

Skin protection in bakers' apprentices

ANDREA BAUER¹, DANIELA KELTERER¹, REINHARD BARTSCH², JAMES PEARSON⁵, MARTINA STADELER³, PETER KLEESZ⁴,
PETER ELSNER¹ AND HYWEL WILLIAMS⁶

¹Department of Dermatology and Allergology, and ²Institute of Occupational, Social and Environmental Medicine, Friedrich-Schiller-University, Jena, ³Research Centre for Applied System Safety and Industrial Medicine, Erfurt,

⁴Social Liability Insurance for the Food Processing Industry, Mannheim, Germany; ⁵Division of Public Health Sciences, School of Community Health Sciences, and ⁶Department of Dermatology, School of Medical and Surgical Sciences, University of Nottingham, England

Skin protection measures – barrier creams, protective gloves – and skin care are widely recommended for the prevention of occupational hand dermatitis (HD) in skin risk professions, but there is hardly anything known about uptake levels of the measures. The objective of this controlled intervention study was to quantify the uptake and maintenance of skin protection and skin care measures in first-year bakers' apprentices. A total of 94 first-year bakers' apprentices were included in the study in September 2000. The apprentices were assigned to the skin protection and control group class-wise to reduce contamination. The skin protection group comprised 39 apprentices who were trained in skin protection measures at the beginning and after 4 weeks of training. 55 apprentices were assigned to the control group representing no skin protection intervention. Standardized interviews took place at the beginning of the training and at 4 monthly follow-ups (FU). The uptake of skin protection measures differed significantly between the groups (barrier cream $p < 0.0001$, protective gloves $p = 0.046$, skin care $p = 0.025$). Barrier cream use in the skin protection group was incorporated in the daily routine very well from the start and reached 100% at the end of the examination period (4th FU). At this time, only 3.2% of the controls used barrier creams. The level of acceptance of protective gloves (4th FU: skin protection group 43.3%; controls 32.3%) was considerably lower than that of barrier creams. The initial level of regular skin care was high in both groups (skin protection group 67.6%, controls 61.7%). After the intervention the acceptance of skin care rose to 88.9% in the skin protection group compared to 68.1% in the controls (4th FU). The present study has shown that skin protection and skin care measures can be introduced successfully in the daily routine of a skin risk occupation and high uptake and maintenance rates can be achieved.

Key words: bakers' apprentices; barrier creams; maintenance; occupational hand dermatitis; protective gloves; skin care; skin protection; skin risk occupation; uptake. © Blackwell Munksgaard, 2002.

Accepted for publication 1 October 2001

Occupational skin disease has been a serious problem for social liability insurance in Germany for many years. In all, 80–90% of all costs for workers' compensation, medical treatment and occupational retraining for occupational skin disease is spent on occupational hand dermatitis (1). Measures of technical–organizational hazard control and individual protective measures are well known (2–5). For many wet work professions, barrier creams and protective gloves combined with adequate skin care have been widely recommended as the most important means of personal protective equipment. In recent years, progress has been made in the development of *in vitro* and *in vivo* methods to evaluate their efficacy, but hardly anything is known about the uptake levels at the work-

places (6–14). The aims and objectives of this controlled intervention study in first-year baker's apprentices was to evaluate the uptake and the maintenance of standard prevention techniques (barrier creams, protective gloves) and skin care (moisturiser). Primary outcome measures were uptake and maintenance of skin protection and skin care measures in the intervention group and the controls during the observation period of 6 months.

