Silica Dust Concerns Among Museum and Conservation Managers and Professionals

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Objectives for this Talk

• Review museum settings where silica exposure is concern
• Describe the regulatory and industrial hygiene environments where leadership and knowledge is needed—Thomas Galassi
• Some sorts of illnesses with silica exposure
• Possible research collaborations with and for museum professionals
Exterior restoration in progress
Introduction

• Inhalation of crystalline silica (Si02) exposure causes silicosis, silico-TB, and cor pulmonale; ~300 deaths per year, though seriously underestimated in U.S.

• Current estimates 2-3 million U.S. workers, ~100+ million workers world-wide exposed to SiO2 mining, coal mining, construction, metallurgy, ceramics, agriculture, sandblasting

• There is evidence since mid 1980s that workplace silica exposure leads to increased risk for multiple diseases, thus joining smoking, & asbestos as multipotential health hazards
Introduction--2

• On March 24, 2016 OSHA/DoL issued new rules for silica dust exposure permitted exposures to silica in construction & general industry at 50 ug/m³ of air over 8 hr workday—1/2 of the 100 ug/m³ under the old standard. [NOTE—not for mining.]


• OSHA is now labeling silica a known human carcinogen, as it has been judged by IARC since 1996; reaffirmed by IARC in 2012

• In addition OSHA recognized that exposure to silica also causes auto-immune diseases and nephritis (kidney disease) as well as COPD and silicosis.

• Museum professionals need to be aware of silica hazards, especially in the field, during construction/repairs of buildings, and globally
Recent Rise in Silicosis/CWP

• Laney et al (2010) reported a higher frequency of r-type small opacities from 2000-2008, consistent with silicosis among underground coal miners from KY, WV, and VA compared with 1990 and 1980s.

• The same study also found 3.8 to 4.4 times prevalence of PMF compared to 1990 and 1980s

• Blackley et al. (2016) discussed a resurgent spike of PMF, including silicosis in coal miners in Eastern KY

• We are aware of recent spikes in silicosis diagnosed among synthetic stonecounter polishers in U.S., Australia and Israel and among sandblasters in Turkey.
Subsequent risks after diagnosis of Silicosis/CWP

• Yin et al. 2018 found excess rates of latent TB among Chinese patients with CWP; this has been reported by many authors

• Tomaskova et al. (2017) studies Czech Republic CWP patients and found a lung cancer SMR of 1.70 (95% CI 1.41, 2.04). Patients with CWP were exposed to coal dust and to silica as well

• Museum H&S professionals must recognize the overlap between creative stone work, excavating fossils in confined spaces, stone repair, compliance with silica standards, and the risk of silica-related diseases
Silicosis and SilicoTB, Especially in South Africa
Goldsmith et al. 1995 studied 590 silicotic (Non CWP) claimants from California from 1946 to 1991—Noncancer causes of death

<table>
<thead>
<tr>
<th>Cause of death</th>
<th>Obs</th>
<th>SMR</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tuberculosis</td>
<td>45</td>
<td>56.4</td>
<td>41.1, 75.4</td>
</tr>
<tr>
<td>Cerebvasc Dis</td>
<td>16</td>
<td>0.6</td>
<td>0.3, 0.9</td>
</tr>
<tr>
<td>All heart Dis</td>
<td>97</td>
<td>0.7</td>
<td>0.5, 0.8</td>
</tr>
<tr>
<td>NMRD</td>
<td>105</td>
<td>3.8</td>
<td>3.1, 4.6</td>
</tr>
<tr>
<td>Emphysema</td>
<td>18</td>
<td>3.4</td>
<td>2.0, 5.4</td>
</tr>
<tr>
<td>Silicosis/other NMRD</td>
<td>68</td>
<td>6.8</td>
<td>5.3, 8.6</td>
</tr>
<tr>
<td>All causes of death</td>
<td>421</td>
<td>1.3</td>
<td>1.2, 1.4</td>
</tr>
</tbody>
</table>
# Malignant Neoplasms SMRs from Goldsmith et al., 1995 Follow-up from 1946-1991

<table>
<thead>
<tr>
<th>Causes of death</th>
<th>Obs</th>
<th>SMR</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>All malig Neoplasms (MN)</td>
<td>81</td>
<td>1.22</td>
<td>0.9, 1.5</td>
</tr>
<tr>
<td>MN Digestive organs</td>
<td>23</td>
<td>1.24</td>
<td>0.8, 1.9</td>
</tr>
<tr>
<td>MN Large intestine</td>
<td>14</td>
<td>2.08</td>
<td>1.1, 3.5</td>
</tr>
<tr>
<td>MN Respiratory System</td>
<td>43</td>
<td>2.0</td>
<td>1.4, 2.7</td>
</tr>
<tr>
<td>MN Lung</td>
<td>39</td>
<td>1.9</td>
<td>1.3, 2.6</td>
</tr>
<tr>
<td>MN Prostate</td>
<td>2</td>
<td>0.3</td>
<td>0.03, 0.9</td>
</tr>
<tr>
<td>All other MN</td>
<td>5</td>
<td>1.1</td>
<td>0.3, 2.5</td>
</tr>
</tbody>
</table>
Other cancer follow-up studies of silicosis patients and registries of silicosis

- Pulmonary and lung cancer excesses have been found repeatedly since the initial studies by Finkelstein et al. in Canada, 1982 and by Westerholm in Sweden, 1980
- There are several meta-analyses showing ~doubling of lung cancer risk for workers with silicosis
- There is epidemiology evidence for elevated risk for skin, lymphatic and kidney cancers among groups with silicosis

• 33 cases of Rheumatoid arthritis (RA), producing RR 6.96, 95% CI 2.93, 16.53
• 1 case of lupus (SLE), producing RR 2.53, 95% CI 0.3, 216.4
• 2 cases of scleroderma, producing RR 28.3, 95% CI 6.09, 129.98
• 2 cases of Sjogrens syndrome, producing RR 0.42, 95% CI 0.09, 2.08
• 6 cases of ANCA-associated vasculitis, producing RR of 25.3, 95% CI 6.34, 101.04
Figure 1: Brick Kiln in Kathmandu Valley, Nepal. Photo by: Sushil Thapa [7].
WHWB-US is a vehicle for students to collaborate with OH professionals, including museum H&S staff

• Get involved with and contribute to ‘real world’ problem-solving
• WHWB-US can mentor students for their practicum and research projects (required for MPH students)
• Museums can provide superb internship opportunities that can lead to hiring young talent after completing their degrees
• Please contact Dr. Goldsmith if you want to start a WHWB chapter
A Couple More Items

• Fulbright Program at the US State Department is an excellent means for museum H&S leaders to further their careers in OSH. Example might be to see the adoption of workplace safety and health perception programs in other countries.

• [https://www.cies.org/program/fulbright-us-scholar-program](https://www.cies.org/program/fulbright-us-scholar-program)

• In 2020 ISEE will meet in Washington DC (GWU will be host) and I urge museum H&S leaders to submit abstracts
Thank you very much

• Any Questions?