Globalization and the Transfer of Hazardous Industry:
Asbestos in Mexico, 1979–2000

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This study quantified asbestos use in Mexico in the past decade and evaluated available data on mortality due to malignant mesothelioma in Mexico between 1979 and 2000. Mortality data were analyzed from secondary databases of the Mexican Social Security System and the Ministry of Health. Data on the import and export of asbestos in Mexico were obtained from the Ministry of Trade and Industrial Development of Mexico. Deaths due to pleural mesothelioma significantly increased in this period. Although the import of asbestos declined, the number of Mexican products that contain asbestos tripled. Export of Mexican asbestos-containing products to Central America grew rapidly in the last ten years of the study. Mexico continues the appreciable use of asbestos and has experienced a significant increase in the occurrence of the sentinel asbestos-related disease, malignant mesothelioma. Given the many limitations to the control of hazardous work exposures in Mexico, a ban on asbestos is advocated as the most feasible means of limiting an epidemic of asbestos-related disease. Key words: mortality; pleural mesothelioma; asbestos; imports; exports; Mexico.

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The causal association between exposures to all types of asbestos and the subsequent development of pleural mesothelioma, asbestosis, and lung cancer has been well-documented. In 1986, asbestos was declared a human carcinogen by the Environmental Protection Agency of the United States and the International Agency for Research on Cancer of the World Health Organization. The common historic and continued use of asbestos in different countries suggests that large numbers of workers and the general population have been and continue to be exposed to asbestos, often without their full knowledge.

Globalization has had important consequences for the dissemination of the hazards of asbestos exposure throughout the globe. The commercial strategy of multinational asbestos industries has depended on the opening of markets within the global economy framework, business liberalization, changes in investment policies, the introduction of new technologies and chemical substances, and the establishment of free trade agreements. The prerogative of free trade has prevailed over human, environmental, and labor rights. This globalization process has been further accompanied by the transfer of hazardous industries, such as the manufacture of asbestos products, from developed countries (i.e., Canada, the United States, the European Union and Japan) to the developing countries of Latin America, Asia, and Africa, including Mexico.

In Mexico, the key factors that have allowed the export of risk by multi-national companies to Mexico are:

- greater legal flexibility in labor and environmental concerns;
- cheap Mexican labor;
- fiscal incentives for multinational companies;
- political control in union organizations;
- lack of updated legislation in health, safety, and hygiene matters;
- deficient governmental surveillance of compliance with the existing laws, regulations, and standards;
- lack of information about health risks of asbestos to workers and neighborhood residents;
- lack of professionals in the fields of environmental and occupational health;
economic crises and unemployment in developing countries; and

stricter environmental and occupational regulating controls in developed countries as well as the increase in legal demands of workers and populations affected in those countries.

The transfer of hazardous industries such as asbestos production to Mexico is generally believed to have an important impact on the health of workers and the general population, but, in fact, this has been little studied in Mexico.

Mexico lacks asbestos mines and, therefore, has depended on import of the raw material from other countries such as Canada. Examples of companies that have set up business in Mexico are subsidiaries of Eternit (Switzerland), and Eureka, Johns Mansville and Textiles Americanos de Asbestos (United States). The United States closed asbestos plants in the United States in the mid 1970s due to regulation and tort litigation. These companies then moved their businesses to other countries, including Mexico. Thus, the resources of underdeveloped countries have contributed to the growth of multinational corporations, especially through the availability of cheap labor, low-cost raw materials, and a regulation- and litigation-free atmosphere. In addition, in spite of the progress in the development of “clean” technologies, transnational companies often transfer “older” and obsolete, and therefore less protective, technologies to economically less developed countries.

The development of asbestos-using industries in Mexico began in the 1930s, when Techo Eterno Eureka, S.A. de C.V, an asbestos cement company, opened a plant in Mexico City. Thereafter, the proliferation of companies manufacturing asbestos products was gradual, until it accelerated in the 1970s due to a significant migration of American and European companies in response to increased regulation of asbestos in developed countries. The total quantity of asbestos imports through 1997 in Mexico is not known.

The goal of this report is to describe the use of asbestos in Mexico and the trend in mortality from pleural mesothelioma in the Mexican population during the period 1979–2000.

