

# The Art of Perpetuating a Public Health Hazard

Morris Greenberg, MB, FRCP, FFOM

*Objectives: Canadian chrysotile (white asbestos) could be a paradigm for those agents that are successfully exploited commercially long after they have been found to be lethal. Mining started in the late 1870s, and reports of disability and death followed in Britain (1898), in France (1906), and Italy (1908), but it was not until 1955 that Canada acknowledged asbestosis in its asbestos miners and millers. Even when shortly after asbestosis was shown to be carcinogenic, Canadian Public Relations experts assisted by their scientists exculpated chrysotile by deeming other agents to have been causal. Results: The PR techniques that have been successfully used in the defense of chrysotile are reviewed, to forewarn scientists involved in formulating public health policy for similar agents, as to the tricks that will be played on them. (J Occup Environ Med. 2005;47:137-144)*

A number of agents continue to be used industrially long after they have first been discovered to be hazardous. Chrysotile asbestos (white asbestos) serves as a paradigm for those agents: identified early as a nonmalignant respiratory hazard by Canada's European customers, it was confirmed half a century later as being carcinogenic and yet continued to be mined and used in manufacture afterward this discovery.

Strategies that were used successfully to support the continued use of chrysotile as a safe material will be reviewed in the hope that awareness of the techniques used for subversion will assist persons involved in refereeing the case for other hazardous agents or processes.

## Awareness of, and Attitudes to, the Health Hazards of Chrysotile

### Europe 1898-1912

With imports of its raw material from Canada, the UK asbestos industry started in the late 1870s. In 1892, an audience at the Institute of Marine Engineers in London was informed that while there had been only three or four uses of asbestos 12 years previously, these had now grown to over a hundred, and it was prophesied that they would continue to extend.<sup>1</sup> A few years later, although annual national imports were only a few hundreds of tons, reports by physicians and laymen of disability and deaths in asbestos workers began to appear in England (1898 and 1906),<sup>2,3</sup> in France (1906),<sup>4</sup> and in Italy (1908).<sup>5</sup> Most of cases of disease reported were in textile workers and mattress makers exposed to dusts containing Canadian chrysotile.

From London, United Kingdom.

Address correspondence to: Morris Greenberg, FRCP, North End Road, London NW11 7SY, United Kingdom.

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H.M. Factory Inspectorate was alerted by the Registrar General in 1912 to the deaths of five persons from "phthisis" in 5 years among 40 workers employed at a factory where asbestos was woven. Investigation of the processes at that factory and at two others provided further confirmation that exposure to asbestos dust was dangerous to health.<sup>6</sup> (Well before Koch demonstrated the tubercle bacillus as the cause of the form of phthisis called "consumption," observant physicians had discriminated between that clinical condition and the "fibroid phthisis" caused by the inhalation of mineral dusts.)

### A Québec Inquiry 1912

Although the findings in the UK investigation of 1912<sup>6</sup> might be deemed to have confirmed the earlier reports, it is conceivable that the UK Factory Department was still unconvinced that the association was causal: they asked the Canadian authorities about the health experience of Québec miners, presumably on the assumption that if any hazard existed it would be more evident in miners and millers. They were informed that on inspection of a large asbestos mine and mill, all the women looked strong and healthy<sup>7</sup> The opinion of a local doctor who attributed respiratory disease to mine work, was set against those of two other local doctors who were reported as believing that affected workers incurred their disease before employment in the mines. Further, it was claimed that death from lung diseases in Thetford was no higher than elsewhere.

Insofar as the nature of the health inspection would seem cursory, and the mortality statistics insufficiently detailed for independent evaluation, the response amounts to a poorly substantiated denial given authority by coming from a government that to this day persists in supporting Canada's asbestos industry in the face of overwhelming evidence for its responsibility for a world wide epidemic. The moral is that a referee

should investigate the "interests" of sources of information.

