16 Occupational Aspects of Atopic Eczema with Emphasis on Atopic Hand Eczema

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16.1 Introduction

Atopic Eczema (AE) is a common, chronically relapsing, inflammatory skin disease, clinically characterized by typically distributed eczematous lesions, dry skin, intense pruritus, and a wide variety of pathophysiologic aspects [9]. There is strong evidence that the prevalence of the disease has increased substantially over the past decades [7], which seems to be associated with a change in environmental and lifestyle factors, especially in Western countries [8]. The clinical phenotype that characterizes atopic eczema is the product of interactions between susceptibility genes, the environment, defective skin barrier function, and immunologic responses [23].

Children with atopic eczema (AE) often struggle at school [35], and adults with AE do their best to keep their job [22]. Looking at AE as a disease with many predisposing, precipitating, and perpetuating factors [40], it is obvious that exogenous factors such as irritants and allergens can precipitate and perpetuate the condition. While it is unlikely that occupational factors are predisposing (although a role of occupational factors operating on the fetus in utero cannot be ruled out), there is a vast body of literature pointing towards certain jobs causing more skin trouble for people with AE. A preliminary reading of this literature generates questions, which one would like to have answered before one is convinced that there is really a problematic association between AE and occupation. One question, for example, is whether the cases described in the literature really have AE. In other words, was AE correctly assessed, without observer bias? Another question is how the cases ended up in their present jobs. In other words, to what extent may AE have influenced the fact that patients selected or avoided a particular occupation. One would also like to know more about those with AE who do not seem to have a (skin) problem within their occupation; perhaps they use adequate protection measures at work or avoid domestic exposure, or they may have a milder or different type of AE.

Various issues such as a discussion on diagnostic criteria for AE, will be dealt with elsewhere in this book. For the time being, a variability in the assessment of AE, which affects the interpretation of most studies, must be accepted. The following will show that a certain degree of selection and observation bias is inevitable in most published studies dealing with occupation and AE.

16.2 Clinical Aspects of Atopic Hand Eczema

It is generally agreed that the atopic skin has a disturbed barrier function [16] and a reduced resistance to irritants, and that consequently individuals with a history of or with current atopic eczema have a tendency to develop an irritant contact dermatitis located mainly on the hands (Fig. 16.1). The clinical pattern is a dry, scaly and fissuring skin at the dorsum of the hand with a tendency to lichenification (Table 16.1). In chronic cases, even a short direct skin contact to mild irritants such as water or wet work will induce a relapse of the inflammatory skin disease. It is most often impossible to distinguish between irritant contact dermatitis on an atopic base caused by work-related exogenous factors and an atopic hand eczema mainly elicited by endogenous factors. A typical pattern for the atopic hand eczema is the involvement of eczematous lesions at the wrist, in contrast to an irritant contact dermatitis where this location is unusual.

Fig. 16.1. Atopic hand eczema

Table 16.1. Clinical characteristics of atopic hand eczema

Morphologic presentation and localization
Irritant type of hand eczema: dry, scaly and fissuring skin at the dorsum of the hand
Over 50 % of all atopic hand eczema shows vesicular volar eruption, sometimes with extension from the distal part of the palm to proximal fingers (apron sign)
Often nail involvement, in some cases fissuring and cracking of fingertips (*pulpite sèche*)
Involvement of the metacarpal-phalangeal joint of the thumb (*tabatière*)
Involvement of other body regions (neck, flexural, dorsa of the feet)

In severe chronic cases, the palms can be involved and the morphology of the skin lesions is characterized by hyperkeratosis and tylotic rhagadiform eczema. Another variant is the tylotic, rhagadiform, finger pad eczema, so-called *pulpite sèche*. Concomitant pain leads to impairment of functions in the involved hand. In chronic cases, the nails are also involved.

In over 50 % of patients, atopic hand eczema shows vesicular volar eruptions, sometimes with extension from the distal part of the palm to proximal fingers (apron sign). Very often the vesicular eruptions begin with intense pruritus at the lateral sides of the fingers. It can be difficult to clinically distinguish this dyshidrotic type of atopic hand eczema from other dyshidrotic hand eczema (pompholyx, e.g., induced by allergens).

In many cases of hand eczema (HE), the diagnosis must rest on clinical features while an absolute marker for AE awaits recognition. Therefore, it is important to examine the whole body carefully for minimal eczematous lesions at typical locations such as the neck, the flexural area of the elbow and knee, dorsa of the feet, ear rhagades, etc.

