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# Epidemiology of Contact Dermatitis

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## 1. Introduction

Substances that are responsible of contact dermatitis can be irritant, as chemical or physical agents that causes irritant contact dermatitis (ICD) , or sensitizers, when causes a tissue inflammation damage with allergic mechanism (allergic contact dermatitis or ACD). ICD results from contacts with irritant substances, while ACD is a delayed-type immunological reaction in response to contact with an allergen in sensitized individuals. Primary lesions of occupational contact dermatitis (OCD) are usually found at the site of contact with the irritant or allergen; in the case of ACD, secondary lesions may occur subsequently on other sites of the body that have never been in contact with the allergens (Meneghini & Angelini, 1984).

Contact dermatitis is a common inflammatory skin disease in industrialized countries, with a great socioeconomic impact. It is one of the most common occupational diseases (Coenreadds & Goncalo, 2007; Saint-Mezard et al 2004). Epidemiology is also used to analyse whether it is more common in specific groups, and which factors are associated with the occurrence of contact dermatitis (or its subtypes) in specific populations or subgroups.

## 2. Factors contributing to contact dermatitis

Studies have been investigated a possible association between different factors and contact sensitization.

### 2.1 Gender and age

Women are usually more frequently patch-tested, and have more positivity results than men (García-Gavín et al, 2011). Gender differences may be attributed to social and environmental factors; females are more likely to have nickel sensitivity because of increased wearing of jewellery, and males are more likely to have chromate sensitivity from occupational exposure (Ruff & Besilto, 2006).

Rui et al estimate the prevalence of nickel, cobalt and chromate allergy in a population of consecutive patients and investigate the possible association with individual and occupational risk factors (Rui et al, 2010). This study showed interesting associations between some occupations and nickel, chromate and cobalt allergy.

ACD in children, until recently, was considered rare (Hammonds et al, 2009). One of the largest population-based patch test studies of unselected pediatric patients, which also provides specific relevance information, found the prevalence of past or current relevant reactions to be 7%, with a higher risk seen in females (Mortz et al, 2002). This is considerably lower than the prevalence in selected pediatric populations (symptomatic patients). Nickel is the most common sensitizer in almost all studies pertaining to pediatric contact dermatitis. Thus, the real prevalence of ACD (defined as a positive patch test with clinical correlation with the dermatitis experienced by a symptomatic individual) ranges from 14% to 77% among children referred for patch testing due to clinical suspicion of contact dermatitis (Bruckner et al, 2000; Fernández Vozmediano & Armario Hita, 2005; Seidenari et al, 2005; Lewis et al, 2004).

Eczema in adults usually exists for years, compromising quality of life and occupational choices. The flexural areas, shoulders, head-and-neck, and hands are typically affected in 5-15% of cases (Katsarou et al, 2001). The relationship between atopy and contact allergy remains unclear. Atopic dermatitis is a risk factor for allergic contact sensitization (Dotterud & Smith-Sivertsen, 2007). ACD increases with age in atopics (Lammintausta et al, 1992).

Contact dermatitis is a significant health problem affecting the elderly people. Impaired epidermal barrier function and delayed cutaneous recovery after injury enhances susceptibility to both irritants and allergens. Exposure to more numerous potential sensitizers and for greater durations influences the rate of allergic contact dermatitis in this population. Medical co-morbidities, including stasis dermatitis and venous ulcerations, further exacerbate this clinical picture (Prakash & Davis, 2010). Aging is correlated with the rate and type of contact sensitization, but only a few studies have evaluated patch test reactivity in elderly individuals with an adequately large population (Nedorost & Stevens, 2001; Balato et al, 2011).

## 2.2 Race

Black people may be less susceptible to sensitisation by weaker allergens and have a lower incidence of ICD because of greater compaction of the lipid component of the stratum corneum, conferring improved barrier function (Robinson, 1999; Astner et al, 2006). Ethnicity is a possible endogenous factor implicated in ICD. While there is a clinical consensus that blacks are less reactive and Asians are more reactive than Caucasians, the data supporting this hypothesis rarely reaches statistical significance. Modjtahedi SP et al conclude that race could be a factor in ICD, which has practical consequences regarding topical product testing requirements, an ever-expanding global market, occupational risk assessment, and the clinical thinking about ICD (Modjtahedi & Maibach, 2002).

## 2.3 Exposure to irritants and allergens

The most important risk factor for OCD is the exposure to irritants. Well-known irritants are water (wet work), detergents and cleansing agents, hand cleaners, chemicals, cutting fluids,

and abrasives. ACD is a common skin condition that can be difficult to diagnose without the aid of a specific diagnostic tool called patch testing. Patch testing performed with a relevant panel of contact allergens is the ultimate confirmatory test of ACD (see Chapter titled "Allergens (patch test studies) from the European Baseline Series" on this book). Correctly identifying the inciting allergen permits appropriate personal avoidance.

## **2.4 Personal history of atopic dermatitis**

General population studies have repeatedly found that atopic dermatitis is the most important risk factor for hand eczema (Meding & Swanbeck, 1990; Dotterud & Falk, 1995; Yngveson M et al, 2000; Mortz et al, 2001; Meding & Jarvholm, 2002; Bryld et al, 2003; Josefson et al, 2006). Thus, the effect of atopic dermatitis seemed to level off with increasing age. Whether association between hand eczema on the one hand and atopic dermatitis or atopy on the other hand is explained by null mutations in the filaggrin gene (de Jongh et al, 2008; Carlsen et al, 2011), by an altered immune response (Davis et al, 2010; McFadden et al, 2011), or by their combination is currently unknown. Future studies should aim to investigate the distribution of these risk factors.

## **2.5 Other possible association**

Studies have re-investigated a possible association between these lifestyle factors (alcohol drinking and tobacco smoking) and contact sensitization (Thyssen et al, 2010).

## **2.6 Analyzed literature**

A substantial number of studies have also investigated the prevalence of contact allergy in the general population and in unselected subgroups of the general population (Thyssen et al, 2007). These studies have demonstrated variations in the prevalence of contact allergy depending on the selected study population and year of investigation. These studies are of high value as they tend to be less biased than studies using clinical populations and as they are important for health care decision makers when they allocate resources. Literature was examined using Pubmed-Medline, Biosis, Science Citation Index, and dermatology text books. Search terms included hand eczema, hand dermatitis, general population, unselected, healthy, prevalence, incidence, risk factor, and epidemiology. In observational studies on contact dermatitis, the ascertainment of cases varied from intensive efforts by a medical examination of the complete study population to the relatively easy-to-apply method of self-administered questionnaires; or by a combination of both. However, a diagnosis of contact dermatitis based on a self-administered questionnaire is significantly less valid than the diagnosis based on examination by a dermatologist (McCurdy et al, 1989).

## **3. Hand eczema in the general population**

Information on the prevalence of hand eczema, contact sensitivity and contact dermatitis in the general population can be obtained from cross-sectional studies that were performed recently (Thyssen et al, 2009; Nielsen et al, 2001a, 2001b; Mortz et al, 2001;

Sosted et al, 2005; Lerbaek et al, 2007). Several studies have investigated the incidence of hand eczema in the general population (Bo et al, 2008; Hald et al, 2008; Moberg et al, 2009; Lind et al, 2007).

