The ASBEST Study
Comparison of Parallel Fibre and Dust Measurements

International Agency for Research on Cancer
Lyon, France

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A historical cohort study is being conducted of cancer mortality in chrysotile asbestos miners and millers in the town of Asbest, Russian Federation. Chrysotile is the only type of asbestos that is mined today.
The Asbest Study

...to characterize the association between chrysotile exposure and cancer mortality

...to compare parallel dust and fibre measurements and determine if conversion factors by stage in the mining and processing of chrysotile or time period can be estimated
Why Conversion Factors

Parallel dust and fibre measurements

MONTHLY GRAVIMETRIC DUST MEASUREMENTS COLLECTED

1950s to Present

ESTIMATED FIBRE MEASUREMENTS – USING CONVERSION FACTOR
Dust Measurements

• Dust measurements were collected using gravimetric samplers:
  • Filters were pre and post weighed to determine mass gain and then converted into a dust concentration (mg/m$^3$)
  • Stationary samplers were used at various sampling points across UralAsbest enrichment processing factories and the mine
Fibre Measurement

- Fibre measurements were collected using stationary air samplers across the factories and mine.
- Fibre can be counted using a number of methods – phase-contrast optical microscopy (PCOM) was used.
- This results in a count of fibres per 100 graticule fields and converted into a fibre concentration (f/cm³).
Data Collection

MONTHLY GRAVIMETRIC DUST MEASUREMENTS COLLECTED

1950s

1. Finnish Institute of Occupational Health
2. National Institute for Occupational Safety and Health
3. Russian Academy of Medical Sciences
4. Medical Research Center for Prophylactic and Health Protection of Industrial Workers

UralAsbest

2013(Nov/Dec)/2014(Jan, Feb, June-Sept): parallel dust and fibre measurements

2007 (March-Sept): parallel dust and fibre measurements

1995 (June): parallel dust and fibre measurements

International Agency for Research on Cancer

World Health Organization
## Method

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td><strong>Data available for</strong></td>
<td>Factory 4 Factory 6 Mine</td>
<td>Factory 4 Factory 6 Mine</td>
<td>Factory 6 Mine</td>
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<tr>
<td><strong>Dust counting method</strong></td>
<td>GRAV</td>
<td>GRAV</td>
<td>GRAV</td>
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<tr>
<td><strong>Fibre counting method</strong></td>
<td>SRIOH: PCOM FOH: PCOM &amp; SEM NIOSH: SEM</td>
<td>PCOM</td>
<td>PCOM</td>
</tr>
<tr>
<td><strong>Measurement taken...</strong></td>
<td>At fixed sampling points and 3-5 metres from these points</td>
<td>over 3-4 days at each sampling point</td>
<td>from each sampling point in summer and winter (1 day per season)</td>
</tr>
<tr>
<td><strong>Number of measurements taken per sampling point</strong></td>
<td>1-2 measurement</td>
<td>3-4 measurements each day</td>
<td></td>
</tr>
</tbody>
</table>
Method

• A fibre to dust ratio was estimated by sampling point
• Conducted preliminary analyses to examine the association between the fibre and dust
Results: Gravimetric dust concentrations* (mg/m³): 1951-2001

* Geometric means of monthly averages. Line thickness proportional to number of measurement points.
Results: Factories

Factories: Fibre to Dust Ratios - log scale
Results: Mine

- The overall fibre to dust ratio in the mine was similar to the factory
Results: Modelling of Ratios

- There was an indication that ratios differed by time period
- Preliminary results suggest variability across units
- It appears that the fibre to dust ratio is dependent on dust concentration
Conclusions

• We are still conducting analyses to determine whether conversion factors can be derived for use in the cohort study and how these findings will be applied to the larger study
Study Team

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