


Environmental Health Disaster Preparedness and Response

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Today's Topics

- Types of environmental health disasters
- Who is involved
- Disaster impacts on worker, community (four examples)
- Public health response options



Types of EH Disasters

	Acute Impacts	Chronic Impacts	Delayed Impacts
Acute Event	Pesticide exposure Wildfire Flood Earthquake	Asthmagen release Teratogen release	Asbestos release Carcinogen release PTSD
Chronic Event	GHGs CFCs Ag security Water security		

Largest recorded foodborne pesticide illness 1985 illness after eating watermelon

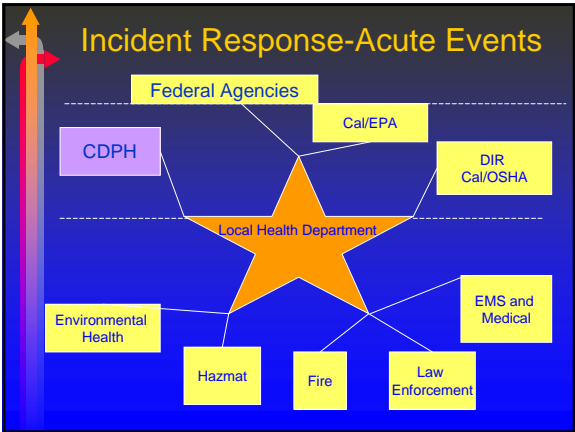
- Aldicarb highly toxic, unregistered pesticide
- Used illegally on watermelons in Washington
- Cholinesterase inhibitor illness diagnosed by ED physician on July 3
- Poison Control Centers notified
 - In turn, PCCs notify physicians through EDs
- 1000 probable pesticide illnesses reported
 - In CA, 8 other states, 2 Canadian provinces
- Integrated food surveillance program now operational



Goldman. Pesticide food poisoning from contaminated watermelons in California, 1985. ARCHIVES OF ENVIRONMENTAL HEALTH, July-August, 1990

1985 watermelon incident Public Health Response Included

- ED physician
- Poison control system
- State health department
- Local health departments
- Other states
- Regulatory agencies



- ### Role of Public Health in Non-Infectious Disaster Response
- Document, evaluate health effects
 - Immediate, long-term
 - Assess exposures
 - Substance, exposure levels, dose
 - Recommend treatment, intervention
 - Evacuate, shelter-in-place
 - Personal Protective Equipment
 - Recommend follow-up, prevention
 - Medical, safety practices
 - Influence regulations, standards
 - Resource allocation



... and always involve workers



Response Workers and Exposures are Varied

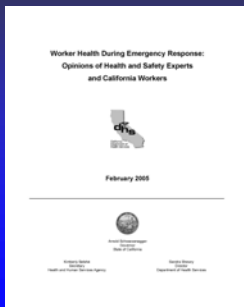
Examples of workers

- Law enforcement
- Transportation
- EMT, fire, ambulance
- Health care
- Public health agencies
- Cleanup, remediation

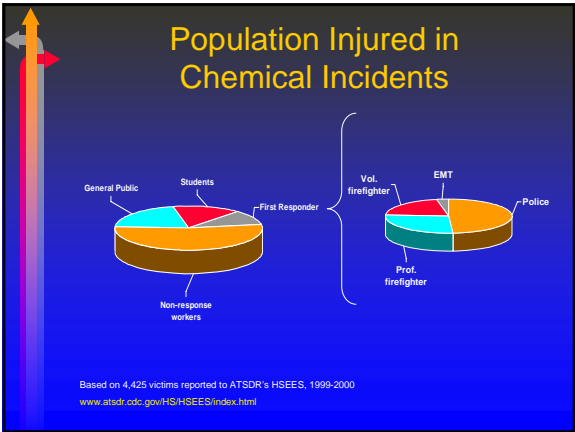
Examples of hazards

- Chemical
- Thermal
- Infectious
- Mechanical
- Ergonomic
- Psychological

Workers Inadequately Prepared



- Firefighters feel prepared but may not be aware of chronic health effects
- Patrol officers feel least prepared even though they may be first to arrive at the scene of an incident



Sulfuric Acid Release Richmond, 1993

- Tank car valve rupture during illegal unloading
- 8 tons SO₃ released over 4 hours
- SO₃ + H₂O → H₂SO₄
- 15-mile long plume

Sulfuric Acid Release Impact on Public Health

- Affected community: population 110,000
- 5000 visits to ERs, clinics on first day
- 2 to 16-fold increase in patients on 1st 5 days
- >20,000 total medical visits to at least 14 facilities

