497. Air pollution: from the particles in town to the pollutants in the countryside

P4776

Farming environment during infancy and lung function at age 31 – Prospective birth cohort study in Finland

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Background: Respiratory diseases are an occupational health problem among farmers. In contrast, farming environment during childhood has been reported to protect from atopic sensitization and asthma. The prospective association between farming environment during infancy and lung function in adulthood has not been studied earlier.

Aims: Investigate the prospective associations between farming environment during infancy and lung function at age 31.

Methods: In a prospective birth cohort study, 5676 subjects born in northern Finland in 1966 were followed up at the age of 31 years. Prenatal exposure to the farming environment was documented prior to or at birth. At age 31, information on health status, current occupation and childhood pet exposure was collected by questionnaire. Forced expiratory volume in 1s (FEV1) and forced vital capacity (FVC) were measured by spirometry and ratio of FEV1: FVC calculated (FEV%). Multivariate linear regression models were used to adjust for multiple potential confounders.

Results: To be born into a farmer family was associated with higher FEV1 (37 ml; 95% CI 5 to 68 ml) and FVC (40 ml; 95% CI 5 to 75 ml) at age 31. Having farm animals during infancy was associated with higher FEV1 (30 ml; 95% CI 1 to 60 ml). No associations were seen with FEV%. Having dogs in childhood showed similar associations. There was some suggestion for a dose-depended association with number of animal species during childhood and higher FEV1 and FVC at age 31, especially among women.

Conclusion: Childhood in a farming environment may protect from restrictive-type lung function impairment during adulthood.

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Latitude variation in the prevalence of asthma and allergic rhinitis in Italy: Results from the GEIRD study

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Background: Earlier studies have pointed out a great variability in the prevalence of asthma and asthma-like symptoms in different geo-climatic areas.
Aim: To test the association between latitude and prevalence of asthma and allergic rhinitis in Italian young adults.
Methods: In the frame of Gene-Environment Interaction in Respiratory Diseases study, a postal screening questionnaire on respiratory health and exposure to environmental factors was administered to 18,357 randomly selected subjects aged 20-44 years in 7 centres: 3 in Northern (Torino, Pavia, Verona), 2 in Central (Ancona, Perugia) and 2 in Southern Italy (Salerno, Sassari).
Results: 10,494 (57.2%) subjects responded to the questionnaire. The prevalence of self-reported doctor-diagnosed asthma and allergic rhinitis in the lifespan was 10.2% and 26.9%, respectively, and was significantly different across the centres ($p<0.05$). After adjusting for sex, age, potential risk factors for respiratory diseases and design confounders, the prevalence of asthma (OR: 1.07 per 1°latitude decrease, $p<0.001$), asthma-like symptoms (wheezing, chest tightness, asthma attacks: OR ranging from 1.04 to 1.06, $p<0.05$) and allergic rhinitis (OR: 1.03, $p=0.04$) showed a significant north-to-south trend. Similarly, a 1°C increment in temperature was significantly associated with asthma (OR: 1.10, $p<0.001$) and asthma-like symptoms (OR from 1.07 to 1.10, $p<0.05$), but not with allergic rhinitis (OR=1.02, $p=0.190$).
Conclusion: The prevalence of asthma and allergic rhinitis increased moving southwards in Italy, suggesting that prolonged exposure to different geo-climatic conditions may affect the onset of asthma and allergic respiratory diseases.

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Traffic-related air pollution and lung function in children – The ESCAPE project

