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Use of asbestos, health risks and induced occupational diseases in the former East Germany

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Abstract

In the period from 1960 to 1990 about 1.4 million tonnes of asbestos were imported and mainly processed into asbestos-cement products for the building industry. The production was concentrated in the former counties of Magdeburg and Dresden. In the past asbestos was primarily used as insulation and fire prevention material, etc. in the large-scale chemical industry. The asbestos was imported from the former Soviet Union, smaller amounts came from Canada. In the German Federal State of Saxony-Anhalt, approximately 600 asbestoses, almost 2700 pleural changes caused by asbestos, 843 asbestos-induced mesotheliomas and 787 bronchial and laryngial carcinomas were recorded in the period from 1960 to 1990. A considerable percentage of the mesotheliomas are solely due to exposure to chrysotile asbestos.

Key words: Asbestos; Chrysotile; East Germany (GDR); Mesothelioma; Occupational diseases

1. Introduction

Like other countries, the former German Democratic Republic (East Germany), now the 5 new Eastern States of the Federal Republic of Germany, used quite large quantities of asbestos-based products. More details are given in the 'Asbestos Catalogue' which was published by the German Federal Environmental Protection Agency in 1991 [1]. Listed in their order of application, the range of products included asbestos-based construction materials, asbestos sheets, boards, tiles and pipes,

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asbestos-based textiles, filters, seals, putties, filling and joint pouring compounds, plastic materials, friction materials and asbestos-containing talcum powder. The asbestos-producing plants were located in Saxony-Anhalt, Saxony and Thuringia.

All asbestos-based products were made from raw asbestos which was primarily imported from the former Soviet Union, particularly from the Kiembay mining area in the Ural mountains. Smaller quantities of long-fibred grades came from Canada (2990 tonnes in 1989) and were mainly used for the manufacture of asbestos-cement pressure pipes free of amphibole asbestos. This was a share of approximately 7% in the total imports. In addition to these imports of chrysotile asbestos, smaller quantities of amphibole asbestos were imported from Mozambique and Italy, and small amounts of crocidolite came as semi-finished goods, however, not in the last 10 years. Health care measures for users of asbestos were prescribed by law. Morbidity and mortality developments caused by exposure to asbestos were carefully monitored by occupational physicists. The autopsy rate which was relatively high in the former East Germany contributed considerably to seeing the effect of asbestos on the development of bronchial carcinoma and mesothelioma much more objectively from an epidemiological point of view. While the frequency of silicoses, for example, continuously decreased, an increase in occupational malignant tumours, caused in 90% of the cases by asbestos, has been obvious since the 1970s.

2. Use of asbestos, exposure and morbidity development

Due to bilateral agreements between the former Soviet Union and East Germany, the latter participated in the development of the Soviet asbestos deposits providing labour and equipment. The supply of this raw material was to cover the GDR's cost of asbestos exploitation. East Germany wanted to use this universal material to cover up the shortages in supplying other materials, such as plastics, aluminium, iron, etc. Compared with other countries, the global use of asbestos in building, e.g. as roofing and lining material, is obvious everywhere. Fig. 1 shows a survey of the raw asbestos imports of the former GDR for the period from 1960 to 1989 which amounted to approximately 1.4 million tonnes.

The figures have been taken from the Statistical Yearbooks of the GDR for the years 1960 to 1989 [2]. Comparing the amount of 55 000 tonnes of raw asbestos quoted for the year 1989 with the data published by the asbestos industry given in Table 1, there is a difference in imports of approximately 13 000 tonnes, which, in our investigations, we could not find deposited anywhere. Consequently, we believe that due to the events of 1989 it is likely that these quantities were not actually imported. Moreover, the table shows the product-specific uses of raw asbestos.

Raw asbestos was mainly used in Saxony, especially in the Dresden region where use began early this century, and in Saxony-Anhalt, especially in the city of Magdeburg and the surrounding area. More than 70% of the imported raw asbestos was processed into asbestos-cement building materials. Assuming 85% of these are building construction products and 10% of them were exported to other countries, the total surface area of the asbestos-cement sheets produced in the former GDR from 1960 to 1989 is estimated to be approximately 500 million m^2 [3]. These products were produced without any surface protection. Paint-coated asbestos sheets were exported to the countries of Western Europe.