Hand eczema is the most frequent occupational skin disease. In many jobs the skin on the hands is subjected to damage caused by contact with skin irritants and contact allergens. Several studies have investigated the incidence and prevalence of hand eczema in the general population.

### 3.1 Usefulness of patch testing

Patch testing remains the gold standard for the diagnosis of ACD (Devos & Van Der Valk, 2002; Uter W et al, 2009). Quality control of patch testing is both a prerequisite for, and an objective of, clinical epidemiology of contact dermatitis. Continuous development of test standards concerning the composition of test series, test concentration, and vehicle and standardization of test readings is provided by the national and international research groups on contact dermatitis.

Many studies in contact dermatitis are based on populations that have been patch tested; usually this means that the participants visited a clinic or a hospital for being evaluated on having contact dermatitis. There are a variety of types of irritant reactions - some can look identical to allergic reactions. The recognised convention for recording patch test reactions is as follows:

+/- doubtful:	faint erythema only
+ weak:	erythema, maybe papules
++ strong:	vesicles, infiltration
+++ extreme:	bullous
IR:	irritant

### 3.2 Measures of disease frequency (incidence and prevalence)

The epidemiologist deals with necessity of data on defined populations. The most basic setting giving rise to epidemiological data is the evaluation of the occurrence of a disease in the presence of an exposure. The exposure may be present or absent and the disease may be present or absent.

Measures of disease frequencies include *prevalence*, which is the amount of disease that is already present in a population; *incidence*, which refers to the number of new cases of contact dermatitis during a defined period in a specified population; and "incidence rate" (IR), which is the number of non-diseased persons who become diseased within a certain period of time, divided by the number of person-years in the population. All measures of disease frequency consist of the number of cases as the numerator, and the size of the population under study as the denominator. Sensitivity and specificity of the diagnostic instruments used are important. In epidemiological studies, an overestimation of prevalence can result from low sensitivity/specificity.

The three most important types of observational study in the epidemiology of contact dermatitis are follow up studies, case-control studies and cross-sectional studies. In follow-

up studies, selection of subjects is based upon exposure to the factor of interest. Instead of exposure, the presence or absence of a risk factor (e.g. nickel allergy, or atopy) can also be chosen as basis for comparison. In case-control studies, the subjects are selected according to their disease status. Information on the past exposure of the persons with contact dermatitis (cases) and the non-diseased persons (controls) is collected. In cross-sectional studies, a study population is selected regardless of exposure status or disease status (in contrast to case-control and follow-up studies).

Data on the incidence and prevalence of occupational dermatoses are scarce. The most important sources of data are occupational disease registries, case series of patients visiting dermatology clinics, and a limited number of cross-sectional studies in one or more occupational groups.

### 3.3 Incidence and prevalence of contact dermatitis and contact sensitisation

*Incidence of hand eczema:* Several studies have investigated the incidence of hand eczema in the general population (Lantinga et al, 1984; Yngveson M, 2000; Meding & Jarvholm, 2004; Brisman J et al, 1998; Meding et al, 2006; Lind, 2007; Lerbaek et al, 2007). The median incidence rate was 5.5 cases/1000 person-years (range 3.3–8.8). Stratified by sex, the median incidence rate of hand eczema was 9.6 cases/1000 person-years (range 4.6–11.4) among women and 4.0 cases/1000 person-years (range 1.4–7.4) among men (Thyssen et al, 2010).

*Prevalence of hand eczema:* Few studies showed that the 1-year median prevalence of hand eczema in the general population was 9.7% (11.4% among women and 5.4% among men) and that the 1-year weighted average prevalence was 9.1% (10.5% among women and 6.4% among men) (Lantinga et al, 1984; Agrup, 1969; Peltonen, 1979; Menné et al, 1982; Kavli & Forde, 1984; Meding, 1990; Meding & Swanbeck, 1987; Meding & Jarvholm, 2002; Ortengren, 1999; Meding et al, 2001; Brisman J et al, 1998; Montnemery et al, 2005; Bo et al, 2008; Fowler et al, 2006; Hald et al, 2008; Svedman et al, 2007; Lind et al, 2007).

Population studies may give valuable information on the magnitude of the disease problem. Different data was found when compared the frequencies of positive path-tests reactions in the general population and in eczema patients at a dermatological clinic in the same area (Menné & Knudsen 1997) (Table 1). Publications based on data of patients visiting dermatology clinics and/or patch testing units can not be used to directly derive population related incidence or prevalence estimates. Data from incidence studies may support and direct strategies for the prevention of contact allergy and ACD, supporting conclusions derived from clinical surveillance data.

Nickel sulphate is the most common allergen in the standard series and the most common cause of allergic contact dermatitis, particularly in women. This gender difference is traditionally explained by increased exposure in women, due to direct skin contact with nickel-releasing metal, such as in jewellery, wristwatches, and clothing accessories. A possible association between nickel allergy and hand eczema in women has been addressed and supported by several population-based studies, whereas an association has been questioned in men (Nielsen et al, 2002; Peltonen, 1979; Meijer et al, 1995) (Tables 2 and 3).



Test substances	General population % positive of tested			Dermatological clinic % positive of tested		
	Men n=279	Women n=288	Total n=567	Men n= 262	Women n= 416	Total n= 672
Potassium dichromate	0.7	0.3	0.5	1.9	2.7	2.4
Neomycin sulfate	0.0	0.0	0.0	3.4	3.7	3.6
Thiuram mix	0.7	0.3	0.5	4.6	2.7	3.4
<i>p</i> -phenylenediamine	0.0	0.0	0.0	1.9	2.7	2.4
Cobalt chloride	0.7	1.4	1.1	2.3	2.7	2.5
Benzocaine	-	-	NT	0.4	0.7	0.6
Caine mix	0.0	0.0	0.0	-	-	NT
Formaldehyde	-	-	NT	1.9	2.2	2.1
Colophony (colophonium)	0.4	1.0	0.7	4.6	5.4	5.1
Quinoline mix	0.4	0.3	0.4	1.9	0.5	1.0
Balsam of Peru ( <i>Myroxylon pereirae</i> )	0.7	1.4	1.1	3.4	5.4	4.6
<i>N</i> -isopropyl- <i>N</i> -phenyl- <i>para</i> -phenylenediamine (IPPD)	0.4	0.0	0.2	1.2	0.0	0.5
Wool alcohols (lanolin alcohol)	0.4	0.0	0.2	1.2	1.7	1.5
Mercapto mix	0.7	0.0	0.4	1.2	0.2	0.6
Epoxy resin	0.4	0.7	0.5	0.8	0.2	0.5
Paraben mix	0.4	0.3	0.4	0.8	0.2	0.5
<i>para</i> -Tertiary-butylphenol-formaldehyde resin (PTBP resin)	1.1	1.0	1.1	0.4	1.2	0.9
Fragrance mix	1.1	1.0	1.1	6.1	7.1	6.7
Ethylenediamine dihydrochloride	0.4	0.0	0.2	0.8	0.2	0.7
Quaternium-15	0.4	0.0	0.2	0.0	0.0	0.7
Nickel sulfate	2.2	11.1	6.7	4.2	16.1	11.0
Cl+Me-isothiazolinonec	0.4	1.0	0.7	0.4	0.7	0.6
Mercaptobenzothiazole	0.4	0.0	0.2	1.2	0.2	0.6
Primin	-	-	NT	0.4	1.5	1.0
Thiomersal	3.6	3.1	3.4	-	-	NT
Carba mix	0.7	0.0	0.4	-	-	NT

Table 1. Comparison of frequencies of positive patch-test reactions in the general population and in eczema at a dermatological clinic in the same area of greater Copenhagen in 1990 (Menné & Knudsen 1997).