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Background and objective: Cohort studies have reported positive associations between long-term exposure to traffic-related air pollution and the incidence and prevalence of asthma and related symptoms. It is unclear whether these effects are associated with impaired lung function.
Methods: As part of the ESCAPE project we analyzed data from four ongoing European birth cohort studies (BAMSE, GINI/LISA, MAAS, and PIAMA) with measured lung function at age 6-8 years. Exposure to traffic-related air pollution [nitrogen dioxide (NO_2), particulate matter ($PM_{2.5}$, PM_{10} and PM_{coarse}), and black smoke] at past and current addresses was estimated by land-use regression models. Associations between lung function (FEV_1 and FVC) and exposure to air pollution were explored by cohort using multiple linear regression analysis. Effects were adjusted for potential confounders and expressed for an interquartile range increase in exposure.
Results: Preliminary results from the PIAMA study indicate inverse associations between traffic-related air pollution and lung function at age 8 years. For all exposure parameters, exposure at the current home address was associated with small, but statistically significant reductions (95% confidence interval) in lung function ranging for FEV_1 from 0.71% (0.00-1.41) for PM_{10} to 1.68% (0.45-2.90) for $PM_{2.5}$. and for FVC from 1.53% (0.93-2.14) for PM_{coarse} to 3.78% (2.56-4.98) for $PM_{2.5}$. Results for the other cohorts are not yet available, but will be available at the time of the meeting.
Conclusions: Long-term exposure to traffic-related air pollution may be associated with reductions in lung function in school children.

P4779

Association between daily levels of air pollution and school absences in the proximity of a cement plant in Italy

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Background: Emission of dust represents the main hazard associated with cement production and may cause adverse respiratory health effects to the population living nearby.
Aim: To evaluate the association between daily levels of PM_{10} and a morbidity indicator (school absenteeism) in children aged 7-14 years attending a school within 2km from a cement plant in Fumane (Northern Italy).
Methods: Data on absences of students (average: 461 students/year) and daily concentrations of PM_{10} from a fixed monitoring station placed in the schoolyard were collected for 3 school years (541 school days from November 2007 to June 2010). The association between pollution in the same day (Lag 0) and in the previous 4 days (Lag 1 to 4) and school absenteeism was studied using generalized additive Poisson regression models, adjusting for short-term trend, day of the week, flu epidemics and daily temperature.
Results: During the considered period, the daily average concentration of PM_{10} was 34.8 $\mu g/m^3$. An increase of 10 $\mu g/m^3$ of PM_{10} was associated with a significant increase of 2.2% in school absences (RR:1.022; 95%CI: 1.007-1.037) two days after (lag2). The association between average level of pollutants from Lag 0 to Lag 4 and school absences confirmed the presence of a statically significant association with PM_{10} levels (RR:1.016; 95%CI:1.003-1.029 for each + $\mu g/m^3$ of PM_{10}).
Conclusions: Daily PM_{10} levels are associated with school absences, a proxy indicator of short-term morbidity, in children who attend schools in proximity to a cement plant. Primary prevention interventions aimed at reducing air pollution in the area are recommended.

P4780

Lung function and respiratory symptoms of Brazilian sugarcane cutters exposed to biomass burning

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Brazil is the largest producer of ethanol from sugarcane in the world and part of this production is still manually harvested and for this, it needs to be burned. This action releases toxic gases to atmosphere and produce large quantities of particulate matter (PM) directly exposing the sugarcane cutters for a prolonged period which can cause important respiratory illness. The objective of this study was to evaluate the lung function and frequency of respiratory symptoms of sugarcane cutters. We evaluated twenty-three male sugarcane cutters (age=25±4,7 years, BMI = 24±3 kg/m^2), non-smokers, from Sugar and Ethanol Company located in Brazil. Evaluations were performed in the pre-harvest and harvest. Lung function was assessed by spirometry and respiratory symptoms by questionnaire. Data normality was tested by the Shapiro-Wilk test, and comparison of spirometric values in the two periods was performed using the paired t test. To compare the qualitative variables we used the Goodman test.The level of significance was $p\leq0,05$. In the pre-harvest spirometric values were: FVC (4,4±0,57), FVC% (93,8±14,33), FEV1(3,9±0,47), FEV1% (96±13,3), FVC/FEV1 (89,4±5,55) FVC/FEV1% (101±6,22). In the harvests of we found the following values: FVC (4,5±0,85), FVC% (94±14), FEV1 (3,9±0,47), FEV1% (90,3±13,23), FVC FVC/FEV1 (83,65±7,85) e FVC/FEV 1% (94,4±10,4). There was a statistically significant decrease in FEV1% (p=0.033) and FEV1/FVC (p=0.002) after harvest. The prevalence of difficulty of breathing when there is dust and/or climate change increase after harvest. Our results suggest that six months of harvest leads to airway obstruction and increases respiratory symptoms in these workers.

