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Historical Perspective

A Report on The Health of Asbestos, Quebec Miners 1940

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Background *Twenty years after the start-up of the Canadian asbestos industry, reports began to appear of respiratory disease and deaths in asbestos workers in England and in France. An inquiry from the UK in 1912 as to the health of Quebec miners was met by a denial of ill-health, but the loading of the premiums of asbestos workers in the 1930s indicated that, despite further reassuring health studies on Quebec miners, actuaries had data that gave cause for serious concern.*

Methods *A report made to the Canadian asbestos industry by a company doctor in 1940, reviewing the literature and presenting his health findings on some 500 employees, was studied in the context of the published information available at the time, and of unpublished contemporaneous material subsequently obtained by legal discovery.*

Results *The physician denied that the health and longevity of Quebec's miners and millers were adversely affected, and was dismissive of earlier reports of there being serious health risks associated with working with asbestos.*

Conclusions *The methodology employed in his health study was defective and his denial of the literature uninformed. The study was widely circulated, and while it may have boosted Canadian industry morale, it met with a sceptical response from British industry. In denying that conditions in Quebec's asbestos mines and mills disabled and killed workers, the author allied himself to fellow professionals loyal to Government and to industry.* Am. J. Ind. Med. 48:230–237, 2005. © *2005 Wiley-Liss, Inc.*

KEY WORDS: Canada; chrysotile; asbestosis; history

INTRODUCTION

Commercial mining for asbestos in Quebec began in the late 1870s, and alarming reports of ill health and excessive premature deaths in workers in asbestos manufacture began to appear abroad some 20 years later. In England in 1898, asbestos, for which Canada would have been the source, was designated as one of the four most serious occupational dusts of the year, with ascertained injury to bronchial tubes and lungs from sifting and carding [Deane, 1899]. The following year, a London asbestos textile worker who had earlier informed his physician that he was the last survivor of ten men who had been employed in the carding room 14 years previously, died in his early 30s. The diagnosis of *non-tubercular pulmonary phthisis*, was confirmed at autopsy [Murray, 1907].

Confirmation that severe respiratory disease and deaths resulted from exposure to dust containing Canadian

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chrysotile, was provided independently from France with an account of some 50 deaths among women workers in an asbestos textile factory, 16 in the 5 years following its conversion from cotton in 1890 [Auribault, 1907].

In 1910, the Registrar General for England and Wales drew the Factory Inspectorate's attention to the deaths of five persons from "*phthisis*" in 5 years, among 40 workers employed at a factory where asbestos was woven. The processes at that factory and at two others were investigated and reported as being dangerous to health [Collis, 1911]. When the UK Factory Department asked the Canadian authorities about the health experience of workers in the Quebec mines, they were informed that on inspection of a large asbestos mine and mill, all the women looked strong and healthy [Department of Labour, 1912]. Further, death from lung diseases in Thetford was asserted not to be higher in the asbestos industry than elsewhere. The sketchy nature of the Canadian inquiry was hardly "State of the Art" even for 1912. Fifty years previously, when measures of the burdens of disease in UK mines and quarries were required, numerous clinical examinations had been conducted throughout the country, supplemented by analyses of national mortality data and even of local sickness-club records (Farr [1860]; Peacock [1860]; cited by Greenberg, M. [1992]. "Thomas Bevill Peacock, MD, FRCP: pioneer occupational and environmental physician," Am J Ind Med, 21: 443–447.)

An American report on "*Mortality from Respiratory Diseases in Dusty Trades*," included the information that American and Canadian insurance companies generally declined to accept asbestos workers on account of the assumed health-injurious conditions of the industry [Hoffman, 1918]. That same year, a study of a group of patients with dust diseases of the lungs, reported the adverse clinical effects and the peculiar radiological abnormalities in 15 asbestos workers [Pancoast et al., 1918].

The Department of Industrial Hygiene, founded at McGill University in 1926 by the Metropolitan Life Insurance Company, was asked in 1930 to conduct studies on asbestos workers and miners in Asbestos and in Thetford [Castleman, 1996]. Several small groups of miners in Asbestos and in Thetford were examined, and it was reported that although abnormalities were found they were of no significance, and further it was asserted that no case of pneumoconiosis had been reported from asbestos in Canada [Pedley, 1930a,b].

