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Source-specific Fine Particulate Using Spatiotemporal Concentration Fields Developed using Chemical Transport Modelling and Data Assimilation

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village, the children are highly vulnerable due to several factors: they are far from the services of health, which makes early diagnosis and treatment difficult, and exposure to this mineral in childhood is a risk of early exposure.

Aim. To evaluate the risk of malignant pleural mesothelioma development in population exposure to erionite through the measurement of serum biomarkers.

Materials and methods. Cross-sectional, case-control study. Exposure population: 80 volunteers 40 adults and 40 children inhabitants from Tierra Blanca de Abajo, San Miguel de Allende, Guanajuato, México. Control group: population without exposure to erionite or asbestos, match by age as the exposure group. Measurements: mesothelin, osteopontin and microRNA profile (mir-222, mir-126, mir-145, mir-100) levels or expression of miRNAs and compare with the control group, and identified cancer familiar history and asbestos concomitant exposure in exposure group.

Field evaluation of air sampling methods using a one-health approach to assess pathogen contamination in animal operation environments

Rule A¹

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.S03: One Health: On animals, humans and the environment, Room 417, Floor 4, August 26, 2019, 10:30 AM - 12:00 PM

Concentrated animal feeding operations (CAFOs) have been identified as a source of antibiotic-resistant bacteria as well as other zoonotic pathogens, which have been detected within CAFO environments (e.g. barn surfaces), the ambient environment near CAFOs (e.g. air, soil, water), CAFO workers, and in community residents without direct livestock contact. Additionally, transmission between animals and humans has been documented. For this reason, it is important to measure contamination of animals, people, and the environment simultaneously (One Health design) to assess transmission dynamics of pathogens, and to develop public health interventions.

Most operations raising animals in confinement administer antibiotics for disease prevention and treatment. Waste is stored in open-air pits in the ground (anaerobic “lagoons”) and then sprayed onto crop fields as fertilizer (“sprayfields”). The use of these animal husbandry and waste management practices has raised concerns amongst CAFO workers and neighboring residents about exposure to pathogenic, antibiotic-resistant bacteria (and associated resistance genes) that may be present in animals and their waste.

To address these concerns, we have deployed personal and area air samplers inside the farm, in the surrounding CAFO environment, and within the communities using three well-established biological air sampling methodologies in a one-health approach: (1) Inhalable air samplers (Button sampler®, SKC Inc.) loaded with 25mm gelatin filters (Sartorius, Germany), (2) Sterile all-glass impingers (BioSampler®, SKC Inc) with 20 mL sterile PBS as collection media, and (3) single stage impactor (N6, Thermo Scientific, Inc) with selective media plates or MD8, (Sartorius) with gelatin filters.

Using a case study we will talk about how the choice of sampler is determined by the specific environment to be measured. Personal samplers are best to capture the individual exposures, whether worker or community member. Impinger samplers are preferred when molecular assays are needed, and impactor samplers are preferred when sampling low concentration environments.

Prenatal Exposure to Airborne Polycyclic Aromatic Hydrocarbons and Childhood Growth Trajectories from Age 5 to 13 Years

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TPS 741: Adverse birth outcomes 2, Exhibition Hall, Ground floor, August 28, 2019, 3:00 PM - 4:30 PM

Background: There is evidence that exposures to polycyclic aromatic hydrocarbon (PAH) in air pollution and to fine particulate air pollution are associated with higher childhood body mass index (BMI) and obesity risk.

Methods: African-American and Hispanic children born in the Bronx or Northern Manhattan, New York (1998-2006), whose mothers underwent personal air monitoring for airborne PAH exposure during pregnancy, were followed up with height and weight measurements at approximate ages 5, 7, 9, 10, 11, 12.5 and 13.5 years. Multivariable generalized estimating equation analyses were used to relate pre-natal airborne PAH exposures to child BMI Z-scores through time. The analyses adjusted for many known risk factors for childhood obesity. Interaction terms between tertile categories of prenatal PAH exposure and age and age squared were included in the model.