P4781

Dampness, mould and endotoxin in primary schools and lung function in children: The international HITEA study

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Respiratory health effects in relation to moisture in homes are well recognised, but little is known on effects of dampness in school environments. We have previously reported a higher prevalence of respiratory symptoms in pupils from moisture damaged schools. Here we aim to study associations between dampness and visible mould in school buildings, endotoxin exposure and lung function in children.

We included 15 Spanish, Dutch and Finnish primary schools with and 10 without moisture, dampness and visible mould based on reports and inspections. Endotoxin in settled dust was measured in 237 classrooms. Acceptable forced spirometry tests were done in 2736 children aged 6-12 years. Associations between moisture, log-transformed endotoxin levels and lung function were assessed by multiple linear regression adjusted for gender, age, height, home moisture, ETS, parental education, technician, school and (for endotoxin analyses) school moisture status. In the Netherlands and Finland, FEV_1 and $FEF_{25-75\%}$ tended to be higher in children attending damaged schools or classrooms with higher endotoxin levels. FEV_1 was 39 (95%CI 5-72) ml higher in Dutch children attending damaged schools and in Finland FEV_1 significantly increased with increasing endotoxin exposure. In Spain, $FEF_{25-75\%}$ tended to be somewhat lower, but not statistically significant, in relation to school moisture status and increased endotoxin levels.
Our findings do not provide consistent evidence for adverse effects of moisture damage in the school environment on lung function in children. Heterogeneity across different geographical areas may be related to climate, ventilation characteristics and type of school building.

P4782
Fate of inhaled ultrafine carbon particles after one week; human exposure using a novel aerosol with ^{111}indium
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Particulate air pollution, such as nanosized particles <100 nm in diameter, has negative health effects. But, there is still limited knowledge regarding the fate of inhaled particles in the human body. Controlled exposure conditions provide information about the biological pathways of particle pollutants, such as deposition and retention, in human body.
Recently we have developed a method for labelling ultrafine carbon particles with an indium isotope (^{111}In), and generating an aerosol, which enables long-term deposition and retention studies in humans (Sanchez-Crespo, et al. 2011: "^{111}Indium-labeled ultrafine carbon particles ..." Inhal Toxicol 23(3): 121-128). In the present study ten healthy volunteers were exposed for the aerosol (particle size range 58-124 nm) and followed for seven days. One volunteer was followed for totally 29 days.
One week after the exposure, pulmonary particle retention was 92%. There was no elimination of particles from the body via urine. The total in vitro leaching of free non-bound activity was 3.2%, which indicates a stable bonding between the particles and ^{111}In. The volunteer that was followed for totally 29 days, demonstrated 10% further clearance of particles out of the lungs. There was marginal translocation of carbon particles out of lungs to blood (0,3%), which supports our earlier results on with ^{99}Tcm labelled ultrafine carbon particles with the size of 35 nm (Wiebert et al 2006: "No significant translocation of inhaled 35-nm carbon particles to the circulation in humans." Inhal Toxicol 18(10): 741-747). We conclude that measurements with indium-111 enables longer follow-up studies as the labelling have higher levels of activity.

P4783
Particulate air pollution on systemic inflammatory response: Roles of monocytes and neutrophils
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Research has increasingly demonstrated the detrimental effects of air pollution on systemic human diseases. However, there has been little examination of the pattern and scope how neutrophils and monocytes respond to the inhalatants. We exposed C57BL/6 mice to ambient fine particulate matter (PM2.5) in a timely manner to investigate the roles of neutrophils and monocytes. C57BL/6 mice were exposed to PM2.5 or filtered air 6 hours a day, 5 days a week for up to 3 weeks in Columbus, OH in a versatile aerosol concentration enrichment system. The measurements were conducted at days 5, 14, and 21 for circulating inflammatory biomarkers via magnetic beads, leukocytes rolling and adhesion in mesentery via intravital microscopy, inflammatory responses in the lung and visceral adipose tissues via flow cytometry and immunohistochemical staining (IHS), and inflammatory chemotaxic responses via Boyden chamber. We found that both rolling and adhesion leukocytes were increased in mesentery, especially at days 14 and 21. Circulating MCP-1, IL-6, and TNFα were elevated, especially at day 5. There were increases in Ly6G+ (neutrophil) and F4/80+ (monocyte) expression from lung bronchoaveolar lavage by flow cytometry and lung and visceral adipose tissues by IHS, especially F4/80 expression throughout the time course. Boyden chamber assay also indicated that lung and visceral adipose tissues were "inflamed", especially monocytes/macrophages after PM2.5 exposure. We concluded that, in this murine model of inhalational exposure to ambient PM2.5, the murine monocytes respond rapidly to chemokines locally (in the lung) and systemically (in visceral adipose tissue), which may not be accompanied by neutrophils.