In what would seem to have been an independent activity, the Metropolitan Life Industrial Health Service studied asbestos workers in mines and mills in Canada and in factories in the United States. They only reported on the US asbestos factory workers, from which they concluded that their pulmonary fibrosis was milder than silicosis, and that no marked disability had been observed [Lanza et al., 1935].

ASBESTOSIS IN ASBESTOS 1940

In 1938, Dr. Stevenson, the Company Doctor for the Johns-Manville plant at Asbestos, addressed the Quebec Asbestos Producers Association (QAPA). In a letter to Sir Samuel Turner about this talk, Stevenson informed him that it had included a reference to a report about the health of workers in a Rhodesian chrysotile mine, and stated:

> "Dr. Stevenson appears to consider that Rhodesian asbestos [is] more liable to promote Asbestosis than Canadian, by reason of the higher proportion of SiO_2, but as far as I can trace from the published analyses the Silica content of Canadian and Rhodesian fiber is almost identical, that is, about 40%."

A typescript of the text of an informal talk that Stevenson gave subsequently in February 1940 to a QAPA meeting in Sherbrooke [Stevenson, 1940] was widely circulated: it exemplifies the work of a physician loyal to Government and to Industry.

APPRAISING THE LITERATURE

Stevenson introduced his study with a strong note of scepticism about the very great volume of reports on Asbestosis from South Africa, England, and the United States, that had attempted to show asbestos in a poor light, expressed in the following forms:

> "Asbestosis has been . . . the victim [sic] of a great many reports;"

> ". . . there has been a great diversity of opinion . . . as to the seriousness of the affection;"

> "The one important point that seems to be emerging from the large amount of literature is that Asbestosis in this country is not the serious hazard to labor that it was a few years ago believed to be."

The medical officer of the Shabanie [chrysotile] Mines of Southern Rhodesia was similarly persuaded of the benignity of chrysotile, having reported that no genuine case of pulmonary asbestosis or any other form of of fibrosis of an occupational origin could be ascribed in 1932 to the asbestos mining industry [Ireland, 1938]. Subsequent clinical and radiological investigations were asserted to have confirmed this. Despite the previous "negative" findings and the mine dust having been deemed negligible, a more extensive review was conducted in which several underground workers were reported to have "ante-primary silicosis" [sic] but in no case had this developed to a further stage. No mention was made

that several of his mineworkers referred to South Africa had been reported to be suffering from asbestosis.

CONCERNING THE SIGNS AND SYMPTOMS OF ASBESTOSIS

Under the heading "Symptoms and signs," he presented the riddle of the asbestos body as an example of diversity of opinion, citing "Lanza's book, 1938" as authority for the statement that the presence of asbestos bodies is a clear sign of disintegration of lung tissue. Gloyne who was the author of the section on "Pathology," had quoted a suggestion of Stewart that the occurrence of asbestos bodies in clusters obtained by his method of concentrating them from sputum, might indicate tissue disintegration in the lungs sufficient to liberate from the small bronchioles in which they have been formed. Leroy Gardner was then quoted (source unreferenced) as having maintained that asbestos bodies cannot be taken into the lung tissue, but remain in the smaller air cells. This, Stevenson said, indicated that there was some confusion of ideas here, but his interpretation of the science to permit the better comprehension by his lay audience will have contributed to it.

The presentation of the experts at odds was interrupted by an account of symptoms and signs of asbestosis that he considered to be fully agreed by all writers, and which importantly were to constitute his criteria for the definitive diagnosis of asbestosis.

1. "Dyspnoea. The most common, but cannot be noticed except following violent exercise, such as stepping up out of a chair 25 times in 30 seconds.
2. Cough. Variable in amount and degree, generally dry though in advanced cases after severe attack a little thick tough sputum may be brought up.
3. Cyanosis. A late sympton [sic].
4. Clubbed finger nails. Also late.
5. Spitting of blood. But not in a big percentage of cases.
6. Loss of weight and emaciation. A late sign.
7. Anorexia. When a man cannot eat it is time to stop work.
8. Poor chest expansion.
9. Substernal pain. A frequent sympton [sic]."