Methods

Study design and participants

A controlled intervention study was performed in 94 healthy first-year apprentices of an occu-

Table 1. Characteristics of the groups

	Controls (<i>n</i> = 55)	<i>n</i>	Skin protection group (<i>n</i> = 39)	<i>n</i>
Demographic profile				
Sex female <i>p</i> = 0.34	61.8%	34	71.5%	28
Age <i>p</i> = 0.28	16.9 ± 1.5	55	16.8 ± 0.9	39
Piercing <i>p</i> = 0.33	61.8%	34	71.5%	28
Costume jewellery allergy <i>p</i> = 0.70	25.5%	14	33.3%	13
Atopy				
No skin atopy	85.4%	47	87.2	34
Skin atopy <i>p</i> = 0.96	14.6%	8	12.8%	5
Rhinitis <i>p</i> = 0.44	16.4%	9	20.5%	8
Asthma <i>p</i> = 0.55	1.8%	1	5.1%	2
Skin protection and skin care habits at the initial examination				
Barrier creams <i>p</i> = 0.40	0%	0	2.7%	1
Gloves <i>p</i> = 0.13	14.5%	8	7.7%	3
Skin care <i>p</i> = 0.57	61.7%	34	67.6%	25

pational school for food processing trades in Thuringia, Germany. The study was set up to evaluate the uptake and maintenance of skin protection and skin care measures. Another aim of the study was to evaluate the possible protective effect of hardening of the skin by ultraviolet radiation, the results of which will be published elsewhere. The apprentices were assigned to the study groups class-wise to prevent contamination. Initially intended cluster randomization had to be abandoned due to short-term changes in the time tables prior to the onset of the training. The study started at the beginning of the training in September 2000. The apprentices were followed-up at 4-monthly examination time points until February 2001.

Written informed consent of the apprentices and their parents was mandatory. The study was approved by the ethics committee of the Friedrich-Schiller-University of Jena.

Intervention

The skin protection training was delivered at the beginning and after 4 weeks of training. It lasted 60 min and comprised a standardized video lecture (15 min), a taught lecture (15 min) and hands-on training (30 min). The video lecture (Turimed, Wallisellen, Switzerland) provided general information about skin hazards in skin risk professions, the structure and function of the skin and common occupational skin diseases as well as skin protection, cleaning and care. The taught lecture dealt with special information about skin hazards in the food processing industry and means of prevention. In the following hands-on training the correct ap-

plication and use of protective gloves, barrier creams and skin care was practised intensively. The topics taught and trained were underpinned by written information material. The main emphasis was laid on the regular, frequent and correct application of skin protection and skin care products and the comprehensive and correct use of protective gloves. The barrier cream (Excipial Protect®), skin care ointment (Lipoderm Lotio®) and protective gloves (Duo-Nit 901®, Solo Ultra 999®) were provided free of charge.

Documentation of the uptake of the skin protection and skin care measures

At the beginning of the training and at 4-monthly FUs a structured interview was performed as described in detail previously (15). To ensure reliability of the data collected and to minimize interobserver variability, the investigators were trained intensively prior to the study onset.

Statistical analysis

Descriptive statistics were performed on all data. Differences in the uptake and maintenance of prevention measures, in demographic and atopic profile as well as in workload between the groups were analysed using the χ^2 test. Statistical analysis was done using the software package SPSS 10 for WINDOWS.

Results

Characteristics of the groups

At the initial examination, 107 apprentices were interviewed. Thirteen apprentices had actual HD (controls $n = 3$, intervention group $n = 10$) and consecutively could not be included in the study, because these apprentices could have changed their skin protection and skin care habits after acquiring HD. The remaining 94 apprentices entered the study. The follow-ups (FU) took place at monthly intervals and 83 (88%) were seen at the 1st FU, 77 (82%) at the 2nd FU, 68 (72%) at the 3rd FU and 61 (65%) at the 4th FU. Changing numbers at the FUs were due to dropouts ($n = 7$, private reasons) and unavailability at the time of examination. The main characteristics of the groups were similar (Table 1). No significant differences were found between the groups concerning skin protection and skin care habits and exogenous risk factors like hand-washing frequency, work load at work and at home as described elsewhere (16).

