Occupational Contact Dermatitis Update
S061- Contact Dermatitis
Heather P. Lampel, MD, MPH, FAAD, FACOEM
February 19, 2018

Disclosures
- I have no relevant financial relationships to disclose
- I will be discussing off-label use of patch testing and off-label treatment of contact dermatitis
- I will mention companies
- Merz - Consultant (Fees)

Objectives
- Discuss the epidemiology of occupational contact dermatitis (OCD)
- Review top and emerging occupational allergens and irritants
- Highlight high-risk occupations for OCD
- Outline the differences in work-up of occupational dermatitis
- Present new data on treatment approaches

Epidemiology of Occupational Contact Dermatitis

Contact Dermatitis
- Contact dermatitis (CD) is reported to account for up to 30% of all occupational disease in industrialized nations
- CD is the most common occupational skin disorder
  - About 95% of all cases of occupational skin diseases
  - Caroe et al., Contact Dermatitis 70, 56-62.

Occupational CD Epidemiology
- Occupational skin disease- 15.2% of all private nonfatal occupational injury
Incidence rate of 0.5-1.9 cases per 1000 full-time workers per year

1 year prevalence estimate of 20%
21-22% in healthcare workers
Ibler et al., Contact Dermatitis 2012;67:200-207.
Luk et al., Contact Dermatitis 2011;65:329-335.

Occupational CD Epidemiology
True epidemiologic data are lacking
Likely underestimated due to underreporting
Mild cases specifically
Bureau of Labor Statistics has rigorous inclusion criteria
May not be obviously work-related (delayed-onset)
Self-treated
Only requiring first aid excluded
Underestimated by 85-88%

Recent Occupational Studies
Shoe manufacturer
Indonesia
29% OCD point prevalence
Febriana et al., Int Arch Occup Environ Health 2014; 87.

Poultry processing and manual laborers
1 year prevalence 23% skin symptoms
Quandt et al., Am J Indust Medicine 2014; 57.

9 Recent Occupational Studies
1 Construction Industry
■ 25.4% point prevalence of hand skin symptoms

2 Construction Industry
■ Self-reported hand CD at a point prevalence rate 32.9%
■ But experts reported a higher point prevalence rate of 61.4%
■ Timmerman et al., Am J Ind Med 2017;60(10).

10 Occupational CD Epidemiology
■ Survey of established cases of Occupational CD reported that over one year:
  ■ 19.9% reported prolonged sick leave
  ■ 23% reported job loss

11 Occupational CD Epidemiology
■ 1985 Mathias estimated annual costs of Occupational CD to be between $222 million and $1 billion
■ 2004 NIOSH estimates $1.2 billion

12 Occupational CD Epidemiology
■ Hands are usually involved
  ■ 80-90% of cases
Great impact on quality of life

13 Contact Dermatitis Overview
   ● Irritant contact dermatitis accounts for 60-80% of all CD
     ● 70% of all OCD in Denmark
     ● 68% due to wet work
     ● Caroe et al., Contact Dermatitis 70, 56-62.

   ● Allergic contact dermatitis accounts for remaining 20-40%
   ● Overlap common

14 Occupational Irritants
   1 ● Alkalis
      ■ Soaps
      ■ Detergents
      ■ Cleansers
      ● Acids

   2 ● Hydrocarbons
      ■ Petroleum
      ■ Oils
      ● Solvents

15 Occupational Irritants
   1 ● Frictional Dermatitis
      ● Repetitive handling of objects or materials
      ● Likely underappreciated
Examples
- Fabric
- Paper
- Metal objects
- Driving

Occupational Irritants
- Gloves
  - Prolonged contact with skin affects the epidermal barrier
  - May be irritant itself
  - May make epidermal barrier more susceptible to allergens or other irritants

Irritants - Recent Literature
- Wet work
  - Irritant chemicals
    - Solvents
    - Food
    - Detergents

Gloves
- Mechanical trauma
- Air (warm, dry)
- Friis et al., Contact Dermatitis 71, 364-370.

Occupations
Occupations at High-Risk for Hand Dermatitis
- Hairdressers
- Musicians
- Food Industry workers
● Agricultural workers
● Factory workers
● Electronics workers
● Cleaners/Washers
● Housekeepers
● Printers
● Builders
● Medical and Dental workers

20 Occupations at Risk for ICD

● Hairdressers
● Nursing
● Doctors
● Mechanics

● Cooks
● Cleaners
● Painters
● Plumbers

Friis et al., Contact Dermatitis 71, 364-370.

