Agricultural Uses for Fabrics to Prevent Injury and Disease

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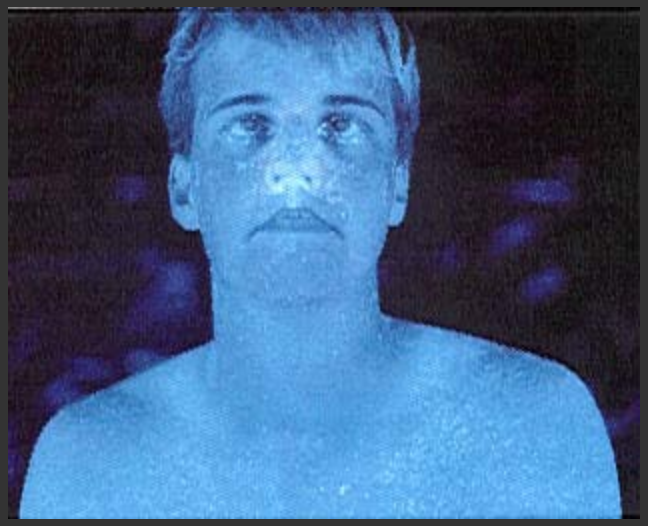
Skin Disease by Industry

Occupational Skin Diseases or Disorders BLS Annual Survey 1993 Numbers and Incidence Rates by Major Industry		
Major Industry	Total number of cases	Incidence (# cases per 100,000 full-time employees)
Agriculture / forestry / fish	2,700	254
Manufacturing	30,800	172
Services	16,300	71
Construction	2,200	54
Transport / utilities	2,800	51
Wholesale / retail trade	2,800	21
Mining	100	17
Finance / insurance / realty	900	15
Total	60,200	76

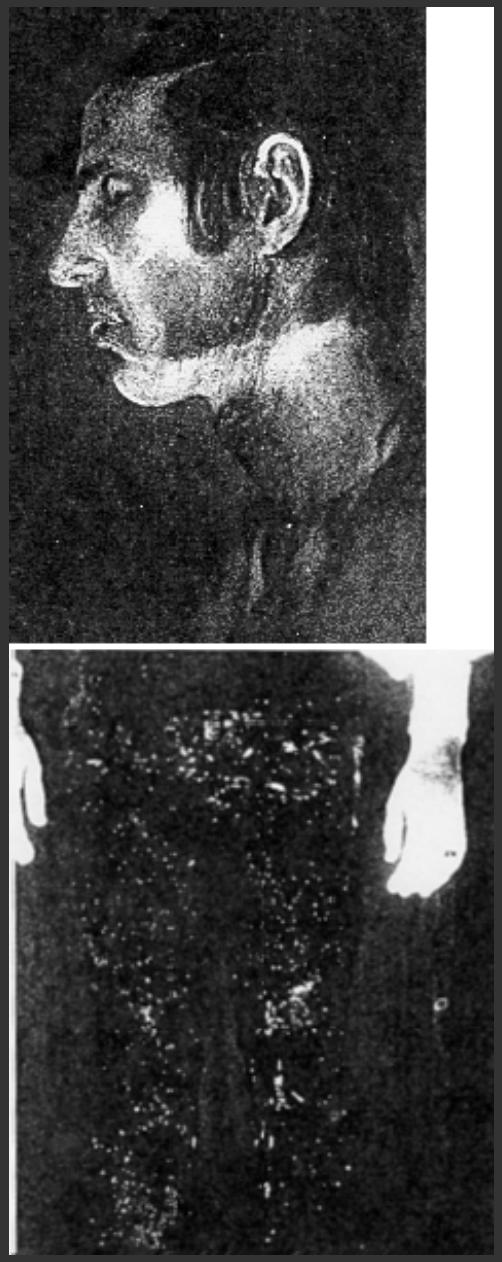
Some Categories of Possible Fabric Development

1. Contact dermatitis prevention
   a) Irritant
   b) Allergic
2. Prevention of pesticide illness
   a) Detoxification
   b) Prevent dermal absorption
3. Prevent solar radiation/heat absorption
4. Prevent cuts/abrasions

Hand pouring - skin contact patterns



Hand pouring contact -2



Fluorescent tracer markings can provide graphic visual demonstration of the pattern of skin exposure - photo from Fenske, 1990

Visual observation of work activities

Girdling vine trunk - California table grape production

“Embolsador” - wrapping banana trees with pesticide impregnated plastic sheets - Panama

