

## CORRESPONDENCE

**Risk of thyroid nodules in subjects occupationally exposed to radiation: a cross sectional study**

Editor—We would like to comment on a recent paper by Antonelli *et al* on the risk of thyroid nodules in subjects occupationally exposed to radiation.<sup>1</sup>

The authors examine the prevalence of nodular thyroid disease in a group of 50 male medical workers in Pisa who were thought to be occupationally exposed to ionising radiation and compare them with two control groups of workers, without known occupational exposure to ionising radiation. The authors suggest that the significantly increased rates of thyroid nodules in the exposed group, compared with the control groups, is causally associated with their occupational exposure to ionising radiation.

However, as the authors acknowledge, the ionising radiation exposures of the exposed group are subject to substantial uncertainties and no exposure information is used in their analysis. There is also almost no accurate information on iodine deficiency for individual workers in either the exposed or control groups, iodine deficiency being a known risk factor for thyroid nodules, again a problem acknowledged by the authors. Moreover, although the cases were individually age matched with the controls, most of the analyses were performed ignoring this matching, the only form of age adjustment being stratification by fairly broad 10 year age groups. This approach is potentially problematic and could lead to a loss of efficiency as well as to possible confounding.<sup>2</sup>

If the median ionising radiation exposure in the exposed group given by the authors, 67.2 mSv, is taken at face value, then a doubling dose of about 73 mSv (95% CI 30 to 517) is indicated. This figure is much lower than that found in a recent combined analysis of incidence of thyroid cancer in the survivors of the Japanese atomic bombs and six medically irradiated groups, for which there was no significant excess risk among those exposed in adulthood.<sup>3,4</sup> All these considerations suggest that the increased risks of thyroid nodules found in the study of Antonelli *et al* are not necessarily causally associated with occupational exposure to ionising radiation.

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- Antonelli A, Silvano G, Bianchi F, Gambuzza C, Tana L, Salvioni G, *et al*. Risk of thyroid nodules in subjects occupationally exposed to radiation: a cross sectional study. *Occup Environ Med* 1995;52:500-4.
- Breslow NE, Day NE. *Statistical methods in cancer research. Vol 1. The analysis of case-control studies*. Lyon: International Agency for Research on Cancer, 1980.
- Ron E, Lubin JH, Shore RE, Mabuchi K, Modan M, Pottern LM, *et al*. Thyroid cancer after exposure to external radiation: a pooled analysis of seven studies. *Radiat Res* 1995;141:259-77.
- United Nations Scientific Committee on the Effects of Atomic Radiation. *Sources and effects of ionizing radiation*. New York: United Nations, 1994.

Author's reply—(1) In the first paragraph Little and Sharp affirm that we report "thy-

roid nodules in the exposed group is causally associated with the occupational exposure to ionising radiation", but this was never said in our article. In fact we only suggest that occupational exposure to radiation may be a risk factor for thyroid nodules.<sup>1</sup>

(2) The occupationally exposed group was chosen among male subjects of the units of orthopaedics, haemodynamics, interventional radiology, and radiotherapy because it is known that the exposure to x ray films is certain (during angiography, radioscopy, etc.) and generally heavier than in other groups of medical workers. We indicated that cumulative dose was 67.2 mSv (SD 96.0), with an extremely high variability ranging from 3.6 to 690.0 mSv and we discussed the reliability of the dosimetric data but not about the uncertainty of the exposure.<sup>1</sup>

(3) The urinary iodine excretion is not a reliable variable because it is variable within subjects from one day to another in relation to the intake of different foods and beverages. The mean urinary iodine excretion in the population is the only reliable biochemical variable of the severity of the iodine deficiency. The mean urinary iodine excretion in Lunigiana (control group 1) is 49.8 µg/day while in Pisa (exposed group and control group 2) it is 88 µg/day; these data were indicated in the discussion.<sup>1</sup> However, iodine deficiency was also evaluated by a questionnaire. Only 12% of subjects presented a history of residence in iodine deficient areas for ≥ 10 years in the exposed group and 10% in the control group 2 (Pisa); everybody presented a history of residence in iodine deficient areas in the control group 1 (Lunigiana). The prevalence of thyroid nodules is significantly higher in the exposed group not only in comparison with the control group 2 from Pisa, but also in comparison with the control group 1 from Lunigiana. So we think that iodine deficiency was accurately evaluated in our study.

