higher than that for Knudson et al or Cotes et al. By age 60, the Miller et al prediction is 10% or 23% higher. If the prediction equations of Knudson et al had been used, probably none of the predicted values for forced expiratory volume in one second (FEV$_1$) or forced vital capacity (FVC) would have been significantly reduced, even without adjustment for smoking habits. If the equations of Cotes et al had been used, certainly none would have been significantly reduced.

In the present paper, Kilburn et al compared the pulmonary function of 17 male current smokers with radiographic changes with that of 39 male current smokers without radiographic changes. In their earlier paper, those with radiographic changes were reported to be on average six years older, but this information is not presented again. The bias in the prediction equations for pulmonary function invalidate this comparison.

Other issues

The text refers to Botham and Holt as showing that “fibreglass also causes peribronchial fibrosis by inhalation.” That paper does not mention peribronchial fibrosis, and indeed it would be unlikely to do so because the study was primarily concerned with inhalation of glass powder for one day, followed up for one month, with some comparison with the effects of exposure to fibrous glass. Kilburn et al failed to reference any of the long term inhalation studies of fibreglass, none of which has shown any evidence that fibrosis is caused by fibreglass exposure.1 20

The participants in this study were 284 volunteers from the “500 workers with 20 years of exposure to fibreglass.” It is difficult to understand how the average duration of exposure to fibreglass could have been 19-9 years (table 2 from Kilburn et al).2 Was the selection criterion based on duration of employment rather than on duration of exposure?

The non-smokers had higher prevalences of bronchitis and of asthma than did the smokers, with the ex-smokers having the lowest prevalence. This is so different from other studies that a discussion of this would have been appropriate. The only explanation given is that this “may reflect current and ex-smokers with senility relocating into jobs with less exposure to fibreglass.” This is hardly an adequate discussion. It is also irrelevant if the true selection criterion was based on duration of employment.

CHARLES E ROSSITER
(Emeritus Professor of Occupational Health, University of London), 10 Munchen Road, Knotty Green, Beaconsfield, Bucks HP9 2AS

1 Kilburn KH, Powers D, Warshaw RH. Pulmonary effects of exposure to fine fibre glass: irregular opacities and small airways obstruction. Br J Ind Med 1992;49:714-20.
2 Kilburn KH, Warshaw RH. Pulmonary effects of exposure to fine fibre glass. In: SA, Siddiqui, ed. Proceedings of 2nd California thermal insulation international conference. North Highlands, California: BHF and TI 1989: 3-9
3 Personal correspondence between KH Kilburn and CE Rossiter, 1989 and 1990.
4 International labour Office. Guidelines for the use of the ILO international classification of radiographs of pneumoconioses. Geneva: ILO, 1980. (Occupational safety and health series No 22 revised.)
5 Weiss W. Cigarette smoking and small irregular opacities. Br J Ind Med 1991;48:841-4.
6 Kilburn KH. Cigarette smoking does not produce or enhance the radiologic appearance of pulmonary fibrosis. Am J Ind Med 1981;2:305-8.
7 Miller A, Thornton JC, Warshaw R, Bernstein J, Selikoff IJ, Teirstein AS. Mean and instantaneous expiratory flows, FVC, and FEV; Prediction equations from a probability sample of Michigan, a large industrial state. Bull Eur Physiopathol Resp 1986; 22:589-97.
8 Knudson RJ, Lebowitz MD, Holberg CJ, Burrows B. Changes in the normal maximal expiratory flow-volume curve with growth and aging. Am Rev Respir Dis 1983;127:725-734.
9 Cotes JE, Rossiter CE, Hoggan ITT, Gilson C. Average normal values for the forced expiratory volume in white Caucasian males. BMJ 1966; 1:1016-1019.
10 Botham SK, Holt PF. Comparison of effects of glass fibre and glass powder on guinea-pig lungs. Br J Ind Med 1973;30:272-6.
11 Drew RT, Kuschnier M, Bernstein DM. The chronic effects of exposure of rats to sized glass fibres. Ann Occup Hyg 1987;31:711-29.
12 Goldstein B, Rendall REG, Webster I. A comparison of the effects of exposure of baboons to crocidolite and fibreglass dusts. Environ Res 1983;32:344-59.
13 Gross P. The effects of fibrous glass dust on the lungs of animals. In: Occupational exposure to fibrous glass, Proceedings of a symposium, division of criteria documentation and standards development, NIOSH, HEW publ No (NIOSH) 76-151. 1976:169-78.
14 Hesterberg TW, McConnell EE, Chevalier J, Hadley J, Thevanaz P, Anderson R. Chronic inhalation toxicity of size-separated glass fibers in Fischer 344 rats. Fundam Appl Toxicol 1992 (in press).
15 Le Bouffant L, Daniel H, Henin JP, Martin JC, Normand C, Tichoux G, Trolard F. Experimental study on long-term effects of inhaled MMMF on the lungs of rats. Ann Occup Hyg 1987;31:765-90.
16 McConnell EE, Wagner JC, Skidmore JW, Moore JA. A comparative study of the fibrogenic and carcinogenic effects of UICC chrysotile B asbestos and glass microfibre (JM100). In: Biological effects of mineral fibres, Vol 2 Copenhagen: World Health Organisation. 1984:234-52.
17 Mitchell RL, Donofrio DJ, Moorman WJ. Chronic inhalation toxicity of fibrous glass in rats and monkeys. J Amer Coll Tox 1986;5:545-75.
18 Muhle H, Pott F, Bellman B, Takenaka S, Zern V. Inhalation and injection experiments in rats to test the carcinogenicity of MMMF. Ann Occup Hyg 1987;31:755-64.
19 Smith DM, Ortiz LW, Archuleta RF, Johnson NF. Long-term health effects in hamsters and rats exposed chronically to man-made vitreous fibres. Ann Occup Hyg 1987; 31:731-50.
20 Wagner JC, Berry G, Hill RJ, Munday DE, Skidmore JW. Animal experiments with MMMF(VF). In: Biological effects of mineral fibres, Vol 2 Copenhagen: World Health Organisation 1984:209-33.