### A Pioneer UK Experimental Study 1912

It is reasonable to conjecture that the UK Factory Department did not find the Québec reply entirely convincing, as it asked Professor J. M. Beattie in 1912 to include asbestos in his pioneering experimental studies on the pulmonary effects of industrial dusts. The results of the asbestos component of the studies were never published, though they were known to at least two authors who quoted from them.<sup>8,9</sup> The interstitial pulmonary changes now familiar in man, were observed in mice, but were misunderstood to show asbestos to be only moderately fibrogenic. One must conclude that in this instance the scientists were guilty of no more than error: Beattie being a pioneer in the experimental method could not be expected yet to have acquired the necessary experience to support an authoritative opinion on the "mildness" of asbestos, any more than the more or less contemporary commentators who cited the findings. In balancing the opinion of an eminent scientist against evidence to the contrary, the possibility of honest error cannot be ruled out.

### US Observations on Asbestosis in Humans, 1918

A report of a study by independent physicians on workers exposed to dusts, included a description of the peculiar radiographic appearances of the chests of 15 asbestos workers and the adverse clinical effects.<sup>10</sup> It was also reported that North American insurance companies generally declined cover for asbestos workers on account of "... assumed health-injurious conditions of the industry."<sup>11</sup> That these observations, among others, could be overlooked for a considerable time, puts a premium on the need for assiduous literature searches when evaluating the hazards of an agent.

### Reports of Asbestosis in Britain: 1924-1930

The death in 1924 of a Rochdale asbestos textile worker (Mrs Nellie Kershaw) certified by her doctor as "asbestos poisoning," prompted the first Coroner's Inquiry into such a condition, and the publication in a core medical journal of the detailed clinical and pathological features.<sup>12</sup> The patient's physician informed the Coroner that he saw 10-12 cases of "asbestos poisoning" a year among his panel patients,<sup>13</sup> and in another town with an asbestos factory, during a short period a family doctor was able to assemble enough clinical and pathological information from his practice patients to complete the first MD thesis on asbestosis.<sup>14</sup>

Despite this alarming evidence there is no evidence that the physicians' reports were investigated, hence no official cognizance was taken of asbestos as a serious health hazard. Only after the publication of a single case report subsequently<sup>15</sup> did the Factory Department feel justified in conducting an asbestos industry survey. This survey reported that the degree of fibrosis of the lungs generally found in the asbestos textile workers examined, was related to the duration of exposure, with 66.7% among those employed for 20 years or more.<sup>8</sup> This led to the drafting of Regulations in 1931, which required dust to be so utterly contained that had it been implemented would have eradicated disease. Unfortunately, in the absence of adequate environmental control technology, not only was it not achieved then but the industry was never to achieve it over the following 70 years.

The scope of the UK 1931 Asbestos Regulations was limited as a result of the belief arising from the Factory Inspectorate's study that the problem was confined to certain parts of the factory designated as "Scheduled Areas." When shortly after, the suspicion that workers outside those areas might be at risk was

confirmed by a small study, the findings were not published,<sup>16</sup> and employment in the "Scheduled Areas" continued to form the basis for periodic medical examinations and for compensation for asbestosis for the next forty years.

### The Health of Canadian Miners in Asbestos and in Thetford, 1930

In 1930, the results of examination of several small groups of miners in Asbestos and in Thetford were published by Dr Pedley, director of the Department of Industrial Hygiene at McGill University, sponsored by the Metropolitan Life Insurance Company for the general surveillance of occupational disease.<sup>17,18</sup> The abnormalities he found he held to be of no significance, and he also concluded that there was no undue mortality from tuberculosis in Thetford Mines. This constituted an early example of denial of the seriousness of a hazard by a physician on the basis of inadequate evidence.

The Metropolitan Life's actuaries to the contrary reported an unfavorable series of claims in Thetford mines in 1935, which prompted them to load their premiums.<sup>19</sup> This was at variance with Pedley's interpretation, and although a cynic might expect an industry physician studying asbestos miners in Quebec to be capable of being influenced wittingly or unwittingly by his employer's interests to play down the significance of unusual findings (and indeed there is evidence of this happening subsequently), in this instance because it was an insurance company that paid the piper, its special interests would have been best served if attention had been drawn to the potential adverse significance of the abnormalities detected.

