Pathology of Malignant Mesothelioma, Tallinn, Estonia, 14-16.11.2007

Global incidence of malignant mesothelioma

Antti Tossavainen, Resident Twinning Adviser, Finnish Institute of Occupational Health
Worldwide Production of Asbestos in 2005

- **Canada**: 185,000 tons
- **Russia**: 925,000 tons
- **Kazakhstan**: 220,000 tons
- **Brazil**: 195,000 tons
- **India**: 20,000 tons
- **Colombia**: 5,000 tons
- **Zimbabwe**: 120,000 tons
- **China**: 520,000 tons
- **Other Countries**: 10,000 tons

**TOTAL**: 2,200,000 tons
## Asbestos consumption in 2003

<table>
<thead>
<tr>
<th>Country</th>
<th>Tons</th>
<th>kg/capita/ Year</th>
<th>Tons</th>
<th>kg/capita/ Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>492 000</td>
<td>0.4</td>
<td>Japan</td>
<td>23 000</td>
</tr>
<tr>
<td>Russia</td>
<td>429 000</td>
<td>3.0</td>
<td>Belorussia</td>
<td>22 000</td>
</tr>
<tr>
<td>India</td>
<td>192 000</td>
<td>0.2</td>
<td>Mexico</td>
<td>20 000</td>
</tr>
<tr>
<td>Ukraine</td>
<td>156 000</td>
<td>3.3</td>
<td>Turkey</td>
<td>14 000</td>
</tr>
<tr>
<td>Thailand</td>
<td>133 000</td>
<td>2.0</td>
<td>Malaysia</td>
<td>13 000</td>
</tr>
<tr>
<td>Brazil</td>
<td>78 000</td>
<td>0.4</td>
<td>Colombia</td>
<td>13 000</td>
</tr>
<tr>
<td>Iran</td>
<td>76 000</td>
<td>1.1</td>
<td>Romania</td>
<td>11 000</td>
</tr>
<tr>
<td>Uzbekistan</td>
<td>42 000</td>
<td>1.5</td>
<td>Algeria</td>
<td>11 000</td>
</tr>
<tr>
<td>Vietnam</td>
<td>39 000</td>
<td>0.5</td>
<td>Azerbaijan</td>
<td>10 000</td>
</tr>
<tr>
<td>Indonesia</td>
<td>32 000</td>
<td>0.1</td>
<td>Cuba</td>
<td>10 000</td>
</tr>
<tr>
<td>Kazakhstan</td>
<td>32 000</td>
<td>2.1</td>
<td>Zimbabwe</td>
<td>5 000</td>
</tr>
<tr>
<td>South Korea</td>
<td>24 000</td>
<td>0.5</td>
<td>Canada</td>
<td>5 000</td>
</tr>
<tr>
<td>Kyrgyzstan</td>
<td>24 000</td>
<td>4.3</td>
<td>Other countries</td>
<td>200 000</td>
</tr>
<tr>
<td><strong>WORLD</strong></td>
<td><strong>2 106 000</strong></td>
<td><strong>0.3</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Mesothelioma incidence and use of asbestos.

<table>
<thead>
<tr>
<th>Country asbestos</th>
<th>Mesothelioma incidence</th>
<th>Use of</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cases/year</td>
<td>Cases/million/year</td>
</tr>
<tr>
<td>Australia</td>
<td>678 (2001)</td>
<td>45</td>
</tr>
<tr>
<td>Finland</td>
<td>75 (2002)</td>
<td>18</td>
</tr>
<tr>
<td>France</td>
<td>870 (2000)</td>
<td>18</td>
</tr>
<tr>
<td>Germany</td>
<td>1094 (2001)</td>
<td>16</td>
</tr>
<tr>
<td>Great Britain</td>
<td>1862 (2002)</td>
<td>39</td>
</tr>
<tr>
<td>Italy</td>
<td>1050 (2000)</td>
<td>21</td>
</tr>
<tr>
<td>Netherlands</td>
<td>389 (2000)</td>
<td>30</td>
</tr>
<tr>
<td>New Zealand</td>
<td>60 (2000)</td>
<td>21</td>
</tr>
<tr>
<td>Norway</td>
<td>57 (2000)</td>
<td>16</td>
</tr>
<tr>
<td>Sweden</td>
<td>149 (2003)</td>
<td>20</td>
</tr>
<tr>
<td>United States</td>
<td>2800 (2000)</td>
<td>14</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>9084</td>
<td>22</td>
</tr>
</tbody>
</table>
ASBESTOS CONSUMPTION AND MESOTHELIOMA INCIDENCE IN INDUSTRIALIZED COUNTRIES

