Cyclists inhale high levels of traffic pollution

One of the benefits of cycling is improved physical health. However, recent research suggests that cyclists inhale more air pollutants than motorists in traffic, mainly due to faster, deeper breathing. This suggests that town planners should carefully consider cycle routes.

Promoting commuting by bicycle instead of by car would reduce traffic pollution, improve physical health and provide a healthier environment with better air quality. However, there is evidence to suggest that particulate emissions from fossil-fuel powered vehicles and traffic are more toxic than a general mixture of pollutants. Commuters experience short periods of high exposure to exhaust emissions and are therefore potentially at greater risk of health problems from traffic pollution.

Three main factors affect exposure of cyclists to air pollution:

- Faster and deeper breathing, which increases the total amount of air inhaled
- Increased amounts of particulate matter reaching the lungs during exercise
- Potentially longer times to complete a trip, compared with travelling by car

In this study, researchers in Belgium compared the exposure to traffic emissions for cyclists and car passengers. 55 healthy, non-smoking participants were driven by motor car along a test route with the windows closed, air conditioning off and fan mode set at ‘1’. Air in the breathing zone (about 30cm from the mouth) was sampled for each trip to measure PM concentrations. Each person then cycled the same route immediately afterwards.

Three test routes were selected in different regions of Belgium: one in Brussels, one in Louvain-la-Neuve, a new town, and one in Mol, a small rural town. During each trip, the breathing frequency, depth, oxygen uptake and heart rate were measured. These measurements were used to calculate the volume of air breathed in and out per minute, the amount of PM inhaled and the estimated amount of PM that would be deposited in the lungs for each participant.

Compared with more stable concentrations inside cars, particle number concentrations (PNCs) fluctuated more for cyclists in traffic, reaching peaks of 100,000 particles per cubic centimetre. PNC values were about three times higher in Brussels than the other two sites.

Cyclists breathed more frequently and took more deep breaths than car passengers. They breathed in and out about 4.3 times more air per minute than car passengers. In addition, cyclists inhaled 400 to 900 per cent more emission particles than car passengers on the same route. The fraction of particles that remain deposited in the lungs after being inhaled was significantly higher for cyclists than car passengers.

These results suggest that transport planners should take the physical effort of cyclists into account and aim to reduce exposure to traffic emissions in addition to considering emission concentrations. Cycle routes should be designed to increase the distance between vehicle tail pipes and cyclists.

Cyclists should be aware that while some studies suggest short bursts of exposure to PM could potentially contribute to cardiovascular health problems, the evidence for this is not as strong as the evidence that regular physical activity, such as cycling, helps prevent chronic conditions (including cardiovascular disease) and reduces the risk of premature death.


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