

hygiene, foot care, vision, and dentition.<sup>14</sup> In the elderly—as in other age groups—there is little place for screening for asymptomatic disease.<sup>15</sup> An exception might be the identification and careful treatment of patients up to the age of 80.<sup>16</sup>

If screening programmes are to have any impact it is important that identification of problems is followed by action. General practitioners, for example, will have to have facilities for evaluating or referring patients who are identified as having visual or hearing defects and give attention to using effective instruments for differentiating dementia from depression in patients with psychiatric abnormalities.<sup>17</sup> Moreover, screening will probably further highlight deficiencies in the local provision of geriatric, psychiatric, social work, and ancillary services. Though doubts remain about the value of recent legislation, it should at least focus attention on the needs of the elderly and stimulate debate on how best to improve their quality of care.

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## High street eye tests

### *Payments are deterring the elderly and blindness will increase*

The government abolished routine free eye testing from 1 April 1989, hoping to save an estimated £70 million a year or 0.35% of the annual budget for the NHS (Department of Health, personal communication). A recent survey has shown a 30% fall in the number of people going to high street optometrists for eye examinations.<sup>1,2</sup> As a result an estimated 135 000 fewer patients will have been referred to general practitioners and ultimately to hospital eye services. This estimate is based on an average referral rate from optometrists to general practitioners of 4.5% (British College of Optometrists, personal communication) and uses the annual number of eye tests for 1987-8—that is, 13.48 million.<sup>1</sup> The reduction in the number of eye tests reported by the survey may in part be owing to the large number of people going for a test before the deadline. It is unlikely, however, that this accounts for the entire 30% decline as there was only a 7% increase in the total number of eye tests during 1988-9 over the previous year.<sup>1</sup> Even though there is no accurate estimate of the age of the people not being tested, the clinical impression is that elderly people have been deterred most. This is particularly worrying as the two most common causes of blindness—age related macular degeneration and glaucoma—are most prevalent in the elderly.

Age related macular degeneration accounts for 30-40% of all new registrations for blindness.<sup>3,4</sup> Around one third of all of the over 75s are affected with some form of the condition.<sup>5</sup> The recent introduction of laser treatment for subretinal neovascular membrane—the more devastating form of the disease—has reduced the risk of severe loss of vision,<sup>6</sup> and the better the visual acuity at the time the subretinal neovascular membrane is discovered the more likely the treatment is to be successful.<sup>7</sup> A recent survey at Leicester Royal Infirmary showed that half of the patients with treatable subretinal neovascular membranes were referred to the eye clinic after routine eye testing by optometrists (M Acar, personal communication).

Open angle glaucoma is the second most common cause of registrable blindness in Britain and accounts for 10-15% of all

new registrations.<sup>3,4</sup> Age and family history are the two most important risk factors,<sup>8</sup> and around 7% of the over 75s are affected.<sup>5</sup> Again, the earlier the diagnosis is made the more effective is the treatment in slowing down or stopping the irreversible loss of visual field.<sup>9</sup> Surveys have shown that opticians refer nearly three quarters of new cases of open angle glaucoma seen in the hospital eye service.<sup>10</sup>

The fundamental objection to payment for routine eye testing is that it is a breach of the principle of free access to primary health care. Under the NHS the British public has a right to screening for conditions that cause blindness—just as they do for screening for other conditions with a high morbidity or mortality such as cervical cancer, breast cancer, raised serum cholesterol concentration, and hypertension. It would be unthinkable to ask patients to pay for their blood pressure to be measured or for cervical smear testing. The recent reforms of the NHS claim to place greater emphasis on preventive medicine. It is therefore inconsistent as well as morally wrong to charge for eye tests.

In Canada in August 1987 the eye examination was removed from the Alberta health insurance scheme for people between the ages of 19 and 64. The demand for eye examinations then dropped by between 30% and 40%. On 1 July 1988, the government of Alberta restored the eye examination to their health insurance scheme—because of public pressure and the worry that blinding disorders were going undetected (British College of Optometrists, personal communication). The British government should follow suit; it should abolish the misguided policy of private fees for eye testing as soon as possible. If the Department of Health waits three to five years to see if the predicted increase in registrable blindness occurs then it will be entirely to blame for the resulting suffering and human misery.