P4784
PM10 is associated with an increase in day-by day inspiratory resistance variability in asthma
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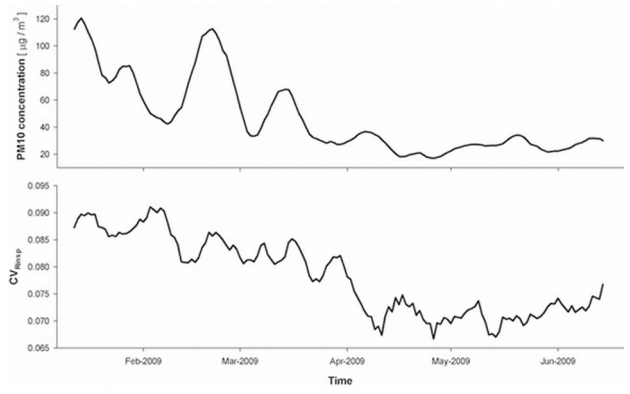
Background: An increased variability of inspiratory resistance, measured by forced oscillations (FOT) and quantified by the coefficient of variation measured over 4 consecutive days (CV_{Rinsp}), is a typical feature of asthma and predicts acute deterioration of airway function within a week.
Aim: To investigate whether air pollution increases CV_{Rinsp} and the risk of future deterioration in asthma.
Methods: Between Jan and Jul 2009, CV_{Rinsp} was measured daily by a portable FOT device in 10 mild asthmatics. CV_{Rinsp} was then compared with the daily concentration of PM10.
Results: In 7 subjects PM10 was linearly correlated with CV_{Rinsp} ($r=0.27$, $p<0.05$). In these individuals CV_{Rinsp} time-series were then averaged to reduce intra-individual variability (Figure) and used to estimate a linear ARMAX model, with the PM10 as input and a white noise modelling unknown effects on the variability. According to the Akaike criterion, the CV_{Rinsp} at a given day was best modelled by a weighted average of the PM10 over the past 4 days.



Conclusions: The concentration of PM10 is associated with an increase in airway resistance variability in asthma, leading to a greater likelihood of future functional deterioration.

P4785
RME30 biodiesel exhaust inhalation causes vascular dysfunction
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Rationale: Whilst particulate air pollution is well recognized as a contributor to greenhouse gas emissions and thus plays a vital role in global warming, exposure is also detrimental to cardiovascular and respiratory health. The environmental impact of switching to more sustainable fuels is well accepted; however there is little evidence of potential health benefits that may result from such an approach. Here we examined cardiovascular and respiratory effects after inhalation of biodiesel blend and petrodiesel exhaust.
Methods: 16 healthy subjects were exposed to petrodiesel exhaust and biodiesel blend (30% rapeseed methyl ester (RME30) blended with petrodiesel) for 1h, standardized for PM mass concentration of 300 $\mu g/m^3$. Vascular vasomotor function was assessed with forearm venous occlusion plethysmography, using acetylcholine, bradykinin, sodium nitroprusside and verapamil. Additional cardiorespiratory measurements were also performed throughout.
Results: Infusion of all vasodilators caused a dose-dependent increase in forearm blood flow ($P<0.01$ for all), which was similar following both exposures ($P>0.05$ for all), but attenuated as compared to filtered air exposures from previous studies.
Conclusions: Diesel exhaust inhalation is known to impair vascular endothelial function, which is linked to an increase in cardiovascular events. This study demonstrates that replacing 100% petrodiesel with RME30, a commercially available mixture, results in similar adverse effects, and suggests there are unlikely to be any health gains in switching from petrodiesel to RME30. We suggest that these adverse health effects should be taken into consideration alongside environmental concerns when assessing future developments.