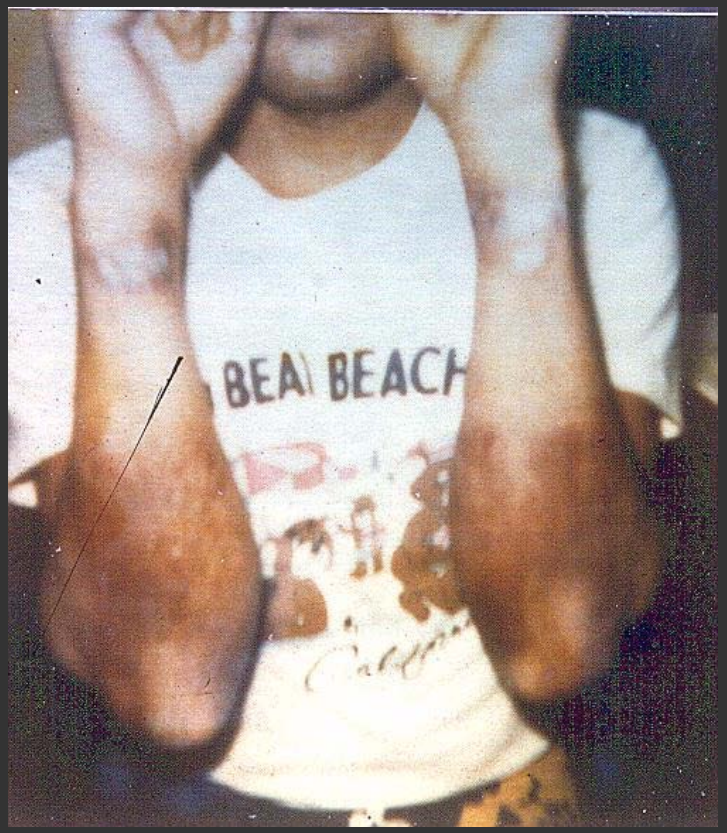
Acid burn - nursery worker

Contact burn from unidentified acid in nursery worker - product used seasonally as a paint remover to clean whitewash from overhead greenhouse glass

Production of poinsettias in raised beds - latex from cuttings associated with lichenified eczema of the fingers

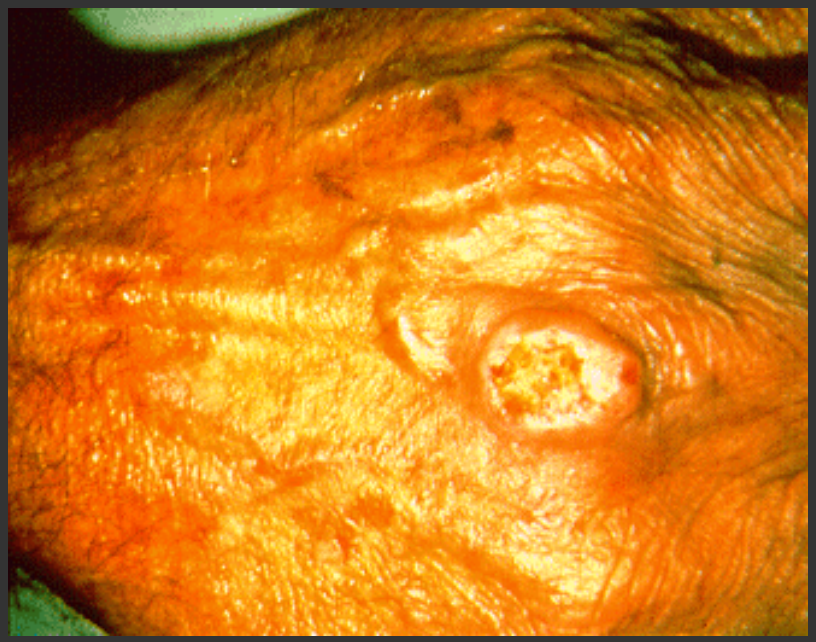
Cocklebur (*Xanthium pennsylvanicum*)

Workers pulling cocklebur in a cotton field developed contact dermatitis - photo at right shows post-inflammatory hyper-pigmentation



- Contact dermatitis associated with pulling velvet leaf - “orejas de elefante”
- Cases identified in labor camp by clinic social worker - not permitted to seek medical attention

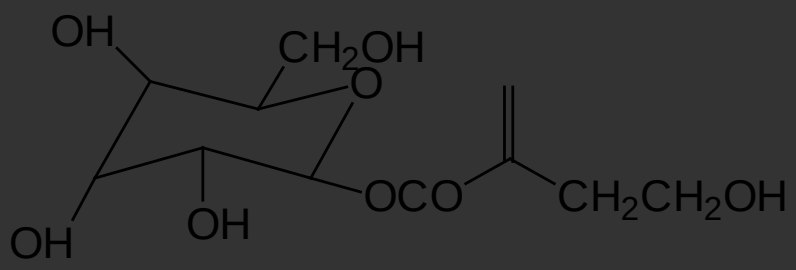
Skin Cancer



- Squamous cell cancer associated with sun exposure is a major risk for ag workers
- Higher risk with fair skin that burns easily

