

Review Article

OEESC-2005 – Summing up on the theme Irritants and Wet Work

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The aim of this paper was to summarize the presentations and discussions on the theme Irritants and Wet Work at the second conference on Occupational and Environmental Exposures of Skin to Chemicals held in Stockholm June 2005 (OEESC-2005) to bring the focus points to a broader group of professionals and stimulate further discussions. Occupational skin diseases are common diseases with a huge potential for prevention. The risk factors are mostly well known, and the ongoing high occurrence of occupational skin diseases may be seen as a paradox problem. Although all mechanisms involved in occupational skin diseases are not shown throughout, much is known. The existing knowledge justifies the relevance of reducing exposure and introducing prevention programmes. The questions identified for further research included an internationally agreed-upon definition of wet work; better methods to assess the exposure to wet work; the effect of combined exposure to water and water-soluble irritants; the importance of wet work with frequent/short wet–dry cycles versus working longer periods with wet hands; testing skin protection and skin care products; long-term skin effects from alcohol-based hand disinfectants; workplace testing of evidence-based prevention programmes in prospective randomized, controlled intervention studies.

Key words: alcohol-based hand disinfectants; contact dermatitis; exposure; intervention; irritant contact dermatitis; irritants; prevention programmes; skin protection; wet work. © Blackwell Munksgaard, 2006.

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Introduction

The occurrence of occupational skin diseases has been permanently high for many years in most industrialized countries. The number of workers affected is 30% or more in high-risk occupations.

This is despite the fact that risk factors for occupational skin diseases are mostly well known and to a large extent well described based on experimental or field studies. When dealing with wet

work, the preventive measures seem obvious and known.

Occupational skin diseases are common diseases with a huge potential for prevention. Thus, it may be seen as a paradox problem that we still experience the high occurrence of occupational skin diseases.

The first conference on Occupational and Environmental Exposures of Skin to Chemicals (OEESC) was held in Washington, September 2002. The conference was initiated by the National Institute for Occupational Safety and Health (USA) and planned by a panel of international experts within the diverse field of OEESC. Programme and extended abstracts from the 2002 conference are available at (<http://www.cdc.gov/niosh/topics/skin/conference>).

The second conference was held in Stockholm, June 12–15 2005 at Karolinska Institute in Solna, Sweden (<http://www.cdc.gov/niosh/topics/skin/>

*On behalf of the organizing committee for the Irritants and Wet Work theme at the conference Occupational and Environmental Exposures of Skin to Chemicals, Stockholm June 2005. Members of the OEESC-2005 organizing committee for the Irritants and Wet Work theme: Mari-Ann Flyvholm, Denmark (Coordinator), Thomas Diepgen, Germany, Magnus Lindberg, Sweden, Howard I. Maibach, San Francisco, CA, USA, James S. Taylor, Cleveland, OH, USA

OEESC2/index.html), and the next conference on OEESC will be held on June 17–20, 2007 in Golden, Colorado, USA (http://www.mines.edu/outreach/cont_ed/oeesc/).

Both in 2002 and 2005, Irritants and Wet Work was one of the six themes at the conference, which consisted of a plenary session and a workshop for each theme plus a summing up on the workshops at the last day of conference (Table 1).

This paper summarizes the presentations and discussions for the Irritants and Wet Work theme at the OEESC-2005 conference.

Prevention of skin disorders in wet work occupations requires other preventive measures compared with the more severe irritants (corrosives), many of which are covered by legal occupational health regulations, and thus not part of the Irritants and Wet Work theme.

One of the problems in the prevention of skin effects from milder irritants and wet work is that cumulative irritation from repeated exposures often is accepted as 'part of the job' by the affected workers. The possibilities for prevention include, for example, prevention programmes, with more or less trade-adapted recommendations on prevention of skin disorders. Evidence-based prevention programmes should be updated regularly based on the available scientific evidence. Implementation at the workplaces requires considerable efforts and ongoing attention are needed.

Although all mechanisms involved in occupational skin diseases are not shown throughout, much is known, and the present knowledge on prevention of occupational skin diseases should be transferred to consultants and workplaces and tested in controlled intervention studies to improve the prevention of occupational skin diseases.