[Stevenson, 1940]. He then reverted to highlighting the differences of experts in a brief section headed: "Symptoms and signs not fully agreed on," quoting two contrary opinions:

> "1. Heart failure. Lanza's book, 1938, says heart affections [are] a very common accompaniment of asbestosis. Public Health Bulletin 241 of U.S. Treasury Dept. says: This has been investigated, and [that there is] no basis for the thought at all."

The contradiction introduced here is more apparent than real: it would be plausible to find right ventricular failure as a result of advanced asbestosis.[1]

HEALTH MONITORING AT ASBESTOS

Then followed a description of what had been tried at Asbestos to find out "... as exactly as possible what effect asbestos dust had been having on employees." Originally, annual physical examinations and fluoroscopic examinations were conducted on all employees, and in cases showing excessive shadow or limitation of chest movement, a single flat plate of the chest had been taken. Later they installed a stereoscopic X-ray apparatus with the aim of obtaining better records of the condition of employees' lungs. For the purposes of this report only men who had worked more than 10 years were studied.

Quoting Dr. Pendergrass [Lanza, 1938] that it was not possible definitely to diagnose any degree of asbestosis less than "Early asbestosis," he commented: "We agree with this because we see many applicants for jobs who have exaggerated hilar shadows, and more linear shadows than are considered normal, which goes to show the truth of the above." While he stated that he considered the radiographic signs of: "Early asbestosis;" "Moderately advanced asbestosis;" and "Advanced asbestosis" as of significance, nevertheless he discounted radiographic appearances and relied exclusively on his clinical findings for the definitive diagnosis of asbestosis.

THE EPIDEMIOLOGY OF ASBESTOSIS AT ASBESTOS

The text dealing with epidemiology is given verbatim to allow the reader to evaluate the nature and quality of the data and of the investigation.

"Incidence of asbestosis in our works"

> [2]We have 507 men on the payroll who have worked here more than 10 years. This is a larger number than I have seen referred to in any report on Asbestosis. Of cases of Early asbestosis we have 17, with work periods of 1–11, 3–12, 2 [see footnote]–13, 1–17, 2–18, 1–19, and 1 of 37 years. Of Moderate asbestosis we have 5, 1–16, 2–17, 1–30, and 1–35 years. Advanced asbestosis–0. Thus

[1] The photocopy studied was not entirely clear. There were problems of legibility, as well as those of reconciling the total of 17 cases of "Early Asbestosis" given in the text, with the shortfall of 6 when the sub-totals in the table are added up.

[2] "Cases" must refer to the number of employees in those years of service categories, rather than to numbers affected Letter to the Editor.

we have a total of 22 cases of 507 men, a percentage of 4.33; and of Moderately Advanced cases a percentage of 0.98. These figures are arrived at by taking results of Stereoscopic examinations only. When these cases are studied from a case history and physical examination standpoint, our percentage of these suffering from asbestosis is exactly zero. If we used all of our employees in making these figures, the percentages would be about three times smaller.

[Elsewhere there is reference to a total of over 1,200 wage earners in the works, but even assuming the denominator were of the order of 1,500, their inclusion would have made no impact on the percentage of radiographic "Advanced asbestosis" or of "Clinical" asbestosis.']

This may be a little difficult to believe in view of all the literature that has been issued showing the lart [hard] lot of the asbestos worker, but the facts as we find them are as follows:

We have two cases in men who have worked over 40 years
6 " " " " " " " between 35 & 40 yrs
12 " " " " " " " 30 & 35 "
28 " " " " " " 25 & 30 "
41 " " " " " " " 20 & 25 "
148 " " " " " " " 15 & 20 "
269 " " " " " " " 10 & 15 "
503[sic]

We have a Quarter Century Club which consists of all those who have worked 25 years for the Company; whether they are still with the Company or not, they still are members. The 48 mentioned and a few others bring the living members above 50, and in addition there have been about a dozen who have died since the Club was organized in 1929, a total of well over sixty. "Death due to Pneumonia Bronchitis, Influenza, and less frequently by TBC"—Sirois. [Dr. Sirois was a physician at neighboring Thetford, Quebec.]