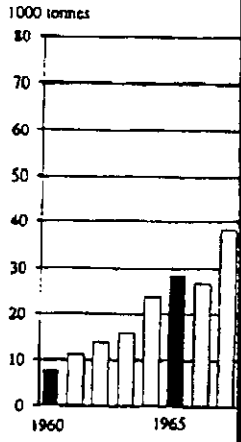

Fig. 1. Raw asbestos imports o

Efforts made to replac
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Despite the great efforts
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straints.

Table 1
Raw asbestos imports of the G

Federal state	Former counties
Brandenburg	Potsdam, Frank and Cottbus
Saxony-Anhalt	Magdeburg and
Thuringia	Erfurt, Gera an
Saxony	Dresden, Leipzi Chemnitz
Total	

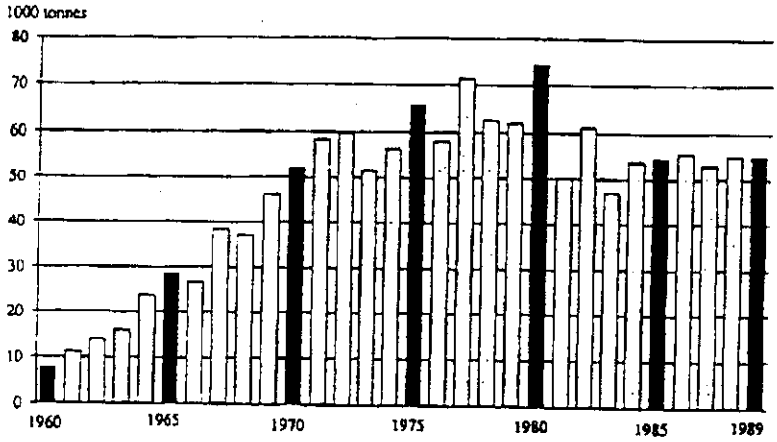

Fig. 1. Raw asbestos imports of the former GDR from 1969 to 1989 (based on East German Statistical Yearbooks).

Efforts made to replace asbestos in the 1980s produced some success. However, they could not reduce the intensive use of asbestos in the building materials industry. Despite the great efforts made by the health system and legal stipulations [4], the comparatively low-cost asbestos was continuously used because of economic constraints.

Table 1
Raw asbestos imports of the GDR 1979/1989 (based on data from industry)

Federal state	Former counties	Quantities used (tonnes)		Product
		1979	1989	
Brandenburg	Potsdam, Frankfurt/O. and Cottbus	100	—	Anthophyllite for acid-resistant products
		130	20	Sealing compounds
Saxony-Anhalt	Magdeburg and Halle	24 000	20 800	Flat asbestos-cement sheets
		15 000	4500	Asbestos-cement pipes
		4000	—	'Sokalit' plates
		300	—	Asbestos paper
		300	—	Asbestos-containing compounds
		3	—	Catalyst carriers
Thuringia	Erfurt, Gera and Suhl	3600	3600	Filter material
		1500	—	Fire bats
		346	170	Jointing compounds
Saxony	Dresden, Leipzig and Chemnitz	17 860	11 170	Flat asbestos-cement sheets
		3020	1427	Friction linings, textiles
		1000	—	Asbestos-containing compounds
		500	—	Jointing compounds
Total		71 659	41 687	

In the past, the fibre concentration at workplaces varied considerably depending on the particular material and working process applied. The measuring results are presented in Table 2. As expected, the values show a considerable range. This broad range in asbestos fibre concentration is due to the significant differences in boundary conditions in each workplace. Consequently, asbestos-exposure calculations made by catalogue data would have the potential for significant error as would a retrospective assessment of exposure. Despite the economic constraints mentioned above, the former GDR carried out comprehensive occupational surveillance programmes. Recognition of asbestos-related diseases was relatively easy and compensation claims were handled generously in former East Germany. In 1988, a total of 5270 occupational diseases were officially recognized. The share of occupational cancers in the total incidence rate was 6.1%, of which 90% were caused by asbestos fibres. Based on data from the Ministry of Health, Table 3 shows a rising trend in occupational cancers caused by asbestos fibres and chemical carcinogens despite the relatively constant figures for asbestosis over a period of 20 years and a successful reduction in the incidences of silicosis [5]. The respective figures for the former county of Magdeburg are shown in Table 4. The autopsy rate was relatively high in the past (about 65%) in patients with bronchial carcinomas and mesotheliomas and connected with other diagnostic procedures. The data made it possible to determine approximately 600 asbestoses, almost 2700 pleural changes caused by asbestos, 787 bronchial and laryngeal carcinomas and a total of 1082 mesotheliomas in the region which is now the German state of Saxony-Anhalt in the period from 1960 to 1990. These 1082 cases included 843 proven asbestos-related mesotheliomas.

