Allergic Contact Dermatitis

Mari Paz Castanedo Tardan, MD
Assistant Professor of Dermatology

maripaz@med.umich.edu
Disclosure

• I have no conflicts of interest to disclose.
Objectives

**Describe**
- What is Allergic Contact Dermatitis?
- Pathogenesis

**Review**
- Epidemiology
- Clinical presentation
- Diagnosis

**Discuss**
- Common and relevant contact allergens
What is it?

When the skin comes in contact with external agents, many adverse events can occur including contact dermatitis which can be either irritant or allergic

- **Irritant** contact dermatitis (ICD) accounts for ~ 80%
- **Allergic** contact dermatitis (ACD) accounts for ~ 20%
ACD is a delayed, type IV, T-cell mediated hypersensitivity reaction within the skin that results from contact between the skin and an allergenic external agent.

- Previous exposure and sensitization to a specific chemical **IS required**

- 2 distinct phases:
  - **Sensitization phase** (when the individual first comes in contact with the allergenic chemical)
  - **Elicitation phase**
Sensitization Phase

Hapten + skin proteins = Antigen

Keratinocytes

IL-1β, TNFα

Langerhans cell

Antigen Uptake
Sensitization Phase

Matures and processes the antigen (IL-1B)

LC migrates out of the epidermis and into the dermis (TNF-α)

Lymph vessel

Naïve T-cell

Clonal expansion

Regional lymph node

Effector T-cell
Elicitation Phase

• If immunologic memory develops, when a sensitized individual is subsequently re-exposed to an antigen, the effector/memory T-cells recognize the antigen, proliferate and call in other inflammatory cells.

• Once sensitized, all that is needed to elicit a reaction is contact with a low concentration of the causative chemical.
Elicitation Phase

- Keratinocytes
  - Cytokine release
  - DDC
  - Antigen presentation
- LC
- Inflammation
  - Neutrophils
  - Mast cells
  - Macrophages
- Blood Vessel
- Effector T-cell

Inflammation-induced recruitment
Epidemiology

• In an analysis of 2013 claims data from private and governmental insurance providers, nearly 85 millions Americans saw a physician for some form of skin disorder (exceeding current annual estimates for CV disease and DM)

• According to this report, contact dermatitis was the 5th most prevalent skin disease in the US with a total population medical cost of US $1.529 billions

• The economic burden of this disease is high not only from medical expenditures, but also in terms of school absences and work time loss (estimated economic cost of $3 billion per year)

• More than 13 million Americans have sought some type of treatment for this chronic condition each year

• ACD can affect individuals in all walks of life / can occur at any age

• 1-10% lifetime prevalence in industrialized societies

• Most common cause of occupational skin disease in industrialized countries
Some Occupations at Risk for Contact Dermatitis

- Hairdressers
- Food handlers
- Construction workers
- Healthcare workers
- Florists
- Maintenance/housekeeping personnel
Clinical presentation

• ACD manifests as a eczematous dermatitis
  • Eczematous → from the Greek “to boil over”
  • Dermatitis → inflammation that usually manifests as erythematous, edematous, pruritic skin

• It may co-exist with other eczematous dermatoses such as ICD and atopic dermatitis which can complicate the diagnosis.
Eczematous Dermatitis

**Acute**
Erythematous, edematous, with vesiculation (oozing)

**Subacute**
Erythematous and scaly

**Chronic**
Erythematous and lichenified
Clinical presentation

- The **distribution of the dermatitis** is usually the **single most important clue to the diagnosis of ACD**
- Acute ACD (and many cases of subacute and chronic ACD) are well demarcated and **localized to the site of contact with the allergen**

- **Topography:**
  - peri/infraumbilical area → suggests metal snaps in jeans and belt buckles
  - facial, eyelid, lip, and neck patterns of dermatitis → cosmetic-related contact allergy

