

University of Minnesota Taconite Studies

Stakeholder Presentation

August 18, 2009



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Presenters

- **Jeff Mandel** -SPH-Overview
- **Tamara Diedrich** -NRRI-Environmental Characterization
- **G. Ramachandran** -SPH-Occupational Exposure Assessment
- **Bruce Alexander** -SPH-Epidemiology
- **David Perlman** -Medical School-Respiratory Health Survey



Overall Goal

- To comprehensively assess/understand exposures and potential health problems associated with dust from taconite operations



Overall Goal

- Because of the complicated nature of this work, obtaining this understanding requires multiple different approaches
- We are focusing on the occupational setting to learn about potential health problems



Important Milestones to Date

- IRB approval on all studies
- SAB involved
- Site visits in several mining facilities
- Exposure studies well into data gathering
- Mortality information moving nicely
- Staff in place for Respiratory Health Survey
- Random sample in progress for RHS



Timeline

- All studies 2+ years from final report, depending on if no major delays
- Some parts will take longer and will depend on occupational exposure assess.
- Further estimates at upcoming meetings



Special Thanks

- Cliffs Natural Resources
Neal Dorr, Dana Byrne
- USS
Laurie Potter, Jeff Dierdorf, Scott Coleman, Stacey Sneberger, Mike Duff, Kent Swanson, John Skube
- ArcelorMittal
Karla McKenzie, Gerald Golobich
- SOAR
Dave Trach
- USW
Bob Bratulich, John Rebrovich



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Environmental Study of Mineral Dust in Population Centers on Mesabi Iron Range: Progress Report

Lung Health Partnership Meeting

August 18th, 2009



NATURAL RESOURCES
RESEARCH INSTITUTE

Minnesota Taconite Workers

Lung Health Partnership

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Sampling Through Shut Downs

<u>Stop date</u>	<u>Run Time (hr)</u>	<u>Mine Activity</u>
Virginia		
11/17/08	100	Active
2/11/09	120	Active
3/2/09	120	Active
4/1/09	138	Active
4/13/09	120	Active
6/16/09	120	UTAC active last two days of sample collection; Minntac 1 line active; Minorca inactive
6/22/09	120	UTAC active; Minntac & Minorca inactive
7/13/09	120	UTAC active; Minntac & Minorca inactive
7/19/09	120	UTAC active; Minntac & Minorca inactive
8/2/09	120	UTAC & Minntac active; Minorca inactive

Hibbing		
2/4/09	120	Active
3/8/09	120	Active
3/8/09	120	Active
4/13/09	120	Active
4/27/09	120	Active
5/3/09	120	Active
5/9/09	120	Active
6/16/09	120	Inactive
7/27/09	120	Inactive
8/2/09	120	Inactive

Keewatin		
1/9/09	77	Inactive
1/27/09	143	Inactive
3/8/09	120	Inactive
6/16/09	119.5	Inactive
7/27/09	120	Inactive
8/2/09	120	Inactive

<u>Stop date</u>	<u>Run Time (hr)</u>	<u>Mine Activity</u>
Silver Bay		
3/23/09	120	Active
4/21/09	120	Inactive
4/26/09	120	Inactive
5/2/09	120	Inactive
5/11/09	120	Inactive
6/8/09	120	Inactive
6/23/09	120	Inactive
6/29/09	120	Inactive
7/13/09	120	Active
7/19/09	120	Active
8/10/09	120	Active
8/16/09	120	Active

Babbitt		
11/21/09	71.5	Active
11/24/08	71	Active
12/5/08	72.5	Active
3/17/09	168	Active
3/24/09	163.5	Active
4/21/09	120	Inactive
4/26/09	120	Inactive
5/2/09	120	Inactive
5/11/09	120	Inactive
6/8/09	120	Inactive
6/23/09	120	Inactive
6/29/09	120	Inactive
7/13/09	120	Active
7/19/09	120	Active
8/10/09	120	Active
8/16/09	120	Active

