Silicosis and Silica Exposure in Dental Technicians

Donald P. Schill, MS, CIH
Occupational Health Surveillance Program
New Jersey
Department of Health and Senior Services
Dental Lab Technology

BEFORE                 AFTER

• Permanent and Removable Dental Restorations
  ✓ Crowns             ✓ Dentures
  ✓ Bridges            ✓ Partials
  ✓ Implants           ✓ Veneers

• Orthodontic Appliances
Sentinel Cases
New Jersey

- Male
- Smoker
- 1946-1992 (46 yrs.)
- 3 Facilities
- Died of lymphoma (Age: 65)

- Male
- Smoker
- White
- 1947-1976 (29 yrs.)
- 2 Facilities
- Died of acute renal failure (Age: 67)
Sentinel Cases
Michigan

- White
- Male
- Smoker
- Other
- 1964-1984 (20 yrs.)
- 1 Facility
- Died of chronic renal failure (Age: 77)

- Male
- Non-Smoker
- White
- 1977-1983 (6 yrs.)
- 1 Facility
- Diagnosed with nodular pneumoconiosis in 1997 (Age: 38)
## Sentinel Cases

### Ohio

<table>
<thead>
<tr>
<th>Sex</th>
<th>Case 1</th>
<th>Case 2</th>
<th>Case 3</th>
<th>Case 4</th>
<th>Case 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>race</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td>DOB</td>
<td>8/29/94</td>
<td>11/09/50</td>
<td>01/18/47</td>
<td>08/06/25</td>
<td>03/27/34</td>
</tr>
<tr>
<td>Age at Diagnosis</td>
<td>32</td>
<td>Unk</td>
<td>49</td>
<td>60</td>
<td>42</td>
</tr>
<tr>
<td>Years exposed at dental mfr/lab</td>
<td>14</td>
<td>Unk</td>
<td>14</td>
<td>13</td>
<td>Unk</td>
</tr>
<tr>
<td>Year first exposed at dental mfr/lab</td>
<td>1943</td>
<td>Unk</td>
<td>1965</td>
<td>1943</td>
<td>Unk</td>
</tr>
<tr>
<td>Literal job title</td>
<td>Laborer</td>
<td>Unk</td>
<td>Dental lab Technician</td>
<td>Mixed Compounds</td>
<td>Compounder-Filler</td>
</tr>
<tr>
<td>COC</td>
<td>889</td>
<td>999</td>
<td>678</td>
<td>756</td>
<td>756</td>
</tr>
<tr>
<td>Literal industry title</td>
<td>Binding Powders Mfr</td>
<td>Dental Products</td>
<td>Dental Eqpt &amp; Supplies</td>
<td>Dental Mold Mixtures</td>
<td>Dental Supply</td>
</tr>
<tr>
<td>SIC</td>
<td>3297</td>
<td>3297</td>
<td>3843</td>
<td>3297</td>
<td>3297</td>
</tr>
</tbody>
</table>

1 – for each of these cases, when start date was known, this date was the date of first occupational exposure to silica.

2- Cases 1,2,4 & 5 worked at same company.
Dental Laboratories

- Dental Laboratories: SIC 8072
- Dental Technicians: COC 678
  - ~14,000 dental labs in US
  - 454 listings in 1997 D & B database for NJ
  - No registration
  - No licensing
  - Certification
    - laboratories (CDL) & technicians (CDT)
    - voluntary
    - CDT: practical exam/continuing ed/disciplinary policies
    - CDL: employ CDT/OHS compliance/infection control
Dental Lab Associations

- NJ Dental Laboratory Association
- National Association of Dental Laboratories:
  - Founded National Board for Certification
  - Funds lobby effort
    - wants regulation of dental labs
  - Offers training packages
    - Infection Control
    - Hazard Communication
Dental Lab Hazards

- Bloodborne Pathogens
- Methyl Methacrylate
- Cyanoacrylates
- Acids (HF, HCL)
- Solvents
- Electroplating
- Soldering
- Metals (Ni, Cr, Co, Be)
- Glutaraldehyde
- Quarternary Ammonium Compounds
- Latex
- Noise
- Vibration
- Ergonomic
- Dusts
Silica Sources in Dental Labs

• Casting investment mixing/breaking
  – Quartz: 10-55%
  – Cristobalite: 20-70%

• Sandblasting
  – silica sand

• Porcelain grinding/polishing

• Clean-up

• Dust collector maintenance
divesting casting
sandblasting castings
glovebox sandblasting unit
work station local exhaust ventilation
local exhaust ventilation hood
hand-grinding enclosure
Hazard Surveillance Project

- Perform initial site visits
- Identify NJ dental labs
  - develop & maintain database
- Develop educational literature and survey form
- Mail survey and literature
  - develop & update database
- Conduct air sampling
- Analyze data
- Disseminate/publish findings & recommendations
## Air Sampling Results

<table>
<thead>
<tr>
<th>LAB</th>
<th>TASK</th>
<th>RESPIRABLE DUST (mg/m$^3$) Raw/TWA</th>
<th>FREE SILICA (mg/m$^3$) TWA</th>
<th>PERCENTAGE OF NIOSH REL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>casting, sandblasting (SiO$_2$)</td>
<td>0.59/0.51</td>
<td>0.021</td>
<td>0.42</td>
</tr>
<tr>
<td></td>
<td>grinding/polishing porcelain</td>
<td>0.39/0.13</td>
<td>ND</td>
<td>NA</td>
</tr>
<tr>
<td>2</td>
<td>divesting (LEV), sandblasting</td>
<td>0.17/0.12</td>
<td>&gt;LOD&lt;LOQ</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>divesting (LEV), sandblasting</td>
<td>0.13/0.12</td>
<td>&gt;LOD&lt;LOQ</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>clean crowns</td>
<td>0.07/0.04</td>
<td>ND</td>
<td>NA</td>
</tr>
<tr>
<td>3</td>
<td>divesting, sandblasting (Al$_2$O$_3$)</td>
<td>0.15/0.13</td>
<td>ND</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>divesting, sandblasting (Al$_2$O$_3$)</td>
<td>0.40/0.38</td>
<td><strong>0.055</strong></td>
<td><strong>1.1</strong></td>
</tr>
<tr>
<td></td>
<td>investing, clean-up</td>
<td>0.11/0.10</td>
<td>ND</td>
<td>NA</td>
</tr>
<tr>
<td>4</td>
<td>divesting</td>
<td>&lt;0.01/&lt;0.009</td>
<td>ND</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>investing</td>
<td>0.13/0.12</td>
<td>ND</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>grinding/polishing porcelain, abrasive blasting (Al$_2$O$_3$)</td>
<td>0.05/0.04</td>
<td>ND</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>grinding/polishing porcelain</td>
<td>&lt;0.01/&lt;0.008</td>
<td>ND</td>
<td>NA</td>
</tr>
<tr>
<td>5</td>
<td>casting</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>grinding/polishing porcelain</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>divesting, sandblasting (Al$_2$O$_3$)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>