Study	N	Allergens used for patch testing	Positive reaction to nickel; total (%)	Three most common allergens
Nielsen et al, 1992	567	TRUE-tests	6.7	Nickel, thimerosal, cobalt/Balsam of Peru
Nielsen et al, 1998	469	TRUE-tests	10.8	Nickel, fragrance mix, and thimerosal
Schäfer et al, 2001	1141	Standard series	9.9	Nickel, fragrance mix, and thimerosal
Akasya-Hillenbrand, 2002	542	Standard series	19.1	Nickel, potassium dichromate, and palladium chloride
Lazarov, 2006	2156	TRUE-tests	13.9	Nickel, fragrance mix, and potassium dichromate
Dotterud & Smith-Sivertsen, 2007	1236	TRUE-tests	17.6	Nickel, cobalt, and thimerosal
García-Gavín et al, 2011	1161	Spanish standard series	25.8	Nickel, potassium dichromate, and cobalt chloride

Table 2. Studies on contact dermatitis in the general population (list is not extensive).

Study	<i>n</i>	Allergens used for patch testing	Positive reaction to nickel; total (%)	Three most common allergens
Röckl et al, 1966	357	Not given; MCI/MI and PPD	2.5	Chromium, HgCl <sub>2</sub> , and formaldehyde
Weston et al, 1986	314	Standard series	7.6	Neomycin, nickel, and chromium
Barros et al, 1991	562	Standard series	0.9	Neomycin, thimerosal, p-tertiary-butylphenol-formaldehyde
Dotterud & Falk, 1994	424	Epiquick test	14.9	Nickel, cobalt, and MCI/MI
Mortz et al, 2001	1146	TRUE-tests	8.6	Nickel, fragrance mix, and thimerosal/colophony/cobalt

Table 3. Studies on contact dermatitis in children (general population) (list is not extensive).

3.4 Current view on the spectrum of contact allergy to important sensitizers across Spain

In 2005, the Spanish Society of Allergology and Clinical Immunology (Sociedad Española de Alergología e Inmunología Clínica (SEAIC) in collaboration with the Allergy and

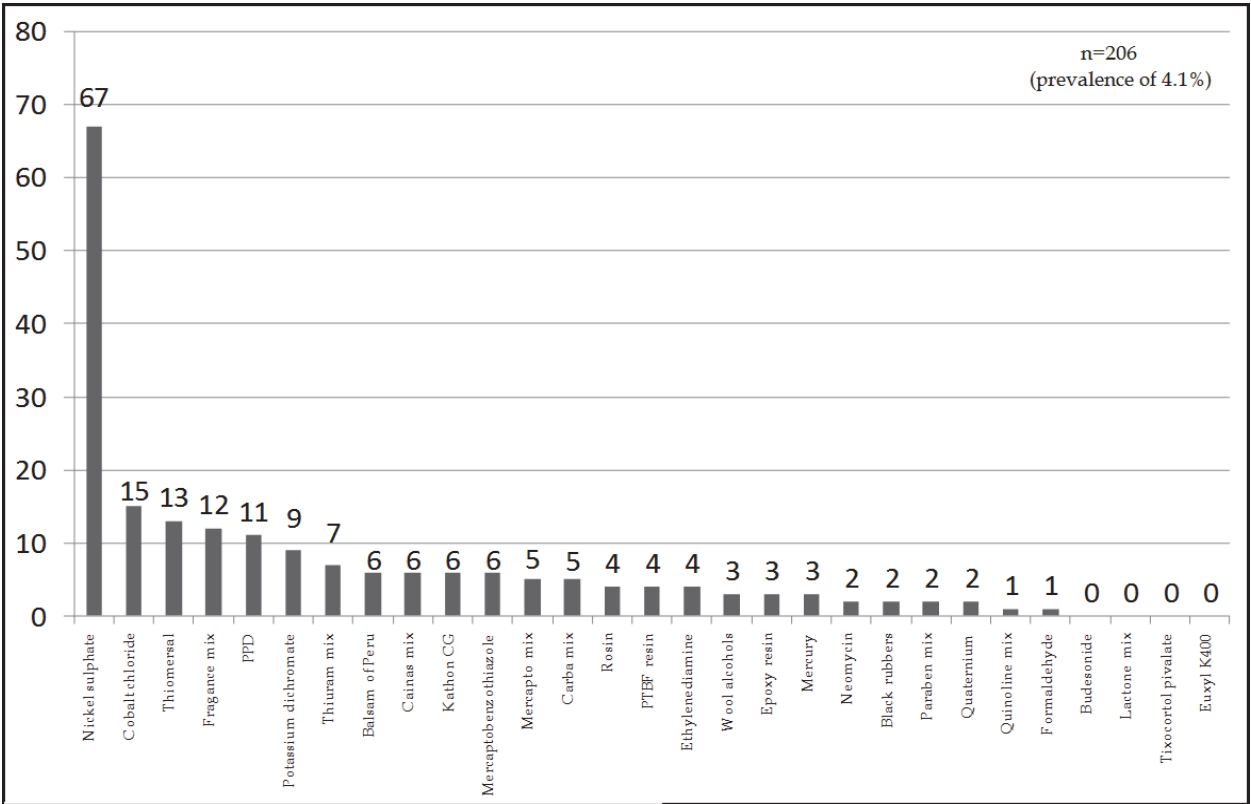


Fig. 1. Etiologic agents for contact dermatitis in Alergológica-2005.



Immunology Laboratory Abelló undertook the “Alergológica 2005” study with the aim of obtaining epidemiologic, clinical and socioeconomic information on allergic patients seen and treated by Allergology specialists in Spain.

In the particular case of contact dermatitis, the results from epicutaneous tests from the standard Spanish series for contact dermatitis were recorded by taking readings at 48 and 96 hours, and evaluating erythema-infiltration, papules and vesicles. Two hundred-six cases of contact dermatitis were diagnosed, which represents a prevalence of 4.1%. The mean age of the patients was 42.5 years and females clearly outnumbered men (2.5:1). In the etiology of contact dermatitis (Figure 1), the leading causes were metals, nickel and cobalt, together with chromium, with a total of 91 cases. Thiomersal is in third place with 13 cases, which represents 6.2% of all causes (Muñoz-Lejarazu, 2009).

