

Formaldehyde and the nasal mucosa

Sir,—Formaldehyde is known to cause irritation of the skin and upper respiratory tract, allergic excematous contact dermatitis, and asthma,¹ but recently controversy has arisen over the possible human cancer risk posed by exposure to formaldehyde. It is a mutagen in the fruitfly and in certain yeasts and bacteria^{2,3} and carcinogenic in mice and rats after long term inhalation exposure,⁴ but the epidemiological evidence is inadequate for an assessment of human carcinogenicity.^{5,6}

Studies showing an increase of nasal carcinoma among rodents have shown dose dependent and reversible effects on the nasal mucosa such as rhinitis, epithelial dysplasia, and squamous metaplasia. These effects were produced in rats with exposure levels of 2.9 ppm of formaldehyde gas for six hours a day, five days a week for 24 months, and 5.6 ppm in mice. Some of these irritative effects might be regarded as precancerous lesions and could be an early sign of exposure to a carcinogen.⁷

In the concluding remarks from a recent meeting on formaldehyde toxicity the question was raised as to whether biopsy of the nasal mucosa in people exposed to formaldehyde could be of diagnostic value.⁸ We present our findings from a pilot study on the effects of formaldehyde on the nasal mucosa in man.

We studied 20 men (mean age 36) exposed to formaldehyde for an average of seven years when processing particle board; exposure levels were in the range 0.1–1.1 ppm (TWA). A clinical examination of the nose and a mucosal biopsy were carried out. Biopsy specimens with a diameter of 2 mm were taken with small forceps under local anaesthesia 1 cm behind the anterior edge of the inferior turbinate. Morphological grading was carried out according to the system proposed by Torjussen *et al*⁹ (table 1). The findings were compared with a reference group of 25 men (mean age 35) without occupational exposure to irritating agents. There were 35% smokers among the exposed and 48% among the non-exposed.

Five (25%) of the exposed men had swollen or dry changes, or both, of the nasal mucosa. Histological examination showed a loss of cilia and goblet cells, squamous metaplasia, and, in some cases, mild dysplasia. The histological grading showed a significantly higher score in the exposed than in the unexposed group (table 2).

Similar pathological changes in the nasal mucosa have earlier been reported as due to age, smoking, and various occupational exposures^{7,9,10} but factors other than formaldehyde could be ruled out in this study. The results indicate that the suspected pre-

Table 1 *Histological characteristics and scores used for grading the nasal mucosa*

<i>Histological characteristics</i>	<i>Points score</i>
Normal respiratory epithelium	0
Loss of cilia	1
Mixed cuboid/squamous epithelium, metaplasia	2
Stratified squamous epithelium	3
Keratosis	4
"Budding" of epithelium	add 1
Mild or moderate dysplasia	6
Severe dysplasia	7
Carcinoma	8

Table 2 *Number of men, age, and average histological scores in exposed and referent groups*

	<i>Age, years</i>			<i>Average score</i>
	<i>No</i>	<i>Mean</i>	<i>Range</i>	
Exposed	20	36	22–51	2.9*
Referents	25	35	25–60	1.8

**p* < 0.01 (one tailed, Wilcoxon).

cancerous findings in animal studies after exposure to formaldehyde might also be present in workers exposed to formaldehyde below the present Swedish TWA of 1 ppm.

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- term inhalation exposure. *Cancer Res* 1983;43:4382-92.
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- ⁸ Golberg L. Concluding remarks and recommendations for future research. In: Gibson J, ed. *Formaldehyde toxicity*. Washington, New York, London: Hemisphere Publishing Corporation, 1983.
- ⁹ Torjussen W, Solberg LA, Høgetveit A. Histopathologic changes of nasal mucosa in nickel workers. A pilot study. *Cancer* 1979;44:963-74.
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Book review

Plan of work 1985-86 and onwards. Health and Safety Commission. (Pp 44, £4.50.) London; HMSO, 1985.

This impressive, well written document describes the role of the Health and Safety Commission as "prime mover" in the system of occupational safety and health. There is inevitably some fudging of the relation between the commission and executive and between the executive and the local authorities, and there is a recognition that, with the displacement of the executive's headquarters to Bootle, administrative problems are not going to decrease.

Four annexes give (1) a formidable list of the output of the various inspectorates and divisions during 1983-4, (2) a statement of the factors taken into account in preparing the commission's plan of work, (3) a list of the 30 regulations and six approved codes of practice issued during 1983-5, and (4) a list of the 47 "control packages" expected to be completed between 1 April 1985 and 31 March 1987.

Occupational health gets a fair share of attention. It is pointed out repeatedly that public concern about health hazards is increasing and that the commission must respond to this concern, not only in the workplace but in the general environment. "Fear and uncertainty," the report says, "can often lead to a distorted perception of some risks." The report recognises that the public needs more help and guidance in reaching a balanced view on many of the issues involved. It believes that the commission, by reason of its independence from day to day ministerial direction and its command of the necessary technical resources is well placed to assume this function. It says that, "we shall seize our oppor-

tunities to establish ourselves more fully in the national eye whenever questions of risk to man from industrial activity arise, but we do not foresee early or dramatic progress."

It is recognised that help will be required from outside bodies. The report says (para 187) "Where investigations involve prolonged study, partnerships with appropriate academic departments will be fostered to enable EMAS staff to continue with immediate advisory duties while academic staff supply the rigour required for sound research investigations."

I found it curious that there is no reference to the professional societies in occupational safety and health without the help of which I do not believe the commission can realise the programme it has set out.

So, if the prime mover has a good head of steam, the intricate and (some of it) old fashioned transmission machinery will have to be maintained and lubricated if it is to achieve its desired output at the sharp end.

ROBERT MURRAY

Notices

International Conference on the Occupational and Environmental Significance of Chemical Carcinogens, Bologna, Italy, 8-10 October 1985

The conference will consist of many sessions on different aspects of chemical carcinogens and the resultant problems, including the mechanisms of carcinogenesis, the dimensions of the chemical carcinogenesis problem, the methods used to identify hazards to the environment, and the means with which society, science, and technology can confront this enormous problem. For further details contact the general secretary, Organising Committee, International Conference on Chemical Carcinogenesis, c/o Istituto di Oncologia, Viale Ercolani 4/2, 40318 Bologna, Italy.

Biochemical and Cellular Indices of Human Toxicity in Occupational and Environmental Medicine, Milan, 19-22 May 1986.

This symposium is aimed at evaluating the new indicators available in selected areas such as liver toxicity (focused on enzyme induction and porphyrin metabolism), nervous system toxicity, nephrotoxicity, and genotoxicity, as well as measurement of toxic substances in human tissues. For further details