### American Textile Workers, 1932

Fourteen years after an urgent call had been made for research into the health of American asbestos workers,<sup>11</sup> a clinical and radiological

study was conducted on over a thousand workers in an American asbestos plant. An analysis was not published and the data were sequestered. The information was discovered only latterly and on independent review showed that despite most workers having had relatively few years of exposure, overall 29% had positive radiographs with 43% for textile workers.<sup>20</sup>

The ensuing silence would have required the acquiescence of the investigating scientists, industry advisors, and the workers' representatives. This might be attributed to the imperatives of the American Depression, but it might be noted that economic conditions were no less dire in Britain when in 1931 its Asbestos Regulations were promulgated. Against concealed evidence the expert reviewer is powerless.

### The First North Carolina Textile Mill Study, 1938

A study was conducted by the US Public Health Service on 541 asbestos textile mill workers. Unfortunately the preponderance had worked fewer than 5 years, few more than 10 years, and a significant number of workers likely to have been affected were omitted.<sup>21</sup> Environmental contamination with asbestos was estimated as the number of all particles visualized per cubic meter in air rather than as the number of asbestos fibers, and sampling was not conducted in the breathing zone. (In Britain a perceptive Chemical Inspector of Factories had earlier employed asbestos fiber counting and personal sampling.)

In one part of their report, the authors were careful to express reservations about the accuracy of the standard that they had derived, but elsewhere the reader was led to assume that what was proposed was effectively a safety standard. Although they concluded with the hope that their standard would soon be validated, this was never to be realized and their tentative 5 million

particles per cubic meter Hygiene Standard was to exert a deadly influence in America and abroad for many years.

### The Health of Southern Rhodesian Chrysotile Miners, 1938

The medical officer of the Shabanie chrysotile mines, reported that no genuine case of pulmonary asbestosis or any other form of fibrosis of an occupational origin could be ascribed in 1932 to the asbestos mining industry, and that his clinical and radiological investigations confirmed this.<sup>22</sup> In a more extensive review subsequently, several underground workers were conceded to have "ante-primary silicosis" [sic], but in no case was it said to have developed to a further stage. In a separate publication<sup>23</sup> a South-African pathologist reported that by 1928 he had received postmortem material from four cases of asbestosis from the same Southern Rhodesian mine. It is difficult in this instance to categorize the process by which chrysotile was initially deemed to be non-existent, then a mild condition, other than as "denial." Such inconsistency should alert the reviewer to the potential for significant bias.

### The Health of Miners in Asbestos, Quebec 1940

In an address to the Quebec Asbestos Producers' Association in February 1940, Johns-Manville's medical officer refuted the 40 years of literature that purported asbestos to have constituted a serious human health hazard, and presented the results of a radiological and clinical survey that he had conducted on mineworkers in Asbestos.<sup>24</sup> Of 507 radiographs conducted on current workers employed for more than 10 years, 17 films were said to show "early asbestosis," 5 "moderate asbestosis," and none "advanced asbestosis." These radiographic appearances were dismissed as irrelevant,

and basing the diagnosis of asbestosis on case history and physical examination, he concluded that there had been no cases. He even went so far as to suggest that work with asbestos might protect workers against tuberculosis.

Redefining the criterion of disease, constitutes a special category of denial, whereas the claim for a prophylactic power for asbestos constitutes merely an error. In the case of other agents with toxic properties similar powers have been advanced by scientists, with coal dust having been claimed to protect miners against lung cancer, and low-dose ionizing radiation being claimed not merely to be innocuous but conducive to longevity.

One must be on one's guard against scientists who act as advocates for their employers or benefactors and who discount the observations of their predecessors, eradicate disease by redefining it, and misinterpret the data. Unfortunately, only in recent years and then only in certain journals, have editors required contributors fully to declare their "interests" and have informed their readers.

