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THE RELATIONSHIP BETWEEN ULTRAFINE PARTICLES FROM TRAFFIC EMISSIONS AND CHILDREN'S HEALTH (UPTECH) – PRELIMINARY EXPOSURE DATA

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1. Introduction

Currently there is a limited body of epidemiological data on the effects of ultrafine (UF) particles (<0.1 µm) on human health, particularly children. Therefore this large project seeks to determine the effect of the exposure to airborne UF particles emitted from motor vehicles on the health of children in schools. To achieve this air quality data as well as respiratory data will be collected at 25 primary schools in Brisbane Metropolitan Area (BMA) over the next two years. This paper presents the preliminary data collected at 3 schools out of 25 planned, which will be used to estimate the exposure profile at the schools.

2. Methods

This cross-sectional study focuses on spatial variation in the exposure-health outcome relationship, among children aged 8 to 11 years. The main hypothesis which is being tested is that variations in long-term exposure to UF particles are associated with variations in specified respiratory, inflammation and endothelial attributes. A random sample of all state schools in the BMA was selected and those that meet the selection criteria were considered eligible (classrooms used by 8-11 year olds are naturally ventilated, no major local air pollution sources, other than road traffic).

3. Results and Discussion

All the details of the study design, which were assessed by the International Scientific Advisory Committee (ISAC) set up for this project, are available at: http://www.ilqgh.qut.edu.au/Misc/UPTECH_Study_Design_22Dec2010.pdf. The first three schools were tested during October to December 2010. Air quality data are collected continuously at 5 sampling locations within the school grounds for two weeks at each school: 3 outdoor (A, B and C) and 2 indoor sites (classrooms D and E). The outdoor sites are selected across the school grounds in order to estimate the exposure profile with respect to the distance from the nearest road. The outdoor site, B,

is selected to represent, as best as possible, the overall exposure within the school grounds.

Analyses of the data collected at the 3 schools are being conducted. In the first instance, correlations between different air pollutants at the school are being investigated. This includes time series of the UF particle number concentrations at all the 5 sampling locations. These time series are the basis to determine the potential indoor or outdoor sources (Figure 1). High correlations between the measured data at indoor and outdoor locations imply that traffic emissions are the main source of UF particles in the classrooms. However, occasional incursions indicate the presence of indoor sources.

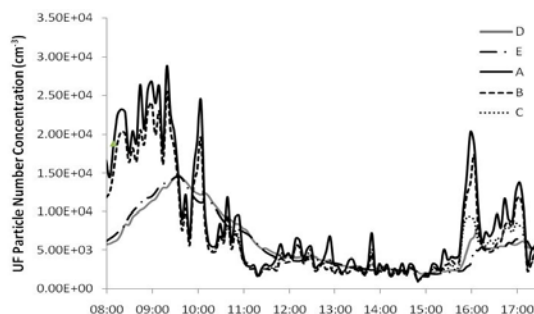


Figure 1. Indoor and outdoor ultrafine particle concentrations at a school.

Preliminary conclusions include: the schools which had lower organic carbon to elemental carbon ratio (a marker for diesel emissions) and higher concentrations of traffic related elements are more influenced by traffic emissions. At these schools, there were high correlations between the traffic counts and UF particle concentrations. Further analyses are currently being performed using the collected data at all the schools.

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