**eAppendix**

ALLOHA is a prospective hospital-based bi-directional case-crossover study investigating the effects of PM10 on asthma and COPD exacerbations, which recruited adult patients admitted to the Chelsea & Westminster Hospital (London) between May 2008 and July 2010 1. Each patient contributed to a case-day corresponding to admission (exposure window of 3 days before admission), and one or two control-days (14 days before and/or after admission).

PM10 particles were collected using a high volume sampler (flow rate: 1.2 m3/min) located within one mile of the hospital, and filters were changed every 3 days, with start/end date and time recorded. The oxidative potential (OP) of filters’ PM10 was assessed using a synthetic respiratory tract lining fluid (RTLF) model, based on modifications of a method previously described2,3. We measured the consumption of three antioxidants, reduced ascorbic acid (AA), reduced glutathione (GSH) and uric acid (UA), all with starting concentration of 200 µmoles/L, after a 4-hour incubation at 37oC, pH 7.0. The incubated samples were centrifuged, and aliquots removed and processed for measurement of remaining antioxidant concentrations. AA and UA were analyzed by reversed-phase high performance liquid chromatography with electrochemical detection4 and GSH by a DTNB-enzyme recycling assay5. All incubations were performed in parallel to a reference negative (carbon black) and positive (NIST1648a) particle. For each filter disc, OP was calculated as the % depletion of each antioxidant relative to a 4-hour particle-free control3, and expressed per unit volume (OP m-3) by dividing the % depletion for the total volume of air passed through the filter disc.

*Data analyses*

Only exacerbations with OP measurements available for the case filter and at least one control filter were analyzed. TheOP effects were estimated using conditional logistic regressions for paired data, adjusting for PM10 mass, temperature, humidity. Daily data on PM10 mass were obtained from three fixed monitoring sites close to the hospital (Air Quality London database: <http://www.londonair.org.uk/london>), while data on temperature and humidity was provided by the Meteorological Office from St James and Kew Gardens stations. The effect of OP was examined with respect to the cumulative exposures over the previous 0–3 days, for which we previously showed the highest effect of PM10 mass on asthma/COPD admissions1. Natural cubic splines of temperature were used (knots at 25th and 75th percentiles), while humidity was modeled as a linear term.

Results are reported as odds ratio with 95% confidence interval (OR, 95% CI) of asthma/COPD admission associated with an increment of 1OP m-3. Effect modification by vitamin C serum levels was assessed through subgroup analysis (high vs. low levels; cut-off at median value), and tested using the likelihood ratio test.

Analyses were performed using Stata IC 10.1 (Stata software version 10.1; Stata Corp., College Station, Texas, USA).

**Reference**

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2. Mudway IS, Stenfors N, Duggan ST, et al. An in vitro and in vivo investigation of the effects of diesel exhaust on human airway lining fluid antioxidants. Arch Biochem Biophys. 2004;423(1):200-212.
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4. Iriyama K, Yoshiura M, Iwamoto T, Ozaki Y. Simultaneous determination of uric and ascorbic acids in human serum by reversed-phase high-performance liquid chromatography with electrochemical detection. Anal Biochem. 1984;141(1):238-243.
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**eTable 1.** Characteristics of the 160 exacerbations in analysis

|  |  |
| --- | --- |
| **Characteristic**  | **n (%)** |
| SexMaleFemale | 78 (49)82 (51) |
| Age18-5455-7475+  | 40 (25)71 (44)49 (31) |
| Previous diagnosisAsthmaCOPDBoth asthma and COPDNone | 47 (29)65 (41)34 (21)14 (9) |
| Smoking statusSmokersEx-smokers/Non smokers | 57 (36)102 (64) |

**eTable 2** Odds ratios (OR) and 95% confidence intervals (CI) of asthma/COPD exacerbations associated with a unit increase in OP m-3 for each antioxidant, by vitamin C serum levels (n=160 exacerbations; n=156 filters)

|  |  |  |
| --- | --- | --- |
| Joint model with all OP effects, adjusted for PM10 mass\* | **Effect on asthma/COPD exacerbations by vitamin C levels**1 | ***p-interaction*** |
| **< 13 µmol/L** | **≥ 13 µmol/L** |
| *OR (95% CI)* | *OR (95% CI)* |
| OPAA | 0.98 (0.91-1.06) | 0.96 (0.90-1.02) | *0.683* |
| OPUA | 0.90 (0.66-1.23) | 1.14 (0.82-1.60) | *0.193* |
| OPGSH | 0.97 (0.86-1.10) | 1.02 (0.91-1.14) | *0.685* |

 \*Model also adjusted for temperature and humidity