

Contact allergy to colophony and hand eczema

A follow-up study of patients with previously diagnosed contact allergy to colophony

GUNILLA FÄRM

Department of Occupational Dermatology, Karolinska Hospital, Stockholm and National Institute of Occupational Health, Solna, Sweden

Colophony is commonly used in many products that we are exposed to both at work and during leisure. At our Department, about 5% of patch tested dermatitis patients show positive reactions to colophony. 83 patients in whom contact allergy to colophony had been diagnosed were followed up after 9–13 years. They were interviewed, examined and retested. At least 30% had current hand eczema on follow-up examination. Among those in whom the dermatitis had started on the hands, there were proportionally more individuals with current hand eczema than among those in whom the onset had been on other parts of the body. 72% of the participants were still patch-test-positive to colophony, and more than 1/2 had additional positive reactions to other allergens. Some of these additional reactions were new compared to the previous test occasion. The degree of exposure to colophony throughout the years was difficult to estimate. Contact allergy to colophony was considered occupational in individuals with, e.g., soldering jobs.

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Colophony is used in more than 300 different types of product (1–3), e.g., soldering flux, plaster (4), adhesives, paints, cosmetics (5), rosin used by dancers and musicians (6), and paper. We are all exposed to colophony to some degree; if not from other sources, then from paper (7, 8). Colophony is a well-known cause of contact allergy. In the Departments of Dermatology and Occupational Dermatology at Karolinska Hospital, Stockholm, the frequency of positive patch test reactions to colophony among dermatitis patients has been 3–7% during the past 5 years.

In clinical work, it is sometimes difficult, though always essential, to evaluate the relevance of a positive patch test reaction in relation to ongoing dermatitis. One might be contact allergic to colophony without noticing it until after intense exposure to, e.g., plaster or colophony-containing products for skin treatment. Contact allergy to colophony, however, may also cause more severe dermatitis and hand eczema, as witnessed by many case reports (9–11).

Hand eczema is the main diagnosis in occupational dermatology. Around 10% of an urban

Swedish population of working age has hand eczema at some time in a year (12). Hand eczema is thus a vast problem, which not only causes suffering for the affected individual, but also has social consequences, such as sick leave, change of jobs and even early retirement. Evaluation of different prognostic factors, e.g., contact allergy, in hand eczema is therefore an important task for the occupational dermatologist. There are several prognostic studies on contact dermatitis and hand eczema in general (13), but I know of no specific study on the prognosis in cases of contact allergy to colophony.

The aims of this study were to investigate the long-term prognosis of dermatitis, particularly hand eczema, in patients with contact allergy to colophony and to identify risk factors for hand eczema in these individuals.

Patients and Methods

Patients

From the records of patch test results for 1981 to 1985 at the Departments of Dermatology and of

Occupational Dermatology at Karolinska Hospital, all patients aged 65 or below, with a positive patch test reaction to colophony ($n=125$), were considered for participation in the study. Those who were still living in the county of Stockholm were chosen ($n=111$). Individuals who, during the past 5 years, had participated in special patch test studies with colophony were excluded ($n=8$).

Of the remaining 103 individuals, informed by letter and invited by telephone, 83 (81%) participated in the study. Of the 20 individuals not participating, 4 were not in the telephone book and did not answer several letters, 4 said they were too busy at work, and 1 had such bad current dermatitis that she was on oral corticosteroids. Among the other 11, the reasons mentioned for not wanting to participate included not wanting another patch test performed, not speaking Swedish, and other illnesses.

The sex, "home clinics" and mean age of the 83 participants are shown in Table 1. 21 individuals (5 male and 16 female) were 40 years or younger, and 12 (1 male and 11 female) were 60 years or older. The mean time from onset of dermatitis to the patch test performed in 1981–1985 was 6 years. 15 individuals had been patch tested earlier, but were retested at some time during these years.