In adults, the most common location of atopic eczema is the hands [2, 17, 33], and atopic eczema is a well-known factor influencing the course and prognosis of hand eczema [1, 21, 33].

16.3 Atopic Skin Diathesis and Hand Eczema

According to the studies of Lammintausta [20] and Rystedt [33], atopic disease and especially atopic eczema in childhood are risk factors for hand eczema in adults. However, both authors also found that a considerable number of subjects with a personal history of AE managed to work in risk occupations without developing HE. Therefore, a reduced resistance to irritants does not occur in all subjects with AE.

Lammintausta [20] introduced the term atopic skin diathesis (ASD) as a prognostically useful definition of the skin condition which might be involved in the development of HE. This condition was defined as (a) dry skin, (b) a history of low pruritus threshold for two of three nonspecific irritants (sweat, dust, rough material, (c) white dermographism, and (d) facial pallor/infraorbital darkening. This atopic skin diathesis was found in 35 % of subjects with respiratory atopy and in 18 % of the nonatopics and significantly increased the risk of HE among employees engaged in wet work. In her careful follow-up, Rystedt [33] found studies of atopic children that reported four to ten times higher frequency of HE in subjects who had had atopic eczema in childhood than in those who had not. Patients with a history of respiratory allergy without associated AE ($n = 222$; 14 % HE) showed no increased frequencies of HE compared to controls without personal or family atopy ($n = 199$; 11 % HE). Therefore it seems to be necessary to subclassify the atopic state of possible skin involvement for occupational risk assessment.

In order to establish a diagnostic score for atopic skin diathesis (ASD), basic and minor features of atopic eczema were evaluated systematically in established cases of AE and in subjects randomly collected from the Caucasian population of young adults in a prospective study [13, 15]. Anamnestic and clinical atopic basic and minor features were investigated in all test subjects by two investigators to obtain a good interobserver agreement. Based on statistical modelling methods, a diagnostic scoring system was constructed, based on anamnestic and clinical features without laboratory investigations (Table 16.2). The presence of an itching flexural dermatitis was not included since this was the selection base. For practical use, every atopic feature obtained a value between 1 and 3 points according to its statistical significance. Based on this scoring system, patients with more than 10 points should be considered to have atopic skin diathesis (ASD); patients with more than 6 points are suspected of having ASD.

Table 16.2. Criteria of atopic skin diathesis (ASD) (according to Diepgen et al. 1991, 1995). Individuals with at least 10 points have an ASD, between 7 and 9 points ASD is suspected.

	Points
Family history of atopy (1st degree relatives)	
Eczema	2
Respiratory atopy	1
Personal history of atopy	
Flexural eczema	
Allergic rhinitis	1
Allergic asthma	1
Cradle cap	1
Itch when sweating	3
Intolerance to wool	3
Intolerance to metal	1
Photophobia	1
Minor manifestations of AD	
Xerosis	3
Ear rhagades	2
Dyshidrosis	2
Pityriasis alba	2
Atopic foot/Pulpitis sicca	2
Nipple eczema	2
Perlèche	1
Atopic stigmata	
Atopic palms	2
Hertoghe's sign	2
Dirty neck	2
Keratosis pilaris	1
White dermographism	3
Acrocyanosis	1

16.4 The Triangle of Atopic Eczema, Hand Eczema, and Occupational Skin Disease

In more than 90 % of cases, occupational skin diseases are subtypes of contact dermatitis [10, 12]. The two most important types of occupational contact dermatitis (OCD) are irritant contact dermatitis (ICD) and allergic contact dermatitis (ACD). ICD results from

contact with irritant substances, while ACD is a delayed-type immunological reaction in response to contact with an allergen in a sensitized individual. However, the development of occupational contact dermatitis is frequently determined by a combination of endogenous (individual susceptibility) and exogenous factors (exposure characteristics) [12]. The majority of OCDs are located on the hands and face. Rarely is there exclusive involvement of the trunk: almost always (also in approximately 90 % of all cases) the hands are affected. Thus, occupational skin disease is mostly a matter of hand eczema. When occupational factors are the subject of a published study, hand eczema appears. This does not rule out the fact that occupation-related flare-ups of AD, not located on the hands, are well documented in persons handling animals to which they are allergic: examples are veterinarians and farmers.

