

Skin diseases in workers at a perfume factory

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The aim of this study is to find out the causes of skin diseases in one-third of the staff of a perfume factory, in which 10 different perfume sprays were being manufactured. Site inspection, dermatological examination and patch testing of all 26 persons at risk with 4 perfume oils and 30 ingredients of them. The results showed 6 bottlers were found suffering from allergic contact dermatitis, 2 from irritant contact dermatitis, 12 workers showed different strong reactions to various fragrances. The main causes of allergic contact dermatitis were 2 perfume oils (12 cases) and their ingredients geraniol (12 cases), benzaldehyde (9), cinnamic aldehyde (6), linalool, neroli oil, terpenes of lemon oil and orange oil (4 each). Nobody was tested positive to balsam of Peru. Job changes for office workers, packers or printers to other rooms, where they had no longer contact with fragrances, led to a settling. To conclude, automation and replacement of glass bottles by cartridges from non-fragile materials and using gloves may minimize the risk.

Key words: allergic contact dermatitis; fragrances; occupational contact dermatitis; perfume.
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Many years ago DeGroot and Frosch (1) deplored the lack of information on occupational allergic contact dermatitis from perfumes and referred to only one communication by Bonnevie (2) in 1948, who found out all workers in a factory becoming sensitized to cinnamic aldehyde. Up to now, this situation has not altered at all. In the literature of the last years, only single case reports were published (3–8). Within the last 5 years, we noticed 5 such cases too:

a doctor's assistant being allergic to benzaldehyde and cinnamic aldehyde, a turner to balsam of Peru, cinnamic alcohol, benzaldehyde and benzoic acid, a hairdresser to balsam of Peru, balsam of Tolu, fragrance mix and isoeugenol, a beautician to Lyrall, farnesol and damascone as well as a fizzy drink bottler to extract of passion fruit.

Some time ago, we were asked to assist a small perfume factory, because one-third of the personnel suffered from skin problems.

Patients and Methods

To find out the causes of increasing number of skin diseases, first of all we carried out a site inspection at the factory (working condition, working process, work places), then a dermatological health survey of all 26 workers was

accomplished. They all were patch tested according to the standard series, 4 relevant perfume oils and 30 ingredients of them (Table 1) following the ICDRG guidelines (9).

Chloroatranol, Lyrall and other very potent allergens were not present in the perfumes. Therefore we did not include them in our series. The application time on the back was 2 days. The readings were taken on the D3 and D4. The concentrations were chosen because of the advice by Fisher (10).

Results

At assembly lines with always 4 work places for each one after another, 26 female workers were filling 10 different perfumes into small glass bottles, setting in spray devices and testing their valves. The degree of automation was very low. Even the bottle-filling machines had to be operated by hand only. In this room, the filled cartridges were inserted into ornamental tubular jackets, boxes were folded and the products packaged. Only the printing office and the administration were in other rooms.

In all rooms, there was an intensive smell of perfumes, caused by open cullet banks, by testing the spray devices per hand and a lack of exhausters at the work places.

Table 1. Fragrance series

Allergens	Concentration and vehicle	Positive reactions
Fragrance mix	8% pet	10
Balsam of Peru	25% pet	0
Turpentine, oxidized	10% pet	1
Colophony	20% pet	2
Perfume A	5% pet	3
Perfume B	5% pet	8
Perfume C	5% pet	3
Perfume D	5% pet	0
α -Amylcinnamic aldehyde	1% pet	0
Benzaldehyde	5% pet	9
Camphor	10% pet	6
Cinnamic alcohol	1% pet	0
Cinnamic aldehyde	1% pet	6
Citronellol	1% pet	2
Clove oil	1% pet	1
Coumarin	5% pet	0
Dipentene (DL-limonene)	5% oo	3
Dwarf pine needle oil	5% oo	1
Eugenol	1% pet	0
Fixoresin base	10% alc	2
Geraniol	2% pet	12
Hydroxycitronellal	1% pet	1
Jasmine absolute, China	5% pet	2
Lavender oil	5% pet	0
Lemon oil terpenes	1% oo	4
D-Limonene	1% oo	0
Linalool	10% pet	4
Linalyl acetate	1% pet	0
Neroli oil R	5% oo	4
Oakmoss absolute	1% pet	0
Orange oil terpenes	1% oo	4
Patchouli oil	2% pet	2
Petitgrain oil	2% pet	3
Sandalwood oil, East India	1% oo	1
Styrol acetate	1% pet	2
α -Terpineol	1% oo	0
Terpinyl acetate	1% oo	0
Vanillin	10% aq	0
Sorbitanesquioleat	20% pet	0

alc = alcohol 70%; aq = aqueous; oo = olive oil; pet = petrolatum.

6 bottlers were suffering from allergic contact dermatitis of the hands, fore arms and the face and two from irritant contact dermatitis of the fingers.