(4) As to the problem of matching it should be noted that our study is not of the case-control type, as we sampled exposed and not exposed subjects, not cases and controls. In this situation matching by age followed by a crude analysis or by an analysis by relatively large age strata entails only a minimal, if any, loss of efficiency.<sup>2</sup>

(5) In our study we evaluated the prevalence of thyroid nodules and not of thyroid cancer in workers exposed to radiation. So any comparison with the results of incidence of thyroid cancer in the Japanese atomic bomb survivors and with their exposimetric data is not appropriate. Furthermore while in the Japanese study an acute (bomb survivors) or a short term (medically irradiated groups) and high dose exposure were considered, in our study a long term, low dose exposure is evaluated. Among the studies that evaluated the effects of long term, low dose exposure on the thyroid, most of them found a high prevalence of thyroid cancer or nodules in subjects occupationally exposed to radiation.<sup>3-5</sup>

So we suggest that long term, low dose occupational exposure to radiation may be a risk factor for thyroid nodules.

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- Antonelli A, Silvano G, Bianchi F, *et al*. Risk of thyroid nodules in subjects occupationally exposed to radiation: a cross sectional study. *Occup Environ Med* 1995;52:500-4.
- Rothman KJ. Matched follow up studies. In: Rothman, KJ, ed. *Modern epidemiology*, Boston: Little Brown, 1986:275-9.
- Boice JD Jr, Mandel JS, Doody MM, Yoder RC, McGowan RA. Health survey of radiologic technologists. *Cancer* 1992;69:586-98.
- Wang JX, Inskip PD, Boice JD Jr, Li RX, Zhang JY, Fraumeni JF. Cancer incidence among medical diagnostic x-ray workers in China, 1950-85. *Cancer* 1990;45:889-95.
- Kendall GM, Muirhead CR, MacGibbon BH, *et al*. Mortality and occupational exposure to radiation: first analysis of the National Registry for Radiation Workers. *BMJ* 1992;304:220-5.

**A cross sectional study of the independent effect of occupation on lung function in British coal miners**

Editor—Lewis and colleagues conclude that coal mining has an effect on lung function independent of the effects of smoking, even in the absence of pneumoconiosis.<sup>1</sup> This is of course not a new finding, but is in line with the conclusions of much larger studies in which the carefully estimated exposures of miners to coal dust have been shown to relate to reduction in forced expiratory volume in one second (FEV<sub>1</sub>) and to add to the effects of smoking; in none of these has the presence of pneumoconiosis had an important influence.<sup>2</sup> It was this and related work which led the Industrial Injuries Advisory Council (IIAC) to prescribe bronchitis and emphysema in coal miners.

The authors have misunderstood the reason that the chest radiograph was included as a criterion for certification in individual cases. The reason that I suggested to IIAC was that airways obstruction is a common finding in the general population as a consequence of smoking, and many miners smoke. A criterion was in my view necessary to allow a judgement to be made in individual cases as to the likelihood that exposure to coal dust had played an important part in the cause of the dysfunction. In the absence of measurements of dust exposure, two surrogates were possible; duration of time spent underground and the presence of category 1 change on the radiograph. The duration of time spent underground has a very poor relation with exposure and is only alterable by an employer as a preventive measure in a way which would act to the financial disadvantage of workers. The presence of category 1 change on the radiograph, especially if it includes irregular opacities as I recommended,<sup>2</sup> bears a good relation to cumulative dust exposure and provides a useful basis for preventive action. As it turned out, the IIAC took both options but did not include irregular opacities.

The outcome has been satisfactory in that many more miners have received benefits than would otherwise have been the case but, as I pointed out previously, any system that arbitrarily dichotomises a continuum will produce injustice. Some miners are undoubtedly in receipt of benefits for smoking whereas others with dust induced

dysfunction are not receiving benefits. Ultimately it is a matter for political decision as to how far in either direction the dividing line should be pushed. Far more important, however, is for the data on the relation between dust exposure and disease to be used to prevent further health problems in miners. It was for this reason, and not to contribute to a debate on so called "compensation", that the National Coal Board funded its research, which ultimately included some 50 000 miners over a 30 year period.

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- 1 Lewis S, Bennett J, Richards K, Britton J. A cross sectional study of the independent effect of occupation on lung function in British coal miners. *Occup Environ Med* 1996; 53:125-8.
- 2 Seaton A. Coalmining, emphysema, and compensation. *Br J Ind Med* 1990;47:433-5.