- However, ACD can also have a “patchy” (commonly) or even diffuse distribution depending on the allergen involved and/or the development of autoeczematization
  - Secondary eczematous lesions appear distant from the primary site of exposure
## Misconceptions

<table>
<thead>
<tr>
<th>False</th>
<th>Truth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contact allergy always occurs <em>only</em> at site of exposure to the offending agent</td>
<td>Typically, the area of greatest dermatitis is the area of greatest contact with the offending allergen(s), but because allergens <em>may be carried to other sites</em>, dermatitis <em>may appear in other locations and/or be more widespread</em>; also because body sites differ in responsiveness to allergens, <em>on occasions, the most severe dermatitis may occur at a site distant form the primary exposure site</em> (e.g. hair dye and eyelid, neck, ear dermatitis)</td>
</tr>
<tr>
<td>ACD is always bilateral</td>
<td>ACD is <em>not always bilateral even when the antigen exposure is bilateral</em> (i.e. shoe or glove allergy)</td>
</tr>
<tr>
<td>If an allergen is applied to a whole body area, the whole surface area is involved equally</td>
<td>Even when exposure is uniform (i.e. contact allergy to ingredient of a cream that is applied to the whole face), eczematous manifestations are very often <em>patchy</em>.</td>
</tr>
<tr>
<td>Allergy develops only to new substances</td>
<td>Allergy usually develops <em>after months or years of contact.</em></td>
</tr>
</tbody>
</table>
Example of allergen carried to other site
Example of dermatitis occurring at site “distant” of primary exposure site

Allergic Contact Dermatitis to hair dye
Diagnosis

• **Patch Testing** - where allergic reactions are reproduced on the patient’s back over several days - is the **gold standard for the diagnosis of ACD**

Patch testing = In vivo “elicitation test”

• Caveat: Sensitization does not necessarily equate with clinical disease (contact sensitivity/allergy to “X” is not the same as allergic contact dermatitis to/secondary to “X”)
Patch Testing and Prick Testing are NOT the same

- **Prick Testing** test for immediate, type I, IgE-mediated hypersensitivity reactions such as:
  - Allergic rhinitis
  - Allergic conjunctivitis
  - Allergy-induced asthma
  - Urticaria
  - Food allergy

- Some of the allergens tested via **Prick Testing** include:
  - Food
  - Pets
  - Dust mites
  - Pollens
  - Grasses, etc...

- In the U.S., Prick Testing is performed by an Allergist.
- Prick Testing is not usually useful in patients with eczematous dermatitis.
Patch Testing

• A screening series of allergens is used:

  • T.R.U.E. TEST ® (Thin-Layer Rapid Use Epicutaneous Patch Test)
    • Approved by the FDA, consists of 3 panels of pre-impregnated allergens
    • Currently screens for 36 substances
      • 35 allergens
      • 1 negative control

  • American Contact Dermatitis Society (ACDS) Core Allergen Series
    • Currently screens for 80 allergens
    • What we currently perform at UofM

  • North American Contact Dermatitis Group (NACDG) screening series
    • Currently screens for 70 allergens
The “cure of ACD” is avoidance, therefore in order to properly manage ACD, it is paramount to accurately identify the causative allergen(s) so they can be avoided.

Studies have shown that medical history alone is inadequate to diagnose ACD in most cases.

The commercially available T.R.U.E. test (35 allergens and 1 control) at most detects 66% of the clinically relevant reactions identified by the NACDG screening series of 70 allergens. Notably, up to 50% of allergens causing occupational dermatitis are missed.
Patch Testing

• Time consuming and labor-intensive

• Requires 3 clinic visits the same week (Monday, Wednesday, Friday)

• Significant investment of personal time by the patient and considerable clinic time by the physician
Patch Testing

• **1st step:** Our nurse prepares the test allergens (chemicals in proper concentration and vehicle)

• At UofM Dermatology → ACDS Core Allergen Series
Major groups of allergens routinely tested include:

