

Patch testing with patients' own cosmetics and toiletries – results of the IVDK*, 1998–2002

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Patch test results with products brought in by the patients collected by the members of the Information Network of Departments of Dermatology (IVDK) between 1998 and 2002 were analysed. 5911 patients were patch tested with their own cosmetics and toiletries during this period. The 34 082 single test preparations applied to these 5911 patients were manually assigned to 1 of 26 categories, based on the EU Classification Annex I to 76/768/EEC, which had been further refined. The leave-on product category most commonly tested was 'creams, emulsions, lotions, gels and oils for the skin' ($n = 3621$ tested, $n = 312$ positive). The rinse-off product type most commonly tested was 'bath and shower preparations' ($n = 1333$ tested, $n = 71$ positive). In one-third of patients tested positive to these products, no other positive test result was observed. In the remainder, positive reactions to the fragrance mix, Myroxylon pereirae resin, methylidibromo glutaronitrile, (chloro)-methylisothiazolinone, 2-bromo-2-nitropropane-1,3-diol and further ingredients of cosmetics and toiletries were more common than in product-negative patients. However, in view of the potential for false-positive reactions mainly to rinse-off products, the results must be interpreted with caution. In conclusion, testing of patients' own products can be regarded as efficient and safe, if in accordance with current recommendations.

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The spectrum of contact allergens of any patient with suspected allergic contact dermatitis (ACD) is potentially very broad, even though the most common allergens are represented in the standard series and in other exposure-related test series. However, not uncommonly a presumptive diagnostic gap prompts the additional patch testing of products brought in by the patient, which he or she has observed to have possibly caused or aggravated ACD. In this context, cosmetics and toiletries apparently play a major role: according to a Swedish study with 1057 patch test patients, 47.3% of these reported intolerance to such products (1). The present analysis of patch test results with patients' own materials will assess the results and the diagnostic benefit, addressing the following questions:

(1) How often did only the patch testing with patients' own products yield a positive result, i.e. provided support to the diagnosis of ACD?

- (2) Which test concentrations and vehicles have been used and to what extent are current recommendations (2, 3) being followed?
- (3) Does the spectrum of concomitant positive reactions to commercially available allergens differ between patients with a positive reaction to own products and patients who did not react positively, possibly allowing conclusions on the spectrum of allergens potentially relevant in the type of product considered?

Materials and Methods

The Information Network of Departments of Dermatology (IVDK, <http://www.ivdk.org>) is an instrument of epidemiological surveillance of contact allergy established some 15 years ago. This network nowadays comprises more than 40 departments of dermatology in Germany, Austria and Switzerland. Standardized patch test data along with basic demographic and clinical information (<http://www.ivdk.gwdg.de/ivdk/doc/ivdkfragebogen.pdf>) are regularly collected in an anonymized format and analysed by the Göttingen data centre (4–7).

A categorized list of contactants is used both to delineate the kinds of products which are being considered possibly causative for the patient's contact dermatitis prior to patch testing and to categorize products brought in by the patient for patch testing to support later analysis of such tests. More or less detailed recommendations for the preparation and application of patients' own products exist (2, 3). The reading of patch test results follows international guidelines (8), further refined by the German Contact Dermatitis Research Group (DKG) (9). The following analyses are all based on readings on the 3rd day after application of patches (D3).

Between January 1998 and December 2002, altogether 48 381 consultations by 47 561 patients were documented in the participating IVDK centres. In case of multiple consultations, the most recent 'case to a patient' was considered for analysis. Of the 47 561 patients, 19 391 were patch tested with 1 or more own products of various kinds. Cosmetics and toiletries analysed here comprise materials categorized as the following contactants: cosmetics, creams and sunscreens, tested in 4760 patients, nail cosmetics, tested in 49 patients, shower gels, soaps, shampoo or toothpaste tested in 1913 patients and hair cosmetics tested in 374 patients. Owing to overlap, data of altogether 5911 patients tested to at least 1 of these contactants were further processed and analysed. As usually

more than 1 product had been patch tested, the total number of patients' own products tested was 34 082. Each single of these 34 082 products was manually assigned to 1 out of 26 detailed categories to further define the product. These categories were based on the EU-Classification Annex I zu 76/768/EEC, including additional categories (Table 1). For data management, MS Access and the SAS software package (version 8.2, SAS Institute, Cary, NC, USA) was used. The latter was also used for statistical analysis which followed current guidelines (10). This article focuses on the 2 most common categories: 'bath and shower products' (BS) as rinse-off products and 'skin-care creams' (SC) as leave-on products.

