JIMSA July-Sept. 2005 Vol. 18 No.3

Asbestos : Disquieting Tale Goes On

SANJAY CHATURVEDI, SUJATA CHATURVEDI

Department of Community Medicine, University College of Medical Sciences and GTB Hospital, Dilshad Garden Delhi-110095, India

Abstract: Evidence on carcinogenicity of asbestos was available in early 20th century but the asbestos mining industry could successfully suppress it for 50 years. Weak politics, weak legislation, half-hearted enforcement and strong and defiant corporate may be some of the reasons behind such a situation. Today, asbestos related corporate is trying to spread a message that some forms of asbestos may be carcinogenic but the chrysotile is not. The motive behind this message is an open secret, since chrysotile occupies nearly 95% of today's asbestos market. Adverse effects of fibrous minerals on human body have always been a matter of debate, not because of scientific reasons alone but also for the interests of the marketing forces. Scientific inquiry must proceed but as long as safer substitutes exist for most asbestos uses, the proposition of releasing more asbestos in the environment, or of relaxing vigilance will be disastrous. India produces as well as imports asbestos. Imports are likely to continue under the pressure of domestic demand unless we promote and popularize safer substitutes. Continued release of several carcinogens in the environment should not be eulogized as price of development.

Introduction

The story of asbestos continues to insult us. Evidence that asbestos causes cancer was available in the thirties but the asbestos mining industry could successfully suppress it for half a century. Warning for those exposed to asbestos was deliberately delayed. As a result, millions of workers were exposed to the carcinogen and hundreds of thousand died. At the end, the industry was forced to produce confidential documents containing research data. The information became public because of legal actions and not because of the interventions by the scientific community. What is more disturbing is the clinching evidence that all this was done in collaboration of some of the leaders of occupational and environmental medicine[1]. Today when the position of the asbestos mining companies and manufacturers is becoming more and more indefensible, a newer type of misinformation campaign has started. Asbestos related corporate is trying to spread a message that some forms of asbestos may be carcinogenic but the chrysotile (white asbestos) is not. The motive behind this message is an open secret. Since chrysotile occupies nerly 95% of today's asbestos market, it must be protected to save the profits.

To get to the root of this problem let us go to the basics. An important group of fibrous minerals is known by the generic term asbestos. There are four commercially important forms: chrysotile; crocidolite; amosite; and anthophyllite. Of them, the chrysotile alone accounts for 95% of global asbestos production and most of its comes from the province of Quebec, Canada[2]. Chrysotile is a fibrous hydrated magnesium silicate mineral, which is being used in many commercial products. There are several accompanying minerals in the fibrous ores, and fibrous amphibole may be among them. In this regard, tremolite is throught to be especially important[3].

Low concentrations of chrysotile are found throughout the global crust (air, water, ice caps and soil) but the human activities contributing to fiber aerosolization and distribution in the environment are chiefly occupational e.g. recovery from geological deposits, processing, manufacturing of asbestos containing products and their disposal. Asbestos cement industry is the largest user (85% of total use) of chrysotile fiber[3].

Correspondence: **Prof. Sanjay Chaturvedi**
E-15, GTB Hospital, Dilshand Garden, Delhi-95,
E-mail : cvsanjay@hotmail.com

The great debate

Partly for scientific reasons and partly for the interests of the marketing forces, the basis and the level of carcinogenicity of fibrous minerals has been a matter of controversy all through the last century[4,5]. Today we have sufficient epidemiological and clinical evidence that besides causing a progressive fibrotic disease of lung called asbestosis, asbestos also causes: cancer of lung; malignant mesothelioma of pleura and peritoneuim; cancer of larynx; and some gastrointestinal cancers. The nature and amount of evidence goes beyond any scientific controversy and in acknowledgement of this body of evidence[6,7], the Environmental Protection Agency (EPA) and the WHO's International Agency for Research on Cancer (IARC) have declared asbestos a proven human carcinogen[2,8]. When doubts were raised against the approach of declaring all forms of asbestos as carcinogenic and it was suggested that some particular asbestos-types might not be causing cancer, the issue was carefully considered among the wider scientific community.