### Early Experimental Studies of Asbestos Carcinogenicity

A study of a hundred mice heavily exposed to dust containing chrysotile was reported in 1941 to have shown hyperplasia and metaplasia of the bronchial epithelium, some of which the researchers considered to be pre-malignant.<sup>25</sup> The authors' interpretation of the histopathology was challenged by certain of his contemporaries and, unfortunately, no confirmatory study was to be attempted for another 10 years, and even then when a US industry-funded experimental study conducted by the director of the Saranac laboratory found an excess of lung cancers in mice,<sup>26</sup> it was promptly contested by the sponsors' experts, the report was suppressed, the histological material sequestered, and proposals for further studies rejected. When a post-

humous compendium of the researcher's work was published in 1957 by his successor, it omitted reference to the findings of malignancy,<sup>27</sup> and when in his turn its author informed industry that a further study that he had conducted was tending to confirm the carcinogenicity of asbestos,<sup>28</sup> the study and his appointment were terminated. The censoring and suppression of the results of Saranac research required scientists to collude with industry. Some 50 years later, by serendipity, the original Saranac material was disinterred and reviewed and the malignancies were confirmed.<sup>29</sup> A report was prepared by the discoverer and sent to South Africa before the alarmed sponsors of the research could impose an embargo, however, because of South Africa's mutual interests, confidentiality was preserved.

When the Saranac report was sent in confidence to a British asbestos company for their information, they referred it to their works chemist for his opinion (whose expertise lay in coal chemistry), rather than to their medical adviser. He considered a causal association between lung cancer and asbestos exposure to be plausible based on their factory experience but gave no further details.

### The Health of Mill Workers, Thetford, 1948

In a textbook on occupational health, while it was noted that Thetford mill workers were heavily exposed to fine asbestos dust, it was still being claimed that they did not suffer from asbestosis.<sup>30</sup> This seems less evidence than hearsay, and quoted by a prestigious author, constituted denial by proxy.

### The Health of Asbestos Workers in East Broughton, Quebec, 1949

In a report on this village of some 3000 French Canadians, the site of an asbestos mine and plant, the author asserted that all the facts essential to the welfare of people exposed to the hazards of asbestos dust had

been well-known in North American mining and medical circles for at least the last 15 years.<sup>31</sup> By way of illustrating the burden of respiratory disease resulting from working with asbestos, he compared tuberculosis rates for 3 years at Thetford Mines, with those for Sorel and Granby, where there was no asbestos exposure. From the data he concluded that:

"Confronted with the abnormally high tuberculosis mortality rates at Thetford Mines, neither the medical profession nor the provincial government can evade the issue, and both are under obligation to make a choice between two alternatives: either inhalation of asbestos dust pre-disposes to and aggravates pulmonary tuberculosis, or many deaths certified at Thetford Mines as having been due to pulmonary tuberculosis were inaccurately diagnosed, and in reality were due to asbestosis. . . The people of this town cannot afford to wait until it is convenient for the medical profession and the provincial government to make a choice: control and elimination of the dust is the obvious and obligatory procedure at this time."

But, unfortunately, he proved to be wrong: the effective way of dealing with a troublesome occupational health problem is simply to ignore it, which was what government, mine owners, unions, and the medical profession did for several more years.

### The Health of Workers in Thetford, 1952

The medical advisor to Turner Brothers Asbestos, Rochdale, visited Quebec's asbestos mines and mills, and reported of 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.<sup>32</sup>

The defense strategy of the Canadian Asbestos Mining Industry, supported by their medical adviser, was still that of denial, even though privately Turner Brothers Asbestos management, both lay and medical, were skeptical of Thetford claims for the fitness of miners and millers.

## The Health of Workers in Thetford, 1955

1955 constituted a watershed in the affairs of Canadian chrysotile, when the mine's medical officer published a report on the clinical, radiological, and pathological data that had accumulated between 1945 and 1953 on some 4000 Thetford asbestos workers.<sup>33</sup> In contrast to the repeated sanguine reports on their health over some 45 years, 128 employees were reported as having asbestosis of various degrees of severity, 121 diagnosed radiographically, and 33 confirmed at autopsy. No explanation was given by the mine's medical officer for this quantum change in the health experience of asbestos miners, nor does any seemed to have been asked for. Nevertheless, he put in as plea in mitigation:

... in practice, this disease [asbestosis] may look more serious and cause important medicolegal problems if a too scientific medical concept [sic] or a too liberal social interpretation is accepted by medicolegal professions, labor and compensation bodies.

