Investigation of Mesothelioma Incidence in Areas of Alaska with Naturally Occurring Asbestos

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www.hss.state.ak.us/dph/chronic/
What’s the Concern about Asbestos?

- Causes mesothelioma (most commonly, a cancer of the pleura -- outer lining of the lungs) via inhalation of fibers

- Common asbestos uses:
  - Insulation for houses, pipes, & boilers
  - Fire retardant in roofing & ceiling tiles, and other products
  - Added to provide strength to concrete, bricks, drywall, drywall mud, and other materials
What’s the Concern about Asbestos?

- Asbestos workers in WWII shipyards, plumbers, construction, mining, etc., have high incidence of mesothelioma
- OSHA established worker exposure standards for asbestos in 1971
- Asbestos listed as a human carcinogen by ACGIH in 1972
- Late 1970s-1980s, asbestos phased out of most products
- Some 1960s-era concrete water mains, called “Transite”, are made with asbestos
- EPA regulates amount of asbestos in drinking water
Project Background

- Aug 2003, AK DOT sampled gravel in gravel pit in Ambler in preparation for airport expansion project
- Test results showed the presence of the asbestos mineral chrysotile at concentrations up to 10%
- Gravel pit used since 1960s for construction gravel
- Community was concerned about airborne asbestos exposure from road dust from ATV use causing mesothelioma
ATV Use in the Villages

- Primary mode of summer transportation is by ATV
- Road dust affects drivers and people near the roads
ATSDR Study

- USDHHS Agency for Toxic Substances & Disease Registry published a health assessment for Ambler in 2007
- Road dust is prevalent during most hours of the day due to continuous ATV use
- Dust found on surfaces of all public areas & is a major complaint of residents
- Measured asbestos presence in the air and gravel
Asbestos Fibers in Gravel Samples

Polarized light microscope (PLM) image of chrysotile in the course fraction of Ambler gravel

Transmission electron microscope (TEM) image of chrysotile in the fine fraction of Ambler gravel

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ATSDR Study Recommendations

- Gravel pit be closed to future mining
- Access to gravel pit be closed
- Barrier with clean fill installed at the school
- Village needs to come up with some future asbestos/dust suppression solution
- Devise a smoking cessation education program for the community – smoking and asbestos exposure are synergistic for lung cancer
State Health Dept Study

- AK Dept of Health & Social Services, Section of Epidemiology, conducted a public health study in 2005
- Reviewed health-related records for Ambler and 3 surrounding villages of Kobuk, Shungnak, & Kiana
- Findings:
  - No incidence or mortality from mesothelioma
  - No diagnosis of any asbestos-related disease
Renewed Interest in Naturally Occurring Asbestos & Human Health

- 2012: Section of Epidemiology wanted to examine locations of malignant mesothelioma cases and their proximity to ultramafic rock deposits
- Mafic & ultramafic rocks are recognized as a common source of naturally occurring asbestos minerals
- Epi coordinated with USGS and AK Division of Geological & Geophysical Surveys (DGGS) for geological data
GIS Data for Study

- USGS & DGGS provided GIS data layers for:
  - Mafic & ultramafic rock deposits
  - Chrysotile mineral deposits
  - Asbestos NOS mineral deposits

- Alaska Cancer Registry provided GIS data layer for:
  - Mesothelioma cases at time of Dx, 1996-2010
Registry Mesothelioma Data

- State rate per 100,000 is 1.8; US rate 1.0
- 90 cases of mesothelioma over 15 years (avg 6/yr)
- Cases located in 31 towns & villages
  - 15 towns have 2 or more cases – towns with relatively large populations
  - 7 towns have 3 or more cases (Anchorage, Fairbanks, Ketchikan, Homer, Soldotna, Palmer, Juneau)
  - No cases in Natives villages of Ambler, Kobuk, Shungnak, or Kiana
Alaska mesothelioma cancer incidence case locations 1996-2010 (dots) with locations of asbestos and chrysotile deposits (rings). Black areas indicate deposits of mafic and ultramafic rocks.
Spatial Analysis of GIS Data