Two presentations were given at the plenary session on Irritants and Wet Work: one by Anne Schmidt, Germany, on the importance of wet work as risk factor for occupational skin diseases, and one by Pieter-Jan Coenraads, The Netherlands, on quantifying the burden of wet work to the skin.

The workshop on Irritants and Wet Work was arranged as a panel discussion with short presentations on Evidence-based prevention, Exposure assessment, Educational aspects, Skin

care products, Industrial hygiene perspectives, and Implementation at the workplaces.

Plenary session

Wet work as the most important risk factor for occupational dermatoses – Anne Schmidt, Germany

Anne Schmidt gave an overview on the background and the German experiences with setting up regulations on occupational dermatoses and wet work in the early 1990s.

Due to an increasing number of occupational dermatoses during the 1970s and the 1980s, a group of experts in Occupational Dermatology were asked to suggest measures to reduce occupational dermatoses. The statistics on occupational accidents showed that chemical burns were not the main problem.

Although epidemiological data on eczema caused by wet work were limited, it could be shown that wet work was the common exposure characterizing most cases of occupational dermatoses. Thus, wet work was at least an important factor even without the influence of other irritant substances.

The approved code of practice 'TRGS 531: Feuchtarbeit' (Skin damage from work in wet environments)* is not entirely scientifically based, but a compilation based on scientific results, practical needs, and practical experiences – and for some aspects adapted according to discussions with representatives from the industry (an English translation of the original TRGS 531 can be found at <http://www.cdc.gov/niosh/topics/skin/pdfs/WetWorkTRGS531.pdf>).

The TRGS 531 on wet work had set up a definition of wet work: (i) spend a large part of their work time, that is, more than one-fourth of the daily shift (2 hours) with their hands in wet environments, or (ii) spend a corresponding amount of time wearing moisture-proof protective gloves, or (iii) must frequently clean their hands.

If this definition for wet work is met, a set of rules on information to the employees, screening, physical examination time limits etc. come into force. The TRGS 531 has been in force for about 9 years, and good effects can be seen in some fields.

And to quote Anne Schmidt: "The experts are convinced nowadays, what is missing now is to convince the responsible in the factories".

Table 1. List of themes at OEESC-2005

Irritants and Wet Work
Quantitative Risk Assessment
Exposure Reduction
Process-based, Qualitative Risk Assessment
Systemic Toxics
Allergens

*In May 2006 the TRGS 531 was replaced by the 'TRGS 401: Gefährdung durch Hautkontakt' (Damage from skin contact) see http://www.baua.de/de/Themen-von-A-Z/Gefahrstoffe/TRGS/TRGS-401.html_nnn=true.

Wet work: quantifying the burden to the skin – Pieter-Jan Coenraads, The Netherlands

Pieter-Jan Coenraads started his presentation showing that water alone can cause skin irritation. In his definition, wet work included exposure to water, liquid detergents, other liquids and prolonged occlusion from glove use.

Recent studies with workplace observations on wet work among health care workers (nurses) in different departments showed that the duration of wet work varied from 10% to 25% of the work time. The frequencies of wet work episodes varied from 20 to more than 40, and most episodes were short (less than 4 min).

The skin damage from either hand washing with soap and water or alcohol-based hand disinfectants, both in combination with glove use, has been studied in an experimental model based on the workplace observations. The results supported a change in wet work exposure towards carrying out a higher number of wet work procedures using gloves. Furthermore, by using gloves, the number of hand washings after wet work procedures could be replaced using alcohol-based hand disinfectants. Thus, this provides experimental evidence for the following recommendations:

- (1) Use gloves for wet work tasks not to get wet or dirty hands.
- (2) Use alcohol-based hand disinfectants instead of water/soap when the hands are not visibly dirty.

An important question arising from these studies are whether wet work with frequent and short wet–dry cycles cause more skin damage compared with longer periods working with wet hands.