Table 2. Levels of uptake of skin protection and skin care measures in the groups at the 1st, 2nd, 3rd and 4th FU

Measures	1st FU <i>n</i> = 83 (88%)		2nd FU <i>n</i> = 77 (82%)		3rd FU <i>n</i> = 68 (72%)		4th FU <i>n</i> = 61 (65%)	
	C %	SP %	C %	SP %	C %	SP %	C %	SP %
Barrier creams	0 <i>p</i> < 0.0001	75	0 <i>p</i> < 0.0001	83.9	5 <i>p</i> < 0.0001	96.4	3.2 <i>p</i> < 0.0001	100
Gloves	25.5 <i>p</i> < 0.005	47.2	17.4 <i>p</i> < 0.046	32.3	27.5 <i>p</i> < 0.17	32.1	32.3 <i>p</i> < 0.71	43.3
Skin care	68.1 <i>p</i> < 0.025	88.9	73.99 <i>p</i> < 0.16	87.1	77.5 <i>p</i> < 0.39	85.7	83.9 <i>p</i> < 0.71	90

Legend: C = controls, SP = skin protection.

Uptake and maintenance of skin protection and skin care measures

Skin protection and skin care measures were accepted and taken up to a different extent in both groups during the course of training (Table 2). As mentioned above, no significant differences were found in barrier cream, protective glove and moisturiser use in the groups at the initial examination (Table 1). Barrier creams were incorporated into the daily routine of the skin protection group very well from the start (75%, 1st FU) and reached 100% at the end of the examination period. The differences between the groups were highly significant over the entire study period ($p < 0.0001$). There was a significant difference in protective glove use for the 1st FU ($p = 0.005$) and 2nd FU ($p = 0.046$) between the groups, but the level of acceptance was considerably lower than for barrier creams. Differences between the groups diminished in the course of the training. Maintenance levels in both groups were 43.3% (skin protection group) and 32.2% (controls) after 6 months of training. The initial level of regular skin care was high in both groups. After the intervention, the acceptance of skin care rose to 88.9% in the intervention group ($p = 0.025$) compared to 68.1% in the controls (1st FU). Again, differences between the groups diminished in the course of the training. Uptake of skin care in both groups was 90% (skin protection group) and 83.9% (controls) at the end of the observation period (4th FU).

Discussion

Characteristics of the groups

Even though randomization was not possible, the distribution of the main characteristics between the intervention group and the controls were quite similar. No statistically significant differences were seen for atopy, sex, age, piercing, allergy to costume jewellery, occupational and leisure time activ-

ities or skin protection and skin care measures at the initial examination (Table 1). Confounding is therefore less likely to be the explanation for the significant differences in uptake and maintenance of skin protection and skin care measures documented during the course of training (Table 2).

Uptake and maintenance of skin protection and skin care measures

The skin protection intervention was tailor-made for the typical exposition profiles in baker's apprentices (15). To reinforce theoretical knowledge and dexterity, the intervention was repeated after 4 weeks and the follow-up examinations served as maintenance surveillance. The intervention was based on a conventional primary prevention approach in health promotion representing the medical model rather than the social model of health. The approach dealt mainly with the individual apprentice and focused on reducing morbidity rather than changing social, economic or environmental determinants of occupational health (17). The transtheoretical model of behaviour change, which describes behaviour change as a multistage process (precontemplation, contemplation, preparation, action and maintenance stage), was adopted and the lecture and hands-on training were designed to initiate and maintain the desired behaviour change (18, 19). Apprentices normally are not aware of the skin risk factors in their chosen occupation (20) and therefore are not thinking about and not planning to engage in skin protection (precontemplation). A few of them, especially those with a history of hand dermatitis, probably are in the contemplation stage. They know about their predisposition and see the necessity to change habits and want to do something about it in future. Some of them may have already thought about using skin protection measures from the start of the training (preparation) or do so inconsistently, but the new habits are not yet totally integrated into

