

## Correspondence

### Twinning in human populations and in cattle exposed to air pollution from incinerators

SIR,—The authors of this paper (1988;45:556-60) appear to be primarily concerned with forcing a correlation between environmental concentrations of polychlorinated hydrocarbons (PCHs), which they imply must have originated from one or both of two incinerators, and a claimed incidence of twinning in people and cattle.

Background concentrations of PCHs were totally ignored. It is universally understood that all pollutants will exist at some level in soils or ambient air. When the authors assert the presence of "toxic chemicals" in the environments of local farms, they fail to grasp that whereas PCHs do exist in the Bonnybridge area, the published concentrations of these compounds are indistinguishable from normal background concentrations in United Kingdom soils. Furthermore, while PCH concentrations around Bonnybridge are considered normal, they have not changed since the Rechem chemical waste incinerator was closed in 1984. This would indicate that if the prevailing concentrations were the result of a local industrial activity that activity had nothing whatsoever to do with Rechem.

Examination of the data presented on twinning rates in people (table 1) clearly shows a *random* occurrence of marginally raised rates. Of the 14 areas studied, five showed twinning levels above ten per 1000 in the period 1980-3. Only two of these five areas were also ten per 1000 during 1976-9; the other three areas which were raised in 1980-3 were low in 1976-9. Of the four raised areas in 1976-9, two were low during 1980-3. There is clearly no consistent trend over the two periods and it is difficult to establish whether human twinning is raised in the general area or not.

The data presented for twinning in cattle would appear to establish a real effect, which also occurred at periods when the Rechem incinerator was not handling PCHs. The authors do not pursue the cause of this. Nor have they established the case for human twinning or made an attempt to determine the cause of cattle twinning, PCHs being indistinguishable from background. Clearly the presence of the Rechem incinerator is an irrelevance to this study, since there is no established effect which has been linked in any way to the presence of the plant.

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*Drs Lloyd et al reply:*

**"Primarily concerned with forcing a correlation between PCHs and the incidence of twinning"**

Following convention, we established, a priori, a

hypothesis that an association between chemical pollution and twinning would be found in the areas at risk from airborne pollution from the incinerators. Because complex chemicals such as PCHs, pesticides, and dioxins have been reported in the flyash of incinerators,<sup>1,2</sup> and hence had probably been released from either or both of the incinerators, a biological mechanism could be suggested to explain any increase in the twinning.

**"Twinning also occurred at periods when the Rechem incinerator was not handling PCHs"**

As described in our paper, PCHs are used in the manufacture of common substances including plastics, paints, resins, glues, lubricants, hydraulic fluids, and electric equipment, and so they may have been released at any date from the municipal incinerator during combustion.<sup>3</sup> Hence the point that twinning in cattle was found at times when specific consignments of PCBs were not being burnt is irrelevant.

**"The data show a random occurrence of marginally raised rates"**

Jones has misinterpreted our table (table 1) which presented only the raw data. To determine whether or not the data showed a random occurrence, table 3 is more informative. Moran's I coefficient is used specifically for detecting spatial clustering or regularity in a pattern of events and is a more objective analytical procedure than "eye-balling" the data. When used to assess the relevant characteristics of the human twinning in the data set, this technique showed significant clustering in the frequency of twinning in 1980. With regard to the fluctuations in the twinning rates noted by Jones these might have resulted from several mechanisms as described in our paper.

**"Attempts to justify a hypothesis on the basis of uncorroborated findings"**

The findings of a clustering of both human and animal twinings are facts supported by statistical analysis. The role of PCHs as a causal agent for the increase in twinning remains a hypothesis, and we are continuing our search for other possible mechanisms.

**"Background concentrations of PCHs were totally ignored by the authors who fail to grasp that, while PCHs do exist in the Bonnybridge area, their concentration is indistinguishable from normal background concentrations"**

Detailed discussion of the background values of PCHs was irrelevant to our investigation for several reasons. Firstly, the term PCH encompasses an enormous number of individual chemicals. Industrial PCBs alone consist of mixtures of homologous or isometric biphenyls, or both, and theoretically there are over 200 different compounds possible. Only a very few of the PCBs and dioxins appear to have been studied in any depth and scant attention has been given to the

question of the biological and toxic effects of the remaining group.<sup>4</sup>

Secondly, while PCHs are known to be ubiquitous it is not known yet what constitutes a normal background concentration, although systematic investigations are in progress.<sup>1</sup> Sampling around the two incinerators, however, in sufficient detail, to allow the proper assessment of the potential role of PCHs as environmental toxins in that area has not been undertaken so far as we know. Nevertheless, one sampling study in the Bonnybridge area reported that the rise in PCB (as Aroclor 1242) was three to five times the background values, and the rise in PCB (as Aroclor 1254) was 16 times the background values.<sup>5</sup> The general location of the soil samples that contained the raised PCB concentrations coincided with the "at risk" areas described in our paper.