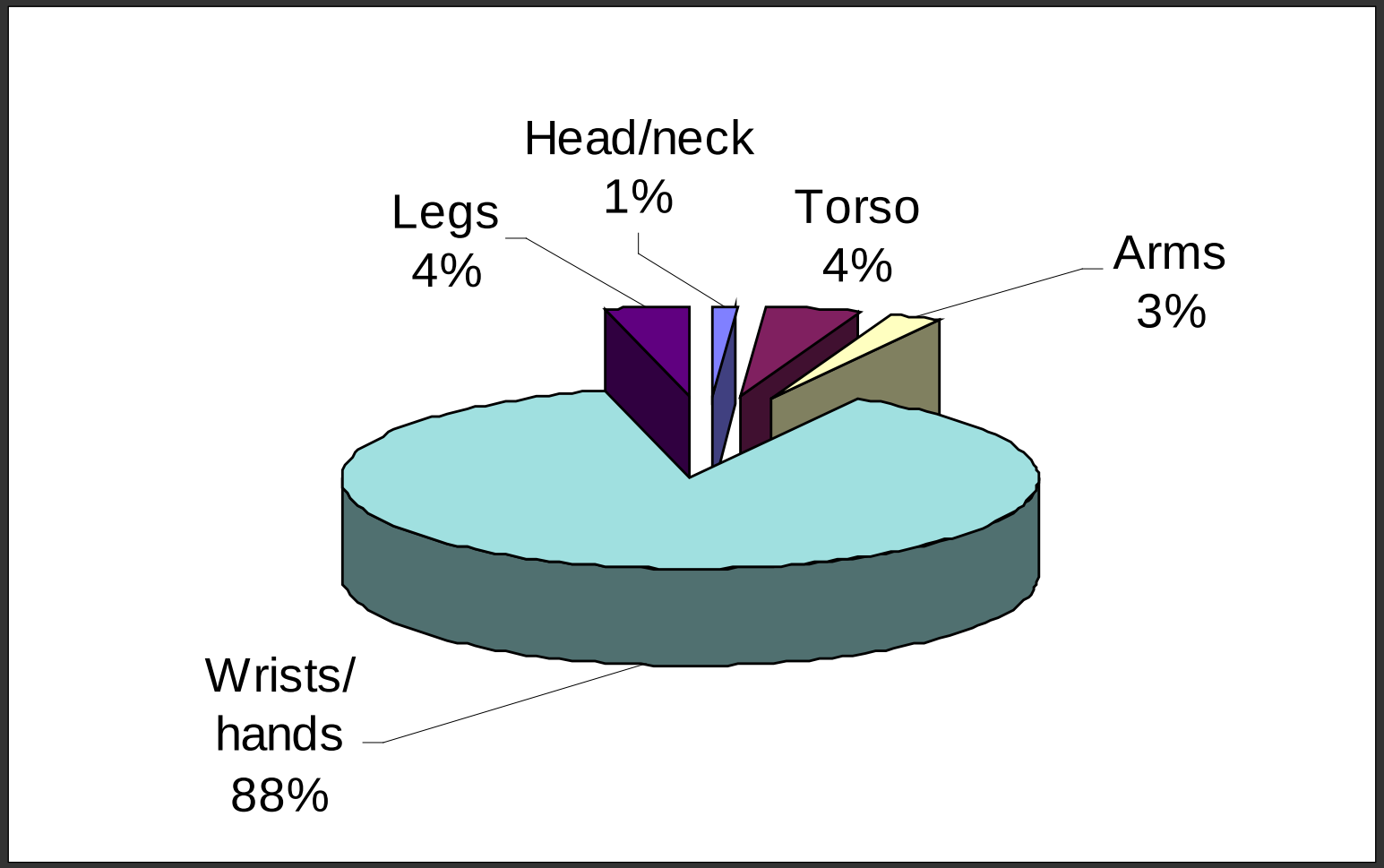
Alstromeria

- Antigen in alstromeria (Peruvian lily) associated with allergic contact dermatitis

