

Prevention of work-related skin problems in student auxiliary nurses

An intervention study

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The present study was designed as an intervention study to investigate whether an educational programme was efficient in preventing work-related skin problems on the hands. 107 student auxiliary nurses (61 in the intervention group and 46 in the control group) were followed during the first 10 weeks of their initial practical training in county hospitals. The intervention group was given an educational programme before the practical training started. For evaluation the participants had questionnaires, clinical examination of the hands, measurement of transepidermal water loss (TEWL) and patch testing. The use of hand disinfectants, which was discouraged in the educational programme, was significantly lower in the intervention group as compared to the control group ($p=0.002$). 48% of the intervention group and 58% of the control group had aggravation of skin problems during practical training ($p>0.05$). Use of hand disinfectant agents was significantly associated with aggravation of skin problems ($p=0.016$). A significant increase in TEWL for the control group ($p<0.005$), but not for the intervention group, was seen after 10 weeks of practical training. In conclusion, the present intervention study shows promising results from the use of an educational programme.

Key words: wet work; irritant contact dermatitis; intervention study; skin care programme; TEWL; occupational; health care workers; auxiliary nurses. © Munksgaard, 2001.

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Contact dermatitis is a major occupational disease in the industrialized world and people in wet work occupations have an increased risk of development of skin problems on their hands (1). Irritant contact dermatitis (ICD) results from contact with irritant substances and is more common than allergic contact dermatitis (1). Epidemiological and clinical studies have identified risk factors for development of skin problems in wet occupations and experimental studies have identified preventive measures that may reduce the risk of developing ICD (Table 1). On the basis of these studies an evidence-based skin care programme was prepared. The present study was undertaken to evaluate if an educational programme, including an evidence-based skin care programme, for student auxiliary nurses could reduce skin problems occurring during their early practical training in county hospitals.

Materials and Methods

Population

107 student auxiliary nurses were included in the study. The intervention group included 61 students (3 classes) from one school and the control group included 46 students (3 classes) from another school, both located in the County of Copenhagen. Power analysis was calculated on the basis of TEWL values (standard deviations and minimal difference to be detected) (2).

Intervention

The intervention group was given an educational programme. In each intervention class a 2×2 h course was given with an interval of 14 days. The course was conducted by 2 teachers and was given immediately before the students had their initial

Table 1. Skin care programme. Evidence-based recommendations for employees in wet-work occupations.

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- Wash your hands in lukewarm water (5). Rinse and dry your hands thoroughly after washing.
 - Use protective gloves when starting wet-work tasks (6,7).
 - Protective gloves should be used when necessary but for as short a time as possible (8–11).
 - Protective gloves should be intact, and clean and dry inside.
 - When using protective gloves for more than 10 min wear a cotton glove underneath (9).
 - Do not wear finger rings at work (12).
 - Do not use disinfectant agents unless they are recommended for special hygienic reasons (12–14).
 - Apply moisturizers on your hands during the working day or after work (15–17). Select a moisturizer which is lipid rich (18) and free from fragrance and with preservatives having the lowest allergen potential (19).
 - The moisturizer must be applied all over the hands inclusive webs, finger tips and dorsal aspects (20).
 - Take care also when you do domestic work (use protective gloves when doing dish-washing and cleaning) (21) and when the weather is cold with low humidity (use insulating gloves) (22).
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practical training. The educational programme was planned in detail to ensure identical information of the 3 classes and included an informative video (3) and a booklet (4), which students were asked to read in between the 2 teaching sessions. The educational programme was based on an interactive dialogue based on the student's own experiences of wet work. The main programme topics included an introduction to the physiology of normal and diseased skin and to allergic and irritant contact dermatitis. As part of the intervention an evidence-based skin care programme was introduced, using knowledge from epidemiological and clinical experimental studies about proper glove use, correct hand wash, use of hand disinfectants and moisturizers (5–22). The skin care programme is outlined in Table 1. The teachers included a doctor, a nurse and a pharmacist. As part of the intervention all participants in the intervention group were given a moisturizer* (100 g), with a documented positive effect on ICD (17, 18).