**"Concentrations of PCH have not changed since the Rechem chemical waste incinerator was closed in 1984"** PCHs do not degrade readily in the environment; the half life of dioxins and furans, for example, has been estimated to exceed ten years<sup>6</sup> (and Rechem International response to the Bonnybridge dossier, 1985). Consequently, the stability of the PCH concentrations during the past few years cannot be used to exclude, as a potential source of that pollution, any industrial activity which ceased as recently as 1984.

To conclude, all interpretations of findings—and particularly unusual types of finding—require to be viewed with caution and subjected to frequent reappraisal. We put forward our ideas in the spirit of the Maud Committee's report on the use of uranium for a bomb: "We should like to emphasise at the beginning of this report that we entered the project with more scepticism than belief, though we felt it was a matter which had to be investigated."

#### References

- 1 Cox BA. Dioxin details. *Municipal Journal* 1988;96:1785-86.
- 2 Tschirley FH. Dioxin. *Scientific American* 1986;254:21-7.
- 3 Royal Commission on Environmental Pollution. *Managing waste: the duty of care*. (11th report) London: HMSO, 1985.
- 4 Safe SH. Comparative toxicology and mechanism of action of polychlorinated dibenzo-p-dioxins and dibenzofurans. *Ann Rev Pharmacol Toxicol* 1986;26:371-99.
- 5 East of Scotland and West of Scotland Colleges of Agriculture. *Report of an investigation into animal health problems in the Denny and Bonnybridge area of Stirlingshire*. 1984.
- 6 Kimbrough RD, Falk H, Stehr P. Health implications of 2,3,7,8-tetrachloro-dibenzodioxin (TCDD) contamination of residential soil. *J Toxicol Environ Health* 1984;14:47-93.

## Notices

**2nd Summer Institute in Environmental Health Studies, Department of Environmental Health Sciences, Johns Hopkins University, Baltimore, 5-16 June 1989**

The Second Summer Institute in Environmental Health Studies will present courses during a two week

period for academic credit or for continuing education credit. It will be possible to register for more than one course. Subjects will include: risk assessment and risk management, toxicology, physiology, occupational health, and industrial hygiene. For further information contact: Dr Jacqueline Corn, Continuing Education Program, Johns Hopkins University, School of Hygiene and Public Health, 615 North Wolfe Street, Room 1003, Baltimore, MD 21205.

Courses held at the Harvard School of Public Health in Boston. Please contact: Sharon E Block, Office of Continuing Education, Harvard School of Public Health, 677 Huntington Avenue, L-23, Boston, MA 02115.

#### Planning for nuclear emergencies, 19-23 June 1989

Addressing all major aspects of emergency preparedness, including accident source terms and dose estimates, standards and guides for emergency response, training programmes and notification systems, and preparedness for meeting public health needs. Fee: \$900.

#### Management and disposal of radioactive wastes, 10-14 July 1989

Designed to address radioactive waste sources and handling, disposal alternatives, environmental modelling and monitoring, the impact of decommissioning wastes, waste transportation, onsite storage and waste repositories. Fee \$900.

#### In place filter/biological safety cabinet testing, 12-16 June 1989

Providing in depth coverage of air filtration theory, aerosol technology, adsorption theory, air flow measurements, in place testing of particulate (HEPA) filters and safety cabinets, and the nature of biohazards. Fee: TBA.

#### Advanced workshop on occupational and environmental radiation protection, 17-21 July 1989

Focusing on current developments in radiation standards, radiation protection instrumentation, waste management, and methods for protection against occupational exposures. Emphasis will also be given to effluent controls and monitoring, and models for environmental surveillance. Fee: \$900.

#### Correction

**Serum type III procollagen peptide in asbestos workers: an early indicator of pulmonary fibrosis** (1988;45:818-23). Two sentences report wrong statements due to a regrettable mistake made in editing the final version of the manuscript. On p820 section Results, line 19 "showed the lowest mean values ( $13.6 \pm 2.3, SD$ ), PIIIP" should be replaced by "showed lower mean values ( $13.6 \pm 2.3, SD$ ). PIIIP" and on the same page, line 21 "intermediate, although values observed in the group with" should be substituted by "intermediate between group 1 and controls, although values observed in the group with."