CORRESPONDENCE

Mortality of workers exposed to methylene chloride employed at a plant producing cellulose triacetate film base

EDITOR—Tomenson *et al*¹ reported results from a cohort study of men exposed to methylene chloride in the manufacture of cellulose triacetate film base. One of the findings in the study was four observed deaths from brain and other central nervous system (CNS) tumours compared with 2.8 expected cases based on national mortality rates. This is an interesting finding, as Heineman *et al*² previously reported an association between exposure to methylene chloride and astrocytic brain cancer in a case-control study of men from southern Louisiana and northern New Jersey who had died. However, Tomenson *et al* dismissed the finding as two of their cases "had minimal exposure to methylene chloride". They furthermore argued that "no support for an association between methylene chloride and brain cancer was provided by the other three retrospective cohort studies".³⁻⁵ However, only one of the three studies that Tomenson *et al* referred to reported data on brain cancer. Hearne *et al*⁶ found two observed deaths from brain cancer compared with 1.7 expected based on reference rates from New York State, excluding New York City, and 2.0 expected based on interval rates from Kodak, Rochester. Brain cancer data were not reported in the studies by Lanes *et al*⁷ and Gibbs *et al*.⁸ The four other available cohort studies⁶⁻⁹ that included workers exposed to methylene chloride also did not report data on brain cancer.

It would have been prudent for Tomenson *et al* to bring to the attention of the reader the lack of data on the association between methylene chloride and brain cancer. Not supported is different from not reported!

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- Tomenson JA, Bonner SM, Heijne CG, *et al*. Mortality of workers exposed to methylene chloride employed at a plant producing cellulose triacetate film base. *Occup Environ Med* 1997;54:470-6.
- Heineman EF, Cocco P, Gómez MR, *et al*. Occupational exposure to chlorinated aliphatic hydrocarbons and risk of astrocytic brain cancer. *Am J Ind Med* 1994;26:155-69.
- Hearne FT, Pifer JW, Grose F. Absence of adverse mortality effects in workers exposed to methylene chloride: an update. *J Occup Med* 1990;32:234-40.
- Lanes SF, Rothman KJ, Dreyer NA, *et al*. Mortality update of cellulose fiber production workers. *Scand J Work Environ Health* 1993;19:426-8.
- Gibbs GW, Amsel J, Soden K. A cohort mortality study of cellulose triacetate-fiber workers exposed to methylene chloride. *J Occup Environ Med* 1996;38:693-7.
- Sinks T, Lushniak B, Haussler BJ, *et al*. Renal cell cancer among paperboard printing workers. *Epidemiology* 1992;3:483-9.
- Cragle DL, Wells SM, Tankersley WG. An occupational morbidity study of a population potentially exposed to epoxy resins, hardeners and solvents. *Appl Occup Environ Hyg* 1992;7:826-34.
- Shannon HS, Haines T, Bernholz C, *et al*. Cancer morbidity in lamp manufacturing workers. *Am J Ind Med* 1988;14:281-90.
- Ott MG, Carlo GL, Steinberg S, *et al*. Mortality among employees engaged in chemical manufacturing and related activities. *Am J Epidemiol* 1985;122:311-22.

Authors' reply—Lynge is correct to point out that Gibbs *et al*¹ and Lanes *et al*² did not report brain cancer mortality in two cohorts of United States cellulose triacetate fibre workers in Cumberland, Maryland, and Rock Hill, South Carolina. At the time of writing our paper,³ the paper by Gibbs *et al*¹ had not been published. However, we had access to a more detailed report⁴ of the mortality experience of workers at the Cumberland facility. For comparison purposes, Gibbs⁴ also reports some mortality findings for workers at the Rock Hill factory. When the paper of Gibbs *et al*¹ was published, we removed the reference to the unpublished report.⁴ Unfortunately we overlooked the fact that the published paper did not include the brain cancer findings which we now give.

