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EDITORIALS

Environmental Exposure to Asbestos:

A Factor in the Rising Rate of Cancer in the Industrialized World?

Concern over the rising rate of cancer in the industrialized world has stimulated a search for all possible etiologic factors, particularly environmental factors, since, in theory at least, these are susceptible to control. First to be indicted are obviously any substances, occupational exposure to which carries a recognized cancer risk, and whose usage is at present sufficiently widespread to result in demonstrable contamination of urban air.

Asbestos is one of several such materials.[1] Occupational exposure to any type of asbestos fiber is well recognized as being associated with an increased cancer risk,[2] affecting primarily the lungs (an obvious target for inhaled materials), and their mesenchymal covering, the pleura, as well as the gastrointestinal tract (an obvious target for ingested material including the effluent of the lungs, swallowed sputum) and its mesenchymal covering, the peritoneum. The presence of asbestos fibers in urban air has been clearly demonstrated though the levels reported with few exceptions (such as in the neighborhood of some plants manipulating asbestos, and in some modern buildings where spray-on insulation has not been enclosed) are an order of magnitude less than the levels frequently reported in association with occupational exposures.[1] Nevertheless, sufficient amounts are inhaled and deposited in the lungs of urban dwellers to result in the almost universal demonstration of asbestos bodies in their lungs at autopsy,[2] a marker of exposure to, and more important, retention of inhaled fibers. In addition, for every coated fiber (or asbestos body) retained in the lung there are at least seven to ten, perhaps more, uncoated fibers of smaller, even submicroscopic, size.[3]

The important question of whether such low levels of exposure increase the risk for lung and/or gastrointestinal cancer in urban dwellers is addressed by Churg and Warnock in the August issue of *Chest* (see page 143). At present, overall cancer rates in the first of these sites, the lung, is still increasing in the United States[4] while for gastrointestinal cancers, rates are decreasing for some sites such as the stomach, but increasing in others such as the pancreas.[5] Using a case-control approach, these workers recorded the number of asbestos bodies in lung samples obtained at autopsy or at thoracic surgery in patients who died with one of these diagnoses and in equal numbers of matched controls who died from other causes. While the number of asbestos bodies so recorded was related to sex (higher in men) and occupation (higher in those engaged in occupations where exposure is known to occur), it was *not* related to the presence of cancer in either of the sites examined.

Evidently, these findings offer no evidence to support the indictment of environmental (ie occupational) asbestos exposure as a factor contributing to the occurrence rates of either of these cancers in urban dwellers. This is reassuring for us all. If such low exposures had been readily implicated, the use of this material in modern society in any form whatever would surely have to be questioned.

On the other hand, as the writers point out, their failure to show an association does not necessarily exonerate urban asbestos pollution as a contributory factor in the rising rate of these cancers for several reasons. First, though the case-control approach has proved so effective in the study of mesothelioma (a rare cancer in which asbestos exposure is a most important risk factor),[2,6] it is likely to be much less powerful in the study of common cancers such as those in the lung which are also causally linked to the most common environmental exposure, namely: the cigarette.[4] Indeed, the only approach here may be through backward extrapolation from a dose-response curve.[7] Second, asbestos bodies record the retention of long fibers whereas it is possible that the relevant fibers for cancer production are the short uncoated submicroscopic ones,[8] only detectable by electromicroscopy;[1,3] these fibers were not counted in the study of Churg and Warnock. Third, though more than 90 percent of the asbestos exploited and used commercially is chrysotile (which presumably, therefore, accounts for most urban air pollution by fiber), nevertheless the fiber core of

INSTITUTE OF OCCUPATIONAL
AND
ENVIRONMENTAL HEALTH
MONTREAL, CANADA

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the majority of asbestos bodies found in the lungs of urban dwellers is amphibole asbestos.[9,10] Does this mean that the chrysotile fiber does not penetrate as deeply into the lung as other fibers, or if it does, that it is more easily eliminated? Or does the lung restrict the process of fiber coating (which results in the formation of asbestos bodies) to the amphibole fiber, leaving any chrysotile fibers free? Do the chrysotile fibers lose their coating more readily, or do they disappear in the course of time because they are more soluble? If so, do they exert their harmful effects in the process of being dissolved? Answers to questions such as these are necessary to understand the mechanisms whereby the asbestos fiber produces its harmful effects in human tissue, and greater understanding must surely lead the way to the more precise formulation of controls for its use with respect to human health.