3. Mesothelioma diseases in Saxony-Anhalt — a cause analysis

Asbestos exposure was highest among the insulation workers in the chemical industry in the Halle area, among workers in the rubber manufacturing industry, in the health care system, among people involved in the manufacture and application

Table 2
Asbestos-fibre concentration at workplaces without suction devices determined by konimetry (fr[om] unpublished reports prepared by Occupational Inspectorates)

Type of work	Fibre concentration (F/m^3)
Scratching and crushing of asbestos-cement	30 000 to 300 000
Abrasive cutting of asbestos-cement without dust removal by suction	300 000 to 10 000 000 approx.
Drilling of asbestos-cement without dust removal by suction	500 000 to 3 400 000
Machining of brake linings	100 000 to 13 000 000
Replacement of gaskets (rubber-asbestos)	20 000 to 500 000
Punching of gaskets (rubber-asbestos)	20 000 to 1 900 000
Use of asbestos gloves	20 000 to 600 000
Replacement of clearing layers	60 000 to 500 000
Use of talcum for powdering gloves	60 000 to 20 000 000
Level limit value (over a whole working day)	1 000 000

[illegible]ly recognized occupational dis[illegible]

[illegible] of diseases	New case[illegible]
	1970
[illegible]	170
[illegible]	943
[illegible]ational cancers	15

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Table 4
Occupational diseases caused by dust a[illegible]
number of diseases

Groups of diseases	New cases[illegible]
	1973
Asbestosis	29 (3.3)
Silicosis	29 (3.3)
Asbestos-cancers	3 (0.3)

Table 3
Officially recognized occupational diseases by dust and fibre exposure

Groups of diseases	New cases				
	1970	1975	1980	1985	1988
Asbestosis	170	253	192	255	202
Silicosis	943	566	439	409	282
Occupational cancers	15	53	118	234	319

of seed dressing agents and in the automotive industry due to the use of talcum (partly contaminated by the amphibole asbestos anthophyllite and tremolite) and naturally in the asbestos cement factories. For the other cases it was subsequently impossible to obtain information about the individual occupational history. However, due to the exact knowledge of the conditions of production it is possible for 481 cases exposed to asbestos to provide detailed information about the relevant grades of asbestos. The relationship is shown in Table 5. On this basis sole exposure to chrysotile asbestos was determined to be the cause of the disease in 67 cases which corresponds to a share of 14%. This clearly points to the mesothelioma-inducing potential of chrysotile asbestos from Russia, which may be smaller than that of amphibole asbestos, but is, however, significant. Consequently, prophylaxis should include both chrysotile asbestos and amphibole asbestos.

The existing comprehensive material was subjected to renewed analysis to enable us to make further statements on which we will report. The types of exposure to asbestos in the asbestosis and mesothelioma cases encountered in our investigations varied strongly and can be traced back in some cases to the beginning of this century; in some cases even the grades of asbestos materials have been identified. We know that prior to World War II approximately 15 to 25% of crocidolite was added to chrysotile asbestos in the insulating plant of the Leuna Works.

Table 4
Occupational diseases caused by dust and fibre exposure in Magdeburg county as percentages of the total number of diseases

Groups of diseases	New cases				
	1973	1975	1980	1985	1988
Asbestosis	29 (3.3)	26 (3.0)	18 (2.4)	23 (3.2)	33 (4.0)
Silicosis	29 (3.3)	33 (3.8)	23 (3.1)	20 (2.8)	9 (1.1)
Asbestos-cancers	3 (0.3)	9 (1.4)	25 (3.4)	31 (4.3)	58 (7.1)

Table 5
Mesothelioma diseases according to types of exposure to asbestos

	Amphiboles	Amphiboles and chrysotile	Chrysotile, amphiboles possible	Chrysotile	Mean values
Age at beginning of exposure	25	28	28	34	28
Duration of exposure (years)	16	21	19	14	19
Lethal period (years)	40	40	41	31	38
Age of person dying of mesothelioma	65	68	69	65	66
Cases	135	279	331	67	812

All types of application of asbestos with common addition of chrysotile fall under the heading 'Chrysotile, amphiboles possible' when previous admixture of amphiboles cannot be definitely excluded.

