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CASE REPORT

Death from diesel fumes

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SUMMARY. A rare fatality from inhalation of diesel motor exhaust fumes is reported and the toxicity of diesel fumes is discussed briefly.

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INTRODUCTION

The highly toxic effects of exhaust fumes from petrol-driven internal combustion engines are well known. Suicide by piping such exhaust fumes into cars with their engines running is a common method of suicide, especially among males. The main fatally toxic component is carbon monoxide, which has up to 200 times the affinity for binding with haemoglobin than oxygen. The resulting compound, carboxyhaemoglobin, is extremely stable and prevents oxygen from combining with haemoglobin. This, in turn, leads to death from acute anoxia. There is a popular belief that diesel emissions are safer, since little carbon monoxide is produced by these engines. It has been suggested that introduction of exhaust-emission controls would have a reductive effect on these suicide rates.[1]

The present case illustrates the potential danger of diesel engines. The products of combustion from diesel engines contain both gaseous and particulate materials. The gaseous constituents are mainly oxides of nitrogen, sulphur and small amounts of carbon monoxide.[2] The particulate matter contains fine particles of soot along with a large number of chemicals, both inorganic and organic, carried by the soot particles.[3] These components are not usually acutely toxic, but have chronic toxic effects including respiratory disease and carcinogenic properties. However, acute toxicity leading to death does not appear to have been reported.

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CASE REPORT

An 83-year-old man was found dead in his Ford saloon car fitted with a diesel engine with the windows tightly closed. There was a hose pipe connected to the interior of the car from the exhaust. It was not known how long he had been in the car, but he appeared to have been dead for about 24–48 h. The interior of the car was heavily stained with soot mixed with oily material. Postmortem examination revealed a well-nourished male 171 cm tall, and weighing 71 kg. There was marked putrefactive skin slip along with putrefactive change present in all the organs. His heart weighed 360 g and had narrowing of the smaller branches of the coronary arteries along with scattered foci of myocardial fibrosis, indicative of ischaemic heart disease. The pleural cavities contained a few ml of blackish fluid owing to putrefaction. The trachea and the main bronchi, along with small bronchi, were thickly coated with soot. The right lung weighed 625 g and the left 600 g. They were intensely congested and oedematous, almost to the point of being jelly-like in consistency. Thick beads of black oily mucoid material were expressed from the cut ends of the small bronchi. The liver showed fatty mottling; the other organs were normal. Microscopic examination revealed that the bronchi and alveoli contained large amounts of small spherical black particles, consistent with aggregates of soot, oily material and mucus. The myocardium showed scattered areas of focal fibrosis and marked narrowing of the coronary arteries. The liver showed a moderate degree of fatty change consistent with a degree of alcohol abuse. Subsequent inquiries confirmed that he had been rather partial to alcohol. Toxicological analysis showed no significant amount of carbon monoxide (less than 5% saturation), and

173 n of temazepam/ml blood, which was within the range of concentrations found during therapeutic use of this drug. The laboratory report made no reference to the presence or absence of any other chemicals. There was no alcohol present. Death was due to inhalation of soot from diesel fumes accelerated by ischaemic heart disease.

DISCUSSION

The advent of catalytic converters that convert carbon monoxide to relatively non-toxic carbon dioxide has reduced the major acutely toxic element, i.e. carbon monoxide, from motor vehicle emissions. Failed suicide attempts from cars equipped with catalytic converters have been reported,[4] but not fatalities. There is now an apparent progressive increase in diesel-driven motor vehicles in all forms of road transportation throughout the UK. Diesel or DERV is a commonly-used fuel and it is believed to be safer than petrol. However, their emissions are potentially toxic. Diesel engines emit more than twice the amount of sulphur dioxide than that contained in petrol emissions; they also emit 14 times the amount of black smoke, i.e. particulate materials, than of petrol engines. Diesel emissions contain marginally more nitrogen dioxide than petrol. Petrol, however, creates 28 times more carbon monoxide than diesel.[1] A detailed discussion on the toxic potentials of these materials on the environment are beyond the scope of this paper. Both fuels can cause acute toxicity by the inhalation of substantial quantities of their emissions. Whereas petrol engines cause death by carbon-monoxide poisoning, diesel fumes cause death by blocking the air passages with soot and other material in the emissions. The absorption is increased owing to the prolonged exposure to the soot particles in the alveoli. This process would take substantially more time. Death would have been accelerated by the effect of anoxia on the pre-existing ischaemic heart disease.

The air passages of all sizes in the present case contained what appeared to be copious quantities of soot mixed with oil droplets. In an environment of uncontrolled diesel emissions, there would be no doubt that these copious quantities of soot, carrying substantial amounts of potentially toxic chemicals, will undoubtedly be deposited in the air passages. Since this particulate soot would carry large numbers of different chemical compounds, the expected effect on the population at risk would be to cause a high increase of morbidity and mortality. Soot not being biologically degradable, will accumulate in the lung and facilitate the absorption of these potentially harmful chemicals.

Even this so-called safe fuel is, therefore, not exempt from causing death if abused. Legislation for control of emissions should involve not only petrol emissions, but also include diesel. These pollution controls should include not only the carbon monoxide reduction (i.e. catalytic converters), but also methods of reducing soot emission. This would undoubtedly reduce acute toxic effects as well as the more important chronic adverse effects. The reductive effect of such preventative measures on social and health costs will no doubt be substantial.

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