					2010
VH 10 of 20 1988–2002	VH 27 of 50 2003–2006				

alc = alcohol; aqs = aqueous; CBS = N-cyclohexyl-2-benzothiazyl sulfenamide; DEA = diethanolamine; DMAPA = dimethylaminopropylamine; DMDM = dimethylol dimethyl; ESSCA = European Surveillance System for Contact Allergies; HCl = hydrochloride; IPPD = N-isopropyl-N-phenyl parathiazyl disulfide; MBTS = dibenzothiazyl disulfide; MCI/MI = methylchloroisothiazolinone/methylisothiazolinone; MDBGN/PE = methylidibromoglutaronitrile/phenoxxyethanol; MOR = morpholinyl mercaptobenzothiazole; NACDG = North American Contact Dermatitis Group; VH = validated hypoallergenic.

* Allergens are presented in alphabetical order. The numbers of ESSCA top allergens are shown in italics; numbers shown in bold represent added top allergens. The vehicle is petrolatum unless otherwise noted.

from 1994 to 1996, showed that the additional 30 allergens in its screening series were responsible for 47% of the allergic reactions of patients.³⁶ Of all patients tested, 12.4% may have had their disease misclassified as a nonallergic disorder, and an additional 34.4% of all tested patients would not have had their allergies fully defined. The NACDG's conclusion from the above reports (along with two additional studies done in 1996–1998³⁷ and 1998–2000,³⁸ all using 50 allergens) was that the increased number of allergens enhanced the usefulness of patch testing. Because 27 of the 50 allergens were present in cosmetics, the VH list increased in 2003 to reflect these 27 allergens, the rating VH-27/27 (indicating all 27 allergens to be absent in the ingredients list) being the most hypoallergenic.

VH 65 Allergen List (2007–2009)

From 2001 to 2006, the NACDG expanded its list to 65 allergens and published its results in 2004,³⁹ 2008,⁴⁰ and 2009.⁴¹ Besides the allergens present in the cosmetic itself, there was the possibility of contamination of the cosmetic by allergens found in packaging and accessories for the following reasons: (1) packaging materials, accessories, and ingredients are purchased from anywhere in the world⁴²; (2) contract manufacturing of cosmetic products (in part or as a whole) for extemporaneous, small, or private-label companies and even large prestige brands is a fairly common practice⁴³; (3) piracy or imitation of products (more in aesthetic terms than in substance) continues to be practiced.⁴⁴

Unlike food recalls, government recalls of cosmetics are relatively few. Besides contamination from the plausible sources cited above (ie, chemical, physical, and microbiologic), cosmetics may be contaminated by chemicals used to adulterate or substitute for expensive ingredients. Allergens such as fragrance in common vessels used to mix both regular and hypoallergenic products can negate a fragrance-free claim for the latter. This is similar to “nut-free” food products that are cooked in vessels previously used for cooking other products with nuts. Plastic monomers and oligomers (phthalates) may contaminate products by leaching out from online filters, plastic seals, pipes, packaging, cleaning solutions, cooling waters, and machinery lubricants.⁴⁵ Drugs such as anesthetics,⁴⁶ antibiotics,⁴⁷ and steroids used as cosmetics or added to cosmetics have been reported.⁴⁸

In 2007, all published NACDG top allergens were included in the VH list (no longer just the allergens commonly found in cosmetics). The most hypoallergenic

rating was VH-65/65; all 65 top allergens, cosmetic (or considered cosmetic) and noncosmetic, are absent from the product's ingredients.

VH 76 Allergen List (2010)

In 2009, the NACDG started to study 70 allergens for the 2005–2006 period⁴¹; ESSCA continues to study 30 allergens.²⁹ Twenty-four of the 30 ESSCA allergens are part of the 70-allergen NACDG series. The 6 remaining ESSCA allergens plus the 70 NACDG allergens add up to the 76 allergens that make up the fourth and current VH 76 allergen list. The most hypoallergenic cosmetic is now rated VH-76/76. Cosmetics with more allergens listed as ingredients correspondingly have lower VH ratings and are less hypoallergenic. (In the cosmetic's ingredients list, the included allergens are referred to by asterisks and are underlined.) For example, a cosmetic containing “propylene glycol,* amidoamine,* ethylenediamine dihydrochloride*, three preservative allergens,*** and three fragrance allergens***” has nine of the top allergens present and is rated VH-67/76. Table 3^{29,41} lists the 76 allergens alphabetically and cites their use in cosmetics, the products in which they are often found, possible ways they can contaminate (taint) products, and the chemicals with which they can cross-react.