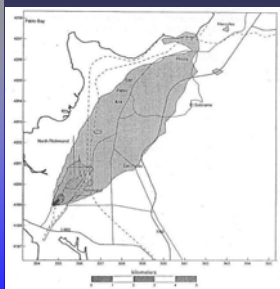
Health Effects

- <5% patients had "target conditions" with objective findings documented by clinician
 - 88% respiratory
 - 8.4% GI
 - 4.6% eye
- 95% had "non-target" conditions
 - 85% health complaints without objective findings
 - 15% no health complaints, "worried well"

Patients with Target Conditions

- Older age
- More likely to report that health effects lasted more than a week
- Respiratory effects more likely in smokers
- 3-fold more likely to have history of asthma

Modeled Exposure Levels



- No life-threatening exposures
- Symptoms reported across all levels
- 50% exposed at levels reported in literature as causing respiratory irritation
- 33%, even those with target symptoms, were outside the lowest exposure areas

Modified from Bartlett et al., Lawrence Livermore National Laboratory

Medical Treatment

- In this case, symptomatic treatment
- Specific treatment for certain substances
 - Mushroom poisoning
 - Some pesticides, toxins
- Rapid treatment advice
 - <http://www.calpoison.org/>
 - 1-800-222-1222



Evacuate or Shelter-in-Place?

- Decision made by incident commander
 - Should be made with input from public health
 - "Shelter-in-place" ordered in this incident
- Evacuations occurred in 5-6% of events reported to HSEES
 - Most were of part or all of a building
 - Often not performed properly

Sulfuric Acid Release Worker Health Issues

- 2 workers capped release, PPE appropriate
- Worker Safety Gaps
 - Safeguards for equipment failure
 - Operator training for H_2SO_4 unloading
 - Spill response team preparation



Conclusions of Health Study

- Health care systems overloaded by people seeking medical care (10-12% of population)
- Hazardous materials releases provoke symptom responses in more persons than predicted by estimated exposure levels
 - Susceptible sub-populations
 - Stress of a community-wide emergency
 - Inability to predict effects of chemicals
- Most susceptible: elderly, smokers, respiratory conditions (asthma, COPD)
- Additional sources of warning information needed
 - Siren system
 - Education campaign

Recommendations

- Improve warning system
 - Special efforts for elderly, respiratory conditions
 - Shelter-in-place advisories for those not at home
 - Notification for non-English speakers
 - Laotian, other Southeast Asian communities
- Measure exposures whenever possible
- Improve record keeping at health care facilities
- Standardize medical history-taking
 - Exposures
 - Health effects

Sulfuric Acid Release Outcomes

- Monetary penalties > \$1 million
- Community health clinic
- Community siren warning system
- Tank car valve design altered
- Class action law suit
 - \$180,000 settlement for thousands of claims



Metam Sodium Spill

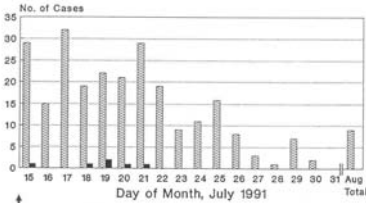
Sacramento River, July 1991



Liquid metam + water → MITC in air

Emergency Room Visits

Emergency Room Visits, Shasta Mercy Hosp
(Spill-related Complaints)



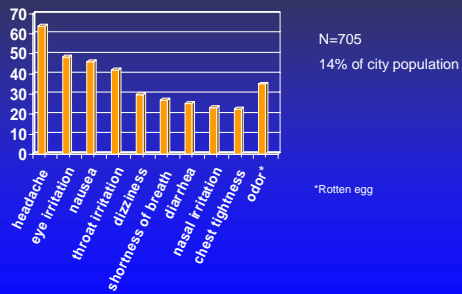
CalEPA, 1991

Emergency Room Symptoms

Days 1-4

- Nausea 51%
- Headache 44%
- Eye irritation 40%
- Throat irritation 26%
- Dizziness 23%
- Vomiting 22%
- Shortness of breath 21%
- Chest tightness 16%
- Abdominal pain 14%
- Diarrhea 10%
- Cough 10%

Community effects over 1 month



http://www.ehpb.org/papers/22_Kreutzer_1992_Acute.pdf

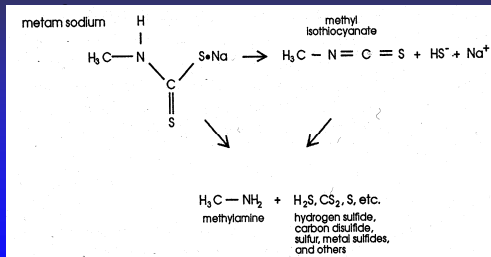
Contact Dermatitis in Cleanup Workers



- 0/31 gov. workers
 - >75% changed immediately
- 27/42 inmates
 - Did not change
- Risk factors
 - Prolonged wetness
 - Occlusive boots
 - Friction, heat

Bustby C.M.M.W.R. 1991: 40:825-833.
Koo D. Ind Med. 1995 27:545-63.

