National Institute of Environmental Health Sciences

The Environmental Health Science FEST

POSTER SESSION

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Tuesday, December 6, 2016

1. Dietary Exposure of Pregnant Women in Suriname to Pesticides

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Abstract:
Suriname imported 1.8 million kg of agricultural pesticides in 2015, however monitoring of pesticides in crops is absent. Data from the Netherlands on imported Surinamese produce from 2011-2013 indicated that 21% of the samples exceeded plant-specific pesticide Maximum Residue Limits (MRLs) of the European Union (EU). Consuming pesticide-contaminated food can cause adverse health effects, and pregnant women and children may be especially vulnerable. The Caribbean Consortium for Research in Environmental and Occupational Health will assess exposure to select pesticides in 1000 mother/child dyads. This pilot study entails pesticide residue analysis in 9 types of produce. We will next conduct a dietary assessment in Surinamese pregnant women to ascertain intake rates of such produce. Residues exceeding MRLs regarded pyrethroids and organochlorines: cypermethrin (0.32µg/g) in tomatoes (USA MRL 0.20µg/g), lambda-cyhalothrin (1.08µg/g) in Chinese cabbage (USA MRL 0.40µg/g), endosulfan (0.07µg/g) in Tannia (EU MRL 0.05µg/g) and lindane (0.03µg/g) in Tannia (EU MRL 0.01µg/g). Endosulfan and lindane are listed under the Stockholm Convention to eliminate/control their use and are banned in Suriname. There is an urgency to address environmental policy gaps and the implications of those gaps for food safety and economic export. The results of this study indicate a pressing need for a pesticide monitoring plan and program for produce from Suriname.

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Poster ID: P5587

2. Ω-Hydroxylation Activity of Cytochrome P450 4A11 is Attenuated in the Presence of Hydrogen Peroxide: Potential Relevance to Hypertension

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Abstract:
Many toxins in the environment are known to cause inflammation which leads to increased production of reactive oxygen species. These products of inflammation can exacerbate toxic effects and contribute to cellular stress and cell death. Cytochrome P450 (CYP) 4A11 is an Ω-hydroxylase that catalyzes the oxidation of arachidonic acid to 20-hydroxyeicosatetraenoic acid (20-HETE). 20-HETE can be pro-hypertensive by constricting microvasculature or anti-hypertensive by inhibiting salt reabsorption in the kidney. Thus, 20-HETE and CYP4A11 have important roles in blood pressure regulation. CYP4A11 activity is attenuated in the presence of hydrogen peroxide, an important secondary signaling molecule. This leads to the central hypothesis that oxidation of CYP4A11 alters regulation and enzymatic synthesis of hypertensive mediators that contribute to pro- and/or anti-hypertensive phenotypes. Isotopic labeling studies indicate that redox status of the cysteine residues alters the enzymatic activity of CYP4A11, a biological control mechanism that mediates 20-HETE production.

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Poster ID: P5620

3. PCB Concentrations in Women Based on Breast Feeding History: NHANES 2001-2004

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Abstract:
Data from the 2001-2004 National Health and Nutrition Examination Survey (NHANES) were used to evaluate serum concentrations of polychlorinated biphenyls (PCBs) in women of reproductive age, with or without a history of breastfeeding. Analytical data for PCBs 138, 153, and 180 were used along with responses to the NHANES Reproductive Health questions: [Have you] breastfed any of your children?" and "[What] number of children [have been] breastfed [for] at least 1 month?" PCB concentrations were found to be significantly lower among 15 to 44 year old women who had a history of breastfeeding compared to those who had not breastfed any of their children. Based on data for 474 women, ages 15 to 44 years, mean serum PCB 138, 153, and 180 concentrations were 16.4, 21.4, and 14.3 ng/g lipid for women who have a history of breastfeeding, and 24.0, 30.0, and 21.4 ng/g lipid for women who have not breastfed, respectively. These results were weighted using the 2001-2004 sample weights provided by NHANES to represent over 27 million U.S. women. PCB concentrations were also lower among women who had breastfed multiple children. Mean serum PCB 138, 153, and 180 concentrations were 11.8, 15.2, and 10.1 ng/g lipid, respectively, for women 35 to 44 years who had breastfed six children and 22.7, 31.9, and 22.5 ng/g lipid, respectively, for women 35 to 44 years who had breastfed only one child. The results tend to support the long-standing hypothesis that depuration of PCBs may occur via breastfeeding.