Results

The number of patients tested and the number and percentage of patients reacting positively to each of the refined categories are shown in Table 1, including the 2 categories considered beyond this initial overall analysis. Important demographic and clinical characteristics of patients tested and the subgroup of patients reacting positively to either category are shown in Table 2. A (much) higher proportion of patients with the face as the main affected site is evident, particularly in SC tested and positive, while the leg was affected less frequently than average. Moreover, a below-average proportion of male patients and occupational causation of dermatitis can be noted among the particular subgroups analysed.

Test results with the 2 main product categories are shown in Table 3, subdivided in different ranges of test concentration. Different diluents were not further considered; mostly, water or isotonic saline or, in case of lipophilic products, petrolatum or different oils had been used. Bath and shower preparations (BS) had mostly been diluted to 2% or less to try to avoid (mild) irritant reactions. However, despite this dilution, a large proportion of irritant or doubtful reactions were observed with these products – almost twice as often as test reactions graded positive (at least erythema with infiltrate). The proportion of irritant reactions, however, was considerably lowered if BS were diluted to $\leq 2\%$. In 71 patients, 103 reactions which were morphologically classified as positive (+ to +++) were noted. Among these, 57.3% were judged to be of current and 1.0% of previous relevance. A lack of clinical relevance was found in 27.2%, while in 10.7%

Table 1. Refined categories used for detailed classification of patients' own cosmetics and toiletries, modified after Annex I to 76/768/EEC

Category	<i>n</i> _{test}	<i>n</i> _{pos}	% positive
Creams, emulsions, lotions, gels and oils for the skin (hands, face, feet, etc.)* (SC)	3621	312	8.6
'Medical' cosmetics (acne treatments, etc.), excluding washing preparations	1282	87	6.8
Bath and shower preparations (salts, foams, oils, gels, etc.)* (BS)	1333	71	5.3
Make-up powders, after-bath powders, hygienic powders, etc. (except for periorbital region)*	827	60	7.3
Hair care products: cleansing products (lotions, powders and shampoos)*	1128	53	4.7
Toilet soaps, deodorant soaps, etc.*	1166	51	4.4
Products for making up and removing makeup (periorbital region)*	709	47	6.6
Deodorants and antiperspirants*	501	31	6.2
Perfumes, toilet waters and eau de Cologne*	383	28	7.3
Hair care products: conditioning products (lotions, creams and oils)*	752	28	3.7
Hair care products: hair tints and bleaches*	271	28	10.3
Products for nail care and make-up*	129	23	17.8
Sunbathing products*	363	21	5.8
Cosmetic cleansing products	464	15	3.2
Hair care products: hairdressing products (lotions, lacquers and brilliantines)*	844	13	1.5
Shaving products (creams, foams, lotions, etc.)*	298	13	4.4
Products for care of the teeth and the mouth*	277	13	4.7
Barrier creams	258	13	5.0
Products intended for application to the lips*	353	10	2.8
Face masks (with the exception of peeling products)*	124	7	5.6
Anti-wrinkle products*	208	6	2.9
Massage products	66	6	9.1
Products for tanning without sun*	47	4	8.5
Hair care products: products for waving, straightening and fixing*	55	3	5.5
Depilatories*	8	1	12.5
Powders (Not elsewhere classified)*	58	0	0

*n*_{test} = number of patients tested; *n*_{pos} = number of patients tested positive, with the corresponding percentage (% positive). Deodorants, perfumes and shaving products comprise only products which had primarily been coded as 'Cosmetics, ...' contactant category. In addition, 1826 products were tested which were not cosmetics, 611 products were not classifiable and 267 substances were part of a break-down testing.

*Original categories of EU Classification.

of these reactions, relevance was not determined. 4 of the 103 reactions were eventually classified as non-allergic, 2 of these obtained with a 10% dilution, 1 with 2% and 1 with 1% shower gel.

