Skin allergy to chemicals
- clinical, epidemiological and public health perspectives

Jeanne Duus Johansen
National Allergy Research Centre
Department of Dermato-allergology
Copenhagen University Hospital Gentofte
Denmark
Exposure

Wide spread skin exposure to chemicals
  • Intended (e.g. cosmetics)
  • Unintended (e.g. work place)

Many chemicals are allergens
  • Preservatives
  • Glues
  • Dyes
  • Fragrances
  • Metals
Epidemiology of skin (contact) allergy

21.6% of the European population is sensitized to one or more chemicals

Women: Men 2:1

Debut at young age:
• 12-16 years: prevalence 15%

Allergic eczema in 5-10% /year

A frequent work related disease

Allergic eczema

Fragrances/preservatives

Hair dyes

Occupational exposures

shoes
Environment/genes?

Twin studies:
- A mainly environmental disease
- No specific genes identified

Susceptible groups?
Multiple allergies
Weak allergens
Enzyme systems in the skin
Skin barrier defects

Cumulative environmental exposure needed

Multiple contact allergies: dependency of age and sex

Carlsen B et al. Contact Dermatitis 2007
Preventable

Dose-response
Thresholds in induction and elicitation

Used in nickel regulation:
Consumer items in close contact with skin
Nickel release limit <0.5 µg/cm²/week

Fischer LA et al. Contact Dermatitis 2009

Decrease in nickel allergy in young eczema patients

Schnuch, A. et al. Contact Dermatitis 2003
Further trends...

Trend of sensitization to nickel in women (aged 1-30 years) (1992 - 2007)

Schnuch A, Wolter J, Geier J, Uter W. Contact Dermatitis 2011; in print
Cosmetics

Fragrance ingredients
• 1-4% of the population
• 10% of patients

Causative products
• creams
• deodorants
• perfumes

Too high levels of skin allergens in products
Cocktails of allergens

Uter W, Geier J, Schnuch A, Frosch PJ.
Nardelli A, Carbonez A, Ottoy W, Drieghe J, Goossens A.
Contact Dermatitis. 2008 Mar;58(3):134-41
Fragrance allergy and daily living

Self-perceived effect on daily living?

<table>
<thead>
<tr>
<th>Due to fragrance contact allergy</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>I have to take special precautions</td>
<td>67.5%</td>
</tr>
<tr>
<td>I often have eczema, itch</td>
<td>47.0%</td>
</tr>
<tr>
<td>I have had sick-leave</td>
<td>17.1%</td>
</tr>
<tr>
<td>My daily living is significantly affected</td>
<td>45.3%</td>
</tr>
</tbody>
</table>

N=147 with fragrance allergy (Gentofte Hospital, 18 months)

Lysdal S, Johansen JD. Contact Dermatitis 2009:61:320-324
General population
N=3460
Year 2006
Patch test (FM I)
Questionnaire

Positive patch test to a mixture of 8 fragrance ingredients were positively associated with:

I. Dermatitis to cosmetic products (past 12 months):
   OR: 3.5 (CI 2.0 - 6.2)

II. Dermatitis to cosmetics lead to medical consultations
   Or: 3.4 (CI 1.8 - 6.2)
Preservation

Needed to avoid contamination of water-based products cosmetics and occupational products

Lundov M. Ph.d.-thesis 2011
Skin allergy to preservatives

Fig. 1. Temporal trends of preservative allergy in Denmark (1985–2008).

Skin allergy to preservatives - German data

Hair dye allergy

Gudbjerg P. Ugeskr. For Læger 2003;11:165(33)
Hair dyes

• Contact allergy caused by hair dyes is an important health problem often causing acute and severe dermatitis.

• Many hair dye substances are extreme or strong sensitizers.