Mesothelioma incidence cases/million/year

Asbestos consumption kg/capita/year

- U.K. ('70,'99)
- Netherlands ('76,'97)
- Australia ('70,'00)
- Finland ('70,'99)
- Italy ('75,'95)
- New Zealand ('70,'96)
- Norway ('70,'95)
- France ('70,'96)
- Sweden ('70,'96)
- U.S. ('75,'00) ('75,'97)
- Germany

Antti Tossavainen/atoka039.ppt/rm
## MESOTHELIOMA INCIDENCE IN CENTRAL AND EASTERN EUROPE
(Bianchi et al. 2000)

<table>
<thead>
<tr>
<th>Country</th>
<th>Cases/year</th>
<th>Cases/million/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Croatia</td>
<td>46</td>
<td>10</td>
</tr>
<tr>
<td>Hungary</td>
<td>78</td>
<td>8</td>
</tr>
<tr>
<td>Romania</td>
<td>133</td>
<td>6</td>
</tr>
<tr>
<td>Slovakia</td>
<td>20</td>
<td>4</td>
</tr>
<tr>
<td>Estonia</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Lithuania</td>
<td>12</td>
<td>3</td>
</tr>
<tr>
<td>Latvia</td>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td>Poland</td>
<td>120</td>
<td>3</td>
</tr>
<tr>
<td>Slovenia</td>
<td>5</td>
<td>3</td>
</tr>
</tbody>
</table>
Use of asbestos, thousand tons/year

FINLAND
Mesothelioma cases

Use of asbestos, thousand tons/year
All men (assuming risk to men born after 1953 is 50% of 1943-48 birth cohort)

- Men born before 1953
Germany

- lung cancer
- mesothelioma
- asbestosis and pleural abnormalities

asbestos consumption [1000 t/year]

GDR
FRG
Asbestos-induced diseases in 1990-2005 (cases of years 2003-2004 are not available)

Number of cases

- Pleural adhesions and calcifications
- Asbestosis
- Cancers
- Others

FINNISH INSTITUTE OF OCCUPATIONAL HEALTH/Finnish Register of Occupational Diseases/Lea Palo
WORK HISTORY

Definite exposure: Manufacture of asbestos products, asbestos spraying, insulation, demolition of old buildings

Probable exposure: Construction, shipbuilding, heating trades, pipefitting, sheet metal work

Possible exposure: Transport, railways, ship engine crew, firefighting, mining and quarrying, oil refining, chemical, paper and metal industries, car repair, general maintenance jobs

Unlikely exposure: Office work, agriculture and forestry, health care and education, telecommunication, textile industry
Radiological findings of small opacities (ILO grade 1/0) are regarded as early stage of asbestosis. Asbestosis is generally associated with high exposure levels at workplace.

Low exposures from work-related, household and natural sources (below 0.01 f/cm\(^3\)) may induce pleural changes (up to 2 % in the adult population) and mesothelioma (up to 1-2 cases/million people/year). Smoking has no influence on the risk of mesothelioma. About 80 % of all mesothelioma cases are caused by asbestos exposure.
HELSINKI CRITERIA (2)

All major histological types of lung cancer can be related to asbestos. Clinical signs and symptoms are of no significant value in deciding whether or not an individual case is attributable to asbestos.