In contrast, SCs, typical leave-on products, have mostly not been diluted for patch testing. Doubtful reactions were noted about as frequently as with many commercial allergens. These occurred even after dilution of these products obviously deemed necessary in selected

instances. Even 4 irritant reactions (in 3 patients) to SC diluted 0.5–2% were observed – possibly due to irritant properties of the product, which had already been expected, prompting the unusual dilution. In 312 patients, a total of 371 positive reactions were found. Of these, 73.9% were regarded as currently and 1.1% as previously relevant, while 3.5% of the positive reactions were eventually judged to be non-allergic. In the remainder, relevance was dismissed (11.3%) or not determined (10.2%).

Table 2. Important demographic and clinical characteristics according to the MOAHLFA index (25) of patients tested and of patients reacting positively to bath additives and skin-care creams, in comparison with the profile of the entire group of patients (right column)

		Bath additives (<i>n</i> = 1333)		Skin-care creams (<i>n</i> = 3621)		IVDK total (<i>n</i> = 47 561)
		Positive	Negative	Positive	Negative	
M	Male	28.2	32.7	20.2	21.6	37.7
O	Occupational dermatitis	9.9	8.8	7.1	7.6	13.6
A	Atopic dermatitis	21.1	21.8	17.3	21.2	16.3
H	Site: hand	28.2	29.8	20.2	23.2	26.1
L	Site: leg	5.6	3.6	8.3	5.1	10.1
F	Site: face	21.1	23.9	39.4	35.4	14.0
A	Age ≥40 years	57.7	54.4	65.1	62.2	63.6

IVDK = Information Network of Departments of Dermatology.

Table 3. Test methods and results (D3 reading) with bathing additives and skin-care creams (multiple tests, also of products from different categories, per patient possible)

	<i>n</i> _{test}	% IR	% (?)	% (+)	% (+ + / + + +)
Bath additives					
>20% – as is	278	6.8	4.3	3.6	0.4
>2 to ≥20%	418	7.9	5.0	6.7	0
≤2%	1633	3.6	5.1	3.4	0.5
Skin care creams					
As is	7450	0.8	2.4	3.8	1.1
10 to <100 %	43	0	2.3	2.3	0
<10%	98	4.1	5.1	1.0	0

In about 35% of patients with positive reactions to either product category, no further reaction to a set of allergens potentially relevant for cosmetic dermatitis (11) was observed. However, the majority of patients exhibiting a positive test reaction to products had other positive test reaction to commercially available allergens.

In case of BS, the list of allergens associated with a positive reaction to the product is led by the fragrance mix (Table 4). Positive reactions to *Myroxylon pereirae* resin (balsam of Peru) were also observed significantly more often in BS positives versus negatives and also contact allergy to different biocides such as methyl dibromo glutaronitrile + phenoxyethanol (MDBGN + PE, e.g. Euxyl® K 400) and MDBGN alone, chloromethylisothiazolinone/methylisothiazolinone (MCI/MI) and 2-bromo-2-nitropropane-1,3-diol (Bronopol®). Moreover, positive test reactions to the detergent cocamidopropyl betaine, to the antioxidants octyl gallate and to propylene glycol were frequently observed.

Skin-care creams were the type of product tested most often (*n* = 3621), and most often they had been tested as is. In two-thirds of patients who turned out to be patch test positive to their own SC, ACD had already been suspected prior to patch testing. Owing to the considerable size of this subgroup, the statistical power of comparisons between patients reacting positively versus negatively to the product(s) yields significant results even in case of lesser differences (Table 5). The fragrance mix was the leading allergen in the SC-positive group, followed by *Myroxylon pereirae* resin. In view of 13.6% SC-positive patients reacting positively to lanolin alcohols, compared to 3.0% in the SC negatives, this emulsifier can be regarded as important allergen, also regarding the derivative Amerchol L-101. A relatively high frequency of positive reactions to propolis can furthermore be noted (Table 5).

Discussion

Patch testing with products brought in by the patient (PBP) and, accordingly, the analysis of the test results is difficult to standardize, in view of the broad variety of products, even in the limited segment of cosmetics and toiletries analysed here. Data analysis is hampered by the fact that, if registered at all in an electronic format, product names are entered as free text. The necessity of later manual classification, which is a tedious task, may explain why analyses of large data are rarely performed (11, 12), in contrast to the popularity of reporting on results with patients' own products in a case report format.