The study by Churg and Warnock does not address the question of mesothelioma of the pleura or peritoneum, a cancer type whose distinctive appearance and rare occurrence (population rates are estimated to be of the order of between one and five per million)[6] were no doubt important in leading to recognition of its association with asbestos exposure.[2] For these cancers, neighborhood and domestic exposures have been implicated, as well as occupational exposures,[2] and while some of the former (neighborhood and domestic exposures) may have been heavier than at first glance seems likely,[12] some of the latter (occupational exposures) appear to have been extraordinarily short, *eg* four months.[13] Thus, one cannot easily discount urban exposure as a factor in the occurrence of this cancer, even though at present such evidence as exists does not support this possibility. For instance, in those occupational exposures where rates are high, as in the London (England) plant studied by Newhouse and Berry,[14] there is a clear dose-relationship to exposure (estimated from years of exposure and job-history) with the rates for low exposure being considerably lower than the rates for high exposure. Second, when dose is measured by number of asbestos bodies and/or fibers in pathologic material,[2] this is found to be higher in cases of mesothelioma than in the general population, though lower than usually seen in relation to fibrosis. Third, in populations where the prevalence of asbestos bodies in routine autopsy lungs has increased over the past several decades, as in London, England,[15] no parallel increase in mesothelioma rates has been reported even though its rate in certain occupationally exposed populations continues to increase.[16] Thus, at present there seems to be no reason to modify the conclusion expressed at the Lyon conference[1] (page 342) that as far as mesothelial tumors are concerned, "there is no evidence of a risk to the general public at present."

Churg and Warnock's study also has certain clinical implications. Their report refers to asbestos bodies in the concentrated residue of digested samples of lung tissue. If these bodies can be readily demonstrated in biologic specimens (sputum, biopsy or autopsy material) *without* such concentration, this implies much greater numbers and almost certainly occupational exposure. Clearly, if not already aware of this exposure, the responsible physician must seek a complete and systematic work history to uncover the relevant exposure, and this includes identifying every single job the individual (man or woman) ever held, for however brief a time, and including casual and summer jobs. Establishing a link with an occupational exposure to asbestos may be of great importance not only for the individual (*eg* if attributability is questioned as in cases of compensation) but also for other workers if the risk has not previously been recognized.[2]

Cigarette smoking, of course, remains the most important environmental factor causally linked to cancer of the lung. (In addition, at least in Great Britain, the rising rate for lung cancer in recent decades can be largely if not entirely explained by the changing pattern of tobacco usage over the earlier decades of this century).[16] Thus, no one would contest the fact that a smoking history constitutes an essential part of the clinical investigation of lung cancer as well as other chronic lung diseases.

Second only to a smoking history, however, and of comparable importance, an occupational history remains a most powerful, and yet singularly underutilized tool. Thus, though the present discussion has centered on asbestos, it is not inappropriate to remind ourselves as clinicians that there are of the order of 30 other recognized human carcinogens,[17] some of the more common being nickel, arsenic, chrome, uranium and the chlormethyl ethers, all of which may be encountered at the workplace and all of which should be integrated into the physician's schema for a systematic and complete work history.

*Margaret R. Becklake, M.D.**
Montreal, Quebec

*Associate, Medical Research Council of Canada, Department of Epidemiology and Health, McGill University, and Department of Medicine, Royal Victoria Hospital.
Reprint requests: Dr. Becklake, 3775 University Street, Montreal H2W1S6, Quebec, Canada

REFERENCES

1 World Health Organization: IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man: 14. Asbestos. Lyon, International Agency for Research in Cancer, 1977

