

CORRESPONDENCE

Inhalation of ammonium nitrate fuel oil explosive (ANFO)

EDITOR.—Ammonium nitrate fuel oil (ANFO) is a granular solid used as a blasting explosive in metalliferous mining. Compressed air is used to propel ANFO from a kettle by way of flexible hosing to drill holes within rock.

I recently treated a miner who accidentally inhaled ANFO when the hose he was using to charge a face slipped out of a drill hole. He described the plume as consisting principally of vapour rather than dust as the kettle was almost empty at the time. He was not wearing a respirator. He experienced irritation of the eyes and throat, headache, nausea, chest tightness, cough, shortness of breath, and wheeze. The occupational health nurse who responded to the emergency call out recorded a respiratory rate of 20 and a blood pressure of 135/100. She administered oxygen and nebulised salbutamol, and then irrigated his eyes. These measures resulted in symptom relief. The miner then returned to see me 15 hours later with a recurrence of his respiratory symptoms. He was 40 years old and a current smoker, with no history of asthma or atopy. Examination showed widespread rhonchi but no cyanosis. His respiratory symptoms and rhonchi were relieved by nebulised salbutamol on three further occasions before complete resolution 46 hours after exposure. The peak expiratory flow rate varied between 610 and 690 l/min during this period. Spirometry results three weeks after the exposure were similar to those obtained during health surveillance four years earlier.

The safety data sheet for ANFO indicates a composition of 94% ammonium nitrate and 6% hydrocarbon solvent fuel oil. It is possible that the irritant features found in this case were due to either or both of these components. Because the inhalation occurred before any explosions took place, there would have been no concomitant exposure to nitrogen dioxide. The absence of cyanosis and hypotension suggests there was no significant systemic nitrate toxicity, although methaemoglobin.

was not measured directly.¹ Chronic respiratory sequelae such as bronchitis obliterans were not found. I am not aware of a previous report of ANFO inhalation.

A MICHAEL DONOGHUE
The Medical Centre, Mount Isa Mines Limited,
Mount Isa, Queensland 4825, Australia

1 Harrison RJ. Nitrates: nitroglycerin and ethylene glycol dinitrate. In: LaDou J, ed. *Occupational medicine*. Norwalk: Appleton and Lange, 1990;342-43.

Effects of acute exposure to ultrahigh radiofrequency radiation on three antenna engineers

EDITOR.—Schilling¹ reports the health problems of three men overexposed to ultrahigh frequency (UHF) TV radiation (785 MHz, >20 mW/cm² for 1-3 minutes). Their symptoms included immediate sensations of heating and pain, and later erythema lasting a few days. Two had diarrhoea for one to three days. Subsequently all three had headaches, dysaesthesia, lassitude, and loss of stamina which slowly improved over some three years. Detailed reports of overexposure are helpful

in understanding the effects of radiofrequency radiation on humans so I would like to make the following observations.

There is no comment about eye examinations yet induction of (posterior subcapsular) cataract has been well documented in animals exposed to UHF or microwave frequencies usually in excess of 100 mW/cm².² Any findings, even negative ones, would be of interest given the anatomical differences between animal and human eyes and hence their likely differences in interaction with these wavelengths.

The persistent symptoms of lassitude, fatigue, and headache are of note in view of the debate about a condition called "microwave sickness" (or neurasthenic syndrome) in east European publications and regarded with scepticism by some western authorities.³ The symptoms include headaches, sleep disturbances, weakness, impotence, chest pains, and poorly defined feelings of illness. There may also be changes in blood pressure and pulse rate. Schilling's detailed report gives substance to the existence of microwave sickness and shows that it should not be dismissed as depression or hypochondriasis or post-traumatic stress disorder. The onset of diarrhoea in two of the men is suggested by Schilling to be due to heating of the bowel. However, the abdomen was largely shielded by the skip so I suggest that it was due to stimulation of the autonomic nervous system passing through the neck, which is similar to the mechanism postulated for other visceral effects—such as on the heart.