Preliminary Active/Inactive Comparison for Babbitt*

WINTER

<u>Stage cut size (um)</u>	Mine inactive				Mine active					
	<u>641</u>	<u>671</u>	<u>Average</u>	<u>Stdev</u>	<u>551</u>	<u>531</u>	<u>351</u>	<u>371</u>	<u>Average</u>	<u>Stdev</u>
≈30 to 18	1.0	1.4	1.2	0.3	1.0	0.4	0.5	0.4	0.6	0.3
18 to 10	0.8	0.8	0.8	0.0	0.4	0.5	0.5	0.5	0.5	0.0
10 to 5.62	0.7	0.5	0.6	0.2	0.3	0.5	0.7	0.4	0.5	0.2
5.62 to 3.16	0.8	0.5	0.6	0.2	0.3	0.8	0.6	0.2	0.5	0.3
3.16 to 1.78	0.6	0.4	0.5	0.1	0.4	0.7	0.6	0.3	0.5	0.2
1.78 to 1	0.5	0.2	0.4	0.2	0.6	0.8	0.6	0.2	0.6	0.2
1 to 0.562	0.9	0.7	0.8	0.2	1.3	1.8	2.4	0.5	1.5	0.8
0.562 to 0.316	1.3	1.1	1.2	0.2	1.5	2.5	1.8	0.8	1.6	0.7
0.316 to 0.178	0.7	0.5	0.6	0.1	0.5	0.8	0.6	0.6	0.7	0.1
0.178 to 0.1	0.5	0.4	0.5	0.1	0.4	0.5	0.4	0.5	0.5	0.0
0.1 to 0.056	0.5	0.4	0.4	0.1	0.4	0.3	0.5	0.4	0.4	0.1
Less than 0.056	0.8	1.6	1.2	0.6	1.1	0.9	0.8	0.9	0.9	0.1
MOUDI total	9.1	8.4	8.8	0.5	8.2	10.6	10.0	5.8	8.6	2.1
PM10	7.3	6.2	6.8	0.8	6.7	9.7	6.7	6.7	7.5	1.5

SUMMER

<u>Stage cut size (um)</u>	Mine inactive						Mine active			
	<u>741</u>	<u>771</u>	<u>831</u>	<u>851</u>	<u>Average</u>	<u>Stdev</u>	<u>921</u>	<u>951</u>	<u>Average</u>	<u>Stdev</u>
≈30 to 18	2.0	0.5	0.4	0.6	0.9	0.7	1.2	0.2	0.7	0.7
18 to 10	0.9	0.5	0.6	0.8	0.7	0.2	1.1	0.3	0.7	0.5
10 to 5.62	0.4	0.4	0.8	0.6	0.6	0.2	0.6	0.4	0.5	0.1
5.62 to 3.16	0.7	0.4	1.2	0.9	0.8	0.3	0.7	0.6	0.7	0.1
3.16 to 1.78	0.6	0.3	0.8	0.9	0.6	0.3	0.5	0.5	0.5	0.0
1.78 to 1	1.2	0.2	0.7	0.4	0.6	0.4	0.4	0.3	0.4	0.0
1 to 0.562	0.5	0.4	1.3	0.5	0.7	0.4	0.6	0.5	0.5	0.1
0.562 to 0.316	0.7	0.5	1.8	0.7	0.9	0.6	0.9	0.7	0.8	0.1
0.316 to 0.178	0.5	0.4	1.3	0.8	0.8	0.4	0.5	0.6	0.6	0.1
0.178 to 0.1	0.4	0.4	0.7	0.4	0.5	0.2	0.4	0.5	0.5	0.0
0.1 to 0.056	0.4	0.4	0.7	0.4	0.5	0.1	0.3	0.4	0.3	0.0
Less than 0.056	1.6	0.8	1.3	1.3	1.2	0.3	1.4	0.7	1.0	0.5
MOUDI total	10.0	5.2	11.8	8.2	8.8	2.8	8.6	5.7	7.2	2.0
PM 10	7.1	4.2	10.8	6.8	7.2	2.7	6.4	5.2	5.8	0.8

