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TUBERCULOSIS AND ASBESTOSIS

A brief review of current knowledge and analysis of tuberculosis mortality in the asbestos mining community of Thetford Mines, P.Q., Canada

Recent developments in Canada have focused attention on the question of the relationship between asbestosis and tuberculosis. Asbestosis has been declared a compensable disease in the Province of Québec, thus increasing medico-legal interest in the establishment of this diagnosis and evaluation of any contributing factors. Autopsy of asbestos miners has disclosed evidence of active tuberculosis and asbestosis in the same individuals.[1&2] In Thetford Mines, where a substantial part of all the asbestos in Canada is produced, the mortality from tuberculosis has in the past 16 years approximately doubled in contrast to a significant decline in the Provincial rate. These developments have materially helped to create the impression in the Province of Quebec that there is a causal relationship between tuberculosis and asbestosis similar to the carefully demonstrated and generally accepted relationship between silicosis and tuberculosis.

Observations in the United States

Previous studies of workers exposed to asbestos dust have not disclosed a higher incidence of tuberculosis among workers with clinical and X-ray evidence of asbestosis. Lanza[3] in 1935 concluded that asbestos dust did not predispose to tuberculosis. In his examination of 126 workers in the industry in the United States, 53.1% were found to have definite X-ray evidence of asbestosis. Two cases of active tuberculosis were found. One of these was a worker with asbestosis.

In 1936[4] Donnelly reviewed X-ray film of 151 workers in asbestos mills and found evidence of asbestosis among 34.4% of the group. No cases of active tuberculosis were found among workers with asbestosis. On the other hand, in the group without asbestosis he found four active cases of tuberculosis. Two of these active cases

had been in the asbestos industry, six and ten years respectively. Donnelly concluded that there was no tendency per se in this type of industrial occupation to exacerbate old tuberculosis lesions.

McPheeters[5] reported in 1936 an X-ray survey of 210 persons exposed to asbestos dust. He found 25.2% had some evidence of asbestosis. Three cases of active tuberculosis were found. No tuberculosis was found in workers with asbestosis. The three individuals with tuberculosis had been exposed to asbestos dust 6, 9, and 10 years respectively. In five cases healed pulmonary tuberculosis and asbestosis were found in association. The average duration of exposure for the 5 was 10.4 years and for the entire group 10.2 years. McPheeters decided there is no accelerating effect of tuberculosis on asbestosis.

In summation of this evidence it can be said that X-ray and clinical studies among asbestos workers in the United States does not reveal a significantly greater amount of tuberculosis than expected in the routine examination of workers in any industry. Moreover there is no evidence from these studies to indicate that long exposure to asbestos dust activates or accelerates the tuberculous process. Both these observations are in contrast to findings among workers exposed to free silica.

Canadian Observations

These have been no published reports of studies among asbestos workers in Canada with respect to the prevalence of asbestosis or of tuberculosis in the asbestos industry. In 1930 Pedley and his associates examined physically and by X-ray 19[illegible] asbestos workers in the towns of Asbestos and Thetford Mines.[6] The results of this survey appear in Table 1.

TABLE 1

	Asbestos	Thetford Mines
# examined	141	54
% with more than 10 years exposure	22	83.4
# with asbestosis	18	24
% with asbestosis	12.7	44.4

One case of active tuberculosis was found among the 195 individuals examined. This is a very satisfactory incidence of tuberculosis among an industrial group, even today. For example, it approximates the indicence in a survey in 1940 of the garment trade when 1 active case was found per 165 individuals examined.[7] Pedley[8] found that the tuberculosis mortality in Thetford Mines for the years 1926, 1927, and 1928 compared favorably with the tuberculosis mortality for the Province of Quebec.

TABLE 2

Average Tuberculosis Mortality for All Ages per 100,000

Place	1926-28	1940-42	% Change
Quebec	123.6	78.6	35 -
Thetford	137.9	252.1	83 +

However, since this report of Pedley there has been a sharp change in the tuberculosis mortality relationship between Thetford Mines and the Province as a whole. Table 2 shows that in the Province of Quebec the average rate for the three years 1940-42 has decreased 35% compared to the average rate for the years 1926-28. This corres-

to experience elsewhere in Canada and the United States. On the other hand, in Thetford Mines for the corresponding period tuberculosis mortality has increased more than 80%. The obvious existence of a serious tuberculosis problem in Thetford Mines has led to speculation regarding the influence of asbestos dust.