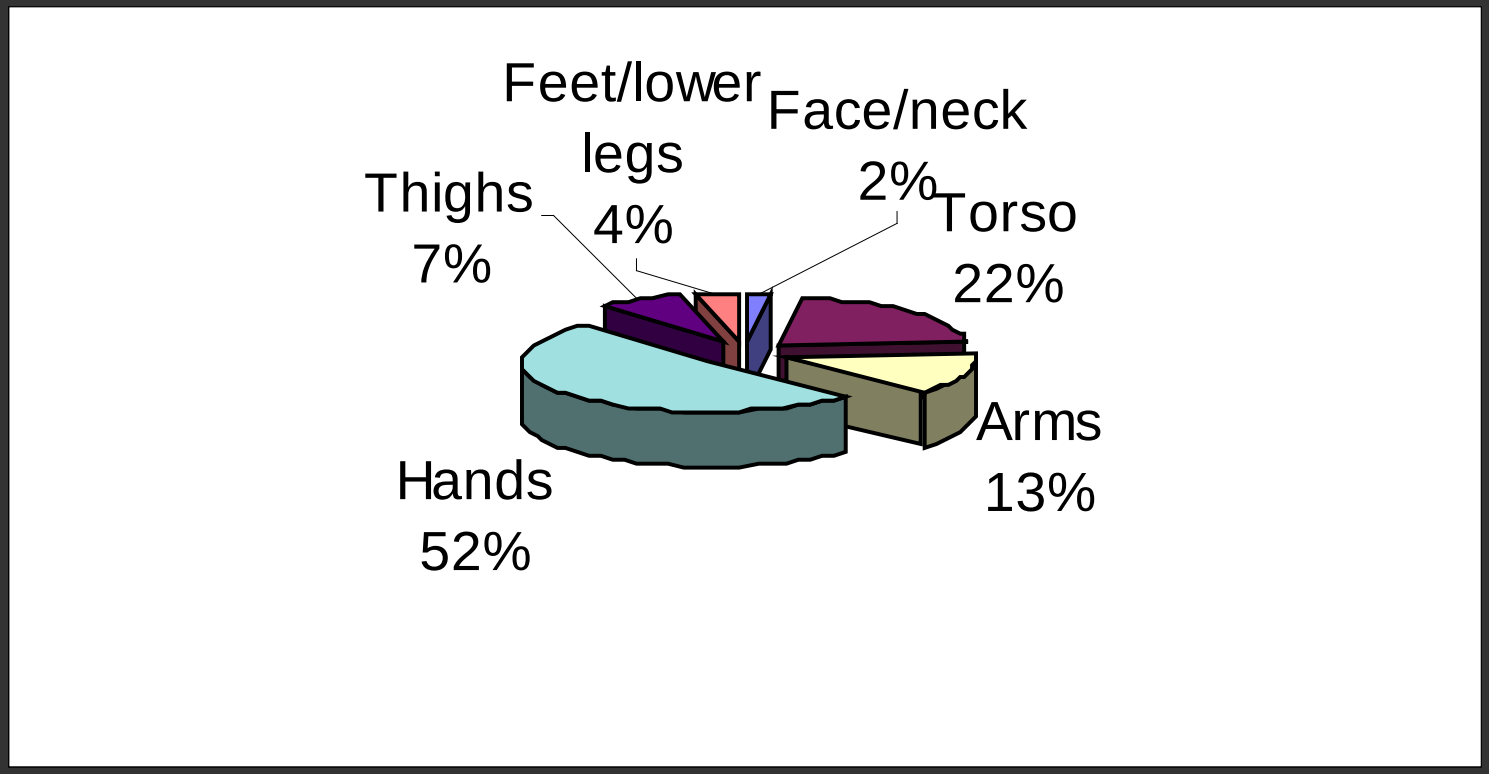


Tuliposide A

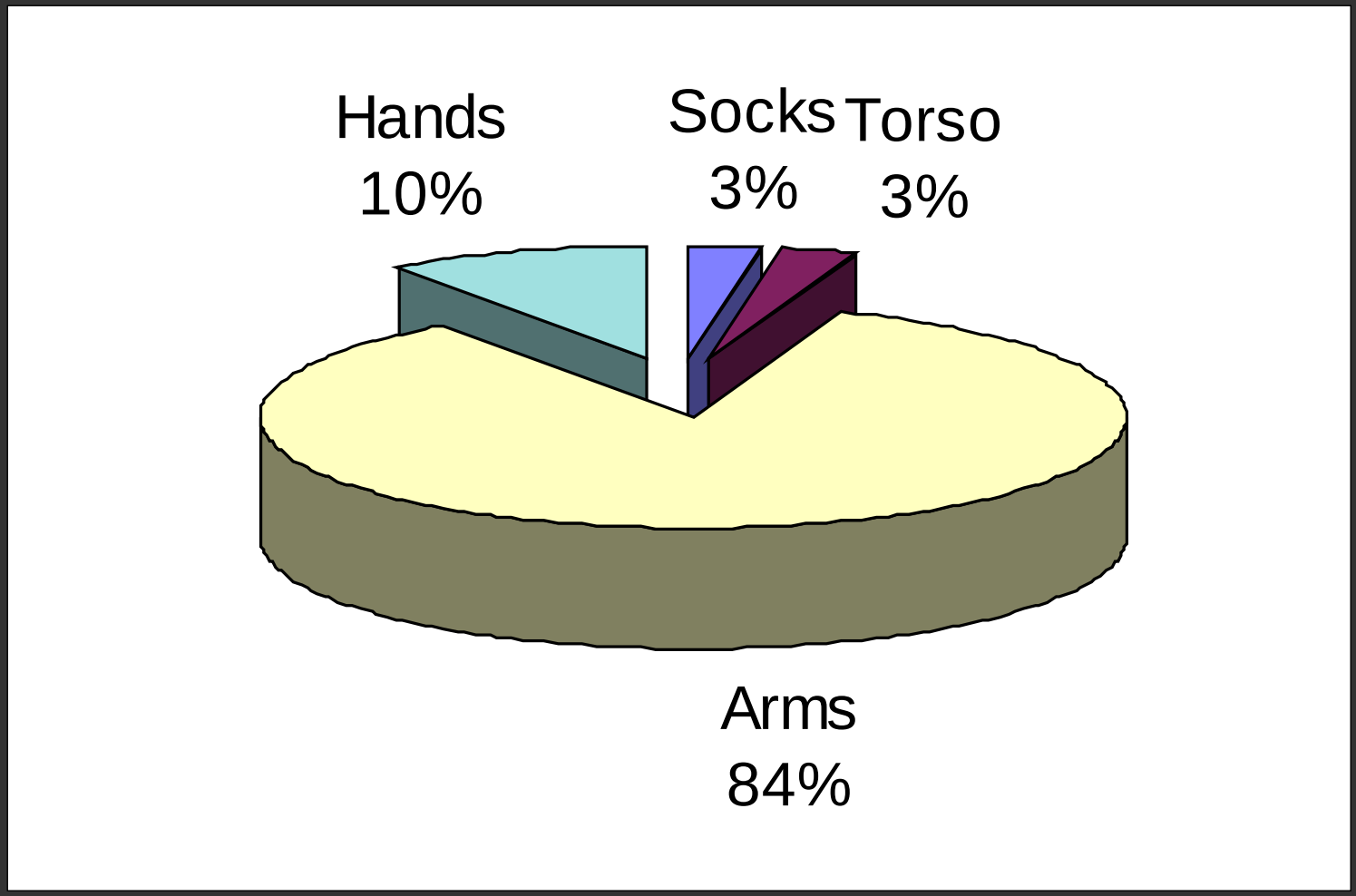
Distribution of exposure to carbofuran - Canadian grain applicators - Hussain, 1990



Distribution of skin exposure - hand labor in grapes - O'Connel, 1993



Distribution of skin exposure - picking bush tomatoes - Spencer, 1991



Eastern Washington Dermatitis by Activity

Activity	Cases	% of Total
Applicators	88	26.5
Mixer/loaders	15	4.5
Drift	36	10.8
Field fumigation	2	0.6
Pack./process.	5	1.5
Field residues	159	47.9
Other residue	1	0.3
Accidental concentrate exposure	13	3.9
Other	3	0.9
Unknown	3	0.9
Total	332	100