One year of heavy exposure (manufacture as asbestos products, asbestos spraying, insulation work, demolition of old buildings) or 5-10 years of moderate exposure (construction, shipbuilding) may increase the lung cancer risk two-fold or more.
HELPSINIKI CRITERIA (3)

A cumulative exposure of 25 fibre-years can be applied to attribute a two-fold risk of lung cancer to asbestos exposure. A two-fold risk is related to the retained fibre level of 5 million asbestos fibres (>1μm)/gram dry lung tissue.

Asbestosis is not prerequisite of lung cancer. Asbestos exposure multiplies the risk of lung cancer similarly in smokers, ex-smokers and nonsmokers. Accordingly, smoking habits have no influence on the attribution of an individual case to asbestos exposure.

In industrialized countries, about 5 % of all lung cancer cases are caused by asbestos exposure equalling about two-fold the number of mesotheliomas.
HELSINKI CRITERIA (4)

For clinical purposes, the following levels identify those persons who highly probably have been exposed to asbestos at work:

- over 1 million amphibole fibres/g dry tissue
- or over 1000 asbestos bodies/g dry tissue
  (100 asbestos bodies/g wet tissue)
- or over 1 asbestos body/ml in brochoalveolar lavage fluid

An increased risk of mesothelioma and pleural plaques may occur below or at these concentrations.
A two-fold risk of lung cancer is related to the retained fibre level of 5 million asbestos fibres/g dry tissue.
Asbestos in lung tissue samples from autopsies or surgical operations, million fibres/g dry tissue.

<table>
<thead>
<tr>
<th>Country and area</th>
<th>Population</th>
<th>Age, years</th>
<th>Chrysotile</th>
<th>Amphiboles</th>
<th>Over 1 million asbestos fibres/g dry tissue</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>mean (range)</td>
<td>mean (range)</td>
<td>mean (range)</td>
<td></td>
</tr>
<tr>
<td>Finland, Helsinki</td>
<td>Male autopsy series (N=300)</td>
<td>52 (33-69)</td>
<td>&lt;0.1</td>
<td>1.4 (&lt;0.1-163) ant, cro, amo, tre</td>
<td>54/300</td>
</tr>
<tr>
<td>Finland, Helsinki</td>
<td>Male lung cancer patients (N=113)</td>
<td>62 (35-81)</td>
<td>&lt;0.1</td>
<td>3.3 (&lt;0.1-150) ant, cro, amo, tre</td>
<td>39/113</td>
</tr>
<tr>
<td>Finland, Tampere</td>
<td>Lung cancer patients (N=25)</td>
<td>61 (43-78)</td>
<td>&lt;0.1</td>
<td>1.0 (&lt;0.1-7.7) ant, amo</td>
<td>7/25</td>
</tr>
<tr>
<td>Estonia, Tallinn</td>
<td>Lung cancer patients (N=20)</td>
<td>61 (39-72)</td>
<td>0.2 (&lt;0.1-1.6)</td>
<td>0.1 (&lt;0.1-0.2) tre</td>
<td>2/20</td>
</tr>
<tr>
<td>Russia, Karelian Republic, Petrozavodsk</td>
<td>Lung cancer patients (N=20)</td>
<td>54 (43-70)</td>
<td>0.3 (&lt;0.1-1.3)</td>
<td>0.1 (&lt;0.1-0.3) tre</td>
<td>1/20</td>
</tr>
<tr>
<td>Hungary, Budapest</td>
<td>Lung cancer patients (N=25)</td>
<td>58 (35-78)</td>
<td>1.0 (&lt;0.1-11)</td>
<td>0.1 (&lt;0.1-0.6) cro, tre</td>
<td>4/25</td>
</tr>
</tbody>
</table>
ASBESTOS BANS

• Marketing and use of all products containing asbestos fibres added intentionally are prohibited (EU countries before 1.1.2005, Estonia 2.11.2000)

• Worldwide over 40 countries have banned the use of asbestos
Asbestos policy documents

World Health Organization, www.who.int
- Elimination of asbestos-related diseases (2006),

International Labour Organization, www.ilo.int
- Asbestos Convention and Recommendation (1986)
- Resolution concerning asbestos (2006)

