

# Occupational skin disease in Finland

## An analysis of 10 years of statistics from an occupational dermatology clinic

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**Summary.** An analysis of 10 years (1974–1983) of statistics was carried out at the Institute of Occupational Health, Helsinki, Section of Dermatology, which is devoted to occupational dermatology. A total of 1,082 cases of occupational skin diseases were diagnosed during this period. Allergic (50.1%) and toxic eczema (47.1%) comprised the majority of occupational cases of dermatosis. The most frequent causes of allergic occupational eczemas were rubber chemicals (19.9%), chromates (18.8%), and epoxy resins (13.1%). If the metals (chromium, nickel and cobalt) were considered as a group, they formed the largest category (28.4%), followed by the plastic materials (27.7%). Detergents (37.8%), followed by organic solvents (16.1%), were responsible for most of the irritant (toxic) eczemas. Occupational skin diseases currently make up about 20% of all occupational diseases in Finland, but the percentage is decreasing.

**Key words:** Contact dermatitis – Rubber chemicals – Chromates – Plastic materials – Contact urticaria – Occupational skin disease – Allergy

### Introduction

Official statistics on occupational diseases and occupational injuries in Finland have been kept since 1926, and at the Institute of Occupational Health since 1964 [28]. Initially, the statistics did not include occupational skin diseases, but these have also been recorded since 1 January 1975. Statistics on occupational skin diseases at our institute have been published on the years 1946–1972 [8]. We have now analyzed the statistics on the last decade (1974–1983), which gives a good view of the trends in occupational skin dermatoses.

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### Materials and methods

The Section of Dermatology at the Institute of Occupational Health, Helsinki, is an outpatient clinic devoted to occupational dermatology. The staff consists of two dermatologists (LK and TE), one chemist (RJ), three nurses specialized in skin allergology, and one secretary. Patients are sent to the clinic by dermatologists, specialists in industrial medicine, and insurance companies. Generally, only patients suspected of having an occupational skin disease should be sent for consultation. A total of 2,484 patients suspected of having an occupational skin disease were referred to our clinic during 1974–1983.

The statistics on skin diseases diagnosed at our clinic from 1974–1983 have been compiled, and the individual allergens and irritant substances responsible for contact dermatitis have been analyzed in detail. Only the main cause was registered as the source of an occupational dermatosis. The resulting statistics were compared to statistics for the total number of cases of occupational diseases in Finland [28] and to a previous occupational dermatosis report from our institute [8]. English editions of the statistics for the whole of Finland are published every other year [28].

Every patient with contact dermatitis underwent epicutaneous testing, using at least the standard series recommended by International Contact Dermatitis Research Group, ICDRG. Additional series, depending on clinical and anamnestic data, were used as well as large-scale testing with samples from individual patients. The Finn chamber method [24] with 24-h application time on the upper back was used as previously described [6, 7, 15]. The tests were read at least three times and always by a dermatologist.

### Results

#### General

A total of 1,082 cases of occupational skin diseases were diagnosed from 1974 to 1983; 1,402 (56.4%) were considered to be nonoccupational (Table 1), although the referring physician suspected the disease of being occupational. Allergic (542 cases: 50.1%)

**Table 1.** Skin diseases diagnosed at the Institute of Occupational Health in Finland in 1974–1983 (primary diagnosis)

Diagnosis	Number of cases	Percentage
Occupational skin disease	1,082	43.6
Eczema allergicum	542	50.1
Eczema toxicum	510	47.1
Contact urticaria	12	1.1
Protein contact dermatitis	9	0.8
Acne professionalis	3	0.3
Paronychia	3	0.3
Hyperkeratosis	1	0.1
Photophyodermatitis	1	0.1
Eczema (non-specific)	1	0.1
Non-occupational skin disease	1,402	56.4
Total	2,484	100.0

