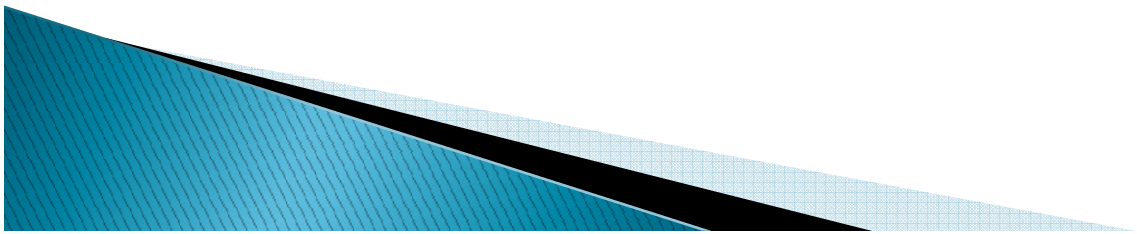
Lessons Learned:Moving Beyond Setting Occupational Health Standards One Chemical at a Time

Molly Jacobs
University of Massachusetts, Lowell
Lowell Center for Sustainable Production

Lowell Center for Sustainable Production
UNIVERSITY OF MASSACHUSETTS LOWELL

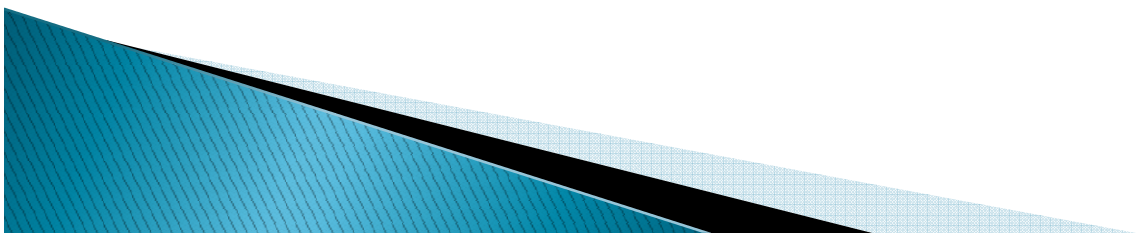
Outline

1. Review limitations in OSHA's system of establishing occupational exposure limits to toxic substances
   - Diacetyl
   - Methylene chloride & 1-bromopropane
2. Outline a series of potential solutions forward
   - Programmatic
   - System-level changes



OSHA health standards

- Early 1970s: *Interim* 450 PELs based on ACGIH's TLVs; 480 PELs total
- 1970–2011: ~30 *permanent* health standards, 20 considered comprehensive
- Existing PELs vastly outdated: based on science primarily from the 1940s–1960s
- Today: ~85,000 chemicals registered for use in US; ~2500 high production volume chemicals



Notable attempts to fix OSHA's health standard-setting problem

- 1980 Generic Carcinogen Policy
  - Streamlined the rule making process by setting science policy
  - Set priorities for regulation
  - Speed-up setting health standards: 10 substances selected for comprehensive rule-making at any one time
- 1989 Air Contaminants Standard
  - Based again on ACGIH's TLVs: 212 additional PELs and 164 PELs updated

Supreme Court's benzene decision

- 1978: OSHA issued 1ppm PEL for benzene
- 1978: Challenged by American Petroleum Institute [no risk below the old limit of 10ppm]
- 1980: Supreme Court vacates the OSHA standard. OSHA must establish:
  1. a workplace is unsafe due to the presence of a "significant risk" to workers
  2. that this risk can be eliminated or lessened by the promulgation of a standard or change in a standard

- Supreme Court:
  - "If the odds are one in a billion that a person will die from cancer by taking a drink of chlorinated water, the risk clearly could not be considered significant. Yet on the other hand, if the odds are one in a thousand that regular inhalation of gasoline vapors that are two percent benzene will be fatal, a reasonable person might well consider the risk significant and take appropriate steps to decrease or eliminate it."