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Poster ID: P5571

4. Modulating the Placental Transport of an Estrogenic Mycotoxin through Genetics and Lipid Raft Signaling

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Abstract:
Fluctuations in the global climate, including steady increases in worldwide temperatures, have favored the production of mycotoxins such as zearalenone (ZEA). ZEA is a nonsteroidal estrogen agonist known to alter perinatal development. We sought to test the ability of BCRP, a key transporter in the placental barrier, to regulate the maternal-fetal disposition of ZEA and determine whether modulation of transporter genetics and membrane dynamics could alter efflux activity. Using BCRP-transfected cells, BeWo placental cells and mice lacking the Bcrp gene, we have demonstrated that BCRP actively removes ZEA and prevents its maternal-to-fetal transfer. Cells expressing the loss-of-function C421A genetic polymorphism of BCRP exhibit a 25% reduction in the ability to efflux ZEA. In addition, placentas from healthy women expressing the C421A BCRP variant demonstrate greater ZEA accumulation compared to the wild-type gene. Subsequent studies revealed that BCRP localizes to lipid rafts, which are glycoprotein and cholesterol rich microdomains in the plasma membrane. Disruption of lipid raft signaling using a cholesterol synthesis inhibitor or by sequestration with methyl-beta cyclodextrin reduced BCRP-mediated efflux of ZEA by 300% without altering overall expression or trafficking to the plasma membrane. Taken together, these data demonstrate that BCRP removes ZEA from the placenta and points to the ability of genetics and lipid signaling to impair this protective function.

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Poster ID: P5609

5. The impact of measurement error in epidemiologic studies on burden estimates

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Abstract:
Effect estimates from epidemiologic studies are used to determine the burden of mortality attributable to $PM_{2.5}$. This research explores how exposure measurement error in epidemiologic studies may impact burden estimates. In this study, we estimated $PM_{2.5}$ attributable mortality when exposure measurement error is explicitly accounted for, and compared it to the estimate when it is not. Inputs include photochemical Community Multiscale Air Quality predicted annual mean $PM_{2.5}$ concentrations fused with ambient monitored data for the year 2005, baseline death rates and population counts. We applied hazard ratios from the Nurses' Health Study (2000-2006) that are, and are not, adjusted for exposure measurement error. Using the exposure measurement-error adjusted hazard ratio resulted in a 21% greater estimate of $PM_{2.5}$ – attributable mortality than the estimate based upon the unadjusted hazard ratio: 14% (95% CI: 2%, 25%) compared to 11% (95% CI: 4%, 17%) of annual deaths that are attributable to $PM_{2.5}$. According to the World Health Organization, this difference would be classified as having a moderate impact on risk estimates. Our results suggest that measurement error in epidemiologic studies has the potential to substantially impact burden estimates.

Disclaimer: The views expressed in this abstract are those of the authors and do not necessarily reflect the views or policies of the U.S. EPA.

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6. The Center for Research on Early Childhood Exposure and Development (CRECE)

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Abstract:
The Center for Research on Early Childhood Exposure and Development (CRECE) is a Children's Environmental Health Center that studies how mixtures of environmental exposures and other factors affect the health and development of infants and children living in the heavily-contaminated island of Puerto Rico—an underserved, highly-exposed, and low-income population with significant health disparities. CRECE recognizes that it is not just one exposure, but many exposures including air quality, water quality, consumer product use, psychosocial dynamics, and internal factors that can combine to create adverse health effects during infancy and childhood. CRECE is using a holistic source-to-outcome strategy known as the "exposome" that captures the totality of the environment. As a multi-project Center, CRECE will couple air-pollution epidemiology (Project 1), high throughput toxicity screening of multi-media pollutant mixtures (Project 2), and biomarker epidemiology (Project 3) to analyze the impacts of early life exposure (both specific stressors and mixture effects) on fetal/child health and development, taking into account environmental, clinical, social, demographic, behavioral, dietary, and other factors. CRECE's mission is to be a vital and informative children's environmental health resource for researchers, cohort participants, the broader underserved Puerto Rican community, and beyond.