their lifestyle (action). Ideally, an intervention should pick up all apprentices from the different stages of readiness for change and guide them to the maintenance stage, in which the desired behaviour is a stable part of the daily occupational routine. In real life this process often is more likely to be a cyclic process, with trying and failure, rather than a linear one (18, 19). The skin protection intervention was highly successful in long-term behaviour change (6 months) concerning barrier cream and skin care use. Glove use was accepted to a lesser extent. After 6 months of training, 100% of the apprentices in the intervention group claimed to use barrier creams regularly. Ninety percent used skin care, but only 43.3% used protective gloves. This indicated that the apprentices were convinced by the intervention and used the protective measures, especially those that they could apply without considerable effort and without attracting major attention. The main obstacle concerning glove use stated by the apprentices was the low acceptance of gloves by their instructors at the workplace. They often made fun of the apprentices when they used them for wet work and cleaning. Obviously, it is not enough to convince the apprentices; serious attempts have to be made to combat the 'macho-culture' in the bakeries and foster a more preventive-orientated occupational environment (21, 22).

There are a few other studies in occupational dermatology which have dealt with the acceptance, uptake or maintenance of skin protection and skin care measures. Mainly, data on hypothetical future use of study products or the cosmetic acceptance of the products are available (23–25). The present authors could not identify a single study concerned with long-term maintenance of skin protection measures. More literature is available in other fields of health promotion. Marcus et al. evaluated 11 community based interventions to promote exercise (26). The majority of the interventions used combined approaches delivering personalized and non-personalized printed material containing information about different kinds of exercise programmes, often backed up by videotape, face-to-face training and telephone calls. They found that most of the smaller scale local interventions and especially personalized home-based programmes backed up by telephone follow-up and maintenance surveillance were successful in changing behaviour and maintaining behaviour change as a result of the intervention, at least in the short term. A high proportion of the participants were lifted up towards higher stages of readiness for change. The most effective were studies that integrated more contacts and theory-based tailored interventions (26).

During the course of the training the uptake rates of skin care and protective glove use increased not only in the intervention group but also in the controls. A possible explanation for this could be a certain amount of contamination between the groups. Under normal circumstances the apprentices should not have met because of their different timetables, but accidental contacts during leisure time could not totally be excluded. Moreover, the regular monthly follow-ups and the repeated inquiries into their skin protection habits might have induced a higher uptake of skin protection and skin care measures. There is some evidence supporting this hypothesis: the use of skin care and gloves in the controls after 6 months of training was significantly higher compared to a historical control group (skin care 46%, gloves 10.1%) from a recent follow-up study in baker's apprentices at the same occupational school (15).

Conclusions

The present study has shown that skin protection and skin care measures can be introduced successfully in the daily routine at a workplace and high uptake and maintenance rates can be achieved. Impediments to the use of individual protective equipment, especially protective gloves, were not apparent in the teaching methods or the individual measures but were due to low acceptance levels at the workplaces in general. Besides individual-orientated preventive interventions, a preventive environment must be created and fostered to facilitate healthy choices.

References

1. Anonymous. *Die Berufsgenossenschaft Nahrungsmittel und Gaststätten, Jahresbericht 1999*. Wiesbaden: Berufsgenossenschaft Nahrungsmittel und Gaststätten. B.C.-Verlags & Mediengesellschaft mbH, 1999.
2. Mathias C G. Prevention of occupational contact dermatitis. *J Am Acad Dermatol* 1990; 23: 742–748.
3. Halkier-Sorensen 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.
4. Diepgen T L. Adäquater Hautschutz- Möglichkeiten, Grenzen Gefahren. *Allergologie* 1993; 16: 25–34.
5. Wigger-Alberti W, Elsner P. Preventive measures in contact dermatitis. *Clin Dermatol* 1997; 15: 661–665.
6. Boman A, Mellström G A. Percutaneous absorption of 3 organic solvents in the guinea pig. Effect of barrier creams. *Contact Dermatitis* 1989; 21: 134–140.
7. Frosch P J, Kurte A. Efficacy of barrier creams (IV). The repetitive irritation test (RIT) with a set of 4 standard irritants. *Contact Dermatitis* 1993; 31: 161–168.
8. Treffel P, Gabard B, Juch R. Evaluation of barrier creams: an *in vitro* technique on human skin. *Acta Derm Venereol (Stockh)* 1994; 74: 7–11.
9. Mellström G A, Carlsson B. European standards on pro-

