that the husbands of alcoholic women were more likely to leave their wives than were the wives of alcoholic men to leave their husbands. This is of great importance because it means that a high percentage of our patients have a degree of background stability.

The high incidence of patients in the higher social classes is in part a feature of population selection because of the location of the RFH in Hampstead, London. Men in the higher social classes also often undertake private medical insurance examinations so that there is a high "pick-up" rate of asymptomatic alcoholics from this group. The high incidence of a positive family history accords with that found in many other series. Nylander,¹² for example, showed that sons of alcoholics have a much higher incidence of alcoholism than other men of the same age. Differences in the type of beverage consumed reflect social conventions. Women generally do not drink beer but favour fortified wines, gin, or vodka. Men prefer beer, whisky, or brandy. Cost also determines the beverage chosen, and availability is important. Many women who would previously not have visited an off-licence will quite happily buy alcohol from the supermarket with the family shopping.

The length of history and the age at presentation were similar for both sexes. Women presented with more established disease, which suggests that they develop cirrhosis after a shorter period of alcohol abuse. Caroli and Pequignot,² found that women developed cirrhosis at a lower level of alcohol intake than men. Wilkinson *et al*³ in Melbourne found alcoholic cirrhosis twice as often in women. The women had a shorter history of alcohol abuse and this suggested that they were more susceptible to alcoholic liver damage.

Of the patients with alcoholic cirrhosis, five of the men but none of the women developed primary liver cell cancer. Lee¹³ found that the incidence of primary liver cell cancer was highest among patients who had given up alcohol and who had developed a coarsely nodular cirrhosis. He suggested that women often continued drinking until death and so the cirrhosis remained micronodular. This explained their low risk of developing primary liver cell cancer. In our series three of the five men who developed this tumour had given up alcohol several years ago. In contrast to the findings of Wilkinson *et al*,¹⁴ and of Brunt⁴ there was a much higher incidence of other alcohol-related disorders among women. The female alcoholic appears more

susceptible not only to liver damage but also to other types of alcohol-related physical injury.

The age at death and the mortality rates were similar for both sexes, confirming the results of Powell and Klatskin,⁵ and Brunt.⁴ Others have shown that women die from alcoholic liver disease at a younger age than men.¹⁶ Women alcoholics are generally regarded as more difficult to treat than men, and this is supported by the significantly higher number who continued to abuse alcohol. Many of these women were bored and lonely housewives without a career, who return after discharge from hospital to an environment in which they are largely unsupervised. Efforts must be made to find these women employment, if only voluntary, to take them out of their home environment.

Our findings suggest that women are more susceptible to alcohol-related diseases, particularly liver disease. Their condition is less easily diagnosed and more difficult to treat. Early diagnosis of alcoholism is of utmost importance. More vigilance and a higher degree of suspicion of possible alcohol abuse among female patients is needed.

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Anaesthetic waste gas scavenging systems

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Summary

The Department of Health and Social Security has recently recommended that waste anaesthetic scavenging systems should be installed to reduce pollution in operating theatres. Three passive and two active systems were

compared to see how effectively they reduced concentrations of halothane in the atmosphere. All five systems reduced halothane levels significantly, the combination of an active system and semiclosed circuitry being the most effective. All obvious leaks from equipment were controlled in this study, but normally such leaks contribute significantly to atmospheric pollution. Some of the benefits of a scavenging system may be lost if gases can still escape through leaks.

Introduction

Various epidemiological studies have suggested an association between atmospheric pollution by anaesthetic gases and vapours and toxic effects in operating theatre staff.¹⁻⁴ Volatile and gaseous agents are an integral part of general anaesthesia, and waste gases escape into the atmosphere of the operating area. Although leaks may occur from anaesthetic apparatus and

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Atmospheric pollution with halothane

	No scavenging	Passive systems			Active systems			
		Enderby valve	Penlon-Papworth system	Coaxial circuit with Penlon valve	BOC with open circuit	BOC with semiclosed circuit	Draeger with open circuit	Draeger with semiclosed circuit
Halothane level before session (ppm)	0	0.5	0	0	0	0	0	0
Mean ($\pm$ SE of mean) halothane level during session (ppm)	18.9 $\pm$ 1.26	4.6 $\pm$ 0.34	3.4 $\pm$ 0.42	1.9 $\pm$ 0.14	4.0 $\pm$ 0.32	1.0 $\pm$ 0.09	5.3 $\pm$ 0.41	0.5 $\pm$ 0.14
No of measurements	135	70	100	185	110	145	175	75
Significance of reduction in pollution (P)		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

during filling of vapourisers, the major leakage occurs from the expiratory valve of the anaesthetic circuit in use. Attention has, therefore, focused on scavenging systems that will reduce pollution arising from this source. Various recommendations on types of scavenging systems and "acceptable" levels of pollution have been published.⁵⁻⁷

