CORRESPONDENCE

Respiratory health effects of opencast coal mining: a cross sectional study of current workers

EDITOR—We are writing to comment on the manuscript by Love et al, on the respiratory health effects associated with opencast mining in the United Kingdom.

Firstly, several years ago, we reported the dangers of surface mining in the United States. Although the general consensus had been that employment as a surface miner was nearly without risk, we identified the very serious risk for aggressive pneumoconiosis in surface drillers and drill helper. A review of our recent clinical experience has shown that the most severe cases of pneumoconiosis in West Virginia are most often associated with surface mining. We are interested in the possibility that any imbalance in all groups (primarily the preproduction group), the jobs of the miners with advanced pneumoconiosis, and the relation between workers with pneumoconiosis and exposures in other dusty jobs. Notwithstanding the authors do not tell us the prevalence of pneumoconiosis in the various occupational groups. Without these data, we cannot judge the degree of adverse respiratory risk for the specific jobs in opencast mining relevant to the cases of advanced pneumoconiosis, particularly the two cases of progressive massive fibrosis. Similarly, this lack of information affects the validity of the authors’ recommendations for additional screening for process workers (a term undefined in the text). We think that, because of the way that these data have been presented, the authors have not provided evidence which would justify screening of these workers.

Secondly, in the abstract, the authors note the risk for pneumoconiosis or decreased lung function was no greater in those opencast miners who had other exposures in the dusty occupations. In view of these data, it remains unclear why the authors did not exclude the 400 men who had worked in previous dusty jobs and focus entirely on workers with opencast mining exposure only. This is especially important as there were twice as many subjects with external dusty exposure as in the preproduction group, the group described as having a considerable number of workers with positive radiographic findings. Frankly, including these 400 miners in the cohort makes it impossible to define the number of miners with pneumoconiosis due to opencast mining with the authors’ statistical approach.

The ground-breaking technique in statistics is to find the best fitting, yet biologically reasonable, model to describe the relation between an outcome and a set of explanatory variables. With this logistic regression, we cannot separate the health effect of radiographic abnormalities due to either underground mining exposure or opencast mining exposure in the same people. Time spent in opencast mining and time spent in underground mining are both entered into the model as independent variables, even when they occurred in the same subject. Biologically, if a miner had worked as both an underground and opencast miner, it would be impossible to separate the adverse respiratory effects of one type of mining from the other.

Thirdly, table 3 is not helpful without knowledge of the duration of dust exposure or the relation between the development of pneumoconiosis and the history of employment in other dusty jobs (a particular job is likely to be related to duration of service in that job). Because of these complications, we sought to characterise risk in relation to full occupational histories taken at survey, a standard epidemiological approach which has proved fruitful in many of our studies. Our stated research objectives, and our presentation of the results, reflected this approach. The detailed exposure data presented in our figure (p 419) and in our table 6 show that means of the exposure could vary widely within occupational groups, but that important contributions to cumulative exposure might be experienced in several of these groups.

The people within our data set varied in age and smoking habits, and had varied durations of exposure in different occupations. Regression models are standard techniques for analysing such data, because they can both separate the simultaneous and independent explanatory variables, and measure the degree of any confounding among them (although Banks et al seem to question these abilities). We based our conclusions on a careful application of logistic regression models to fit several combinations of variables. In individual people, of course, it usually difficult or impossible to ascribe the contributions of different factors to overall risk; but we did not attempt this. We performed the analysis epidemiologically, not clinical; and that the film readers were all experienced in their allotted task, the application of the International Labour Organisation classification for the standardised description of radiographic abnormalities. We used the median of their readings of profusion, and attempted to maintain the important distinction between subjects contributing radiographs which were judged to show small opacities, and (being diagnosed as) having pneumoconiosis. Because we did not attempt to diagnose, we did not consider subjects with small opacities but those with little exposure to be false positives; the influence of age and smoking on small opacities are well known.

Banks et al express concern that our results may reflect exposures outside the opencast mining industry. We reviewed our data and showed no relation with time worked in underground mining or other dusty employment, and we have reported elsewhere that exclusion of 198 men who had previously worked as underground miners did not substantially alter the estimates of risk related to opencast working. None of the six men with category 2 small opacities or large opacities had worked at any time as an underground coalminer.

We are confident that our stated findings of an association between increased risk of (mostly mild) radiographic abnormalities and time worked in the dusty, preproduction jobs in the industry, after adjusting for smoking habits, are not due to confounding with other occupational risks. Our findings are consistent with the clinical observations and epidemiological film readings of Banks et al in drillers, who are included in our preproduction occupational group. We summarised our fitted regression models by showing, in table 6, average risks of showing small opacities >0/1 predicted (although not in the sense of “in the future”) by the model for various patterns of


Authors’ reply—We thank Banks et al for their interest in our paper. They make several comments, and we are glad of the opportunity to reply to these.