Student auxiliary nurses

All students had started education as auxiliary nurses 10 weeks before entering the study. The education comprises 3 periods of 3 months of theoretical education followed by 3 months of practical training. All student auxiliary nurses had their initial practical training in departments of surgery or internal medicine in county hospitals (8 different hospitals situated in the County of Copenhagen). The students had identical exposures since working conditions were similar in the different hospitals.

Study design

All participants were examined in the week prior to practical training (1st examination) and the ex-

amination was repeated after the first 10 weeks of training (2nd examination). All students were examined within a period of 10 days in order to minimize bias because of changes in climate (temperature and humidity). The study was conducted in the months of January–April. The local ethical committee approved the study and all participants gave informed written consent.

Evaluating methods

All students had questionnaires, underwent clinical examination of their hands and had measurements of TEWL taken.

Questionnaire

All participants were given a self-administered questionnaire at each examination. The questionnaire elements included were: demographic data (sex, age, etc.), occupational history, former dermatosis (atopic eczema, contact dermatitis), atopic disposition, and presence of skin symptoms on the hands. The second questionnaire included additional questions about daily exposure in the work place (wet work, glove use, moisturizers, disinfectant agents etc.)

Clinical examination

The clinical examination included registration of erythema, dryness, scaling, vesicles, papules, fissuring and lichenification on the hands. A scoring system as suggested by Meding et al. (23), which is based on the extent of eczema/skin irritation was used. The highest possible score for a participant was 74. Based on the number of points all participants were divided into 3 groups: 0 points (none), 1–5 points (mild eczema), >5 points (moderate to severe eczema). The same doctor performed the clinical examination throughout the study period.

* All moisturizers were fragrance-free and provided with full ingredient list but without the tradename.

Table 2. Demographic data

	Intervention	Control	<i>p</i>
age (mean and range)	28.1 (19–55) years	28.2 years (19–45)	n.s
sex (<i>n</i>)	57 w+4 m	39 w+7 m	n.s
participants (<i>n</i>)	61	46	n.s
participation (%)*	81	71	n.s
drop outs (<i>n</i>)	7	6	n.s
ear piercing (<i>n</i>)	55	43	n.s
atopic dermatitis (doctor-diagnosed**) (<i>n</i>)	3	3	n.s
previous hand eczema (doctor-diagnosed**) (<i>n</i>)	4	3	n.s
asthma/hay fever (<i>n</i>)	21	13	n.s
dish-washing machine (<i>n</i>)	13	1	<i>p</i> =0.003
children < 4 yrs (<i>n</i>)	5	6	n.s

*Data indicate in % how many subjects actually participated out of the possible number of students. **The question in the questionnaire was: "Has a doctor ever told you that you have atopic eczema (childhood eczema, atopic dermatitis)/hand eczema?"

Non-invasive measuring methods

Transepidermal water loss (TEWL) is the passive diffusion of water through stratum corneum, and is an indicator of the barrier function of the skin. 3 measurements of TEWL were taken from the back of the dominant hand with an evaporimeter (Servomed, Stockholm, Sweden), according to the guidelines given by the European Society of Contact Dermatitis (24). For acclimatization all participants were rested for 30–45 min before the TEWL measurements. The students were not allowed to use moisturizers on their hands the day measurements were taken and they were not allowed to wash hands 1 h prior to the examination. The results are given in $\text{gm}^{-2} \text{h}^{-1}$. The mean value obtained from the 3 test sites was used in the statistical analysis.