METHODS

To determine the mortality due to pleural mesothelioma in Mexico, we obtained information from secondary data sources that reported deaths based on death certificates. The following sources were used: the National Institute of Statistics, Geography and Informatics (INEGI); the Mexican Institute of Social Security (IMSS); the Institute of Social Security Services for State Workers (ISSSTE); the Ministry of Health (SSA); the Naval Hospital; the medical departments of Petróleos Mexicanos, the Army, and numerous private hospitals.

The underlying causes of death on death certificates were coded according to the 9th and 10th revisions of the International Classification of Disease of the World Health Organization. The death certificates contain the following information: gender, age, date of death, cause of death, date of birth, place of residence, occupation, place of death, and type of health insurance. This information was validated by comparing the underlying causes of death that were recorded in the INEGI and SSA records in order to verify the concordance between them. In addition, we analyzed IMSS records of occupational diseases that occurred among insured workers and that were generated by health services at the respective work places between 1992 and 2002.

To determine the use of asbestos in Mexico, we obtained data on imports and exports of asbestos in Mexico from 1992 to 2000 from the Ministry of Trade and Industrial Development (SECOFI).5 Data prior to 1992 were not available. The information from SECOFI was validated through use of specific customs codes for asbestos.

RESULTS

Imports and Exports of Asbestos

According to SECOFI data and reports of asbestos industrial facilities, the asbestos industry, which has begun in Mexico in 1932, accelerated in the metropolitan area of Mexico City in the 1970s (Table 1). By

<table>
<thead>
<tr>
<th>Company</th>
<th>Location</th>
<th>Year Established</th>
</tr>
</thead>
<tbody>
<tr>
<td>Techo Eterno Eureka, S.A. de C.V.</td>
<td>Mexico City</td>
<td>1932</td>
</tr>
<tr>
<td>Asbestos de Mexico, S.A. de C.V.</td>
<td>State of Mexico</td>
<td>1943</td>
</tr>
<tr>
<td>Mexalit, S.A. (División Centro)</td>
<td>State of Mexico</td>
<td>1952</td>
</tr>
<tr>
<td>Eureka del Norte, S.A. de C.V.</td>
<td>Nuevo León</td>
<td>1956</td>
</tr>
<tr>
<td>Asbestos del Noroeste, S.A. de C.V</td>
<td>Sonora</td>
<td>1956</td>
</tr>
<tr>
<td>Mexalit, S.A. (División Norte)</td>
<td>Chihuahua</td>
<td>1960</td>
</tr>
<tr>
<td>Eureka de Occidente, S.A. de C.V.</td>
<td>Jalisco</td>
<td>1960</td>
</tr>
<tr>
<td>Mexalit, S.A. (División Occidente)</td>
<td>Jalisco</td>
<td>1960</td>
</tr>
<tr>
<td>Asbestoll de Guadalajara, S.A.</td>
<td>Jalisco</td>
<td>1976</td>
</tr>
<tr>
<td>Asbestos de Hidalgo, S.A.</td>
<td>Hidalgo</td>
<td>1977</td>
</tr>
<tr>
<td>Asbestoll del Sureste, S.A.</td>
<td>Tabasco</td>
<td>1977</td>
</tr>
<tr>
<td>Mexalit, S.A. (División Sureste)</td>
<td>Tabasco</td>
<td>1979</td>
</tr>
</tbody>
</table>

*Source: Asociación Mexicana de Fabricantes de Productos de Asbestos—Cemento, A. C. 1985, 3
1986, there were 97 asbestos industries in this zone, mostly in Mexico City (92 in Mexico City and five in the State of Mexico). Automotive products was the principal asbestos-using industry (61 facilities), followed by the asbestos cement industry (30 plants). After the Mexican economic crisis of 1994, the number of small asbestos-using companies diminished. By 2001, there were 1,881 companies in Mexico importing different forms of asbestos: 263 facilities (13.9%) made prefabricated construction materials, including tiles, 45 facilities (2.3%) made brake pads, and 38 (2%) used it as fiber or rock.