* Weights given in (ug/m³)

Preliminary Active/Inactive Comparison for Silver Bay*

SUMMER

Stage cut size (um)	Mine inactive						Mine active			
	731	751	821	841	Average	Stdev	911	941	Average	Stdev
≈30 to 18	1.1	0.7	0.9	0.7	0.9	0.2	0.9	0.6	0.8	0.3
18 to 10	1.4	0.8	0.8	0.7	0.9	0.3	0.9	0.4	0.6	0.4
10 to 5.62	0.3	0.7	1.1	0.7	0.7	0.3	0.8	0.3	0.5	0.3
5.62 to 3.16	0.4	0.5	1.0	0.8	0.7	0.3	0.7	0.5	0.6	0.2
3.16 to 1.78	0.2	0.4	0.9	0.6	0.5	0.3	0.6	0.4	0.5	0.1
1.78 to 1	0.3	0.4	0.9	0.5	0.5	0.3	0.5	0.4	0.4	0.1
1 to 0.562	0.6	0.6	1.8	0.6	0.9	0.6	0.7	0.4	0.6	0.2
0.562 to 0.316	0.8	0.8	2.4	0.9	1.2	0.8	0.9	0.7	0.8	0.1
0.316 to 0.178	0.7	0.6	1.2	0.5	0.8	0.3	0.6	0.5	0.6	0.1
0.178 to 0.1	0.6	0.6	0.9	0.5	0.6	0.2	0.7	0.4	0.6	0.2
0.1 to 0.056	0.5	0.5	0.9	0.4	0.6	0.2	0.5	0.3	0.4	0.2
Less than 0.056	1.0	1.4	0.9	1.1	1.1	0.2	1.0	0.6	0.8	0.3
MOUDI total	7.9	7.8	13.8	8.0	9.4	3.0	8.9	5.5	7.2	2.5
PM 10	5.4	6.3	12.1	6.5	7.6	3.0	7.1	4.5	5.8	1.8

WINTER

Stage cut size (um)	Mine inactive				Mine Active
	651	661	Average	Stdev	561
≈30 to 18	4.6	0.8	2.7	2.7	0.6
18 to 10	0.8	0.7	0.8	0.1	0.8
10 to 5.62	0.9	0.5	0.7	0.3	0.7
5.62 to 3.16	0.8	0.5	0.6	0.2	0.7
3.16 to 1.78	0.6	0.4	0.5	0.1	0.7
1.78 to 1	0.5	0.3	0.4	0.2	0.8
1 to 0.562	0.8	0.6	0.7	0.2	1.1
0.562 to 0.316	1.3	0.9	1.1	0.3	1.0
0.316 to 0.178	0.8	0.9	0.9	0.0	1.0
0.178 to 0.1	0.6	0.6	0.6	0.0	0.5
0.1 to 0.056	0.6	1.1	0.9	0.3	0.5
Less than 0.056	1.1	0.8	1.0	0.3	0.5
MOUDI total	13.5	8.0	10.8	3.9	9.0
PM10	8.1	6.6	7.3	1.1	7.5

* Weights given in (ug/m³)

In-plant sampling

Unmetamorphosed Iron Formation

3/27/09	Rod/ball mills & magnetic separator	Active
3/26/09	Balling drums	Active
3/27/09	Kiln pellet discharge	Active
3/27/09	Fine crusher	Active

