What is that Rash From? 
Occupational Skin Disorders

Stephen Thornton, M.D. 
Medical Director 
University of Kansas Hospital Poison Control Center

Disclosure

• No conflicts of interest to disclose

Objectives

• Describe differences between irritant contact dermatitis (ICD) and allergic contact dermatitis (ACD). 
• List 3 common causes of ICD 
• List 3 common causes of ACD 
• Describe the role of patch testing.
• Describe 3 conditions which may mimic contact dermatitis.
• List 3 common causes of occupational acne, including chloracne.
The Skin

- Largest organ system
  - 8 pounds and 22 square feet.
- Turnover ~ 28 days.
- Thinnest skin: eyelid
- Thickest skin: soles of feet

Skin Structure

- Epidermis
  - Thin, tough, outer layer
  - Top layer = stratum corneum
  - Langerhans cells
- Dermis
  - Thick layer of fibrous/elastic tissue
- Subcutaneous/Hypodermis
  - Fat = Insulation

Occupational Skin Disorders

- Among most common occupational diseases.
- Hands involved 80% of time, face 10% of time.
- Types:
  1. Contact Dermatitis – most common
     - Economic burden > $10 billion/year
  2. Acne
  3. Cancer - underappreciated
  4. Infection
  5. Other (kerotosis, granulomas, etc)
**The 2 Faces of Occupational Contact Dermatitis**

1. Irritant (ICD): 4 subtypes:
   A. Corrosion
   B. Acute irritation
   C. Chronic cumulative irritation – #1
   D. Phototoxicity.

2. Allergic (ACD):
   – Maybe more common than thought\(^1\).
   – Generally worse prognosis.

**Pathophysiology**

- Inflammatory reaction, different causes:
  - Irritant: Direct toxic effects of chemicals leading to disruption of stratum corneum and release of pro-inflammatory cytokines
    – Single, intense vs. chronic, “mild” exposures.
  - Allergic: Two stages:
    1. Sensitization- Involves Langerhans Cells
    2. Elicitation – Involves T-cells

---


http://dermaamin.com/site/images/clinical‐pic/c/chronic_cumulative_irritant_contact_eczema/chronic_cumulative_irritant_contact_eczema10.jpg

The Result

Irritant vs. Allergic Contact Dermatitis

<table>
<thead>
<tr>
<th></th>
<th>Irritant</th>
<th>Allergic</th>
</tr>
</thead>
<tbody>
<tr>
<td># of People Affected</td>
<td>Many</td>
<td>Few</td>
</tr>
<tr>
<td>Distribution</td>
<td>Localized</td>
<td>Spreads</td>
</tr>
<tr>
<td>Onset</td>
<td>Rapid (strong irritant).</td>
<td>Usually Days.</td>
</tr>
<tr>
<td></td>
<td>Delayed (weak irritant).</td>
<td>Some cases years.</td>
</tr>
<tr>
<td>Resolution</td>
<td>3-6 weeks upon cessation of exposure.</td>
<td>Days but may persist for months/years.</td>
</tr>
<tr>
<td>Evaluation</td>
<td>History. Exam limited</td>
<td>History. Exam limited.</td>
</tr>
<tr>
<td></td>
<td>Patch Test</td>
<td></td>
</tr>
</tbody>
</table>

Differentiating between the two can be difficult/impossible based on physical exam:
- Irritant tends more on dorsum?
- Less vesicles with irritant dermatitis?
- Chronic irritant and allergic can appear very similar.
Common Causes of ICD

- Soaps/Detergents $\rightarrow$ chronic irritation
- Organic solvents $\rightarrow$ chronic irritation
- Disinfectants $\rightarrow$ acute/chronic irritation
- Alkalis/Acids $\rightarrow$ corrosion or acute irritation.

Don’t Forget Water!

- “Wet Work” a significant risk factor for ICD
- Defined as:
  - Immerse hands in liquids for $>2$ hrs per shift
  - Or wear waterproof (occlusive) gloves for a corresponding amount of time
  - Or wash their hands $>20$ times per shift.
High Risk Occupations for Irritant Contact Dermatitis

- Hairdressers
- Healthcare
- Food Industry
- Cleaning/Janitorial Industry
- Metal Machining

Management of ICD

- Treatment:
  - Avoid irritant.
  - Wet Dressings for first 24-48 hours.
  - Burow’s solution.
  - Then lipid-rich moisturizers.
  - Steroids not recommended.
- Prevention: Barrier creams may help.

Prognosis of ICD

- 99% of acute irritant dermatitis resolves upon removal of irritant.
- With continue exposure two outcomes:
  - “Hardening”
  - Chronic cumulative irritant contact dermatitis
The Top 10 Causes of Allergic Contact Dermatitis in NA

1. Epoxy Resin
2. Thiuram Mix
3. Carba Mix
4. Nickel Sulfate
5. Cobalt Chloride
6. Potassium Dichromate
7. Glyceryl thioglycate
8. p-Phenylenediamine
9. Formaldehyde
10. Glutaraldehyde

In Germany...