- No apparent correlation between locations of mesothelioma cases and locations of naturally occurring asbestos
Case Demographics

- 88% Males, 12% Females
- 94% White, 4% Alaska Native
- Registry’s occupation data tend to suggest exposure for many cases (36 of 90, 40%) is work-related

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asbestos/gold mine worker</td>
<td>2</td>
</tr>
<tr>
<td>Asbestos worker</td>
<td>2</td>
</tr>
<tr>
<td>Boiler maker, US Army</td>
<td>1</td>
</tr>
<tr>
<td>Carpenter</td>
<td>4</td>
</tr>
<tr>
<td>Electrician</td>
<td>2</td>
</tr>
<tr>
<td>Heavy equipment operator</td>
<td>1</td>
</tr>
<tr>
<td>Longshoreman</td>
<td>1</td>
</tr>
<tr>
<td>Maintenance engineer</td>
<td>1</td>
</tr>
<tr>
<td>Navy sailor on aircraft carrier</td>
<td>1</td>
</tr>
<tr>
<td>Oil refinery/pipeline worker</td>
<td>2</td>
</tr>
<tr>
<td>Pipe fitter/welder</td>
<td>5</td>
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<tr>
<td>Power plant worker</td>
<td>1</td>
</tr>
<tr>
<td>Pulp &amp; paper mill worker</td>
<td>1</td>
</tr>
<tr>
<td>Sheet metal worker</td>
<td>2</td>
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<tr>
<td>Shipyard worker</td>
<td>3</td>
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<tr>
<td>Others</td>
<td>21</td>
</tr>
<tr>
<td>Unknown</td>
<td>33</td>
</tr>
</tbody>
</table>
### Non-Asbestos Workers

- **21 cases located in 13 different towns and villages**
- **Only 3 towns with more than 1 case (Anchorage, Fairbanks, Kodiak)**
- **71% Male / 29% Female; 86% White / 14% Alaska Native**

<table>
<thead>
<tr>
<th>Admin assist/office worker (2)</th>
<th>Fisherman (2)</th>
<th>Prisoner (1)</th>
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</thead>
<tbody>
<tr>
<td>Air taxi operator (1)</td>
<td>Homemaker (1)</td>
<td>Musician (1)</td>
</tr>
<tr>
<td>Commercial vehicle inspector (1)</td>
<td>House painter (1)</td>
<td>Seafood plant worker (1)</td>
</tr>
<tr>
<td>Correctional officer (1)</td>
<td>Hardware store manager (1)</td>
<td>Social worker (1)</td>
</tr>
<tr>
<td>Dry cleaner (1)</td>
<td>Bookstore owner (1)</td>
<td>Truck company supervisor (1)</td>
</tr>
<tr>
<td>English professor (2)</td>
<td>Police officer (2)</td>
<td>Waitress on railroad (1)</td>
</tr>
</tbody>
</table>
Other Studies

- Italy: Maule et al. (2007): Documented relationship between mesothelioma incidence and residential distance from an asbestos cement plant.
- California: Pan et al. (2005): Documented relationship between mesothelioma incidence and residential distance from ultramafic rock deposits.
  - Odds of developing mesothelioma decreased 6.3% with every 10 km of distance away from the nearest asbestos source.
Why the Difference Between AK & CA?

- Low population in areas with high amounts of ultramafic rock
- Most asbestos deposits in AK are remote, undisturbed, and unmined
- Only 1 asbestos mine in AK – Ing Ink Mine, about 50 miles east of Ambler by Dahl Creek, active only during WWII
Conclusions

- At least in Alaska, there is no correlation between naturally occurring asbestos and cases of malignant mesothelioma
- Mesothelioma patients in Alaska tend to be White male laborers, many of whom have worked with asbestos as part of their occupation
Acknowledgements

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