While the use of test series comprising pure, chemically well-defined allergens undoubtedly is the standard for the diagnosis of contact allergy (8, 9), these series only represent a part of the individual spectrum of potential contact allergens, albeit often the most important part. Hence, the testing of PBP may serve as a valuable supplement, bridging a diagnostic gap. However, there are 2 pitfalls:

- (1) The use concentration of allergens in products, like biocides or fragrances, very often is below the optimum patch test concentration, as used in commercial test substances, based on long experience and, partly, formal dose-finding studies. Thus, false-negative reactions to these compounds may occur, especially, if the product has to be diluted even further, to compensate for its irritant properties.
- (2) Products which are not irritating under normal use concentration may cause irritant patch test reactions when patch tested, due to occlusion and prolonged exposure, which could be misinterpreted as a positive reaction.

These general limitations have to be kept in mind when interpreting our study results.

Diagnostic benefit of patch testing with PBP

One obvious result of the analysis presented is the fact that in a considerable proportion of patients only the testing of PBP yielded a positive result. Positive results, especially with SC products, were often found clinically relevant. This is not surprising, as products are usually tested because they are considered a possible cause of dermatitis. In cases with lacking relevance, causation had apparently been regarded as improbable in retrospect. In conclusion, the (limited) additional costs for testing PBP are evidently often compensated by diagnostic benefit. Moreover, a positive test result with a PBP is a potential starting point for

Table 4. Comparison of the frequency of positive patch test reactions to the most common allergens in bath and shower product (BS)-positive patients, compared with BS negatives

	Test concentration (%)	BS positive (<i>n</i> = 71)				BS negative (<i>n</i> = 1262)			
		<i>n</i> _{test}	<i>n</i> _{pos}	% positive	95% CI	<i>n</i> _{test}	<i>n</i> _{pos}	% positive	95% CI
Fragrance mix	8	70	21	29.6*	18.2–41.0	1178	152	12.6	10.7–14.5
Nickel (II) sulfate	5	70	14	19.4	11.3–27.6	1171	207	17.9	15.8–20.0
Myroxylon pereirae resin (balsam of Peru)	25	70	13	17.3*	8.3–26.3	1180	99	8.2	6.6–9.7
(Chloro-methylisothiazolinone (MCI/MI)†	0.01	70	8	13.0*	4.1–21.8	1181	21	1.8	1.0–2.5
Methyldibromo glutaronitrile + 2-phenoxyethanol	1	66	8	13.2*	4.2–22.2	974	52	5.3	3.9–6.7
Cocamidopropyl betaine†	1	64	7	8.4*	3.0–13.9	1102	14	1.3	0.6–1.9
Methyldibromo glutaronitrile	0.3	37	7	19.6*	6.2–33.0	671	52	7.8	5.8–9.9
Cobalt (II) chloride	1	70	7	9.6	2.8–16.3	1176	76	6.5	5.1–7.9
Octyl gallate	0.3	64	6	9.7*	2.1–17.3	1096	26	2.3	1.4–3.2
Oil of turpentine	10	70	6	7.8	1.7–13.9	1187	42	3.5	2.5–4.6
Potassium dichromate	0.5	70	5	6.4	0.9–11.9	1181	49	4.0	2.9–5.1
Colophony (rosin)	20	70	5	6.0	1.0–11.0	1179	50	4.2	3.1–5.4
<i>p</i> -Phenylenediamine (CI 76060)	1	70	5	6.5	0.9–12.1	1180	38	3.2	2.2–4.2
Propylene glycol†	20	64	5	6.9*	0.9–12.9	1113	18	1.7	0.9–2.5
Lanolin alcohols	30	70	5	6.5	0.9–12.1	1181	38	3.2	2.2–4.1
Amerchol L-101	50	65	4	5.1	0.3–9.9	1119	34	3.0	2.0–4.0
Thiomersal	0.1	60	4	6.4	0.4–12.5	1038	64	6.4	4.9–7.9
2-Bromo-2-nitropropane-1,3-diole (Bronopol®)	0.5	64	4	7.1*	0.0–14.2	1104	10	0.9	0.3–1.4
Formaldehyde†	1	70	3	3.8	0.0–8.1	1181	17	1.5	0.8–2.1
Neomycin sulfate	20	70	3	3.8	0.0–8.1	1182	15	1.3	0.6–1.9

In addition to the numbers of patients tested and positive, respectively, the age- and sex-standardized percentage positive (26) together with a 95% confidence interval (CI) are shown. *n*_{test} = number of patients tested; *n*_{pos} = number of patients tested positive, with the corresponding percentage (% positive).