The evidence linking pollution to toxicity is entirely circumstantial,⁸ however, and no threshold for exposure or specificity for a particular agent has been established. Nevertheless, a recent American report⁶ recommended that atmospheric levels of halothane and nitrous oxide (the most commonly used inhalation anaesthetic agents) should be below 1 part per million (ppm) and 30 ppm respectively and further stated that these levels could be achieved with currently available scavenging devices.

We therefore undertook a study to assess commercially available waste gas scavenging systems. We measured halothane levels,⁹ and we assumed that other pollutants follow a similar pattern.

Methods

The scavenging devices studied were of two sorts—passive, in which the patient's respiratory effort drove the waste gases along the scavenging system, and active, where a remote air pump provided the driving force and waste gases were actively extracted.

The passive systems studied were: the Enderby collecting valve,¹⁰ the Papworth block and Penlon collecting valve,¹¹ and the Bain coaxial circuit.^{12,13} In each system waste gases were ducted to a wall exit point using plastic tubing impervious to anaesthetic agents. The two active systems were manufactured by the British Oxygen Company (BOC) and Draeger. The BOC system ducted expired gases via a collection valve and tube to a reservoir (water capacity 1½ litres). A remote diaphragm-type pump producing a withdrawal flow rate of 25 l/min continuously evacuated the reservoir. The scavenging flow rate with the Draeger system was 40 l/min (though higher figures are possible) produced by a compressor and Venturi. Unlike the BOC device this system had no reservoir. Direct transmission of negative pressure to the patient's circuit was prevented by a ring of perforations in the terminal sleeve of the ducting tubing at the point of attachment to the anaesthetic apparatus.

The scavenging systems were used during general anaesthetic sessions for gynaecological surgery in an operating theatre (size 6 m × 5 m, 10 air changes per hour, and ventilation rate 10 000 l/min) at the National Temperance Hospital.

The three passive systems and the BOC system were used with a BOC Boyles anaesthetic machine delivering oxygen and nitrous oxide via an open circuit with halothane 1-1.5% from a Fluotec mark 3 vapouriser.

The active systems were assessed using two types of anaesthetic circuitry. The open circuit was a high-flow system (8 l/min) with a continuous supply of fresh gases and no recirculation. The semiclosed circuit was a circle system with CO₂ absorption and a flow rate of 3 l/min with a vapouriser outside the circuit. The Draeger system was used with a Draeger anaesthetic machine with its own halothane vapouriser (1-1.5%) and circle absorber.

All patients were intubated, and when intermittent positive pressure ventilation (IPPV) was required this was provided by a Manley ventilator (for open circuits), by a Pneupac (for coaxial systems), or manually (for semiclosed circuits).

Halothane (ppm) was measured in the atmosphere using a Leak-

meter (Analytical Instruments).⁹ Sampling was carried out around the anaesthetic machine and operating table before starting anaesthesia and every 15 minutes during operating sessions. Five constant sampling sites were used at a height of 1 m from the floor. Four sites were situated 30 cm from each side of the anaesthetic machine and the fifth at the foot of the operating table. The study was conducted over 12 three-hour sessions. Student's *t* test for paired data was used for statistical analysis of the results.

Results

The results are shown in the table. The average halothane pollution without any scavenging system was about 18 ppm. All the devices tested significantly reduced pollution (*P* < 0.001). The most effective systems proved to be the active ones used in conjunction with semiclosed circuits and the coaxial circuit.

Discussion

All the systems studied will significantly reduce the pollution of the atmosphere in the operating theatre, although leaks from anaesthetic apparatus, especially during IPPV, greatly contributed to the overall level of contamination. Differences in the effectiveness of the individual systems seemed to be related to the quality of the manufacture—for example, of leakproof joints—and design, especially their ability to cope with high flow rates of expired gases. The degree of pollution caused by leakage was significantly reduced in those systems in which low fresh gas flow rates were used.