World Trade Organization, www.wto.org
- European Communities-Measures affecting asbestos and asbestos-containing products (2001)

United Nations Rotterdam Convention, www.pic.int
Ratifications of ILO Asbestos Convention 162

Belgium 1996
Bolivia 1990
Bosnia-Herzegovina 1993
Brazil 1990
Cameroon 1989
Canada 1988
Chile 1994
Colombia 2001
Croatia 1991
Cypros 1992
Ecuador 1990
Finland 1988
Germany 1993
Guatemala 1989

Japan 2005
Macedonia 1991
Netherlands 1999
Norway 1992
Portugal 1999
Russia 2000
Serbia 2000
Slovenia 1992
Spain 1990
Sweden 1987
Switzerland 1992
Uganda 1990
Uruguay 1995
Zimbabwe 2003

Antti Tossavainen/Twinning/atoka44.ppt
EU ASBESTOS DIRECTIVES

2003/18/EC on the protection of workers from the risks related to exposure to asbestos at work

1999/77/EC on the marketing and use of asbestos products

1987/217/EEC on the prevention and reduction of environmental pollution by asbestos
Estonian asbestos regulations

• Asbestitööle esitatavad töötervishoiu ja tööohutuse nõuded, Vabariigi Valitsuse määrus nr 32, 2.2.2000 ja nr 224, 11.10.2007
• Elanikkonnale ja loodusele ohtlike kemikaalide kaitlemise piirangud, Sotsiaalministri määrus nr 36, 28.2.2005
• Asbesti sisaldavate jäätmetekaitlus nõuded, Keskkonnaministri määrus nr 22, 21.4.2004
OTHER REGULATIONS

- Tööõnnetuste ja kutsehaigestumise registreerimise, teatamise ning uurimise kord, Vabariigi Valitsuse määrus nr 146, 13.5.2003
- Töötajate tervisekontrolli kord, Sotsiaalministri määrus nr 74, 28.4.2003
- Kutsehaiguste loetelu, Sotsiaalministri määrus nr 66, 9.5.2005
- Töötervishoiu ja tööohutuse nouded ehituses, Vabariigi määrus nr 377
Kutsehaigustel loetelu 2005
Sotsiaaliministri määrus nr 66

§2. Respiratorised kutsehaigused ja -kasvajad:
- asbestoos
- mesotelioom, mis on põhjustatud asbestitolmu sissehingamisest
- pneumokonioos, mis on põhjustatud silikaattolmu sissehingamisest
- asbestoosi tüsistusena tekinut kopsukasvaja
- asbestist põhjustatud pleura fibroossed haigusest
- kopsukasvaja, mis on põhjustatud asbestitolmu sissehingamisest
- respiratoorised haigused, mida põhjustavad kvartsitolm, asbestitolm või tsemenditolm
MANAGING OCCUPATIONAL RISKS RELATED TO ASBESTOS, EST-FIN Twinning Project

Component 1. Survey of asbestos containing materials, work practices and regulations

Component 2. Training of medical personnel

Component 3. Screening study

Component 4. Awareness raising and information

Component 5. Kick-off and concluding meetings
NECESSARY ACTIONS

1. Implementation of asbestos directive 2003/18/EC
   - notification and inspection of demolition works
   - training of employers and workers
   - health examinations of exposed people

2. Ratification of ILO Asbestos Convention
   - tripartite preparation of policies and regulations
   - licencing of competent demolition companies

3. Total revision of diagnosis, registration and compensation practices of occupational diseases
   - mandatory insurance for work accidents and occupational diseases (TöKS)
   - revival of the Occupational Health Center for research, service and information activities
Four - dog defense of asbestos

1. Nothing has happened. (Asbestos diseases don't occur here)
2. We don't own a dog, another dog bit him. (Old companies don't exist anymore, diseases were caused by smoking)
3. The dog bit him but didn't hurt. (Diseases are benign and signs of exposure only)
4. He knew that the dog was dangerous. (Workers should have worn respirators and paid their own accident insurance)