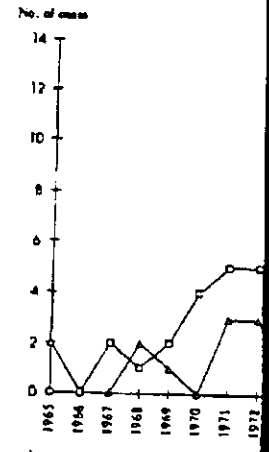
The 843 mesothelioma cases for which exposure to asbestos was proven included 812 cases with complete and secured data for statistical evaluation. In all groups of exposure, the age at which exposure began varied from school-leaving age (14 years in the past) to about 50 years. However, in the group of sole exposure to chrysotile asbestos some unskilled workers took a job at a later age more accidentally in a plant using personal protective equipment containing chrysotile asbestos. Consequently, the average beginning of exposure is clearly at a later age.

The duration of exposure varies in all groups from a few months to more than 50 years. The average in the 'Amphibole and chrysotile' group is clearly highest resulting from the fact that they were only partially exposed at the same time. For example, addition of crocidolite to chrysotile-containing insulating materials which was common in many places in the past was stopped in later years. Moreover, it is due to subsequent jobs in various employments.

The 'lethal period' from the beginning of exposure to death caused by the mesothelioma comprises latency period and duration of the disease as a parameter which can be clearly determined. Experience shows that it is at least 10 years in all groups; in exceptional cases it may be 7 to 8 years only. However, it can also be as much as 70 years. It is obvious that the average lethal period in the chrysotile group is about one decade shorter than after exposure to amphibole asbestos. The lethal consequences of sole exposure to chrysotile asbestos cannot be assessed as minor than the other types of asbestos. This fact is also substantiated by the death age figures which almost agree with regard to the minimum, the highest and the average age for all exposure groups encountered among the diffuse malignant mesotheliomas.

4. Discussion

Chrysotile asbestos from Russia was introduced into East Germany in the early 1960s as a result of establishing an asbestos-cement industry. Asbestos spraying has



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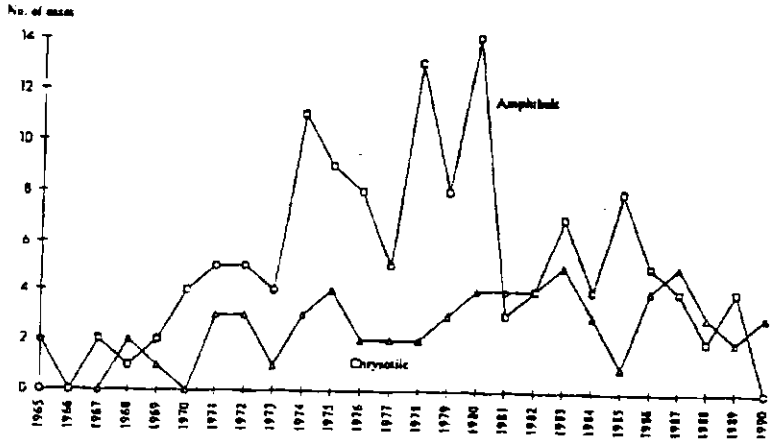

Fig. 2. Annual death rate caused by mesotheliomas in Saxony-Anhalt.

been prohibited since 1969. Consequently, we feel that we will be able in the next few years to improve the accuracy of the results of our investigations because chrysotile is clearly going to dominate among the various types of exposure to asbestos. The trend is shown in Fig. 2. A total of 58 occupational cancers caused by asbestos in the former county of Magdeburg (1.3 million inhabitants) presents more than one-fifth of the total incidence rate in the former East Germany (16.8 million) in 1988. The only exception known to us is a spraying compound containing amphibole asbestos which was used in the 'Palast der Republik' in East Berlin. Contamination of the building and the structural state of portions of its sprayed-on insulation called for the closure of the building. The planned demolition of the building aims to eliminate any health risk for staff and visitors. Little is known so far about any obvious damage to the health of the workers who built the Palace, however, their state of health should be thoroughly monitored. The number of cases of asbestos-induced diseases caused by predominant use of chrysotile asbestos in the last 30 years will also be interesting in the years to come, all the more because we are able today to allocate the exposures more clearly and to partially quantify them due to measurements made at the places of work.

We are of the opinion that even though the persistence of the chrysotile fibre in the human organism may be shorter than that of the amphibole fibre, it may obviously be long enough to cause chronic and progressive processes, including mesotheliomas. Therefore, as with dioxin, a factor of equivalence for every asbestos grade should be developed when further research has generated dose-effect curves as a function of the respective cumulative dose of asbestos dust.

5. References

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