21 Healthcare workers

● Dutch apprentice nurses followed prospectively
  ■ 1 year period prevalence of hand eczema
    ● 23% in first year
    ● 25% in second year
    ● 31% in third year
Frequent hand washing at work, at home, and outside wet work-all risk factors
Visser et al., Contact Dermatitis 70, 44-55.

Mechanics and Repairers- NACDG
- 691 of 38,784 patients (1.8%) patch tested were mechanics/repairers
- Hand involvement (59.5%)
- Occupationally relevant allergens:
  - Carba mix
  - Thiuram mix
  - Methylchloroisothiazolone/methylisothiazolone
- Allergen sources: Gloves, automotive vehicles, solvents, oils, lubricants, and fuels
  - Warshaw et al., Dermatitis 28(1), 47-57.

Production Workers- NACDG
- 2732 of 39,332 patients (7.0%) patch tested were production workers
  - Hand (53.8%) and arm (29.4%) involvement
  - Workers had more ACD and ICD
  - Warshaw et al., Dermatitis 28(3), 183-194.

Occupationally relevant allergens:
- Epoxy
- Thiuram mix
- Carba mix
- Formaldehyde
- Cobalt
- Allergen sources: Adhesives/glues, metalworking fluids/cutting oils, coatings
Allergens

Top 10 Overall Allergens in North America
1. Nickel sulfate
2. Fragrance mix I
3. Methyliso-thiazolinone
4. Neomycin
5. Bacitracin
6. Cobalt chloride

7. Balsam of Peru
8. p-Phenylenediamine
9. Formaldehyde
10. Methylchloroiso-thiazolinone/Methylisothiazolinone

Top Workplace Allergens- Canada
1. Epoxy resin
   • Thiuram Mix
   • Carba Mix
   • Nickel sulfate
   • Cobalt chloride
   • Potassium dichromate

2. Glyceryl thioglycolate
   • P-phenylenediamine
   • Formaldehyde
   • Glutaraldehyde

Top Workplace Allergens- USA
• Carba Mix
28 **Top Workplace Allergens- USA**

- Thiuram Mix
- Epoxy Resin
- Formaldehyde
- Nickel

29 **Top Workplace Allergens- USA**

- Carba Mix
- Thiuram Mix
- Epoxy Resin
- Formaldehyde
- Nickel

30 **Top Workplace Allergens- USA**

- Carba Mix
- Thiuram Mix
31. **Formaldehyde-Releasers**
   - Carba Mix
     - Thiuram Mix
     - Epoxy Resin
     - Formaldehyde
   - Nickel
   - Quaternium-15
     - Imidazolidinyl urea (Germall 115)
     - Diazolidinyl urea (Germall II)
     - DMDM hydantoin (Glydant)
     - 2-Bromo-2-nitropropane-1,3-diol (Bronopol)
     - Sodium hydroxymethyl glycinate

32. **Top Workplace Allergens - USA**
   - Carba Mix
   - Thiuram Mix
   - Epoxy Resin
   - Formaldehyde
   - Nickel
Emerging Occupational Allergens

Coconut Derivatives

1. Cocamide diethanolamine (DEA)
   - Surfactant in industrial, household and cosmetic products
     - 19 of 25 reactions in Finland study were noted to be occupational, with most exposures noted to be in the metal industry in soaps and metalworking fluids
     - Aalto-Korte K et al. Contact Dermatitis. 2014;70(3).

3. Cocamide monoethanolamide (MEA)
   - Recently described allergen found in metalworking fluid
     - Aalto-Korte K et al. Contact Dermatitis. 2013;69(5).

Coconut Derivatives

1. Capryldiethanolamine
   - Occupational allergen in metalworking fluids
     - Not listed on the MSDS
     - Suuronen K et al. Contact Dermatitis. 2014;72(2).

Sodium cocoamphopropionate

- Surfactant derived from coconut fatty acids condensed with amino-ethyl ethanolamines
  - In soaps, shampoos and conditioners
  - Occupational allergen in Swedish fast-food workers

Medications
Benzodiazepines- facial airborne contact from crushing pills in a cohort of patients
  - Swinnen I et al. Contact Dermatitis. 2014;70(4).

Medications
  - Sevofluorane- airborne allergic contact dermatitis in a surgeon
    - Burches E et al. Contact Dermatitis. 2015;71(1).

Medications
  - Omeprazole-used to treat and prevent stomach ulcers in horses-
    OCD in a horse caregiver and in a horse trainer
    - Al–Falah K et al. Contact Dermatitis. 2014;71(6).

