

Science for Environment Policy

Traffic pollution associated with risk of developing type 2 diabetes

Long-term exposure to traffic-related air particle pollution is linked with type 2 diabetes, a new study in Germany has found. Furthermore, the study found that people living close to busy roads were at greater risk of developing the disease than those living further away.

Air pollution has been linked to a number of **health** problems, including heart, circulatory and lung diseases. It has also been shown to be particularly harmful to vulnerable groups of people, such as those with diabetes. So far, in the case of diabetes, it has not been clear whether air pollution and especially particulate matter (PM) contribute to the pathogenesis and incidence of the disease itself.

Traffic emissions are a major source of air pollution, especially PM, tiny solid or liquid particles in the air. This study explored whether long-term exposure to total PM and traffic-related PM pollution in particular had an effect on the incidence of type 2 diabetes in people living in a densely populated region of Germany.

The researchers analysed data on 3 607 participants aged 45–75, who were taking part in an ongoing study following the health of people living in three adjacent German [cities](#). At the start of that study (over the period 2000–2003) and again after five years, participants were interviewed, filled in a questionnaire, and were given a medical examination to assess their health and lifestyle habits.

For this study, people were considered to have developed type 2 diabetes if they said a doctor had diagnosed them with diabetes, if they took drugs for diabetes, or if laboratory tests showed they had abnormally elevated blood sugar levels.

For each participant, the researchers used the European Air Pollution Dispersion and Chemistry Transport Model (EURAD-CTM). The EURAD-CTM uses input data from official emission inventories on a scale of 1 km² to track the flow of chemical species in the atmosphere. The researchers could estimate the daily average exposure to total and traffic-related PM₁₀ (particles 10 micrometres (µm) or less in diameter) and PM_{2.5} (particles 2.5 µm or less in diameter) at their home addresses within the study region. The model included hourly weather conditions and emissions from industries, home heating, traffic sources and agriculture, as well as air particles transported in from outside the study area. The model was also able to distinguish between the influence of PM from all sources in the air and PM specifically from local traffic pollution, and is the first study to do so.

In all, 331 of the 3 607 participants had developed type 2 diabetes during the five years between the initial and follow-up tests. The researchers found some positive associations between exposure to both total PM₁₀ and total PM_{2.5} and increased risk of developing type 2 diabetes.

The risk associated with exposure to traffic-related PM was assessed separately. There was a 36% increased risk of developing type 2 diabetes for each additional 1 µg/m³ exposure to either PM₁₀ or PM_{2.5} pollution from traffic. This suggests a higher toxicity of traffic-specific air pollution compared to that of total PM.

For each participant, the researchers also calculated how far away they lived from a busy road. They found that people living within 100 m of busy roads had a 37% increased risk of developing type 2 diabetes compared with people living more than 200 m away.

The exact mechanisms underlying how air pollution influences the body's metabolic systems and insulin production, which regulates blood sugar levels, is not known. However, it is thought that PM causes inflammation in the body. This in turn has been linked to cells becoming resistant to insulin, which can lead to the development of type 2 diabetes. Older, obese participants were more likely to develop type 2 diabetes than other participants in this study. Being overweight and older has been linked to inflammation in the body in other studies, suggesting exposure to PM is an additional burden for such people.



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