Gibbs *et al*¹ and Gibbs⁴ reported mortality results for workers in two groups exposed to methylene chloride. Among workers in the high exposed group (350-700 ppm) there was one death from cancer of the central nervous system (CNS) (2.01 expected) and three deaths from cancer of the CNS (2.54 expected) in the low exposure group (50-100 ppm).⁴ Exposure levels of workers in the Rock Hill cohort studied by Lanes *et al*,² were similar to those of workers in the Cumberland cohort, but it was not possible to separate them into exposure categories. There was one death from cancer of the CNS (1.52 expected) in the Rock Hill workers.⁴ Hence these studies do not provide support for an association between methylene chloride and brain cancer. However, we apologise for not ensuring that readers had access to the relevant data.

When discussing the supporting evidence for an association between brain cancer and exposure to methylene chloride, we focused on the information provided by the four cohorts of workers producing cellulose triacetate fibres or film base.^{1-3,5} These workers had high and well characterised exposure to methylene chloride compared with workers in the four other cohort studies cited by Lynge,⁶⁻⁹ which did not report brain cancer mortality, but they have limited relevance to an assessment of the human health effects of exposure to methylene chloride.

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- Hearne FT, Pifer JW, Grose F. Absence of adverse mortality effects in workers exposed to methylene chloride: an update. *J Occup Med* 1990;32:234-40.

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- Shannon HS, Haines T, Bernholz C, *et al*. Cancer morbidity in lamp manufacturing workers. *Am J Ind Med* 1988;14:281-90.
- Ott MG, Carlo GL, Steinberg S, *et al*. Mortality among employees engaged in chemical manufacturing and related activities. *Am J Epidemiol* 1985;122:311-22.

Inhalation of ammonium nitrate fuel oil explosive: and possible concomitant exposure

Author's reply—Sostrand¹ has suggested that the nitrogen dioxide component of diesel engine exhaust fumes may have caused the symptoms detailed in the case of ammonium nitrate fuel oil explosive (ANFO) inhalation that I reported recently.²

This is unlikely for the following reasons:

- Symptom onset after inhalation of the ANFO plume was immediate

- At the time of the ANFO inhalation the miner was charging a face at ground level and the diesel powered platform truck had been switched off for about 15 minutes

- There were no other diesel units operating in the area

- Three other miners in the same area who were not exposed to the ANFO plume were unaffected

- The affected miner had regularly worked in very similar conditions for 9 years without symptoms.

Sostrand has correctly indicated that diesel fuel is commonly used in ANFO. As I indicated in my previous report either the hydrocarbon solvent fuel oil, or the ammonium nitrate, or possibly both of these components of ANFO, may have caused the symptoms described.²

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- Sostrand P. Inhalation of ammonium nitrate fuel oil explosive (ANFO): and possible concomitant exposure. *Occup Environ Med* 1998;55:647.
- Donoghue AM. Inhalation of ammonium nitrate fuel oil explosive (ANFO). *Occup Environ Med* 1998;55:144.

CORRECTION

Risk of pulmonary tuberculosis relative to silicosis and exposure to silica dust in South African gold miners by E HNIZDO, J MURRAY (1998;55:496-502).

The cumulative dust exposure measurements given in this paper were in units of ghm^{-3} and not in $\text{mg}/\text{m}^3\text{-y}$ as incorrectly stated. The cumulative dust exposure in ghm^{-3} units was calculated as a sum of products between the number of shifts spent in an occupational category, the average number of hours spent underground in the occupational category, and the average respirable dust concentration (mg/m^3) for the occupational category. To convert the cumulative dust from ghm^{-3} into $\text{mg}/\text{m}^3\text{-y}$ one needs to multiply the average

exposure of 14.3 given in the paper by 1000 and divide by (270×8) to obtain 6.6 mg/m³-y.

We are grateful to Professor HJ Weitowitz from the Institute of Work and Social Medicine in Giessen, Germany, for pointing out this error.