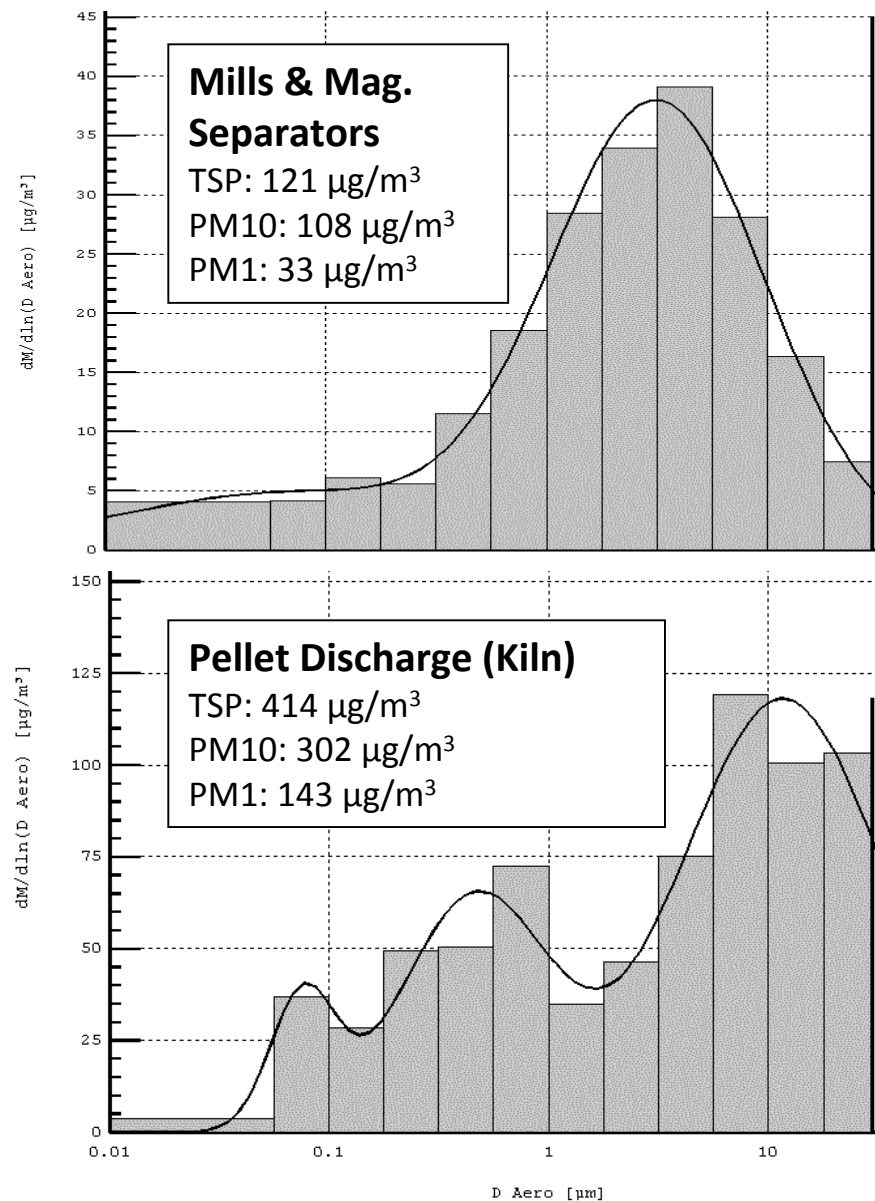
