

New England College of Occupational and Environmental Medicine/
Massachusetts Association of Occupational Health Nurses

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"Expanding Horizons-Local and Global"

Dermatitis in the Workplace

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My conflict of interests:

- No financial disclosures
- I am a member of the North America Contact Dermatitis Group (NACDG) and the President of the American Contact Dermatitis Society (ACDS)
- Many allergens do not have an FDA approved test



"Dermatoses resulting from occupational activities and work site conditions have been found to represent almost 15% of total workplace injuries, thus making it among the most prevalent of all occupational disorders and a serious public health concern in need of continued investigation"

McCall BP, Horwitz IB, Feldman SR, et al. Incidence rates, costs, severity, and work-related factors of occupational dermatitis. Arch Dermatol 2005;141:713-718

Occupational Dermatitis A Worker's Comp Analysis 1990-1997, Oregon

- Average cost per claim \$3552
- Average disability time: 23.9 days

Overview

- The Common Types of Workplace Dermatitis
- Who is at Risk?
- Cases
 - Evaluation strategies
 - The role and procedure of patch testing
- Interventions, Prognosis, Prevention, Getting back to work

Occupational Dermatitis

- IRRITANT CONTACT DERMATITIS
- ALLERGIC CONTACT DERMATITIS
 - Delayed type hypersensitivity
- Other dermatoses:
 - Contact urticaria (latex, proteins)
 - Atopic dermatitis

A single cause is rare. Often there are multiple contributing factors

Occupational Contact Dermatitis

- Irritant dermatitis→
 - **No testing** available to prove; diagnosed on clinical basis
- Allergic (type IV) dermatitis→
 - Delayed onset 8hrs-3-4days
 - Diagnosed by **patch testing** to relevant allergens
- Contact Urticaria (type I allergy)->
 - Diagnosed by **prick testing**, or RAST

Types of Irritant Contact Dermatitis

- **Corrosion** (third-degree chemical burn)
- **Acute irritation** (second-degree chemical burn)
 - Alkalis, strong acids, oxidizing and reducing agents
- **Chronic cumulative irritation**
 - Repeated exposure to mild irritants including water, solvents, greases, chronic friction
- Photo toxicity

Irritant vs. Allergic Contact Dermatitis

- | | |
|---|---|
| <ul style="list-style-type: none">• ICD<ul style="list-style-type: none">• Many can be affected• Rapid onset, later onset if weak irritant• Resolves after 3-6 weeks away from exposure• Atopy predisposes | <ul style="list-style-type: none">• ACD-type IV delayed<ul style="list-style-type: none">• Few affected• Onset: 24-72 hours if sensitized previously• Can occur despite prior tolerance and exposure• May occur despite long term exposure• May improve within days of avoidance, but may persist |
|---|---|

Contact Urticaria

- Onset immediate within minutes to hours
- Pruritus, wheals, may manifest with respiratory symptoms of shortness or breath, wheezing, anaphylaxis
- Examples: latex proteins, seafood, various foods- i.e. potatoes, garlic, meat

Post Traumatic Eczema

- Eczema onset within a few weeks of injury, at the site of trauma, that may persist and recur.
 - Trauma may be friction, pressure, torsion, shearing, chemical. Single or repetitive trauma.

Does childhood atopic dermatitis influence future working life?: **YES!**

- Hand eczema 3x more common in atopics than controls (42% vs. 13%)
- High risk jobs equal among atopics and non-atopics:
 - Wet work, water detergent, chemical exposure equal
- Atopics 9% reported job change due to eczema vs. 2% controls, sick leave 10% vs. 2% controls

Nyren M, Lindberg M, Stenberg B, et al. (FSCD abstract 2004) Dermatitis 50;3: 153.