**Table 2.** Occupational allergic eczemas in 1974–1983 (cause)

Cause	Number of cases	Percentage
Metals	154	28.4
Chromium	102	18.8
Nickel	36	6.6
Cobalt	16	3.0
Plastic materials	150	27.7
Epoxy resins	71	13.1
Phenol formaldehyde resins	27	5.0
Photopolymers	12	2.2
Acrylic monomers	9	1.7
p-Tert.butylphenol formaldehyde resins	5	
Melamine formaldehyde resins	3	
Polyesters	3	
Urea formaldehyde resins	2	
Isophoron diisocyanate	1	
Other plastic materials	17	
Rubber and rubber chemicals	108	19.9
Formaldehyde	31	5.7
Dyes and pigments	16	2.9
Textile dyes	8	1.5
Printing inks	4	
Leather and fur dyes	4	
Metalworking fluids (CA to own products)	9	1.7
CA to colophony or/and formaldehyde	6	
Antimicrobials	8	1.5
Betadine (components NT)	2	
Desimex-I (components NT)	5	
Glutaraldehyde	1	
Plants	8	1.5
Turpentine	7	1.3

**Table 2 (continued)**

Cause	Number of cases	Percentage
Colophony	6	1.1
Medicaments	6	1.1
Penicillins	3	
Benzocaine	1	
Neomycin sulfate	1	
Quinidine	1	
Foods	5	
Papers	5	
2,3-Epoxypropyl trimethylammonium chloride	4	
Hair-dressing chemicals	3	
Hair dyes	2	
Ammonium persulfate	1	
p-Phenylenediamine	3	
Photographic chemicals	3	
C.D. 3	1	
Hydroquinone	1	
Metol	1	
p-Tert. butylcatechol	2	7.4
Perfumes	2	
Abitol	1	
Animal epithelium	1	
Anthraquinone	1	
Barrier cream (CA to wool alcohols)	1	
Detergent (CA to own product, components NT)	1	
Dibutyl thiourea	1	
Dodecyl gallate	1	
Dust (CA to own product and colophony)	1	
Herbicide (propachlorine)	1	
Hydrazine	1	
Leather (CA to own products, components NT)	1	
Oils <sup>a</sup>	1	
Total	542	100.0

<sup>a</sup> Metal-working fluids not included  
CA, Contact allergy; NT, not tested

and irritant (510 cases: 47.1%) contact dermatitis comprised the majority of occupational skin diseases. Contact urticaria and protein contact dermatitis together formed 1.9% (21 cases) of occupational skin diseases.

*Occupational allergic eczemas*

The causes of occupational allergic eczemas are given in Table 2. The most frequent causes were rubber chemicals (108 cases: 19.9%), chromium (hexavalent

**Table 3.** Occupational toxic (irritant) eczemas in 1974–1983 (cause)

Cause	Number of cases	Percentage
Detergents	193	37.8
Organic solvents <sup>a</sup>	82	16.1
Mechanical causes	62	12.2
Dusts	37	7.3
Other mechanical causes	25	4.9
Foods	44	8.6
Metal-working fluids	29	5.7
Oils, greases <sup>b</sup>	22	4.3
Alcalis	16	3.1
Wet and dirty work	16	3.1
Wet cement	13	2.6
Glues	11	2.1
Acids	8	1.6
Hair-dressing chemicals	3	
Photographic chemicals	2	
Anti-rot chemicals	2	
Barrier creams	1	
Bitumen	1	2.8
Cold and moisture	1	
Plants	1	
Sodium fluoride	1	
Ultraviolet radiation	1	
Vapors in tin plating	1	
Total	510	100.0

<sup>a</sup> Glues not included

<sup>b</sup> Metal-working fluids not included

and/or trivalent) (102: 18.8%), and epoxy resins (71: 13.1%). If the metals are considered as a group (chromium, nickel, and cobalt), they formed the largest category, i.e., 154 cases (28.4%) and if all the plastic materials (epoxy resins, phenol formaldehyde resins, photopolymers etc; see Table 2) are combined, they formed the second largest group (150 cases: 27.7%). Detailed reports on rubber chemical allergy and occupational epoxy resin dermatoses have been published elsewhere [6, 15].