Related to the definition for wet work in the German regulation (with focus on the total length of time with wet hands), the results from these investigations questions whether more focus should be given to the frequency of wet work episodes.

Workshop on Irritants and Wet Work

The workshop focussed on prevention of skin disorders in wet work, as this area requires other preventive measures than the more severe irritants (which are more easily controlled by legal regulations).

Evidence-based prevention – Thomas Diepgen, Germany

Thomas Diepgen introduced the hierarchy of evidence used in evidence-based medicine (Systematic reviews of randomised controlled trials (RCT) > RCT > cohort study > cross-sectional

study > case report > anecdote), and emphasised that the best study design depends on the question(s) asked.

Examples were given for the evidence of the preventive measures included in the German regulation on wet work (TRGS 531: Feuchtarbeit). The current evidence confirms that most occupational skin diseases are caused by irritants, and exposure to water seems to rank first.

For the choice of preventive measures, the workplace level should still be given first priority (elimination of exposure > technical measures > work organization > personal protection > pre-employment screening). The effectiveness of implementing skin care programmes was illustrated by a study in a metal working factory, and other examples can be found in the literature.

A final aspect covered was the definition of occupational risk categories for occupational skin diseases used in the German regulation on wet work. At least for individuals belonging to the first risk category (atopic dermatitis with hand involvement, chronic hand eczema, or change of work due to irritant dermatitis) predictions for developing hand eczema within the first year among hairdressers seems to be fairly good.

In conclusion, Thomas Diepgen pointed out that the available evidence provides good ideas on what to do, but there is still a need for testing in intervention studies. A need for guidelines on occupational skin care management was emphasized.

Exposure assessment – Pieter-Jan Coenraads, The Netherlands

Based on studies on wet work exposures among health care workers (mentioned above), the definition of wet work in the German regulation (TRGS 531) was discussed. More studies are needed to show whether the definition should focus on the total length of wet work or the frequency of wet work episodes, or both.

An important observation from an investigation comparing results from workplace observations and questionnaire studies was that the duration of wet work was overestimated when assessed by questionnaires, and the frequency of wet work episode was underestimated by questionnaire studies – both by a factor two.

Educational aspects – Elisabeth Held, Denmark

The efficacy of interventions to prevent occupational skin diseases has been scientifically documented. The first step is education of employees, including an evidence-based prevention programme,

which should influence knowledge, behaviour, and skin symptoms. By education of 'frontline workers' and written instructions, the training of all employees is facilitated.

To get attention, the prevention programme should be directed to a specific group, and the information given should be comprehensive. To keep attention on the programme, it should involve the organizational level and be part of the health and safety routines with regular repetitions, instruction to new employees, and regular evaluations.

In Denmark, in an ongoing project in the health care sector, 'skin instructors' were educated and subsequently formed a skin network. Furthermore, a web page dealing with preventive measures for the health care sector was developed. These skin instructors are expected to train local 'frontline workers' to improve the prevention of occupational skin diseases.

Skin care products – Peter Elsner, Germany

A major problem in the use of skin care products is the fact that many employees do not start using skin care products until they get dermatitis, and in studies cases often use skin care products more often than controls. Hence, it could be interpreted that the skin care products are causing the dermatitis. A concern in the distribution of skin care products is to ensure the correct use.

Peter Elsner questioned the conventional theory on the mechanism of action of protective creams, as for both oil/water and water/oil emulsions the water will evaporate rapidly after application and leave an oily film on the skin.

Studies have shown that integrated skin care, including skin protection (creams), milder skin cleaning and the use of moisturizers at least partly can prevent irritant contact dermatitis from wet work. Other aspects that need attention are:

- (1) Products must be chosen on the basis of efficacy data.
- (2) Application of the products may be just as important as their efficacy.
- (3) Motivation and training of workers on the application of skin care product is the key to success in the prevention of irritant contact dermatitis.

Industrial hygiene perspectives – Aaron Sussell, USA

Aaron Sussell outlined the pathway from water exposure to impaired skin barrier function, followed by irritant contact dermatitis and possibly

allergic contact dermatitis. An additional factor is that exposure to water is often combined with other exposures. The exposure factors include frequency, duration and temperature and mechanical irritation, glove occlusion, and ambient relative humidity.