Benzene decision impacts

- OSHA "stays" the Generic Carcinogen Policy
- 11th Circuit Court of Appeals vacates the Air Contaminants Standard
- OSHA standard rule-making practice: Accepting risks for workers that are magnitudes higher than EPA accepts for the general public
- OSHA's interpretation of the benzene decision:
  - 1 cancer death per 1,000 workers exposed to a specific agent over a lifetime
- For comparison, EPA:
  - 1 cancer death per 100,000 or 1,000,000 individuals

Lessons learned: Case example, diacetyl

Diacetyl- artifical butter flavoring

- 2000, cluster of *bronchiolitis obliterans* among workers in a popcorn manufacturing plant
- Mixing area employees exposure to diacetyl: 17-1,000x higher than other plant employee exposures.
  - Deep lung damage associated with where workers spent most their time*
- No OSHA PEL;
- FDA: "generally recognized as safe" yet no inhalation tests conducted
- NIOSH RELs/OSHA PELs: fewer than 5% of the 1,037 flavoring ingredients
- Regulation by litigation: substitutes, yet safer?

*Kriess et al. N Engl J Med 2002;347:330.

Lessons learned: Case example, methylene chloride & 1-bromopropane

MeCl2 & 1-bromopropane

- 1997 MeCl2 OSHA permanent health standard
  - Standard considered a success story
  - Prompted by NTP evidence of carcinogenicity in 1985
  - Took 12 years to finalize the MeCl2 rule
  - Residual life time risk of cancer at the new PEL 3.6 per 1,000
  - Exposure reduction strategies: dependent on engineering controls rather than source reduction
  - Yet regulations by multiple fed. agencies prompted employers to substitute

MeCl2 & 1-bromopropane

- 1-Bromopropane
  - Virtually untested substitute in late 1990s; marketed as “green” “non hazardous” substitute for restricted chlorinated solvents
  - No OSHA/EPA regulations
  - Within a years of use evidence emerged regarding neurotoxicity*
  - NTP panel: reproductive/developmental toxicant**
  - NTP carcinogenicity testing: potentially more carcinogenic than MeCl2***

*Int Arch Occup Environ Health. 2005;78:79.

**See: http://cerhr.niehs.nih.gov/evals/bromopropanes/1-bromopropane/1BP_monograph.pdf.

***see: http://ntp.niehs.nih.gov/index.cfm?objectid=4E0C03A9-F1F6-975E-79F1E370B9027815.

Summary of lessons-learned

- Too many chemicals to regulate one at a time
- Supreme Court's benzene decision: significance of risk for each individual chemical
- Rule making process long & tedious: workers remain at risk while rule making occurs
- Disjointed US system of chemicals management
- OSHA standards: focus on "risk management" via engineering controls
- Source reduction/substitution occurring at employers' discretion

Proposed solutions

- OSHA: example of considerations
  - **Legislative**
    - New authority to adopt existing consensus standards
  - **Use of "general duty clause"**
  - **Rule making: Generic standards**
    - Injury & Illness Protection Program (I2P2)
      - Employers/employees to identify & assess workplaces hazards
      - identify & implement hazard prevention & control program
        - 1989 MA TURAct demonstrates that employer-based planning works to reduce toxics use
    - Technology based standards (EPA's general approach)
    - Control/hazard banding
      - A single *control* technology or strategy is matched with a single *band*, or range of exposures/hazards

Control banding example

Band No.	Range of exposure concentrations	Hazard group	Control
1	>1 to 10 mg/m^3 dust >50 to 500 ppm vapor	Skin and eye irritants	Use good industrial hygiene practice and general ventilation.
2	>0.1 to 1 mg/m^3 dust >5 to 50 ppm vapor	Harmful on single exposure	Use local exhaust ventilation.
3	>0.01 to 0.1 mg/m^3 dust >0.5 to 5 ppm vapor	Severely irritating and corrosive	Enclose the process.
4	<0.01 mg/ m^3 dust <0.5 ppm vapor	Very toxic on single exposure, reproductive hazard, sensitizer*	Seek expert advice.

Additional systems-level solutions

- Comprehensive Chemicals Policy Reform
  - Example EU's Registration, Evaluation, and Authorization of Chemicals (REACH)
  - Encouraging alternatives assessments (source reduction) vs. risk management (focus on engineering controls)
- Prevention through Design (PtD)
  - We designed the hazards (little regard to toxicity when chemicals initially engineered) so we can design them out
  - Encourages innovation & breaks free of the false dichotomy of safety vs. profit
  - NIOSH's initiative
  - Example: green chemistry

12 Principles of Green Chemistry (sample)

- Design chemicals and products to be effective w/ little or no toxicity
- Prevent waste that requires treatment or clean-up
- Develop less hazardous ways to synthesize chemicals
- Use renewable raw materials
- Design chemicals to break down after use

No worker should fall ill simply by showing up to work and doing the job asked of them