Results: In total, 535 children had at least one height and weight measure during follow-up. The prevalence of obesity was 20.6% at age 5 and increased across follow-ups until age 11 when it was 33.0%. At age 5, BMI Z-scores were significantly greater for children in the third tertile of exposure relative to the first tertile (0.35 Z-score units, 95% CI 0.09, 0.61, p=0.007) and were non-significantly higher for the second tertile of exposure compared to the first tertile (0.25 Z-score units, 95% CI -0.02, 0.52, P=0.075). The trajectories of BMI Z-scores by tertiles of exposure converged as the children aged, such that by age 11 years the estimated mean BMI Z-scores associated with each tertile of exposure were not different.

Conclusions: Prenatal exposures to airborne PAH were associated with higher childhood BMI Z-scores at a young age, but growth trajectories converged by age 11 years. Accordingly, highly exposed children spend a greater proportion of their childhood with higher BMI Z-scores, the health significance of this finding will need to be examined.

Source-specific Fine Particulate Using Spatiotemporal Concentration Fields Developed using Chemical Transport Modelling and Data Assimilation: Application to North Carolina for Health Associations with Coronary Heart Disease

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OPS 47: Increasing spatiotemporal resolution in assessment of exposure to outdoor air pollutants, Room 412, Floor 4, August 27, 2019, 4:30 PM - 5:30 PM

A number of studies have found differing associations of disease outcomes with PM_{2.5} components (or species), and sources (e.g., biomass burning, diesel vehicle and gasoline vehicle). Here, a unique data fusion method has been utilized to generate spatiotemporal fields of major gaseous pollutants and PM_{2.5} components (e.g., ozone, NO₂, SO₂, total PM_{2.5} mass and speciated PM_{2.5} including crustal metals) over North Carolina for 2002-2010. In a prior study, the PM_{2.5} total mass field was used as part of the CATHGEN study of associations between PM_{2.5} and disease associated with cardiac heart disease patients. Here, we extend the exposure method for further health analyses. The method fuses daily CMAQ model observations with observations to develop accurate spatiotemporal maps of pollutant concentrations. Those results are then used in an advanced chemical mass balance source apportionment model, CMBGC-Iteration that uses both gas and particulate matter concentrations to quantify source impacts. The method, as applied to North Carolina, quantifies the impacts of nine source categories and

estimate source contributions of total PM_{2.5} mass. The nine source categories include sources of both primary (diesel vehicle, gasoline vehicle, suspended dust, biomass burning, and coal combustion sources) and secondary components (ammonium sulfate, ammonium bisulfate, ammonium nitrate and secondary organic carbon). The results show the dramatic decrease in source impacts, e.g., sulfate, primarily from coal-burning, and from mobile sources. Secondary organic aerosol, e.g., from biogenic emissions, is becoming more dominant over the state. This study highlights an advantage of using a chemical transport model to develop spatiotemporal fields of pollutants, i.e., the ability to assess PM components and their sources.

Personal Exposure to Ultrafine Particles is Associated with Reduced Lung Function in Adolescents with Asthma

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TPS 681: Short-term health effects of air pollutants 1, Exhibition Hall, Ground floor, August 26, 2019, 3:00 PM - 4:30 PM

Background: Few studies have examined personal exposure to ultrafine particles (UFP) and respiratory health in adolescents. Our objective was to characterize personal UFP exposure and examine their association with respiratory symptoms and lung function among adolescents with and without asthma.

Methods: Participants (ages 13-17 years) completed seven days of personal UFP sampling. On each day, personal UFP exposure was recorded at one second intervals for three hours using the PUPF C200, a wearable UFP monitor. Ecological momentary assessment was used to assess the frequency of respiratory symptoms and spirometry was performed by trained technicians at the completion of the seven day sampling period. The percent-predicted forced expiratory volume in 1 second (% FEV₁), forced vital capacity (% FVC), ratio of FEV₁/FVC, and forced expiratory flow between 25% and 75% of the FVC (% FEF₂₅₋₇₅) were calculated for each participant based on their age, sex, race, and height. Linear and zero-inflated Poisson regression models were used to estimate the association between log-transformed weekly median UFP exposures, lung function, and frequency of respiratory symptoms adjusting for BMI.