*Significant difference (*P* < 0.05) adjusted for age and sex. All allergens in petrolatum, except where indicated otherwise.

†Allergens in water.

Table 5. Comparison of the frequency of positive patch test reactions to the most common allergens in skin care cream (SC)-positive patients, compared with SC negatives

	Test concentration (%)	SC positive (n = 312)				SC negative (n = 3309)			
		n _{test}	n _{pos}	% positive	95% CI	n _{test}	n _{pos}	% positive	95% CI
Fragrance mix	8	304	101	31.4*	25.5–37.2	3108	397	11.9	10.7–13.1
Myroxylon pereirae resin (balsam of Peru)	20	304	64	21.2*	15.8–26.5	3110	307	9.1	8.1–10.2
Nickel (II) sulfate	5	301	62	19.1	14.6–23.6	3083	551	17.5	16.1–18.8
Methyldibromo glutaronitrile + 2-phenoxyethanol	1	284	59	17.1*	13.1–21.2	2720	123	4.5	3.6–5.3
Methyldibromo glutaronitrile	0.3	158	46	29.5*	16.5–42.5	1717	110	6.4	5.1–7.6
Lanolin alcohols	30	304	40	13.6*	9.1–18.2	3110	105	3.0	2.4–3.6
Amerchol L-101	50	288	39	14.1*	9.1–19.1	2891	96	3.0	2.4–3.7
Cobalt (II) chloride	1	303	31	9.1*	6.0–12.3	3102	187	5.9	5.0–6.7
Thiomersal	0.1	258	28	11.4*	6.7–16.0	2737	195	7.7	6.6–8.8
Propolis	10	263	23	8.8*	4.9–12.7	2508	48	1.7	1.2–2.3
Colophony (rosin)	20	304	22	6.3*	3.6–8.9	3105	127	3.9	3.2–4.7
Phenylmercuric acetate	0.05	243	22	7.8	4.6–11.0	2540	177	6.6	5.5–7.6
Potassium dichromate	0.5	304	20	6.4*	3.6–9.1	3108	111	3.3	2.6–3.9
Oil of turpentine	10	304	18	5.3*	2.8–7.7	3120	97	2.9	2.3–3.5
Octyl gallate	0.3	281	15	4.3*	2.1–6.5	2817	84	2.9	2.2–3.5
p-Phenylenediamine (CI 76060)	1	302	14	3.9	1.8–6.1	3105	110	3.3	2.7–4.0
(Chloro-)methylisothiazolinone (MCI/MI)†	0.01	304	13	5.7	2.1–9.2	3112	94	3.1	2.4–3.7
Bufexamac	5	264	13	5.0*	1.8–8.2	2551	49	1.9	1.3–2.5
Cocamidopropyl betaine	1	287	13	4.9*	1.7–8.1	2858	54	1.9	1.4–2.5
Diazolidinyl urea (Germall II)	2	281	12	4.7*	1.4–8.0	2825	24	0.7	0.4–1.0

In addition to the numbers of patients tested and positive, respectively, the age- and sex-standardized percentage positive (26) together with a 95% confidence interval (CI) are shown. n_{test} = number of patients tested; n_{pos} = number of patients tested positive, with the corresponding percentage (% positive).

*Significant difference ($P < 0.05$), adjusted for age and sex. All allergens in petrolatum, except where indicated otherwise.

†Allergens in water.

a break-down testing with product ingredients, the only opportunity to identify the causative allergen for future avoidance. If such results are systematically collected, 'new' allergens can be identified (13).

Test concentration of PBP

For patch testing rinse-off products such as BS, shampoos or liquid soaps, a 1% dilution in water is commonly recommended (2, 3). Largely, these recommendations are being followed in the IVDK. However, despite this dilution, irritant or doubtful test reactions were observed twice as often as erythematous, infiltrated, possibly papular or papulovesicular reactions (Table 3). Interestingly, the proportion of irritant/doubtful reactions was not exceedingly higher if the product was diluted >2%. Apparently, higher concentrations had conscientiously been chosen when dealing with a less-irritating product (e.g. lipid containing bath additives). In cases of doubt, a dilution series in a reasonable concentration range has been recommended (2). In contrast, it is usually safe to patch test leave-on products as is (3), except if certain active ingredients necessitate some dilution. This may have been the case in the few SCs which had been

diluted in our material. In case of doubtful or possibly false-positive reactions, a ROAT may serve as validation test (3).