3.5 Current view on the spectrum of contact allergy to important sensitizers across Europe

In 1996 a European surveillance network was created to analyze routinely collected data in various contact allergy units in several European countries (European Surveillance System on Contact Allergies [ESSCA]; [www.essca-dc.org](http://www.essca-dc.org)). ESSCA has been fully operational since 2001, with several surveillance networks currently participating, among them the British Contact Dermatitis Group; the IVDK in Germany, Switzerland, and Austria; the Northeast Italian Contact Dermatitis Group; and, more recently, the 5 hospital dermatology departments affiliated with the Spanish Group for Research Into Contact Dermatitis and Skin Allergy/Spanish Surveillance System on Contact Allergies (Hospital del Mar, Barcelona; Hospital La Princesa, Madrid; University General Hospital, Alicante; Complejo Hospitalario Universitario, Santiago de Compostela; and University Hospital Puerto Real) (García-Gavín et al, 2011). Nickel sulphate remains the most common allergen with standardized prevalences ranging from 19.7% (central Europe) to 24.4% (southern Europe). While a number of allergens shows limited variation across the four regions, such as

1.	Contact allergy was independent of enhanced IgE responsiveness.
2.	The median prevalence of contact allergy was 20% (adults 15–69 years).
3.	Contact allergy to a wide range of allergens as well as multiple contact allergy was observed in both children and adults.
4.	Contact allergy was most commonly observed against nickel, fragrances, and thimerosal.
5.	The proportion of nickel allergy out of contact allergy to at least 1 allergen has been increasing significantly over the past 4 decades.
6.	The median prevalence of nickel allergy among women was 17.1%.
7.	A median prevalence of 81.5% women, have pierced ears.
8.	Pierced ears are a strong risk factor for nickel allergy.
9.	Nickel contact allergy may be associated with hand eczema in women.
10.	Heavy smoking may be a risk factor for nickel allergy.

Table 4. Main findings from epidemiological population-based studies (published between 1966 and 2007) investigating contact allergy in the general population or subgroups of the general population (Thyssen et al, 2007).

Myroxylon pereirae (5.3-6.8%), cobalt chloride (6.2-8.8%) or thiuram mix (1.7-2.4%), the differences observed with other allergens may hint on underlying differences in exposures, for example: dichromate 2.4% in the UK (west) versus 4.5-5.9% in the remaining EU regions, methylchloroisothiazolinone/methylisothiazolinone 4.1% in the South versus 2.1-2.7% in the remaining regions (Uter et al, 2009).

The continuous collection and analysis of data within multicenter clinical epidemiology offer practical findings. Thyssen et al (2007) described main findings from epidemiological population-based studies (Table 2) investigating contact allergy in the general population or subgroups of the general population.

4. Occupational contact dermatitis

Work-related dermatoses, in particular hand dermatitis, are still among the most prevalent occupational diseases. Understanding the epidemiology of OCD is essential to determine etiologic factors of the disease and to make recommendations for its prevention.

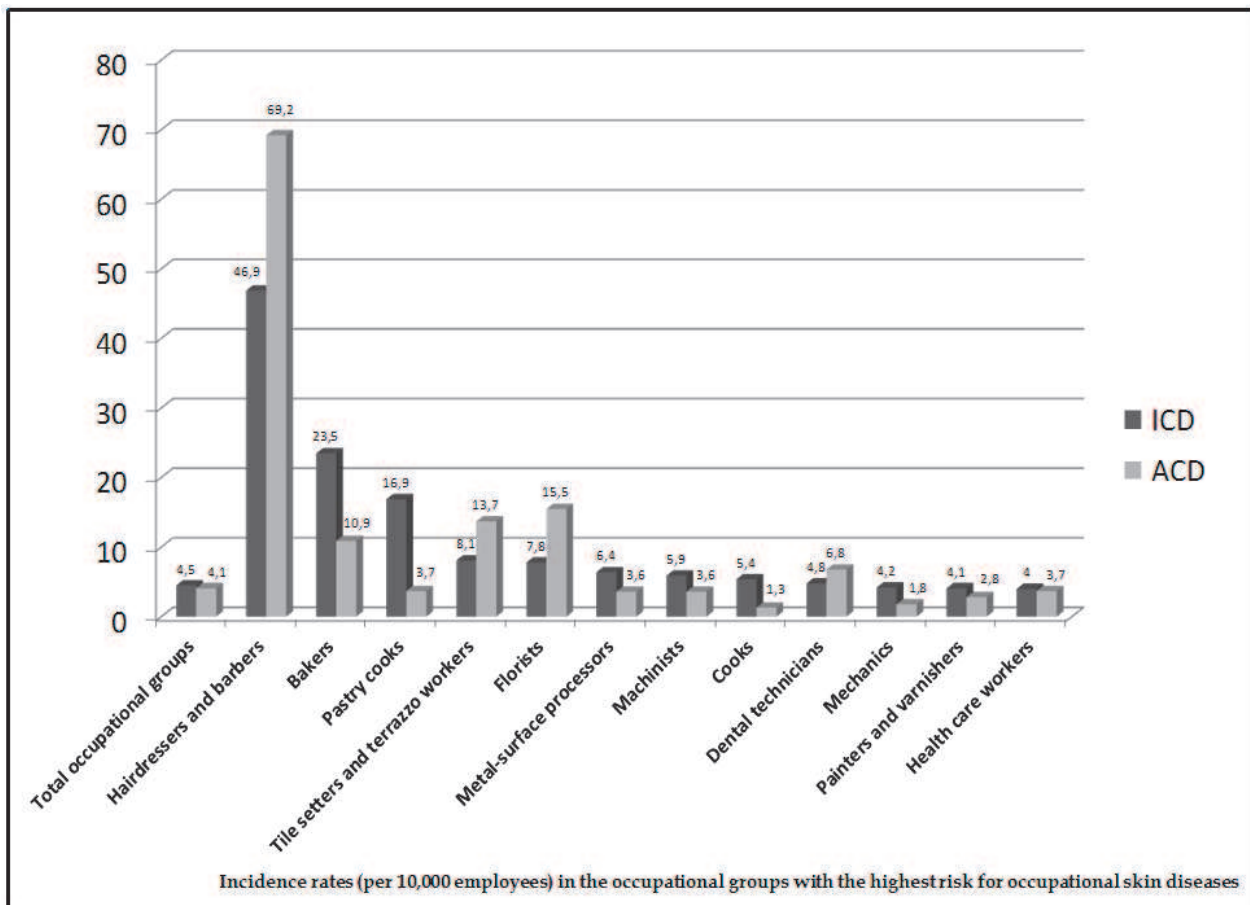


Fig. 2. Incidence rates of ICD and ACD in the occupational groups with the highest risk for occupational skin diseases (Diepgen & Coenraads PJ, 2000).

Different professions have differing risks for occupational skin disease. Those at the highest risk for a contact dermatitis are hairdressers (yearly rate 120/100,000), printers (rate

71/100,000), machine tool operatives (rate 56/100,000), chemical/petroleum plant operatives (rate 45/100,000), assemblers (rate 35/100,000), and machine tool setters (rate 34/100,000) (Cherry et al, 2000). Accurate estimates of the incidence of occupational skin disease are difficult to find but a recent report from the EPIDERM and OPRA occupational skin disease surveillance project suggests a rate of 13 per 100 000 per year 5 and a prevalence of 15 per 10,000 of those ever employed has been quoted (Cherry et al, 2000).

