Editorial

Future of research into occupational lung disease

The contributions of population based studies of workers exposed to hazardous inhalants are widely recognised. The results from studies of workers in the cotton textile, asbestos, coal, and many other industries have been used to set dust standards in the workplace and have substantially mitigated the adverse respiratory effects of these exposures. Despite these successes in occupational health the future prospects for such studies are unclear. There are multiple reasons for this uncertainty. These include: (1) a perception that because the specific dust related conditions—for example, coal workers’ pneumoconiosis, asbestosis, and silicosis—are decreasing in prevalence, the public health importance of the contribution of the workplace to lung diseases has diminished; (2) funding for epidemiological research is increasingly difficult to obtain when choices have to be made between support of cell and molecular biology and a perceived soft science—although many questions about worker health can be answered in no other way; (3) resistance to participation by management and workers is often encountered; and (4) there is a shortage of trained epidemiologists, particularly those who are medically qualified. These comments may today be most relevant to the United States, but in our era of global scientific (and other) communities, similar issues exist, or will soon appear, in other industrialised nations.

Is the research needed?

Is there a need to undertake expensive, time consuming studies of workers who may be exposed to respiratory hazards in the workplace? Although the classical dust diseases of the lungs, recognisable radiographically or pathologically, are now more rarely encountered, there continue to be new issues, such as assessment of the carcinogenic risk associated with exposures to mineral dust. For example, whether crystalline silica is a carcinogen in human lung is unresolved. If it is, does the increased risk of lung cancer depend on the presence of lung fibrosis (as with asbestos), and if so, what is the mechanism? What carcinogenic risks, if any, result from exposure to manmade mineral fibres, and if present, do these risks differ by fibre type, and what are the other determinants of such risks? These questions persist, not apparently having been fully resolved by extensive mortality studies on both sides of the Atlantic.

No one doubts the important aetiological role of smoking in chronic obstructive lung disease, but chronic airways obstruction is not a unifactorial condition. There is scattered evidence, collected over many years, that some occupational exposures make a significant contribution to airflow limitation. This is definite in occupational asthma (for example, from exposure to disocyanates), is probable in exposures to some mineral dusts (for example, coal, silica) and organic dust (for example, cotton, grain), and is uncertain in long term exposure to irritant chemical vapours and gases (for example, chlorine). The evidence that a single high exposure to such a gaseous material results in long standing bronchial hyperresponsiveness in previously unaffected subjects is entirely anecdotal. It is clear that future investigation of occupationally induced lung disorders will largely focus on the contribution of the workplace to non-specific respiratory disorders, such as chronic airway obstruction and lung cancer, diseases that continue to increase in incidence in the general population. The role of occupational exposures can only be sorted out by carefully performed population studies with well defined biological response variables (for example, excess annual decline in lung function) and adequate characterisation of occupational and non-occupational risk factors.

Research funding

It has never been easy to obtain funding for occupational epidemiological studies, but this difficulty has increased in recent years. Costs are substantial, often the result of necessary travel, multiyear project duration, and multidisciplinary investigators such as physicians, industrial hygienists, bioengineers, epidemiologists or statisticians, and computer scientists. Five years of collection of longitudinal data (needed, for example, to calculate valid slopes of annual change in lung function) force such studies to consume eight or more years from design to completion of analyses. Published papers are usually scarce in the first several years, including when it is time to show productivity for
grant renewal. The payoff is obviously slower than for research by fundamental biological methods at the laboratory bench. But how else can data be obtained that is relevant to the quantification of human health risks in association with well characterised exposures? Also, although this research depends on methodological rigour, our scientific colleagues and reviewers have not all been persuaded that this is real science. In times of finite (some would say inadequate) biomedical research funding, the long standing tension between experimentalists and those who study populations is likely to exacerbate the obstacles that stand in the way of support for epidemiological studies.