"I have investigated the cause of death in all these cases, and not one of them has died of a lung affection. It is a remarkable fact that no one died of pneumonia, asthma, or anything even suggesting a lung condition. Of those living, there is not one that displays the classical signs of asbestosis . . . A good percentage of these oldsters are still doing as hard manual work as they ever did, and with no more sign of fatigue than any other men of similar age in other occupations." [Stevenson, 1940].

FURTHER EXAMPLES OF EXPERTS DISAGREEING

The document then returned to the presentation of disputed opinions, taking issue, for example, with the pathological significance attributed to signs in the chest radiograph. In this he cited:

"Page 175. Merewether and Lanza, in Lanza 1938. States that X-ray estimate of fibrosis will be an under-estimate of what would be found at autopsy."

This is a free paraphrase of Dr. Pendergrass's text which read:

". . . as Merewether states, that an opinion as to the degree and intensity of an asbestosis fibrosis, based upon a comparison of roentgenographic changes with those shown in standard silicosis films, will be an underestimate."

In the absence of correlation studies between the chest radiograph and lung pathology, it is probable that Merewether was reporting the severity of disability in asbestosis as being greater in relation to radiographic changes than is the case in silicosis, as had been pointed out by Dr. Sutherland in his internal report on the early working of the Asbestosis Compensation Scheme.

In contradiction to Merewether's experience, and to Pancoast's earlier observations in 1918, Stevenson gave his opinion:

"From my own experience I would say that the X-ray picture would lead a person to believe that that there should be a greater impairment of health than there actually is."

Having earlier in this study set Lanza and the US Public Health Bulletin 241 at loggerheads over the association between asbestosis and heart disease, he repeated the charge with:

"Page 185. Pendergrass, in Lanza 1938. Merewether in same, says heart not affected."

Page 185 included no reference to Merewether, and Pendergrass refers not only to radiological blurring of the cardiac outline, but to:

". . . right-sided hypertrophy and ultimate decompensation of the heart. Realizing, therefore, that ventilation of the lungs is seriously interfered with, one can readily understand why these patients are embarrassed with dyspnea, weakness, and cyanosis."

To which Stevenson commented:

> "Our experience conforms to that of Merewether, as our workers show less heart trouble, age for age, than that of the general population."

Next he proceeded to discuss the likelihood of asbestosis regressing after withdrawal from further exposure:

> "Page 187. Pendergrass. In Lanza 1938. Says in [the] early stages if they leave work their condition improves, but in advanced cases this is not so"

A reading of page 187 referred to provides no support for this sanguine asseveration from Pendergrass, and little in the way of data-based support from the three opinions on the natural history of asbestosis cited by Pendergrass on that page.

> "Shull states that it would seem that improvement could be expected in early cases, but that, as the disease progresses, improvement is less likely. Sparks feels that it is too early in the study of this disease to say very much on the subject. Lanza believes that it is by no means certain that asbestosis progresses as does siliosis after withdrawal from dust exposure..."

Pendergrass had indeed stated on page 186:

> "The condition is apparently progressive, even after cessation of occupation."

And on page 187 had written:

> "My experience in this condition is also limited, but I feel quite certain that, when asbestosis can be diagnosed by roentgenologic examination, the condition is likely to become progressive..."

Stevenson on the contrary was less diffident:

> "Our experience certainly goes to show that on leaving the dust laden air the X-ray appearance does progressively improve. As we have no advanced cases we cannot comment on the effect cessation of work would have on them."

The citation of differences of scientific opinion, real or apparent, has constituted an effective public relations technique employed in the defence of the continued use of hazardous or suspect agents, in the form:

> "It would be irresponsible to put the livelihood of workers at risk or to deny society the benefit of a valuable material, while there is such disagreement among the experts."

STEVENSON's DIFFERENTIAL DIAGNOSIS OF ASBESTOSIS

Stevenson listed a few conditions that might be misdiagnosed as asbestosis.

> "Page 188. Pendergrass, Lanza 1938.
>
> Differential diagnosis: States that in X-ray, asbestosis might be diagnosed when the condition is:
>
> 1. Passive congestion due to a failing heart.
> 2. Advanced bilateral Bronchictosis [sic].
> 3. Erythremia.
> 4. Disseminated cancer.
>
> "Dr. Sirois, of Thetford, Que., has shown that many conditions could easily be confused with Asbestosis."