Cosmetic Classification and Labeling

The US FDA and most regulatory bodies worldwide classify products as cosmetics or drugs and do not recognize “cosmeceuticals.” A cosmetic product improves the look and smell of skin. Once manufacturers claim that a product also treats or prevents disease or otherwise affects the structure or function of the skin, the product is classified as both a drug (over the counter [OTC] or prescription) and a cosmetic. Toothpastes that contain fluoride, deodorants that also serve as antiperspirants, and antidandruff shampoos act as cosmetics but are also classified as drugs because of their intention to treat. A sunscreen is classified as a cosmetic in Europe but as an OTC drug in the United States; moisturizers and makeup products that are marketed with sun-protection claims are therefore also OTC drugs. Drug ingredients are listed alphabetically as “active ingredients.” Cosmetic ingredients are listed in order of predominance (amount). In the United States, the ingredients' International Nomenclature of Cosmetic Ingredients names are used. This label appears prominently, usually (but not always) in the information panel on the back of the product's packaging.⁴⁹

Table 3. Validated Hypoallergenic 76 Allergens List Based on 70 NACDG and 6 ESSCA (Not in NACDG) Top Allergens (Updated, 2010)

No.	INCI and Common Drug Names	Action As Cosmetic or Drug	Presence, Potential Taint from Packaging or Production, and Cross-Reactivity with other Allergens
<i>Acrylates</i>			
1	Ethyl acrylate (acrylic acid ethyl ester)	Liquid or powder that hardens and becomes solid	In artificial nails, conditioners
2	2-Hydroxyethyl methacrylate (HEMA)		In film formers of packaging adhesives
3	Methyl methacrylate (methacrylic acid methyl ester)		May taint
<i>Anesthetics</i>			
4	p-Aminobenzoic acid (PABA) ethyl ester (benzocaine)	US OTC/Rx	In numbing skin care products for burns, procedures, mucosa
5	Cinchocaine hydrochloride (dibucaine)		Benzocaine cross-reacts with PABA, azo dyes, tetracaine (not with dibucaine, lidocaine)
6	Lidocaine		
<i>Antiseptics, Preservatives, Disinfectants, Antioxidants</i>			
7	Bacitracin	US OTC/RX	May taint cosmetics
8	p-Chloro-m-xlenol (chloroxylenol, PCMX)	Antiseptic, preservative	Cross-reacts with chlorocresol
9	Clioquinol	Antiseptic, preservative	In cosmetics, hand soaps, antiseptic hand creams
10	Formaldehyde (formalin, methaldehyde, methanal)	Antiseptic, preservative	
11	2-Bromo-2-nitropropane-1,3-diol (bronopol)	Formaldehyde releaser	In cosmetics, shampoos; personal care and baby products
12	Diazolidinylurea (Germall II)	Formaldehyde releasers	In packaging plastics, resins, rubber, fabrics, papers, inks, paints
13	Imidazolidinylurea (Germall 115, Euxyl K200)		
14	Dimethylol dihydroxyethyleneurea (DMDHEU)	Formaldehyde releaser	May taint cosmetics during production
15	DMDM hydantoin (Glydant)	Formaldehyde releasers	In nail adhesives, deodorants, packaging glues, varnishes, inks May taint cosmetics
16	Quaternium-15 (Dowicil 200)		
17	p-tert-Butyl phenol formaldehyde resin		
18	Tosylamide/formaldehyde resin (toluene sulfonamide/ formaldehyde resin)	Resin is important, (not the formaldehyde)	In nail hardeners, polishes, packaging lacquers, adhesives May taint cosmetics
19	Glutaral (glutaraldehyde)	Antiseptic, preservative	In personal care products, treated paper and leather; germicidals may taint cosmetics; production/ packaging may taint May cross-react with formaldehyde
20	DL- α -Tocopherol (vitamin E)	Synthetic antioxidant	In numerous cosmetics, skin, hair, nail, and personal care products
21	Iodopropynyl butyl carbamate (IPBC)	Preservatives; nonformaldehyde releasers	In baby wipes, numerous skin, hair, nail, shaving, and personal care cosmetics
22	Methyldibromoglutaronitrile (dibromodicyanobutane)	US Rx/OTC	May taint packaging materials, paints, primers, disinfectants
23	Methyldibromoglutaronitrile + 2-phenoxyethanol (Euxyl K400)		
24	MCI/MI (Euxyl K100, Kathon CG)		
25	Neomycin sulfate		
26	Propylene glycol (1,2 propanediol; 2-hydroxypropanol; methyl ethyl glycol)	Preservative; also solvent humectant softener	In numerous cosmetics, drugs, industrial products, foods

