Interventions for preventing occupational irritant hand dermatitis

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Occupational irritant hand dermatitis

- Occupational irritant hand dermatitis (OIHD) is an important cause of morbidity in the working population
- **Definition:** OIHD is an inflammatory reaction of the skin after contact to various irritants
  - Acute (redness, edema, vesiculation)
  - Subacute (redness, papules, infiltration)
  - Chronic dermatitis (redness, lichenification, scaling, hyperkeratosis, fissuring)
Acute hand dermatitis
Subacute hand dermatitis
Chronic hand dermatitis
• Incidence of occupational skin disease in western industrial countries
  – North Bavaria: 6.7 cases/10,000 worker/year
    (Dickel et al. Contact Dermatitis 2001:44:258-259)
  – Saarland: 6.8 cases/10,000 worker/year
    (Dickel et al. Contact Dermatitis. 2002:46:197-206)
  – Europa: 5-19 cases/10,000 worker/year
    (Diepgen & Coenraads IAOEH 1999:72:496-506)
  – USA: 7.6 – 10 cases/10,000 worker/year
Occupations under risk
Register data from North Bavaria (1990-99)

Dickel et al. Contact Dermatitis 2001:44:258-259
Influencing factors

- Constitutional factors
  - Atopic skin diathesis
  - History of:
    - Flexural eczema
    - Hand dermatitis

- Wet work
  - Wet hands >2h/day
  - Occlusion by gloves
  - Frequent hand washing

- Age, sex

- Chemical irritation

- High/low temperature

- Mechanical irritation
Prevention

• Technical organizational hazard control
• Regular and correct use of skin care and protection products (gloves, skin protection ointments)
Prevention

• Protective gloves: to be used regularly to avoid contact to allergens and irritants
• Protective ointments: to be used before work and 2-3x during work
• Regenerative skin care: to be applied regularly during and after work
Rational for doing the review

• Irritant hand dermatitis is no life threatening disease and mild forms do not usually interfere with daily life, but in more severe cases prognosis is uncertain and the impact on QoL can be considerable

• Irritant hand dermatitis may lead to allergic contact dermatitis and cause long term illness, unemployment and social decline
Rationale for doing the review

- There are indications that the currently recommended protective measures work in primary prevention.
- However, it is not known whether the measures are beneficial (single use, combination) or potential hazardous under real world conditions at different work places.
Objectives

• To assess the effect of interventions for preventing OIHD in healthy people, who work in occupations where the skin is at risk of damage
Inclusion criteria

• Types of studies
  – RCT, CT conducted under normal working conditions (parallel, cross over)

• Types of participants
  – Any employees in occupations where there is a risk of OIHD (nurses, hairdressers, construction workers, food industry employees, printers, metal workers etc)
Inclusion criteria

• Types of interventions
  – Barrier creams/moisturizers/vehicle/protective gloves/education/complex interventions (education + gloves + barrier creams moisturizers)/ other interventions/no intervention
Inclusion criteria

• Types of outcome measures
  – Primary outcome measures
    • Proportion of participants developing any signs and symptoms (S&S) OIHD as rated by investigator
  – Secondary outcome measures
    • Clinical course of S&S of dermatitis
    • Proportion of participants with significant changes in skin barrier function (TEWL) and skin hydration (Corneometry)
    • Change of occupation because of OIHD/staying in occupation
    • Proportion of participants satisfied with the products
    • All adverse events - severe and not severe
Search strategy

• Electronic data bases
  – CSG Specialist Register to 01/07
  – Cochrane Central Register of CT to 01/07
  – Medline (Ovid) to 01/22/07
  – Embase (Ovid) to 01/22/07

• References of articles
• Conference proceedings
• No language restrictions
Methods

• Study selection
  – Titles and abstracts were checked by AB
  – Full text versions were assessed independently (AB, JSch)

• Assessment of methodological quality (Juni 2001)
  – Randomisation: adequate when it protects against biased allocation; neither clinicians nor participants are aware of future allocation
  – Blinding: neither clinicians nor participants are aware of the allocation
  – Loss to follow up: adequate when numbers of drop outs and withdrawals were stated and ITT was done
  – Diagnostic criteria/scoring system for OICD
  – Quality of bioengineering methods (Pinnagoda 1990)
Methods