There has been much debate on the issue of whether patients with AE are more (or less) prone to (occupational) delayed-type contact allergy. While some studies argue that there may be a slightly decreased risk, at least a "classical" type IV contact allergy to common sensitizers does not seem to be more prevalent among atopics [18, 32]. This is supported by data from a study among hairdressers (Table 16.3): even in this group of people, who are heavily exposed to occupational allergens, there are no significant differences in sensitization rates between those with atopic manifestations on the skin and nonatopics (T. Diepgen, personal communication). This is in agreement with a study of 143 hairdressers with hand eczema in the UK: no significant difference was found between the eczematous atopics, mucous membrane atopics and nonatopics in their capacity to be sensitized to hairdressing allergens or to nickel [38].

Table 16.3. Type IV contact allergy and atopic skin diathesis among hairdressers with notified occupational contact dermatitis in North Bavaria, Germany (according to Diepgen, submitted)

	Atopic skin diathesis (n = 215)	Nonatopics (n = 312)
Occupational allergens		
Glycerylmonothioglycolate	48 %	54 %
P-phenylenediamine	28 %	30 %
Ammoniumpersulphate	22 %	26 %
Nonoccupational allergens		
Nickel sulphate	49 %	45 %
Balsam of Peru	2 %	4 %

However, with respect to type I (Ig-E-mediated) contact urticarial reactions, which can develop into hand eczema, the situation is different. Immediate-type contact reactions to latex (gloves used by health-care personnel) or alpha-amylase (yeast used by bakers) or food proteins are more common among atopics [19, 30].

Among persons with AE exposed to irritants, it is difficult to distinguish between hand eczema based on atopy and hand eczema as a manifestation of irritant contact dermatitis. There is consensus that exposure to irritants precipitates or aggravates hand eczema in individuals with a history of AE [26, 32]. Most of this consensus is derived from a perceived overrepresentation of skin atopy among those with irritant contact dermatitis of the hands. This overrepresentation stems mainly from studies with a kind of cross-sectional design, with a posterior assessment of skin atopy. A few studies look at hand eczema and occupational factors in atopics (instead of atopy in persons with hand eczema), and even fewer have a follow-up design. Rystedt's study has elements of a cohort study: work-related hand eczema was assessed in persons diagnosed with or without AE more than 24 years earlier [31]). Although details about the inclusion and exclusion criteria are lacking, Lammintausta's study also consists of a cohort of teenage AE patients, reexamined in adulthood [22]. In both studies, however, the (historical) "cohorts" were assembled retrospectively, mostly based on hospital records.

Other methodological problems emerge: for example, does the study involve irritant contact dermatitis or AE as a manifestation of hand eczema? Several studies mentioned in Table 16.4 show that a considerable number of individuals with a personal history of AE manage to work with irritant-exposure without developing hand eczema. Therefore a discussion on the role of AE as an effect modifier (i.e., whether AE makes a person more likely to develop hand eczema from occupational exposure) or a role of AE of the hands independent of occupational factors seems appropriate. Some older studies on the role of occupational skin exposure only mention "atopy" without distinction between mucosal atopy (asthma, hay fever) and atopic eczema. However, there is sufficient evidence that mucosal atopy, without skin manifestations, is not associated with increased risk of irritant contact dermatitis [11, 25, 32]. An association between skin risk and "atopy" is most likely based on the inclusion of patients who have mucosal atopy and AE.

Table 16.4. The relationship between hand eczema (HE) and atopy

Author, year	Study group	Sample size (*n*)	
HE among atopics			
Cronin (1970)	AE	233	68 % HE
Breit 1972 [2]	AE	130	69 % HE
Rystedt 1985 [33]	Severe AE	549	60 % HE
	Moderate AE	406	48 % HE
	Respiratory atopy	222	14 % HE
	Nonatopics	199	11 % HE
Diepgen, personal communication	AE	428	72 % HE
Atopics among HE			
Lammintausta and Kalimo 1981 [22]	HE in hospital wet work	259	54 % atopics
Cronin 1985 [3]	HE in women	263	34 % personal history of atopy
Meding and Swanbeck 1990 [26]	HE in a population-based sample	1,238	27 % childhood eczema 28 % asthma/hay fever
Lodi et al. 1992 [24]	Pompholyx	104	50 % personal or family history of atopy
Diepgen and Fartasch 1993 [11]	HE (matched case control study)	458	19 % respiratory atopy 34 % family history of atopy 62 % personal or family history of atopy
Meding and Jarvholm 2004 [27]	HE (self-reported)	386	12 % childhood eczema 9 % asthma 24 % hay fever
Skoet et al. 2004 [37]	Occupational HE	758	16 % AE
Dickel et al. 2003 [5]	Occupational skin diseases	3,730	37 % ASD or AE