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2 [illegible] MR: Asbestos-related diseases of the lung and other organs: their epidemiology and implications for clinical practice. Am Rev Respir Dis 114:187-227, 1976
3 Ashcroft T, Heppleston AG: The optical and electron microscopic determination of pulmonary asbestos fiber concentration and its relation to the human pathological reaction. J Clin Path 26:224-234, 1973
4 Smoking and Health: A report of the Surgeon General. Washington, D.C., US Department of Health, Education and Welfare. 1979
5 Haenzel W, Correa P: Developments in the epidemiology of stomach cancer over the past decade. Cancer Res 35: 3452-3459, 1977
6 McDonald JC, McDonald AD: Epidemiology of mesothelioma from estimated incidence. Preventive Medicine 6:426-446, 1977
7 McDonald JC, Liddell FDK: Mortality in Canadian miners and millers exposed to chrysotile. Ann NY Acad Sci (in press)
8 Stanton MF: Some etiological considerations of fibre carcinogenesis. *In* Biological Effects of Asbestos. (Bogovski P, Gilson JC, Timbrell V, Wagner JC eds). Lyon, IARC Scientific Publication No. 8, 1973, pp 289-294
9 Churg A, Warnock MD: Analysis of the cores of ferruginous (asbestos) bodies from the general population. I. Patients with and without lung cancer. Lab Invest 37: 250-256, 1977
10 Langer AM, Selikoff IJ, Sastre A: Chrysotile asbestos in the lungs of persons in New York City. Arch Environ Health 22:348-361, 1971
11 Pooley FD: An examination of the fibrous mineral content of asbestos in lung tissue from the Canadian chrysotile mining industry. Environ Res 12:281-298, 1976
12 Newhouse MD, Thompson H: Mesothelioma of pleura and peritoneum following exposure to asbestos in the London area. Br J Industr Med 22:261-269, 1965
13 McDonald AD, McDonald JC: Mesothelioma after crocidolite exposure during gas mask manufacture. Environ Res 17:340-346, 1978
14 Newhouse MD, Berry G: Predictions of mortality from mesothelial tumours in asbestos factory workers. Br J Ind Med 33:147-151, 1976
15 Um CH: Study of the secular trend in asbestos bodies in the lungs in London 1936-66. Br Med J 2:245-251, 1971
16 Townsend JL: Smoking and lung cancer: a cohort data study of men and women in England and Wales, 1935-70. J Roy Statist Soc A. 141:95-107, 1978
17 Doll R: Epidemiology of cancer: current perspectives. Am J Epidem 104:396-404, 1976

Diagnosis and Treatment of Pulmonary Vasoconstriction Following Palliative Procedures in Congenital Heart Disease

Tolazoline hydrochloride (Priscoline) has been used in infants to reverse pulmonary arteriolar constriction in such diverse conditions as persistent fetal circulation and hypoperfusion in hyaline membrane disease. Its use in postoperative care in infants and children, however, is not well known. In this issue of *Chest* (see page 274), Moodie et al report successful use of tolazoline in a four-month old infant with transposition of the great arteries who developed pulmonary vasoconstriction following a palliative operation to enlarge the interatrial communication and assure better interatrial mixing. The postoperative chest x-ray film and radionuclide perfusion scan were consistent with reduced pulmonary perfusion. Hyperventilation with 80 percent oxygen did not relieve the vasoconstriction or improve the arterial oxygenation. However, following intravenous administration of tolazoline and blood volume replacement, the PaO_2 gradually increased, and a second chest x-ray film and radionuclide scan showed a significant improvement in pulmonary perfusion.

A similar set of circumstances is frequently encountered in neonates with transposition of the great arteries undergoing palliation by atrial balloon septostomy. Usually, there is a marked immediate improvement in aortic oxygen saturation after a successful septostomy. Most newborns with transposition of the great arteries have a patent ductus arteriosus which increases the pulmonary blood flow and favorably affects the left atrial filling required for the left-to-right shunting. Perhaps related to the acutely improved PaO_2 following septostomy, the ductal closure is accelerated, the left atrial filling and left-to-right shunting are soon reduced, and consequently, the arterial oxygen saturation falls, sometimes to alarmingly low levels. Under these circumstances, a second septostomy may be attempted, only to find an adequate interatrial communication and a low left atrial pressure. Administration of prostaglandins[1] may be successful at this point, since re-establishing the ductal patency will increase the pulmonary blood flow. However, when the drug is discontinued, the PaO_2 often falls rapidly, and the magnitude of ductal flow becomes prostaglandin-dependent. Patients with this clinical picture may then be subjected to surgical creation of an atrial septal defect which carries a high mortality, in part because its function is the same as that of balloon septostomy which it supplants. The Mustard operation with obligatory rerouting of venous streams, however, should be successful in infants who remain very cyanotic in the presence of an adequate atrial septal communication.

All possible mechanisms responsible for inadequate arterial oxygen saturation after a technically successful atrial balloon septostomy have not yet been clarified. Low pulmonary blood flow due to delayed resolution of neonatal pulmonary vascular resistance may well be one of the factors, especially after rapid functional closure of the ductus and consequent drop in aortic oxygen saturation. Under such circumstances, administration of tolazoline may prove to be effective.

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