Applicator Dermatitis by Use/Chemical Class

Use/Chemical Class	***Cases***
Antibacterial	2
Fumigant	1
Herbicides	11
Fungicides	14
Dithiocarbamates	3
Captan	2
Myclobutanil	4
Insecticides	44
OP/Carbamates	23
Azinphos-methyl	10
Chlorpyrifos	6
Carbaryl	5
Pyrethrin/pyrethroid	3
Total	88

California Insecticide Dermatitis

Insecticides/miticides	# of Cases	% of 1,288
Propargite	241	18.7
Propargite/Sulfur	51	4
Methomyl*	13	1
Diazinon*	12	0.9
Malathion*	8	0.6
Naled*	8	0.6
Dicofol	10	0.8
Dienochlor	8	0.6
Acephate *	8	0.6
Carbaryl*	8	0.6
Cyhexatin	21	1.6
Fenbutatin oxide	6	0.5
Dimethoate*	6	0.5
* OP or carbamate		

Orchard crops

- Potential exposure in orchard crops often limited to upper body
- Actual exposure depends upon residue persistence and thickness of foliage

Row Crop Exposures

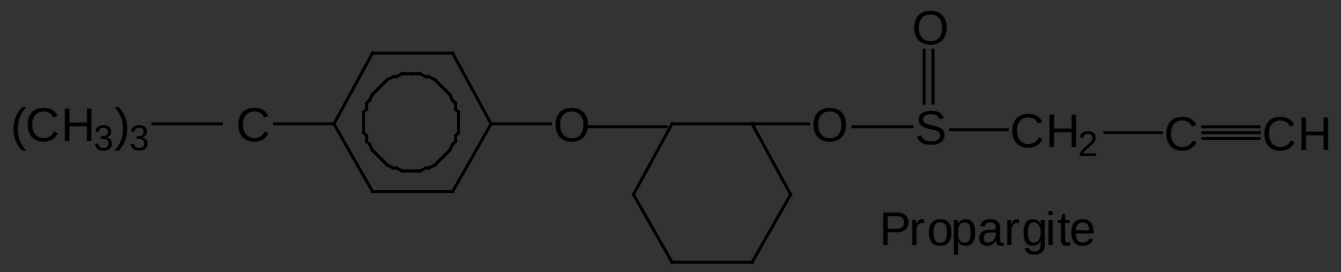
Working in row crops limits exposure to upper extremity

Distribution of lesions in 407 applicator cases

Arms	39.8
Face	30
Hands	23.5
Neck	18.7
Legs	15.5
Chest	12
Abdomen	11.1
Back	9.6
Feet	5.7
Genitals	4.4
Buttocks	1.2

Propargite

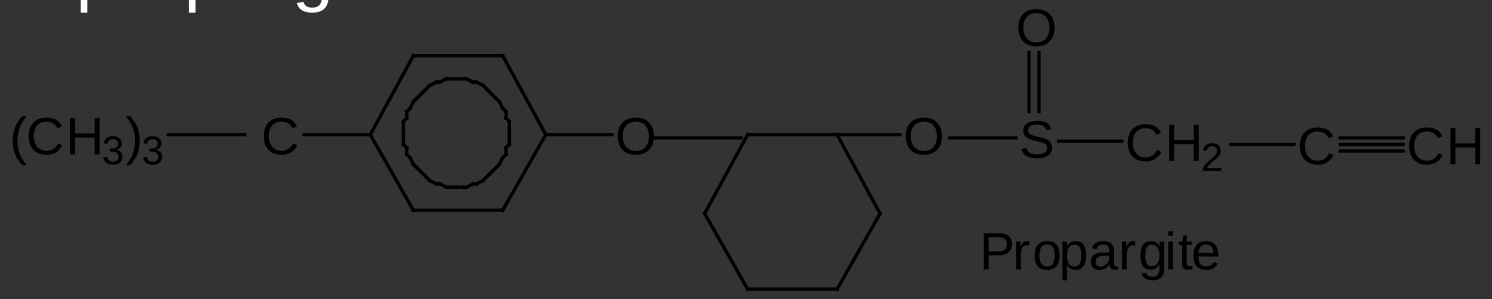
- Technical formulation is corrosive in animal tests.
- Recognized as a severe skin irritant since its introduction. Reformulated in water soluble bags to protect mixer/loaders.



Propargite

Propargite - peaches

- On 7/14/88 a crew picking peaches in an orchard in Kings County noticed a helicopter spraying in an adjacent cotton field
- That same afternoon several workers noticed itching and skin lesions on the arms
- Helicopter was spraying pix and zinc
- Field had been treated 6/22 with diazinon and propargite



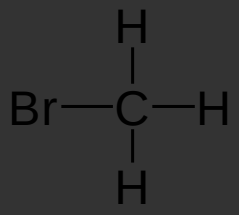
Propargite

Delayed release propargite

- Severe postinflammatory changes associated with blistering propargite dermatitis in 1986 outbreak

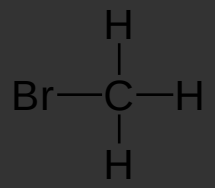
Fumigant reactions

- Blistering dermatitis of the foot associated with application of fumigants (methyl bromide in the case shown)
- 61% of fumigant dermatitis cases involve the feet



Methyl Bromide

- Skin irritant property identified in a 1942 industry accident
- Pesticide label indicates corrosive to the skin
- Typical occupational case
  - 82-32: methyl bromide leaked into employee's boots when he changed cylinders on the tractor. Feet became inflamed, ulcerated and infected over several days before employer noticed problem and sent worker to doctor.



