

The composition of fine fragrances is changing

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High frequencies of contact allergy to fragrance ingredients have been reported in recent years. Developments in analytical chemistry have made it possible to measure exposure to well-known fragrance contact allergens. It has been shown that exposure is widespread in different types of products. The products with the highest concentrations of allergens have been shown to be prestige perfumes intended for women. This investigation explores the possible development in formulation of prestige perfumes, with regard to their content of the chemically defined ingredients of the diagnostic patch test material, the fragrance mix (FM). 10 fine fragrances were subjected to chemical analysis: 5 of these had been launched years ago (1921–1990) and 5 were the latest launches by the same companies, introduced 2 months to 4 years before purchase. The analysis revealed that the 5 old perfumes contained a mean of 5 of the 7 target allergens of the FM, while the new perfumes contained a mean of 2.8 of the allergens. The mean concentrations of the target allergens were 2.6 times higher in the old perfumes than in the new perfumes, range 2.2–337. It is concluded that the old perfumes, which are still popular products on the market, have a different composition from the new perfumes. This may be due to change in fashion or to an effort by the fragrance industry to focus on fragrance contact allergy, especially that to the FM ingredients.

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The high frequency of fragrance contact allergy in the consumer has been an issue of interest for some years (1–3). Wide exposure to the main allergens present in the diagnostic patch test fragrance mix (FM) has been documented in several studies (4, 5). This wide exposure, in conjunction with high concentrations of allergens in certain products, has been the main hypothesis to explain the increasing frequencies. The products with the highest concentrations of allergens were prestige perfumes intended for women (5).

The high frequency of fragrance contact allergy, together with the increased insight into the composition of fragrance formulations made possible by developments in analytical chemistry, led to a number of initiatives. A Fragrance Think Tank was established with experts from industry and dermatologists (6), the Scientific Committee on Cosmetic Products advisory to the European Commission was asked to address the issue of fragrance contact allergy in relation to cosmetic products (7) and The American Academy of Der-

matology submitted a position paper to the FDA asking for action to reduce the high prevalence of fragrance contact allergy (8). Two major European studies on fragrance allergy were funded by the European Commission, one in 1996 and the other in 1999. The fragrance industry took action on the basis of their expert panel and reduced the recommended concentration of 2 major allergens, isoeugenol and oak moss/tree moss extracts, in perfume formulations (9, 10).

The current study was undertaken to explore whether the composition of prestige perfumes had changed with regard to their content of well-known fragrance allergens.

Materials and Methods

Target products and allergens

Ten women's fine fragrances were purchased on the Danish retail market in January 2001; 5 of these had been launched years ago (1921–1990) and 5 were the latest launches by the same

companies, introduced 2 months to 4 years before purchase, according to the local sales manager. Chemically defined allergens of the FM were used as target substances:

- isoeugenol;
- eugenol;
- geraniol (+linalyl acetate);
- hydroxycitronellal;
- cinnamal;
- cinnamyl alcohol and;
- α -amylcinnamal.

Chemical analysis

Chemical analysis was performed on the 10 fine fragrances. The target substances were quantified by gas chromatography–mass spectrometry as previously described (11). The detection limit was approximately 1 ppm for all of the target fragrance chemicals. The relative standard deviation was 10%. The results are reported as the mean of 2 replicate analyses. Linalyl acetate was found to interfere with the determination of geraniol and, therefore, results are given as the sum of both.

Results

The old perfumes contained a mean of 5 of the 7 target allergens of the FM, while the new perfumes contained a mean of 2.8 of the allergens (Table 1). The most frequently used substances were hydroxycitronellal and geraniol, which were present in all perfumes, both old and new (Table 2). All of the target fragrance ingredients were found in the old perfumes. However, cinnamal was present in very low concentrations (mean 0.002%). The least used of the target fragrance substances in the old perfumes was α -amylcinnamal.

Table 1. Number of FM ingredients in old and new prestige perfumes

Company	No. of target allergens present	
	Old perfume	New perfume
Chanel	5	2
Christian Dior	4	2
Yves Saint Laurent	6	2
Estée Lauder	5	4
Lancôme	5	4
Mean	5	2.8

Cinnamal, cinnamyl alcohol and α -amylcinnamal were not present in the new perfumes. In all cases, the maximum concentrations of the target allergens were higher in the old perfumes than in the new ones. The mean concentrations of the allergens in the old perfumes were greater than the new ones by a factor of 2.2 to more than 300 (Table 2). In total, the mean concentrations of the target allergens were 2.6 times higher in the old perfumes than in the new perfumes.

Disregarding the results of the geraniol (+linalyl acetate) analysis gave a similar difference between the old and the new perfumes, both as to number of target fragrances present and as to total mean concentration.

Discussion

The old fine fragrances were shown to contain more of the target allergens and in higher concentrations than the new fine fragrances. This may be a coincidence, as the sample size of the products investigated was small. However, the results were uniform. It seems that either fashion has changed or industry has taken the concerns about fragrance allergy more seriously. The selected old

Table 2. Concentration of FM ingredients in old and new prestige perfumes

Fragrance	Old perfumes			New perfumes		
	In no. of perfumes	Range % (m/m)	Mean % (m/m)	In no. of perfumes	Range % (m/m)	Mean % (m/m)
Geraniol*	5	0.072–0.432	0.340	5	0.090–0.236	0.156
Cinnamal	2	0.002–0.002	0.002	0	–	–
Hydroxycitronellal	5	0.222–0.979	0.615	5	0.015–0.478	0.169
Cinnamyl alcohol	4	0.068–0.232	0.147	0	–	–
Eugenol	5	0.032–0.738	0.337	2	0.001, 0.001	0.001
Isoeugenol	3	0.0257–0.249	0.119	2	0.001, 0.004	0.003
α -Amyl cinnamal	1	0.0192	0.019	0	–	–
Total	25		1.579	14		0.329
Mean			0.063			0.024

*All samples contained geraniol and linalyl acetate. Due to linalyl acetate interference in the determination of geraniol, total geraniol + linalyl acetate concentration is reported.

fine fragrances constitute a different risk potential with regard to the investigated allergens than the newly launched fine fragrances. Consumers are still exposed to the old fine fragrances as they are still among the most popular brands, even though some of them were formulated more than 80 years ago (12). In 1998, The International Fragrance Association (IFRA) changed their guidelines on isoeugenol and reduced the recommended concentration from 0.2% to 0.02% (9). One of the old fine fragrances contained 0.2% isoeugenol, however, even though it was purchased in 2001. The shelf-time of the products is unknown, but it shows that it takes time before new recommendations become effective for existing products. The current study indicates that exposure to the FM constituents is reduced in newly formulated fine fragrances. This does not necessarily mean that they are less allergenic, as fine fragrances are composed of many hundreds of ingredients and well-known allergens exist that are not part of the FM (13–15). Furthermore, new fragrance substances are being developed continually, some of which may be allergens not yet identified.

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