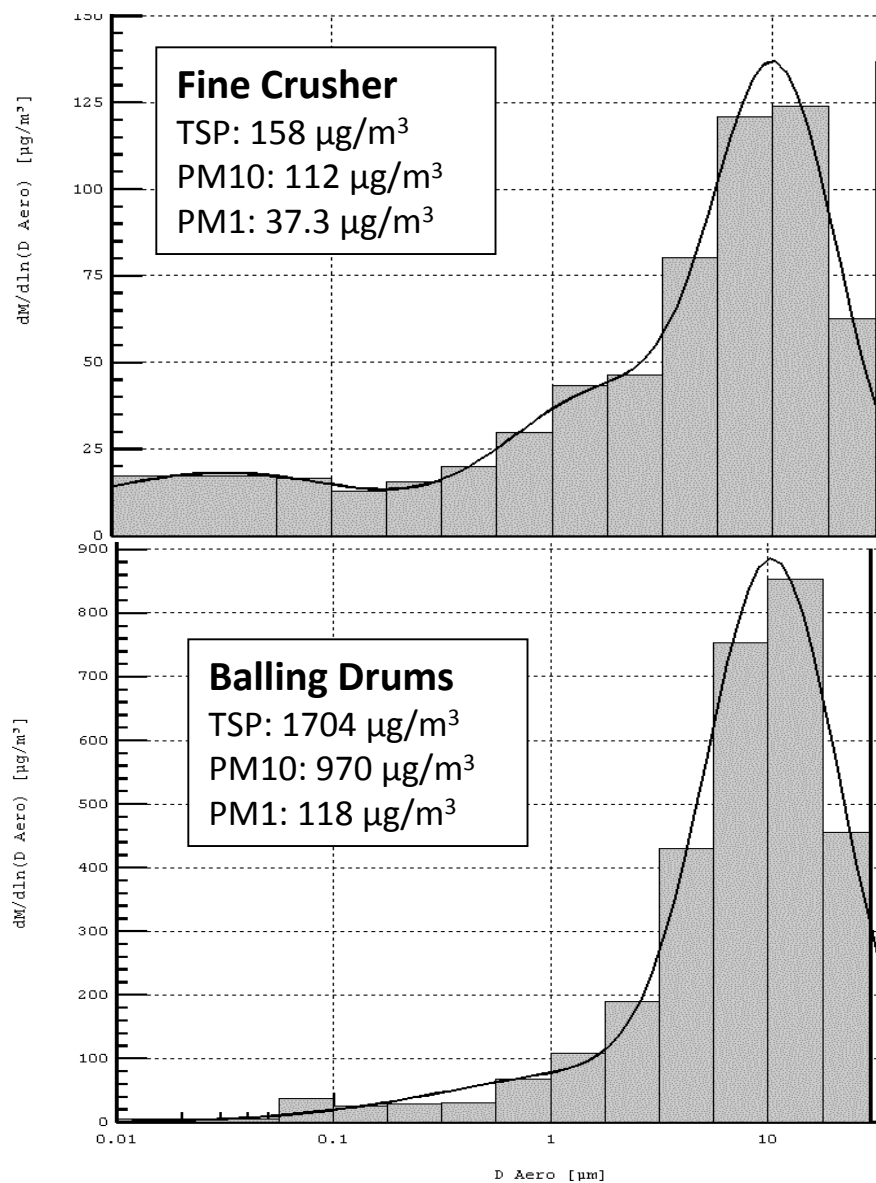
Metamorphosed Iron Formation