P4786

Respiratory effects in a chamber study of diesel exhaust exposure in healthy volunteers

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Background: In previous chamber studies of diesel exhaust exposure by the Umea group, volunteers were exposed to particle mass concentrations (PM) of 300 $\mu g/m^3$ for 1 hour. Clear effects were found in bronchial biopsies and BAL, but not in crude lung function tests.
Aim: To examine whether exposure to diesel exhaust at 300 $\mu g/m^3$ for 3 hours would cause symptoms, signs and or lung function changes.
Methods: Eighteen healthy subjects were exposed twice to diesel exhaust at 300 $\mu g/m^3$, and twice to clean air ($<3\mu g/m^3$), in a double-blind cross-over design, at least one week apart. NO_2 levels were about 1.4 ppm. Before and after exposure medical examination and spirometry were performed. Symptom scores and PEF were assessed before, and after 15, 75, and 135 minutes of exposure. Generalized Estimating Equation models were used to analyze changes from baseline, adjusted for exposure sequence.
Results: Symptom scores for eyes and throat were higher during diesel exhaust exposure than during filtered air after 75 and 135 minutes. Signs of irritation in upper airways were more common after diesel exhaust exposure. PEF increased during filtered air exposure, but decreased during diesel exhaust, with a statistically significant difference after 75 and 135 minutes. There were no such differences for spirometry.
Discussion and conclusion: Increased symptoms and signs from eyes and upper airways were to be expected, while a decrease of PEF has not been reported previously. Repeated PEF measurements during exposure may be a statistically more powerful design than spirometry before and after exposure. Symptoms, signs, and lung function changes were found at exposure levels much lower than occupational limit values.

P4787

Effect of NO2 on inflammatory response in subjects with asthma

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Patients with asthma may be more susceptible to NO2. Our aim was to investigate whether repeated exposure to realistic indoor concentrations of NO2 enhances inflammatory response in the airways of subjects with asthma. Participating were 19 nonsmoking subjects with intermittent asthma and airway hyperresponsiveness during methacholine-challenge. The study had a double-blinded, crossover design. On day 1, the subjects were exposed to either 200 ppb NO2, 600 ppb NO2, or purified air for 30 min, and on day 2, to the same pollutant, for 2 x 30 min. The order of exposure to the two concentrations of NO2 and air-only was randomized and exposures were separated by 2 weeks. Markers of inflammation were measured in sputum daily, 6 hours after the first (on Day 1) and the third exposure (on Day 2) and 48 h after the first exposure (Day 3) and compared to baseline. The effect of NO2 on bronchial responsiveness to methacholine was tested at baseline and on Day 3. Exposure at rest to 200 ppb or 600 ppb of NO2 had no direct effect on respiratory function either during or after the exposure sessions. Compared to baseline, the variation in the percentage of eosinophils in induced sputum after exposure to NO2 was -2% after air, +16% after 200 ppb NO2, and +78% after 600 ppb NO2. The linear association between the variation and the level of exposure was significant (p=0.01). Exposure to NO2 did not cause any change in lung function and no NO2-related effect on responsiveness to methacholine was found. NO2 exposure had a significant and dose-related effect on the eosinophilic inflammatory response of patients. These data suggest that exposure to NO2 might enhance the eosinophilic activity in sputum in subjects with intermittent asthma.