A Worker's Comp Analysis 1990-1997, Oregon: Occupation and New Workers

- >47% of claimants had 1 year job tenure or less; 75% with < 5 years
- Industries with highest claim rates: farming, forestry, fishing, machine operators and assemblers, laborers, and service occupations

Who is at risk? Predisposing Factors for OCD

- Inverse susceptibility to irritants with increasing age
- Gender differences likely reflect exposure differences
- Race: African Americans appear to have better barrier function
- Atopic eczema history predisposes to ICD, allergy to occupational allergens NOT more common
- Wet work, chronic friction, low humidity

A Work History Template is a Necessary Tool

1. Job title, work description, process details, change of process
2. How long at the job?
3. Previous jobs and exposure, skin history
4. Exposures, mechanism of exposure
5. Change in work activities and affect
6. Personal protection- specific type of gloves
7. Other worker' affected?
8. Affect of time away
-Consider therapy during time off

Establishing Occupational Association and Likelihood

Mathias Criteria

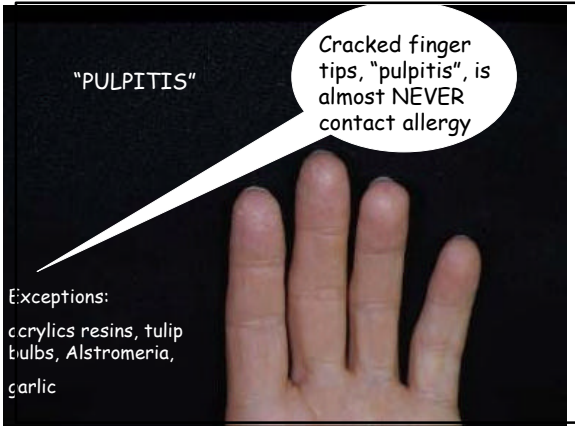
Mathias CGT.: Contact dermatitis and worker's compensation: criteria for establishing occupational causation and aggravation. J Am Acad Dermatol 20:843-848, 1989.

Mathias Criteria: 4/7 "yes" helpful to establish probable occupational association

1. Is the **clinical appearance** compatible with contact dermatitis?

Acute eczematous dermatitis: erythema, edema, vesicles, itch or burn
Chronic eczematous dermatitis: lichenification, erythema, scaling, itch or burn





Exceptions:
 acrylics resins, tulip
 bulbs, Alstromeria,
 garlic

Mathias Criteria:
 4/7 "yes" helpful to establish
 probable occupational association

2. Are there workplace exposures
 to potential irritants or
 allergens?

- Common Irritants**
- Acids
 - Alkalis
 - Solvents
 - Soaps
 - Repeated water
 - Detergent
 - Paper
 - Enzymes
 - Oxidizers
 - Reducers
 - Mechanical-friction, dusts
 - Low humidity

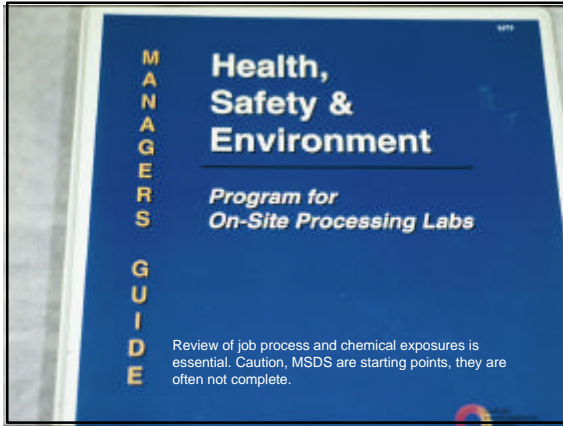
Who is at Risk:
 Relationship of Occupation to
 Contact Dermatitis 1998-2000

- Allergens most frequently found in occupational cases
 - Epoxy resin (more occupational than non)
 - (Electrical equipment 23/72, assemblers 13/72, painters 7/72)
 - Carba mix (nurses 9/60 cases)
 - Thiuram mix (nurses, aides 22/75 cases)
 - Formaldehyde (hairdressers 5/40 cases)
 - Nickel (hairdressers 6/45 cases, assemblers 7/45)

Rietschel et al. Am J Contact Dermatitis, Vol 13, 2002: 170-176

Occupationally Relevant Allergens

Germany (Dickel, 2002)	North America (Rietschel, 2001)
1) Thiuram mix	1) Nickel
2) Epoxy resin	2) Thiuram
3) P-phenylenediamine free base	3) Carba mix
4) P-phenylenediamine-black-rubber mix/ N-isopropyl- N'-phenyl- p-phenylenediamine	4) Formaldehyde
5) Potassium dichromate	5) Quaternium-15
6) Formaldehyde	6) Neomycin
7) Chloromethylisothiazolinone/methylisothiazolinone	7) Cobalt
8) Mercapto-mix/mercaptobenzo-thiazole	8) Thimerosal
	9) Bacitracin
	10) Balsam of Peru