Table 3. Continued

No.	INCI and Common Drug Names	Action As Cosmetic or Drug	Presence, Potential Taint from Packaging or Production, and Cross-Reactivity with other Allergens
27	Paraben mix: benzyl-, butyl-, methyl-, propyl- (4-hydroxy benzoates)	Most used cosmetic, drug, and industrial product preservative	Cross-reactions between parabens often; with other “para” compounds (eg, p-phenylenediamine), not definite
<i>Corticosteroids (Steroids)</i>			
28	Budesonide: class B	US Rx	Steroid abuse (used as a cosmetic to whiten/clear/ moisturize skin)
29	Clobetasol-17-propionate: Class D	US Rx	
30	Hydrocortisone-17-butyrate: Class D	US Rx/OTC	May taint cosmetics during production
31	Desoximetasone (class B)	US Rx/OTC	
32	Tixocorotol-21-pivalate (class A)	US Rx/OTC	
Dyes			
33	Disperse Blue 124/106 mix (thiazol-azoyl-p-phenylenediamine derivative dyes)	For polyester fabrics and blends	May cross-react with cosmetic azo dyes and with p-phenylenediamine
34	p-Phenylenediamine	Used in making dyes and pigments	In all permanent (some semipermanent) henna black hair dyes; in some dark-colored cosmetics
<i>Emollients/Surfactants</i>			
35	Lanolin alcohol (wool alcohols most allergenic)	Sheep sebum protects fleece	In numerous cosmetics, skin care products May taint package coatings, finishes
<i>Reactants with nonallergenic coconut fatty acids to form allergenic coca-type surfactants/polymers</i>			
36	Stearamidopropyl dimethylamine (Amidoamine)	Cationic emulsifiers	In cosmetics, soaps, washes, shave gels; baby lotions; hair color kits, shampoos, conditioners; toothpaste
37	Dimethylaminopropylamine (DMAPA)		May X-react with other amidoamides
38	Cocamide DEA (coconut diethanolamine)	a non-ionic surfactant	
39	Cocamidopropyl betaine	Amphoteric surfactants	
40	Oleamidopropyl dimethylamine		
41	Decyl glucoside from glucose (cornstarch) and decanol fatty acid from coconut	Mild non-ionic surfactants	In baby products, sensitive-skin products
42	Ethylenediamine dihydrochloride (chlorethamine)	Emulsifier, solvent, stabilizer	In cosmetics, shellac, fungicides, insecticides, latex May taint cosmetics
<i>Fragrance, Botanicals, Essential Oils, Essence of Fragrance and Flavor (F&F)</i>			
43	Benzyl alcohol (phenylmethanol/ phenylcarbinol)	Natural grape aromatic preserves and scents	In “fragrance-free” cosmetics, dyes, skin care products, antifungal/antimicrobial cleansers May taint utensils, packaging Cross-reacts with balsam of Peru, benzylparaben
44	Carvone (D-carvone; D-1-methyl-4-isopropenyl-6-cyclohexen-2-one)	From dill, caraway seeds, spearmint, orange peel	In perfumes, aromatherapy massage bath oils, lip balms, scented creams, moisturizers, lotions, some color cosmetics, personal care products
45	<i>Cananga odorata</i> (ylang ylang, <i>Cananga</i> distillates)	From the flower	
46	Cinnamic aldehyde (cinnamaldehyde)	From tree bark: <i>Cassia</i> , camphor, cinnamon	
47	Colophonium rosin (abietic acid, alcohol, Abitol)	From pine trees	In mascara, rouge eye shadow, soaps, package inks, glues, washes May taint cosmetics