The assertion that asbestosis was a less serious problem than commonly perceived had earlier been employed in the defense of chrysotile. In 1935, a notorious expert presented asbestosis commonly to be a mild condition, and he informed fellow physicians that with the precautions that had been taken by industry they were unlikely to meet a case again.<sup>34,35</sup> The physician who reported the 1898 case of asbestosis<sup>3</sup> anticipated him when expressing the opinion that such care was now being taken to control dust, that further cases were unlikely to arise; as a consequence fibroid phthisis of the lung was not made a compensatable disease for a quarter of a century. Events were to prove him wrong, much as in the case of the British family doctor who wrote the first MD thesis on asbestosis<sup>14</sup> who was persuaded that the engineering controls in the local asbestos factory would be effective: many more cases of asbestos related disease were to be diagnosed, and although it closed a number of years ago cases are still being reported in ex-workers and in local residents. It cannot be stressed

enough that a reviewer should not accept the unsupported opinion of an expert on matters that lie outside his field of expertise.

## Lung Cancer in Thetford, 1958

When in 1955 an excess of lung cancer was reported in a population of UK asbestos textile workers,<sup>36</sup> confirming beliefs in a causal association with asbestos exposure that had been strongly asserted in America and Germany in 1943,<sup>37,38</sup> the Quebec Asbestos Mining Association would not accept that the risk applied to its employees. Doll's<sup>36</sup> and Merewether's<sup>39,40</sup> cancer mortality data were discounted by industry's experts and considered unconvincing or irrelevant to North America, and attributed to poor hygiene standards in the UK.

A mortality study of its miners sponsored by the Quebec industry reported that not only did they not suffer a significantly higher death rate from "lung cancer" than comparable segments of the general population but that worldwide the experience of the asbestos exposed was not worse than that of the nonexposed.<sup>41</sup>

Although the authors had prime responsibility for offering misplaced reassurance to the reader, based on deficiencies in the design of the study and its population characteristics, the relatively short period of follow up, the preponderance of the study population being "young," and the authors comparing their miner data with urban rather than with rural mortality statistics, the editor and his referees are not without responsibility. British Industry experts were not misled by the report, but kept their opinions to themselves, effectively operating a policy of concealment by silence in the face of error.

## An American Company Physician's Testimony 1945-1963

The Medical Director of a major American asbestos company stated that over the period of 18 years of its

mining, milling and fabrication operations, during which more than 50,000 physical examinations and chest x-rays had been observed, among those workers exposed only to chrysotile fiber there were no more cases of malignancy than among the general population.<sup>42</sup> In the absence of supporting data it would be prudent to relegate his claim to the "denial" category.

## Quebec Mines, 1963

In a personal communication, the medical officer at Thetford Mines informed a visiting British industry physician that he had observed 126 workers with pleural plaques, 93% of whom had signs of asbestosis.<sup>43</sup> This communication was kept confidential between the British medical officer and his management.

## Damage Limitation of Experimental Evidence for the Carcinogenicity of Chrysotile

By 1970, cell and tissue culture and whole animal experimental studies of the effects of mineral fibers found chrysotile to be quite as potent in producing cell transformation and tumors as other varieties of asbestos in commercial use. The Public Relation response to these "positive" animal studies, with the support of industry scientists, was to decry them as meaningless or unnatural and of no relevance to humans. (When assessing so-called "negative" studies, industry protagonists tended not to apply similar standards.)

## McGill University's Studies of Quebec Miners and Millers: 1966-1992

In 1966, McGill University announced its mission as the determination of the risk associated with the effects on Quebec miners and millers of exposure to low concentrations of chrysotile over a working lifetime.<sup>44</sup> By 1976, they acknowledged that there was no way of judging the effects of current exposures except by extrapolating from their findings,

which they considered a very difficult and hazardous sort of procedure.<sup>45</sup> Yet in 1980, they proceeded to assess the mortality risk associated with work at different levels of dust particle concentration in background samples, and offered it for the determination of the social decision as to what level was "acceptable."<sup>46</sup> Against their better judgment, they were to follow their study population for a further 10 years, concluding in 1997 that from the viewpoint of mortality, exposure in this industry to less than 300 mpcf/year (which they judged to be roughly equivalent to 1000 fibers/mL × years) had been innocuous, that is apart from a small risk of pneumoconiosis or mesothelioma.<sup>47</sup> They were never able to reconcile this with the observation of the extraordinarily high lung cancer rates found to apply to Carolina's chrysotile textile workers.