AE atopic eczema
ASD atopic skin diathesis

16.5 Sick Leave and Changing Occupations Due to Atopic Eczema

Sick leave or absence from work due to AE has rarely been studied by reviewing employment records or other registries. One of the main reasons is that most records are not detailed enough to distinguish between AE and other (skin) diseases. In a Finnish cohort, patients with AE did not go on sick leave more often than others [22]. But among those with moderate/severe AE, their sick leave was more often due to the problems with their skin. Also the duration of a period of absence from work due to AE was longer than average, but the total number of compensated days was not different in this study from the number of days due to other diseases. In a recent study from Denmark [4], occupational hand eczema cases were identified from the Danish National Board of Industrial Injuries Registry (758 cases) and the severity and consequences of occupational hand eczema was investigated using a questionnaire. The response rate was 82 % and the results showed that occupational irritant contact dermatitis ICD and AE appear to be strongly associated with severity of occupational hand eczema. Additionally, AE and severity of occupational hand eczema were independently associated with prolonged sick leave.

An analysis of cost, including days of work lost, is presented in a study based on an occupational disease registry [36]. Unfortunately, the conclusions, indicating more days of work lost among atopics, are based on a subset of responders that comprises only 13 % of all registered cases, and are therefore likely to be affected by selection bias.

Not only is sick leave multifactorial, but also the decision to change jobs. Studying the role of AE in changing occupations is fraught with difficulties, and is virtually impossible using a cross-sectional design.

In the above-mentioned Finnish study, the majority of patients with AE had learnt to work and live with their skin symptoms [22]. A low level of education was associated with occupational changes, and it is possible that educated patients tend to avoid occupations that may be harmful to their skin. A cross-sectional study comparing AD patients with and without hand eczema showed a higher rate of occupational change among those with hand involvement and those whose first job was wet and dirty [17]. A questionnaire-based study among patients who had in the past been hospitalized for AE and psoriasis showed no differences in the frequency of occupational change, but those with AE reported their skin problem more often as a reason for change [29]. However, the design of that study was unable to detect a possible impact of AD on work history. No adjustment was made for the age difference between the groups: age, for example, may have been a confounder because it undubtedly reflects differences in occupational environment, education and employment prospects.

In a follow-up of newly employed female hospital workers, sick leave and job change occurred more often in those with AE and among those with a history of hand eczema [28]. However, all assessments, including the assessment of the occurrence of hand eczema, were made by questionnaire; the absence of any clinical verification may have led to responder bias. Sick leave and medical consultations due to hand eczema were uncommon, and had occurred in only 8 % of those with AE who were employed in wet work. Among the reasons given for not consulting a physician were mild dermatitis and self-medication. Especially nurses may avoid medical consultation deliberately and have easy access to topical self-medication.

16.6 Atopic Eczema as an Effect Modifier or Risk Factor for Hand Eczema

Exposure to irritants may cause irritant contact dermatitis of the hands. Conversely, patients with moderate to severe AE often have hand dermatitis. Assessing the contribution of irritant exposure to the hand eczema risk is very difficult when the study is restricted to such patients. Many studies have resorted to the assessment of hand eczema according to the presence of AE and have tried to associate the findings with occupational exposure. Usually, atopy or AE is studied as a risk factor for hand eczema. It is more logical to look at AE as an effect modifier, i.e., to address the question of the extent to which the presence of AE elicits more skin reactions (hand eczema) from occupational exposure. Most papers do not clearly give estimates of effect modification of the exposure by AE but give only summaries of relative risk. However, a recent study attempted to estimate the etiologic fraction (attributable risk) of occupational exposure in AE and/or AE-related hand eczema [5].