7/1/09	Fine crusher	Inactive
7/1/09	Fine crusher	Inactive
7/1/09	Mills & separator	Inactive
7/1/09	Balling drums	Inactive
7/1/09	Pellet discharge	Inactive

Next sampling planned for August 20th



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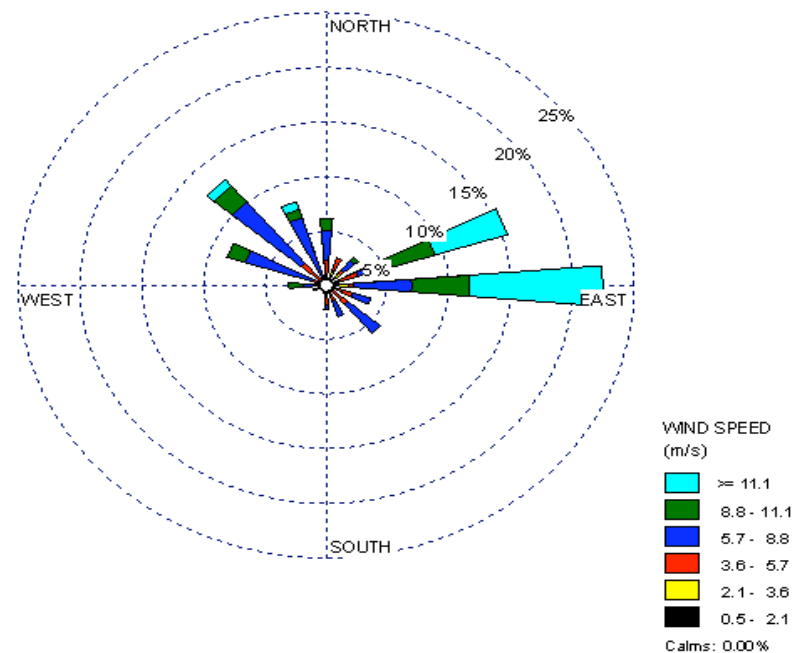
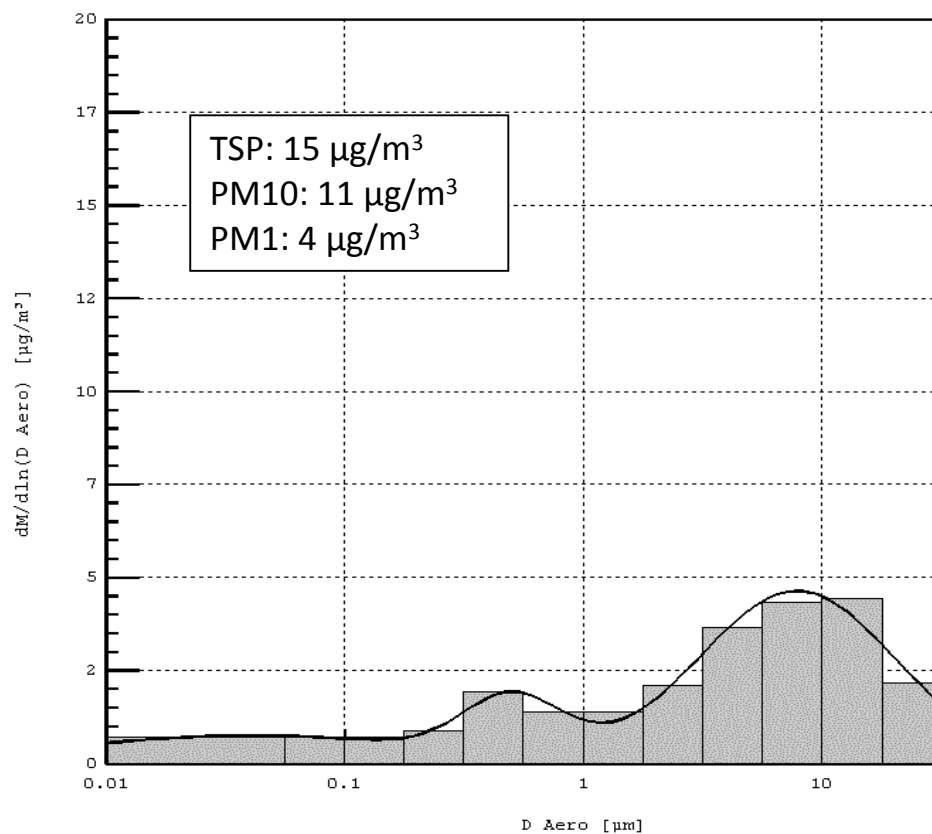


		Amphiboles (Fibers/m ³)
620-T	Fine Crusher	nd
590-T	Rod/ball mills & magnetic separator	nd
600-T	Balling drums	nd
610-T	Kiln pellet discharge	nd

Chrysotile	Non-Amphibole/Non-chrysotile	Ambiguous
nd	238,052	nd
nd	123,938	nd
nd	374,156	nd
nd	138,253	8,133