P4788

Noise exposure during sleep and risk of OSAS: A population-based study

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Background: Noise-induced sleep fragmentation increases upper airway collapsibility and sleep-disordered breathing (SDB). Heart rate variability (HRV) is altered in SDB, as obstructive sleep apnea/hypopnea syndrome (OSAS). We investigated the association between exposure to nocturnal traffic noise and HRV as proxy of OSAS in a representative sample from the Swiss adult population.
Methods: 1363 participants of the SAPALDIA study underwent a 24-hour ECG. SDB was defined by physician-diagnosed OSAS or respiratory pause during sleep. Using the HRV frequency-domain component of the 24-hour ECG, we calculated the percentage of the very low frequency increment interval (VLFI) over the total power spectral density, a surrogate marker of OSAS (%VLFI 4%). Night-time traffic noise exposure (10pm-6am) obtained from SONBASE, the Swiss databank on noise pollution, was linked to participants' home addresses. Logistic regression models using 35dB(A) cut-off were adjusted for relevant covariates. Subjects treated for OSAS or under beta-blockers were excluded from analyses.
Results: MeanSD %VLFI was 5.983.28 in men and 4.11±2.40 in women ($p<0.0001$; interaction %VLFI*sex, $p<0.0001$). Higher %VLFI values were found in subjects reporting SDB (n=137) compared to controls (n=1200) (5.773.17 vs. 4.932.99; p=0.002). Exposure to noise levels >35 dB(A) at night was significantly associated with increased %VLFI in men (OR: 1.54; CI: 1.03-2.32; p=0.036), but not in women (OR: 0.96; CI: 0.65-1.40; p=0.825).
Conclusion: In this large population, the %VLFI index derived from the 24h-ECG proved useful to corroborate reports of SDB. This study suggests that nocturnal noise is an independent factor for OSAS in men, but not in women.

P4789

Lung function decrement with arsenic exposure to drinking groundwater along river Indus: A comparative cross-sectional study

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Objective: To determine the association between chronic arsenic exposure through drinking groundwater and decrement in lung function among adult individuals who do not have signs of arsenic lesions.
Methods: Comparative cross-sectional study during January to March 2009. 100 participent >15 years of age in each group i.e. exposed (>100 ug/L) and unexposed (< 10 ug/L) to arsenic, determined by testing drinking water samples, were compared for effects on lung function using spirometry. A validated questionnaire was administered.
Results: There was a decline in mean adjusted FEV1of 154.3 ml (95 percent CI: -324.7, 16.0; p = 0.076), in mean adjusted FVC of 221.9 ml (95 percent CI: -419.5,-24.3; p = 0.028), and in FEV1/FVC ratio of 2.0 (95 percent CI: -25.3, 29.4; p = 0.884), among participants who were exposed to arsenic compared to unexposed. A separate model comprising a total of 160 participants, 60 exposed at arsenic concentration of >250 ug/L and 100 unexposed at arsenic concentration of < 10 ug/L showed a decrement in mean adjusted FEV1of 226.4 ml (95 percent CI: -430.4, -22.4; p = 0.030), in mean adjusted FVC of 354.8 ml (95 percent CI: -583.6,-126.0; p = 0.003), and in FEV1/FVC ratio of 9.9 (95 percent CI: -21.8, 41.6; p = 0.539), among participants who were exposed to arsenic in drinking groundwater.
Conclusion: This study demonstrated that decrement in lung function is associated with chronic exposure to arsenic in drinking groundwater, occurring independently, and even before any manifestation, of arsenic skin lesions or respiratory symptoms. The study also demonstrated a dose-response effect of arsenic exposure and lung function decrement.

P4790

Ground-level ozone levels are associated with acute hospital admissions and emergency room visits in Reykjavík, Iceland

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Background: Air pollution levels in Reykjavík, Iceland, are generally low, but follow a different pattern than in most other cities. Intercorrelations are low, a large fraction of particulate matter with aerodynamic diameter $\leq 10\mu m$ (PM_{10}) is from natural sources, and ozone (O_3) peaks in early in spring. This study aimed to study short-term associations between pollution levels and daily emergency room visits and hospital admissions (ERV/HA) for cardiopulmonary causes.
Methods: A time series of daily cardiopulmonary ERV/HAs between the years 2003 and 2009 was made from hospital register data. Three-day moving averages of exposure variables PM_{10}, nitrogen dioxide (NO_2), O_3, and weather variables were calculated. The ERV/HA counts were regressed on the exposure variables with Generalized Additive Models assuming Poisson distribution, and time trend adjustment using Cubic splines. The relative increase in number of events per interquartile (IQR) increase in pollutant level was calculated from the model coefficients with a 95% confidence interval (CI).
Results: Mean daily number of ERV/HAs was ten, 76% were cardiac and 60.8% in people older than 70 years of age. Pollution was characterized by seasonality and large PM_{10} fluctuations. Daily ERV/HA's were associated with O_3 levels, we estimated a 4.6% increase in ERV/HA's per IQR change in three-day moving average (95% CI 1.9-5.5). The association was stronger in women; 7.2% (95%

CI 3.3-11.4). In elderly, NO_2 was associated with an increase of 3.4% (95% CI 0.1-6.8). We found no associations with PM_{10}.
Conclusion: In this study, O_3 was associated with cardiopulmonary ERV/HAs. NO_2 was associated with ERV/HAs in the elderly.