Elemental Sulfur

- Large number of cases associated with elemental sulfur suggest that it may be a potent skin irritant.
- Animal experiments on skin irritation secondary to sulfur are equivocal.
- Differences between positive and negative studies may be explained on the basis of differing product compositions and experimental conditions.

Applicator -sulfur irritation

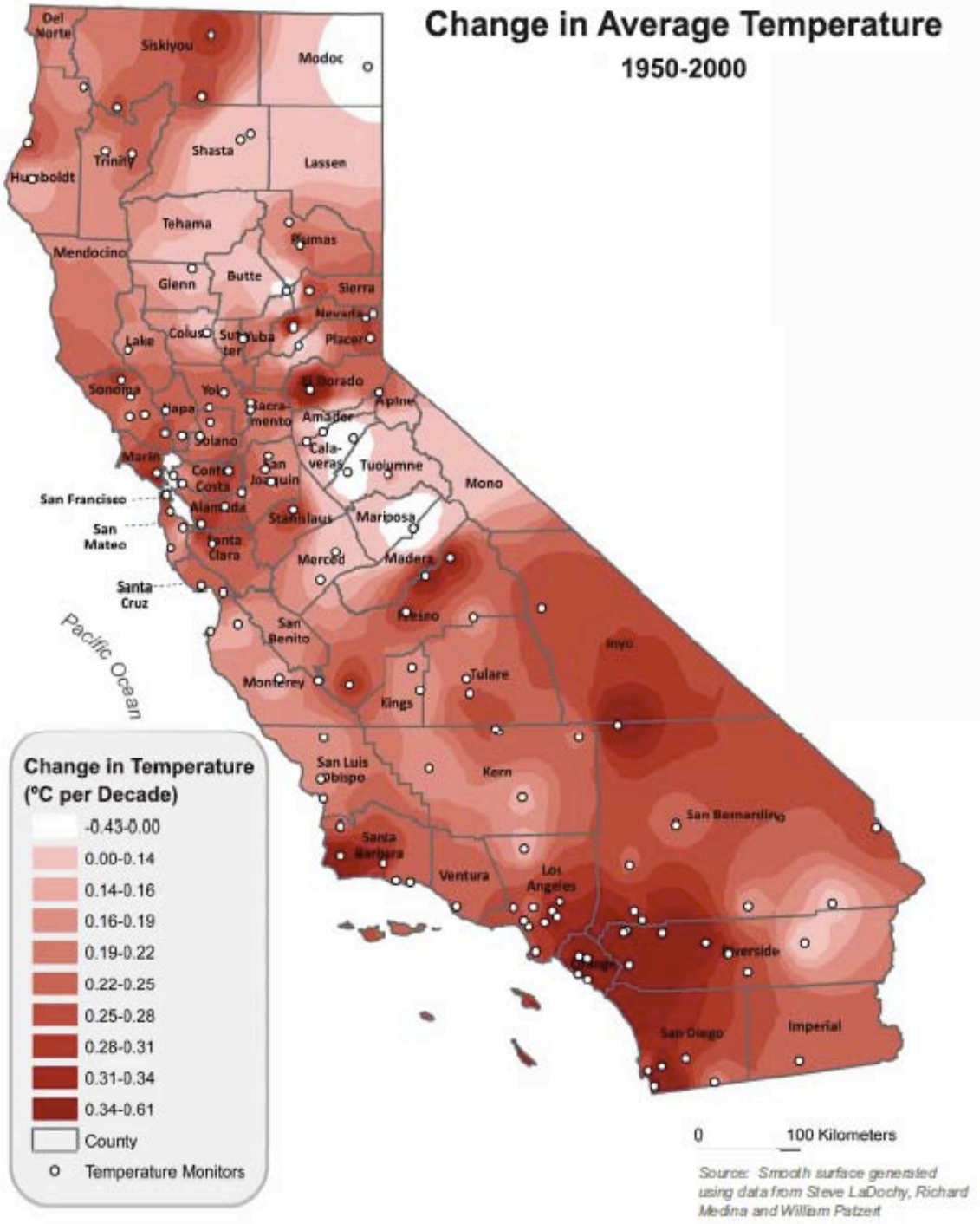
Dusting roses - Pattern of lesions corresponded to places where dust settled on sweaty skin

Mixture of sulfur/zineb/malathion

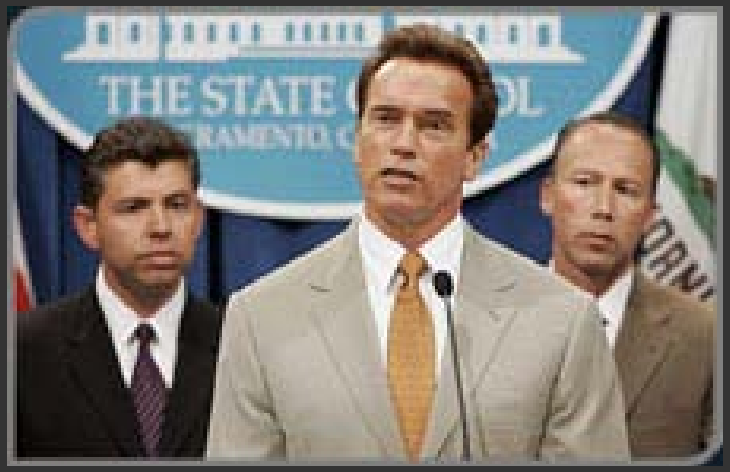
Heat Stress Prevention

2003 European Heat Wave Deaths

- 22,000 – 45,000 excess deaths (estimates up to 70,000 excess deaths)
  - France had 14,800 excess deaths in 9 days
  - One-third of deaths attributed to heat stroke
  - Increased cause-specific deaths
    - Cardiovascular
    - Pulmonary
    - Renal
    - Psychiatric