In a larger retrospective cohort study, individuals with the diagnosis of AE treated at the Department of Dermatology of the Karolinska Hospital in Stockholm in 1952 – 1956 (group 1, 1,549 inpatients, group 2, 406 outpatients) were contacted by questionnaire more than 25 years later [31]. There was a high (97 %) response rate, and the frequency of sporadic or continuous HE after 15 years was 60 % in group 1 and 48 % in group 2. A subsample was clinically examined: hand eczema was present in 34 % – 48 % of the persons in that sample. Hand eczema was significantly more prevalent in those with exposure to irritants. The publication concentrates on the role of irritants in patients with AE, and does not give an estimate of the effect of AE on the relationship between occupational exposure and hand eczema. Although the material was heavily biased towards hospital cases, the severity of childhood AE appeared to be a decisive factor for the development of hand eczema, and irritant contact dermatitis seemed to be the subordinate diagnosis after endogenous (mostly atopic) hand eczema. The bias towards hospital cases may reflect the severe end of the spectrum of AE. This study was a cross-sectional assessment of exposure, and patients may well have adapted their occupational exposure to their skin problems. In a separate analysis, domestic exposure to irritants was more clearly associated with hand eczema in this group of patients [34]. The study demonstrates that a careful assessment of exposure (occupational as well as domestic) is needed before further conclusions can be drawn about the role of AE in any occupation.

In a large cross-sectional sample of the general population, Meding and Swanbeck [26] studied the relative importance of various risk factors for hand eczema by regression analysis [26]. Similar to findings obtained in other studies, it showed that childhood eczema, which is more or less equivalent to childhood AE, was the most important “predictive” factor for hand eczema. It

Author, year	Follow-up period	No AE No exposure	AE No exposure	AE, with irritant exposure
Meding and Swanbeck 1990 [26]	12 months	5 % – 9 %	14 % – 23 %	34 % – 48 %
Nilsson 1986 [28]	20 months	16 %	38 %	62 % – 72 %
Rystedt 1985 [33]	24 years	5 %	37 % – 50 %	60 % – 81 %

Table 16.5. Some estimates of predicted risk for hand eczema in adults with and without atopic eczema (AE). Selection bias may be in operation

also showed that among the individuals with a history of childhood AE there was a tendency to avoid occupations with irritant exposure. Occupational exposure seemed to raise the predicted probability of having hand eczema by about one-third. The significantly raised rates found among women arouses the suspicion that domestic exposure to household irritants plays a major role (Table 16.5).

Nilsson [28] studied a large cohort of about 2,600 newly employed hospital workers. History of AE and/or visible AE was assessed during the pre-employment examination, and all workers were followed for 20 months. It should be kept in mind that all data were gathered by questionnaire only. About half the subjects identified with AE had hand eczema before they began their job. It was not clear whether relevant occupational factors were present in their previous jobs, but bias should be suspected: of the office workers (no occupational exposure), 23 % had developed hand eczema prior to their current job, in contrast to 8 % of craftsmen. A history of AE increased the odds ratio of developing hand eczema by a factor of roughly 3 in wet and in dry work. This indicates a role of AE as a constant multiplicative effect modifier for any kind of exposure. In general, the predicted probability of developing hand eczema during the observation period (20 months) was 38 % for office workers with AE and 72 % for nurses with AE. It should be kept in mind that AE meant a combination of confirmed AD with atopic mucosal symptoms in the interpretation of these figures. That study raises the question of how those individuals with mild skin atopy would perform in these occupations. A grading of skin atopy therefore seems to be an important variable to be included in such studies.

Meding et al. [27] conducted a retrospective study to estimate the incidence rate of self-reported hand eczema in a sample from the general population and to investigate the relation of this to age, sex, and atopy. The cumulative self-reported prevalence of hand eczema was in total 17.4 % (386 of 2,218). The crude incidence rate of self-reported hand eczema was 5.5 cases per 1,000 person-years (females 7.1 and males 4.0). There was no difference, however, in the incidence rate between women and men over 30 years of age. In a Poisson regression analysis, female sex, childhood eczema, and asthma/hay fever were all significantly associated with hand eczema, but only at ages under 30 years. A moderate influence of recall bias and a probable tendency to underreport imply that the incidence rates presented are to be considered as minimum rates.

In a population-based registry of occupational skin diseases (OSD) in North Bavaria, out of 3,730 cases with confirmed OSD, 37 % ($n = 1{,}366$) were classified as cases with atopic skin disease or with a personal history of atopic eczema [5]. The median age of ASD cases (24 years; Q_1 21 [lower Quartil]; Q_3 33 [upper Quartil]) was significantly lower ($P < 0.0001$) than in non-ASD cases (28 years; Q_1 21; Q_3 43). Similarly, the median occupational period of exposure of ASD cases was significantly less than that of non-ASD cases. These results demonstrate that workers with ASD developed their OSD at a younger age and earlier in their working life, confirming a higher risk of developing OSD at an early stage.