During this study the levels of halothane in the operating theatre were continuously monitored throughout each session and all obvious leaks were controlled where possible. Normally this control would not be possible and staff may still be exposed to pollution resulting from leaks even though waste gas scavenging systems are in use. Contamination of the atmosphere during the induction of anaesthesia, as a result of refilling vapourisers and from patients' expired air during recovery, will also add to the problem. Clearly considerable attention to detail and some form of monitoring is required to maintain a low degree of contamination. A false sense of security engendered by attaching an impressive piece of equipment to the exhaust valve must be avoided.

Nevertheless, installing one of these devices is a positive step in reducing pollution, though one which may imply changes in techniques and necessitate extra capital expenditure at a difficult time.

Certain areas—for example, dental surgeries—are not really suitable for such systems, and clearly further development is needed. More efficient air conditioning, multichannel scavenging, and high-flow extraction from the region of the anaesthetic machine seem promising.

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FOR DEBATE . . .

Breakfast and Crohn's disease

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Summary

The breakfast habits in adult life of 34 patients with Crohn's disease were compared with those of 68 matched controls. Cornflakes were being eaten at least weekly by 23 of the patients (67.6%) at the time that their symptoms began, compared with 17 (25%) of the controls at the corresponding time. Only one of the 34 patients had not eaten cornflakes at all, compared with half of the controls. A significant but weaker association was found between Crohn's disease and the eating of wheat cereals. However, in both patients and controls the taking of cornflakes and of wheat cereals were correlated, and the observed preponderance of wheat eating among the patients was almost entirely ascribable to this association of habits.

Eating of rice cereals and of porridge was not associated with Crohn's disease, though it was correlated with eating cornflakes. There was an excess of bran eaters among the *propositi*, but this, too, was attributable to their being also cornflake eaters. Other breakfast foods were taken with equal frequency, and omission of breakfast was equally common. Six of the 68 controls, but none of the patients, ate cornflakes later in the day but not at breakfast.

The results need confirmation. There was no evidence that bias could have caused the correlation found. The association of Crohn's disease with the eating of cornflakes is strong and unlikely to be indirect. Variable digestive secretory behaviour after waking may play a part in determining susceptibility to Crohn's disease.

Introduction

While the incidence¹ of Crohn's disease increases rapidly its cause remains unknown. Although foodstuffs seem possible causal agents none has been identified as such.² I describe an investigation of breakfast habits, which was begun on the

assumption that food taken on a completely empty stomach is more likely to reach the areas usually affected by the disease. The habits of patients with Crohn's disease were compared with those of matched controls.

Patients and controls

The patients were 16 men and 18 women, and all were patients of Hillingdon Hospital or of Hayes Cottage Hospital. Their ages ranged from 19 to 64 years (mean 37.17 years; SD 12.82). The diagnosis was confirmed by radiography in all, and acceptance for the series preceded dietary inquiry. The small intestine alone was involved in 16, the large alone in 7, and both in 11. Nineteen had had resections, three more than once.

There were 68 controls, two for each *propositus*. They, too, were patients of the hospitals. Each was of the same sex as the corresponding *propositus*, and within 11% of his age; the mean age of the controls was 37.29 years (SD 12.93). They were being treated for a wide variety of conditions and had had no major gastrointestinal symptoms. All but six resided in the same area as the *propositi*.

THE INQUIRY

The questioning was done by me and the study was not, therefore, a blind one. I asked each subject whether he ate breakfast and then specifically about each of a list of foodstuffs. The patients were asked about their habits up to the time of onset of their symptoms, and the controls up to the corresponding time. A form was used that tabulated the foodstuffs on one axis and the frequencies with which they were eaten on the other; a reply was recorded in respect of each food.

The foodstuffs listed were: breakfast foods in general; cornflakes; wheat cereals (shredded wheat and wheat biscuits were not distinguished); rice cereal (rice enriched with wheat gluten was classified as rice; no patient professed to eat other mixtures); bran; oats or porridge (all types of porridge preparations were classified together); muesli; toast; egg; fried foods; milk taken alone. The frequencies recorded were: daily; at least once a week; monthly; rarely; at weekends; on holiday; never. When a habit had been adopted or abandoned the fact and the date were noted. The subjects were also asked whether they ate cereals at meals other than breakfast.

The results were subsequently classified as follows: regularly (daily, at least once a week, and at weekends), or otherwise (monthly, rarely, and never). In some tables the categories of daily or never were shown. The replies tabulated referred to the period until symptoms began. Few subjects could recall their habits before they left school. Three patients had developed their symptoms before school leaving age (at ages 11½, 14, and 15½ respectively) and were able to remember their previous eating habits; otherwise the inquiry related to adult life only.

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