Patch testing

All participants were offered patch testing with selected allergens from the European standard series. A special panel with 8 selected allergens (TrueTest®) was delivered by ALK-Abelló, Hørsholm, Denmark. Patch testing was included in the study since sensitization may be a risk factor for development of occupational contact dermatitis. The patch test is a self-applicable adhesive tape and was mailed to the participants 1 week before the 2nd examination. The participants placed the adhesive tape on their backs and they removed it 2 days later and marked the location of the tape with a pen. Readings were performed on the following day as +, ++ and +++ according to the guidelines given by ICDRG. Allergens relevant for wet work employees were selected: nickel (ubiquitous), fragrance mix, formaldehyde and methylchloroisothiazolinone/methylisothiazolinone (skin care products, soaps), colophonium (adhesive materials, bandages), thiuram mix, mercapto mix and mercaptobenzothiazole (gloves).

Statistics

Statistical evaluation was done using the software package SPSS 10.0. Non-parametric tests were used for comparison of the 2 groups at the 1st and 2nd examinations, respectively (χ^2 and Mann-Whitney tests for independent samples) and for analysis of change over time within each group (Wilcoxon- and Marginal Homogeneity test for paired samples). A logistic binary regression model was used to investigate which factors were significant for prediction of skin problems at the 1st and 2nd examinations respectively. Candidate variables were taken into the regression model using a forward stepwise procedure. A significance level of 5% was chosen.

Results

Of the 107 student auxiliary nurses included in the study 13 participants dropped out during the training period (see below). The intervention group and the control group did not differ in main aspects at baseline (Table 2).

Behaviour

Data on daily behaviour/exposures are shown in Table 3. At the 2nd examination significantly more students in the control group used hand disinfectants compared with the intervention group ($p=0.002$). Working hours spent on wet work, frequency of hand washing, the use of gloves and moisturizers was equal in the 2 groups.

Self-reported skin problems

At the 1st examination 39% in the intervention and 32% in the control group had current skin

Table 3. Daily behaviour/exposures during the practical training

Number of hand washes	0–10	11–15	16–20	>20	
intervention/control (%)	12/18	22/23	28/28	38/31	n.s
Wet hands (h)	0–1 h		>1 h		
intervention/control (%)	72/78		28/22		n.s
Glove use (h)	0–1 h	1–2 h	>2 h		
intervention/control (%)	38/30	45/50	17/20		n.s
Cotton gloves	yes		no		
intervention/control (%)	4/0		96/100		n.s
Moisturizers	no use	1–2×	3–4×	>4×	
intervention/control (%)	6/3	24/25	18/25	53/48	n.s
Hand disinfectants	no use	rare use	1–3×	>3×	
intervention/control (%)	21/2	14/3	22/20	43/75	$p=0.002$

problems on their hands* ($p=0.43$). Whereas the figures for the 2nd examination were 56% in the intervention group and 44% in the control group ($p=0.26$). There was a non-significant increase in self-reported skin problems from the 1st to the 2nd examination in both the intervention group ($p=0.26$) and in the control group ($p=0.61$).

Clinical examination

Data on the clinical examination are given in Fig. 1. In both groups, a significant increase in the number of participants with skin problems from the 1st to the 2nd examination was found ($p<0.0005$). More students in the control group developed skin irritation or had aggravation of already existing skin irritation: 48% in the intervention group and 58% in the control group, a difference which was not statistically significant. All participants (except 1 in the intervention group) having skin problems at the 1st examination (>0 points) had aggravation of skin problems during the training. Data on prevalence and incidence (new cases) of skin problems are given in Table 4. 3 females with atopic eczema (all belonging to the control group) developed severe vesicular hand eczema during the training.

Measurements of transepidermal water loss

Results are shown in Fig. 2. A statistically significant increase in TEWL was found in the control group ($p<0.005$) after 10 weeks of training but not in the intervention group (Fig. 2). High basal TEWL ($>12 \text{ gm}^{-2} \text{ h}^{-1}$), which has been used as a threshold value in another field study (25), was not found to correlate with the degree of skin symp-

toms during the practical training (data not shown). Nor were TEWL scores significantly correlated with the degree of skin irritation that occurred during the practical training. Ambient humidity was 24–37% and room temperature was kept at 20–22°C.