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Measuring the health of the 2012 European green capital, Vitoria-Gasteiz: "The impact of air pollution and weather conditions on COPD"
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Background: On October 21, 2010, the European Commission designated Vitoria-Gasteiz European Green Capital 2012. The air that the citizens breathe received the highest score given to any city. Only 65 km far away from Vitoria- Gasteiz, Bilbao is the second industrialized region of Spain, behind Barcelona.
Aims: To compare the impact of air pollution and weather conditions on COPD in two cities from the Basque Country, very close by distance, but with a different environmental scenario.
Methods: Between January 2010 and December 2010 in Santiago Hospital (Vitoria-Gasteiz) and Basurto Hospital (Bilbao) all admissions for COPD exacerbations were retrospectively evaluated. The daily average values of NO2 and Ozone (both oxidant air pollutants), and metheorology data were obtained from the Basque Meteorological Agency.
Results: Measuring air quality, in Vitoria-Gasteiz the NO2 exposure average was low. In contrast, in Bilbao, ozone concentration was $>100\ \mu g/m^3$ several times over the year.

Oxidant Pollutant	Concentrations	Limit values (WHO)
NO2 (Vitoria-Gasteiz)	$28\ \mu g/m^3$	$40\ \mu g/m^3$ (mean annual)
Ozone (BIlbao)	$>100\ \mu g/m^3$	$100\ \mu g/m^3$ maximum daily mean of hour

Pearson correlation for COPD exacerbations rate and air pollution was: Ozone: 0.74 and NO2: 0,73 ($p<0,01$). The weather correlation was no significant, but there was an inverse relation between higher NO2 levels and lower temperatures, ($r:0,78;p<0,01$).
Conclusions: This data shows that air quality improves health, comparing both cities. An increase of air pollution relates to more hospital admissions for COPD exacerbations. During winter NO2 levels could be related with an increase of heating use at home.

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Statins augment the processing and removal of ambient particulate matter in the lung
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Rationale: Ambient particulate matter (PM) exposure causes lung inflammation and retention of these particles in the lung which perpetuate the lung inflammatory response. We have previously shown that 3-hydroxy-3-methylglutaryl coenzyme A (HMG-CoA) reductase inhibitors (statins) suppress the PM-induced inflammatory response *in vivo*. Here we hypothesize that statins enhance the processing of PM in the lung and reduce the retention of these particles in lung tissues.
Methods: Four groups of New Zealand White rabbits were used: 1) saline instillation, 2) saline instillation with statin treatment, 3) PM (EHC 93) instillation, and 4) PM instillation with statin treatment. PM or saline was administrated by intratracheal instillation, 3X a week for 4 weeks. Lovastatin (5mg/kg/day) was given 4 weeks prior and during PM exposure. PM retention in the lung tissues and macrophages was quantified by morphometry on H&E stained slides. Alveolar macrophages (AM) from bronchoalveolar lavage were analysed for their phagocytic ability.
Results: Morphometric analysis showed that PM exposure increased the recruitment of AM ($P<0.01$) and activated AM ($P<0.001$) into lung tissues and lovastatin suppressed all these effects. Lovastatin also reduced the fraction and total lung burden of PM in AM ($32.7\pm2.9\ mm^2/10^4\ mm^2$ vs. $16.5\pm5.1\ mm^2/10^4\ mm^2$, $P<0.05$) as well as the total burden of PM in all lung tissues ($P<0.5$). Ex vivo, lovastatin augmented the phagocytic index of both opsonized and unopsonized particles by AM.
Conclusion: Treatment with statins attenuated the PM–induced recruitment and activation of AM. It also reduces the burden of PM in the lung and promotes the clearance of PM from the lung by macrophages.