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URBAN AIR NO_2 EXPOSURE AND PEAK EXPIRATORY FLOW RATE VARIABILITY IN PRESCHOOL CHILDREN

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Objective: To investigate the effect of urban air NO_2 exposure on the variation of peak expiratory flow rates (PEFR) in preschool children.

Methods: A prospective cohort study was conducted among 76 children who were aged 4 to 6 years and attended municipal day-care centres (DCC) in the city of Helsinki. Because traffic is the main outdoor source of NO_2 at the breathing level, four DCC were selected from the central area, where traffic is heavy, and four were selected from the suburban area with less traffic. PEFR was measured at home in the evening (19-21) for 7 weeks in autumn, for 8 weeks in winter and for 8 weeks in spring. Twenty-four-hour average NO_2 concentrations were determined from measurements at fixed-site monitoring stations. The association between the daily mean deviation of PEFR and the 24-hour NO_2 concentration was analysed by linear regression adjusting for first-order autocorrelation, temperature, day and day squared.

Results: The average PEFR was 205 l/min (SD 33). The range of the daily mean deviation of PEFR was -20.1 - 17.2 l/min in the central area and -11.6 - 9.9 l/min in the suburban area. The mean 24-hour NO_2 concentration was 44.6 $\mu g/m^3$ (SD 15.3) and 35.7 $\mu g/m^3$ (SD 19.0), respectively. There was no association between the 24-hour NO_2 concentration and the daily mean deviation of PEFR (ß= -0.0112, se= 0.0128). Also when central and suburban area was analysed separately no association was observed.

Conclusion: Low exposures to urban air NO_2 do not affect significantly the evening PEFR of preschool children.

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EFFECT OF AMBIENT AIR POLLUTION ON RESPIRATORY HEALTH - RESULTS OF THE PANEL STUDY IN CHILDREN LIVING IN UPPER SILESIAN INDUSTRIAL ZONE, POLAND

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The objective of the study was to examine the association between acute respiratory responses [symptoms and Peak Expiratory Flow Rate (PEFR)] and 24-hour mean concentrations of airborne pollutants in children living in the most polluted region of Poland - Upper Silesian Industrial Zone (USIZ). The panel study was performed during the "heating season" (01.12.93-08.02.94). In the study period the concentrations of the following pollutants were recorded: total suspended particles (TSP in $\mu g/m^3$, range: 50-383), particular matter <10 μm (PM_{10} in $\mu g/m^3$, range: 48-228), sulphur dioxide (SO_2 in $\mu g/m^3$, range: 20-260) and nitrogen oxides (NO_2 in $\mu g/m^3$, range: 23-387). Respiratory symptoms were recorded in the diary and PEFR was measured twice a day using individual meters. The complete panel study data were collected in 70 children with "asthmatic tendency" ("A"), and 70 symptom-free children ("H") aged 7-9 years, identified from respiratory health survey. In both groups there was a statistically significant effect of SO_2 on the symptoms of cough ("A" r=0.28; "H" r=0.31) and runny nose ("A" r=0.24; "H" r=0.25), of NO_2 on cough in group "H" (r=0.30) and of PM_{10} on breathing trouble in group "A" (r=0.32). SO_2 concentration was also associated with morning and evening PEFR values in group "A" (r= -0.34, r= -0.37, resp.) and group "H" (r= -0.36, r= -0.36, resp.). The findings were supported by statistically significant differences in symptoms and PEFR in three classes of days, defined according to the distribution of air pollutants concentrations. The findings will be further evaluated using multivariate statistical techniques. The results of the study suggest that the current "heating season" levels of air pollution in USIZ affect the respiratory health status in both healthy and asthmatic children. The strongest effect of SO_2 seems to reflects the predominant source of air pollution in USIZ which is coal-based domestic heating and energy production in this densely populated urban area.

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ACUTE SYMPTOMS DUE TO MTBE WHILE DRIVING

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Methyl tertiary butyl ether (MTBE) is an additive to gasoline to decrease winter time carbon monoxide emissions from automobile exhaust. Little is known about acute health effects from environmental exposures to MTBE. We performed cross-sectional studies in two separate cohorts: (1) state workers who spent more than 25 hours per week driving in their cars and (2) a group of older (>50 years) men, to assess acute symptoms due to MTBE exposure. Twenty-nine workers during high MTBE exposure and 25 workers during low MTBE exposure were surveyed regarding symptoms they had experienced while driving and fueling their vehicles. No statistical differences were found in comparing seven symptoms including headache, nausea, cough, drowsiness, eye, nose and throat irritation (all symptoms separately and aggregately) between the two groups (p>0.05). In comparing symptoms across the work shift between the groups, no differences were found (p>0.05). To see if older individuals might be more susceptible to symptoms following exposure to MTBE, a cohort of 107 white men (age range 50-84) were surveyed for symptoms. When stratified by the number of hours per week spent in an automobile and by age, no differences were found in rates of symptom reporting (p>0.05). Despite reports of case-control studies of similar symptom complexes attributed to the addition of MTBE to fuels in other communities (Fairbanks and Anchorage, Alaska and Stamford, Connecticut), those results could not be duplicated in this study; indeed, overall symptom reporting was quite low even among the retired older men so that the "healthy worker effect" was thought to be an unlikely explanation for this phenomenon.

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BENZENE AND MTBE: WHAT HAPPENED IN ALASKA?

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Alaskan gasoline is refined in Alaska mostly from North Slope crude. All Alaskan gasoline is high in aromatic compounds as octane enhancers. The benzene content of Alaskan gasoline is 5%. In cold temperatures during incomplete combustion other aromatic compounds in gasoline such as toluene and ethylbenzene are partially converted to benzene increasing benzene exhaust emissions. Ambient concentrations of benzene are high in urban areas of Alaska and are directly related to carbon monoxide concentrations in most areas. During the winter of 1992-93 the Alaska Department of Environmental Conservation took indoor and ambient air samples in Fairbanks, Alaska. Blood samples from persons exposed to gasoline were taken by CDC at the same time that air samples were taken. In November and December of 1992 in Fairbanks 15% methyl tertiary butyl ether (MTBE) was added to gasoline as an oxygenate. MTBE use was discontinued in Fairbanks in late December because of citizen complaints. The indoor air samples showed a significant decrease in benzene while MTBE was used. Blood samples from mechanics showed that blood benzene levels tripled after MTBE was removed. Gasoline with MTBE burns more completely and benzene exhaust emissions are reduced especially at cold temperatures. The difference between the small changes is ambient air levels and the much grater changes in blood levels may be explained by a second factor. An odor threshold study done at the University of Alaska Fairbanks determined that Alaskan gasoline is detectable at 1.67 ppm of hydrocarbon in air. When MTBE is added to Alaskan gasoline the odor threshold drops to 0.4 ppm hydrocarbon. Because the odor of gasoline with MTBE was perceptible at low concentrations, mechanics were able to reduce exposure. Odor is helpful in reducing exposures.

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