Occupational disease registries provide national incidence data based on the notification of occupational skin diseases and are available in many countries. Although the comparison of national data are hampered by differences across countries in reporting and the definition of occupational diseases, the average incidence rate of registered occupational contact dermatitis in some countries lies around 0.5-1.9 cases per 1,000 full-time workers per year (Dickel et al, 2002; Halkier-Sorensen, 1996). The highest incidence rates were seen in hairdressers (Diepgen et al, 2000). In Figure 2, the incidence rates of ICD and ACD of employees of the twelve groups with the highest risk for an occupational skin disease are presented.

#### 4.1 OCD in different work forces

The majority of work-related dermatoses, in particular hand dermatitis, comprise contact dermatitis (90-95%); the rest are of other dermatoses such as contact urticaria, oil acne, chloracne, chemically-induced leucoderma, and infections. In this section, different “work-related OCD” are discussed.

**Health care workers** (especially nurses) are often affected by OCD, whose “occupational sensitization pattern” comprises thiuram (rubber compounds), thiomersal (vaccine preservative) and several biocides (glutaraldehyde, formaldehyde, glyoxal and benzalkonium chloride) (Schnuch A et al, 1998). Operating-room staff is a subset of health-care workers (preparation and clean up may involve exposure to cleaning and disinfecting agents, and some workers may also have exposure to sterilizing agents, such as glutaraldehyde, and some workers may use ethylene oxide).

The frequency of OCD in **dental personnel** (dentists, dental assistants, dental technicians and orthodontics) has steadily increased over the last decades and currently considered to be about 40% (Uveges et al, 1995).

Hand eczema is a well-known and potentially severe drawback to the **hairdressing profession**. Hair cosmetic producers provide the hairdresser with a great variety of chemicals to fulfil stylist and customer desires. Smit et al studied a cohort of apprentice hairdressers (n=74) and nurses (n=111) and found an average incidence rate of hand dermatitis of 32.8 cases/100 person-years for the hairdressers, compared with 14.5 cases/100 person-years for the nurses (Smit et al, 1994).

**Construction workers** (bricklayers, manufacturers of concrete elements...) are in contact with wet cement products in the form of mortar or concrete. ACD due to hexavalent chromium in cement is still the most important contact allergy. Also, other substances have been identified (e.g., cobalt, tuber additives, epoxy resin, hexamethylenediamine and isophorondiamine) (Geier & Struppek, 1995).

**Metal workers** are exposed to numerous exogenous factors that play a substantial role in the development of ACD as well as ICD. Even though nickel is regarded as the most frequent source of all reported metal allergies, metal-work fluids are the most important cause of irritant hand dermatitis (also exposed to other chemical irritants, such as cleaning detergents, solvents and degreasers) (Itchner L et al, 1996). Metal polishers remove excess metal and surface defects from various items such as the accessory parts of cars. The most commonly polished metals are aluminium, brass, bronze and zinc (Adams 1999).

#### 4.2 Social and economic impact of contact dermatitis

The total economic impact of OCD is high according to the following costs (Diepgen & Coenrads, 2000):

- Direct costs of medical care, workers compensation or disability payments.
- Indirect costs associated with lost workdays and loss of productivity.
- Costs of occupational retraining.
- Costs attributable to the effects on the quality of life.

### 5. Conclusion

Numerous studies have investigated the prevalence and risk factors of hand eczema in the general population. Contact sensitization has become a significant public health problem. In many parts of the world, more than 20% of the adult population is suffering from contact allergy. The profile of sensitizations may differ in each country. However, nickel sulphate is the most prevalent allergen practically everywhere. Patch testing remains the gold standard for the diagnosis of ACD. Quality control of patch testing is both a prerequisite for, and an objective of, clinical epidemiology of contact dermatitis. Publications based on data of patients visiting dermatology clinics and/or patch testing units cannot be used to directly derive population related incidence or prevalence estimates.

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### 7. References

Adams RM (1990). Metal polishers. In: Adams RM (ed) Occupational skin disease, 2<sup>nd</sup> ed; Saunders, Philadelphia, pp 638-639, ISBN 0-7216-2926-1.

- Agrup G (1969). Hand eczema and other hand dermatosis in South Sweden. *Acta Derm Venereol*, Vol 49, (Suppl. 61): 1-91, ISSN 0001-5555.
- Akasya-Hillenbrand E, Ozkaya-Bayazit E (2002). Patch test results in 542 patients with suspected contact dermatitis in Turkey. *Contact Dermatitis*, Vol.46, No.1 (January 2002), pp. 17-23, ISSN 0105-1873
- Astner S, Burnett N, Rius-Díaz F, Doukas AG, González S, González E (2006). Irritant contact dermatitis induced by a common household irritant: a noninvasive evaluation of ethnic variability in skin response. *J Am Acad Dermatol*, Vol.54. No.3 (March 2006), pp. 458-465, ISSN 0190-9622
- Balato A, Balato N, Di Costanzo L, Ayala F (2011). Contact sensitization in the elderly. *Clin Dermatol*, 2011 Vol.29, No.1 (January-February 2011), pp. 24-30, ISSN 0738-081X.
- Barros M A, Baptista A, Correia T M, Azevedo F (1991). Patch testing in children: a study of 562 schoolchildren. *Contact Dermatitis*, Vol.25, No.3 (September 1991), pp. 156-159, ISSN 0105-1873
- Bo K, Thoresen M, Dalgard F (2008). Smokers report more psoriasis, but not atopic dermatitis or hand eczema: results from a Norwegian population survey among adults. *Dermatology*, Vol.216, No.1 (January 2008), pp. 40-45, ISSN 1018-8665.
- Brisman J, Meding B, Jarvholm B (1998). Occurrence of self reported hand eczema in Swedish bakers. *Occup Environ Med*, Vol.55, No.11 (November 1998), pp. 750-754.
- Bruckner AL, Weston WL, Morelli JG (2000). Does sensitization to contact allergens begin in infancy? *Pediatrics*, Vol.105, No.1 (January 2000), pp. e3, ISSN 0031-4005
- Bruynzeel DP, Diepgen TL, Andersen KE, Brandão FM, Bruze M, Frosch PJ, et al G (2005) Monitoring the European Standard series in 10 centres: 1996-2000. *Contact Dermatitis*, Vol.53, No.3 (September 2005), pp. 146-149, ISSN 0105-1873
- Bryld L E, Hindsberger C, Kyvik K O, Agner T, Menné T (2003). Risk factors influencing the development of hand eczema in a population-based twin sample. *Br J Dermatol*, Vol.149, No.6 (December 2003), pp. 1214-1220, ISBN 0007-0963
- Carlsen BC, Thyssen JP, Menné T, Meldgaard M, Linneberg A, Nielsen NH, et al (2011). Association between filaggrin null mutations and concomitant atopic dermatitis and contact allergy. *Clin Exp Dermatol*, Vol.36, No.5 (July 2011), pp. 467-472, ISSN 0307-6938.
- Cherry N, Meyer JN, Adisesh A, Brooke R, Owen-Smith V, Swales C, Beck MH (2000). Surveillance of occupational skin disease: EPIDERM and OPRA. *Br J Dermatol*, Vol.142, No.6 (June 2000), pp. 1128-1134, ISBN 0007-0963
- Coenraads PJ, Goncalo M. Skin diseases with high public health impact. Contact dermatitis (2007). *Eur J Dermatol*, Vol.17, No.6 (November-December 2007), pp. 564-565, ISSN 1167-1122.
- Davis JA, Visscher MO, Wickett RR, Hoath SB (2010). Influence of tumour necrosis factor- $\alpha$  polymorphism-308 and atopy on irritant contact dermatitis in healthcare workers. *Contact Dermatitis*, Vol.63, No.6 (December 2010), pp. 320-332, ISSN 0105-1873
- de Jongh CM, Khrenova L, Verberk MM, Calkoen F, van Dijk FJ, Voss H, et al (2008). Loss-of-function polymorphisms in the filaggrin gene are associated with an increased susceptibility to chronic irritant contact dermatitis: a case-control study. *Br J Dermatol*, Vol.159, No.3 (September 2008), pp. 621-627, ISBN 0007-0963