According to SECOFI data, Mexico imported raw asbestos from 19 countries in 1992, which dropped to six in 2000. In 2000, two countries dominated: Canada, which doubled its sales in tons of asbestos and increased its share of Mexican asbestos imports from 30% to 68% between 1992 and 2000; and Brazil, which tripled its sales of asbestos to Mexico and raised its share from 7% to 30% during the same period (Table 2). Overall, imports of asbestos in Mexico decreased from 35.3 tons to 26.1 tons of asbestos between 1992 and 2000. Thus, between 1992 and 2000, asbestos imports decreased, both in tonnage and in the number of exporting countries.

Comparison of average imports in 1992 and 2000 shows increases from 3.20 to 4.35 tons per year per country. The cost of a kilogram of asbestos dropped from $0.51 to $0.46 during the same period. Despite the drop in imported asbestos, total and average exports increased (Table 3).

In 1992, 96% of asbestos products manufactured in Mexico were exported to the United States. By 2000, however, this percentage had decreased to 58%. By contrast, El Salvador, which purchased only 0.04% of Mexican asbestos exports in 1992, had increased its share to 22.6% by 2000 (Table 4).

In 2001, 29 of the 1,881 asbestos-using companies were located in the Valley of Mexico (which includes Mexico City and State of Mexico), employing approximately 5,000 workers. Half (47%) of these facilities produced brake linings, and an additional fourth (21%) made gaskets. Other products included waterproofing materials (14%) and water tanks and sheets (7%). Approximately 50% of these asbestos-using industries were located near residential areas with a high population density within a 2-km radius (Figure 1). Social security records for 2001 indicated that there were 15 asbestos cement industries that insured their workers and that employed approximately 7,200 persons in 2001. This employed population is in addition to the 5,000 workers cited above. Thus, it appears that no fewer than 12,000 workers were employed in asbestos-using companies in Mexico City in 2000.

**MESOTHELIOMA AND ASBESTOSIS IN MÉXICO**

During the 22-year period, 1979 to 2000, there were 793 deaths from malignant mesothelioma of the pleura.

### TABLE 2. Source Countries for Asbestos Imports and Their Costs to Mexico, 1992 and 2000

<table>
<thead>
<tr>
<th></th>
<th>1992 Tons (%)</th>
<th>Total Cost (US $ in millions)</th>
<th>Cost/kg (US$)</th>
<th>2000 Tons (%)</th>
<th>Total Cost (US $ in millions)</th>
<th>Cost/kg (US$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canada</td>
<td>10.5 (30)</td>
<td>5.3</td>
<td>0.51</td>
<td>17.8 (68)</td>
<td>8.3</td>
<td>0.46</td>
</tr>
<tr>
<td>Switzerland</td>
<td>6.3 (18)</td>
<td>4.5</td>
<td>0.71</td>
<td>7.8 (30)</td>
<td>4.2</td>
<td>0.54</td>
</tr>
<tr>
<td>Brazil</td>
<td>2.5 (7)</td>
<td>1.8</td>
<td>0.72</td>
<td>3.0 (1.1)</td>
<td>1.9</td>
<td>0.64</td>
</tr>
<tr>
<td>Zimbabwe</td>
<td>2.4 (7)</td>
<td>2.4</td>
<td>0.98</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>35.3 (100)</td>
<td>21.2</td>
<td>0.60</td>
<td>26.1 (100)</td>
<td>12.8</td>
<td>0.48</td>
</tr>
</tbody>
</table>


*The unit cost of 1 kg of asbestos was 0.60 US $.
†The unit cost of 1 kg of asbestos was 0.48 US $.
‡Units per year.


### TABLE 3. Total and Average Asbestos Imports and Exports and Their Costs in Mexico, 1992 and 2000

<table>
<thead>
<tr>
<th></th>
<th>1992 Amount/Year</th>
<th>Cost US $</th>
<th>2000 Amount/Year</th>
<th>Cost US $</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Imports</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average</td>
<td>3,209,143 tons</td>
<td>1,928,794</td>
<td>4,350,306 tons</td>
<td>2,128,935</td>
</tr>
<tr>
<td>Total</td>
<td>35,300,576 tons</td>
<td>21,216,739</td>
<td>26,101,840 tons</td>
<td>12,773,616</td>
</tr>
<tr>
<td><strong>Exports</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average</td>
<td>112,674 units‡</td>
<td>189,562</td>
<td>201,151 units</td>
<td>309,896</td>
</tr>
<tr>
<td>Total</td>
<td>20,619,497 units</td>
<td>34,689,914</td>
<td>67,184,516 units</td>
<td>104,745,041</td>
</tr>
</tbody>
</table>

*The unit cost of 1 kg of asbestos was 0.60 US $.
†The unit cost of 1 kg of asbestos was 0.48 US $.
‡Units per year.