16.7 Attributable Risk for Occupational Skin Diseases

From a prevention point of view, it is important to quantify the proportion of occupational skin diseases in the working population which may be attributable to AE or ASD. Assuming that ASD can be surveyed and therefore its manifestation as atopic dermatitis is preventable, public health authorities should have a genuine interest in an answer to the question of whether it is correct to infer that preventive measures aimed at ASD are potentially of great benefit.

An analysis on the contribution of atopic skin diathesis to the total number of cases of occupational skin disease was conducted in two different population-based studies [5, 39], meaning that the total number of

employees in the study region was known, and all cases of occupational skin disease (mainly hand eczema) were well documented with respect to atopy.

In the food service and catering sector, especially bakers and cooks [39], an assumption was made that the prevalence of AE in the general population is 10 % (background prevalence). Under this assumption, the risk of an employee with AE developing occupational skin disease (mainly hand eczema) was on average eight times higher. The etiologic fraction of AE (attributable risk) in all cases of occupational skin diseases among bakers was about 50 %.

Dickel et al. [5] determined the odds ratio and attributable risk (AR) of occupational skin diseases (OSDs) in the working population due to atopic skin diathesis (ASD) and assessed the potential for preventive interventions in different professions. The results of this study are presented in Table 16.6: ASD accounts for about 20 % of the overall annual OSD incidence of 6.7 cases per 10,000 workers, or, that at least one-fifth of this OSD rate could be prevented if ASD among the working population could be monitored. Clearly, AR depends on ASD prevalence in the total population. Assuming, for example, 10 % or 30 % ASD in the total population, the average AR would increase to 30.3 % (95 % CI 28.4;32.2) or decrease to 10.3 (95 % CI 7.9;12.7), respectively. However, our findings illustrate a potential impact of ASD on OSDs in the context of preventive strategies, primarily in food preparation workers (pastry cooks, bakers, cooks), florists, and health care workers.

16.8 On the Quantification of Risk

Public health authorities, especially occupational health services, as well as individual patients, are inter-

Table 16.6. Odds ratio (OR) and attributable risk (AR) in cases with an OSD within 24 occupational groups for the risk factor of ASD in different professions

Occupational group	Insured persons (Average number of employees over 10 years)	Incidence rate of cases with an OSD (95 % CI) (Per 10,000 workers per year)	$OR_{(ASD)}$ (95 % CI) $p_{(ASD)}$ = 20 %	$AR_{(ASD)}$[a] (95 % CI)
Pastry cooks	2,188	20.6 (14.6;26.6)	7.0 (3.8;12.8)	53.3 (35.7;70.8)
Bakers	4,221	33.2 (27.8;38.6)	5.8 (4.1;8.2)	47.3 (37.2;57.4)
Florists	1,548	23.9 (16.3;31.5)	5.0 (2.6;9.6)	43.1 (23.2;63.1)
Health care workers	65,731	7.3 (6.7;8.0)	4.0 (3.4;4.8)	37.4 (31.8;43.0)
Cooks	17,007	6.6 (5.4;7.8)	3.7 (2.6;5.4)	34.9 (23.4;46.4)
Dental technicians	2,508	10.8 (6.7;14.9)	3.3 (1.5;7.0)	30.8 (7.4;54.2)
Locksmiths and automobile mechanics	54,827	2.2 (1.8;2.6)	3.2 (2.2;4.6)	30.7 (19.6;41.9)
Mechanics	6,688	6.0 (4.1;7.9)	2.7 (1.4;5.1)	25.1 (6.1;44.1)
Food-processing industry and butchers	15,836	2.9 (2.1;3.7)	2.6 (1.4;4.7)	24.0 (6.3;41.6)
Hairdressers and barbers	8,792	97.4 (91.2;103.6)	2.3 (1.9;2.6)	18.9 (14.9;22.9)
Solderers	1,285	10.9 (5.2;16.6)	2.2 (0.7;6.8)	19.8 (–11.6;51.2)
Machinists	5,205	9.0 (6.4;11.6)	2.1 (1.1;3.8)	17.7 (0.7;34.6)
Housekeepers, catering trade, cleaners	57,893	3.4 (2.9;3.9)	2.1 (1.5;2.8)	17.3 (9.1;25.6)
Wood processors	27,622	2.6 (2.0;3.2)	1.8 (1.1;3.0)	14.4 (1.1;27.7)
Metal-surface processors	28,889	9.0 (7.9;10.1)	1.7 (1.3;2.3)	12.6 (5.6;19.6)
Painters and varnishers	13,100	6.6 (5.2;8.0)	1.7 (1.0;2.6)	11.4 (–0.6;23.4)
Leather industry and fur processors	4,220	5.0 (2.9;7.1)	1.6 (0.6;4.2)	10.8 (–13.4;34.9)
Electrical industry	57,900	1.2 (0.9;1.5)	1.5 (0.9;2.6)	9.4 (–3.7;22.6)
Assemblers	8,810	5.8 (4.2;7.4)	1.4 (0.7;2.6)	6.9 (–8.1;21.9)
Construction and cement workers	27,605	5.4 (4.5;6.3)	1.4 (1.0;2.0)	6.9 (–1.8;15.7)
Metal processors	20,156	6.4 (5.3;7.5)	1.3 (0.8;1.9)	5.1 (–4.2;14.3)
Unskilled workers	12,664	2.1 (1.3;2.9)	1.2 (0.5;3.0)	3.9 (–16.4;24.1)
Tile setters and terrazzo workers	2,472	19.0 (13.6;24.4)	1.1 (0.5;2.2)	1.6 (–13.1;16.4)
Electroplaters	1,653	13.3 (7.8;18.8)	0.6 (0.2;2.1)	–
All of the above occupational groups	462,239[b]	6.7 (6.5;6.9)	2.4 (2.2;2.6)	21.6 (19.4;23.7)

