WHAT IS THE BEST INDICATOR OF THE ADVERSE HEALTH EFFECTS OF COMBUSTION PARTICLES: BLACK CARBON OR PARTICLE MASS?

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Background and Aims: Current air quality standards for particulate matter use the mass concentration (PM10 or PM2.5) as a metric. It has been suggested that particles from combustion sources are more health relevant. Expressed in reduction of the total mass concentration the impact of policies directed at reducing particles from combustion processes is usually relatively small. We therefore evaluated the value of black carbon particles (BCP) as an additional indicator in air quality management.
Methods. We consider different measurement methods for BCP and compare the near roadway concentration gradients of BCP with those of PM mass. We review the evidence comparing the health effects of BCP with those of PM mass. We compare the potential health benefits of a hypothetical traffic abatement measure calculated based on concentrations response functions for BCP with those based on PM2.5.
Results. Near roadway concentration gradients are much steeper for BCP than for PM mass. A relatively large part (40-70%) of the roadside increment in PM2.5 mass concentrations can be attributed to BCP. Health effect estimates from mortality and morbidity time-series studies as well as cohort studies were higher for BCP than for PM10 or PM2.5 when expressed per $\mu g/m^3$. When applying the calculated Relative Risks (RR) for all cause mortality from cohort studies, the increase in life expectancy associated with a hypothetical traffic abatement measure was four to nine times higher when expressed per achievable reduction in BCP compared to that per an equivalent amount of PM2.5 mass.
Conclusion. BCP is a valuable additional air quality indicator to evaluate the health risks of air quality dominated by primary combustion particles