Patch testing

Patch testing revealed that 25 % (13/53) in the intervention group and 38% (14/37) in the control group had nickel allergy ($p=0.35$). 2 participants had reactions to fragrance mix, 2 had reactions to colophonium and 1 had reaction to mercapto mix. 4 students did not volunteer for patch testing (1 in the intervention group and 3 in the control group).

Drop outs

7 in the intervention group and 6 in the control group dropped out and did not participate in the

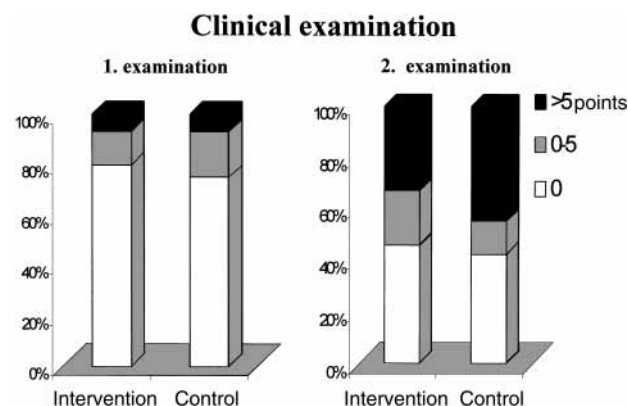


Fig. 1. Clinical examination. Skin symptoms were graded on a scale based on extent of eczema: 0 point (none), 1–5 points (mild eczema), >5 points (moderate to severe eczema). A significant increase was seen in both groups ($p<0.0005$) from the 1st to the 2nd examination. No significant difference was observed between intervention and control group either at 1st or at 2nd examination.

* Participants having 2 or more of the following symptoms: redness, vesicles, papules, itching, scaling, dryness, fissuring, rough and thickened or suppurate skin changes lately or at present were registered as having skin problems.

Table 4. Prevalence of students with skin problems (>0 point) at 1st examination and cumulative incidence of students developing skin problems during the practical training (new cases) (2nd examination).

	Intervention	Control	I versus C
prevalence, % (n)	25% (15/61)	20% (9/46)	$p=0.64$
cumulative incidence, % (n)	39% (16/39)	48% (15/31)	$p=0.64$

I: intervention. C: control

2. examination. 11 students stopped the education as auxiliary nurse, 1 dropped out because of severe hand eczema, and 10 of those who discontinued the education did so for reasons other than skin problems. 2 participants were, for practical reasons, unable to participate in the 2nd examination. No statistically significant differences between drop-outs and other participants were found in a binary logistic regression analysis with respect to basal characteristics (Table 2) or occurrence of skin problems at baseline (Fig. 1).

Logistic regression analysis

2 regression analyses were performed in order to assess possible risk factors/preventive measures for: (i) baseline level of skin problems and (ii) change in skin problems from 1st to 2nd examination. All students including the *drop outs* were included in the analysis for basal level of skin problems. The dependent variables were in both cases derived from the scoring system used for clinical evaluation of skin problems. Both dependent variables were dichotomous in order to perform binary logistic regression. The baseline level of skin problems was measured as *skin problems* (>0 point) versus *no skin problems* (0 points). The change in skin problems was measured as *aggravation* versus *unchanged/no aggravation*. In the first model, (i)

risk factors identified as significant were indicator variables for *doctor-diagnosed atopic dermatitis* (odds ratio: 4.89, confidence interval: 1.16–20.64, $p=0.027$). All variables listed in Table 2 as well as TEWL values and the presence of nickel allergy were taken into the analysis and the result is controlled for using dish-washing machines. In the 2nd model, (ii) *use of hand disinfectants* was a significant risk factor for aggravation of skin problems during the training (odds ratio: 6.13, confidence interval: 1.11–38.9, $p=0.016$). All variables listed in Tables 2 and 3 as well as TEWL-values and the presence of nickel allergy were taken into the analysis. The result is controlled for membership of the intervention/control group as well as for using dish-washing machines.