<table>
<thead>
<tr>
<th>Year</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of patients</td>
<td>13,117</td>
<td>13,320</td>
<td>13,529</td>
</tr>
<tr>
<td>Nickel(II) sulfate</td>
<td>14.9%</td>
<td>15.6%</td>
<td>15.3%</td>
</tr>
<tr>
<td>Fragrance mix</td>
<td>7.4%</td>
<td>9.1%</td>
<td>9.1%</td>
</tr>
<tr>
<td>Balsam of Peru</td>
<td>5.9%</td>
<td>7.0%</td>
<td>7.2%</td>
</tr>
<tr>
<td>Cobalt chloride</td>
<td>4.4%</td>
<td>5.3%</td>
<td>5.8%</td>
</tr>
<tr>
<td>Fragrance mix II</td>
<td>4.6%</td>
<td>4.4%</td>
<td>4.6%</td>
</tr>
<tr>
<td>MCI / MI (e.g., Kathon CG)</td>
<td>3.1%</td>
<td>3.8%</td>
<td>4.5%</td>
</tr>
<tr>
<td>Rosin</td>
<td>3.2%</td>
<td>4.0%</td>
<td>3.9%</td>
</tr>
<tr>
<td>Propolis</td>
<td>2.0%</td>
<td>2.2%</td>
<td>3.2%</td>
</tr>
<tr>
<td>Potassium dichromate</td>
<td>2.5%</td>
<td>3.4%</td>
<td>3.0%</td>
</tr>
<tr>
<td>MDBGN</td>
<td>2.3%</td>
<td>2.6%</td>
<td>2.7%</td>
</tr>
</tbody>
</table>
8/12/2016

Occupations and Allergens

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Allergens</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bakers</td>
<td>Flavouring, oil, antioxidant</td>
</tr>
<tr>
<td>Building trade workers</td>
<td>Cement (Ca, Co), rubber, resin, wood</td>
</tr>
<tr>
<td>Caterers, cooks</td>
<td>Vegetable, acrylate (NI), rubber glove, spore</td>
</tr>
<tr>
<td>Cleaners</td>
<td>Rubber glove, nickel, fragrance</td>
</tr>
<tr>
<td>Dental personnel</td>
<td>Rubber, acrylic, fragrance, resin</td>
</tr>
<tr>
<td>Electronics assemblers</td>
<td>Cr, Co, Ni, acrylate, epoxy resin</td>
</tr>
<tr>
<td>Hairdressers</td>
<td>Dye, rubber, fragrance, Ni, thiohexolinate</td>
</tr>
<tr>
<td>Metal workers</td>
<td>Preservative, Ni, Cr, Co, antioxidant</td>
</tr>
<tr>
<td>Office workers</td>
<td>Rubber, Ni, dye, glue, copier paper</td>
</tr>
<tr>
<td>Textile workers</td>
<td>Formaldehyde resin, dye, Ni</td>
</tr>
<tr>
<td>Vegetarians, farmers</td>
<td>Rubber, antibiotics, plants, preservatives</td>
</tr>
</tbody>
</table>

Metal Contact Allergies

- ~20% of population has a metal allergy
- Common offenders: Nickel, Cobalt, Chromium
- Don’t forget: Palladium, Mercury, Gold.
- Mechanism not fully understood
  - Metal ions act as hapten.
  - Cross reactivity possible (Nickel/Palladium)
What can’t you be allergic to?

• Though certain chemicals are “common offenders,” theoretically any substance can cause sensitization.

Occupational allergic contact dermatitis caused by omeprazole in a horse breeder

Khuzaa Al-Falih, Jordan Schachter and Denis Savoille
Division of Dermatology, Royal Victoria Hospital, McGill University Health Centre, Montreal, H3A 1A1, Canada
Ann 111 Issue 12/2003

Key words: airborne-allergic contact dermatitis; dextraneprazole; esomeprazole; horse breeder; lanosprazole; occupational; omeprazole; pantoprazole; subepithelial.

Gastric ulcers are common in thoroughbred racehorses, with an estimated prevalence of > 90% (1). Signs may be poor appetite, reluctance to trot, and a decrease in performance. Omeprazole, a proton pump inhibitor (PPI), is approved by the US Food and Drug Administration for the oral treatment of gastric ulcers in horses (2). Here, we describe the occurrence of occupational allergic contact dermatitis caused by omeprazole, with cross-reactions to other members of this class of gastric acid inhibitors.
Patch Testing

- Recommended test for differentiating allergic vs. irritant dermatitis.
- “Gold Standard”
- Results guide treatment and inform prognosis.
- Allergen(s) to be tested guided by history.
- Core Allergen vs Occupational Specific Panels.
- More allergens tested → higher yield.