- tective gloves. In: *Protective Gloves for Occupational Use*, Mellström, G A, Wahlberg, J E, Maibach, H I (eds) Boca Raton, FL: CRC Press, 1994: pp. 39–43.
10. Henry N W. Protective gloves for occupational use – US rules, regulations, and standards. In: *Protective Gloves for Occupational Use*, Mellström, G A, Wahlberg, J E, Maibach, H I (eds) Boca Raton, FL: CRC Press, 1994: pp. 45–50.
 11. Gabard B, Treffel P, Charton-Picard F, Eloy R. Irritant reactions on hairless micropig skin: a model for testing barrier creams. *Curr Probl Dermatol* 1995; 23: 275–287.
 12. Zimmerli T. European standards on protective gloves. *Curr Probl Dermatol* 1996; 25: 177–181.
 13. Wahlberg J E, Boman A S. Prevention of contact dermatitis from solvents. *Curr Probl Dermatol* 1996; 26: 57–66.
 14. Anonymous. TRGS Technische Regeln für Gefahrstoffe 531- Gefährdung der Haut durch Arbeiten im feuchten Milieu (Feuchtarbeit). *Bundesarbeitsblatt* 1996: 9.
 15. Bauer A, Bartsch R, Hersmann C, et al. Occupational hand dermatitis in food industry apprentices: results of a three year follow up cohort-study. *Int Arch Occup Environ Health* 2001; 74: 437–442.
 16. Bauer A. Prevention of hand dermatitis in baker apprentices. efficacy of UVB hardening versus skin protection measures. MPH-Thesis. University of Nottingham, 2001.
 17. Jones L, Naidoo J. Theories and models in health promotion. In: *Promoting, Health. Knowledge and Practice*, Kaatz, J, Peberly, A, (eds) London: McMillan, The Open University, 1997: pp. 75–88.
 18. Prochaska J O, DiClemente C C. Towards a comprehensive model of change. In: *Treating Addictive Behaviour*, Miller W R, Heather N (eds) New York: Plenum, 1986: pp. 3–27.
 19. Prochaska J O, Norcross J C, DiClemente C C. *Changing for Good*. New York: Avon Books, 1994.
 20. Itschner L, Hinnen U, Elsner P. Prevention of hand eczema in the metalworking industry: risk awareness and behaviour of metal worker apprentices. *Dermatology* 1996; 193: 226–229.
 21. World Health Organization (WHO). *Ottawa Charter for Health Promotion*. Geneva: WHO, 1986.
 22. World Health Organization (WHO). *Jakarta Declaration*. Geneva: WHO, 1997.
 23. Amphoux M, Robin J. Double blind test with a protective ointment (Ivosin) on the hands of cement workers. *Occup Environ Dermatol* 1975; 23: 214–226.
 24. Berndt U, Wigger-Alberti W, Gabard B, Elsner P. Efficacy of a barrier cream and its vehicle as protective measures against occupational irritant contact dermatitis. *Contact Dermatitis* 2000; 42: 77–80.
 25. Perrenoud D, Gallezot D, van Melle G. Efficacy of a protective cream in a real-world apprentice hairdresser environment. *Occup Environ Dermatol* 2001; 49: 71–72.
 26. Marcus B H, Owen N L A H, Forsyth Cavill N A, Fridinger F. Physical activity interventions using mass media, print media, and information technology. *Am J Prev Med* 1998; 15: 362–378.
- Address:
A. Bauer, MD, MPH
Friedrich-Schiller-University Jena
Erfurterstr. 35
07740 Jena
Germany
Tel: +49 3641 937370
Fax: +49 3641 937343
e-mail: abau@derma.uni-jena.de