- Ingredients in personal care products such as:
  - Fragrances
  - Preservatives
  - Sunscreens

- Topical medications:
  - Antibiotics
  - Steroids

- Rubber and adhesive related chemicals

- Metals

- Etc...
• Some of patient’s **personal care products** may be used as test materials.
• **Skin medications** may also be tested.
Day 1 (first visit): Monday

- Test materials = patches, are applied usually to the upper back then covered with a hypoallergenic tape and left in place until next visit (Wednesday).
Day 3 (second visit): Wednesday

Patch removal, skin marking, preliminary interpretation of result
Day 5 (third visit): Friday

- **Final interpretation**
  - Each site where an individual allergen was placed is assessed for erythema, edema, infiltration, scaling and blisters and the reaction is graded
  - Based on these variables the patient is determined to have contact sensitization, an irritant reaction, or no (negative) reaction to each allergen

<table>
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<tr>
<th>1+</th>
<th>Weak / Mild</th>
<th>1+ reaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>2+</td>
<td>Strong</td>
<td>2+ reaction</td>
</tr>
<tr>
<td>3+</td>
<td>Extreme</td>
<td>3+ reaction</td>
</tr>
<tr>
<td>IR</td>
<td>Irritant reaction</td>
<td>Pustular/ Irritant reaction</td>
</tr>
<tr>
<td>?</td>
<td>Doubtful reaction</td>
<td></td>
</tr>
<tr>
<td>(-)</td>
<td>Negative reaction</td>
<td></td>
</tr>
</tbody>
</table>
Day 5 (third visit): Friday

2+ reaction

3+ reaction
Day 5 (third visit): Friday

The patch tester must now integrate the results of patch testing with the patient’s history, exposures, and physical examination to determine whether the positive allergic reaction is clinically relevant for the patient’s dermatitis.
Day 5 (third visit): Friday

• **Patient education** regarding:
  - Their allergen(s)
  - Where could this allergen(s) be found

• **Avoidance strategies**

  • List of safe products / safe alternatives free of their contact allergen(s) – American Contact Dermatitis Society (ACDS), Contact Allergen Management Program (CAMP)

• Patient education is critical for successful treatment and long-term prevention of recurrence
A world with many contact allergens!
Culprits