- Devos SA & Van Der Valk PG. (2002) Epicutaneous patch testing. *Eur J Dermatol*, Vol.12, No.5 (September-October 2002), pp. 506-13, ISSN 1167-1122.
- Dickel H, Bruckner T, Bernhard-Klimt C, Koch T, Scheidt R, Diepgen TL (2002). Surveillance scheme for occupational skin disease in the Saarland, FRG: first report from BKH-S. *Contact Dermatitis*, Vol.46, No4 (April 2002), pp. 197-206, ISSN 0105-1873
- Diepgen TL & Coenrads PJ (2000). The epidemiology of occupational contact dermatitis. In: Kanerva L, Elsner P, Wahlberg JE, Maibach HI (ed). *Handbook of occupational dermatology*, 1<sup>st</sup> ed; Springer Verlag berlin Heidelberg New York, ISBN 3-540-064046-0, pp 3-16.
- Diepgen TL, Coenrads PJ (2000). The impact of sensitivity, specificity and positive predictive value of patch testing: the more you test, the more you get? *Contact Dermatitis*, Vol.42, No.6 (June 2000), pp. 315-7, ISSN 0105-1873
- Dotterud LK, Falk E S (1994). Metal allergy in north Norwegian schoolchildren and its relationship with ear piercing and atopy. *Contact Dermatitis*, Vol.31, No.5 (November 1994), pp. 308-313, ISSN 0105-1873
- Dotterud LK, Falk E S (1995). Contact allergy in relation to hand eczema and atopic diseases in north Norwegian schoolchildren. *Acta Paediatr*, Vol.84, No.4 (April 1995), pp. 402-406, ISSN 0001-656X.
- Dotterud LK, Smith-Sivertsen T (2007). Allergic contact sensitization in the general adult population: a population-based study from northern Norway. *Contact Dermatitis*, Vol.56, No.1 (January 2007), pp. 10-15, ISSN 0105-1873
- Fernández Vozmediano JM, Armario Hita JC (2005). Allergic contact dermatitis in children. *J Eur Acad Dermatol Venereol*, Vol.19, No.1 (January 2005), pp. 42-46, ISSN 0926-9959.
- Fowler J F, Duh M S, Chang J, Person J, Thorn D, Raut M, et al (2006). A survey-based assessment of the prevalence and severity of chronic hand dermatitis in a managed care organization. *Cutis*, Vol.77, No.6 (June 2006), pp. 385-392, ISSN 0011-4162.
- García-Gavín J, Armario-Hita JC, Fernández-Redondo V, Fernández-Vozmediano JM, Sánchez-Pérez J, Silvestre JF, et al (2011). Epidemiology of Contact Dermatitis in Spain. Results of the Spanish Surveillance System on Contact Allergies for the year 2008. *Actas Dermosifiliogr*, Vol.102, No.2 (March 2011), pp. 98-105, ISSN 0001-7310
- Geier J, Struppek K (1995). Amamnese-Auxilium für die berufsdermatologische Untersuchung von Mauren, Betobbauern, Fliesenlegern and Angehörigen verwandter Berufe. *Dermatosen in Beruf und Umwelt*, Vol.43, No.2 (January 1995), pp. 75-80, ISSN 03432432.
- Hald M, Berg N D, Elberling J, Johansen J D (2008). Medical consultations in relation to severity of hand eczema in the general population. *Br J Dermatol*, Vol.158, No.4 (April 2008), pp. 773-777, ISSN 0007-0963
- Halkier-Sorensen L (1996). Occupational skin diseases. *Contact Dermatitis*, Vol.35, Suppl 1:1-120, ISSN 0105-1873
- Hammonds LM, Hall VC, Yiannias JA (2009). Allergic contact dermatitis in 136 children patch tested between 2000 and 2006. *Intern J Dermatol*, Vol.48, No.3 (March 2009), pp. 271-274, ISSN 0011-9059.



- Itschner L, Hinnen U, Elsner P (1996) Skin risk assessment of metalworking fluids: A survey among Swiss suppliers. *Dermatology*, Vol.193, No.1 (January 1996), pp. 33-35, ISSN 1421-9832.
- Josefson A, Farm G, Stymne B, Meding B (2006). Nickel allergy and hand eczema-a 20-year follow up. *Contact Dermatitis*, Vol.55, No.5 (November 2006), pp. 286-290, ISSN 0105-1873
- Kavli G, Forde O H (1984). Hand dermatoses in Tromsø. *Contact Dermatitis*, Vol.10, No.3 (March 1984), pp. 174-177, ISSN 0105-1873
- Katsarou A, Armenaka M (2011). Atopic dermatitis in older patients: particular points. *J Eur Acad Dermatol Venereol*, Vol.25, No.1 (January 2011), pp. 12-18, ISSN 0926-9959.
- Lammintausta K, Kalimo KM, Fagerlund VL. Patch test reactions in atopic patients. *Contact Dermatitis*, Vol.26, No.4 (April 1992), pp. 234-240, ISSN 0105-1873.
- Lantinga H, Nater J P, Coenraads P J (1984). Prevalence, incidence and course of eczema on the hands and forearms in a sample of the general population. *Contact Dermatitis*, Vol.10, No.3 (March 1984), pp. 135-139, ISSN 0105-1873
- Lazarov A (2006). European Standard Series patch test results from a contact dermatitis clinic in Israel during the 7-year period from 1998 to 2004. *Contact Dermatitis*, Vol.55, No.2 (August 2006), pp. 73-76, ISSN 0105-1873
- Lerbaek A, Kyvik K O, Ravn H, Menné T, Agner T (2007). Incidence of hand eczema in a population-based twin cohort: genetic and environmental risk factors. *Br J Dermatol*, Vol.157, No.3 (September 2007), pp. 552-557, ISSN 0007-0963
- Lewis VJ, Statham BN, Chowdhury MMU (2004). Allergic contact dermatitis in 191 consecutively patch tested children. *Contact Dermatitis*, Vol.51, No.3 (September 2004), pp. 155-156, ISSN 0105-1873
- Lind M L, Albin M, Brisman J, Kronholm Diab K, Lillienberg L, Mikoczy Z, et al (2007) Incidence of hand eczema in female Swedish hairdressers. *Occup Environ Med*, Vol.64, No.3 (March 2007), pp. 191-195, ISSN 1351-0711.
- McCurdy SA, Wiggins TH, Seligman PJ, Halperin WE (1990). Assessing dermatitis in epidemiologic studies: occupational skin disease among California grape and tomato harvesters. *Am J Ind Med*, Vol.16, No.2 (March-April 1990), pp. 147-157, ISSN 0271-3586
- McFadden JP, Dearman RJ, White JM, Basketter DA, Kimber I (2011). The Hapten-Atopy hypothesis II: the 'cutaneous hapten paradox'. *Clin Exp Allergy*, Vol.41, No.3 (March 2011), pp. 327-337, ISSN 0954-7894
- Meding B (1990). Epidemiology of hand eczema in an industrial city. *Acta Derm Venereol Suppl (Stockh)*, Vol.153, No.1 (January 1990), pp. 1-43, ISSN 0365-8341.
- Meding B, Lidén C, Berglind N (2001). Self-diagnosed dermatitis in adults. Results from a population survey in Stockholm. *Contact Dermatitis*, Vol.45, No.6 (December 2001); pp. 341-345, ISSN 0105-1873
- Meding B, Jarvholm B (2002). Hand eczema in Swedish adults – changes in prevalence between 1983 and 1996. *J Invest Dermatol*, Vol.118, No.4 (April 2002), pp. 719-723, ISSN 0022-202X
- Meding B, Jarvholm B (2004). Incidence of hand eczema-a population-based retrospective study. *J Invest Dermatol*, Vol.122, No.4 (April 2004), pp. 873-877, ISSN 0022-202X