Health care workers are an example of a high-risk group, with frequent wet work, glove use and high hand hygiene demands. The recommendation of alcohol-based hand disinfectants was emphasized as evidence shows that this method is both higher in efficacy (compared with hand washing with soap/water) and low in irritancy. In conclusion, the following measures were recommended for prevention of skin disorders from wet work:

- (1) Select less-irritating process and skin care products, test acceptability.
- (2) Change process to reduce wet work exposure, including duration and frequency of glove use.
- (3) Examine glove use critically – looking for inappropriate glove types, use indicators, and procedures.
- (4) A good programme addresses training, exposure reduction, glove use, skin care and protection products, defining and promoting good practices, and medical surveillance.

Implementation at the workplaces – Mari-Ann Flyvholm, Denmark

Implementation at the workplace is often the missing link from evidence on how occupational skin diseases can be prevented to the actual prevention among the employees.

Several intervention studies have shown a preventive strategy, including an evidence-based prevention programme and a method for implementation to be effective. The evidence-based prevention programme was derived from scientifically documented risk factors. The method for implementation included both an educational programme in combination with other workplace activities and establishment of an occupational health management system. The local workplace activities make the workplace aware of prevention of occupational skin diseases and spread the knowledge on how to prevent.

Process evaluation have shown that an occupational health management system alone have had only minor effect on the prevention of occupational skin diseases, but in combination with active frontline workers and safety representatives educated in how to prevent occupational skin

diseases an occupational health management system improved the outcome.

Highlights from the discussion

The presentations and further comments underlined a need for an internationally agreed-upon definition of wet work. A definition of wet work should include duration and frequency, and occlusion. In addition, a definition should take into consideration that wet work is not 'water only', but a combined exposure to water, water-soluble irritants and moist hands due to glove use. An additional explanation for skin damage caused by wet work could be physical manipulation of the hydrated skin. Better methods to assess the wet work exposure were asked for.

The quality of the evidence for water/wet work as an occupational hazard was discussed. The German wet work regulation has not been fully evidence-based and although participants from several countries considered the existing evidence adequate for regulation, the participants from the United States stressed that the evidence was not sufficient for regulation in their country.

Questions were raised on the recommendation of skin care products and/or skin protection products; there seems to be different (regional or national) traditions or preferences. There is a need for better measures (models and test systems) to show which products are good skin care products. The preventive effect of petrolatum and high-fat moisturizers has been scientifically documented for skin care, but not for skin protection.

Alcohol-based hand disinfectants were discussed. The recommended composition is ethanol with glycerol added (moisturizer). It was argued that the use of milder soaps may change the outcome of studies comparing skin irritation from alcohol-based hand disinfectants and hand washing with soap and water in comparison with earlier/existing studies. A question on the long-term skin effects from alcohol-based hand disinfectants were raised by a Canadian participant who stated that after using these products for many years,

Table 2. Future research issues from the workshop on Irritants and Wet Work at OEESC-2005

An internationally agreed-upon definition of wet work
Better methods to assess the exposure to wet work
Studies on the effect of combined exposure to water and water-soluble irritants
Are wet work with frequent and short wet–dry cycles more skin damaging compared with working longer periods with wet hands
Test systems and models for testing skin protection and skin care products
Long-term skin effects from alcohol-based hand disinfectants
Workplace testing of evidence-based prevention programmes in prospective randomized, controlled intervention studies

eczema patients among the users begin to complain of skin changes such as increased and severe skin irritation. As this observation seems to be related to the use of alcohol-based hand disinfectants without moisturizers, this may be a reminder to use products containing a moisturizer.

Table 2 lists questions for future research mentioned in the presentations or in the subsequent discussion. While we are waiting for better/more evidence on parts of the preventive measures for occupational skin diseases, the existing knowledge justifies the relevance of reducing exposure and introducing prevention programmes. One of the main challenges is to ensure sufficient and permanent implementation of the preventive measures at the workplaces.

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