He went on to claim:

> "Page 199. Dr. Gloyne mentions other dusts that would cause lung shadows, and like asbestos, are not likely to cause harm. For example, pure iron and pure coal; and in my opinion our men resemble more the picture of pure anthracosis than that of Silicosis."

The page reference to Gloyne is an error: nowhere on that page is there reference to the topic, and Gloyne was unequivocal about the fibrogenic property of asbestos.

THE CONSEQUENCES OF ASBESTOSIS

As there was no disease in Asbestos, Stevenson had to rely on the experience of others.

> "Page 244. Sequelae. Lanza 1938. Gloyne says:
>
> 1. Purulent Bronchitis and Broncho Pneumonia and Tuberculosis. The first two we very definitely do not have as sequelae, [but presumably, no asbestosis no sequelae] and as for the standing is as follows. Munther 417 says that in [the] general populati[on] the incidence of TB is 1 to 11/2%, and in industrial workers it is 21/2%. He rules out asbestosis as a cause of Empyema [sic], Bronchictosis [sic], Pulmonary cancer, which seem to have been mentioned as sequelae."

"In our works, with over 1,200 wage earners, we have not managed to find three active cases of T.B. per year during the last 4 years. This may go to confirm the statement we sometimes see that asbestos dust has a restraining effect on asbestosis [presumably a typographical error for Tuberculosis] for we have a much greater percent or incidence in office workers."

Stevenson conjectured why Quebec miners were so healthy:

"After reading a very great volume of reports from South Africa, England, and the United States ... one is tempted to wonder if our immunity from asbestosis may not be due to some variation in the arrangement of the elements in the Mollicule [sic] of the Quebec asbestos. I believe there may be chemical support for this theory, when one considers the enormous variety of things that can be made by the carbohydrates with only slight rearrangements in the elements. Also the various different effects produced by the hundreds of different Salvarsan groups and the newly discovered Sulphanilamides."

He noted:

"There are a good many reports of autopsies which seem to show that asbestos dust does cause a bad condition of the lungs, but we have never had a reason to have autopsies on our men, owing to absence of symptons [sic] suggesting Asbestosis."

causes other than Asbestosis.

"Dr. Stevenson has obviously had but little experience of post-mortem examinations and we shall therefore have to be guided more by men who have the opportunity of many such examinations. I cannot but feel that with their experience of known cases if our Medical Board were to examine the 507 men mentioned there would be more cases to report." [Bussy, 1940]

It was also seen by other company members, and a manager at the Turners Asbestos Cement Co plant in Erith, replied frankly and at greater length to an old colleague at the London office of Turner and Newall:

"...I am afraid that as a whole our Home Office Doctors and our Works Medical Officers would not agree with Dr. Stevenson but, of course, it must be remembered that the Home Office Doctors have specialized in lung troubles for Silicosis for many years and have now had an appreciable amount of experience in Asbestosis. I think we are all agreed that X-ray may not always give the true story in connection with Asbestosis, but it is definitely a guide and gives a certain amount of contributory evidence as to the condition of the lung ... It may interest you, but this is unofficial, that the Home Office medical experts have even gone to the extent of examining the cats that we have that live in our Fiber Treating Plant and, in fact, from time to time we lose one and unofficially we are asked to try and get some more kittens brought up in that area. Possibly this sounds a little cruel, but the men's health is more important than a cat..." [Cann, 1940]

THE UK INDUSTRY RESPONSE TO STEVENSON 1940

A copy was sent from Bell Mines, Thetford to their parent UK company (Turner and Newall Ltd.) where it was circulated to members of the Board. One commented briefly to a fellow director W.W.F. Shepherd:

"... It is very evident that there is quite a difference of opinion on this subject; personally, I agree with some of Dr. Stevenson's findings and disagree with others."

Our experience shews that as stated on page three, it is difficult to definitely diagnose any degree of

THE INFLUENCE OF STEVENSON 1940 ON QUEBEC OCCUPATIONAL DISEASE LEGISLATION

An account was produced by the head of Johns-Manville's legal department in New York of a brief meeting in April 1940 [Brown, 1940]. At it, the management of four asbestos mines, in which Dr. Stevenson was included, and representatives of asbestos miners, were informed by the Minister of Labor and Mines of proposed changes in the law on lung fibrosis. The present law, which treated asbestosis as a form of silicosis, was to be amended to apply solely to silicosis.