[a] AR as percent and provided if OR ≥ 1, [b] Number differs slightly from sum due to averaging

ested in having an answer to the broad question: how employable is a person with AE? In other words, what is the magnitude of the risk for individuals with AE that their skin problems will worsen, or what is the risk that they develop hand involvement for the first time because of occupational exposure, resulting in interference with their work? Obviously, the question also bears the hidden fear that someone with AE will be handicapped, irrespective of occupational exposure.

In summary of the studies discussed in the preceding sections, it is clear that a precise overall estimate is meaningless. It would disregard the importance of the level of skin exposure to irritants, including domestic exposure, and the importance of the degree/severity/subtype of atopic eczema or skin atopy. Estimates expressed as relative risk (with or without confidence limits) may be elegant from a statistical point of view, but they are difficult to interpret intuitively when there is no notion as to the "normal" background risk. From the literature, it is clear that the risk of developing hand eczema, irrespective of exposure, is considerable in subgroups of persons with AE or a history of AE. Accordingly, a relative risk due to exposure on the order of 2 affects a considerable additional number of employees.

The probability of having hand eczema in a 12-month period, with no supposed risk factor involved (i.e., no atopy, no occupational exposure), was calculated in Gothenburg [26]. Within the limitations of a cross-sectional design, this probability was estimated at 5 % for men and 9 % for women. In individuals with a history of childhood eczema, irrespective of occupational exposure, the calculated probability of hand eczema was 14 % (men) and 23 % (women). Occupational exposure in general raises this probability by one-third, and occupational exposure in service work doubles the probability to 34 % for men and 48 % for women among those with a history of AE.

The questionnaire-based study by Nilsson [28] among hospital employees, where AE was defined as past or present signs of AE, calculates much higher absolute risks: the predicted probability of hand eczema in nonatopic craftsmen was 16 %. AE increased the risk about three times, and this tripled risk was present in high and low levels of exposure. This finding seems to be in agreement with Meding and Swanbeck's [26] observed triplication of risk among persons with a history of AE. For office workers with AE, a predicted probability of 38 % was calculated, and determined for nurses was 62 % – 72 % [28]. Also, in this material, exposure to irritants seems to increase the risk by a factor of 2.

In Rystedt's follow-up study of childhood AE cases, occupational exposure to irritants did not seem to increase the risk for hand eczema very much. However, in a separate analysis among women, there were about twice as many cases among those who were exposed to domestic work [31, 34]. Pooling domestic and occupational exposure to irritants seemed to indicate a rise in hand eczema prevalence by less than one-third. The selection of cases that were on the moderate-to-severe end of the spectrum is reflected in a "background" risk of hand eczema of 40 % – 50 % found in AE patients wihout exposure vs 5 % – 11 % found among persons without AE.

