Advances in medical surveillance

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Case presentation

• 32 y.o. man with 2 months SOB, wheezing, cough and chest pain. FEV1 = 1.10 L (28% predicted). HRCT with peribronchial thickening, mosaic attenuation.
• 43 y.o. woman with 1 month SOB, cough. FEV1 = 0.55 L (18% predicted). HRCT with ground glass opacities.
Diagnosis of BO

- Air trapping, mosaic attenuation
- Rare granulomas, submucosal fibrosis, bronchiolar narrowing, chronic bronchiolitis

High-resolution CT scan  Lung biopsy

Bronchiolitis obliterans

- NIOSH study at “sentinel” microwave popcorn plant
- 4 of 8 workers on lung transplant list
- One recent death

NIOSH HHE - 1984

- Request for study of bakery operation in Indiana
- 2 workers with severe lung disease
- Multiple exposures to dusts, flour, flavorings
Young, nonsmoking workers
2/3 mixers affected
Severe loss of FEV₁ with fixed airways obstruction

Flavor manufacturer with batch processes using ribbon blenders
Dust emissions during mixer operations

Toxicology studies
- Multifocal necrotizing bronchitis in rats exposed to 285-371 ppm of diacetyl
Epidemiology studies

- Airways obstruction in popcorn workers related to cumulative diacetyl exposure levels (dose-response relationship)

Exposure studies

- Lowest mean TWA diacetyl concentration in popcorn plant with mixer with $BO = 0.02$ ppm
- Peak diacetyl concentration while pouring liquid butter in Plant D = 80 ppm

Public health action

- Risk notification of employers, HCPs
- Survey of CA companies with potential use of diacetyl
- NIOSH study of lung disease and exposure risk
- Petition for Cal/OSHA standard


NIOSH HE Report - April 2007

- Production areas had highest diacetyl concentrations, below detection (0.002 ppm) to 1.13 ppm
- Mean personal samples - 0.03 ppm, mean area samples - 0.025 ppm
- Peak concentrations up to 100 ppm

April 27, 2007 MMWR Publication
Materna B et al.

Table II: Characterization of 97 Cases With Asthma/Occlusion in the Cross-Sectional Study of California Flavor Manufacturing Workers

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Number</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production</td>
<td>45</td>
<td>91.8</td>
</tr>
<tr>
<td>Production support</td>
<td>2</td>
<td>11.8</td>
</tr>
<tr>
<td>Office</td>
<td>1</td>
<td>8.2</td>
</tr>
<tr>
<td>Any work</td>
<td>1</td>
<td>8.2</td>
</tr>
<tr>
<td>Any asthma</td>
<td>1</td>
<td>3.1</td>
</tr>
<tr>
<td>Reported cases</td>
<td>4</td>
<td>21.0</td>
</tr>
<tr>
<td>Reported controls</td>
<td>3</td>
<td>14.7</td>
</tr>
<tr>
<td>Reported medical</td>
<td>1</td>
<td>3.1</td>
</tr>
<tr>
<td>Reported severity</td>
<td>1</td>
<td>3.1</td>
</tr>
<tr>
<td>Positive diagnosis</td>
<td>4</td>
<td>21.0</td>
</tr>
<tr>
<td>Chronic asthmas</td>
<td>3</td>
<td>14.7</td>
</tr>
<tr>
<td>Lung disease</td>
<td>1</td>
<td>3.1</td>
</tr>
<tr>
<td>Reported cases</td>
<td>4</td>
<td>21.0</td>
</tr>
<tr>
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AB 514 - Lieber bill 2007

- Requires Standards Board to adopt standard by 2008 to prohibit diacetyl use in the workplace by 2010

SB 456 - Simitian bill 2007

- Prohibits the manufacture, process or distributing in commerce any products that contain diacetyl

Medical Surveillance for Flavorings Related Lung Disease
California Department of Public Health – August 2007
Petition for emergency standard CalOSHA 2006 - 2010

- AFL/CIO petition 8/24/06 for emergency standard granted by Standards Board 1/18/07 - referred to advisory committee
- Advisory meetings held 9/28/06, 2/13/07, 3/21/07, and 5/18/07
- Public hearing 11/19/09
- Second revision - comments due 9/7/10
Epidemiology