Interview and clinical examination

The participants were interviewed, following a standardized questionnaire. The questions concerned: type, onset and location of dermatitis; course of dermatitis, sick leave, medical consultations and treatment due to dermatitis. Questions regarding previous and current work and occupational exposure to soldering fluxes, wood, paint and lacquer, cutting oils, soap and paper were included. Leisure activities were also discussed and specified questions were put concerning carpentry, wood chopping, playing stringed instruments, ballet dancing and sports activities, such as handball and bowling. In most cases, there was access to the previous medical records, which were read prior to inviting the patient. The results, however, are based on the patients' answers at interview.

The skin of the face, neck, chest, back, arms and

hands, as well as other parts of the body if affected, was examined for dermatitis. The location and diagnosis of skin disease were recorded. For the hands, a scoring system was established. Thus, fingers, palms and backs of the hands and wrists were examined separately. Each of these 4 sites scored 1 if there were only patches of dry skin with possibly 1 or 2 fissures (regarding the fingers, if only 1 finger was involved). If most of the examined part was involved with dry skin, a score of 2 was given (regarding fingers, 2 or more fingers involved). When there were also other clinical signs of eczema (including redness, scaling and papulovesicles (14)), scores were doubled to 2 and 4 respectively, depending on extent of involvement. The scores were then summed, with a possible maximum score of 16. The participants were divided into 4 groups: (i) no visible hand dermatitis, score 0; (ii) mild hand dermatitis, score 1–4; (iii) moderate hand dermatitis, score 5–8, and (iv) severe hand dermatitis, score ≥ 9 .

The mean follow-up period, i.e., from 1981–1985 to the present examination, was 10 years.

Patch testing

All the participants were patch tested by the internationally accepted method (15), using Finn Chambers[®] (Epitest Ltd Oy, Finland) and Scanpor[®] tape (Norgesplaster A/S, Norway). Application time was 2 days and reading was done 3 days after application. Minimum criteria for a positive reaction were erythema and infiltration. Test substances were a slightly modified European standard series of 30 substances, which included colophony 20% pet., from Chemotechnique Diagnostics, Malmö, Sweden.

Statistics

Confidence intervals for the differences between proportions were calculated using the normal distribution (16).

The study was performed, during the spring and autumn of 1994, at the Department of Occupational Dermatology, Karolinska Hospital.

Table 1. Number of patients patch test positive to colophony in 1981–1985 and invited to the study, and number of patients that participated, their "home clinics" and mean ages on follow-up examination

Invited number	(M/F)	Participants							
		Number from Department of						Mean ages (M/F)	
		number	(M/F)	Occupational Dermatology	(M/F)	Dermatology	(M/F)		
103	(26/77)	83	(19/64)	21	(9/12)	62	(10/52)	48	(46/48)

The study was approved by the Karolinska Hospital Ethical Committee.

Results

Location and severity of dermatitis

The reported locations of the dermatitis at onset and of skin lesions on current follow-up examination are shown in Table 2. Table 3 shows the findings on the hands on current examination. 17 participants (20%) had moderate or severe hand dermatitis, 24 (29%) had mild hand dermatitis and 42 (51%) had no hand dermatitis. Among the 64 women, 35 (55%) had no hand dermatitis. The corresponding figure among the 19 men was 7 (37%).

Of the 19 individuals (Table 3) who reported that hands had not been involved at onset, 3 (16%) had hand dermatitis on current examination. Of the 64 participants with reported hand eczema at onset, 38 (59%) had hand dermatitis on current examination. The difference between these 2 groups is thus 43%, with a 95% confidence interval from 63 to 23% ($p < 0.001$) (16).

Course of dermatitis

The reported course of hand dermatitis during the follow-up period (i.e., the past 9–13 years) is shown in Table 3. 26 of all participants (31%) reported continuous dermatitis or longer periods with der-

matitis than without, and 31 (37%) reported hand dermatitis over the years, but longer periods free from dermatitis than with dermatitis. Another 26 of the 83 participants (31%) reported that they had had *no* hand dermatitis during the follow-up period. Among the 19 with dermatitis on *other locations than hands* at onset, 14 (74%) reported *no* hand dermatitis during the follow-up period, and among those *with* hand eczema at onset, 12 (19%) reported *no* hand dermatitis during the follow-up period. The difference is 55%. The 95% confidence interval for the difference is 77–33% ($p < 0.001$) (16).