Discussion

In the present controlled intervention study we examined the effect of an educational programme for student auxiliary nurses. The programme had a significant positive effect on behaviour as well as on subclinical skin changes as evaluated by TEWL.

The students in the intervention group were discouraged from using hand disinfectant agents as part of the skin care programme. At the end of the intervention period significantly less students in the intervention group compared to the control group used hand disinfectant agents frequently. This difference in behaviour between the 2 groups reflects the influence of the intervention (educational programme). No statistically significant difference in behaviour between the intervention and the control group was found with respect to number of hand washes or use of gloves and moisturizers, which was also not addressed in the educational programme. Instead they were instructed how to wash hands and use gloves correctly. During the intervention period both groups had an increase in TEWL values but the increase was only statistically significant in the control group. This indicates that the control group at the 2nd examination had a more compromised barrier function of the skin than the intervention group, since an increase in TEWL is generally accepted to be a result of an impaired barrier function of the skin (24).

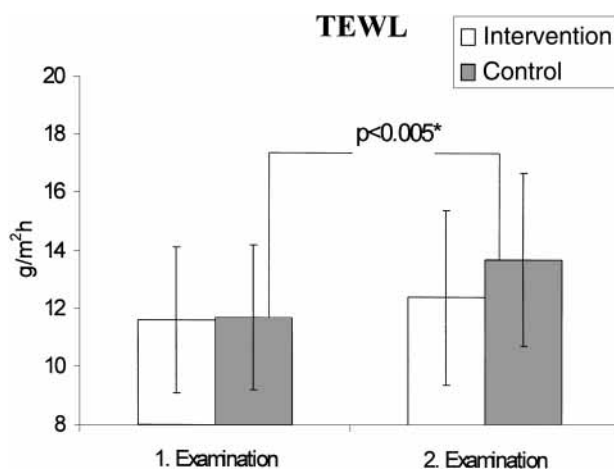


Fig. 2. Measurements of transepidermal water loss. Results are given in means and standard deviations. All students participating in the study had measurements of TEWL taken.

No significant differences between the 2 groups were observed regarding self-registered skin problems or by the clinical examination. More participants in the intervention group reported skin problems than in the control group at the 2nd examination. This is probably explained by an increased awareness of symptoms because of the educational programme (information bias).

In the present study, the focus in the clinical examination was on registration of skin symptoms/problems, and not on identification of hand eczema cases. Dry or chapped skin on the hands grades imperceptively into ICD (26), and the line dividing non-eczema from eczema may be hard to define and unrealistic in the real-life situation. The clinical examination revealed that a higher number of participants in the control group compared to the intervention group developed or had aggravation of already existing skin problems during the training; however, the difference was not statistically significant, and was either a true negative finding or a finding due to the small number of participants included. Few intervention studies within the dermatological area are currently available. Goh & Gan (27) examined the efficacy of a barrier cream and an after-work emollient for the prevention of cutting fluid dermatitis in 54 metalworkers. They found fewer cases of cutting fluid dermatitis in the group using after-work moisturizers compared to those using barrier creams and controls, but the study included too few participants for statistical significance to be obtained. Halkier-Sorensen and Thestrup-Pedersen tested the efficacy of a moisturizer in a crossover study in cleaners and kitchen assistants (28). They observed significant clinically increased dryness during periods without moisturizer treatment, but no changes in TEWL. The study was hampered by a large number of dropouts during the no-treatment period.

Atopic dermatitis was a significant risk factor for having skin problems before the training started, which supports earlier findings (21, 29–31). This underlines that a history of atopic dermatitis and wet work are often non-compatible factors. The reason that a high prevalence of nickel allergy was found in both groups is probably because most participants had been ear pierced (>90%) (32, 33). In the present study nickel allergy was not found to be a predictive factor for having skin problems, either before or during the training period. Epidemiological and clinical studies have shown that frequent use of hand disinfectants in wet work increases the risk of development of hand eczema (12, 13). In the present study the logistic regression analysis revealed a significant association between use of disinfectants and aggravation of skin problems, confirming the earlier studies.