Table 3. Continued

No.	INCI and Common Drug Names	Action As Cosmetic or Drug	Presence, Potential Taint from Packaging or Production, and Cross-Reactivity with other Allergens
48	Compositae mix	From common plants of Asteraceae (Compositae) family: yarrow, mountain arnica, German chamomile, feverfew, tansy	In cosmetics, skin care, alternative care products In botanical cosmetics and skin care products
49	Fragrance mix I (FM I) a-amyl cinnamic aldehyde (synthetic; intense, like jasmine) Cinnamic alcohol (resins, balsams, used as F&F) Cinnamic aldehyde (cinnamon leaves, bark; strong cinnamon odor; F&F) Eugenol, clove leaf, bud, cinnamon leaf (clovelike smell; F&F) Isoeugenol, synthetic; also from eugenol, ylang ylang, nutmeg oils (clove) Geraniol, synthetic; also from geranium oil (sweet rose scent) Hydroxycitronellal, synthetic (sweet lily of the valley scent) Oak moss absolute (from oak and tree moss; masculine scent) Sorbitan sesquileate (added to FM I for stability; also has scent)		Fragrance is one of the top allergens in contact dermatitis and the top allergen in cosmetic contact dermatitis (as ingredient or taint) In regular cosmetics, personal care/medicated products, lip balms; hair and nails care products In perfumes, toilet waters, colognes, after shaves, tonics In aroma/masking chemicals of “fragrance-free” products In soaps, cleansers, shampoos, baby products, oils, powders Insect repellent
50	Fragrance mix II Lylal (synthetic; scent of lily) Citral; from lemongrass oil (lemon aroma; F&F) Farnesol (scent and biocide; many essential oils [balsam, citronella, musk]) Citronellol; from rose and geranium oil Hexyl cinnamic aldehyde (fragrance) Coumarin, synthetic (sweet spicy aroma)		In cosmetics (especially “natural” skin care, hair care products), antiinflammatory medications, mouthwashes
51	Hydroxyisohexyl-3-cyclohexene carboxaldehyde (Lylal)	Scent of lily	
52	<i>Jasminum grandiflorum</i> (jasmine absolute, officinale oil)	Essence of jasmine flowers	In cleansers, detergents, washes that may taint cosmetics produced in the cleansed vessels, packaging, and accessories
53	<i>Lavandula angustifolia</i> (lavender oil)		In aromatherapy oil, oil paint medium
54	D-Limonene; from citrus rind (carvene, citrene)	Citrus smell	
55	Majantol (2, 2-dimethyl-[3-methylphenyl]-propanol)	Lily of the valley scent	
56	<i>Melaleuca alternifolia</i> (tea tree oil)		In cosmetics and skin care products as antiseptic, antifungal, disinfectant
57	<i>Mentha piperita</i> (peppermint oil)	Mint flavor; oral care	
58	<i>Myroxilon pereirae</i> (Balsam of Peru); known to contain cinnamic aldehyde/alcohol: high in tomatoes benzyl benzoate, benzoic acid, vanillin		Cross-reacts with numerous fragrance ingredients listed here

Table 3. Continued

No.	INCI and Common Drug Names	Action As Cosmetic or Drug	Presence, Potential Taint from Packaging or Production, and Cross-Reactivity with other Allergens
59	Primin (2-methoxy-6-pentyl-1,4-benzoquinone), primetin, miconidin	Common indoor plants	May taint cosmetics
60	Propolis cera (bee glue, bread resin, hive doss)	From beehives	Cross-reacts with many fragrance and plant ingredients Not listed as fragrance
61	Sesquiterpene lactone mix	From the large Compositae (daisy) plant family	
<i>Hair Permanent Waves</i>			
62	Glyceryl thioglycolate (glyceryl monothioglucolate)	Breaks disulfide bonds to keep curls on cooling	In acid permanent waves
<i>Metals</i>			
63	Cobalt chloride hexahydrate	Metal and nonmetallic form	In hair dye, cosmetic dyes, paints, pigments; may taint cosmetics
64	Nickel sulfate (nickel sulfate/hexahydrate)	Metal; hard, resistant to rust	In cosmetics accessories, tools, metal packaging, cutting fluids; may taint cosmetics
65	Potassium dichromate (chromium compounds)	Metal, powder, ash	In cosmetic: concealers, powder, eyeliner, eye shadow, foundations, packaging materials; may taint cosmetics
<i>Resins</i>			
66	Bisphenol A epoxy resin, synthetic: diglycidyl esters + bisphenol A and epichlorohydrin	2-component glues, paints, varnishes	In paper, textiles, varnishes, glues of packaging; may taint cosmetics
67	Shellac (candy glaze, lac resin)	A natural waxy plastic	In lip shines, glosses, waxes, glues, inks, PVC plastic laminates; may taint cosmetics
<i>Rubber</i>			
68	Black rubber mix: N-isopropyl-N'-phenyl-p-phenylenediamine (N,N-diphenyl-p-phenylenediamine [DPPD]; N-isopropyl-N-phenyl-p-phenylenediamine [IPPD])	Chemicals used in the manufacture of black rubber	In black rubber hoses, tubes used in production May taint packaging components and cosmetics In eyelash curlers, hair dyes with p-aminodiphenylamine
69	Carba mix Diphenylguanidine Zinc dibutyldithiocarbamate Zinc diethyldithiocarbamate	Rubber; also latex accelerators	
70	N-Isopropyl-N-phenyl-p-phenylenediamine (IPPD)	Rubber antioxidant, anticracking	In package sealant, rubber hoses, plugs, insulation; may taint cosmetics
71	Mercaptobenzothiazole	Accelerator in rubber for shoes, insoles, gloves, and elastic	In pesticides, fungicides, antimold, insect repellants, disinfectants; may taint cosmetics
72	Mercapto mix: only CBS, MBTS, MOR		In cosmetic applicators, eyelash curlers, some soaps and shampoos
73	Mercapto mix: CBS, MBTS, MOR, MBT		85% also allergic to thiuram
74	Thiuram mix: tetramethylthiuram monosulfide; disulfiram, tetramethylthiuram disulfide, and dipentamethylenethiuram disulfide	Accelerator in the making of rubber; also found in pesticides	