MANAGEMENT AND WORKER COOPERATION
Disappointingly, those with the most to gain from new knowledge regarding occupational lung diseases—namely, workers and their employers, show restrained enthusiasm for their participation. The reasons for this reluctance seem to be complex. As well as making a product, management’s attention has in recent years turned increasingly to compliance with regulations and defending their companies and themselves in litigation. As the numbers of in house lawyers and their outside counsel and litigators increase, there seems to be no end of reasons why a company’s participation in a study is perceived to be not in their interest. The case has often been made to management that they have little to gain from such participation. The results could be used in future law suits and more stringent regulations. Also, although funding of the studies comes most often from external agencies (for example, the NIH in the United States), company time (which equals money) is usually needed to provide job and industrial hygiene records. The large companies who have their own full time epidemiologists often contend that they are collecting and interpreting their own health and exposure data. Does it matter whether the results achieve credibility and general acceptance, particularly if there are no competing studies that might have come to differing conclusions?

Gaining the collaboration of both managers and workers has not been facilitated by the polarisation of many researchers and physicians in the area of occupationally induced diseases; in many instances this results in mistrust on both sides. Management has been scared off by overzealous researchers whose utterances have often blurred the distinction between scientifically supportable conclusions and political and social objectives. Workers have concerns that investigators will fail to detect (or make public) hazards in the workplace, presumably because they have a management bias. All of this has in no small measure been exacerbated by the explosion in tort litigation with its insatiable need for “expert” witnesses, who sometimes evolve to a posture of predictable opinions on one side or the other, resulting in the tarnishing of their reputations as impartial investigators. There are times, however, when polarisation is not a factor yet worker cooperation is still unsatisfactory. Some workers simply find it too inconvenient to participate in an annual survey, even when that participation means only blowing into a spirometer and answering questions about their respiratory health. As it is customary for their time in testing to be compensated at the usual pay rates, can this attitude be described as anything but apathetic, or a way of thwarting a programme promoted by management?

AVAILABILITY OF EPIDEMIOLOGISTS
Trained epidemiologists who are interested in an academic career are in short supply. Large companies increasingly hire epidemiologists, others are attracted to jobs in public health agencies, and others find clinical therapeutic trials rewarding. Still, there is no rush to energise the training of epidemiologists generally and few medical students view a career in epidemiology, likely because of perceived limitation of professional rewards, including but not limited to the financial. The scarcity of formally trained epidemiologists has in the past been compensated for by migration of academic physicians who develop an interest in the field and for many years effectively do epidemiological research, often in conjunction with statisticians. For many of the reasons that make these investigations difficult, some of which have been discussed, this is now happening less often.

THE FUTURE
What to do? We must make known more widely that this type of research provides important answers to health problems that are all preventable, answers that are not obtainable by other means. We must point out that governmental agencies charged with protecting worker health should look first to evidence obtained from studies of human populations when setting workplace standards. Too often, however, a paucity of human data leads to decisions based only on animal exposures at very high levels that are extrapolated to humans at much lower levels. Although this alternative is sometimes unavoidable, a viewpoint held by some experimentalists maintains that the exclusive use of animal and in vitro data is actually preferable for modern risk assessment. This position is highly dubious when valid human data are available, and collaboration between epidemiologists and fundamental researchers can lead to enormous enhancement of the usefulness of population based studies, particularly at a time when disease related expo-
sure will be increasingly assessed at the margin of detectability with traditional epidemiological tools. Just as in the past, as with respiratory physiology, there were exciting opportunities to apply state of the art scientific methodology to the study of large numbers of exposed and adversely affected workers, similar opportunities are emerging now. Particularly challenging is the prospect of developing biomarkers that are minimally invasive or non-invasive, to detect and quantify exposure, identify susceptibility to an untoward response, and uncover the early indicators of a disease process. The councils of our biomedical research funding agencies are increasingly focusing on opportunities to prevent disease, and they must be educated with regard to the scientific rigour with which good epidemiology is performed and the enormous long term payoff that this research yields.

It is unclear what, if anything, can be done about the unfavourable political and litigious climate in the United States, and, increasingly, in other countries, but management, workers, and their representatives must regain confidence in researchers in this field and appreciate the need for their product. A selling point is that sensible regulation and reduced need for litigation should result from more knowledge concerning occupational health risks (and non-risks). Assessments based on little or no data lead to inappropriate regulation and law suits, and both are ultimately harmful to management and workers.

The questions are still important but different than in the past. The information obtained continues to be used in disease prevention. The opportunity of applying new scientific approaches to these investigations remains viable today. There seems adequate justification for the continued investigation of occupational lung diseases through studies of exposed populations.

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