- Meding B, Swanbeck G (1987). Prevalence of hand eczema in an industrial city. *Br J Dermatol*, Vol.116, No.5 (May 1987), pp. 627-634, ISSN 0007-0963
- Meding B, Swanbeck G. Predictive factors for hand eczema (1990). *Contact Dermatitis*, Vol.23, No.3 (September 1990), pp. 154-161, ISSN 0105-1873
- Meding B, Wrangsjö K, Hosseiny S, Andersson E, Hagberg S, Toren K, et al (2006). Occupational skin exposure and hand eczema among dental technicians-need for improved prevention. *Scand J Work Environ Health*, Vol.32, No.3 (June 2006), pp. 219-224, ISSN 0355-3140
- Meijer C, Bredberg M, Fischer T, Widstrom L (1995). Ear piercing, and nickel and cobalt sensitization, in 520 young Swedish men doing compulsory military service. *Contact Dermatitis*, Vol.32, No.3 (March 1995), pp. 147-149, ISSN 0105-1873
- Meneghini CL, Angelini G (1984). Primary and secondary sites of occupational contact dermatitis. *Dermatosen in Beruf und Umwelt*, Vol.32, No.6 (November-December 1984), pp. 205-207, ISSN 03432432.
- Menné T, Borgan O, Green A (1982). Nickel allergy and hand dermatitis in a stratified sample of the Danish female population: an epidemiological study including a statistic appendix. *Acta Derm Venereol*, Vol.62, No.1 (January 1982), pp. 35-41, ISSN 0001-5555
- Menné T, Knudsen B (1997). Clinical data in the classification of contact allergens. In: Flyvholm A-A-, Andersen KE, baranski B, Sarlo K (eds). Criteria for classification of skin and airway-sensitizing substances in the work and general environments. *WHO Regional Office for Europe*, Copenhagen, pp 91-100, EUR/ICP/EHPM 05 02 01.
- Moberg C, Alderling M, Meding B (2009). Hand eczema and quality of life: a population-based study. *Br J Dermatol*, Vol.161, No.2 (August 2009), pp. 397-403, ISSN 0007-0963
- Modjtahedi SP, Maibach HI. Ethnicity as a possible endogenous factor in irritant contact dermatitis: comparing the irritant response among Caucasians, blacks, and Asians (2002). *Contact Dermatitis*, Vol.47, No.5 (November 2002), pp. 272-278, ISSN 0105-1873
- Montnemery P, Nihlen U, Lofdahl C G, Nyberg P, Svensson A (2005). Prevalence of hand eczema in an adult Swedish population and the relationship to risk occupation and smoking. *Acta Derm Venereol*, Vol.85, No.5 (September 2005), pp. 429-432, ISSN 0001-5555
- Mortz CG, Lauritsen JM, Bindslev-Jensen C, Andersen KE (2001). Prevalence of atopic dermatitis, asthma, allergic rhinitis, and hand and contact dermatitis in adolescents. The Odense Adolescence Cohort Study on Atopic Diseases and Dermatitis. *Br J Dermatol*, Vol.144, No.3 (March 2001), pp. 523-532, ISSN 0007-0963
- Mortz C G, Lauritsen J M, Bindslev-Jensen C, Andersen K E (2002). Contact allergy and allergic contact dermatitis in adolescents: prevalence measures and associations. The Odense Adolescence Cohort Study on Atopic Diseases and Dermatitis (TOACS). *Acta Derm Venereol*, Vol.82, No.5 (September 2002), pp. 352-358, ISSN 0001-5555
- Muñoz Lejarazu D (2009). Contact dermatitis: Alergológica-2005. *J Investig Allergol Clin Immunol*, Vol.19, Suppl 2:34-6, ISSN 1018-9068

- Nedorost ST, Stevens SR. Diagnosis and treatment of allergic skin disorders in the elderly. *Drugs. Drugs Aging*, 2001 Vol.18, No.11 (December 2001), pp. 827-835, ISSN 1170-229X.
- Nielsen NH, Linneberg A, Menné T, Madsen F, Frølund L, Dirksen A, et al (2001a) Allergic contact sensitization in an adult Danish population: two cross-sectional surveys eight years apart (the Copenhagen Allergy Study). *Acta Derm Venereol*, Vol.81, No.1 (January-February 2001), pp. 31-4, ISSN 0001-5555
- Nielsen NH, Linneberg A, Menné T, Madsen F, Frølund L, Dirksen A, et al (2001b). Persistence of contact allergy among Danish adults: an 8-year follow-up study. *Contact Dermatitis*, Vol.45, No.6 (December 2001), pp. 350-353, ISSN 0105-1873
- Nielsen N H, Linneberg A, Menne T, Madsen F, Frølund L, Dirksen A, Jørgensen T (2002a). The association between contact allergy and hand eczema in 2 cross-sectional surveys 8 years apart. *Contact Dermatitis*, Vol.47, No.2 (August 2002), pp. 71-77, ISSN 0105-1873
- Nielsen N H, Linneberg A, Menné T, Madsen F, Frølund L, Dirksen A, et al (2002b). Incidence of allergic contact sensitization in Danish adults between 1990 and 1998; the Copenhagen Allergy Study, Denmark. *Br J Dermatol*, Vol.147, No.3 (September 2002), pp. 487-492, ISSN 0007-0963
- Nielsen N H, Menne T (1992). Allergic contact sensitization in an unselected Danish population. The Glostrup Allergy Study, Denmark. *Acta Derm Venereol*, Vol.72, No.6 (November 1992), pp. 456-460, ISSN 0001-5555
- Ortengren U, Andreasson H, Karlsson S, Meding B, Barregard L (1999). Prevalence of self-reported hand eczema and skin symptoms associated with dental materials among Swedish dentists. *Eur J Oral Sci*, Vol.107, No.6 (December 1999), pp. 496-505, ISSN 0909-8836
- Peltonen L (1979). Nickel sensitivity in the general population. *Contact Dermatitis*, Vol.5, No.1 (January 1979), pp. 27-32, ISSN 0105-1873
- Prakash AV, Davis MD (2010) Contact dermatitis in older adults: a review of the literature. *Am J Clin Dermatol*, 2010 Vol.11, No.6 (December 2010), pp. 373-381, ISSN: 1175-0561.
- Robinson MK. Population differences in skin structure and physiology and the susceptibility to irritant and allergic contact dermatitis: implications for skin safety testing and risk assessment (1999). *Contact Dermatitis*, Vol.41, No.2 (August 1999), pp. 65-79, ISSN 0105-1873
- Rockl H, Muller E, Hiltermann W (1966). On the prognostic value of positive skin tests in infants and children. *Arch Klin Exp Dermatol*, Vol.226, No.4 (October 1966), pp. 407-419, ISSN 0300-8614
- Ruff CA, Belsito DV (2006). The impact of various patient factors on contact allergy to nickel, cobalt, and chromate. *J Am Acad Dermatol*, Vol.55, No.1 (July 1966), pp. 32-39, ISSN 0190-9622
- Rui F, Bovenzi M, Prodi A, Fortina AB, Romano I, Peserico A, et al (2010). Nickel, cobalt and chromate sensitization and occupation. *Contact Dermatitis*, Vol.62, No.4 (April 2010), pp. 225-231, ISSN 0105-1873