NOTICES

International Course of Molecular Epidemiology. 19-24 April 1999. Villa Gualino, Torino, Italy.

The Institute for Scientific Interchange Foundation, the International Agency for research on cancer, the University of Torino, the Centre for Oncologic Prevention, and the Italian Molecular Epidemiology Group are running this course.

Keynote lectures

- Current perspectives in cancer research and prevention
- The aetiology of common diseases and their pathogenetic pathways

Session 1—molecular dosimetry: techniques and methods

- DNA adducts and protein adducts
- From adduction to DNA damage

Session 2—genetic susceptibility

- high and low penetrance cancer genes
- metabolic polymorphisms
- DNA repair

Session 3—epidemiological methods

- Study design: transitional and formal studies
- Case-control, cohort studies
- Bias, confounding, and effect modification

Session 4—DNA damage

- Acquired mutations and mutational spectra
- Cytogenetic damage

Session 5—statistical analysis

- Exploratory data analysis
- Univariate analysis
- Multivariate analysis

Session 6—issues in molecular epidemiology

- Ethical aspects
- Combined evidence, meta-analysis
- Causality assessment

Course directors: P Vineis (Torino), P Boffetta (Lyon). Faculty (provisional list): N Rothman (Bethesda), M Berwick (New York), D Phillips (Sutton), M Ingelman-Sundberg (Stockholm), F Real (Barcelona), P Hainaut (Lyon), R Montesano (Lyon). Keynote speakers: P Kleihues (Lyon), F Perera (New York).

No registration fee is required. The ISI Foundation has reserved single rooms for participants from April 18 to 24 at Villa Gualino. The full board package is ITL 780.000. Deadline for registration: 28, February 1999.

For information contact: ISI Secretariat, Villa Gualino, Viale Settimio Severo 65, Torino, Italy. Tel 0039 11 6603090, fax 0039 11 6600049; email: isi@isi36a.isi.it - www.isi.it

EPICOH 14th International Conference on Epidemiology in Occupational Health. Herzlia, Israel. 10-14 October 1999.

The ICOH together with the Occupational Health and Rehabilitation Institute in Israel is organising the EPICOH 14th International Conference on Epidemiology in Occupational Health.

The main topics of the conference are:

- Occupational work related diseases
- Occupational cancer
- Occupational epidemiology
- Molecular epidemiology
- Biological markers
- Value of pre-employment examinations
- Exposure assessment
- Reproductive health studies
- Communicable diseases

For information contact: Dr Judith Shaham, Occupational Health and Rehabilitation Institute, PO Box 3, Ra'anana, Israel. Tel 00 972 9 771 0092; fax 00 972 9 771 2212; email judiths@trendline.co.il

International Conference on The Combined Effects of Environmental Factors ICCEF 2000. 26-29 August 2000, Savonlinna, Finland.

The 9th international conference on the combined effects of environmental factors will take place in Savonlinna, in the beautiful eastern lake area of Finland. The conference is organised under the auspices of the International Society of Complex Environmental Studies (ISCES) in cooperation with national and international research institutes and universities.

The ICCEF 2000 invites all scientists who are interested in basic or applied studies related to complex interactions and combined effects of physical, chemical, psychosocial, and biological environmental factors on human health and wellbeing, or on biological systems. Contributions cover the following main subject areas *Complex Environmental Studies, Combination Epidemiology, Combination Toxicology, Combined Mutagens, Genotoxins, Carcinogens and Teratogens, Combined Environmental and Psychosocial Factors, Psychophysiological Studies on Combined Environmental Factors, Methodological Issues and Computer Simulation as well as Modelling*. The programme will include introductory lectures, oral and poster presentations. The working language of the Conference is English.

Further details from: Dr Olavi Manninen, The International ISCES Society, c/o Labour Protection Department, PO Box 272, FIN-33101 Tampere, Finland. Tel 00358 3 260 8820; fax 00358 3 2608899; email: Olavi.Manninen@tsp.stm.fi