Spectrum of positive test results with commercial allergens

Patients who had been patch tested because of suspected ACD often had been exposed to, and possibly sensitized by, different products. Moreover, additional, e.g. occupational, exposures may have caused contact allergy. For instance, patients reacting positively to BS or SC may have been heavy users of perfumes and deodorants also and may have been sensitized by this exposure (14), resulting in some overestimation of the importance of the BS or SC exposure in this regard. As a consequence, the spectrum of contact sensitization in BS or SC positives is not solely related to these products, but is a mixture of different exposures. Only by comparing different product-related spectra, the relative importance of allergens may be estimated with some caution.

The fragrance mix is an allergen of eminent importance in the 2 – mostly scented – product categories analysed here and also in several others (11). Myroxylon pereirae resin, in our

analysis, is an important allergen too. Among the biocides, MDBGN ranks as a top allergen. Together with other evidence (15, 16), its ban in leave-on products is thus well substantiated. However, also in rinse-off product (BS-) positive patients, a significantly elevated proportion of MDBGN sensitized can be noted. Although, again, some confounding by coexposure and sensitization by leave-on products can be suspected, this observation supports the notion that current use concentrations of MDBGN in rinse-off products are not safe (17). The use of MCI/MI has, for several years, been largely limited to rinse-off products. Hence, it is not surprising that the proportion of MCI/MI-positive patients is only slightly (non-significantly) elevated in SC-positive patients, while in BS-positive patients, a significant association is observed. In the context of replacement cycles of biocides, the observation of a high proportion of Bronopol[®]-positive BS-positive patients is interesting and deserves further attention.

Morphologically positive patch test reactions (erythema and infiltrate) to a number of other allergens, which are, under test conditions, at the same time marginal irritants must be interpreted with caution (18):

- (1) Octyl gallate may be an antioxidative compound in lipophilic SC or, e.g. lipsticks (19). According to animal studies, it is a moderate sensitizer (20), however, the relevance of positive test reactions, mostly of the + grade, is very often unclear. This raises the suspicion that many of these reactions are false positive, i.e. irritant.
- (2) Propylene glycol is a very common ingredient not only of SC or BS. Hence, the relatively high number of propylene glycol-positive patients in the BS-positive subgroup may appear plausible. However, the patch test concentration advocated as a good compromise between sensitivity and specificity – 20% aqueous – can cause (infiltrated) irritant reactions (21).
- (3) Cocamidopropyl betaine is a very common ingredient of shampoo and also of other BS. It is notoriously difficult to patch test. However, relevant positive reactions do occur, especially in the range of ++ and +++ reactivity (22).
- (4) Lanolin alcohols, the derivate Amerchol L-101 and several other modifications (23), are both common ingredients of leave-on products and marginal irritants under patch test conditions. Therefore, ROAT or other validation tests have been recommended (23). The irritant potential somewhat limits the interpretation of the relatively high proportion of positive reac-

tions, which are, at the same time, more (in case of SC products) or less (in case of BS products) plausible in terms of exposure by such products.

In the individual case, uncertainty about the interpretation of patch test results with a certain product may either be eliminated by performing a use-related test with this product or by re-inviting the patient to a break-down patch test with the single constituents of the product. While this latter approach is cumbersome, it does have the potential to identify the causative allergen for the patient and to identify potential new allergens of general importance and report this result (13).

Conclusion

Patch testing with patients' own products which have caused skin problems according to the patients' observation is a valuable adjunct to routine diagnostic procedures. However, especially in case of products with irritant potential when applied occlusively for 24 hr or 48 hr adequate dilution, following current recommendations (2, 3) and critical interpretation of observed results is mandatory. Both false-negative and false-positive (irritant) reaction may be observed. Taking the time course of the reaction from D1 or D2 to D3 or D4 into account may sometimes be helpful. In case of doubt, a ROAT or use test should be performed, and, if possible, a break-down testing of single ingredients. Only the latter is capable of identifying the causative allergen, which is a major prerequisite for successful allergen avoidance, in view of the qualitative INCI declaration achieved – even if this is, unfortunately, not always correct (24). Moreover, the systematic analysis of such break-down tests could help identify new allergens and assess the significance of known allergens in various categories of products. In a situation where such data is largely lacking, the analysis of the spectrum of concomitant contact allergens as in this paper may provide at least some crude insight into the role of the most common contact allergens in different product categories.

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