Measurements of Deposition of Inhaled Welding Fume Particles in the Human Lung

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Introduction: Epidemiological studies have associated exposure to welding fumes with a range of adverse health effects, such as airway irritation, bronchitis, lung function changes and possibly also increased risk of lung cancer. However, knowledge is limited about the underlying mechanisms behind these effects and the dose-response relationships. The objective of this study was to determine the respiratory tract deposition of inhaled welding fume particles.

Method: The deposition probability of inhaled welding fume particles was determined experimentally in the range 20-530 nm for four welders with an instrumental set-up developed at Lund University (RESPI, Löndahl et al. 2006). The welders were breathing spontaneously through a mouthpiece while sitting in a relaxed position. The deposition was also calculated with the ICRP model for comparison.

Results: By number the deposited fraction of inhaled welding fume particles was 0.20±0.08. Several experimental challenges made it difficult to determine the deposition fraction by mass. The measurements did not cover the complete distribution and especially not the large particles that contribute much to the inhaled mass. In addition, the density of the particles was not easy to determine because of multiple charging of the particles.

Conclusions: The study indicates that deposition of welding fume particles by number is comparable to other common air pollutants; lower than for fresh traffic exhaust particles but approximately similar to biomass combustion particles.

References

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