The deaths were recorded in Mexico. None of these deaths was recognized as an occupational disease, according to records of Social Security.9 Of those who died, 62% (491) were male and 38% (302) were female. The mean age was 60.7 years (SD = 16 years), with a range of 1 to 105 years; 81 cases, or 10%, were less than 40 years of age, and 92, or 11.6%, were 80 years old or older. Analysis of the deaths by age shows that 31.9% (252) occurred between the ages of 40 and 59 years (Table 5 and Figure 3). There was no significant difference between the mean ages of males and females. Of the cases for whom the sources of medical care were known, 50.4% (316) received health care as part of the Mexican social security system for private-sector workers (IMSS). Nearly 90% of the people who died from mesothelioma had had no more than some primary school education (Table 5).

From 1979 to 1997, there were 487 deaths from malignant mesothelioma, or a mean of 25.6 deaths per year, including means of 15 deaths among males and ten in females. The gender ratio was 1.5:1. During the period 1998–2000, there were 306 deaths from malignant mesothelioma of the pleura, or a mean of 102 cases per year. This represented a fourfold increase. In the latter period, there were means of 64.7 and 37.3 deaths from malignant mesothelioma of the pleura among males and females, respectively, with a resulting ratio of 2:1 (Figure 2).

A third of the deaths from pleural mesothelioma (256, or 32.3%) were recorded in the metropolitan area of the Valley of Mexico; This coincides with the geographic location of greatest concentration of asbestos industries in Mexico, and also the location of the most important hospitals with the best technology for diagnosing cases of pleural mesothelioma (Figure 4).

Based on an analysis of the social security records obtained from IMSS,9 there were 211 cases of asbestosis recognized as an occupational disease between 1992 and 2000 in Mexico. Nearly all (202, or 95.7%) were male workers, but nine (4.3%) were female workers. The mean age at the time of diagnosis was 49 years (SD = 5 years), with a range of 23–76 years. A recording error caused a decrease in the number of cases of asbestosis between 1998 and 2002, when many cases of asbestosis were coded as pneumoconiosis rather than asbestosis specifically (Figure 5). Of the cases of asbestosis, 48.8% (103) were concentrated in the Valley of Mexico.9
DISCUSSION

Imports and exports of asbestos to and from Mexico were dynamic in the ten years under study. Virtually all asbestos used in Mexico is now imported from just two countries, Canada and Brazil. By contrast, whereas the United States used to be nearly the sole recipient of asbestos-containing goods from Mexico, Central America now imports over a third of Mexico’s asbestos products. Even though the import of asbestos into Mexico...
fell by 25% between 1992 and 2000, the number of asbestos-containing units produced in Mexico more than tripled in the same period.

These changes in Mexico have occurred in a context of widespread restrictions on asbestos use and relaxation of trade barriers, especially in North America. Asbestos import fell dramatically in Europe and the United States in the 1980s as a consequence of stricter regulation and accelerated litigation. In more recent years, a number of countries have adopted a ban on asbestos, including the European Union’s ban on the use of all forms of asbestos, effective in 2005. In Latin America, Chile and Argentina have banned the use of asbestos.

The sense of urgency about asbestos control and elimination has been substantiated by a growing literature documenting the overall burden of asbestos-related diseases, especially malignant mesothelioma.
Several studies show that mortality due to malignant mesothelioma has increased rapidly among workers exposed to asbestos in many countries, including France, Italy, the United Kingdom, the United States, Australia, Denmark, Canada, Sweden, Germany, and China. According to Banaei et al., mortality due to mesothelioma among French men aged between 50 and 79 years will continue to increase until it reaches an annual peak ranging between 1,140 and 1,300 deaths per year in the period 2030–2040. Thus, between 1997 and 2050, the total number of mesothelioma deaths in France will increase from 44,480 to 57,020. In Finland, which banned the use of asbestos in 1976, there was an average of 35 cases of mesothelioma in men in 1995, and this trend is expected to increase to 40–50 annual cases by 2010. Despite the more recent bans, most developed countries are expected to experience continued epidemics of asbestos-related diseases for several decades.