Banks et al suggest that we should present figures representing prevalence in the various jobs in the industry, by which they presumably mean the jobs current at the time of the survey. There are two problems with this approach: men move between jobs; and the contribution to risk of working in a particular job is likely to be related to duration of service in that job. Because of these complications, we sought to characterise risk in relation to full occupational histories taken at survey, a standard epidemiological approach which has proved fruitful in many of our studies. Our stated research objectives, and our presentation of the results, reflected this approach. The detailed exposure data presented in our figure (p 419) and in our table 6 show that means of the exposure could vary widely within occupational groups, but that important contributions to cumulative exposure might be experienced in several of these groups.

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identify any major differences in the radio systems used by the workers in different industries because of their potentially differing biological effects and so avoid non-differential misclassification. Portable radios operate at differing parts of the spectrum, including 150, 450, and 900 MHz. The wavelengths range from around 4 m to 20 cm. The longer waves couple with the whole body but shorter ones interact more with a local body part such as the head. In turn this could influence development of cancer in different sites, such as leukemia or brain tumour. The modulations (AM, FM, pulsed) used should also be noted as pulsed frequencies have been found to promote tumours in animals. The duration of calls is obviously relevant to exposure but the meters used for detecting PEMFs are intended to only detect transient exposures and hence would underestimate exposure to radio frequency radiations. The place of use may also influence exposure. For example communication from a vehicle with an external antenna should cause minimal exposure, but communication from a tower made of metal beams may lead to local field enhancements and increased exposure depending on the power of the radio.

The reported interaction of radio frequency radiations with 3,4-benzpyrene on mouse skin to promote tumour development is relevant to the finding of increased lung cancer in utility workers, some of whom are exposed to occupational carcinogens as well as cigarette smoke. The possibility that radio frequency radiations from radios may act as a cancer promoter could be considered in data analysis of cancer in various sites where differences between industries are found. Adjustment should be made for the types of systems used and the patterns of use by workers.

Given the widespread use of radio frequency radiation communication devices in industry a further detailed analysis of the data would be of much interest.

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CORRECTION


The table of title 6 should read “Predicted risks of showing small opacities ≥0.1 as a function...”.

Pulsed electromagnetic fields and cancer

Editor.—Savitz, et al have further analysed the reported association between lung cancer and 60 Hz magnetic fields and pulsed electromagnetic fields (PEMF) in electrical utility workers. They found a weak association but raised the possibility that larger associations may have been diluted through misclassification of exposure. They also note that the PEMF measurements were likely to have recorded use of communication devices such as mobile phones and two way radios which emit radio frequency radiations, as well as high frequency transients from the electricity network.

It is important that subanalyses of PEMFs attributed to such radio frequency radiations

BOOK REVIEW

Book review editor: R L Maynard

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The first edition of this publication appeared in 1980 and since then, there has been much progress in laying down national and international standards for biological monitoring reference values. The format of the third edition remains substantially unchanged. Monographs are presented over a range of substances to which workers might be exposed and where some form of biological monitoring has been recommended. Each monograph is headed by recent values from German and American authorities for BT1 (biologically available concentration), BE1 (biological exposure index), EKA (carcinogen exposure equivalent), MAK (maximum workplace concentration), OSHATWA (8 hour time weighted average maximum permissible concentration defined by the United States Occupational Safety and Health Administration), and TLV (threshold limit value). The half-life of the substance in blood is also quoted. Sections follow on occurrence and usage; blood concentrations; metabolism and excretion; toxicity; biological monitoring; and analysis. After the reference list, a few analytical procedures to monitor the presence of the substance itself in biological fluids, and where appropriate, a biological marker of its effects, are presented in sufficient detail for a laboratory analyst to put them into practice.

This is not designed as a text book and for students of occupational hygiene it will be quite useful. However, as a source of reference for clinical and forensic toxicologists, this book should have the same appeal for occupational physicians and industrial toxicologists and will save hours of ploughing through some of the heavier tomes on industrial hygiene to find that same basic data.

Surprisingly, in view of the fact that Basel is in essence a laboratory scientist, many of the analytical methods which are cited or described in detail were originally developed over 20 years ago. This probably reflects the tendency for industrial hygiene laboratories to adopt the principle of “if it works don’t fix it” and the author is therefore obliged to quote old methods which are in widespread routine use. This is a pity, as numerous analytical advances have been achieved, even for substances which have been monitored for decades and these should have at least recorded a mention.

This is not designed as a text book and for students of occupational hygiene it can serve only as an adjunct to the more comprehensive volumes available which deal with its specialty. However, as a source of reference for students in related disciplines such as biochemical toxicology it will be quite useful.

The book is not cheap at £129.00, but given that it is likely to be consulted very often, this outlay will be justified.

BRIAN WIDDOP