• The **common** allergens that cause ACD may be found in:
Common & Relevant Contact Allergens
4871 pts were patch tested to a series of 70 allergens, 3255 pts (66.8%) had at least 1 positive reaction, 2412 pts (49.5%) were ultimately determined to have a primary diagnosis of ACD.
<table>
<thead>
<tr>
<th>Substance</th>
<th>n</th>
<th>Positive Reactions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nickel sulfate hexahydrate, 2.5% pet</td>
<td>4850</td>
<td>975</td>
</tr>
<tr>
<td>Fragrance mix I, 8.0% pet</td>
<td>4858</td>
<td>576</td>
</tr>
<tr>
<td>MI, 0.2% aq</td>
<td>4857</td>
<td>527</td>
</tr>
<tr>
<td>Neomycin sulfate, 20.0% pet</td>
<td>4857</td>
<td>409</td>
</tr>
<tr>
<td>Cobalt (ii) chloride hexahydrate, 1.0% pet</td>
<td>4859</td>
<td>361</td>
</tr>
<tr>
<td>Bacitracin, 20.0% pet</td>
<td>4858</td>
<td>360</td>
</tr>
<tr>
<td><em>Myroxylon pereira</em> resin (balsam of Peru), 25.0% pet</td>
<td>4859</td>
<td>348</td>
</tr>
<tr>
<td>4-Phenylenediamine base, 1.0% pet</td>
<td>4853</td>
<td>342</td>
</tr>
<tr>
<td>Formaldehyde, 2.0% aq</td>
<td>4858</td>
<td>339</td>
</tr>
<tr>
<td>MCI/MI, 0.01% aq</td>
<td>4856</td>
<td>309</td>
</tr>
<tr>
<td>Fragrance mix II, 14.0% pet</td>
<td>4859</td>
<td>277</td>
</tr>
<tr>
<td>Formaldehyde, 1.0% aq</td>
<td>4858</td>
<td>274</td>
</tr>
<tr>
<td>Lanolin alcohol (Amerchol L 101), 50% pet</td>
<td>4859</td>
<td>260</td>
</tr>
<tr>
<td>Quaternium-15, 2.0% pet</td>
<td>4856</td>
<td>235</td>
</tr>
<tr>
<td>Carba mix, 3.0% pet</td>
<td>4859</td>
<td>234</td>
</tr>
<tr>
<td>Iodopropynyl butylcarbamate, 0.5% pet</td>
<td>4859</td>
<td>229</td>
</tr>
<tr>
<td>Cinnamal (cinnamic aldehyde), 1.0% pet</td>
<td>4858</td>
<td>203</td>
</tr>
<tr>
<td>Diphenylguanidine, 1.0% pet</td>
<td>4859</td>
<td>185</td>
</tr>
<tr>
<td>Methylidibromo glutaronitrile/phenoxyethanol (Euxyl K 400), 2.0% pet</td>
<td>4855</td>
<td>179</td>
</tr>
<tr>
<td>OPDMA, 0.1% aq</td>
<td>4859</td>
<td>172</td>
</tr>
<tr>
<td>Thiram mix, 1.0% pet</td>
<td>4859</td>
<td>153</td>
</tr>
<tr>
<td>Propylene glycol, 100.0% aq</td>
<td>4859</td>
<td>137</td>
</tr>
<tr>
<td>2-HEMA, 2.0% pet</td>
<td>4859</td>
<td>128</td>
</tr>
<tr>
<td>Propylene glycol, 30.0% aq</td>
<td>4859</td>
<td>106</td>
</tr>
<tr>
<td>Potassium dichromate, 0.25% pet</td>
<td>4859</td>
<td>105</td>
</tr>
<tr>
<td>Tixocortol-21-pivalate, 1.0% pet</td>
<td>4859</td>
<td>102</td>
</tr>
<tr>
<td>2-Bromo-2-nitropropane-1,3-diol (Bronopol), 0.5% pet</td>
<td>4859</td>
<td>101</td>
</tr>
<tr>
<td>Benzopherone-4, 10.0% pet</td>
<td>4857</td>
<td>100</td>
</tr>
</tbody>
</table>
Contact Allergens of the Year (CAoY)

- 2018 – Propylene glycol
- 2017 – Alkyl Glucosides
- 2016 – Cobalt
- 2015 – Formaldehyde
- 2014 – Benzophenones
- 2013 – Methylisothiazolinone
- 2012 – Acrylates
- 2011 – Dimethyl Fumarate
- 2010 – Neomycin
- 2009 – Mixed dialkyl thioureas
- 2008 – Nickel
- 2007 – Fragrance
- 2006 – p-Phenylenediamine
- 2005 – Corticosteroids
- 2004 – Cocamidopropyl betaine
- 2003 – Bacitracin
- 2002 – Thimerosal
- 2001 – Gold
- 2000 – Disperse Blue

ones in RED = among top 10
Nickel

• #1 identified (testable) cause of ACD

• CAY 2008

• Strong, silver-color metal

• ACDS to nickel particularly affects females

• Jewelry (costume), zippers, buttons, snaps, belt buckles, hair pins, eyeglass frames, razor blades, bra underwire, orthopedic implants, keys, coins, tools, utensils, as well as many other metal-containing objects

Traditionally, the prevalence of nickel sensitivity has been higher in women.
Nickel

• Allergy on the rise in the US (based on NACDG data):
  • 1985: 10.5% of patch tested patients
  • 2006: 19%
  • 2013-2014: 20.1%

• In Europe, there has been a significant reduction in nickel allergy as a result of legislation limiting nickel release from items in contact with the skin
ACD to Nickel

