University of Minnesota
Taconite Workers Health Study
http://taconiteworkers.umn.edu/

Stakeholder Presentation
March 30, 2010
Agenda

1. Welcome: John Finnegan and Ron Dicklich, Partnership co-chairs
2. Agenda Overview: Jeff Mandel, principal investigator
3. Environmental Exposure Characterization Study: George Hudak, Ph.D., University of Minnesota-Duluth Natural Resources Research Institute
4. Occupational Exposure Assessment: Gurumurthy Ramachandran, Ph.D., University of Minnesota School of Public Health
5. Mortality and Cancer Incidence Studies: Bruce Alexander, Ph.D., University of Minnesota School of Public Health
6. Taconite Worker Respiratory Health Survey: Jeff Mandel, M.D., University of Minnesota School of Public Health
7. Discussion: All Partnership Members
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Environmental Exposure Characterization Study
### Community Sampling

<table>
<thead>
<tr>
<th>Iron Range Communities</th>
<th>Sampling Events</th>
<th>Non-Iron Range Communities</th>
<th>Sampling Events</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silver Bay High School</td>
<td>11</td>
<td>Duluth NRRI Rooftop</td>
<td>5</td>
</tr>
<tr>
<td>Virginia Court House</td>
<td>9</td>
<td>Ely Fernberg Site</td>
<td>2</td>
</tr>
<tr>
<td>Hibbing High School</td>
<td>9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Keewatin Elementary School</td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Babbitt Municipal Building</td>
<td>13</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### In-Plant Sampling

<table>
<thead>
<tr>
<th>Taconite Facility</th>
<th>Sampling Events</th>
<th>Taconite Facility</th>
<th>Sampling Events</th>
</tr>
</thead>
<tbody>
<tr>
<td>United Taconite (Cliffs Natural Resources)</td>
<td>1 active</td>
<td>Keetac (U. S. Steel Corp.)</td>
<td>1 inactive</td>
</tr>
<tr>
<td>Hibtac (Cliffs Natural Resources)</td>
<td>1 inactive</td>
<td>Northshore (Cliffs Natural Resources)</td>
<td>1 inactive</td>
</tr>
</tbody>
</table>
## Sample Analysis - Filters

<table>
<thead>
<tr>
<th>Sample Type</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mineral Fibers in air utilizing MDH 852 TEM Method (Braun Intertec Corp.)</td>
<td>29</td>
</tr>
<tr>
<td>Indirect TEM Analysis (EMSL Analytical, Inc.)</td>
<td>39</td>
</tr>
<tr>
<td>Proton-induced X-ray Transmission Analysis (Elemental Analysis, Inc)</td>
<td>42</td>
</tr>
<tr>
<td>Modified Elutriator Method (EMS Laboratories)</td>
<td>10</td>
</tr>
<tr>
<td>Scanning Electron Microscopy / Energy Dispersive Spectroscopy (UMD/NRRI)</td>
<td>11</td>
</tr>
</tbody>
</table>

## Lake Sediment Sample Analysis

<table>
<thead>
<tr>
<th>Lake</th>
<th>General Location</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>“North of Snort”</td>
<td>Eastern Mesabi Range</td>
<td>Core has been age dated by Pb$^{210}$ method; samples ready for follow-up analysis</td>
</tr>
<tr>
<td>Silver Lake</td>
<td>Central Mesabi Range</td>
<td>Samples currently being age-dated using Pb$^{210}$ method</td>
</tr>
</tbody>
</table>
Natural Resources Research Institute
Environmental Study of Airborne Particulates – 2010

In-Plant Sampling

<table>
<thead>
<tr>
<th>Taconite Facility</th>
<th>Sampling Events</th>
<th>Taconite Facility</th>
<th>Sampling Events</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minorca (ArcelorMittal)</td>
<td>1 active</td>
<td>Northshore (Cliffs Natural Resources)</td>
<td>1 active</td>
</tr>
</tbody>
</table>

Reports in Preparation

- Quality Assurance Project Plan (QAPP)
- Glossary of Terminology for the Environmental Characterization Study
- Several Standard Operating Procedures (SOPs)

Plans for Second Quarter 2010

- Completion of QAPP, Glossary, SOPs
- Continued in-plant and community sampling
- Completion of community sampling
- Continued lake sediment sampling and age dating
- Continued laboratory analysis of samples
- Initiate preparation of community sampling reports
- Initiate preparation of in-plant sampling reports
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Occupational Exposure Assessment
Exposure Assessment Team

- Dr. Gurumurthy Ramachandran, Ph.D, CIH
  - Industrial Hygiene, Exposure Assessment
- Dr. Peter C. Raynor, Ph.D
  - Industrial Hygiene, Assessment of exposure controls
- Jooyeon Hwang
  - Graduate Student
Goals for Exposure Assessment

1. **Assess historical exposures** of workers to dust from taconite operations and relevant components (asbestos and non-asbestos fibers, respirable dust, and respirable silica).