9 of the 19 men (42%) and 27 of the 64 women (28%) reported continuous hand dermatitis or longer periods with dermatitis than without. 65 of all 83 (78%) participants thought that their skin condition had improved during the follow-up period, 2 thought that it had worsened and 16 reported that it was the same. The reported periods of *sick leave* due to dermatitis, (after the 1st period of dermatitis in association with the patch testing) are shown in Table 4. 2 individuals had retired partly due to dermatitis. 37 of the 83 participants reported that they had never seen a physician for skin disease during the follow-up period. 15 reported *medical consultations* for dermatitis during the past 12 months. Most participants reported regular *use of emollients*. Regular use of *topical corticosteroid preparations* was reported by 1 indi-

Table 2. Numbers of participants and locations of dermatitis at onset and on follow-up examination

Period	Location (no. participants=83)			
	hands ^{a)}	face ^{b)}	other than hands or face	no. dermatitis
at onset	64	6	12	1 ^{c)}
on follow-up examination	41	1	5	36 ^{d)}

^{a)} Hands only or in combination with other locations.

^{b)} Face only or in combination with other locations, except hands.

^{c)} 1 individual reported no dermatitis, but had been patch tested due to unclear systemic symptoms.

^{d)} 1 individual had ongoing psoriasis, 1 had paronychia, 34 had no skin lesions.

Table 3. Numbers of participants, findings on follow-up examination and reported history of hand dermatitis during the follow-up period

Location of dermatitis at onset	Findings on examination (n=83)				Reported history of hand dermatitis (n=83)			
	no hand dermatitis (n=42)	mild hand dermatitis (n=24)	moderate hand dermatitis (n=10)	severe hand dermatitis (n=7)	no hand dermatitis (n=26)	longer periods healed than with dermatitis (n=31)	longer periods with dermatitis than healed (n=16)	always dermatitis (n=10)
hand eczema at onset (n=64)	26 ^{a)}	22	10	6	12	29	14	9
dermatitis other than hand eczema at onset (n=19)	16 ^{b)}	2	0	1	14	2	2	1

^{a)} 5 individuals had dermatitis on other locations.

^{b)} 1 individual had lip eczema.

Table 4. Numbers of participants and length of sick leave due to dermatitis during the follow-up period, findings on follow-up examination and reported history of hand dermatitis

Length of sick leave	Findings on examination (n=83)				Reported history of hand dermatitis (n=83)			
	no hand dermatitis (n=42)	mild hand dermatitis (n=24)	moderate hand dermatitis (n=10)	severe hand dermatitis (n=7)	no hand dermatitis (n=26)	longer periods healed than with dermatitis (n=31)	longer periods with dermatitis than healed (n=16)	always dermatitis (n=10)
never (n=63)	39	17	5	2	25	23	10	5
a few days or weeks (n=8)	0	3	3	2	1	2	2	3
1-6 months on 1 or more occasions (n=8)	1	4	2	1	0	4	3	1
>6 months on same occasion (n=4)	2	0	0	2	0	2	1	1

vidual only, but 44 (53%) participants reported using them now and then.

Type of job and exposure to colophony

All but 7 participants were gainfully employed. Many types of job were represented. Table 5 shows the participants by type of occupation, current occupational exposure to colophony, and findings on current examination. 12 participants reported exposure to wood, paints, lacquers, soaps or soldering flux in the current job. 24 reported regular paper work where they themselves described the exposure to paper as intense.

Altogether, 15 individuals reported changes of job due to dermatitis or contact allergy to colophony. On current examination, 7 of these were healed, 3 were scored as having mild hand dermatitis, 2 moderate hand dermatitis and 3 severe hand dermatitis. Among those 7 who were healed, 3 had previously had soldering jobs, 3 had had wet work and 1 had been a car mechanic. The individuals with soldering work had been exposed to colophony in soldering fluxes. In the others, the degree

of exposure to colophony in previous jobs was difficult to estimate.