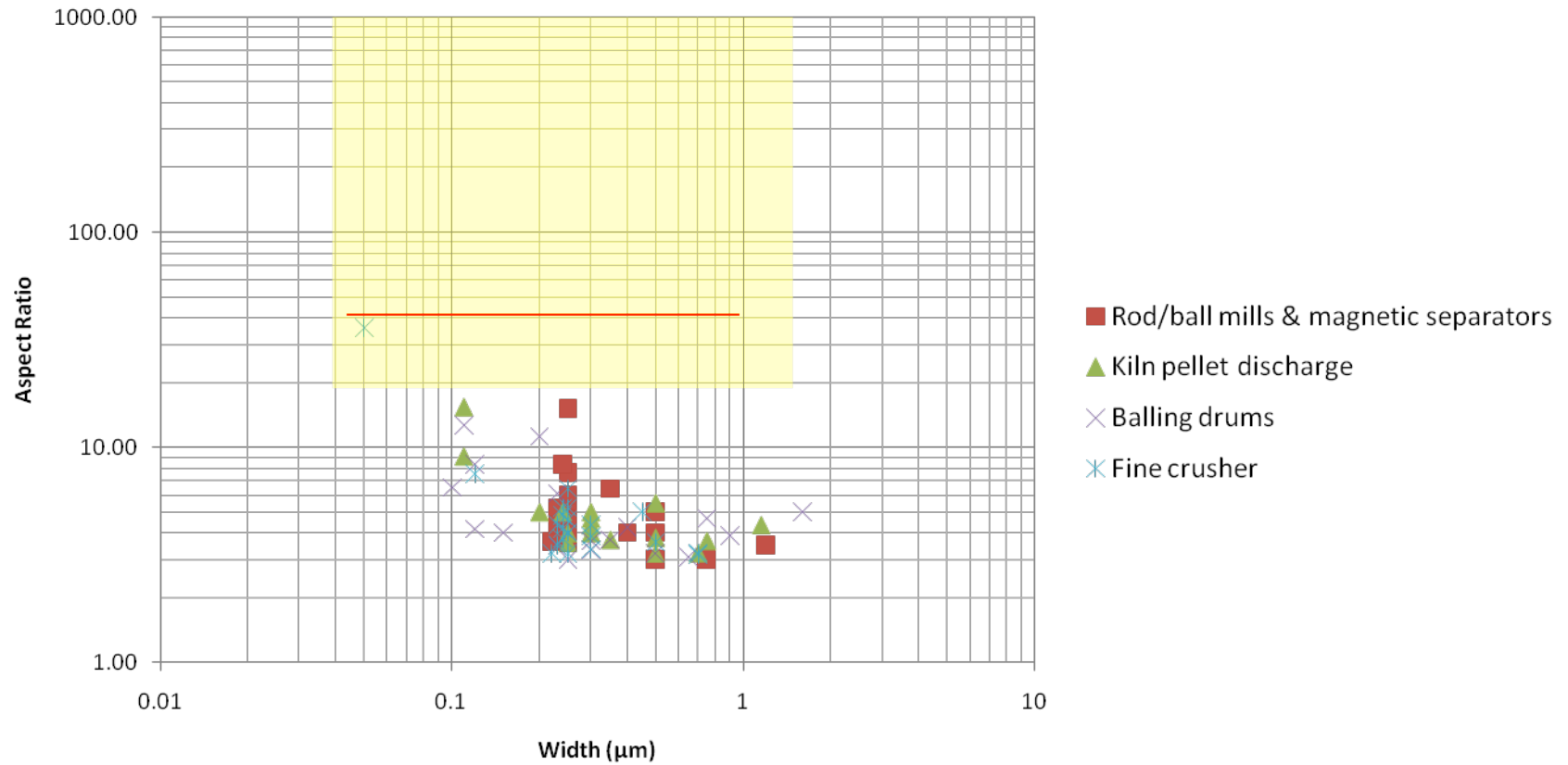
During the same time in Virginia

Virginia Collection 4/01/09



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Non-amphibole Non-chrysotile



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Conclusions

- Project is proceeding on schedule
- Sampling is currently underway both in communities and in taconite plants
- No amphibole was detected in unmetamorphosed in-plant samples
- Population of non-amphibole non-chrysotile elongated particles have similar dimensions at all locations tested within unmetamorphosed iron formation plant



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Exposure Assessment Progress



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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
- Monika Vadali
 - 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
 - **(Cleveland Cliffs, US Steel, Arcelor Mittal) – Partially 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

- Observation of tasks performed by workers in various job titles – Started Jan, 2009 in Cleveland Cliffs. Temporarily halted due to slowdown
- Interviews with supervisors, workers, and union representatives
- Identify areas and jobs for assessing current exposures – Started Jan, 2009 in Cleveland Cliffs. Temporarily halted due to slowdown