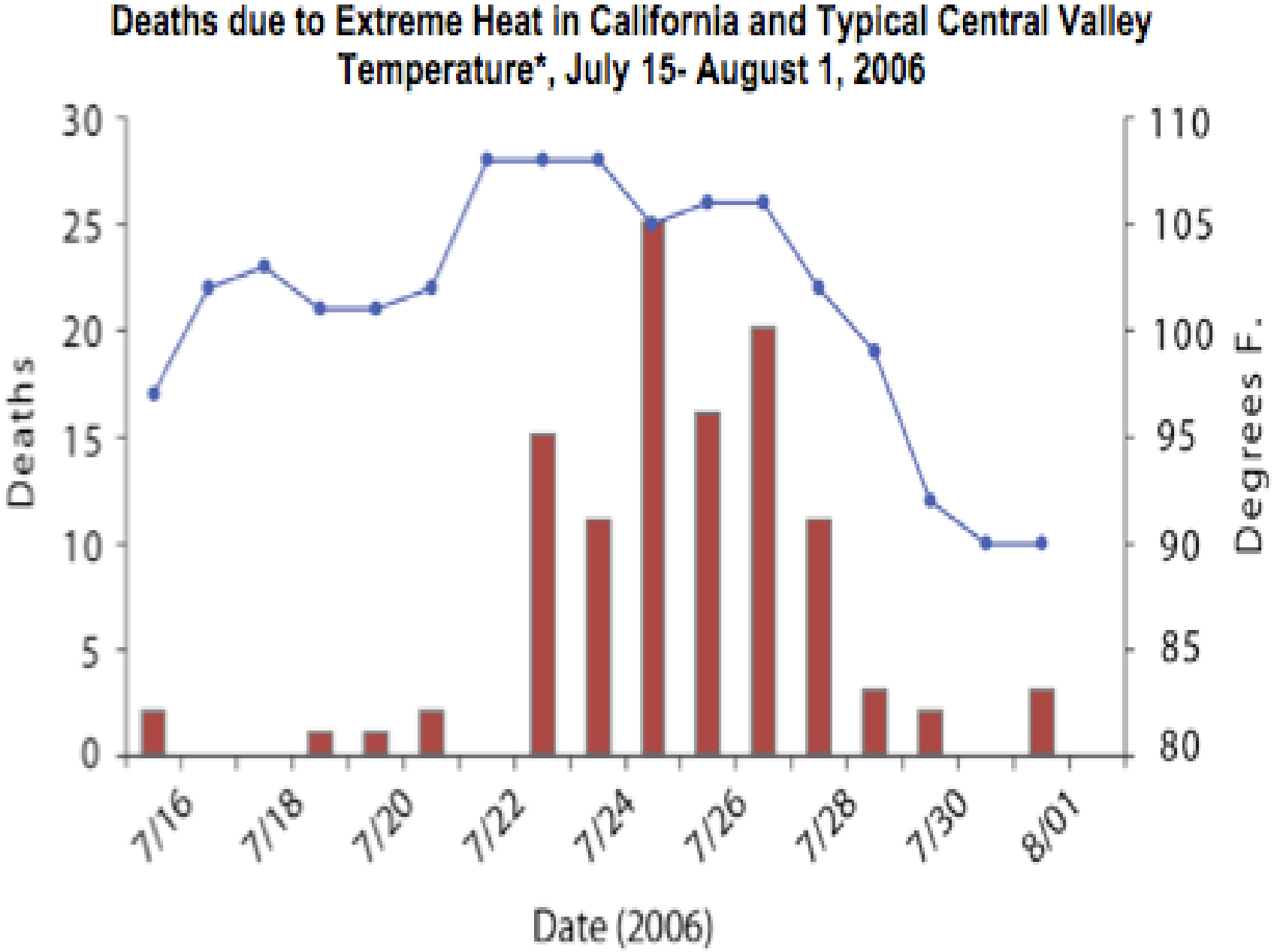

Change in Average Temperature
1950-2000
Del Norte
Siskiyou
Modoc
Humboldt
Trinity
Shasta
Lassen
Tehama
Plumas
Mendocino
Glenn
Butte
Sierra
Nevada
Colusa
Sutter
Yuba
Placer
Lake
Sonoma
Yolo
El Dorado
Alpine
Napa
Sacra-mento
Amador
Solano
Cala-veras
Marin
Conta Costa
San Joaquin
Tuolumne
Mono
San Francisco
Alameda
Stanislaus
Mariposa
San Mateo
Santa Clara
Merced
Madera
Santa Cruz
Fresno
San Benito
Inyo
Pacific Ocean
Tulare
Monterey
Kings
San Luis Obispo
Kern
San Bernardino
Santa Barbara
Ventura
Los Angeles
Riverside
San Diego
Imperial
Change in Temperature
(°C per Decade)
-0.43-0.00
0.00-0.14
0.14-0.16
0.16-0.19
0.19-0.22
0.22-0.25
0.25-0.28
0.28-0.31
0.31-0.34
0.34-0.61
County
Temperature Monitors
0
100 Kilometers
Source: Smooth surface generated using data from Steve LaDochy, Richard Medina and William Patzert

August 3, 2005



"This is a tragedy…and we will do everything it takes to prevent this from happening again"

August 8, 2005
Emergency occupational regulations for heat illness


Deaths due to Extreme Heat in California and Typical Central Valley Temperature*, July 15- August 1, 2006
Deaths
Degrees F.
Date (2006)
0
5
10
15
20
25
30
80
85
90
95
100
105
110
7/16
7/18
7/20
7/22
7/24
7/26
7/28
7/30
8/01

2006 California Heat Wave Impacts on All-Cause ED Visits

- Increase in ED visits (all causes) (n=16,166) and hospitalizations (n=1,182) for all age groups
- Increase in ED visits for all race/ethnic groups
- Increase in ED visits for all regions except SE desert
- Increase in cause-specific hospitalizations: heat illness, electrolyte imbalance, acute renal failure, nephritis.