Mathias Criteria:
4/7 "yes" helpful to establish probable occupational association

3. Is the **anatomic distribution** of the eruption compatible with contact dermatitis?



Allergy is not always limited to the site of contact:
"Autoeczematization"

- Initially, dermatitis to a contact allergen is localized to the area of contact
- In some, with persistent allergen exposure previously unaffected skin outside the area of contact becomes eczematous
- May result in erythroderma (total body redness, mimicking cutaneous lymphoma, or drug reaction)

Mathias Criteria:
4/7 "yes" helpful to establish probable occupational association

4. Is the **temporal relationship** between exposure and onset consistent with contact dermatitis?

Mathias Criteria:

4/7 "yes" helpful to establish probable occupational association

5. Have non-occupational exposures been excluded as causes?

Template history: Hobbies, home duties second jobs, skin care, treatments



Mathias Criteria:

4/7 "yes" helpful to establish probable occupational association

6. Does the dermatitis improve away from work exposure to the suspected irritant or allergen?

But...Persistent Post-Occupational Dermatitis Exists

Wall and Gebauer, 1991

describe ongoing skin disease precipitated by occupational contact dermatitis.

"Many patients had difficulty with workers' compensation because of dermatitis persistence, thought by some to negate work-relatedness"

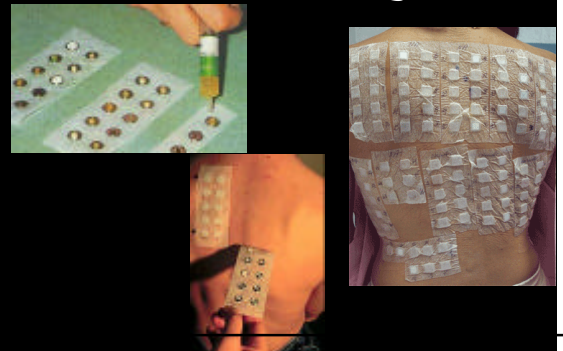
Nixon R, Sajjachareonpong P, Keegel T, et al. (ESCD abstract 2004) Dermatitis 50:3: 153

Mathias Criteria:

4/7 "yes" helpful to establish probable occupational association

7. Do patch or provocation tests identify a probable allergic cause?

Patch Testing





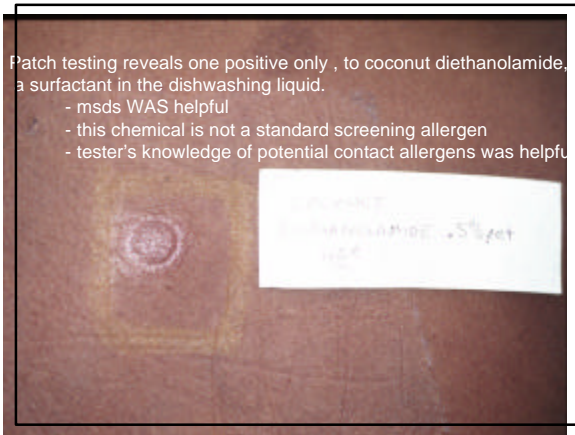
Hand dermatitis from formaldehyde releasing preservatives- Irritant dermatitis, and allergic dermatitis, work, and likely non-work exposures to blame

"...No single standard series restricted to <30 allergens can comprehensively survey the environment of the patient."

- Saripalli, Achen, Belsito. JAAD 2003 49:65-9
- Larkin, Rietschel. Am J Contact Dermatol 1998;9:142-5
- Cohen D, Brancaccio R, Andersen D, Belsito DV. J Am Acad Dermatol 1997;36:914-8.



A dishwasher with a forearm and hand dermatitis



Patch testing reveals one positive only, to coconut diethanolamide, a surfactant in the dishwashing liquid.