• Most commonly occurs at sites of contact with earrings, necklaces, back of watches, belt buckles or metal snaps

• Eyelid dermatitis from metal eyelash curlers or eyeglasses can also be seen

• Facial dermatitis due to ACD to nickel within cellular phones is well described

The presence of nickel is demonstrated by a positive dimethylglyoxime test (pink indicator)
Fragrances

• 2nd most common contact allergen in North America with a rate of 11.9%

• CAY 2007

• Ubiquitous in our environment. They are used to provide a pleasant odor and have been used extensively for centuries

• Natural or synthetic

• 1% of population is sensitive

• Women > men

• ACD to fragrance is diagnosed by patch testing patients to three mixes: fragrance mix I (n 8), fragrance mix II (n 6) and Balsam of Peru (complex mixture)
Fragrances - challenges

• Fragrances can also be used to mask an unpleasant odor = masking fragrances

• The above often occurs in products labeled as "unscented"

*Unscented is not the same as fragrance-free*
More challenges!

• Also, there are several fragrance ingredients that have other purposes i.e. they can act as a preservative or emollient = covert fragrance

  • E.g. benzyl alcohol, bisabolol

  • A product containing these fragrance(s) may still be labeled as fragrance-free as long as the ingredient is used for a purpose other than fragrance
Index Case

- 67 y/o female

  - April 2010, while vacationing in the Dominican Republic, developed severe photo-distributed dermatitis

  - Feb 2011, while on a cruise in the Caribbean, developed facial dermatitis with marked swelling
Index Case

• Given her h/o photodistributed and photoinduced dermatitis when traveling to places with intense sunlight, she was patch tested and photo-patch tested to sunscreen ingredients only, on June 2011

• Also tested to patient’s own sunscreen products (x 7)
• 3+ Neutrogena ultra sheer sunblock
• 3+ Neutrogena pure sunblock
• 3+ Neutrogena sensitive sunblock SPF 30
• 1+ Neutrogena sensitive sunblock SPF 60
• 1+ Aveeno daily moisturizer with SPF
• 1+ Oxybenzone (Benzophenone-3)
• 1+ Benzophenone-8

• No photo aggravation

• **Oxybenzone** was in many of the sunscreens

• Suspect possible additional allergens added NACDG + Supplemental Series

---

96 hrs

• 3+ Neutrogena ultra sheer sunblock
• 3+ Neutrogena pure sunblock
• 3+ Neutrogena sensitive sunblock SPF 30
• 1+ Neutrogena sensitive sunblock SPF 60
• 2+ Aveeno daily moisturizer with SPF
• 1+ Oxybenzone (Benzophenone-3)
• (Benzophenone-8)

• Again, no photo aggravation

• On NACDG series: Questionable (?) reaction Methylchloroisothiazolinone/Methylisothiazolinone (MCI/MI)

• List of ingredients of all 3+ products pooled: Methylisothiazolinone ALONE (MI) was a common ingredient in all products

• At that time, we wanted to add a patch of MI alone, however we did not have it available
Follow-up

• Patient returned for a solitary patch to Methylisothiazolinone

• MI 0.2% in water applied
Background

- Methylchloroisothiazolinone (MCI) with Methylisothiazolinone (MI) in a 3:1 combination = MCI/MI (trade names: Kathon CG, Euxyl K 400) used in industrial and consumer products since the early 1980s
- MCI more potent sensitizer of the mix
- MCI/MI one of the most frequently used preservatives in toiletries
- MCI/MI one of the most common causes of preservative contact allergy → 10th most common contact allergen in North America
Background - MCI/MI

• Until recently, the maximum concentration for all personal care products in the European Union was: 15 ppm (11.25 ppm MCI and 3.75 ppm MI)

• Maximum concentration in the U.S.:
  • 15 ppm for rinse-off products
  • 7.5 ppm for leave-on products (5.62 ppm MCI and 1.87 ppm MI)
Background - MI (alone)

• Due to the believe that MI was a weaker sensitizer when compared to MCI...