In the light of hard scientific evidence IARC-WHO acknowledged that all forms of asbestos are known carcinogens. All have been shown in epidemiological, clinical and laboratory studies to be fully capable of causing lung cancer, mesothelioma and a whole range of asbestos related diseases[8]. These developments resulted into mounting public pressure culminating in government bans in developed countries on further release of asbestos in the environment. New use of absestos has almost completely ended in developed world. In contrast to all this, extensive and aggressive marketing by Canada and other exporting nations coutinues in the developing world, where sales remain strong[9].

Some publications on exposure to chrysotile asbestos[10-14] have asked to take a fresh look on the subject. Consequent to the newer knowledge about chrysotile form and significant decline in high-dose asbestos exposure, at least in the developed world, the focus of research and public health debate is now shifting towards supposedly low level of carcinogenicity of a particular type of asbestos and its effects on human health with non-occupational low-dose exposure. This has created a space for a renewed

debate. However, the situation may take a worrisome turn when the lure of sales may prompt corporate forces to turn this plain scientific curiosity into profitable confusion. Some of these scientific inquiries are already being used by the industry to further its agenda.

Efforts have been made by the international health community to make a considered opinion and settle the issues raised by this new debate. The collective opinion has been suitably represented by an editorial[15] and a commendtary[16] that published in two of the leading multi-disciplinary biomedical journals. The commentary in the *Lancet*[16], counters authors' suggestion that chrysotile could be commercially used with very little health risk, by saying that chrysotile asbestos found in nature is typically contaminated with amphibole and the highly carcinogenic tremolite.

As for the lung cancer, the basis of assertions about safety of chrysotile is very precarious. Though these fibers are not commonly found in large quantity at necropsy[12] for they are rapidly cleared from human lung, their carcinogenicity in animal models is well established[17].

The editorial in JEJM[15] quotes the landmark research conducted by Selikoff and colleagues[6,7] to prove the point that Canadian chrysotile, like all other forms of asbestos, is a potent human carcinogen. It also highlights the fact that one of the findings published by Camus, et al[14] (more than sevenfold mortality from pleural cancer in mining area), corroborates with Selikoff's conclusions. In fact, the amount of chrysotile asbestos already released in the environment creates a situation where exposure to chrysotile products remains the leading cause of mesothelioma in the world[18].

Enormous and continued release of several carcinogens in the environment is being eulogized as price of development. Weak politics, weak legislation, half-hearted enforcement and strong and defiant corporate may be some of the reasons behind such a situation. But can all this happen without weak science and/or collaboration of scientific community? The case of asbestos is a specimen. To gain insight into corporate activities regarding the identification of occupational carcinogens in this century, Lilienfeld reviewed the actions of one, the asbestos industry. He studiously collected all the relevant correspondence, confidential reports, and even the exhibits used as evidence in several legal proceedings and cited them as references along with academic documents in his case study. What he found was that the industry, in concert with many of its collaborators, first gnerated data on carcinogenicity of asbestos and when found unfavorable, systematically suppressed it for five decades. The development of warning for those exposed to asbestos was deliberately delayed. As a result, millions of workers were exposed to the carcinogen and hundreds of thousand died. At the end, the industry was forced to produce confidential documents containing research data. The information became public because of legal actions and not because of the interventions by the scientific community. More disturbing to not ewas that the members of academic medical community, in collusion with the insurance industry, participated in this exercise of deception. Some of them were the leaders of occupational medicine. The surprised author of the above quoted study further states: "The degree to which scientific fraud permeated published reports is also of concern. However, unemployment or withdrawal of research support may be the ultimate 'reward' for those who do not participate in such activities"[1]. The story still remains patchy and incomplete.

What should worry the wider scientific community more is the fact that such unfortunate happenings are not confined to asbestos industry alone. A similar history has been documented in aniline dye industry as well[19]. Despite the disclosures of suppression and fraud, no mechanisms have been developed to prevent recurrences.

Where do we go from here?

Coming back to chrysotile, the empirical evidence is sufficient itself to argue against any relaxation of public health control over any type of asbestos. Recent efforts to portray chrysotile asbestos as safe, are inaccurate. And the assertions that chrysotile asbestos can be used without risk are contrary to fact and extremely dangerous. The WHO Environmental Health Criteria - 203 concludes by stating that the exposure to chrysotile asbestos poses increased risk for asbestosis, lung cancer and mesothelioma in a dose-dependent manner. Though the question of threshold has been raised by some researchers[14], the criteria say that no threshold has been identified for carcinogenic risks[20]. On the positive side, it is getting clearer that the direst predictions about an epidemic wave because of non-occupational exposure to chrysotile have shown little evidence of materializing. The risk is not nil, but low. However, the proposition of releasing more asbestos in the environment, or of relaxing pressure will be disastrous as long as safer substitutes exist for most asbestos products.