Results: A total of 98 adolescents (35% with asthma) were included in this analysis. Median weekly UFP exposures ranged from 351 – 58,300 p/cm³ (IQR = 5,478 p/cm³). Personal exposure to UFPs was associated with decreased lung function among adolescents with asthma; for a 10-fold increase in median UFP exposure the %FEV₁ was decreased 10% (95% CI: -21, 0%), %FEV₁/FVC decreased 11% (95%CI: -19.0, -3.5%) and the %FEF₂₅₋₇₅ decreased 31% (95%CI: -55.5, -7.6%). No significant associations were observed between UFP exposure and lung function in children without asthma nor was UFP exposure associated with the frequency of respiratory symptoms in either asthmatic or non-asthmatic adolescents.

Conclusions: Exposure to UFP is associated with reduced lung function, but not increased respiratory symptoms, in children with asthma.

Per- and polyfluoroalkyl substances in early pregnancy and risk for preeclampsia

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OPS 15: Chemicals and pregnancy, Room 114, Floor 1, August 26, 2019, 10:30 AM - 12:00 PM

BACKGROUND

Preeclampsia affects 3-7 percent of all pregnant women and is one of the most common causes of perinatal and maternal morbidity/mortality. Preeclampsia has been called “the disease of theories” because so much

is unknown. One risk factor that has been suggested is exposure to endocrine disrupting environmental pollutants such as per- and polyfluoroalkyl substances (PFAS). Pregnant women absorb PFAS by ingestion, inhalation and dermal exposure. The present study aims to investigate the hypothesized association between serum concentrations of PFAS in early pregnancy and the risk of developing preeclampsia.

METHODS

The study was a case-control study including 296 women from the most southern county in Sweden (Skåne) who were diagnosed with severe preeclampsia (cases) and 580 health pregnant controls. Maternal serum samples were obtained from a biobank, which included samples collected in early pregnancy (around 12-14 weeks) in connection with screening for infections and German measles (rubella). Serum concentrations of perfluorohexane sulfonate (PFHxS), perfluorooctanoic acid (PFOA), perfluorononanoic acid (PFNA) and perfluorooctane sulfonate (PFOS) were analyzed at the laboratory of Occupational and Environmental Medicine in Lund, Sweden, using liquid chromatography-tandem-mass-spectrometry (LC/MS/MS).

RESULTS

The median serum concentration of all four PFAS was significantly higher among the cases as compared to the controls (18-26%; p-values<0.05). When the PFAS substances was categorized into quartiles, the women in the highest quartiles had significantly increased risks of developing preeclampsia as compared with women in the lowest category for PFOA (OR=1.96), PFNA (OR=1.83), and PFHxS (OR=2.18), respectively, whereas for PFOS there was a non-significant increase (OR=1.22). Adjusting for potential confounders did increase these estimates somewhat.

CONCLUSIONS

In the present study among women from the general population we did observe significant associations between maternal levels in early pregnancy of PFOA, PFNA and PFHxS, respectively, and the risk for developing preeclampsia.

Association between anthropometry and lifestyle factors and future risk of B cell lymphoma; an exposome wide analyses

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TPS 771: Diet and lifestyle, Exhibition Hall, Ground floor, August 26, 2019, 3:00 PM - 4:30 PM

Background/Aim

The etiology of B-cell lymphomas (BCL) remains mostly unknown, and only a few risk factors have been clearly established which explain a small proportion of the cases in general population. Moreover, epidemiological studies have suggested differences in risks among BCL subtypes for a wide range of risk factors. To better understand the role of different exposures in human disease, it would be preferable to study a representation of the exposome in a single study. We aimed to create a model Exposome-Wide Association Study, to search for anthropometry, socioeconomic status, and lifestyle factors associated with lymphoma on a broad scale.

Methods

476,160 subjects (aged 30-70 years) including 2257 BCL cases (newly diagnosed after cohort inception) participated in the European Prospective Investigation into Nutrition and Cancer cohort with data on lifestyle, demography, and anthropometry were included in current study. Cox regression model adjusted for age, sex, and country and multivariable penalized cox regression model were used to identify associated exposures. Moreover, we used principal component analysis coupled with a Cox-regression to look at clusters of exposures in relation to lymphoma risk.