Fragrances
  - Citral- OCD in spa beauticians
    - De Mozzi P et al. Contact Dermatitis. 2014;70(6).
  - d- limonene- OCD from machine cleaners, hand soaps, moisturizers, surface cleanser, and dishwashing soaps
    - Pesonen M et al. Contact Dermatitis. 2014;71(5).

Fragrances
  - United Kingdom study of OCD 1996-2015
    - Beauticians, hairdressers and beauty industry workers had a 47-
      times higher incidence rate ratio of allergy to fragrance when compared to the average rate of all other occupations combined
    - Montgomery RL et al. Contact Dermatitis. 2018;78(1).

Isothiazolinones
Increasing in OCD
- Pesonen M et al. Contact Dermatitis. 2015;72(3).

- Paints, varnishes, cleaners and cleansers, and polishing liquids
  - Friis UF et al. Contact Dermatitis. 2014;71(2).

**Isothiazolinones**
- High risk industries: painting, welding (blacksmiths), machine operating, cosmetology
  - Schwensen JF et al. Contact Dermatitis. 2014;71(5).
- Working in a water cooling tower
- Unique case- ultrasonographer’s ultrasound gel
  - Suuronen K et al. Contact Dermatitis. 2014;72(2).

**Preferred Approach to Occupational Exposure**

**Treatment**
- Avoidance
  - Harder with omnipresent allergens (epoxy versus rubber allergens)
- MSDS in workplace

**Material Safety Data Sheets**

1. Mandated
2. Hazardous chemical name
   - Chemical properties
   - Physical hazards
   - Route of entry
   - Known exposure limits
   - Carcinogenicity
   - Clean-up practices
   - Control measures
   - Contact information
Material Safety Data Sheets

- Mandated
  - Hazardous chemical name
  - Chemical properties
  - Physical hazards
  - Route of entry
  - Known exposure limits
  - Carcinogenicity
  - Clean-up practices
  - Control measures
  - Contact information

- Not required
  - If proprietary
    - Specific name often avoided (general category used)
    - Irritants and sensitizers if <1% concentration
    - Often do not address prevention of sensitization and irritancy

MSDS

Treating Hand Dermatitis - What’s new

- Barrier creams - Repair versus Protect
  - Repair creams with ceramides
  - Rebuild integrity of skin

Treating Hand Dermatitis - What’s new

- Barrier creams - Repair versus Protect
  - Barrier “protect” creams with dimethicone
    - Prevention of irritant contact dermatitis
    - At high dose of application (2-20x actual application) can help prevent ICD
  - Schliemann et al., Contact dermatitis 70, 19-26.
Studies are variable in demonstrating any benefit from barrier creams when compared to regular emollients. At least recommend moisturizing.

51 Treating Hand Dermatitis- What’s new
- Cotton liners under gloves

52 Treatment- What’s New
- Multidisciplinary teams aid in successful return to work
  - German model included inpatient and outpatient care
    - 87% remained in workforce
  - Netherlands included a dermatologist, education nurse, occupational medicine physician
    - Van Gils et al., Contact Dermatitis 2012 66(4) and 66(5).
  - Canadian models
    - Multidisciplinary
      - Gomez et al., Dermatitis 2011;22(3).
    - Graduated approach to RTW- 78% returned to job, 17% went to administrative role
      - Chen et al., Dermatitis 2016;27(5).

53 Prevention
- Evidence-based intervention- “Education”
  - 1 hour voluntary hand protective behavior lecture/ intervention
  - Full-time hospital cleaners
- At 3 months post-intervention
  - Decreased hand cleansing
Better knowledge of hand preservation
Improved hand dermatitis
Clemmensen et al., Contact Dermatitis 72, 47-54.

Prevention
- Review of skin protection and disease prevention training programs
  - Fairly difficult to create consensus
  - Focused mostly on ICD
  - Need for more data and programs to determine effectiveness
Zack et al., Dermatitis 2017;28(3).

Prevention
- Personal protective equipment
  - Match task with glove
  - “Quick Selection Guide to Chemical Protective Clothing” by Forsberg and Mansdorf
- Legislation

Occupational Dermatitis Resources
- Quick Selection Guide to Chemical Protective Clothing by Forsberg and Mansdorf
- Contact and Occupational Dermatology by Marks, Elsner, DeLeo
- Patch Testing. Test Concentration and Vehicles for 4350 Chemicals by de Groot
- ACDS website- contactderm.org
- OSHA, NIOSH

Legislation
- Filon et al., Dermatitis 28(5), 327-328.

Summary
1. Occupational contact dermatitis is underreported
   - Irritant and allergic contact dermatitis
   - Novel and emerging allergens in the workplace

2. Follow hazard controls approach
   - Work with employer for RTW

References

References


Thank you!