Tuberculosis Mortality Study

If the industrial exposure to asbestos dust is a significant factor in exacerbating or accelerating tuberculosis one would expect to find a significant difference in males over 25 years of age since, in Thetford Mines, practically all of this part of the population not in military service work in the asbestos industry. Socio-economic factors are also significant in relation to tuberculosis. Therefore, comparison of the tuberculosis mortality rates in Thetford Mines with communities in the Province of like size, medical and public health facilities, socio-economic and racial characteristics is important. Dublin has pointed out that where socio-economic factors were dominant the tuberculosis mortality rates for both husbands and wives were similarly affected; where industrial factors played a leading role the standardized mortality rates for the husbands greatly exceeded that of the wives.[9]

Through the courtesy of the Demographer of the Provincial Ministry of Health and Social Welfare, Dr. Paul Parrot, we were furnished the number of deaths from tuberculosis by age and sex for the years 1939 to 1943 for the cities of Thetford Mines, Rimouski, Chicoutimi, Cap de Madeleine, St. Hyacinthe, St. Jeand, and Valleyfield, as well as for the Province and the Dominion as a whole. Of the six communities picked with these characteristics in mind, the town of Rimouski was thought more nearly to compare with Thetford Mines, except instead of asbestos mining its principal industry is lumbering and wood finishing (see Table 3, p.4a).

TABLE 4

Shows the Average Mortality Rate by Sex for All Ages in Province and in the Seven Selected Communities 1940-1942

	Tuberculosis Death Rate per 100,000 All Ages	
	Male	Female
PROVINCE OF QUEBEC	77.5	80.8
Cap de la-Madeleine	55.9	44.5
St. Hyacinthe	84.5	90.9
St. John	75.1	109.8
Valleyfield	101.7	85.3
Chicoutimi	141.8	149.1
Thetford Mines	190.1	223.9
Rimouski	171.9	287.3

TABLE 3

Descriptive Data on Selected Communities

	Population	Industries	Health Officers ~	Health Unit	Pub.H. Nurses	≠Private Physicians	Ratio Phys.to Population
ıetford Mines	12,000	Asbestos mining	1	1	5	12	1/1000
ımouski (incl. suburbs)	10,000	lumbering, wood finishing	1	1	4	10	1/1000
ıp Madeleine	13,000	rubber mfg., steel foundry, bag, mfg. silk	1	1**	6	2	1/6500
hree Rivers	45,800	paper, linen mfg., rubber, iron	1	1	9	40	1/1150
hicoutimi	25,000	aluminum, pulp, paper, iron fdry., clay products	1	1***	10	19 (incl. 7 specs.)	1/4500
t. Hyacinthe	18,500	textile mfg.	1	1****	6	14	1/1300
alleyfield	20,600	munitions, other war industries, cotton, silk	1	1	5	10	1/2000

≠full-time health officers
~ including 1 dentist
** including 1 tb. specialist
**** including 2 full-time physicians

From Table 4 it will be noted that three of the seven towns for which data was obtained have a tuberculosis mortality which is appreciably higher than the provincial rate. Females in Rimouski have the highest average rate for the years 1940-42. Females in Thetford Mines have a higher average mortality for the corresponding period than males in Thetford Mines who ranked third in this analysis.

Further analysis by age and sex has been attempted for the communities of Rimouski and Thetford Mines and the results appear in Table 5. Interpretation is difficult because of the small number of persons involved in the age groups in the two communities. It is of interest to note, however, that among Thetford males the highest mortality rate is recorded in males aged 25-34. In Rimouski males the highest rate is in the group 35 and older. Thetford females aged 25-34 have the highest rate in either male or female groups, being 519.8 per 100,000, or four times the Provincial rate for the same agres. The rate in the corresponding age group in Rimouski females is 446.4 which is nearly three times the Provincial rate in the same age group. Tuberculosis also takes a high toll in Rimouski females 35 and older. Here the rate is four times that of Provincial females of the same ages.

TABLE 5

Tuberculosis Deaths and Death Rates per 100,000
1940-1942

MALES

AGE	Prov. of Quebec		Rimouski		Thetford Mines	
	Deaths	Rate	Deaths	Rate	Deaths	Rate
All Ages	3888	77.5	17	171.9	36	190.1
0-24	1167	45.2	5	93.3	13	121.3
25-34	803	102.1	2	114.4	10	342.9
35 +	1918	116.2	10	360.9	13	245.0

FEMALES

AGE	Prov. of Quebec Deaths	Prov. of Quebec Rate	Rimouski Deaths	Rimouski Rate	Thetford Mines Deaths	Thetford Mines Rate
All Ages	4019	80.8	32	287.3	43	223.9
0-24	1614	62.7	13	211.9	18	162.5
25-34	1072	134.1	9	446.4	16	519.8
35 +	1333	83.1	10	334.7	9	178.1

ENVIRONMENTAL OBSERVATIONS AT THETFORD

Visual inspection of the mills of the three asbestos operators was made. Dust counts were made at all important working locations of these properties, and the results are given in a separate report. There was no opportunity to personally observe home conditions, eating and living habits of the population, but this information was reported to us by competent observers.