• Data extraction
  – Reviewer AB, JSch
  – Data checked and entered into Revman by AB

• Analysis
  – Weighted effect of intervention (random effects) across trials
  – Odds rations (95%CI)
  – Weighted mean difference (95%CI)
  – TEWL/Corneometry: changes from baseline
Results

• 18 published studies and 1 ongoing trial
  – 1 study dealt with the effect of gloves (Davis 2005)
Included studies

• 4 RCT (Duca 1994, Goh 1994, Halkier-Sorenson 1993, Perrenoud 2001) and 1 CT (Bauer 2002) involving 1079 healthy participants at the beginning of the studies

• Field studies in occupations prone for OIHD performed by Dermatologists and Occupational Physicians

• Neither occupations (Bauer 2002 bakers, Goh 1994 metal workers, Duca 1994 dyeing/printing, Halkier-Sorenson 1993 cleaners/kitchen workers) nor employees included (age distribution, sex, stages of training and experience) were comparable
• CT, parallel groups,
• 185 healthy baker apprentices
  – Complex intervention n=39
  – UVB-hardening n=55
  – No intervention n=91
  – Comparable at baseline: yes
  – Follow up of drop outs: yes
• Observation period: 6 months
• Final number evaluable n=140 (76%)
Bauer 2002

- Educational intervention (60 min at start and after 4 weeks, lectures and hands on training, free protection and care products)
- UVB hardening (start 0.01J/cm², increased by 20-30% over 3 weeks)
- Monthly assessments
- Prevalence of hand dermatitis (defined by authors) and barrier impairment (TEWL)
Perrenoud 2001

- RCT, cross over trial,
- 21 healthy second year hairdresser apprentices
  - Barrier cream versus vehicle
  - Comparable at baseline: unclear
  - Follow up of drop outs: yes
- Observation period: 4 weeks
- Final number evaluable n=16 (76%)
• Intervention (cream 1 for 5 days a week for two weeks, 2 days wash out followed by cream 2 and vice versa)
• Assessments days 12, 15, 26, 29
• Prevalence of irritant changes (score defined by authors), skin barrier impairment (TEWL), skin hydration (Cornemetry), opinion of participants on different features of the creams
RCT, parallel groups

54 healthy newly employed metal workers
- Barrier cream (Arretil) n=17
- Moisturiser (Keri lotion) n=14
- No intervention n=23
- Comparable at baseline: yes
- No drop outs

Observation period: 6 months
Final number evaluable n=54 (100%)
Goh 1994

- Intervention (barrier cream to use 3-4x/day versus after work moisturiser)
- 3 weekly assessments
- Prevalence of hand dermatitis (defined by authors) and skin barrier impairment (TEWL)
Halkier-Sorenson 1993

- RCT, cross over design
- 111 healthy cleaners and kitchen workers
  - Moisturiser (Locobase) n=56
  - No intervention n=55
  - Comparable at baseline: sig.diff. for emollient use
    - Follow up of drop outs: yes
- Observation period: 4 weeks
- Final number evaluable n=70 (63%)
Halkier-Sorenson 1993

- Intervention (moisturiser for free use versus no intervention for 2 weeks and vice versa for another 2 weeks)
- 2 weekly assessments
- Prevalence of hand dermatitis (defined by authors), skin barrier impairment (TEWL), subjective opinion on the quality of the moisturiser
Duca 1994

- RCT, parallel groups
- 708 healthy (868 total) dyeing and printing industry workers
  - Barrier creams (Silicone, Hydrocarbone) n=428
  - No intervention n=440
  - Comparable at baseline: yes
  - Follow up of drop outs: yes
- Observation period: 12 months
- Final number evaluable n=497 (70%); (n=657 total)
Duca 1994

- Intervention (barrier cream 2x/day versus no intervention)
- Assessments after 4, 8 and 12 months
- Prevalence of hand dermatitis (defined by authors)
Dickel 2007 Ongoing study

• RCT by Dickel 2007 included 107 healthy metal workers handling cutting fluids
• Comparison of
  – Moisturiser
  – Barrier cream + moisturiser
  – Barrier cream
  – no intervention
• No significant differences after randomisation
Excluded studies