• In 2005, MI alone began to be used as a separate preservative in all personal care products at a concentration of 100 ppm.

• The introduction of MI alone has lead to a more than 25-times increase in the permitted concentration of MI in cosmetics:
  • From 3.75 ppm (one quarter of 15 ppm MCI/MI) to 100 ppm

Background - MI (alone)

• Parallel to the increased presence of MI in personal care products, cases of allergic contact dermatitis to MI began to be published all around the world.

• Similarly, there has been an increase in the frequency of sensitization to MCI/MI
  • In part due to increasing exposure to MI alone in personal care products.
• Patch testing to MCI/MI (75ppm/25ppm) but not MI alone, can miss MI allergy

• Due to low concentration of MI in the patch test substance.
Contact Allergy to MI alone

• 1st occupational cases:
  • 2004 - Isaksson et al → wall-paper glue
  • 2006 - Thyssen et al → paint

• Airborne contact dermatitis after exposure to MI from carpet glue and wall paint
Contact Allergy to MI alone

• 2010, Garcia-Gavin et al: 7 non-occupational cases related to cosmetics/toiletries:
  
  • 6/7 - perianal dermatitis from moist toilet paper
  
  • 1/7 – eyelid dermatitis from make-up remover

• Allergic contact dermatitis to methylisothiazolinone in a wet wipe used to remove make-up.
Wet Wipes

• The use of wipes for intimate hygiene is an important sensitization source for MI (also MCI/MI).

The use of such products in non-keratinized and occluded areas could be responsible for this.
Sources of Exposure
Contact Allergy to MI

• Allergic reactions to MI are increasing at dramatic rates in both the EU and the US → epidemic of contact allergy to MI

• 3rd most common contact allergen in North America
  • Due to increasing exposure to MCI/MI in cosmetic products
  • Increasing exposure to MI in industrial applications (paints)
  • Exposure to MI alone in cosmetics
Baby Shampoo
Manzanilla
Chamomile

Libre de parabenos
Paraben free
Hipoalergénico
Aclara y acondiciona
Natural lightening and conditioning

Richtos de Oro*

INGREDIENTES:
Aqua/Water, Sodium Trideceth Sulfate, Lauraminodipropyl Betaine, Chamomilla Recutita Extract/Chamomilla Recutita (Matricaria) Flower Extract, Peg-150 Distearate, PEG-40 Hydrogenated Castor Oil, Phenoxyethanol, Glycerin, Parfum/Fragrance, Limonene, Linalool, Citric Acid, CI 47005/D&C Yellow No. 10.

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Leave-on product
House-hold products
How to use: Squeeze body wash onto a wet pouf or washcloth and work into a rich, creamy lather.

+ contains neutralizing fragrance agents

Dove and NutriumMoisture are registered trademarks.
Dove Sensitive Skin Body Wash is hypoallergenic: it's our best body wash for sensitive skin.
Neomycin

• CAY 2010

• Most common sensitizing topical antibiotic

  • 4th most common allergen in North America!

• Cross reacts with other aminoglycosides

• Co-reacts but not cross-reacts with Bacitracin

Your allergy to Neomycin means you could react to certain closely related antibiotics. You could develop a rash all over your body if you are given one of these by mouth or injection. **Do not use:**

| Tobramycin | Spectinomycin |
| Gentamicin | Streptomycin |
| Butirosin | Dihydrostreptomycin |
| Paromomycin | Netilmicin |
| Framycetin | Sisomicin |
| Kanamycin | Ribostamycin |
| Amikacin | }
Cobalt

- **5th most common allergen** in North America
- CAY 2016

- Common false positive due to irritation

- **Co-reacts** with nickel (NOT the same thing as cross-react)

- Found in costume jewelry; metal objects (buckle, zipper, coin, key, tools); metal implants (orthopedic **prosthesis**, dental), blue dye for enamel, glass, ceramic, porcelain, crayons, blue paints; hair dyes (light brown) Vitamin B-12 (cyano-cobalamine), etc...