Cases
from the clinic

"You'll never get the big picture without looking at the little details."
W. Shelley

The Machinist

59 y.o. Machinist

- Diffuse eczema
 - Hands and forearms most prominent
 - Then generalized
- Weeping, swollen, pruritic
- Onset: 6/03 , referred 8/03
- Treatments: Eucerin, SBS 40 Barrier Cream, Clobetasol, Prednisone
- No childhood eczema, no prior skin problems

59 y.o. Machinist

- No medications, no allergies
- Personal care products: Brut, Mentadent, deodorant.
- Hobbies: Auto racing, football
- Occupation: machinist, 10 years at this jobs, makes bolts using CNC machine, for gun parts. Water based coolant exposure. Same coolant for 4 years

59 y.o. Machinist

- Improved on weekends
- Improved with time away
- No second jobs
- SBS 40 barrier cream used
- Started wearing nitrile gloves when problem began

25 days lost from work at time of referral
1 pcp visit, 2 dermatology visits
2 topical, 1 oral medication



Contact dermatitis clues: Look for erythema, edema, vesicles, itching

Patch testing results: Machinist

- NACDG 2003 allergens, oil and cooling fluid series, SBS 40 cream, coolant open test and diluted 10% in water
- Results & Relevance
 - 2+ carba mix
 - (rubber gloves)
 - 3+ thiuram mix
 - (rubber gloves)
 - 2+ epoxy resin
 - (unknown relevance)
 - Questionable:
Methyldibromoglutaronitrile/phenoxyethanol
 - Negative to the coolant as tested

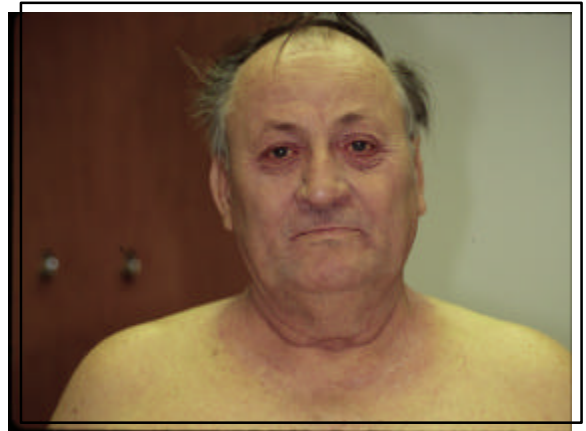
Education & treatment: Machinist

- **Diagnosis, irritant dermatitis with complicating allergic contact dermatitis**
- Return to work
- Sensitive skin care, mild soap, nonabrasive cleanser
- Use bland emollient frequently
- Change glove to vinyl- carbamates and thiurams are additives to rubber and the most common cause of glove related allergy (even nitrile)
 - Use of gloves discretionary, given concern of safe use of gloves when machining

1 Year Follow-up: Machinist

- 1 year later: occasional mild dryness, cracking of thumb and wrist, occasional use of topical steroid.
- Very pleased with skin condition. QOL marked improvement
- Worker's compensation denied
- Continues work, same employer

The Quality Assurance Inspector



61 y.o. Quality Assurance Inspector

- Recurrent periorbital, facial and neck pruritic dermatitis-3-4 episodes
- Resolves when not around fumes or sprays, others not affected, no disability time
- Work history: 40 years QA inspector
 - Present work: witness mixing of industrial coatings for bridge components
 - MSDS for coatings reviewed- acrylic resin and a isocyanate hardener. Polyamide epoxy and hardener
- Treatments: Eye drops for watering and itch, Vitamins.
- No childhood eczema, no prior skin problems

The Quality Assurance Inspector

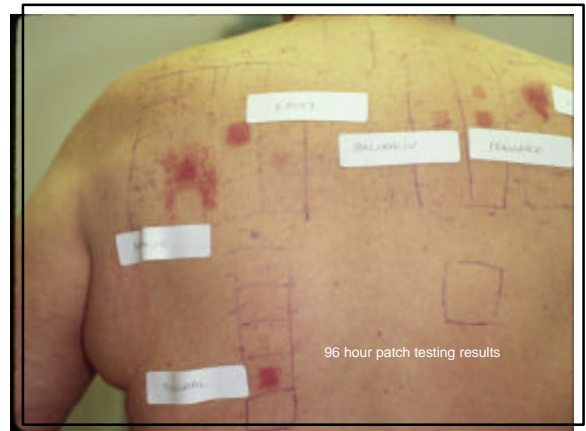
- Impression: Allergy suspected
 - Clues to allergy
 - Episodic, temporal related flares
 - Marked itching and edema along with erythema
- Strategy:
 - Arrange testing as soon as possible
 - In interim:
 - Simplify skin care, remove potential allergens
 - Topical treatment prior to testing

Before patch testing: A Skin Diet for the Very Sensitive "K.I.S.S."= Keep it strictly simple

- Minimize allergen exposure, from unsuspected sources
- Products allowed are only those on the diet
- Overcome the "yes - but phenomenon", you need to be very convincing!