- Median PAR = 17.6% (Toren and Blanc, 2009)
- Occupations at high risk: painters, bakers, woodworkers, welders, chemical workers
- Most common exposures: isocyanates, flour/grain, wood, latex, glutaraldehyde, lab animals
Top 10 Occupations with Highest Rates of WRA

Classification of Confirmed Cases
Work-related asthma in California

Current policy directions
- Cal/OSHA “sensitizer committee”
  - Comprehensive approach to designation
  - Compromise instead of lowering PEL
- Medical surveillance issues
  - “Trigger”: use or worker symptoms?
  - Scope: ACGIH, UK, Germany, AOEC
  - Responsibility for medical oversight
  - Medical removal protection
OSHA Lead Standard

- General Industry Lead Standard issued in 1979
- Scientific research over 30 years has demonstrated health effects at lower levels than previously understood
- EPA has lowered acceptable blood lead for children
- OSHA Standard may no longer offer sufficient protection to workers

Adult Blood Lead Epidemiology and Surveillance Program

- Problems identified:
  - Misleading interpretive information on BLL reports
  - Lead standards based on medical information from 1970s
  - Newer research shows adverse health effects at lower blood lead levels
  - No adult equivalent to the CDC’s Guidelines for Children

Recommendations for Medical Management of Adult Lead Exposure

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WOEMA Scientific Advisory Review Panel

- CDPH/OLPPP Medical Guidelines Update
  - Panel Chair: James P Seward, MD, MPP
  - Members:
    - Leslie Israel, DO, MPH
    - Robert C. Blink, MD, MPH
    - Hong Zhang, MD, MPH, MS
    - Paul J. Papanek, Jr., MD, MPH
    - T. Warner Hudson, MD, FACOEM

CALIFORNIA DEPT. of PUBLIC HEALTH
ADULT LEAD GUIDELINES

See http://www.cdph.ca.gov/programs/olppp/Pages/default.aspx

WOEMA Letter to Cal/OSHA

- November, 2009
- Encouraging Cal/OSHA to move forward with revisions of the Cal/OSHA lead standards
OSHA Lead Standards

Medical removal not mandatory until blood lead concentrations ≥ 50 or 60 µg/dL.

Health effects of lead at low dose warrant a reappraisal of the levels of lead exposure that may be safely tolerated in the workplace.

- **Chronic effects of cumulative dose**
  - Hypertension
  - Decrements in renal function
  - Cognitive dysfunction

- **Acute effects of recent dose**
  - Adverse reproductive outcome

<table>
<thead>
<tr>
<th>Category</th>
<th>Recommended medical surveillance</th>
</tr>
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<tbody>
<tr>
<td>All lead-exposed workers</td>
<td>Baseline/preplacement H&amp;P, baseline BLL, serum creatinine</td>
</tr>
<tr>
<td>BLL &lt; 10</td>
<td>BLL q month for first 3 mo. or if ↓ to higher exp., then BLL q 6 mo.</td>
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<tr>
<td></td>
<td>If BLL ↑ ≥ 5, evaluate exposure and protective measures. Increase monitoring if indicated</td>
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<tr>
<td>BLL 10 - 19</td>
<td>As above for BLL &lt; 10, plus: BLL q 3 months</td>
</tr>
<tr>
<td></td>
<td>Evaluate exposure, controls, work practices</td>
</tr>
<tr>
<td></td>
<td>Consider removal</td>
</tr>
<tr>
<td></td>
<td>Revert to BLL q 6 mo after 3 BLLs &lt; 10</td>
</tr>
<tr>
<td>BLL ≥ 20</td>
<td>Remove from exposure if repeat BLL measured in 4 weeks remains ≥ 20, or if first BLL ≥ 30</td>
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<td></td>
<td>Monthly BLL</td>
</tr>
<tr>
<td></td>
<td>Consider return to lead work after 2 BLLs &lt; 15 a month apart, then monitor as above</td>
</tr>
</tbody>
</table>

Surveillance recommendations apply to all potential lead exposed workers, even in absence of documented elevations in air lead levels.

Routine measurement of zinc protoporphyrin not indicated

With potential exception of annual BP measurement and risk factor questionnaire, medical evaluations unnecessary for workers maintaining BLL < 20 µg/dL.

Annual worker education about lead hazards is recommended.