In response to these events, Canada, a leader in asbestos exportation, has implemented a strategy to revitalize the industry of this raw material with the participation of state governments of Canada and Quebec and the National Chambers of Fibrous Cement Industries in Mexico (now grouped into the Asbestos Institute). Their strategy has consisted of establishing their markets in developing countries through the promotion of “the safe and controlled use of asbestos.” Recently, this has resulted in pressure on the governments of Chile and Argentina, which banned the use of asbestos in 2001 and 2003, respectively, to reverse the bans.

There has been little study of asbestos-related diseases in Mexico. In 1990, Gaviria et al. identified 52 cases of malignant mesothelioma using pathologic anatomy records of different hospitals of the national health institutes (IMSS and ISSSTE) during the period 1980–1985. The extent to which Mexican physicians failed to diagnose mesothelioma was not addressed. In 1986, Pérez L et al. studied pulmonary function and chest x-rays of 23 of 400 workers at a Borg Warner subsidiary in Mexico, which manufactured brake linings. The periods of exposure to asbestos in this group of workers ranged from one to ten years. Two of the examined workers had pleural thickening; 14 workers (60%) had obstructive abnormalities in respiratory function tests; in five cases, the obstruction was in central airways; in three, a mixed pattern was present (restrictive and obstructive); and finally, six workers’ examination results were recognized by the social security system as presenting evidence of occupational diseases.

Recent labor and community activities in Mexico demonstrate that there is increased awareness of the importance of asbestos exposure. In 1998, Mexican workers who had been fired from the ITAPSA and American Brakeblock companies of Mexico City, which manufactured asbestos brake linings, brought an action before the National Administrative Office (NAO). This body was created in 1994 as a part of Parallel Agreements of the North American Free Trade Agreement (NAFTA) signed between Mexico, Canada, and the United States, in part to address issues involving occupational health and safety and the prevention of occupational accidents and diseases. The lawsuit described a series of violations, including the lack of enforcement of safety and hygiene standards necessary to prevent health risks due to the use of asbestos. The NAO affirmed the claims and issued a summons to Mexican labor authorities, though with little action taken to date. In a second case, community residents of the San Lucas quarter in Iztapalapa, Mexico City, brought a lawsuit against American Roll, S.A. de C.V. (ITAPASA S.A. de C. V.), a company manufacturing car brake linings, to close its factory. The plant is located within 300 meters of six schools and numerous housing complexes housing at least 500 families. No action has been taken by governmental authorities, and the facility remains open.

There are numerous limitations to our study. We have not identified the reason for the precipitous increase in mesothelioma deaths beginning in 1998. The mortality statistics are fragmented in Mexico and make the underestimate of mesothelioma deaths highly probable. The failure of the Mexican health care system to recognize occupational diseases, including mesothelioma, as we demonstrated here, further undermines the proper reporting of cases of even obvious occupational diseases. There is no effective public health surveillance system in Mexico to monitor the
occurrences of occupational diseases and occupational risks. These limitations impede the ability to fully characterize the risk and burden of disease for the best known of all occupational hazards—asbestos.

The relatively recent introduction of asbestos in Mexico suggests that Mexico is only now beginning to experience asbestos-related disease. Given the very long latency for asbestos-induced mesothelioma, the incidence of this disease is likely to increase in coming decades. Factors that are specific to, or more common in, developing countries such as Mexico are likely to intensify this epidemic. These include poor nutritional levels associated with high rates of morbidity in workers, absence of a union organization, lack of governmental authorities’ awareness regarding contamination and occupational health risks, lack of care and action on the part of authorities, and lack of workers’ experience in this kind of industrial environment, as well as the absence of occupational health services and qualified staff.

Given the many failures of the occupational health system in Mexico, it is imperative for the Mexican government to ban the use of asbestos25,26 in order to limit the future extent of asbestos-related disease and to protect the health of the Mexican population.

References

12. Resolución 823/2001 del Ministerio de Salud de la Nación Argentina, que prohíbe en todo el territorio del país la producción, importación, comercialización y uso de fibras de asbesto, variedad crisotilo y productos que la contengan a partir del 1º de enero del 2003.