Adverse Effects

<table>
<thead>
<tr>
<th>Occurrence</th>
<th>Side effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common</td>
<td>Itching at site of patch testing</td>
</tr>
<tr>
<td></td>
<td>Psoriasis</td>
</tr>
<tr>
<td></td>
<td>Tape irritation</td>
</tr>
<tr>
<td>Rare</td>
<td>Anaphylaxis</td>
</tr>
<tr>
<td></td>
<td>Angry back syndrome</td>
</tr>
<tr>
<td></td>
<td>Infection</td>
</tr>
<tr>
<td></td>
<td>Koebnerization</td>
</tr>
<tr>
<td></td>
<td>Persistent patch test reaction</td>
</tr>
<tr>
<td></td>
<td>Scarring</td>
</tr>
<tr>
<td></td>
<td>Sensitization</td>
</tr>
</tbody>
</table>


Interpreting Patch Test Results

<table>
<thead>
<tr>
<th>Reaction</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>7+</td>
<td>Doubtful reaction; faint erythema only</td>
</tr>
<tr>
<td>1+</td>
<td>Weakly positive reaction; erythema, infiltration, and possible papules</td>
</tr>
<tr>
<td>2+</td>
<td>Strongly positive reaction; erythema, infiltration, papules, and vesicles</td>
</tr>
<tr>
<td>3+</td>
<td>Extreme positive reaction; intense erythema, infiltration, and coalescing vesicles</td>
</tr>
<tr>
<td>−</td>
<td>Negative reaction</td>
</tr>
<tr>
<td>IR</td>
<td>Irritant reaction: patterns include follicular, glazed erythema, and ulceration</td>
</tr>
<tr>
<td>NT</td>
<td>Not tested</td>
</tr>
</tbody>
</table>

Limitations of the Patch Test

- Allergens can be irritants!
- Subjective interpretation
- False negatives:
  - Failure to do delayed read
  - Too low [allergen]
  - Systemic immunosuppression

Management of ACD

- Identify: Delay in diagnosis → worse outcomes.
- Treatment:
  - Stop exposure
  - Moderate to potent steroids
    - Fluticasone propionate
    - Clobetasol butyrate
    - Clobetasol propionate
Management of ACD

• Prevention:
  — Paucity of evidence/recommendations.
  — DTPA Cream may help with nickel, cobalt.

Prognosis of ACD

• If allergen not identified will wax and wane.
• Can be persistent or recurrent.
• Chronic skin changes (lichen simplex) may occur.

It's Not Always Contact Dermatitis

NO! I DON'T NEED TO GO TO A DOCTOR...

IT'S JUST A RASH!
• 26 year old nurse presents with this intensely pruritic rash for 5 days. On hands – primarily in web spaces - and also palmar aspect of wrists. Spreading, now in antecubital area.

• Scabies
  - Microscopic Sarcoptes scabiei mite
  - Very contagious, highly pruritic.
    - Can survive 72 hours off host.
  - “Burrows” can be seen.
  - Itching worse at night?
  - Treatment:
    - 5% permethrin cream
    - Ivermectin

• A 65 year old farmer presents with a non-healing rash/wound on dorsum of right hand. Does not itch.
Skin Cancer

• Underappreciated occupational hazard.
• Incidence: Basal > Squamous > Melanoma
• Mortality: Melanoma > Squamous >> Basal
• Not just caused by sunlight (UV light)
  — Polycyclic Aromatic Hydrocarbons
  — Arsenic

Herpes Whitlow

• Caused by both HSV-1 and HSV-2.
• A potential occupational disorder.
  — Medical, Dental, Respiratory therapy.
• Prodrome of pain (2-3 days) before rash.
• Can be recurrent.
• Can be confused with felon/paronychia.
• Treatment: Acyclovir topical or systemic.
  — Start within 48 hours of pain if possible.

40 year old dental assistant presents with painful rash on left hand for several days.
A 54 year old prime minister of the Ukraine presents complaining of a whole body, non-pruritic rash, most pronounced on the face he thinks started after he drank something at work.

Chloracne

- Characterized by multiple closed comedones and pale yellow cysts.
- Caused by exposure to chlorinated polycyclic aromatic hydrocarbons.
  - Pesticides: Pentachlorophenol
  - Contaminants: Dioxin
- Delayed presentation (months)
- Other organs frequently involved!
- Treatment: Stop exposure.

Occupational Acne

- Typically caused by exposures to oils and petroleum products.
- Examples
  - Acne mechanica
  - Acne cosmetica
  - “McDonald’s” acne
- Comedones, pustules, furuncles seen.
- Treatment: Stop exposure/prevention.
Take Home Points

- ICD differs from ACD in how many people are affected, and onset of symptoms but not physical exam.
- 3 common causes of irritant contact dermatitis are water, soaps, and solvents.
- 3 common causes of allergic contact dermatitis include metals (nickel) chemicals found in rubber (thiuram) and plastics (epoxy).
- Patch testing best way to diagnosis ACD.
- Scabies, skin cancer, and herpes whitlow may mimic contact dermatitis.
- Petroleum products and cosmetics are associated with occupational acne while polyhalogenated hydrocarbons (dioxin) cause chloracne.

Bibliography