• These may not be safe for the consumer.
Ingredient label examined:

• 120 out of 122 oxidative hair dye products contained potent skin sensitizers

• More than 80% contained at least four such substances
Exposure to hair dyes

75% of adult women have dyed their hair

**Girls (15-18 years)**
n=1062 population-based:

- 82.3% have dyed their hair
- 13.1 years age at first hair dye
- 3.7 hair dyes/ year

- Adverse effects:
  - 2.9% oedema after hair dying
  - 9.4% report rash from hair dyes

*Extract from:
Bregnhøj A, 2011: Contact Dermatitis:64:85-9*
Occupational exposure: hairdressers

Exposure to hair dye in saloons from
• Dying
• Cutting
• Background
• Wrong use of gloves


Cohort of 5,324 hairdressers:
• 44.3% stopped in profession
• Mean time in profession: 8.4 years
• Half of these because of hand eczema
• 70% says it started as apprentice

Lysdal S et al Contact Dermatitis 2011: submitted
Occupational skin disease:

- Represent up to 25% of all occupational illness
- Account for 90% of all work related problems in the age group of 15-25 years

**Chart:**

<table>
<thead>
<tr>
<th>Occupation</th>
<th>ICD</th>
<th>ACD</th>
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</thead>
<tbody>
<tr>
<td>twenty-four occupational groups</td>
<td>4.5</td>
<td>4.1</td>
</tr>
<tr>
<td>hairdressers and barbers</td>
<td>10.9</td>
<td>46.9</td>
</tr>
<tr>
<td>bakers</td>
<td>23.5</td>
<td>67.2</td>
</tr>
<tr>
<td>pastry cooks</td>
<td>16.9</td>
<td>16.9</td>
</tr>
<tr>
<td>tile setters and terrazzo workers</td>
<td>12.7</td>
<td>12.7</td>
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<tr>
<td>florists</td>
<td>15.5</td>
<td>15.5</td>
</tr>
<tr>
<td>metal-surface processors</td>
<td>11.4</td>
<td>11.4</td>
</tr>
<tr>
<td>machinists</td>
<td>1.9</td>
<td>1.9</td>
</tr>
<tr>
<td>cooks</td>
<td>3.9</td>
<td>3.9</td>
</tr>
<tr>
<td>dental technicians</td>
<td>4.0</td>
<td>4.0</td>
</tr>
<tr>
<td>mechanics</td>
<td>1.8</td>
<td>1.8</td>
</tr>
<tr>
<td>painters and varnishers</td>
<td>4.1</td>
<td>4.1</td>
</tr>
<tr>
<td>health care workers</td>
<td>4.0</td>
<td>4.0</td>
</tr>
</tbody>
</table>

European Agency for Safety and Health and Work.
Observatory report 2008
Consequences

Hand eczema

- Symptoms ≥ 1/2 time: 28%
- No symptoms: 34%
- Symptoms < 1/2 time: 38%

15-year follow-up:
2 out of 3 have had symptoms

Chronic disease

Skin allergy (positive patch test):
Risk factor for bad prognosis

The determinants of chronic disease not known

Meding B et al. Contact Dermatitis 2005;53:308-313
John SM. Epos 2010

NATIONAL ALLERGY RESEARCH CENTRE
Consequences

Sick-leave: 7%
• Total median: 38 weeks

Medical attention
Treatment
• 50% corticosteroids

Psycho-social consequences
• Disturbances: 96%

Occupational changes

Estimated direct expenses of occupational disease > 5 billion Euro/years

Decrease in nickel allergy in young eczema patients

Schnuch, A. et al. Contact Dermatitis 2003
Reduction in new cases estimated value in DK: 1.3 billion Euro/20 years

Meding B et al. Contact Dermatitis 2005:53:308-313
John SM. Epos 2010
Conclusions

Skin allergy is frequent
  • Caused by a range of different exposures
  • Frequent problems / severe problems

Impact on the individual and society

Can be reduced/prevented
Gaps of knowledge

Data on a European level
  • Trends
  • Causative exposures (consumers/occupational)

Susceptible groups?
  - Role of skin enzymes
  - Role of skin barrier
  - Genetics/gender

Determinants of chronic disease

Strategy for using preservative

Exposure data: cocktails of allergens, many sources

Risk assessment strategy and risk reduction: preventive measures
This paper was produced for a meeting organized by Health & Consumers DG and represents the views of its author on the subject. These views have not been adopted or in any way approved by the Commission and should not be relied upon as a statement of the Commission's or Health & Consumers DG's views. The European Commission does not guarantee the accuracy of the data included in this paper, nor does it accept responsibility for any use made thereof.