Assessing Current Exposures

- **In selected areas/processes within the industry, characterize current exposures of workers to**
 - Asbestos fibers – **Identified analytical laboratories (EMSL).**
 - Respirable silica dust – **Identified analytical laboratories.**
 - Mineralogical analysis of dust samples through certified laboratories – **Identified analytical laboratories (EMSL).**
 - Real-time instruments – **Purchase of equipment**



Assessing Controls in Current Workplaces

- Gather process and work environment information – Started Jan, 2009 in Cleveland Cliffs. Temporarily halted due to slowdown
- Evaluate existing exposure control measures through detailed walkthrough surveys – Started Jan, 2009 in Cleveland Cliffs. Temporarily halted due to slowdown
- Make concrete recommendations, if needed, for improvement of control measures



Timeline

- Evaluating exposure controls: January 2010 – June 2010
- Assessing current exposures: January 2010 – December 2010
- Assessing historical exposures: August 2008 – August 2010



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Cancer Incidence and Mortality
Studies



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Cancer Incidence and Mortality Studies

- Bruce H. Alexander, PhD
- Christine Lambert, Graduate
- Diane Kampa Coordinator
- Richard Hoffbeck Data Systems
- Nancy Pengra, Staff



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The cancer incidence and mortality studies will address the following questions

Does long term exposure to dust exposure from mining and processing of taconite increase the chance of developing or dying from:

- Cancer
 - Mesothelioma
 - Lung
 - Colon
 - Pharyngeal
 - Esophageal
 - Laryngeal
 - Stomach
- Nonmalignant respiratory disease



Progress to Date

- Identified duplicates in original population
- Determined vital status for most of cohort
- Obtained causes of deaths for those who died in Minnesota
- Transferred work history records to electronic format for ease of abstracting
- Creating templates to cover all companies



Ongoing Activities and Plans

- Abstract detailed work histories from people who died with selected causes of death
- Abstract detailed work histories from a sample of the population for comparison
- Update link to Minnesota Cancer Registry
- Update death search through 2007 (last year when data are available nationally)
- Update information on work histories
- Link work histories with exposure reconstruction effort



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Taconite Workers Health Study
Respiratory Health Survey Update



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Respiratory Health Survey Overview

- Plan to assess respiratory health status of 1200 current and former mining industry employees and 800 spouses
- Any current or former worker could be selected to participate in the health survey
- Sample will include a range of ages, exposures and geographic distribution
- Recruitment for the health survey has started



Respiratory Health Survey Recruitment

- Participant is randomly selected
- They will receive a letter from the University of Minnesota asking them to participate in the Respiratory Health Survey
- Selected person can call to participate, opt-out or request more information
- If there is no response a follow-up post card will be sent
- 2nd follow-up letter if still no response



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Respiratory Health Survey Recruitment

- First recruitment letters mailed July 27
- 178 letters sent
- 35 appointments scheduled as of 8/14
- Response rate \approx 20%



Respiratory Health Survey Process

- Telephone discussion explaining process and consent information
- Clinic appointment scheduled
- Participant will receive health questionnaire and consent form in the mail
- Reminder call 1-2 days prior to appointment
- Clinic appointment



Respiratory Health Survey Process

- Clinic located at Virginia Regional Medical Center
- Participants will be reimbursed for mileage
- Transport will be arranged if needed
- Clinic appointment will last approx 2 hours



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Respiratory Health Survey Clinic Visit

- Registration and welcome
- Review and signing of consent and HIPAA forms with staff
- Chest Exam and Vital Signs
- Blood draw
- Review of questionnaire with staff
- Pulmonary Function testing – 2 stations
- Chest X-Ray
- Mileage form and checkout



Respiratory Health Survey

Why should people participate?

- This is a large, important study that will determine whether lung conditions may be associated with exposure to dust from taconite operations
- Findings may assure current & future mine workers that they are working in a safe environment or help to determine proper safety measures
- Tests may reveal a previously undiagnosed condition
- Participants will receive results of all tests