- Saint-Mezard P, Rosieres A, Krasteva M, Berard F, Dubois B, Kaiserlian D et al. Allergic contact dermatitis (2004). *Eur J Dermatol*, Vol.14, No.5 (September-October 2004), pp. 284-295, ISSN 1167-1122
- Schafer T, Bohler E, Ruhdorfer S, Weigl L, Wessner D, Filipiak B, et al (2001). Epidemiology of contact allergy in adults. *Allergy*, Vol.56, No.12 (December 2001), pp. 1192-1196, ISSN 0105-4538
- Schnuch A, Uter W, Geier J, Frosch PJ, Rustemeyer TH (1998). Contact allergies in health care workers. *Acta Derm Venereol Stockh*, Vol.78, No.5 (September 1998), pp. 358-363, ISSN 0365-8341.
- Seidenari S, Giusti F, Pepe P, Mantovani L (2005). Contact sensitization in 1094 children undergoing patch testing over a 7-year period. *Pediatr Dermatol*, Vol.22, No.1 (January-February 2005), pp. 1-5, On-line ISSN 1525-1470.
- Smit HA, Van Rijssen A, Vandenbroucke J, Coenraads PJ. (1994) Susceptibility to and incidence of hand dermatitis in a cohort of apprentice hairdressers and nurses. *Scand J Work Environ Health*, Vol.20, No.2 (April 1994), pp. 113-121, ISSN 0355-3140
- Sosted H, Hesse U, Menne T, Andersen KE, Johansen JD (2005). Contact dermatitis to hair dyes in a Danish adult population: an interview-based study. *Br J Dermatol*, Vol.153, No.1 (July 2005), pp. 132-135, ISSN 0007-0963
- Svedman C, Ekqvist S, Möller H, Bjork J, Gruvberger B, Holmstrom E, Bruze M (2007). Unexpected sensitization routes and general frequency of contact allergies in an elderly stented Swedish population. *Contact Dermatitis*, Vol.56, No.6 (June 2007), pp. 338-343, ISSN 0105-1873
- Thyssen JP, Linneberg A, Menné T, Johansen JD (2007). The epidemiology of contact allergy in the general population - prevalence and main findings. *Contact Dermatitis*, Vol.57, No.5 (November 2007); pp. 287-99, ISSN 0105-1873
- Thyssen JP, Linneberg A, Menne T, Nielsen NH, Johansen JD (2009). The prevalence and morbidity of sensitization to fragrance mix I in the general population. *Br J Dermatol*, Vol.161, No.1 (July 2009), pp. 95-101, ISSN 0007-0963
- Thyssen JP, Johansen JD, Linneberg A, Menné T (2010). The epidemiology of hand eczema in the general population - prevalence and main findings. *Contact Dermatitis*, Vol.62, No.2 (February 2010), pp. 75-87, ISSN 0105-1873
- Thyssen JP, Johansen JD, Menné T, Nielsen NH, Linneberg A (2010). Effect of tobacco smoking and alcohol consumption on the prevalence of nickel sensitization and contact sensitization. *Acta Derm Venereol*, Vol.90, No.1 (January 2010), pp. 27-33, ISSN 0001-5555
- Uter W, Räämsch C, Aberer W, Ayala F, Balato A, Beliauskienė A, et al (2009). The European baseline series in 10 European Countries, 2005/2006 - results of the European Surveillance System on Contact Allergies (ESSCA). *Contact Dermatitis*, Vol.61, No.1 (July 2009), pp. 31-38, ISSN 0105-1873
- Uveges RE, Grimwood RE, Slawsky LD, Marks JG Jr (1995) Epidemiology of hand dermatitis in dental personnel. *Mil Med*, Vol.160, No.7 (July 1995), pp. 335-338, ISSN 0026-4075
- Weston W L, Weston J A, Kinoshita J, Kloepper S, Carreon L, Toth S, Bullard D, Harper K, Martinez S (1986). Prevalence of positive epicutaneous tests among infants,

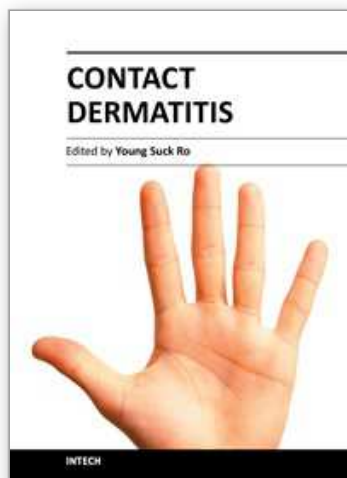
children, and adolescents. *Pediatrics*, Vol.78, No.6 (December 1986), pp. 1070–1074, ISSN 0031-4005

Yngveson M, Svensson A, Johannisson A, Isacsson A (2000). Hand dermatosis in upper secondary school pupils: 2-year comparison and follow-up. *Br J Dermatol*, Vol.142, No.3 (March 2000), pp. 485–489, ISSN 0007-0963

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This book centralizes on the subject of contact dermatitis. It aims to provide the dermatologist with a sound base of clinical wisdom and key scientific findings to make an accurate diagnosis and management plan. **SPECIAL FEATURES:** - Describes numerous possible allergens that cause contact dermatitis. - Provides details of research in the basic sciences to help our readers understand more about contact dermatitis. - Provides a comprehensive description of recently developed methods that have evolved for the diagnosis of contact dermatitis. - Provides a concise, clinically focused, user-friendly format, which can rapidly improve your knowledge of the disease. The past decade has seen significant changes in contact dermatitis. Our understanding of the pathophysiology, our diagnostic approaches, and management of the disease has evolved. In this volume, some of the world's most highly regarded experts discuss areas that have seen significant improvement, as well as areas for future development.

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