*Occupational toxic eczemas*

Irritant and toxic eczemas are combined in the statistics. Detergents (193 cases: 37.8%), followed by organic solvents (82 cases: 16.1%) and mechanical causes (62 cases: 12.2%) were the most frequent causes (Table 3).

*Occupational skin diseases compared to total number of occupational diseases*

A comparison was made to determine the percentage of occupational skin diseases compared to the total number of occupational diseases in Finland during the last decade (Table 4). It shows that the absolute and relative number of occupational skin diseases was decreasing in the late 1970s. The number of occupational skin diseases has been about the same since 1979. Other occupational diseases have steadily increased since 1977 (except in 1980). Thus the percentage of occupational skin diseases has constantly decreased (from about 34% in 1975–1977 to 19.0 % in 1983).

**Table 4.** Occupational diseases in Finland in 1974–1983

Year	Occupational diseases reported to the registry <sup>a</sup>				OSD <sup>b</sup> diagnosed at the Institute		
	OSD <sup>b</sup>		Other than OSD <sup>b</sup>		Total Number of cases	Percent of registered OSD <sup>a</sup> cases	
	Number of cases	Percent of total number	Number of cases	Percent of total number			
1974	— <sup>c</sup>	—	1,753	—	—	123	—
1975	1,799	34.0	3,499	66.0	5,298	138	7.7
1976	1,861	34.2	3,580	65.8	5,441	140	7.5
1977	1,608	34.7	3,031	65.3	4,639	126	7.8
1978	1,345	30.1	3,120	69.9	4,465	82	6.9
1979	1,183	26.6	3,261	73.4	4,444	90	7.6
1980	1,214	27.2	3,257	72.8	4,471	80	6.6
1981	1,169	22.4	4,060	77.6	5,229	92	7.9
1982	1,132	21.1	4,233	78.9	5,356	117	10.3
1983	1,124	19.0	4,780	81.0	5,904	94	8.4

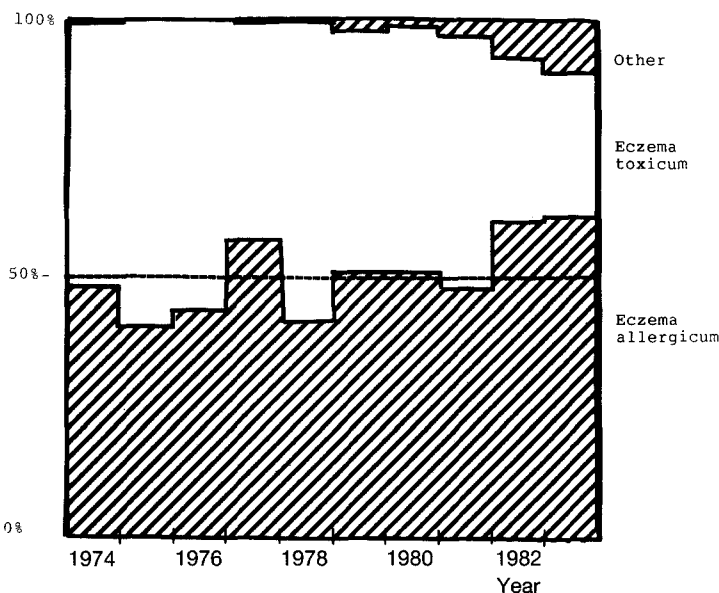
<sup>a</sup> The Finnish Occupational Disease Register

<sup>b</sup> Occupational skin diseases

<sup>c</sup> Not registered

**Table 5.** Cases of occupational allergic contact dermatitis during the period 1946–1972 [8] compared to the decade 1974–1983 (main cause). Causes have been verified by positive epicutaneous tests