- Practically speaking, best way to avoid cobalt is to avoid nickel

Cobalt spot test = **disodium-1-nitroso-2-naphthol-3,6-disulfonate**
OTC Neosporin not only contains Neomycin!
Bacitracin

- 6th most common contact allergen in North America!

- CAY 2003

- In addition to causing a type IV (delayed, T-cell-mediated) hypersensitivity reaction, it can also cause a type I (immediate, IgE-mediated) hypersensitivity reaction.
Balsam of Peru

- 7th most common contact allergen in North America

- *Myroxylon pereirae* also know as Balsam of Peru, is a substance derived from *Myroxolon balsamum*, a tree that is native to El Salvador

- Marker for fragrance allergy
  - Because its main components (cinnamic acid, cinnamyl cinnamate, benzyl benzoate, benzoic acid, benzyl alcohol, and esterified polymers of coniferyl alcohol) are naturally derived, they have a significant number of natural cross-reactors
  - Certain foods, such as tomatoes and tomato-containing products, citrus fruit peel/zest, chocolate, ice cream, wine, beer, vermouth, dark colored sodas, and spices such as cinnamon, cloves, curry, and vanilla, have chemical ingredients related to Balsam of Peru
  - Consumption of these foods may result in a systemic reactivation of ACD in some patients allergic to Balsam of Peru
Para-phenylenediamine (PPD)

- 8th most common contact allergen in North America
- CAY 2006
- Dark dye used in almost all permanent hair dyes and some semi-permanent hair coloring
- Potent contact allergen which triggers severe acute contact dermatitis in sensitized individuals
- Also in “black” henna tattoos (contaminant = adulterated henna)
Clinical examples of ACD to PPD

ACD to PPD in hair dye
Para-phenylenediamine (PPD)
Para-phenylenediamine

• Cross reactivity with:

  • PABA plus PASSTE:
    • PABA
    • Para-aminosalicylic acid
    • Azo and aniline dyes
    • Sulfonamides
    • Sulfonylureas
    • Thiazides
    • Ester anesthetics (they only have 1 “i”) - procaine, benzocaine, cocaine, tetracaine
Formaldehyde

• 9th most common contact allergen in North America
• CAY 2015

• Found in:
  • Embalming fluid, formalin
  • Personal care products AND topical medications = formaldehyde releasing preservatives
  • permanent press or “wrinkle-free” textiles (melamine and urea formaldehyde resins)
  • cleaning products, disinfectants
  • Paper

• Occupational: metal working, cutting oils, paints, inks, lacquers, cleaning products

• Notable irritant (careful when interpreting patch test results)

• Pts w/ formaldehyde allergy commonly present with hand and/or generalized dermatitis (slow recovery)
Formaldehyde Releasing Preservatives

- Formaldehyde is released by these common preservatives:
  - quaternium-15
  - DMDM hydantoin
  - diazolidinyl urea (Germall II)
  - imidazolidinyl urea (Germall, imidurea)
  - 2-bromo-2-nitropropane-1,3-diol (Bronopol)

- and in industry tris nitromethane (Tris Nitro)
Methylchloroisothiazolinone/Methylisothiazolinone (MCI/MI)

Fragrance

DMDM hydantoin (formaldehyde-releasing Preservative)

Imidazolidinyl urea (formaldehyde-releasing Preservative)
Most common culprits of ACD in North America:

- 2 metals
- 2 fragrances
- 3 preservatives
- 2 topical antibiotics
- 1 hair dye ingredient
Reasons why I LOVE this field

• Play detective
• Learn about what people do
• In-vivo process: “experiment”
• Potential to cure the rash
• Team work
• Public health