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7. Growth acceleration: Examining associations of *in utero* exposures to BPA and phthalates on dynamics of infant's BMI growth

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Abstract:
The early infancy period is of the greatest importance for cognitive, emotional and social development. The near ubiquitous environmental exposure to endocrine disrupting compounds (EDCs) such as BPA, phthalates and heavy metals experienced among children and women during sensitive developmental periods are potentially associated with the developmental and reproductive effects. We developed a semi-parametric stochastic velocity model to capture individual growth trajectory and to assess the effect of BPA or phthalates on potential delay of growth. Our statistical analysis was done using a Bayesian method with a prior of Ornstein-Uhlenbeck process for the growth rate function. We investigated whether and how prenatal environmental exposures of BPA and 9 phthalates (MEHP, MEHHP, MEOHP, MECPP, MBzP, MBP, MiBP, MEP, and MCPP) in women in the first three trimesters are associated with infant growth dynamics of body mass index (BMI) during at-birth to 3 years, with the focus on the modeling of growth acceleration. We found that BPA and most phthalate metabolites exposed during the first trimester significantly reduced infant BMI growth acceleration. Specifically, as maternal EDC exposure increases during the first trimester, decreased BMI growth acceleration resulted in a delayed timing of achieving BMI infancy peak. This early growth deficiency may have a profound impact on their putative later outcomes (e.g., tempo of sexual maturation).

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8. The Impact of Pesticides on Latino Farmworkers' Functional Brain Networks

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Abstract:
The neurotoxic effects of long-term exposures to cholinesterase-inhibiting pesticides, including organophosphates and carbamates, place the farmworkers at risk for developing neurodegenerative disorders such as Parkinson's disease. Previous studies have indicated that cholinesterase levels and brain anatomy are changed in Latino farmworkers exposed to pesticides. Using resting-state functional magnetic resonance imaging (rs-fMRI) data, this study investigates the differences in the probability and strength of interregional connections as well as network topology between Latino farmworkers and non-farmworkers. Resting state functional connectivity analysis has emerged as a promising method to study the altered brain function in people at risk for degenerative disorders. The brain network differences between those exposed and unexposed to pesticides, and the association of functional connectivity patterns in the brain with blood cholinesterase and urine cotinine levels are quantified. Using a mixed-effects modeling framework, while controlling for confounding variables such as age, education level, and smoking status, we consider how the cholinesterase and cotinine levels change the relationship between brain network organization and functional connectivity patterns in farmworkers. This study provides further evidence for potential neurotoxic and delayed neurodegenerative effects of long-term exposures to pesticides experienced by Latino farmworkers.

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9. Social determinants of risk and attitudes about asbestos in a Superfund Environmental Justice community

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Abstract:
Context: Asbestos exposure is most widely studied as an occupational phenomenon. However, there is evidence of asbestos-related diseases among non-occupationally exposed individuals. Using Ambler, PA, we aimed to characterize non-occupational exposure to asbestos and its resultant mortality.Methods: Using the 1930 census, we extracted name, address, gender, race and occupation. Paraoccupational exposure was defined as having the same address as an individual with occupational exposure. We calculated summary statistics of demographics, tabulated exposures, and used chi-square tests to describe associations among exposure variables. Using a set of innovative sources we identified the location and mortality status of 52% of the total 4.524 individuals. Results: 9.6% of the population had occupational exposure, whereas approximately one third had paraoccupational exposure. A smaller proportion of women had occupational exposure, although the trend was reversed for paraoccupational exposure. 52% of those we identified migrated from Ambler and 17% migrated outside of Pennsylvania prior to their death..Conclusions: We found significant paraoccupational exposure to asbestos. Future efforts will focus on characterizing mortality as function of occupational and paraoccupational exposure. We also identified a significant number of individuals who whose mortality status could not be determined by focusing only on local data.