Table 3. Continued

No.	INCI and Common Drug Names	Action As Cosmetic or Drug	Presence, Potential Taint from Packaging or Production, and Cross-Reactivity with other Allergens
75	Dialkyl thiourea mix: diethylthiourea/dibutylthiourea (alkylated thioureas)		In cosmetic applicators, adhesives; rubber (especially solid neoprene products), insect repellants; may taint cosmetics
<i>Sunscreens</i>			
76	Benzophenone-3 (2-hydroxy-4-methoxybenzophenone; oxybenzone; Eusolex 4360)	Sunscreen In US, an OTC drug; in Europe, a cosmetic	In makeup; lip, nail, and hair products; moisturizers Cross-reacts with benzophenones, PABA padimates, cinnamates, salicylates, dibenzoylmethane, ketoprofen, tiaprofenic acid, fenofibrate

Adapted from Uter W et al²⁹; Zug KA et al.⁴¹

CBS = N-cyclohexyl-2-benzothiazyl sulfenamide; DEA = diethanolamine; F&F = fragrance and flavor; INCI = International Nomenclature of Cosmetic Ingredients; MBT = mercaptobenzothiazole; MBTS = dibenzothiazyl disulfide; MCI/MI = methylchloroisothiazolinone/methylisothiazolinone; MOR = morpholinyl mercaptobenzothiazole; OTC = over the counter; PVC = polyvinyl chloride; Rx = prescription; US = United States.

Contact Dermatitis Prevalence

Contact dermatitis prevalence among users of cosmetics in general has risen in tandem with cosmetic industry reports of global growth by developed countries and emerging markets.⁵⁰

In the 1980s, studies in the United States among the general population reported rates of less than 1%.^{51–53} Likewise, in Europe from 1989 to 1994, the Swedish Medical Products Agency evaluated only 191 reports concerning adverse effects of 253 cosmetics and toiletries.⁵⁴ Later studies in Europe in the 1980s began to show rising prevalence,^{55–59} and a study by Nielsen and colleagues showed a doubling of rates among patients in Denmark tested in 1990 and 1998.⁶⁰

In the twenty-first century, prevalence rates of patch test–proven CCD continue to rise worldwide,^{61–64} ranging from 2.4 to 36.3%, most studies reporting between 4% and 9%.⁶⁵ Even higher was the rate reported by the latest NACDG analysis for the study periods from 2001 to 2004, which found that 24% of females (vs 18% of males) who were patch-tested were allergic to 20 of the 65 cosmetic allergens tested.⁶⁶ Users of facial cosmetics and users of eye makeup (color cosmetics) had 11% and 4% CCD rates, respectively.⁶⁷ These studies show that the occurrence of cosmetic allergy varies with time and geographic location⁶⁸ and is associated with increased consumer use of cosmetics, use of more allergenic ingredients, and enhanced accessibility of allergens for patch testing.⁶⁹

