



## **COMMITTEE ON CARCINOGENICITY OF CHEMICALS IN FOOD, CONSUMER PRODUCTS AND THE ENVIRONMENT**

### **NON-TECHNICAL SUMMARY**

#### **STATEMENT ON THE REVIEW OF THE POSSIBLE ASSOCIATIONS BETWEEN CHILDHOOD LEUKAEMIA AND RESIDENCE NEAR SOURCES OF TRAFFIC EXHAUST AND PETROL FUMES**

##### **Background to review**

1. Air pollution from motor vehicles has increased over the past 45 years due to the rise in the number of motor vehicles on the roads. Motor vehicles release both engine exhaust and petrol vapour and both of these contribute to air pollution in urban and rural areas. Engine exhaust is produced from the combustion of motor fuel and high levels can accumulate along busy roads. Petrol vapour is produced when motor fuel evaporates from the hot engines and fuel tanks of parked or moving cars. Therefore, high air concentrations of petrol vapour tend to accumulate in places such as petrol stations and garages.
2. Many of the chemicals present in these vehicle emissions are potentially toxic and could cause damage to health. Engine exhaust contains many different chemicals, some of which have been shown to cause cancer in laboratory animals. It is possible that traffic exhaust could cause cancer in humans. One of the chemicals found in both petrol and traffic exhaust is benzene. Some adults working in an environment where there is a high concentration of benzene in the air have developed a type of leukaemia called Acute Myeloid Leukaemia (AML). The rate of leukaemia in children is growing and concerns have been raised about whether the increase in childhood leukaemia could be a consequence of living near high traffic areas.
3. The Committee was asked by the Department of Health's Air Pollution Unit to review information from three studies which reported a possible link between living near to petrol stations and garages and road traffic exhaust fumes, and childhood leukaemia. The Committee considered these studies (<http://www.advisorybodies.doh.gov.uk/pdfs/cc0437.pdf>) at the November 2004 COC meeting, but was unable to reach a firm conclusion. The Committee asked the secretariat to prepare a paper which collated all the available studies on this issue and reviewed this information in 2005.

##### **Childhood leukaemia: current perspectives**

4. Although cancer is a very rare disease in children, many different types of cancer can occur during childhood. In the developed world, leukaemia is the most common type and, in the UK, the proportion of children with leukaemia is increasing. Two main types of leukaemia are known to occur in children;

these are Acute Lymphoblastic Leukaemia (ALL) and Acute Myelogenous Leukaemia (AML) ALL is the most common type of leukaemia in children.

5. A small number of risk factors<sup>1</sup> is generally accepted to be associated with ALL. These include various inherited conditions and exposure to radiation in certain situations. However, only a small percentage of leukaemia cases are thought to be related to these known risk factors.
6. The Committee first reviewed the possible chemical causes of leukaemia in children in 2004, as part of a larger exercise to examine the evidence for chemicals as a cause of cancer during childhood (see <http://www.advisorybodies.doh.gov.uk/pdfs/cc0431.pdf>). Exposure to motor vehicle emissions was briefly considered.

### Petrol and diesel fuel

7. Petrol and diesel fuel are generally used to power vehicle engines. Diesel fuel produces more energy than petrol and is therefore used for heavy-duty applications such as buses and lorries. Petrol is mainly used as a light fuel in cars and motorbikes. Diesel fuel is a much more viscous fluid than petrol and so is less likely to evaporate. Therefore, the likelihood of being exposed to diesel vapour is low and little information is available on the risk of inhaling diesel fumes. This contrasts with the large amount of information available on public exposure to petrol vapour and to benzene.

### Inhalation of petrol vapour

8. A recent study<sup>2</sup> was carried out to try and estimate the amount of petrol vapour inhaled after (i) a typical visit to a service station, (ii) driving in a car and (iii) staying at home. The study compared the levels of petrol vapour likely to be absorbed into the body in children and adults for each of the situations described above. It found that children absorbed higher levels of petrol vapour than adults, on a body weight basis, in each of these situations. The highest estimated airborne exposures to petrol vapour occurred whilst the child was at home. This is because children spend a large amount of time indoors compared to the time spent travelling in cars or visiting service stations.

### Exposure to benzene in the air

9. The level of benzene in the air is reported to be much higher inside the home than outside<sup>3</sup>, especially in those households with an attached garage. This is partly because benzene is also emitted from sources other than fuel, such as building and furnishing materials, environmental tobacco smoke, particleboard furniture, floor adhesives and paints. Research has shown that children are likely to have higher intakes of benzene compared to adults from all sources, as well as from petrol vapour alone. Staying indoors produces the highest

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<sup>1</sup> A risk factor is a factor associated with an increase in the risk of getting a disease

<sup>2</sup> Report produced by The Oil Companies' European Organisation for Environment, Health and Safety (CONCAWE)

<sup>3</sup> Outdoor benzene levels do increase with increasing proximity to parked or moving traffic.

levels of exposure to benzene in children due to the amount of time spent inside and the different sources of benzene present inside the home.

10. On the basis of the available information, the Committee concluded that children could receive higher exposures to benzene and petrol vapour inside the home than outside. The Committee suggested that further work should be carried out to investigate the significance to health of indoor exposures to petrol vapour and benzene.

#### Exposure to motor vehicle exhaust

11. A large amount of information is available on exposure to motor vehicle exhaust. High air concentrations of vehicle exhaust occur along main roads and motorways where there is a high traffic volume. In urban areas, homes situated close to traffic are likely to receive the highest exposures to vehicle exhaust. Petrol stations and garages, however, are unlikely to generate sufficient traffic on their own to cause a substantial increase in pollutants from vehicle exhaust.

#### Health Studies

12. Research studies that have examined the human health effects of exposure to vehicle emissions have focussed more on the investigation of effects associated with exposure to traffic exhaust than those associated with exposure to petrol fumes. The Committee reviewed 17 relevant research studies. In general terms, these studies investigated whether children who lived close to busy roads, petrol stations and/or garages were more likely to develop leukaemia than those who lived further away.
13. To help it decide whether there could be a link, the Committee considered both the results of each study and the quality of each study in terms of how well it was designed. The better designed the study, the more confidence it was possible to have in the results. The following factors were considered:
  - the number of people included in each study;
  - the method used to determine the level of exposure to traffic exhaust and petrol fumes;
  - the child's complete residential history (i.e. where the mother lived during pregnancy in addition to the child's residence at birth or where the child lived when diagnosed with leukaemia).
14. Two studies were considered to be better designed than the others; these were also among the largest studies. Neither found a link between living close to road traffic exhaust fumes, petrol stations and garages and leukaemia in children. Although over half of the studies did report a link, the Committee considered that there were shortcomings in many aspects of their design and it could not be concluded that the greater number of positive studies meant that a true association had been established.

#### Conclusion

15. From the available information, the Committee concluded that there was no basis on which to conclude that living close to petrol stations, garages and road traffic leads to an increased risk of child developing leukaemia.
16. The Committee advised that future studies should consider the different types of leukaemia separately (rather than leukaemia as a whole). It also asked for a separate review which investigates the exposure of children to petrol vapour and to benzene inside the home.

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