Previous or current exposure of the hands to colophony during leisure was reported by 14 participants. Only 1 of them reported symptoms from such exposure: a man whose dermatitis worsened from carpentry and wood chopping.

Atopy

31 participants (37%) reported a history of 1 or more atopic diseases, 26 of them reporting asthma or hay fever (9 of the 26 also had or had had dermatitis). 14 reported current or previous atopic dermatitis, and 11 of these had ongoing hand dermatitis on current examination (9 of the 14 also had a history of asthma or hay fever).

Patch testing

The results of current patch testing are shown in Table 6. 60 participants (72%) were positive to colophony, 16 (19%) were negative and 7 others (8%) had doubtful reactions, not fulfilling the cri-

Table 5. Type of work, reported current occupational exposure to colophony and findings on follow-up examination

Findings on examination	Type of work (n=83)		Occupational exposure to colophony-containing products and paper (n=83)		
	wet work or traumeric work (n=34)	office work teaching, pension (n=49)	no known exposure to colophony at work (n=47)	occupational exposure to colophony (n=12)	paper work (n=24)
No hand dermatitis (n=42)	13	29	28	4	10
mild hand dermatitis (n=24)	12	12	13	5	6
moderate hand dermatitis (n=19)	5	5	2	2	6
severe hand dermatitis (n=7)	4	3	4	1	2

Table 6. Results of current patch testing

Patch test results	Number of individuals		
	positive test reactions to		
	nickel ^{a)}	perfumes and/or balsam of Peru ^{a)}	
positive reaction to colophony only	12 ^{b)}	—	—
positive reaction to colophony and 1 or 2 concomitant positive test reaction(s)	25	10	13
positive reaction to colophony and 3 or more concomitant positive test reactions	23	15	13
negative or doubtful reactions to colophony, positive reactions to other test substances	17	9	8
no positive patch test reactions	6 ^{c)}	—	—

^{a)} Some individuals reacted both to nickel and to perfume mix or balsam of Peru.

^{b)} including 2 individuals never tested with nickel due to history of strong nickel allergy.

^{c)} including 1 individual with a doubtful reaction to colophony.

teria given for a positive patch test result. 11 of the 23 individuals, who on the current patch test were negative or had doubtful reactions, had had only weak positive reactions on the previous test.

34 participants (33 women and 1 man) or 41% showed positive patch test reactions to nickel (Table 6). On previous patch testing, performed in 1981–1985, the number of nickel positives was 22 (27%). On current testing, 34 individuals (41%) were patch test positive to perfume mix and/or balsam of Peru (Table 6), and on previous testing, 33 were positive. (A detailed comparison of patch test

results on previous patch testing and current testing will be published separately).

Patch test results, in relation to findings on current examination and reported course of hand dermatitis, are shown in Table 7.

Reported intolerance to colophony and exposure

Most participants had noticed intolerance to adhesive plaster. 41 of the 64 women reported intolerance to some cosmetic. The products mentioned as being responsible were, however, many and it was not possible to evaluate how far the symptoms were caused by colophony. In 3 cases, soldering flux was, according to the subject, the suspected cause of sensitization to colophony, and in 7 cases plaster or adhesive bandages. 1 individual suspected that wood dust had caused the allergy and in 1 participant, dermatitis had started with the use of a resin-containing massage cream.

Of the 83 participants in the study, 52 reported that they had been properly informed about the results of the previous patch test, and of what to avoid to minimize exposure to colophony. Most of them had tried to follow advice given.

Characteristics of severe cases

7 participants had severe hand dermatitis on current examination and 10 reported "always hand dermatitis" (Table 3). 3 participants belonged to both groups. Characteristics of these 14 participants, who by history and/or findings were considered to have the most severe hand dermatitis, are presented in Table 8.