Table 16.6 summarizes the studies that have attempted to calculate absolute risks in terms of predicted probabilities. As explained in the previous paragraph, these absolute figures should be interpreted with caution, since they are highly dependent on the chosen study design and may suffer from selection bias. In terms of relative risk, the data from the different studies show a rather consistent pattern: a history of AE without exposure at least doubles the risk for hand eczema, and occupational exposure doubles this risk again. This is a multiplicative effect, which means that the risk of hand eczema in persons with AE who perform work that is unfriendly to their hands is four times as high. This is supported by data from two different studies among hairdressers [14, T. Diepgen,, personal communication]. Two different epidemiological studies have been performed in hairdressers: a prospective cohort study and a case–control study. Skin atopy was defined as ASD, based on a score of at least 10 points on our scale for ASD [13, 15]. The relative risks (calculated as odds ratios) are almost identical in both studies: again, a doubling of risk is shown for persons with ASD, multiplied by roughly 2 by exposure to wet work, with a possible additional increase of risk due to exposure to special high-risk tasks such as permanent waving. The data do not present a possible (statistical) interaction of ASD on the relationship between wet work and hand eczema.

16.9 Occupational Guidelines for Individuals with Atopic Eczema

In summary of the evidence gathered thus far, it is clear that AE patients run a certain risk of developing hand eczema, and that this risk is dependent on the severity of their AED. In this severity, a history of hand involvement or a present involvement of the hands plays a central role. Proper advice at a pre-employment examination is essential, and regular follow-up and counseling of persons at increased risk will help them to keep functioning in their jobs.

The German occupational organizations (which also administer the occupational insurance funds) have reached consensus on a series of guidelines for pre-employment advice (G-24) to employees opting for occupations that carry increased risk for the skin, and this regulation has been mandatory for all workers exposed to wet work for 4 h or more since the beginning of 2005. As an analogy, this chapter can be concluded with Table 16.7, which presents guidelines for the course to take when receiving a request for preventive advice to individuals with AE. As a first step, the risk category is defined, and as a second step the corresponding advice is formulated. Although the guidelines are restricted to occupational aspects, it is clear that domestic exposure, such as household wet work or handicraft work, should not be neglected, and that this should be an important component of occupational counseling.

Following our study in North Bavaria [5, 39], we suggest increased efforts in terms of proper medical advice at pre-employment examination and regular follow-up and counseling of workers with atopic skin diatheses and AE, to give them support so as to avoid occupational skin diseases and remain in their jobs. It is clear that discouraging applicants with an ASD from entering risk occupations applicable, because of the large number of applicants with this risk factor. Assuming that all workers with an expected ASD (92,448/462,239; p(ASD) = 20 %) within the 24 occupational groups most hazardous to the skin had been excluded by pre-employment screening, 1 % of those (1,151/92,448) would have finally developed an OSD [5]. Thus, it seems only to be justified that severe cases (past or present signs of atopic dermatitis with long-lasting hand involvement) should be discouraged from entering risk occupations.

16.10 Key Points

- Occupational irritants precipitate atopic eczema (AE)
- Occupational contact urticaria is more common in atopics
- Allergic contact dermatitis is not more common in AE
- Patients with AE are at risk of developing irritant hand eczema

Table 16.7. A practical guide for occupational pre-employment counseling in persons with (possible) atopic eczema

STEP 1: Defining the occupational risk category	STEP 2: Occupational counseling for each risk category
First risk category Moderate to severe AE with hand involvement Chronic hand eczema Change in job due to irritant contact dermatitis	**For the first risk category** Occupations with wet work or other exposure to irritants not advisable Pre-employment medical-occupational counselling and medical advice is required
Second risk category AE without involvement of the hands Dyshidrosis (history of pompholyx) Allergic rhinitis or asthma in occupations with increased risk for type I allergies (e.g., bakers)	**For the second risk category** Technical and organizational protection measures Personal protection measures Repeated follow-up examinations every 3 months in the 1st year, and every 6 months in the 2nd year
Third risk category Evidence for low threshold to nonspecific irritants Wool intolerance Itch due to sweating Unusually dry skin	**For the third risk category** Technical and organizational protection measures Follow-up examinations after 6, 12 and 24 months

- A history of (childhood) involvement of the hands is a major risk factor
- Respiratory atopy without atopic skin diathesis is not a risk factor for HE
- AE is probably an effect modifier for occupational exposure
- A personal history of AE doubles the risk of hand eczema
- In severe AE, this increase in relative risk is probably higher
- Exposure to occupational irritants multiplies this risk by at least a factor of 2, in some professions more
- Severity grading of skin atopy is recommended for future studies
- It is unclear how many patients avoid certain occupations, adapt to their jobs, or change occupations
- Occupational counseling must take a history of AE and ASD into account

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