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## Regular Review

# The challenge of fire effluents

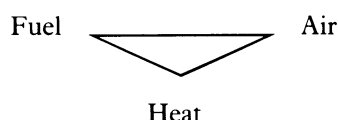
## Poisonous gases are potential killers

In the seventeenth and eighteenth centuries all flammable materials were thought to contain the substance "phlogiston," which escaped by the process of combustion.<sup>1</sup> After Lavoisier's discovery of the process of oxidation the phlogiston theory became "the swan song of alchemy."<sup>2</sup> Nevertheless, the emphasis on phlogiston as the "Feuergeist" (the spirit of fire) may be said to have paved the way for the recent recognition of the harmful effects of fire effluents.<sup>3</sup> Fire research and fire science are providing a firm basis for a specific study of fire toxicology.<sup>4</sup>

Experience from prehistoric forest fires, through the mediaeval conflagrations of entire cities, to present day disasters such as the fire on the oil platform Piper Alpha or the huge gas explosion in the Urals has taught man that his ancient and lifelong companion allows poor chances for survival. Study of this hostile environment has shown that flame contact and burns have not been, as would be expected, the only or even the major cause of injury and death. Man is genetically prepared for heat perception, and thermal injury should occur only in the inescapably close proximity of fire. In 1985 at the Bradford City Football Club ground 56 people died after being trapped in contact with heat "so intense that clothing and skin were burned in seconds."<sup>5</sup> Nearly all of the 96 victims in the Dupont Plaza Hotel in Puerto Rico in 1986 lost their lives because of heat and flames.<sup>6</sup> These were, however, unusual fires. The more common pattern was seen in the MGM Grand Hotel fire in Las Vegas in 1980 when 86 people died, yet only two as a result of burns. All of the others died after smoke inhalation, for the most part in rooms or corridors many levels above the fire itself.<sup>6</sup> Of the 560 people admitted to hospital with respiratory complaints, none had burns.<sup>7</sup> In an analysis of causes of death in 530 fire victims reported by Birky and Clarke 11% of deaths were related to burns and 89% to "inhalation of toxic smoke and hot gases."<sup>8</sup> Many other examples are found in fire journals. Yet medical practice has not yet come to terms with the fact that so many fire victims succumb to the effects of chemical fire products.

### The toxic fire triangle

Some understanding of the physical and chemical mechanisms of fire is essential as a basis for fire toxicology. The fire phenomenon is traditionally portrayed as a triangle consisting of the three components: fuel, air, and heat.<sup>9</sup>



If any of the components of the triangle is absent or fades out the fire cannot continue. Alterations in the supply of these components account for the diversity in the size, shape, spread or growth, rapidity, duration, even the colour of a fire—and most of all the toxicity of its effluents. It is, however, the fuel that is most decisive for fire toxicity.<sup>10</sup> During the past few decades man has changed his way of life—and the "fuel" in the triangle. He has become less dependent on natural polymers such as wood, the traditional fuel of our ancestors, and has made more and more use of synthetic polymers in his plastic empire.

Effluents from fires fuelled by synthetic polymers are more toxic than those from traditional fires.<sup>11</sup> Clarke *et al* found that a gradual increase in the number of fire victims in Britain parallels the increasing use of synthetic polymers.<sup>12</sup> Between 1971 and 1981 the yearly total in Britain of deaths in people who had been overcome by gaseous effluents from fires rose from 381 to 572.<sup>13</sup> The increase in the total number of victims (with fatal or non-fatal injuries) was more than tripled: the number was 659 in 1971 compared with 2331 in 1981. Furthermore the figures quoted in fire statistics are often an underestimate as many fires and therefore many patients with non-fatal injuries go unrecorded.<sup>13</sup> Even deaths due to toxic fire effluents may not be recognised as such if considerably delayed.

### Oxidative and pyrolytic decomposition

Fire effluents are produced by two thermal decomposition processes: combustion—as oxidative degradation—and pyrolysis. When there is sufficient oxygen to support a fire the oxidative degradation products are mostly carbon dioxide and carbon monoxide (practically all fuels contain carbon). Their ratio depends on the amount of oxygen available at the site of combustion. In some fires oxygen may be consumed faster than it can be supplied, and the effluents contain more carbon monoxide and more particulate matter (soot). The smoke (the visible component of effluents) becomes dense and very hazardous. By contrast, in a well ventilated fire with oxygen in excess combustion is complete. The final effluents consist of quite innocuous ingredients—carbon dioxide and water vapour—and no smoke is emitted. Many natural materials (leather, furs, cereals) contain nitrogen, and so when burnt give off nitrogen oxides, and sulphur, which oxidizes to sulphur dioxide and sulphur trioxide. Nevertheless, at least 85% of all fire deaths not due to burns are thought to be attributable to carbon monoxide.<sup>14</sup>

Pyrolysis is a non-oxidation chemical reaction that may intensify as the fire progresses when the available oxygen is