Discussion

The study focussed on hand eczema in colophony-sensitive individuals. Hands were also the site of

Table 7. Results of follow-up patch testing related to findings on follow-up examination and reported history of hand dermatitis

Results of current patch testing	Findings on examination (n=83)				Reported history of hand dermatitis (n=83)			
	no hand dermatitis (n=42)	mild hand dermatitis (n=24)	moderate hand dermatitis (n=10)	severe hand dermatitis (n=7)	no hand dermatitis (n=26)	longer periods healed than with dermatitis (n=31)	longer periods with dermatitis than healed (n=16)	always dermatitis (n=10)
positive to colophony only (n=12)	5	5	0	2	2	6	2	2
positive to colophony and other substances (n=48)	23	16	4	5	13	17	11	7
negative to colophony, positive to other substances (n=17)	9	4	4	0	6	8	2	1
patch test negative (n=6)	5	0	1	0	5	0	1	0

Table 8. Some characteristics of the 14 participants with the most severe hand dermatitis, according to history and findings on examination

Characteristics	Number and % of participants			
	among those with severe hand dermatitis (n=14)		Among all (n=83)	
	no	(%)	no.	(%)
male	7	50 ^{a)}	19	23 ^{a)}
current wet work or traumatic work	7	50	34	41
reported current possible occupational exposure to colophony and/or paper	7	50	36	43
previous or current atopic dermatitis	6	43 ^{b)}	14	17 ^{b)}
positive patch test reaction to colophony	13	93	60	72
positive patch test reaction(s) to other substance(s)	11	79	65	78

a), b) The difference is not statistically significant.

the initial dermatitis in 64 of the 83 (77%) participants. On current follow-up examination, 1/2 the participants had hand dermatitis and 26 (31%) reported a chronic course of hand dermatitis ("always dermatitis" or "longer periods with dermatitis than without") (Table 3). The dermatitis had been serious enough to cause sick leave for longer than 1 month during the follow-up period in 14% of participants, and had made 18% see a doctor during the last 12 months.

Hand dermatitis on examination might, however, be somewhat over-diagnosed in this study, since individuals with merely dry skin of the hands were also included. The way of scoring hand dermatitis, also recording dryness of the skin, was chosen, since dry hand skin may be the final step in a dermatitis process or the beginning of an eczema. All individuals with *no* other criteria of hand dermatitis than dry skin (n=15) are found in the group of "mild hand dermatitis" (Table 3). If those 15 individuals are withdrawn from the 41 participants with hand dermatitis (Table 3), 31% of participants still showed hand dermatitis on examination.

The findings are not fully comparable with the findings of other follow-up studies, because of major differences in study design (13). Few of the follow-up studies found (concerning contact allergy and hand eczema) included retesting (17). Follow-up periods in different studies vary, from as short as 3 months to many years, but most cover less than 10 years (17–20). In the present study, with a follow-up period of approximately 10 years, 51% of participants had no hand eczema on examination. In one long-term study, Wrangsjö & Meding (21) found that 44% of patients with contact allergy to rubber chemicals were clear of hand eczema on examination around 10 years after diagnosis. In a study of nickel allergy and hand eczema, Christensen (19) found that 30% were healed on examination after 6 years.

Factors influencing the prognosis of hand eczema in individuals with contact allergy to colophony

Intervention. Most participants reported that they had been well informed about their contact allergy. Proper information is beneficial to the prognosis in contact allergy (22). The information given might thus have contributed to the fact that 78% reported that their skin condition had improved compared to 1981–1985.

Onset of dermatitis. The prognosis concerning hand eczema was less favourable when the hands were involved from the beginning than when dermatitis started somewhere else. This was shown in the significantly lower proportion of individuals with hand dermatitis on follow-up examination, and with reported history of hand dermatitis during the follow-up period, among those where hands were not involved at onset than among the others. This agrees with the findings of Menné & Bachmann (23) in nickel-allergic individuals. The medical records from the initial examination were reviewed, in 72 individuals, concerning location of dermatitis at onset. The onset location reported by the subject was confirmed by the medical records in all cases reviewed.