Several conditions prevail in the mills which would favor the spread of pulmonary tuberculosis. The workmen appear to be careless about spitting and other personal habits. In order to keep warm in cold weather they huddle in groups in small wooden cabin-like enclosures. These measure about 6' x 6'. They usually contain a bench or two and a chair, with some heating facilities; a small tin can on the floor which is used for cigaratte butts, spitting, or left-over food. In one mill a tin drinking cup has been in use for many years. It is obvious that, if there is an employee with tubercle bacilli in his sputum, these environmental conditions favor the spread of tuberculosis. It should be noted that in review of the death claims in the mines insured with the Company a difference in tuberculosis mortality was found. In Mine A between 1941-1944, eight deaths were due to tuberculosis with a rate of 2.8 per 1,000 employee-years. In Mine B for the corresponding period there were two tuberculosis deaths with a rate of 1.4. It was in Mine A that the most conspicuous unsanitary practice, the common drinking cup, was found.

Home living conditions are crowded and it is common practice for children and adults

[redacted]re beds. This is an important factor favoring the transmission of the disease--not [redacted]ly because it promotes closer human contact but, by interfering with adequate rest, the individual's resistance to infection is lowered. Poor eating habits and food selection which prevail also contribute to the lowering of resistance to tuberculosis.

These observations on environmental factors are admittedly superficial because of the brief time available for inspection and observation. Nevertheless, because of their probable importance in creating and maintaining tuberculosis in the community, further investigation of them would seem to be warranted.

DISCUSSION

It is obvious that tuberculosis mortality is excessive in the town of Thetford Mines. But there is no indication from these data that occupation is a dominant factor because: 1) the mortality is equally bad among females; 2) it is excessive in the age group under 24 where there is little or no industrial exposure; 3) tuberculosis is also a serious problem in Rimouski where there is no asbestos industry.

The age and sex distribution of mortality from tuberculosis resembles the picture of tuberculosis in a heavily seeded, susceptible population with a substantial proportion of the mortality occurring in both sexes under age 24 and the majority of deaths under age 35. There is no evidence, if asbestos dust is a factor, that it resembles free silica in its influence on tuberculosis mortality. Careful and thorough mortality studies[10] among granite cutters in the state of Vermont revealed that they are subject to an excessive frequency of deaths from pulmonary tuberculosis, not because of an exceptional risk of contact infection, or because of inferior physique, or because of unfavorable housing conditions or other sanitary deficiencies, but primarily because of the occupational exposure. This same conclusion has been reached in every other study of workers who contract silicosis.

Unfortunately we were unable to calculate expected deaths based on the Provincial rates because the age groupings obtained for Thetford Mines and Rimouski did not correspond to the age groupings available in the census data for the Province. For further insight into the magnitude of the tuberculosis problem in these two communities, it would be desirable not only to construct such expectancy tables, but to carry out case-finding studies in these and similar communities in the Province of Quebec.

CONCLUSION

1. Based on current mortality data, tuberculosis in Thetford Mines, in contrast to many communities in the Province as well as the Province as a whole, has substantially increased.

2. Rimouski, a lumbering town, comparable to Thetford Mines in socio-economic conditions, medical and public health resources, has a high tuberculosis mortality comparable to Thetford Mines.

3. Analysis of the tuberculosis mortality by age and sex in Thetford Mines, in the other communities and in the Province shows that both males and females in Thetford succumb to the disease with approximately the same frequency. This is not the mortality picture seen where there is industrial exposure to free silica.

4. Admittedly our data is inadequate for final conclusions, nevertheless there is no indication from this mortality study that demonstrates asbestos mining per se in Thetford Mines is the cause of the high tuberculosis mortality.

5. Further mortality studies should be made to construct expectancy tables for age and sex in Thetford Mines, Rimouski, and perhaps elsewhere in the Province.

6. Tuberculosis case-finding surveys should be made both in Thetford Mines and comparable communities.

7. Health education concerning prevention of the disease is needed, as well as improved sanitation, particularly in the plants.

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Dr. N. L. Burnette, Assistant Secretary, secured for us the information on the socio-economic conditions of the selected communities.