A total of 97 positive reactions from essential oils and fragrances was recorded in 18 out of 26 persons with the majority (50 reactions) in the 6 eczema patients (Table 2), i.e. 12 persons were positive tested only but never became ill. The exposure time ranged from 3 months to 3 years. 15 female controls were regarded negatively at all.

The main causes of allergic contact dermatitis and positive patch test reactions were the perfumes A, B and C and their ingredients geraniol, benzaldehyde, cinnamic aldehyde and some others (Table 1).

Discussion

Fragrance allergy is an increasing phenomenon. Mostly afflicted with are users of perfumes,

Table 2. Fragrance allergy in perfume bottlers with eczema

Positive substances	Bottlers					
	1	2	3	4	5	6
Perfume A	1+	1+	-	-	-	-
Perfume B	1+	-	1+	1+	1+	1+
Perfume C	1+	-	-	1+	-	-
Fragrance mix	2+	1+	2+	1+	1+	1+
Benzaldehyde	-	-	1+	1+	1+	-
Camphor	1+	-	-	-	-	1+
Cinnamic aldehyde	1+	-	2+	-	-	-
Citronellol	1+	-	-	-	-	-
Dipentene	1+	1+	-	-	1+	-
Fixoresin base	-	-	-	1+	-	-
Geraniol	2+	2+	1+	1+	2+	2+
Jasmine absolute	2+	-	-	-	-	-
Lemon oil terpenes	-	-	1+	1+	-	-
Linalool	1+	1+	-	-	1+	-
Neroli oil	1+	1+	-	-	-	2+
Orange oil terpenes	-	1+	1+	-	-	-
Patchouli oil	-	-	-	1+	-	1+
Petitgrain oil	1+	-	-	-	-	1+
Sandalwood oil	-	-	-	2+	-	-
Turpentine	1+	-	-	-	-	-

deodorants, antiperspirants and dishwashing liquids, that is literally everybody.

Occupational contact dermatitis can be found with hairdressers, beauticians, physiotherapists, geriatric nurses, cleaning personnel and many other jobs. An accumulation of cases may be expected in the cosmetics industry. But in the literature little information can be found, mostly about single cases only. The high prevalence of fragrance allergy in our investigated small factory is a result of permanent skin contact and inhalative exposure. Vicariously for other cases, one typical bottler could be taken, who has been working at the assembly line for 3 months. She suffered from allergic contact dermatitis of the hands, fore arms and face and was patch test-positive to geraniol (2 +), jasmine absolute (2 +), linalool (1 +), citronellol (1 +), dipentene (1 +), oil of turpentine (1 +), neroli oil (1 +), cinnamic aldehyde (1 +), perfume A, B and C (2 +), camphor (1 +) and the fragrance mix (2 +) of the standard series. Neroli oil contains geraniol, linalool, nerol, D-limonene, pinene, dipentene and camphor. Cinnamic aldehyde to be found in jasmine absolute, petitgrain oil, perfume A, B and C and in the fragrance mix. The perfume spray C contains jasmine absolute, geraniol, citronellol and dipentene. The positive reactions to linalool, citronellol, dipentene and turpentine in this person may be cross-reactions to a common terpene body. and the individual results in other persons indicated that simultaneously occurring positive reactions to fragrances and essential oils were based on cross-reactivity in general rather than concomitant sensitization.

This shows the complexity of the phenomenon of perfume allergy and the composition and connection of fragrances.

Geraniol is a very important allergen (11–14). Fenn (15) found it in 90% of 400 perfumes analysed. Cinnamic aldehyde is also a very frequent allergen (16, 17), as well as jasmine absolute (18–20). Benzaldehyde is an ingredient of balsams and fixoresin base and is used for perfuming industrial hand cleansers and well known as a contact allergen (11, 21).

Our prevalence list of positive reactions is completely different from patch test reactions in patients normally suspected of cosmetic dermatitis (3, 4, 13, 22–24). But the composition of fine fragrances is changing (25).

Only some of our fragrances are in the list of fragrance ingredients to be labelled on cosmetic products in Europe (26, 27), and there was not a single reaction to balsam of Peru, normally a marker of fragrance allergy (28). But we observed 6 positive patch tests to camphor in connection with 9 reactions to terpenes and 11 reactions to essential oils. Only 2 persons showed weak reactions to colophony with doubtful reactions to geraniol but no cross-reactions to jasmine absolute and other essential oils. In 10 fragrance-mix-positive patients 6 were positive to geraniol and 4 to cinnamic aldehyde, too.

Further on, all 6 workers with allergic contact dermatitis could be successfully rehabilitated by job rotation to the office, the printing room and the forwarding as a packer. Job change to other rooms without exposition to fragrances led to a complete clearing. Other measures proposed by us were the replacement of glass bottles through cartridges from non-fragile materials (plastics, metal), automatic bottling, mounting of spray devices and testing their functions as well as exhaustion above every work place. Disposable nitrile gloves are unpopular but a protection against liquid perfume oils. All this was realized and successful.

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