A Skin Diet for the Very Sensitive

- Ointments
 - Aquaphor
 - Vaseline petroleum jelly
 - Hydrolatum
- Creams
 - Aveeno cream
 - Vanicream
 - (1-800-325-8232)*
- Lotions
 - Aveeno moisturizing lotion
 - Curel fragrance free (green bottle only)
 - DML lotion
 - Theraplex emollient
- Shampoos and conditioners
 - DHS clear
 - Free and Clear*
- Deodorant
 - Almay
- Soaps
 - No liquid washes
 - Glycerin soap
 - Vanicream bar
 - Aveeno Bar



Education & Treatment: Q.A. Inspector

- Avoidance of epoxy, other non-occupational allergens
- Mild topical steroid:
 - desonide ointment for 3 weeks
- Avoidance of other allergens, education
- Follow the strict "Skin Diet" Use bland emollient frequently
 - i.e. Aquaphor, Vaseline, Aveeno, Vanicream, DML

Printing Ink Engineering Technician

51 y.o. Engineering Technician

- Pruritic dermatitis 2 months after starting work with an ink jet label printer, UV cured inks
- Wore latex gloves
- Rash worse toward end of week, improved on weekends

51 y.o. Engineering Technician

- April: onset on arms
 - September: spread to face
 - October transfer to another building, rash improved initially, but recurred
- Transfer again, unanticipated exposure results in flare
- October, 1 year later quits job

51 y.o. Engineering Technician

- Prior job: 93-96-worked assembling printing presses, exposure to cutting oils, no rash
- No prior rashes, no atopic eczema
- Personal care products: Lever, Vaseline intensive care, Head and Shoulders shampoo, Mennen Aftershave
- Hobbies: golf, snowmobiling, working on cars

Patch Testing: Engineering Technician

- Referred for patch testing
 - NACDG series
 - Acrylic series for printing inks
- Results at 96 hours:
 - Balsam of Peru 3+
 - Thimerosal 2+

Additional Patch Testing: Engineering Technician

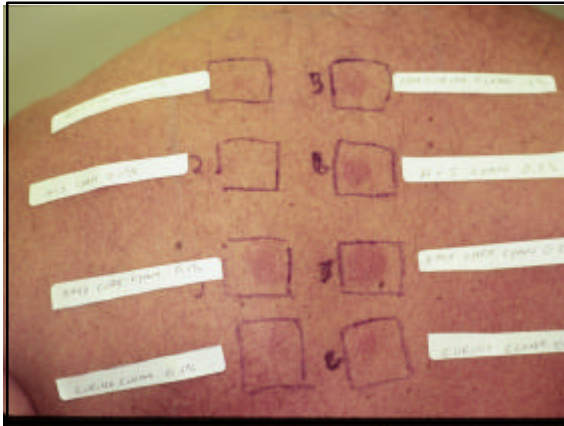
Relevance-- occupational or otherwise-- of initial positive tests doubted.

Clinical history strongly pointed to allergy.

- Tested again, this time to inks sent from workplace diluted to 0.1% and 0.5%

Additional Patch Testing: Engineering Technician

- Results of testing to inks sent from workplace diluted to 0.1% and 0.5%
 - Ez-care Cyan 0.5% : 3+
 - Curing clear 0.1 and 0.5%: 2+
 - H & S Cyan 0.5%: 2+



Know Your Glove Options: The Right Glove for the Job

- Acrylic resins penetrate latex, rubber, vinyl gloves
- Nitrile not perfect, but may work with frequent changes and attempt at no touch technique.
 - Avoid common accelerator additives in nitrile gloves
- Multilayer laminates
 - Greatest protection against widest range of chemicals