*Author's reply*—We agree with Seaton that the presence of pneumoconiosis on a chest x ray film is a clear indication that extensive coal dust exposure has occurred. Where we differ (or we perhaps misunderstand) is in the inference implicit in recommending that pneumoconiosis should be present to qualify for certification of chronic bronchitis and emphysema, that the absence of pneumoconiosis on a chest x ray film provides evidence to the contrary. As a result, many ex-coal miners with a history of heavy exposure to coal dust, and with serious disability from the disease this scheme intends to compensate, are being refused compensation. If as Seaton states, the presence of pneumoconiosis is not in itself an independent predictor of a higher probability that chronic bronchitis and emphysema are due to coal dust, and if it adds nothing to the likelihood either way that smoking has contributed to any degree of chronic bronchitis and emphysema, what is the logic of including pneumoconiosis as an obligatory criterion for compensation? We agree that any compensation scheme that dichotomises a continuum will produce injustice, but would argue that if we are to continue with such an approach then the criteria used for that dichotomisation need to be seen to be as logical and fair as possible. In our view the inclusion of a requirement for the presence of one abnormality (pneumoconiosis) to qualify for compensation for another and unrelated abnormality (chronic bronchitis and emphysema) is irrational and unjust.

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## NOTICES

### 14th Annual Occupational Health and Safety Institute. 9-20 September 1996. Minneapolis, Minnesota, USA.

The 14th Annual Occupational Health and Safety Institute has an intensive programme offering graduate level credit or continuing education credit within an interdisciplinary setting and will be held on the Minneapolis Campus of the University of Minnesota in the Health Sciences Complex. Specific directions and maps will be sent to participants upon receipt of the completed registration form. People may choose from a wide array of courses in occupational and environmental health. The Institute is taught by members of the faculty of the School of Public Health at the University of Minnesota as well as guest lecturers and professionals from business and industry, with extensive field experience.

The Institute offers graduate level courses in a two week format (*unless otherwise specified*) designed to:

- offer a convenient alternative for those who cannot take advantage of graduate level courses during the regular academic year
- provide selected courses in occupational health and safety to professionals who are just entering the field and/or who wish to formalise their experience in the field
- assist those preparing to take certification examinations through the American Board of Preventive Medicine, American Board of Industrial Hygiene, or the American Board of Occupational Health Nursing
- provide educational options for students who do not have the time or opportunity in their regular programme of study to enroll in occupational and environmental health courses.

The intended audience includes graduate students and practising occupational medicine physicians, industrial hygienists, occupational health nurses, safety specialists, managers, supervisors, and others with responsibilities for providing a safe and healthy work environment.

Academic credit is transferable to other accredited institutions in the United States.

For further information contact: Midwest Center for Occupational Health and Safety, Program In Continuing Education, University of Minnesota, 640 Jackson Street, St. Paul, MN 55101, USA. Fax 612 292 4773.

### Keele '96: 21st National Safety Symposium. 2-4 September 1996. Keele University, Staffordshire

*Building for success*, the theme for the 1996 National Safety Symposium, reflects past, present and future success of this annual event and also the predominant programme theme of buildings management.

The event is staged by the Municipal and Public Services (MAPS) Division of the Institution of Occupational Safety and Health (IOSH), and attracts mainly public sector health and safety professionals, although the subjects to be addressed will appeal to anyone working within occupational safety and health.

Topics on this year's programme include:

- Healthy buildings and workplaces
- Lighting for a safe working environment
- Assessing risks posed by exposure to biological agents
- Fire safety in public buildings
- Glass and glazing
- Implications of the Disability Discrimination Bill
- Disaster management software
- Human factors in safety systems
- Information technology in occupational safety and health

The MAPS annual dinner, held at Keele Hall on 2 September, will include the presentation of the Zurich Municipal sponsored awards for outstanding contributions to public sector safety and health.

More information on Keele '96 is available from Murray Clark at the Institution of Occupational Safety and Health, tel: +44 (0)116 257 1399, ext. 110, e-mail: cpdevnts@iosh.co.uk

### XIII International Symposium on Night and Shiftwork: New Challenges for the Organisation of Night and Shiftwork. 23-27 June 1997. Majvik, Finland

#### Themes:

- 1 International regulations on the organisation of shiftwork
- 2 Innovative shift schedules
- 3 12 Hour shifts
- 4 Optimal sleep wake rhythm in shiftwork
- 5 Shiftwork and safety
- 6 Shiftwork and wellbeing: the interaction of individual and social differences

#### Abstracts:

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#### For further information contact:

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