Knowlton, EHP 117:61, 2009

1999 - 2003 California Heat Wave Mortality

- 232,676 non-accidental deaths
- Each 10˚ F (≈4.7˚ C) increase in mean temp assoc. with a 2.6% increase cardiovascular deaths
- Elevated risks for:
  - Persons >65 y/o
  - Infants ≤ 1 y/o
  - African-Americans
- No difference by gender

Basu, AJE 2008

Heat Illness Fatalities in Agriculture, 2008

Maria Isabel Jimenez
May 14, 2008
17 y.o. picking grapes

Ramiro Rodriguez
July 9, 2008
48 y.o. picking nectarines

Jose Hernandez
June 20, 2008
64 y.o. picking squash

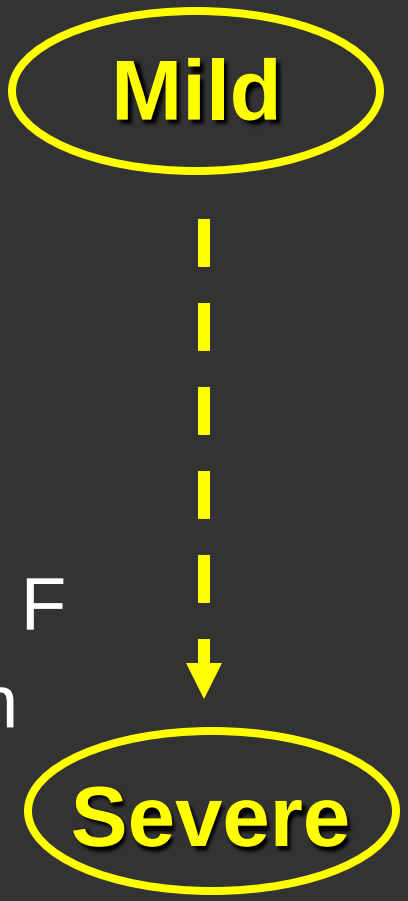
Jorge Herrera
July 31, 2008
37 y.o. loading grapes

Abdon Garcia
July 9, 2008
46 y.o. loading grapes

Maria Alvarez
August 2, 2008
63 y.o. picking grapes

Heat-Related Illness

- Heat rash
- Heat syncope (fainting)
- Heat cramps
- Heat exhaustion
- Heat stroke
  - Core body temperature >104˚ F
  - Multi-organ system dysfunction
  - Medical emergency
- Death



Heat exchange of worker performing physical work in hot weather

Solar radiation

Wind

Evaporation (sweat and respiration)

Air temperature

Air humidity

Radiation

Convection

Metabolic heat

Ground thermal radiation

Reflected solar radiation

Conduction

Personal Risk Factors

- Lack of Acclimatization
- Dehydration
- Lack of Fitness
- Obesity
- Heavy Clothing

The Short Life and Preventable Death of Maria Isabel Vasquez Jimenez

Meet **Maria Isabel Vasquez Jimenez.**

On May 13, seventeen-year-old Maria was a farmworker, working the grape vineyard of West Coast Grape Farming in Stockton, California alongside her fiancee, **Florentino Bautista.**

Three days later, Maria was dead -- killed after working nine straight hours in the broiling heat of the California summer, without access to water or shade.

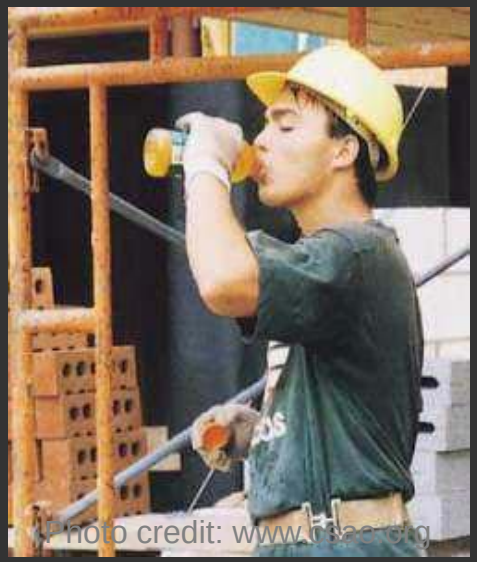
Cal/OSHA Campaign Highlights Heat Hazards, Prevention, May 14, 2010

Cal/OSHA announced it is taking a multifaceted approach to protecting California's outdoor workers from heat illness and injuries that includes a combination of education, outreach, and enforcement efforts.

"Employers need to understand that they are responsible for ensuring that all the requirements under the Heat Illness Prevention Standard are followed,"

"Our heat sweeps are designed not only to send employers a strong enforcement message but also to provide employers and employees with information they need to keep their workers safe."

The campaign's slogan is "Water. Rest. Shade. Without them, the work can't get done."



Thank you!