Gloves Choices

- Permeation, degradation data for glove and chemical combinations are important
- Change gloves when worn, torn
- Consider all exposures
- Safety in gloves, comfort, cost are important considerations

Multilaminate Gloves

- Non-elastic, generally poor dexterity and poor fit
- Poor resistance to cuts, abrasions, tears
- Disposable vinyl glove worn over Barrier gloves can allow necessary dexterity.
 - Silvershield
 - Polyethylene/ethylene vinyl alcohol/polyethylene
 - Chemical protection slightly better than barrier
 - Barrier
 - Polyethylene/polyamide/polyethylene
 - Fit better, right and left gloves
 - Non woven liner of polyethylene provides moisture dispersion, decreased slippage

**The Health Care
Providers:
doctor,
dental assistant,
dentist**

Dentist with hand dermatitis-hyperkeratotic type
9 year history prior to patch testing!





The allergen culprits for a dermatitis are often multiple. This can fool you when trying avoidance of just one thing!

Typical Health Care Worker Cases

- Dental assistant
 - Topical, superficial X-ray, PUVA treatment
 - Frequent hand washing
 - Relevant allergies to: glutaraldehyde & Dental acrylic resins
 - Change to nitrile gloves, frequent changes, no touch technique for allergen handling
 - Dermatitis resolved at 1 year
- Resident Physician
 - Atopic
 - Frequent hand washing-irritant dermatitis
 - Allergy to Quaternium 15:
 - Preservative quaternium 15 found in Germacare
 - Improved markedly at 3 months
 - Allergen avoidance
 - Better emollient use
 - Better protection vs. irritants

Interventions

- Simplify skin contact regimen. Use the skin diet.
- Better protection- gloves
 - A vinyl glove, or glove without common rubber accelerator allergens is best
- Patch testing to identify allergens, educate on avoidance, hand care. A Word of Caution-- T.R.U.E. test alone may not be adequate.

Medical Therapy

- Medical treatment of eczematous dermatitis
- No strong steroids (class I, II, or III) on the face, genitalia
 - Can consider topical tacrolimus, pimecrolimus for use on the face
- Limit or avoid super potent topical steroids
- Ointments have more plain formulations, penetrate better
- Limit use to cycles of 2-3 weeks
- If dermatitis persistent or recurrent, requiring continued therapy → refer to dermatologist

Interventions

- Prick testing if history suggests urticarial, or immediate reaction to an exposure
- Repair and protect the barrier- Emollients
- Re-education of avoidance measures
- **Patience! Time to get better after allergen identification often prolonged-- 3-6 months, sometimes longer.**

CASES- Pitfalls

- MSDS can be misleading
 - If concentration less than 1% it may not be on the MSDS
- Post occupational eczema happens
- Lack of allergen availability limits testing options

The Most Helpful Referrals

- Summarize
 - Patient's history
 - Interventions
 - Response to treatments
- Summarize
 - Job type, processes involved
- Identify exposures, and include MSDS

Outcomes: Factors that May Improve Prognosis

- Accurate identification of irritants and allergens
- Increased preventive measures
- Worker education- early and often

Factors associated with worse prognosis

- ACD to:
 - Formaldehyde, rubber, nickel and chromium allergy may result in chronic disease
- Chronic dermatitis
 - (delay in diagnosis)
- Treatment delay
- History of atopic dermatitis
- Chronic cumulative irritant contact dermatitis
- Poor worker understanding of disease

Take Home Points

- Early diagnosis
- The right diagnosis
- Adequate (appropriate) patch testing if not getting better and an eczematous dermatitis
- Protection and/or avoidance
- Education and reinforcement
- Treatment

Review of Prevention: Methods of Skin Protection

- Identification of Allergens
- Elimination/Replacement of Harmful Exposures
- Personal Protective Equipment
- Personal & Occupational Hygiene
- Educational Programs
- Prevention of Barrier Breakdown
- Post-exposure Skin Care

Helpful Resources

- Marks JG, DeLeo AV: Contact and Occupational Dermatology, 2nd ed. St. Louis, 1997, Mosby
- Adams, RM, ed.: Occupational Skin Disease. Philadelphia, 1999, W.B. Saunders
- www.bestglove.com
- www.contactderm.org
 - (Website for the American Contact Dermatitis Society)