• 13 out of the 18 studies had to be excluded.
• 10 studies
  – inclusion of varying amounts of workers with hand dermatitis
  – Authors were contacted, but did not respond, or did not give the relevant information.
• 3 studies
  – 1 qualitative study, no sufficient data on hand dermatitis prevalence (Brown 2007)
  – 1 study (protective gloves) performed in an experimental setting with an extremely short duration over only 1 day (Davis 2005)
  – 1 study where only preliminary data were available (Perrenoud 2001a).
Methodological Quality

- Randomisation
  - Duca 1994: random numbers
  - Others: unclear

- Allocation concealment (selection bias)
  - No information given

- Blinding (performance, detection bias)
  - Blinding of participants: Perrenoud 2001
  - Blinding of outcome assessor: Duca 1994, Perrenoud 2001
  - Others: unclear or no blinding
Methodological Quality

• Follow up and Exclusion (attrition bias)
  – Follow up of drop outs: all studies
  – ITT analysis: no study
• Other sources of bias
  – Diagnostic criteria given in all studies
  – Standardised bioengineering techniques used in all studies
  – Baseline comparability: Perrenoud 2001 unclear, Halkier-Sorenson: sig. differences in cream use before study
  – Definition of objectives and outcome measure were clearly defined by all studies
  – Description of interventions: no details given in Halkier-Sorenson 1993
  – Study duration: to short in Perrenoud 2001, Halkier-Sorenson 1993 (each only 4 weeks)
### Results - Primary outcome measures

- Proportion of participants developing any signs and symptoms of hand dermatitis (bc/ control)

<table>
<thead>
<tr>
<th>Author intervention</th>
<th>OR</th>
<th>95% CI</th>
<th>Weight %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duca 1994 Bc / control</td>
<td>0.75</td>
<td>0.53-1.07</td>
<td>92.61</td>
</tr>
<tr>
<td>Goh 1994 Bc / control</td>
<td>0.87</td>
<td>0.25-3.05</td>
<td>7.39</td>
</tr>
<tr>
<td>Total</td>
<td>0.76</td>
<td>0.54-1.07</td>
<td>100</td>
</tr>
</tbody>
</table>
Results—Primary outcome measures

- Proportion of participants developing any signs and symptoms of hand dermatitis (moisturiser/control and complex intervention)

<table>
<thead>
<tr>
<th>author</th>
<th>OR</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goh 1994</td>
<td>0.31</td>
<td>0.07-1.28</td>
</tr>
<tr>
<td>Moisturiser /control</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bauer 2002</td>
<td>0.37</td>
<td>0.12-1.19</td>
</tr>
<tr>
<td>Complex/control</td>
<td>0.58</td>
<td>0.21-1.61</td>
</tr>
</tbody>
</table>
Results - Secondary outcome measures

- Bioengineering methods
  - Methods to objectively assess the barrier function and hydration of the skin
  - TEWL: measures the transepidermal water loss. Increased values indicate the amount of skin disruption and barrier function impairment
  - Corneometry: measures the level of skin hydration, i.e. how much water the skin holds
Results - Secondary outcome measures

• TEWL
• No significant differences between groups
  – Barrier cream, moisturiser versus no treatment (Goh 1994)
  – Perrenoud 2001
  – Halkier-Sorenson 1993
• Significant differences
  – Complex intervention (delta TEWL 0.2g/m²h) versus no treatment (delta TEWL 4.9g/m²h) and UVB hardening (delta TEWL 3.8g/m²h (Bauer 2002))
Summary - Main results

• There is some evidence that primary prevention interventions identified in this review have a protective effect for preventing OIHD in some, but not in all skin risk occupations
  – complex educational interventions
    • trend towards a protective effect in bakers
  – barrier creams
    • conflicting evidence: no effect in metalworkers
    • significant protective effect in the dyeing and printing industry
  – moisturisers
    • Short term benefit in hairdressers, cleaners and kitchen workers
    • trend towards a protective effect in metalworkers
  – No major harmful effects were identified.
  – Side effects were only minor and limited to local problems like itching, reddening, stinging and dryness of the skin.
Overall completeness and applicability of evidence

