Non-tailpipe emissions: brake dust

Flemming R. Cassee, PhD ERT
What can be detected in air?

Brake particles ¹)

Alves et al., 2015
http://dx.doi.org/10.1590/1519-6984.00113suppl

Selley et al., https://doi.org/10.1039/c9mt00253g
Oxidative potential– source specific particles

Brake wear more potent than diesel particles based on PM mass – role of Cu
Considerable variability in the toxic potency of brake wear particles.

The more to the left the higher the toxic potency

Gerlofs-Nijland et al. 2019

Poultry farm
BW-4
BW-3
Modern stove
Diesel engine exhaust
Old-fashioned stove
Tire/road wear
BW-2
BW-1

95% Confidence intervals

BW=Brake wear

\[ 0.1 \quad 1 \quad 10 \quad \text{Inf} \]

\[ \text{dose (mg/kg bw)} \]
Brake dust versus diesel exhaust particles exposure exacerbates inflammation and compromises phagocytosis in macrophages

- Similar toxicological profiles in macrophages
- Metals more abundant in brake dust
- Conclusion: consider contributions of abrasion particles to traffic-related clinical health effects

Selley et al., https://doi.org/10.1039/c9mt00253g
Messages

● Brake dust / non-tailpipe particles can be equally or more potent than tailpipe (diesel) particles

● Size has a large impact on adverse health effects

● However, this has to be put in perspective of exposure concentrations — lower levels for dust on average, though hotspots can be identified