It is interesting that the men had persistent headaches and dysaesthesias after exposure to their upper body. I have reported a series of people who develop unpleasant, burning sensations on the side of the head when using a mobile phone (900 MHz) suggesting that lower level exposures may have similar effects on some people.⁴ It is postulated that the A delta (pain) and C (sympathetic) nerves produce these diverse effects and are susceptible to certain combinations of wavelengths and modulations.

B HOCKING
Consultant in Occupational Medicine, 9 Tyrone St
Camberwell Victoria, Australia 3124

- Schilling C. Effects of acute exposure to ultrahigh radiofrequency radiation on three antenna engineers. *Occup Environ Med* 1997;54:281-4.
- Michaelson S, Elson E. Interaction of non-modulated and pulse modulated radiofrequency fields with living matter. In: Polk C, Postow E, eds. *Handbook of biological effects of electromagnetic fields*. Boca Raton: CRC Press, 1996:11.
- Hill D. Human studies. In: Elder J, Cahill D, eds. *Biological effects of radiofrequency radiation*. US EPA, 1984;5:10. (EPA-600/8-83-026F.)
- Hocking B. Symptoms associated with mobile phone use. Presented at the Annual Scientific Meeting of the Royal Australasian College of Physicians. Auckland, New Zealand: RACP, 1997.

Author's reply—I welcome the interest and comments from Hocking regarding my recent case report. Man A and man B, the two who were likely to have had the greatest exposure on the basis of their symptoms and signs and their position in relation to the antenna, had full ophthalmological examinations within a few months of the incident and no abnormalities were reported. As a result of Hocking's enquiry I am arranging for them to have follow up examinations in the near future.

Hocking suggests that the abdomen was largely shielded by "the skip". The skip was about 1 m deep and the edge of it was about at waist level. The three men were winched

up to the live antenna panel and as they were winched up the skip tipped as it caught on the structure supporting the antenna panel so that it reached an angle of perhaps greater than 30°. Two men had to lean forward to free the skip from the transmission mast. As a result of this the abdomen above the waist and thus a substantial proportion of the large bowel is likely to have been exposed to radiofrequency radiation. I am, however, most interested in the suggestion that the diarrhoea may have been the result of stimulation of the autonomic nervous system passing through the neck.

C J SCHILLING
Consultant in Occupational Health, 4 Albion Square,
London E8 4ES, UK

Correspondence to: Dr CJ Schilling, Consultant in Occupational Health, 4 Albion Square, London E8 4ES, UK. Tel/Fax: 0044 171 254 0169.

NOTICES

International Symposium: From Protection to Promotion: Occupational Health and Safety in Small Scale Enterprises. 4-6 May 1998. Helsinki, Finland.

Topics:

- A global overview of small scale enterprises (SSE) in employment and national economies
- The present situation in occupational and health and safety in SSEs (situation analysis)
- Regulation, enforcement, and inspection
- Occupational health and safety services and other services
- Strategies and approaches for the prevention and solving of occupational health and safety problems in SSEs
- Interventions and case reports on actions at the workplace level
- Competence and skills of the personnel in SSEs
- Economic impact on occupational health and safety in SSEs
- Future challenges.

Contact:

Ms Anneli Vartio, Topeliuksenkatu 41 a A, FIN-00250 Helsinki, Finland. Tel: 00358 9 4747 354; Fax: 00358 9 4747 548; Email: anneli.vartio@occuphealth.fi; Internet: http://www.occuphealth.fi/eng/project/small

International Symposium: Good Occupational Health Practice and Evaluation of Occupational Health Services. 8-10 June 1998. Hanasaari Cultural Centre, Espoo, Finland.

Topics:

- Good occupational health practice, focusing on workplace evaluation and systems evaluation
- Evaluation
- Future perspectives
- Other topics related to good occupational health practice and occupational health service evaluation.

Contact:

Ms Inkeri Haataja, Finnish Institute of Occupational Health, Topeliuksenkatu 41 a A, FIN-00250 Helsinki, Finland. Tel: 00358 9 4747 470; Fax: 00358 9 4747 548; Email: Inkeri.Haataja@occuphealth.fi; Internet: http://www.occuphealth.fi/eng/project/gohp