A word of caution for activists!

On one hand, we need to stop further release of asbestos in the environment and on the other, a studied restraint is needed while dealing with the asbestos that remains as a legacy of harmful construction practices in millions of schools, homes and commercial buildings. This is to be borne in mind that manipulation of friable asbestos products may be an important source of chrysotile emission in the environment.

Mistakes have been made in the past while handling the asbestos already used in buildings. Agitated parents in some communities have caused great harm to their children, school staff and themselves by tearing out asbestos sheets from school buildings without proper safety cover. In view of this a rational set of legally enforceable controls were evolved in USA under Asbestos Hazard Emergency Resposne Act (AHERA)[21]. Unless asbestos fibers become airborne and can be inhaled, an intact asbestos sheet in a building poses little threat to health of the inmates. However, in-place building materials containing asbestos may pose risk to those carrying out alterations, maintenance and demolition. Such materials also have the potential to deteriorate over the years and create exposures.

Do safer substitutes exist?

The process of substituting asbestos with other safer materials may encounter certain difficulties including technical performance of the substitute and operational feasibility. Cost considerations will also come into picture but they should be seen in the perspective of the total cost of asbestos related health hazards. New products may be costlier initially but the prices will rapidly come down with the increasing demand and mass production. Looking at the balance of stakes, these obstacles should not deter us from stopping further release of asbestos in our environment.

There are several established alternatives to asbestos that do not depend on fiber technology. Materials like corrugated polyvinyl chloride (PVC) and steel sheeting can replace asbestos in building material. Many non-asbestos fibers have also been developed and

they can replace asbestos in a wide range of products. Commonest of them are polyvinyl alcohol (PVA), aramid and cellulose[22]. They ahve been tested and found safer than asbestos by Committee on Carcinogenicity, United Kingdom's Dept. of Health and European Commission Scientific Committee on Toxicity, Ecotoxicity and the Environment.

Asbestos in India

Asbestos continue to be mined and manufactured in India. Because of current needs, locally mined asbestos is not enough and India imports a lot of asbestos from Canada. In fact, asbestos figures among top ten imported minerals in India[23]. The most worrisome trend is about the popular demand of asbestos in building industry, though there are other areas of consumption like industries dealing with friction materials, break linings, seals and gaskets. Under the pressure of domestic demand, imports may continue. There is recoverable deposit of 2.29 milion tones of asbestos in our country[23], which may further be mined and released in our environment.

Occupational health surveys have reported pulmonary function impairment and radiological abnormalities in 54.8% of asbestos milling workers and 19.5% of miners[24]. Mesothelioma is also reported occasionally but in the absence of any systematic registry and investigation of mesothelioma cases, epidemiological and clinical evidence is sketchy. Airborne concentration of asbestos fibers in milling units of India are found much higher than prescribed standard. Of the 8 major asbestos products manufacturing units in India, examined by the Central Pollution Control Board, 6 were not complying with the emission standards. For the remaining 2, the compliance could not be ascertained[25].

Asbestos related policies and legislation in India remain confusing and loosely enforced. Mesothelioma is not amongst the notifiable diseases under the Factories Act. However, the Mines Act (1995 revision) includes cancers of lung, pleura and stomach in the list of notifiable diseases. Import duties for asbestos have been lowered by 68% between 1995-2000. All this is not in agreement with our New Mineral Policy (1995), that has: 'minimizing adverse effects of mineral development on forest, environment and ecology' and 'ensuring conduct of mining operations with due regard to safety and health of all concerned' as its stated objectives.