Main cause	1946–1972			1974–1983		
	Number	Percent	Ranking order	Number	Percent	Ranking order
Chromium	803	35.3	1	102	18.8	3
Turpentine	507	22.3	2	7	1.3	–
Nickel and cobalt	285	12.5	3	52	9.6	4
Rubber and rubber chemicals	250	11.0	4	108	19.9	2
Plastic materials, synthetic resins	186	8.2	5	150	27.7	1
Aldehydes (formaldehyde, glutaraldehyde etc.)	69	3.0	6	32	5.9	5
Others	175	7.7	–	91	16.8	–
Total	2275	100.0		542	100.0	

**Fig. 1.** Most common occupational skin diseases diagnosed at the Institute of Occupational Health in Finland from 1974–1983

#### *Allergic contact dermatitis in 1946–1972 compared to 1974–1983*

In order to elucidate the trends in occupational skin allergology we compared the statistics on 1946–1972 from our clinic [8] to the present statistics. Table 5 shows that chromium used to be the most common allergen, but is now third in “ranking order.” Oil of turpentine is not a major allergen any more, but the allergy towards synthetic resins has strongly increased: from below 10% to 27.8% of cases of occupational allergic contact dermatitis.

#### *Relative number of allergic and toxic occupational eczema*

The relative numbers of allergic, toxic, and other causes of occupational skin diseases at our institute

are shown in Fig. 1. The relative amount of allergic eczema is increasing and is now more common than toxic eczema. In 1983, 58 cases (61.7%) of allergic eczema were diagnosed and 26 cases (27.7%) of toxic eczema. The number of other types (10.6%) of occupational skin diseases has been increasing.

#### **Discussion**

Occupational skin disease is a significant occupational problem, accounting for 46%–60% of lost working days [14, 17]; atopy [26] and nickel and chromate allergies [20] have particularly bad prognoses. A great number of publications have appeared in which the frequencies of contact dermatitis for allergens were studied in patients attending dermatology clinics (see [2, 10]). There is much less new information on trends in occupational dermatoses except for workers in certain special occupations or industries [5, 21, 22]. During 1960–1969 Fregert [9] analyzed 1,752 patients with occupational dermatoses. The most common allergens in men were chromium, rubber, and plastic, and in women nickel, rubber, and chromium. In Czechoslovakia, the most common allergen for men during 1978–1980 was chromium from contact with cement, and nickel among women [12]. In Singapore, the three main causes were chromates (52%), rubber chemicals (9.4%), and epoxy resins (6.3%) [11]. In a recent report by Meneghini and Angelini [19] on 1,055 cases of occupational allergic contact dermatitis, 90% of the cases were on the hands, as was the case two decades ago. It is interesting to note that in an Austrian study done in 1984, 4,4-diaminodiphenylmethane was the second-most-common allergen for men [10], probably for occupational reasons. Earlier, this substance was not thought to be an important allergen [4], but 6 of our 71 occupational epoxy allergy pa-

tients were allergic to 4,4-diaminodiphenylmethane in addition to epoxy resin during 1974–1983 [15].

When comparing statistics from different countries, it should be remembered that an occupational disease is not a disease per se but a diagnosis that is determined by law. Accordingly, a wide variation might be expected between different countries. In the present study we used both statistics for the whole of Finland and statistics from our own clinic. About 10% of the cases of occupational dermatosis in Finland are diagnosed at our clinic (Table 4).

The present report shows that in comparison to all occupational diseases, the relative and absolute number of occupational skin diseases was decreasing in Finland in the second half of the 1970s. An improvement in protective measures and an increase in information on hazards and harmful agents has probably been responsible for this favorable development. It is generally considered that protective measures can efficiently eliminate toxic eczemas [1]. However, the number of occupational skin diseases has not decreased since 1979. This is partly due to the fact that occupational skin diseases are being diagnosed more accurately. Furthermore, with legislative reforms, new groups are now being covered by occupational insurance in Finland, such as the farmers since 1982. This, in turn, increases the number of occupational diseases.

In 1982, the number of occupational irritant and allergic eczemas in the whole of Finland were 55% and 34% and in 1983, 53% and 34%, respectively, which shows that the majority of occupational dermatoses are still caused by irritant factors. Our reverse figures reflect good diagnostic accuracy and/or selected patient material. Some of the allergic eczemas and contact urticarias had probably previously been classified as irritant eczemas, but because of more accurate epicutaneous testing, especially using specimens from the patients themselves and more knowledge about contact urticaria, more precise diagnoses are now made.