An extensive critique of the McGill studies has been published.<sup>48</sup> The program missed opportunities to provide definitive answers to a number of important questions, by failing to establish and operate a long term sampling strategy for determining the qualitative and quantitative measures of asbestos exposure of subjects in the study, and by failure to adopt the consensus view on asbestos measurement.

The statistician who analyzed the data for the later part of the program had been involved in the longitudinal British coal industry field study, which having been designed to establish a hygiene standard for mine dust, paid special attention to dust sampling strategy. Unfortunately, he had joined McGill too late to remedy this shortcoming in the protocol. During the 30 years of the program, occupational health epidemiology methods were evolving, and although more sophisticated methods of statistical analysis were brought into use, they could not overcome the self-imposed constraints on the

the two methods of dust measurement showed it to be too inconstant for "bridging" calculations to be made with the necessary level of confidence, but pragmatism triumphed in the final analysis. The following statements appeared in the valediction to the Quebec studies:

... questions of peak exposures and fiber size distributions in ambient air have not been examined.

... we are left with an unexplained mystery of very considerable importance which directly affects the future use of both natural and manmade mineral fibers. The question was identified epidemiologically 15 year ago and despite further studies remains unsolved.

The advice given to Lewis Carroll's Alice, "Curtsey while you are thinking what to say. It saves time," might cynically be rephrased as: "Initiate an epidemiological survey when faced with a health problem. It buys time." The limitations of the McGill studies were recognized by two expensive and thorough official Canadian Reviews conducted in 1976 and 1986, but they bought some 40 years, during which time an acknowledged carcinogen continued to be mined and manufactured. Against a program of progressive banning in the Developed World based on the perception that the "safe use" of asbestos is not reasonably practicable even under its best conditions, the McGill studies are adduced to assert to the contrary in promoting the marketing of chrysotile to the Third World.

### Adversarial Science in the Service of Industry

The New York Academy of Sciences' 1964 conference on the "Biological Effects of Asbestos" can be seen as marking the outbreak of the asbestos industry's 40-year war for survival. Subsequent to it, scientists came to be polarized as "asbestophiles" or "asbestophobes."<sup>47</sup> The "phobe" would be decried by industry as an irresponsible, self-seeking demagogue in the pay of the unions, whereas the "phile" by inference was a responsible scientist with the best health, safety and economic interests

of the worker and of society at heart. Personalizing an issue to the extent of demonizing the individual expounding an opinion is an effective public relations strategy for obfuscating it, and justifying maintaining the status quo until "they" reach agreement.

When these stratagems were exhausted, it was still maintained that chrysotile could be safely used. First a string of alternative agents were claimed to be responsible for the effects observed, rather than chrysotile per se. When they were shown to be irrelevant as confounding factors, bankrupt of ideas, "Another as yet unidentified agent" was proposed. By the process of reiteration of the confounding factors by chrysotile apologists despite their refutation, they took on a life of their own, reflecting the belief of Lewis Carroll's Bellman that what he said three times must be true.

### Resume

The expert faced with the responsibility for advising on public health policy cannot afford to be trusting. "Denial" of the hazard of an agent by its protagonists, no matter how distinguished, may not correspond with "the truth, the whole truth and nothing but the truth," although it has served as an effective first line defense for a number of agents. A popular form runs: "There is no evidence for a causal association between an agent and its alleged effects," when the absence of evidence results from such factors as:

1. No investigation ever having been conducted;
2. Conclusions that the results of analyses were "negative" were unsound by virtue of the nature and quality of the material and methods employed;
3. The concealment of data, overlooking published evidence, or the deliberate termination of studies at a stage where findings were suggestive.

With the progressive banning of asbestos spreading out from Europe, the battle for its survival has shifted to the Third World. There, the old canards, that chrysotile pure and simple is free of the hazards of the amphiboles, that it is irreplaceable, and that it is reasonably practicable to use safely, are being recycled by Public Relations organizations, supported by the experts who have failed to influence their peers in the Developed World. The lessons to be learned from how the public health hazard of asbestos was successfully perpetuated for more than a hundred years must be remembered when reviewing of other agents.

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