2. **Assess current exposures** of workers to the dust from taconite operations and relevant components.

3. **Evaluate existing practices and methods** to control worker exposures in this industry.
Assessing Historical Exposures - 1

- Identify all the sources of primary exposure measurements for the time period 1955-present.
  - Mining companies’ internal databases – Done
  - Mine Safety and Health Administration - Done.
  - Previous studies conducted by University of Minnesota (mid-1980’s) - Done
  - Studies conducted by the Department of Health - Done
Assessing Historical Exposures - 2

- Reconstruct historical exposures of workers for studies of the relationship between exposures and health effects.
  - Available measurements
  - Exposure modeling
  - Interviews with plant personnel and veteran workers
  - Statistical techniques that allow combining these various sources of information in a systematic manner.
Assessing Current Exposures

• In selected areas/processes within the industry, characterize current exposures of workers to
  – Fibers (PCM and TEM) - Personal
  – Respirable silica dust (XRD) – Personal
  – Mineralogical analysis of dust samples through certified laboratories – (MOUDI size classifier samples through TEM) - Area
  – Real-time instruments – (Particle number, mass, and surface area concentrations, size distributions) - Area
Assessing Current Exposures

Northshore: February-April 2010 (almost completed)

HibbTac – April-May 2010

MinnTac – June 2010
Keetac – June-July 2010

Minorca – July 2010
Utac – July-August 2010
Assessing Controls in Current Workplaces

• Gather process and work environment information – Ongoing alongside current EA

• Evaluate existing exposure control measures through detailed walkthrough surveys – Ongoing alongside current EA

• Make concrete recommendations, if needed, for improvement of control measures
Timeline

• Evaluating exposure controls: January 2010 – December 2010

• Assessing current exposures: January 2010 – August 2010

• Assessing historical exposures: August 2008 – August 2011
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Mortality and Cancer Incidence Studies
Studies

• Mortality (cause of death) Study
  – Entire cohort

• Cancer Incidence Study
  – Alive as of January 1, 1988
  – Cases reported to Minnesota Cancer Surveillance System
Work History Records

- Converted the historical work history records on microfilm and hard copy to an electronically readable format to aid abstraction.
- Review of historical documents to properly classify work history information.
- Protocol established for abstracting the work history records.
  - Standardized process to abstract records from different mining companies
- Work history records are being abstracted for causes of death of interest
Mortality Records

- Vital status determined
  - Social Security Administration service for epidemiologic studies

- Death record information obtained
  - Minnesota Department of Health
  - National Death Index.
  - Hard copy death certificates being obtained as necessary.
    - Died before 1979 and not in Minnesota

- Underlying and contributing causes being evaluated
Cancer Case Identification

- Final linkage to the Minnesota Cancer Surveillance underway
  - Update number of mesotheliomas
  - Identify other cancers of interest
## Summary of Cohort

<table>
<thead>
<tr>
<th>Status</th>
<th>&lt;1920</th>
<th>≥ 1920</th>
<th>Missing</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alive</td>
<td>525</td>
<td>29,792</td>
<td>0</td>
<td>30,317</td>
</tr>
<tr>
<td>Deceased</td>
<td>11,871</td>
<td>12,925</td>
<td>69</td>
<td>24,865</td>
</tr>
<tr>
<td>Presumed deceased</td>
<td>4,899</td>
<td>1,424</td>
<td>0</td>
<td>6,323</td>
</tr>
<tr>
<td>Unknown/presumed alive</td>
<td>4,989</td>
<td>2,061</td>
<td>182</td>
<td>7,232</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>22,284</td>
<td>46,202</td>
<td>251</td>
<td>68,737</td>
</tr>
</tbody>
</table>
Next Steps

- Complete abstraction of work history records and update information
- Finalize cause of death identification
- Combine work history information with exposure assessment
- Initial analyses for mortality and cancer
Respiratory Health Survey

- Provides information on lung function and scarring from dusts
- Not done to look for mesothelioma
- Chest x-ray, breathing tests, blood test
Respiratory Health Survey Update

Progress to date

• Good consistency in testing
• Excellent evaluations from participants
• Feedback to participants going smoothly
• B-reading in progress
• Nearing half-way point in terms of numbers of participants
Taconite Survey - No. Completed Clinic Appointments for Workers & Spouses

As of 3/23/10

Cumulative No. Appts Completed

workers-complete
spouses-complete
Respiratory Health Survey

Needs

• Increased participation all age groups, especially 35-45
• If you received invitation, let us know one way or the other (toll-free number)
• If you receive call, let us know whether you received the invitation and/or whether you have any questions
Respiratory Health Survey

• Toll-free number: 1-888-840-7590

• Website: taconiteworkers.umn.edu