The change in ranking order of occupational allergic dermatoses reflects the change in exposure, i.e., the change in the type of industry in Finland during the last few decades. Chromium is still an important allergen and usually develops from cement and mortar. In Denmark and Sweden, they now add ferrosulfate to cement to change the much-more-potent six-valency chromate to the less allergic (penetrating) three-valency chromium. This amendment is taking place in Finland, too. This could decrease the allergy towards chromium during the next decade in Finland. Another reason for the change in “ranking order” is the selection of patient material at our clinic, e.g., cement and mortar eczemas are well

known today and the diagnosis can be made at less specialized clinics.

A rapid increase in the incidence of eczema due to synthetic resins had already been observed in the 1960s and 1970s; in the years 1946–1956 these resins caused only about 1% of all occupational dermatoses [8], but the figure for 1965–1972 was 9%. Then synthetic resins were the main cause for allergic occupational dermatoses, comprising 150 cases (27.7%) (Table 5).

Rubber chemicals are another important group of allergens that have increased significantly during the last few decades. From 1946 to 1964 rubber chemicals caused only 2%–3% of occupational dermatoses [28], while the number had clearly increased during the next few years (1965–1972) to 13% [28]. In the present study, rubber chemicals were seen to cause 19.9% of allergic occupational contact dermatoses, and rubber gloves were responsible for the majority of these allergy cases [6]. This reflects the increased use of protective gloves, which are often made of rubber.

It is beyond the scope of the present report to evaluate the role of atopy in the development of occupational skin disorders, although it is known that atopic people have a tendency to develop hand eczema [3, 18, 26], the commonest dermatological disorder encountered in occupational dermatology [3, 9, 19]. Rystedt [26] recently studied extensively the job-related skin problems in atopics in order to distinguish individuals at risk and high-risk occupations. Food-handlers having skin contact with various food substances, ladies' hair dressers and nurses involved in work with exposure to tensides were deemed high-risk occupations. Individuals at high risk of having atopic dermatitis should always be warned against high-risk occupations. The strongest risk factors for the development of hand dermatitis as an adult were, in order of frequency: hand eczema in childhood (before 15 years of age), persistent body eczema, and dry/itchy skin. These were the main risk factors but were followed by: widespread atopic dermatitis in childhood; exposure to chemical, water, soil or wear (friction); the female sex; a family history of atopic dermatitis. While Rystedt [26] and Lamintausta [18] did not consider a history of respiratory allergy (without eczema) as a risk factor for hand eczema, just the opposite was found in another study [27]. Earlier reports [23, 25] had indicated that atopic patients who had contracted hand eczema at work benefited by a change in occupation, but Rystedt [26] indicated that there was no clear difference in prognosis between patients who had changed jobs and those who continued in their original work. Consequently, when a change of occupation is planned,

the patient should be clearly informed of the probable (poor) prognosis before making a decision, since a change in occupation has social and economic consequences. The effect of a change in occupation is better in non-atopics than in atopics [26], but atopics do not change their occupation more than non-atopics [26].

In the future, the different subgroups of allergic occupational contact dermatitis will be analyzed in detail. So far, studies on allergy to dibutyl thiourea [16], allergy to 2,3-epoxypropyl trimethylammonium chloride [7], rubber and plastic glove allergy cases [6], occupational epoxy resin [15], and formaldehyde dermatoses [13] have been published.

In summary, the present study shows that the ratio of allergic to irritant eczemas is increasing. This probably reflects an improvement in diagnostic accuracy and in information available about the hazards of irritant substances. The change in ranking order of allergens reflects the changes in exposure in industry and points out the allergens towards which protective measures ought to be directed. Full information about the risks of developing occupational skin disease, especially in the case of people with atopic dermatitis, should be given in every case.

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Received May 8 / Accepted September 25, 1987