If the miners wished, asbestosis would be included, but the Commissioner was reported as having been told that they

preferred it not to be included; but if included, it be listed separately.

The mining group decision reached at a prior meeting was stated to be based on the following considerations:

> "(a) There having been no cases of disability or death resulting from asbestosis, there is no necessity from the employees' point of view of having the disease made compensable;
> (b) No "racket" having developed in connection with Common Law actions, there is no need from the employers' point of view in having the disease compensable; and
> (c) The listing of the disease by name would point so definitely in the direction of the asbestos mining industry as to render it probable many groundless claims would be filed."

HEALTH OF QUEBEC MINERS AFTER 1940

Eight years after Stevenson's clean bill of health for his Johns-Manville Asbestos workers, Thetford millworkers with heavy exposure to asbestos were still reported not to suffer from asbestosis [Johnstone, 1948]. The explanation given was:

> "... very finely ground asbestos is not dangerous. This conclusion has support in clinical observation, for it has long been known that at Thetford Mills there was no clinical asbestosis even though in former years the atmosphere was very dusty and the dust was extremely fine."

A few years later, the medical advisor to Turner Brothers Asbestos after a visit to Quebec's asbestos mines and mills, reported his impression that at Thetford:

> "... there is a considerable amount of asbestosis here of sub-clinical type (P2 or A1)... I am assured that... many workers over 70 years of age are still employed and are active and vigorous. Several of these were seen and they were alleged, even after 30–40 years in the mill, to have negative X-ray films." [Knox, 1952]

Reporting on clinical, radiological, and pathological data that had accumulated between 1945 and 1953 from some 4,000 Thetford asbestos workers, despite persistent earlier negative reports, the mines' medical officer found 128 workers to have asbestosis of various degrees of severity, 121 of whom were diagnosed radiographically, and 33 of whom were additionally confirmed at autopsy [Cartier, 1955].

Although asbestos disease in Quebec miners and millers could no longer be gainsayed, Cartier was at pains to assert that things were not as bad as some made out:

> "... [asbestosis could be] a serious disease in some instances... more frequently it remains a disease which can be tolerated quite well for many years, even without appreciable symptoms, as long as another serious disease does not supervene to cause death... in practice, this disease may look more serious and cause important medicolegal problems if a too scientific medical concept or a too liberal social interpretation is accepted by medicolegal professions, labor and compensation bodies."

The Quebec Asbestos Mining Association, doubted the application to its employees of the excess of lung cancer claimed for textile workers [Doll, 1955]. This despite a recent, never to be completed or published study at Saranac Laboratory, in which mice were exposed to Thetford chrysotile asbestos, which reported to the QAMA that at 14 months there was an excess of pulmonary tumors [Vorwald, 1952]. While this had not reached statistical significance, the researchers warned that the incidence of tumors had increased ominously in the most recently killed group of exposed animals. The QAMA had in the early 1940s received and suppressed a report of a similar study at that institute that had demonstrated asbestos to be tumorogenic [Schepers, 1995]. They sponsored a mortality study of its miners, which concluded that Quebec asbestos miners did not have a significantly higher death rate from "lung cancer" than comparable segments of the general population, and even contended that world-wide the experience of the asbestos exposed was not worse than that of the non-exposed [Braun and Truan, 1958]. These conclusions were treated with scepticism even within industry [Knox, 1958].

At a further visit to Thetford, the Turner Brothers physician was informed by Cartier that he had observed 126 cases of pleural plaques, 7% of which had no other evidence of asbestosis, and knew of 29 cases of lung cancer found in the course of 147 autopsies, and 4 cases of mesothelioma in 843 deaths [Knox, 1964].

CHRYSOTILE AFTER 2000

Under the aegis of WHO, ILO and their agencies, independent international expert consensus has been reached that chrysotile presents an unacceptable public health risk. This has led to the progressive banning of asbestos use in the Developed World, and a shift of chrysotile exports to the Third World. There, Stevenson's spiritual successors continue to deny the hazards of chrysotile, and are advising governments and workers of its health and economic benefits. As late as 2001, the Journal of the Canadian