The Authors' reply

We would like to reply to Rossiter as follows:

No dual publication

Rossiter begins, in his first sentence, with the accusation of dual publication, which is both unkind and wrong. The proceedings of the second California thermal insulation conference were compiled and provided to the participants—not published.

No fibrosis from cigarette smoking alone

He proceeds by renewing his contention that Weiss, using minifilms read by magnification, found irregular opacities. Weiss did not use International Labour Office (ILO) criteria for film interpretation, and his work was done in 1972 not 1991 as implied by Rossiter’s reference and has not been replicated. Finally he apparently failed to appreciate that silver halide grains may be magnified to haziness in minifilms. The definite study in several thousand subjects with exposure to asbestos showed that smoking apparently enhances the opacities but does not create them.
Differences between 1989 and 1991 radiographic findings
The differences in radiographic findings in Rossiter's table are because the preliminary report was based on my readings of the x ray films only. When Power's readings, which showed more positives and slightly higher average profusions were included, the final percentages were slightly higher.

Pulmonary function: predicted equation
The suggestion that the pulmonary function prediction equations from Miller et al of a Michigan population and Morris' Oregon population study are "supranormal" was settled 20 or more years ago. The pulmonary function tests of neither Knudson et al, nor Cotes et al were free enough of technical faults to be representative, let alone being normal. Of course, if one lowers the predicted far enough, the pulmonary function tests of many working populations will exceed the predicted.

There is a bias in pulmonary function comparison if height, age and duration of cigarette smoking are not adjusted. As table 3 of our paper makes clear, these data were adjusted and are presented as % predicted. This, as Rossiter knows, adjusts for the six year difference in age (which was actually four years in the present table 3).

Animal studies
I am not privy to exclusive information implied by Rossiter concerning the Botham and Holt findings but their descriptions are quite clear and even their title (Rossiter Ref19) mentions comparison of glass fibre. Other animal studies seem to be negative but each of his 10 references would require detailed discussion, which does not seem relevant to the major issues.

Our error
The minimal criteria for workers entry into this study was actually 15 years of fibreglass exposure in the plant, which yielded 19-9 years as the average duration of exposure.

1 Kilburn KH, Lilis R, Anderson HA, Miller A, Warshaw RH. Interaction of asbestos, age and cigarette smoking in producing radiographic evidence of diffuse pulmonary fibrosis. Am J Med 1986;80:377-81.

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NOTICE

Pro health care-94, promotion of health for health care workers, the second international conference on occupational health for health care workers, is being organised by the Swedish National Institute of Occupational Health.

The conference is an event for all people concerned about the working environment of health care personnel in hospitals as well as outpatient care.

The planning committee consists of people from varied backgrounds, including also employee and employer representatives, to ensure a wide ranging scientific programme.

The aim is to bring experience from research to practice and from practice to research. Invited lecturers will present both the scientific state of the art and practical applications and there will be workshops, oral sessions, and posters.

Topics will include infection hazards, dermatoses, chemical health hazards, physical risk factors, occupational accidents, ergonomics, developing countries, job content and skills development, work organisation and development, the client/patient and the health care worker, and gender perspectives.

There will be visits to hospitals and health care institutions in the Stockholm area. Some one-day courses on topics related to the conference will be arranged.

For further information please contact the conference secretariat, Britta Eklund or Britt Gardelach, National Institute of Occupational Health, S-14184 Solna, Sweden. Telephone + 46-8-7309100, Fax + 46-8-273505.