References

1. Lilienfeld DE. The silence: the abestos industry and early occupational cancer research - a case study. *Am J Public Health* 1991;81:791-800.
2. Environmental Protection Agency. Airborne asbestos health assessment update. Washington DC: The Agency, 1986.
3. World Health Organization. Environmental health criteria 203: chrysotile asbestos. Geneva: The Organization, 1998:1-9.
4. Chaturvedi S. Chrysotile asbestos: why should a carcinogen remain in demand? [editorial]. Indian J Public Health 2000;44(3):71-74.
5. Chaturvedi S, Chaturvedi S. Carcinogenicity of asbestos: convincing evidence, conflicting interests. Natl Med J India 2001;14:43-6.
6. Selikoff IJ, Seidman H. Asbestos associated deaths among insulation workers in the United States and Canada, 1967-1987. *Ann NY Acad Sci* 1991;643:1-4.
7. Selikoff IJ, Churg J, Hammond EC. Asbestos exposure and neoplasia. JAMA 1964;188:22-6.
8. International Agency for Research on Cancer. IARC monographs on the evaluation of carcinogenic risks to humans, Suppl 7. Lyon: *The Agency,* 1987:106-16.
9. Asbestos Institute. Chrysotile asbestos: an overview. Montreal: *The Instiute*, 1996:1-30.
10. McDonald JC, McDonald AD. Chrysotile, tremolite and carcinogenicity. *Ann Occup Hyg* 1997;41:699-705.
11. Liddell FDK, McDonald AD, McDonald JC. The 1891-1920 birth cohort of Quebec chrysotile miners and millers: development from 1904 and mortality to 1992. *Ann Occup Hyg* 1997;41:13-36.
12. McDonald AD, Case BW, Churg A, et al. Mesothelioma in Quebec chrysotile miners and millers: epidemiology and aetiology. Ann Occup Hyg 1997;41:707-19.
13. Liddell FDK, McDonald AD, McDonald JC. Dust exposure and lung cancer in Quebec chrysotile miners and millers. *Ann Occup Hyg* 1998;42:7-20.
14. Camus M, Siemiatyeki J, Meed B. Non-occupational exposure to chrysotile asbestos and the risk of lung cancer. *N Engl J Med* 1998;338:1565-71.
15. Landrigan PJ. Asbestos: still a carcinogen (editorial). *N Engl J Med* 1998;338:1618-9.
16. Cullen MR. Chrysotile asbestos: enough is enough. *Lancet* 1998;351:1377-8.
17. Stainer LT, Dankovic DA, Lemen RA. Occupational exposure to chrysotile asbestos and cancer risk: a review of the amphibole hypothesis. *Am J Public Health* 1996;86:179-86.
18. Smith AH, Wright CC. Chrysotile asbestos is the main cause of pleural mesothelioma. *Am J Indust Med* 1996;30:252-66.
19. Michaels D. Waiting for the body count: corporte decision-making and bladder cancer in the U.S. dye industry. *Medical Anthropology Quarterly* 1988;2:215-32.
20. World Health Organization. *Environmental health criteria 203: chrysotile asbestos.* Geneva: The Organization, 1998:144.
21. World Health Organization. *Environment health criteria 203:chrystile asbestos.* Geneva: The Organization, 1998:97-8.
22. Health and safety executive. Substitutes for chrysotile (white) asbestos. *<www.open.gove.uk/hse/pubns/misc155.htm>*.
23. Mining India. Editorials and reviews. *<ww.mningindia.comwritups79/4.htm.*
24. Dave SK, Bhagia LJ, Mazumdar PK, Patel GC, Kulkarni PK, Kashyap SK. The correlation of chest radiograph andpulmonary function tests in asbestos miners and millers. Indian J Chest Dis Allied Sci 1996;38:81.

Manuscript Submission : For JIMSA

Check-List

(i) Copyright statement/declaration (not submitted or published elsewhere) signed by all the authors.

(ii) Three hard copies of manuscript with illustrations attached to each; **floppy** in addition will be desirable.

(iii) **Title page :** Title of manuscript, Name(s) and affiliation of author(s); institution(s) and city(ies) address of corresponding author (Tel; Fax; e-mail).

(iv) **Abstract** should highlight objectives, methods, results, conclusions.

(v) **Article** (double-spaced on A/4 size paper) : material & methods, results, discussions ; ***Indian literature must be referred,*** references numbered ***in text*** *as they appear.*

(vi) **References** maximum number of references for update-20, original-10, Case reports-6.

(vii) Each table on separate sheet; maximum number=4 in original article.

(viii) Photographs/Figures in envelope, each marked figure number on reverse with legends on separate sheet. Number not to exceed 3, preferably.

(ix) Statement regarding adherance to ***standard ethical guidelines*** prescribed by ICMR 2000. *(see page 135)*