- There were only a limited number of field studies published dealing with interventions for primarily preventing occupational irritant hand dermatitis.
- The picture is far from being complete.
Quality of evidence

- **Good methodology quality**
  - Duca 1994 incurring a low risk of bias (Evidence grade 1b, Bias risk A)

- **Fair methodology quality**
  - Goh 1994 (Evidence grade 1b, Bias risk B)

- **Poor methodology quality**
  - Bauer 2002 (Evidence grade 2b, Bias risk C)
  - Halkier-Sorenson 1993 (Evidence grade 2b, Bias risk C)
  - Perrenoud 2001 (Evidence grade 2b, Bias risk C).
Potential bias in the review process

- Low risk of bias
  - no language restriction
  - grey literature, proceedings of relevant conferences were searched
  - experts of the field were contacted

- However, the results of this review could be biased towards a beneficial effect of the interventions by not identifying of not published studies with null- or negative finding (publication bias).
Discussion

• We identified only a limited number of randomised controlled studies which investigated the effectiveness of the measures preventing OIHD under field study settings in different occupations

• Only one high quality study was identified

• The majority of the studies showed certain methodological weaknesses
Discussion

- A variety of non-standardised semi-quantitative scores were used
- Two out of five studies identified, were short-term studies providing only limited information on long term effectiveness.
- The low number of studies identified, the small sample size in the majority of the studies, the heterogeneity of methodology, participants and occupations included as well as the measurement of outcome made pooling of statistical data difficult
Reviewer’s conclusions
Implications for practice

• There is evidence from a well designed randomised controlled study in dyeing and printing workers, that a hydrocarbone containing, but not a silicone containing, barrier cream showed a protective effect for preventing OIHD.

• There is some evidence from a fair quality randomised controlled trial in metal workers, that the use of an afterwork moisturiser could reduce the risk to develop OIHD. The barrier cream under study did not show any effect in metal workers.

• There is some evidence from two poor quality randomised controlled trials in hairdressers, cleaners and kitchen workers, that a barrier cream or its vehicle (hairdresser) and a moisturiser (cleaner, kitchen workers) were effective in preventing OIHD at least during a limited time period.
Reviewer’s conclusions
Implications for practice

• There is some evidence from a controlled trial, that a complex educational intervention promoting the regularly use of a skin care product, a barrier cream and nitrile gloves, could be effective in the prevention of OIHD and skin barrier impairment measured by TEWL in bakers.

• The potential protective effects of barrier creams seemed to be only up to the level of regular moisturisers.

• The efficacy of the products seemed to depend on the formulation and the profile of the irritants at the workplace.

• It is most likely that results are not generalisable from one occupation to another.

• There is no evidence to support or refute the use of protective glove in the prevention of OIHD.
Reviewer’s conclusions
Implications for research

• The absence of substantial evidence that specific or complex interventions in the prevention of OIHD, which are regularly used work does not necessary imply that they are not effective.
• Our results indicate that further large randomised controlled trials over extended time periods (6 months up to 1 year) are needed to determine whether, or to confirm that complex or single interventions for preventing OIHD in skin risk occupations are working.
• There is still little and partly conflicting evidence for moisturisers and barrier creams and no evidence for gloves, as to whether skin protection measures work in real world wet-work settings.
Reviewer’s conclusions
Implications for research

- Additional studies examining the preventive properties of individual measures (barrier creams, moisturisers) in different occupational settings with different irritant profiles must be available.
- The efficacy of glove use in different occupational settings and different irritant profiles has to be proven.
- The agreement on diagnostic criteria of established ICD are quite clear, but further research should be directed to develop and validate a hand dermatitis scoring system for a better and standarised discrimination of irritant skin changes from irritant contact dermatitis.
Reviewer-Protocol

- Andrea Bauer
- Jan Bong
- John English
- Pieter-Jan Coenraads
- Peter Elsner
- Hywel Williams
- Consumer: Nicky Cullum
- Statistical support: Sallie Hollis
Reviewer-Review

- Andrea Bauer
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- Hywel Williams

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  - Finola Delamere
  - Tina Leonard