Breakdown of MITC



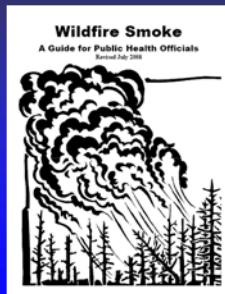
Wildfires in California

- Ongoing risk
 - Late spring through late fall
 - Many locations across state (& U.S.)
 - Fairly predictable emergency event
- Health impacts fairly well understood
 - Respiratory irritation due to particulate exposure is the principal short-term concern for the public & employees not fighting fires

Wildfire Smoke Guide 2003 needed revisions

- Multi-agency, multi-state collaboration
- Strategies to reduce smoke exposure
- Respiratory protection section redone
- New appendices on key issues

<http://www.preparedcalifornia.ca.gov>



CDPH response to Local Health Officers' concerns

- Messaging for the public – Should we recommend that people wear masks?
- Policies for public sector workers – Should outdoor workers wear masks?
- Cal/OSHA – Will employers be cited for respirator use without fit testing?
- Protection of office workers in high smoke areas – Should employers allow employees to wear masks? Should the HVAC intake be closed down?

Fact sheet for lay audiences

- Simple language – in English & Spanish
- Take other measures first – stay indoors, limit physical activity
- NIOSH-certified N95 or P100 respirator may help to protect lungs
- What not to select
- How to use it





Injury Pattern Among Rescue Workers at WTC Site

% NYFD workers

	24 hrs.	11 mos.
Respiratory	25.7	18.5
Trauma	38.1	
Eye	10.4	
Systemic	31.3	
Psychological	3.3	12.6



MMWR September 11, 2002; 51:1-20.

24 hrs: N=240; 11 mos: N=10,116; 48 hours: 90% of 10,116 rescue workers complained of acute cough often accompanied by nasal congestion, chest tightness, or chest burning.

WTC Worker Injury/ Illness Surveillance

Injury/Illness	Number seen: 3363	% of total
Eye injury	483	14
Headache	279	8
Blisters	268	8
Lung injury	228	7
Sprain/strain	220	7
Laceration	208	6
Skin irrit/rash	130	4

Time period: 9/14 to 9/24/2001

Worker Exposures at WTC Site

	<u>% > OSHA PEL</u>
Acid gases	1.7
Asbestos	1.3
Carbon monoxide	1.6
Metals	5.2
Respirable silica	7.0
Respirable total dust	2.8
Polynuclear aromatic hydrocarbons	7.3
Dioxins	no PEL
Noise	26.9





Photo: The New Yorker, May 20, 2002

Sampling began 9/13; variable measurement periods


WTC Workers Acute/Subacute Health Effects

- GI and respiratory tract irritation
- Persistent cough (WTC cough)
- Irritant-induced asthma
- Chronic laryngitis
- Eosinophilic pneumonia
- Bronchiolitis obliterans



WTC Workers: 5-year Findings


- Workers arrived Sept 11—Oct 10 2001
- Rescue and recovery workers who arrived early have
 - More prevalent, worse symptoms
 - Worse lung function



WTC Health Registry— Preliminary findings 2008

- 410,000 people heavily exposed
 - > 91,000 rescue & recovery, volunteers
 - > 57,000 residents
 - 15,000 children and staff in schools
 - > 360,000 building occupants, residents & people passing by


<http://www.nyc.gov/html/doh/wtc/html/registry/findings.shtml>



WTC Health Registry Preliminary findings 2008

- Most caught in dust cloud had symptoms
 - Sinus problems, cough, eye irritation
- Higher asthma rates
 - In all workers, highest in those who did not wear respirators
 - In children under 5, twice regional rate
- Higher rates of PTSD (13%)


<http://www.nyc.gov/html/doh/wtc/html/registry/findings.shtml>



Optimizing Public Health Response to Chemical Incidents: Workers


- Anticipate work-specific hazards and potential emergency response actions
- Consider potential for long-term effects
- Establish health and safety protocols
 - Illness and Injury Prevention Programs*
- Train workers through exercises
- Establish communication before incident

*Title 8 Sec 3203



Optimizing Public Health Response to Chemical Incidents: Community

- Establish criteria for determining illness
- Anticipate large numbers of “worried well”
- Collect biologic and environmental samples early in the incident
- Recognize potential for prolonged effects
- Encourage community and personal emergency preparedness plans



Spectrum of Action

- Prevent
- Anticipate
- Respond as needed
- Do nothing

Sufficient Certainty Principle

- *The degree of scientific certainty that is SUFFICIENT for governments to pass from inactivity to requiring precautionary planning or cheap or expensive protective actions should not be fixed but should depend on the severity, magnitude, irreversibility and moral implications of the health, political or environmental threat.*

A Basic Policy Question

- *“All other things being equal how certain must we be of how much danger before we would opt for cheap or expensive protective alternatives?”*