Almost all of these patch-test studies postulate that the actual prevalence of cosmetic reactions is higher. Milder allergic and irritant reactions usually result in discontinued

use of the cosmetic product, forestalling the need for medical attention or reporting to the cosmetic manufacturer. In 50% of cases, neither the patient nor the physician suspected a cosmetic product as a cause of the dermatitis.⁷⁰

VH-Rated Hypoallergenic Cosmetics and CCD Prevalence

VMV Hypoallergens in the Philippines has been following the VH rating system guidelines for 30 years. All of its formulations have high VH ratings (meaning zero to, at most, two VH-listed allergens). The company has a strong postmarketing surveillance network made up of beauty counselors at outlets where products are sold; physicians' liaisons who (like drug representatives) regularly visit dermatologists' offices; a newsletter that informs consumers about CCD; and active Internet contact sites. Packaging complaints and reports of CCD are sent directly by consumers to the company, or cases are seen by a physician or dermatologist and are reported to the company. Individuals with perceived CCD are sent to their own dermatologists or dermatologists at the VMV Skin Research Centre for examination and testing. The company reviewed CCD cases reported for the more than 200 types of products it produced from 2006 to 2009. One number (the numerator) was based on the number of complaints of a perceived allergic reaction that were reported verbally or in writing. The denominator was calculated by dividing the units sold in a year (a known number) by the average number of units purchased per customer and then dividing the quotient by the average number of times a customer purchased a product from the

company in a given year. This gave the company an estimate of the total number of customers per year. In 2006, 0.05% of total customers reported reactions. The number was 0.12 % in 2007, 0.06% in 2008, and 0.09% in 2009. The resulting average yearly reported CCD rate among users of cosmetics with high VH ratings in the period is 0.08%.⁷¹

Limitations

For those who wish to follow similar guidelines, the following outlines the limitations of the use of the VH rating system.

First, the system rates only cosmetics with ingredients lists on product labels. Fortunately, self-regulation by many cosmetic companies and regulatory bodies worldwide now mandate this. The United States,⁷² European Union members,⁷³ Canada,⁷⁴ and Japan,⁷⁵ as members of the International Cooperation on Cosmetic Regulation, follow this rule⁷⁶; so do Australia⁷⁷ and 10 countries in Southeast Asia (Brunei Darussalam, Cambodia, Indonesia, Malaysia, Myanmar, Lao People's Democratic Republic, Philippines, Singapore, Thailand, and Vietnam) that signed the Association of Southeast Asian Nations (ASEAN) Harmonized Cosmetic Regulatory Scheme⁷⁸ in 2003 and started to implement it in 2008. In June 2010, Chinese-made and imported cosmetics marketed in China were mandated to list all ingredients (including lead, mercury, and pigments). Manufacturers that fail to meet this requirement are to be suspended from the Chinese market.⁷⁹ As of 2009, India and some other countries that manufacture cosmetics for the global market had not yet mandated ingredient lists.⁸⁰

Second, ingredients basic to cosmetic formulations (acidifiers, chelating agents, emollients, emulsifiers, humectants, solvents, and surfactants) are reported to cause CCD but not often enough to be a part of the list studied by the patch testing groups. Customized products can be a service for these patients.

Third, the patch testing groups have increasingly identified more CCD allergens in shorter periods of time, which, for companies intending to use the VH rating system, can mean more frequent reformulations and retestings, often involving whole product lines. Careful reviews are needed to assure the absence of the VH-listed allergens in raw ingredients, packaging materials, manufacturing methods, and other possible sources of contamination. These practices are time consuming and expensive but need to be done by manufacturers committed to producing hypoallergenic cosmetics.

Conclusion

The VH rating system—properly updated and implemented and with postmarketing surveillance of products that follow the system—has been shown to be a valid method for substantiating hypoallergenic claims made on cosmetics labels.

Acknowledgments

Dr. Verallo-Rowell is Program Director of the Center for Skin Research, Testing and Product Development, Inc. (the VMV Skin Research Center + Clinics [VSRC]), a dermatologic clinic and testing facility that develops and tests cosmetics, pharmaceuticals, accessories, and devices for third-party companies such as Leo Pharmaceuticals, GlaxoSmithKline (GSK), Galderma, Candela, and Lumenis. She is head of Research and Development and a cofounder and shareholder of VMV Hypoallergenics.

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