Adverse Effects of Diesel Exhaust Inhalation on Men with Heart Disease

European researchers have recently assessed the health effects of exposure to diesel exhaust in men with stable coronary heart disease. Decreased blood flow to the heart and inhibition of the release of an important protein involved in blood clotting were observed, which together can have serious cardiovascular consequences.

Previous studies have shown that short-term exposure to air pollution is generally associated with increased cardiovascular mortality, with deaths due to ischaemia (reduced blood flow to the heart), arrhythmia (abnormal disturbance of the heart rhythm), and heart failure. These correlations between air pollution and cardiovascular diseases are strongest for fine particulate air pollutants, which can be produced during the combustion of diesel oil in cars. It is difficult to quantify the effects of inhaled particulates on patients with heart disease through observational research, partly because of the difficulties in accurately estimating personal exposures to air pollution.

In this context, a team of European researchers recently undertook controlled exposures to investigate the direct effects of diesel exhaust particulates on the cardiovascular system. Twenty middle-aged men with prior myocardial infarction (heart attacks) were studied in a specially built exposure chamber. Diesel exhaust was generated from an idling diesel engine with the exhaust diluted to achieve particle concentrations of 300 µg/m³; a level actually reached in heavy traffic, occupational settings and the world’s largest cities. In two sessions, at least two weeks apart, the subjects were exposed for one hour to diesel exhaust or filtered air. During each exposure, they performed two 15-minute periods of exercise separated by two 15-minute rest-periods. The authors measured heart rate and rhythm during and after exposures, and assessed blood vessel function 6-hours later.

The results of this experiment show that men with stable coronary heart disease suffer reduced blood flow to the heart during exercise in polluted air when compared to clean filtered air. Moreover, detailed assessment of blood vessel function showed that exposure to diesel exhaust reduced the ability of the blood vessels to release a clot dissolving protein called tissue plasminogen activator (impaired fibrinolysis).

This study suggests that myocardial ischaemia and impaired fibrinolytic function are important mechanisms to explain the association between fine particulate air pollution and adverse cardiovascular events.

Environmental health policy interventions targeting reductions in pollutant emissions by cars, such as the Euro 4 standard, in effect since 2006, and Euro 5 standard that will come into force in 2009, should be considered in order to decrease the risk of adverse cardiovascular events.

1 This study was performed with the approval of the local research ethics committee, in accordance with the Declaration of Helsinki, and the written, informed consent of all volunteers.


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