Patch test results. Contact allergy is generally considered to be lifelong or at least to last for many years (24). On current follow-up, patch testing, 16 participants were negative to colophony and in 7 the reaction was doubtful, even though all participants had previously been patch-test-positive to colophony. On previous patch testing, the same method was used as in the present study, but with test substances from another supplier. Colophony is not known to cause irritant patch test reactions (25). Most doubtful reactions are therefore believed to be caused by contact allergy. The number of colophony reactions that had proved truly negative were thus probably smaller than indicated above.

An attempt was made to relate findings on follow-up examination and course of hand dermatitis, to patch test results, to see if the relative importance of contact allergy to colophony could be illustrated. The majority of participants were, however, patch-test-positive to colophony and to other substances, which made the groups (Table 7) too small for statistical analysis.

On current patch testing, 41% showed positive reactions to nickel. This is a higher figure than among colophony-sensitive patients in general at our department, of whom 25% were recorded as nickel positive during the past 2 years. Many patients of this study had had dermatitis for 10 years or more. This might have facilitated sensitization to nickel. The prevalence of positive patch test reactions to nickel on previous testing was lower, which supports this assumption. The prevalence of positive patch test reactions to perfume and/or balsam of Peru (41%) is probably what could be expected, since these reactions are often found simultaneously to positive patch test reactions to colophony (26, 27).

Sex. A larger proportion of men than women reported a chronic course of hand dermatitis, and more women than men were healed on current examination. Among those with the most severe hand dermatitis (Table 8), 1/2 were men, although men made up only 25% of the participants in the study. Because of the low numbers, the differences are, however, not statistically significant. The low number of participating men reflects the low proportion of men fulfilling the criteria for entering the study. In our department, there is generally no sex difference in prevalence of positive patch test results to colophony.

Job and exposure to colophony. To be able to study how work might have influenced hand dermatitis, only individuals below pensionable age, i.e., 65 years or younger, were invited to participate. The degree of exposure to colophony in both previous and present jobs was generally difficult to estimate. 3 individuals had previously been engaged in soldering jobs when dermatitis started and they had healed after changing jobs. Some soldering fluxes are known to contain colophony and there are previous reports on contact dermatitis from soldering flux (28, 29). There were no other cases where occupational colophony exposure could with any certainty be related to the course of dermatitis. Jobs with a high risk of exposure to colophony, such as carpenter's work and work in the paper and printing industry, were, however, not represented. Paper contains colophony and previous studies have shown that exposure to paper might contribute to relapses or persistence of hand eczema in colophony-sensitive individuals (7, 8).

Among the individuals in this study who reported "more than ordinary" exposure to paper at work, there were some with no hand dermatitis and some with severe dermatitis (Table 5). The proportion of individuals with hand dermatitis on examination was higher among those with wet work or traumatic work than among those with other types of job (Table 5), though this difference is not statistically significant.

Atopy. 11 of 14 individuals with a personal history of atopic dermatitis had hand dermatitis on current examination. This supports previous knowledge that atopic dermatitis is a risk factor for developing hand eczema (30). Many individuals in this study reported allergic asthma or hay fever. Some participants might have misinterpreted other respiratory symptoms for allergy, maybe influenced by a Swedish newspaper series current at the time of the study. The question of asthma or hay fever from colophony was never discussed at interview.

Rate of participation

81% of all invited patients participated, which seems an acceptable rate of participation, seeing that 2 visits to the hospital were required. Individuals who had participated in studies of contact allergy to colophony during the previous 5 years were excluded. The reason was the suspicion that previous interview and patch testing might influence the results of the present study. No interview was performed on the telephone, but a few individuals, when called about participation, spontaneously said that they still suffered from skin disease, while others said they no longer had any problems.

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Address:

Department of Occupational Dermatology
National Institute of Occupational Health
S-171 84 Solna
Sweden

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