Some studies have shown that skin irritation often occurs early in the career (12) or even within the first month of employment (25). Our study confirmed this. A Swedish study showed that having children <4 years and not using a dish-washing machine significantly increased the risk of getting hand eczema (21). A Danish study in hospital workers did not confirm this (34) and neither did the present study.

The use of bioengineering measuring methods in field studies has been discussed, since it is difficult to obtain optimal circumstances for measurements. In the present study an effort was made in order to ensure this. High basal TEWL was not associated with skin symptoms that occurred during the practical training as evaluated by the clinical examination. A similar result was found in a prospective follow-up study in baker and confectioner apprentices (25). They had a significant increase in TEWL during their first months of training, but TEWL scores failed to correlate with the development of skin damage.

Preventive measures within the area of occupational contact dermatitis are not only related to the use of moisturizers; although it is an important aspect many other factors are equally important. Workers at risk should be aware how contact dermatitis develops and what they can do to prevent skin problems/ICD by changing daily habits both at the workplace and at home. Researchers in the field of occupational dermatitis may, however, not always agree on what should be recommended. No general agreement exists on how often workers should be advised to apply moisturizers on their hands or if they should use moisturizers at the workplace or after work. We do not have enough facts about this matter at present and it is a challenge to obtain more evidence.

In conclusion, the present intervention study shows promising results from the use of an educational programme. Change of behaviour and less subclinical skin damage after intervention was statistically confirmed, and a decrease in clinical skin symptoms occurred although not statistically significant. We suggest that educational programmes should be tested in future large-scale intervention studies.

