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LETTERS TO THE EDITOR

Lung cancer and passive smoking

Sir–Darby and Pike (1988; **58**, 825) use a multistage model together with data on smoking and lung cancer to estimate the effect of exposure to other people's smoke on the risk of lung cancer. They give examples of the expected risks according to levels of passive smoking, expressed in terms of the number of equivalent cigarettes per day actively smoked.

In our review of the epidemiological studies of lung cancer and exposure to other people's tobacco smoke, we estimated that the risk of lung cancer among non-smokers living with smokers was about 50% higher than the risk in non-exposed non-smokers (Wald *et al.*, 1986). This risk, according to Darby and Pike, is approximately equivalent to smoking 0.5 cigarettes a day from birth to age 65 years, and they conclude it is some 5–17 times too high in the light of the level of biochemical markers of tobacco smoke exposure that have been measured in non-smokers. We did not think that this was so in our review and we are still of the opinion that the biochemical data are broadly in line with the estimates of risk based on epidemiological studies.

In our study of the principal marker, urinary cotinine (Wald *et al.*, 1984; Wald & Ritchie, 1984), the mean level in non-smokers who lived with smokers was about 1.5% (cited in Wald *et al.*, 1986; US National Academy of Science's Committee on Passive Smoking, 1986; Barlow & Wald, 1988) of the mean level found in active smokers, equivalent to smoking about 0.3 of a cigarette per day if active cigarette smokers typically smoke 20 cigarettes a day (1.5% of 20). An exposure equivalent to smoking 0.3 of a cigarette a day is similar to the estimate of 0.5 of a cigarette that would, according to the model adopted by Darby and Pike, 'explain' a 50% higher risk of having lung cancer in passive smokers. The half-life of serum cotinine in non-smokers may be about 50% greater than in smokers and, if this were the case, our estimate would become 0.2 instead of 0.3.

The principal reason for the difference in the estimates of Darby and Pike and our own arises from their use of data on urinary cotinine levels in passive smokers showing levels of 0.6–0.8% of active smokers (Jarvis *et al.*, 1984). We believe that the figure of 1.5% is more appropriate than that of Jarvis and his colleagues because they did not classify cotinine levels by the smoking habit of the person the subject lived with, which is needed when comparing the results with similar epidemiological data. They also excluded self-reported non-smokers with plasma cotinine levels greater than 20 ng ml^{-1}, which is likely to have excluded some individuals who, while not smokers themselves, were nonetheless heavily exposed to environmental tobacco smoke.

Bearing in mind the recognised uncertainties and difficulties involved in extrapolating from the biochemical data to the epidemiological data, there does not seem to be an obvious discrepancy between the two.

Yours etc.

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References

BARLOW, R.D. & WALD, N.J. (1988). Use of urinary cotinine to estimate exposure to tobacco smoke. *JAMA*, **259**, 1808.

JARVIS, M., TUNSTALL-PEDOE, H., FEYERABEND, C., VESEY, C. & SALLOOJEE, Y. (1984). Biochemical markers of smoke absorption and self reported exposure to passive smoking. *J Epidemiol. Comm. Health*, **38**, 335.

NATIONAL RESEARCH COUNCIL (1986). *Environmental Tobacco Smoke. Measuring Exposures and Assessing Health Effects.* National Academy Press: Washington, DC.

WALD, N.J., BOREHAM, J., BAILEY, A., RITCHIE, C., HADDOW, J.E. & KNIGHT, G. (1984). Urinary cotinine as marker of breathing other people's tobacco smoke. *Lancet*, **i**, 230.

WALD, N.J., NANCHAHAL, K., THOMPSON, S.G. & CUCKLE, H.S. (1986). Does breathing other people's tobacco smoke cause lung cancer? *Br. Med. J.*, **293**, 1217.

WALD, N.J. & RITCHIE, C. (1984). Validation of studies on lung cancer in non-smokers married to smokers. *Lancet*, **i**, 1067.

Response to the letter from Dr. Wald

Sir–Wald and his colleagues question the conclusion we reached in our recent paper that there is a discrepancy between the low levels of exposure indicated by cotinine measurements in those passively exposed to cigarette smoke and the high relative risk for lung cancer of 1.5 from passive smoke exposure estimated by Wald *et al.* (1986) from epidemiological studies.

As noted by Wald and his colleagues, an important reason for the difference in our estimates is that we considered the urinary cotinine levels of passive smokers to be 0.6–0.8% that of active smokers, whereas they considered a figure of 1.5% to be more appropriate. Our figures were derived from Tables I and II of Jarvis *et al.* (1984). These data compared 27 non-smokers reporting 'some' or 'a lot' (there was no difference in the data from these two groups) of exposure to passive smoke to 94 smokers. The mean urinary cotinine for these 27 non-smokers reporting passive smoking exposure was 8.8 ng ml^{-1} while that for the smokers was 1,391.0, so that the ratio is 0.63% (8.8/1,391.0). A slightly higher figure is obtained if plasma and salivary values are considered, and for this reason we gave a range of 0.6–0.8%. In addition to these 27 non-smokers, there were 79 non-smokers with 'none' or 'a little' exposure to passive smoke, and 21 persons claiming to be non-smokers but whose level of plasma cotinine was according to the authors incompatible with their claim. Only one of the 100 accepted non-smokers (mean plasma cotinine, 1.5 ng ml^{-1}) had a plasma cotinine value above 10 ng ml^{-1} (actual value 14 ng ml^{-1}), whereas all the 21 'deceivers' had values above 20 ng ml^{-1} with a mean value of 239.3, which was 87% of the mean value for the declared smokers. Excluding those deceivers seems completely justified to us.

Taking, as do Wald and his colleagues, our high figure of 20 cigarettes per day consumption for smokers, and allowing a factor of 2/3 to account for the different half-life of cotinine in smokers and non-smokers, the cigarette equivalent exposure of passive smokers is estimated to be 2/3 × 0.63% of 20 cigarettes per day or 0.08, which is still only one-sixth