Public release date: 15-Dec-2006

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Underground air might cause DNA damage

Our everyday environments are full of airborne particles that are harmful to varying degrees when inhaled. Particularly damaging to our cellular DNA are the particles from the underground system in Stockholm, Sweden, according to a new doctoral thesis from Karolinska Institutet.

"Luckily, most of them do not remain in the underground for any length of time," says scientist Hanna Karlsson. "However, particle levels are often very high. My results show that there is every reason to speed up the work being done to clean the air in the underground."

Every year, some 5,300 Swedes die premature deaths from inhaling the microscopic particles of coal, asphalt, iron and other materials that pollute the city 痴 air. These particles, which are the result of incomplete combustion, road surface attrition, etc. could be reduced if the right steps were taken; the problem is that it is not known which particle sources pose the greatest threat to human health.

To build up a picture of which particles are the most harmful, Dr Karlsson has compared how particles from a variety of sources affect cultured lung cells. The results, which are presented in her thesis Particularly harmful particles show that particles from the Stockholm underground are much more damaging to cellular DNA than the other sources tested (e.g. wood smoke and cars).

The airborne particles in the underground system largely comprise iron, and are formed by the abrasion of the train wheels against the rails. The damage is caused when these particles enter the body and form free radicals in the body 痴 cells. Free radicals are highly reactive molecules that can prove harmful to the cell 痴 DNA; although such damage can often be repaired by the cell, it can sometime remains untreated, and this increases the risk of cancer.

Another type of particle that stood out in the studies was that caused by the friction between car tyres and the road surface. The report shows that these particles trigger a powerful inflammatory response (i.e. a general defence reaction in the body). Levels of these particles

are particularly high in the spring, when road surfaces dry out and cars are still fitted with studded winter tyres.

"It 痴 a serious problem, as these particles exist in large concentrations in environments that people remain in for long periods," says Dr Karlsson.

Apart from particles from the underground and the roads, the study also examined those released by the combustion of wood, pellets and diesel. None of the other types of particle tested were totally harmless. Modern wood- and pellet-burning boilers gave off much fewer emissions than old ones, but the particles produced were no less harmful.

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Thesis: "Particularly harmful particles" - A study of airborne particles with a focus on genotoxicity and oxidative stress" by Hanna Karlsson, Department of Bioscience and Nutrition, KI.

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