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References

1. Diepgen T L, Coenraads P J. The epidemiology of contact dermatitis. *Int Arch Occup Environ Health* 1999; 72: 496–506.
2. Agner T, Serup J. Individual and instrumental variations in irritant patch-test reactions- clinical evaluation and quantification by bioengineering methods. *Clinical and Experimental Dermatology* 1990; 15: 29–33.
3. Informational videoprogramme on hand eczema: "Pas godt på dine hænder – et program om håndeksem". (Take care of your hands. A program about hand eczema). 11 min, produced by the Department of Dermatology, Gentofte Hospital, University of Copenhagen, 1995.
4. Booklet "Rene hænder – uden skader", (Clean hands – without trauma). 17 pages. The Danish Working Environment Council, 1996.
5. Øhlenslæger J, Friberg J, Ramsing D W, Agner T. Temperature dependency of skin susceptibility to water and detergents. *Acta Dermato-venereologica* 1996; 7: 274–276.
6. Mellström G A, Wahlberg J E, Maibach H I. *Protective gloves for occupational use*. USA: CRC Press, 1994.
7. Uter W, Pfahlerberg A, Gefeller O, Schwanitz H J. Hand dermatitis in a prospectively-followed cohort of hairdressing apprentices: final results of the POSH study. Prevention of occupational skin disease in hairdressers. *Contact Dermatitis* 1999; 41: 280–286.
8. Ramsing D W, Agner T. Effect of glove occlusion on human skin (I). Short-term experimental exposure. *Contact Dermatitis* 1996; 34: 1–5.
9. Ramsing D W, Agner T. Effect of glove occlusion on human skin (II). Long-term experimental exposure. *Contact Dermatitis* 1996; 34: 258–262.
10. Burke F T J, Wilson N H F, Cheung S W. Factors associated with skin irritation of the hands experienced by general dental practitioners. *Contact Dermatitis* 1995; 32: 35–38.
11. Wrangsjö K, Osterman K, van Hage-hamsten M. Glove-related skin symptoms among operating theatre and dental care unit personnel (I). Interview investigation. *Contact Dermatitis* 1994; 30: 102–107.
12. Hansen K S. Occupational dermatoses in hospital cleaning woman. *Contact Dermatitis* 1983; 9: 343–351.
13. Stingeni L, Lapomarda V, Lisi P. Occupational hand dermatitis in hospital environments. *Contact Dermatitis* 1995; 33: 172–176.
14. Tupker R A, Schuur J, Coenraads P J. Irritancy of antiseptics tested by repeated open exposures on the human skin, evaluated by non-invasive methods. *Contact Dermatitis* 1997; 37: 213–217.
15. Hannuksela A, Kinnunen T. Moisturizers prevent irritant dermatitis. *Acta Dermato-venereologica* 1992; 72: 42–44.
16. Loden M, Andersson A C. Effect of topically applied lipids on surfactant-irritated skin. *Br J Dermatol Res* 1996; 134: 215–220.
17. Ramsing D W, Agner T. Preventive and therapeutic effects of a moisturizer. An experimental study on human skin. *Acta Dermato-venereologica* 1997; 77: 335–337.
18. Held E, Lund H, Agner A. Effect of different moisturizers on SLS-irritated human skin. 8th edition. *Contact Dermatitis* 2001; 43: in press.
19. Held E, Johansen J D, Agner T, Menné T. Contact allergy to cosmetics: testing with patients' own products. *Contact Dermatitis* 1999; 40: 310–315.
20. Wigger-Alberti W, Maraffio B, Wernli M, Elsner P. Self-application of a protective cream. Pitfalls of occupational skin protection. *Arch Dermatol* 1997; 133: 861–864.
21. Nilsson E, Mikaelsson B, Andersson S. Atopy, occupation and domestic work as risk factors for hand eczema in hospital workers. *Contact Dermatitis* 1985; 143: 216–223.
22. Agner T, Serup J. Seasonal variation of skin resistance to irritants. *Br J Dermatol* 1989; 121: 323–328.
23. Meding B, Swanbeck G. Epidemiology of different types of hand eczema in an industrial city. *Acta Dermato-venereologica* 1989; 69: 227–233.
24. Pinnagoda J, Tupker R A, Agner T, Serup J. Guidelines for transepidermal water loss (TEWL) measurement. *Contact Dermatitis* 1990; 22: 164–178.
25. Bauer A, Bartsch R, Stadel M, Schneider W, Grieshaber R, Wollina U, Gebhardt M. Development of occupational skin diseases during vocational training in baker and confectioner apprentices: a follow-up study. *Contact Dermatitis* 1998; 39: 307–311.
26. Wilkinson D S. *Hand eczema*. 2nd edition. Boca Raton USA: CRC Press, 2000.
27. Goh C L, Gan S L. Efficacies of a barrier cream and an afterwork emollient cream against cutting fluid dermatitis in metalworkers: a prospective study. *Contact Dermatitis* 1994; 31: 176–180.
28. Halkier-Sørensen L, Thestrup-Pedersen K. The efficacy of a moisturizer (Locobase) among cleaners and kitchen assistants during everyday exposure to water and detergents. *Contact Dermatitis* 1993; 29: 266–271.
29. Brisman J, Meding B, Järvholm B. Occurrence of self reported hand eczema in Swedish bakers. *Occup Environ Med* 1998; 55: 750–754.
30. Rystedt I. Hand eczema and long-term prognosis in atopic dermatitis (thesis). *Acta Dermato-venereologica* 1985; 117: 1–59.
31. Tacke J, Schmidt A, Fartasch M, Diepgen T L. Occupational contact dermatitis in bakers, confectioners and cooks: A population-based study. *Contact Dermatitis* 1995; 33: 112–117.
32. McDonagh A J, Wright A L, Cork M J, Gawkrödger D J. Nickel sensitivity: the influence of ear piercing and atopy. *Br J Dermatol* 1992; 126: 16–18.
33. Nielsen N H, Menné T. Nickel sensitization and ear piercing in an unselected Danish population. Glostrup Allergy Study. *Contact Dermatitis* 1993; 29: 16–21.
34. Barfred L, Rasmussen H H, Andersen K E. Incidence of hand eczema after surgical washing and use of surgical gloves. *Ugeskr Laeger* 1993; 26: 1258–1261.

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