

# Lungs Hold 50% of Inhaled Diesel Soot

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Diesel-powered vehicles, coal-driven power stations, and wood fires all produce small particles of soot that are released into the atmosphere, which pollute the air and affect the climate, but they also present a danger to human health.

*The Journal of Aerosol Science* has recently published the first in-depth study on 10 healthy volunteers to establish how diesel soot gets stuck in people's lungs.

With every breath, the body inhales tiny airborne particles, which are also called aerosol particles, and whilst some particles occur naturally in the atmosphere, others like soot, are the result of human activity.

Soot is a by-product produced by decorative candles, small-scale wood fires and power stations, and diesel exhaust from vehicles, despite the fact that modern diesel engines have significantly lower levels of emissions due to efficient filters. In 2014, the EU is set to tighten the rules on emissions for heavy-duty diesel vehicles.

Jenny Rissler, a researcher in aerosol technology at Lund University's Faculty of Engineering demonstrated in her study that over half of all inhaled soot particles remain in the body. This is a higher percentage than for most other particles. For instance, from wood smoke and other biomass combustion, "only" 20% of particles remain in the lungs. One potential explanation could be that because diesel soot consists of smaller particles, these particles are able to penetrate deeper into the lungs and get deposited there.

Rissler, who authored the study, says: "Findings of this kind can be extremely useful both for researchers to determine what doses of soot we get into our lungs out of the amount we are exposed to, and to enable public authorities to establish well-founded limits for soot particles in outdoor air."

Scientists in other population studies have observed that people living in areas with high concentrations of particulates have a higher risk of both respiratory and cardiovascular diseases. However, until now, authorities have not decided on any guidelines because there is no conclusive evidence that these effects are to blame on soot in particular. Rissler states: "Currently there is no specific limit for soot particles in the air, despite the fact that soot in the air is linked to both lung cancer and other diseases."

She believes that in future there will be set limits on soot levels, referring to the WHO's recent reclassification of diesel exhaust which was changed from "probably carcinogenic" to "carcinogenic".

Besides having an adverse effect on health, soot particles may also contribute to a warmer climate. Other types of aerosol particles can, in part, be beneficial for the climate, which may seem paradoxical, but they have a cooling effect on the climate and therefore mitigate carbon dioxide's warming effect. Rissler explains: "Soot particles are black and absorb light, thus producing a warming effect. So it could be a double advantage to reduce it."

Jenny Rissler's next research will involve studying individual variations in deposits in the lung as well as exposing cells to soot. She is currently working on developing methods to measure the particles' surface area, as this appeared to be a significant indicator in terms of their toxicity.

## References:

*"Experimental determination of deposition of diesel exhaust particles in the human respiratory tract"*

Jenny Rissler, Erik Swietlicki, Agneta Bengtsson, Christoffer Boman, Joakim Pagels, Thomas Sandström, Anders Blomberg, Jakob Löndahl

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## Citations:

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