In-vehicle CO_2 and ultrafine particle (UFP) Microenvironments: Climate Change

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There are many current threats whose potential impact we need to prioritise (climate change, air pollution, antibiotic resistance and violent crime) in terms of our response.

Atmospheric CO_2 and climate change were linked long ago by Arrhenius. Humans exhale CO_2. Inhalation of *air pollution*has been linked to 7 million premature deaths annually worldwide by the WHO, saying that more than 9 out of 10 people in the world live in regions breaking WHO air-quality guidelines. The aims of the present study were to map $CO_2$and UFP emissions inside-outside a Euro 3 diesel vehicle (chosen because of its high emissions) as it drove to London's Heathrow airport through the tunnelled spur road from the M4 motorway and while the two 17-year-old investigators inhaled-exhaled urban air. NDIR and CPC analysers were used in real-time.

CO_2 levels inside the Euro 3 diesel Seat Leon with closed windows were initially lower (400ppm) than outside (425ppm) but rose rapidly during the drive (400s-1600s) to and from LHR reaching 1650ppm CO_2. Outside there were two major sharp CO_2 maxima in concentration in the passage through the LHR tunnel (of 520 and 630ppm). Concentrations of 50nm UFPs inside the Euro 3 diesel Seat Leon were also lower than outside, but as those outside rose during at traffic lights and on the approach to the airport tunnel there was leakage into the car.

Interestingly the ratio of CO_2 exhalation to UFP retention by the investigators is very different.

It is concluded that microenvironments on board vehicles should be monitored in real-time for climate change and pollution control reasons.

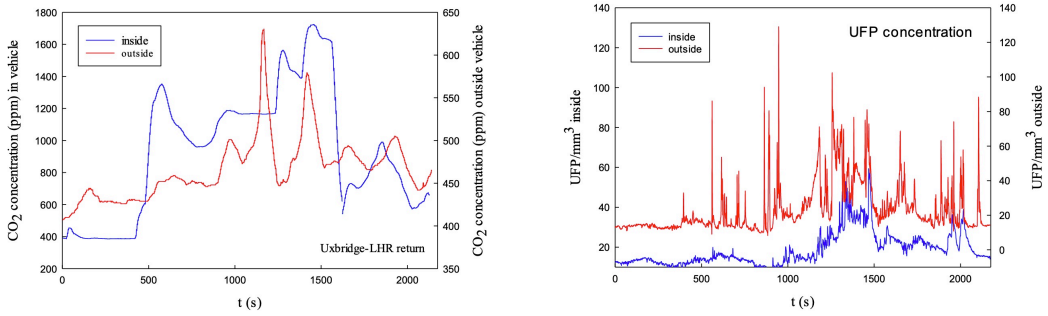

Figure 1 CO_2 and UFP concentrations inside and outside a diesel Seat Leon vehicle driving to London Heathrow airport