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10. The Study of Asian Women, their Offspring's Development and Environmental Exposures: The SAWASDEE Birth Cohort Study in Northern Thailand

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Abstract:
Women who perform farming activities during pregnancy in Thailand are routinely exposed to pesticides. Although birth cohort studies in the US have shown neurodevelopmental effects related to prenatal insecticide exposure, the neurodevelopmental pathways and timing of exposure leading to adverse outcomes is not clear. Our birth cohort study in Thailand will measure insecticide exposure throughout pregnancy and evaluate the relation of those exposures to neurodevelopmental trajectories from birth to age 3. 300 pregnant farmworker women will be recruited in Northern Thailand. Urine (N=8), blood (N=4), and umbilical cord blood samples will be collected during pregnancy to document temporally-resolved insecticide exposure. The Brazelton Neurobehavioral Assessment Scale (BNBAS) will be given at birth followed by tests of visual attention, emotion regulation, memory and inhibitory control to determine how the cascade of neurologic development ultimately affects overall cognitive function. Our pilot study (N=56) showed widespread, seasonal exposure to insecticides in pregnant farmworkers. We found an association between 1st trimester exposures and abnormal reflexes and inverse associations between 2nd trimester exposures and attention/orientation and motor performance (all $p<0.001$). The larger cohort will expand on this study by addressing two exposure scenarios and using more refined testing to help understand the trajectory of neurodevelopment related to prenatal exposures.

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11. Enhanced bioaccumulation of arsenic in aquatic food webs of contaminated, weakly stratified lakes in the Puget Sound lowland

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Abstract:
Arsenic, a priority Superfund contaminant, is a legacy pollutant impacting many aquatic ecosystems. We examined the mobility of arsenic from contaminated sediments and arsenic bioaccumulation in aquatic organisms in urban lakes with varying mixing regimes in the Puget Sound basin downwind of the ASARCO Superfund site, a former copper smelter in Renton, WA. In lakes with strong seasonal thermal stratification, high aqueous arsenic concentrations (>10 ppb) were limited to anoxic bottom waters and arsenic concentrations were low (<5 ppb) in oxic surface waters. However, in weakly stratified lakes, elevated arsenic concentrations (up to 30 ppb) were found throughout the entire oxic water column. Because aquatic life primarily inhabits oxic waters, elevated arsenic in oxic waters results in spatial overlap between elevate concentrations of arsenate, a phosphate analog, and lake biota. Hence, in weakly stratified study lakes, mobilization of arsenic from lake sediments into overlying oxic water columns led to enhanced trophic transfer of arsenic through the aquatic food webs, with higher arsenic accumulation (up to an order of magnitude) in both phytoplankton and zooplankton compared to stratified lakes. We also evaluated ecological toxicity as a result of chronic arsenic exposure and found higher concentrations of phytochelatin in the water column, a molecular biomarker for heavy metal(loid) stress in phytoplankton.

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12. Using mobile and digital technology to improve cohort management in the Duke NICHES cohort

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Abstract:
Traditional methods for recruiting and maintaining contact with participants in cohort studies include print-based correspondence, which can be unidirectional, labor-intensive, and slow. Needed are methods that utilize modern communication tools to maintain engagement of study participants in large longitudinal cohort studies and collect data from the field to enhance exposure assessment. The poster presents the development process and design of a cohort management platform used in Duke University's NICHES children's environmental health research center. The platform uses a combination of communication channels [web, email, SMS, voice response] to facilitate interactive communication with participants over the course of the study. It is programmed to semi-automatically perform many recruitment/retention procedures traditionally done by research assistants. For instance, the platform reads dates in study databases and sends automated pre-programmed messages on specific dates/times or generic messages to all participants on dates specified by research staff. Messages are stored, so participants may call back to receive missed messages. The interactive system is also collecting data, such as sleep duration/quality, by prompting participants to respond to queries. All procedures have been IRB-approved and vetted through our information security office. This platform can serve as a model for enhancing communication and engagement with longitudinal study cohorts.

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13. Expanding environmental health knowledge of health specialists to facilitate home visit education of clients

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Abstract:
Environmental toxins are harmful to children's health and development. Speech-Language Pathologists (SLPs) often assess and treat clients in their homes, and have ongoing interactions with their parents/caregivers. Though the amount of time SLPs spend in children's homes is immense, there is very little training offered to them on the importance of environmental toxins and their lasting effects on development. Therefore, the goals of this study are 1) to assess the environmental health knowledge of SLPs currently working in early intervention (EI) and 2) to educate a cohort of EI SLPs on environmental health. First, we surveyed 158 SLPs on an EI SLP Online community and found that 60% of those surveyed had no specific environmental health training. Based on the results of this survey, it is evident that there is a need for SLPs currently practicing in EI to receive more education regarding environmental exposure as it relates to child development. We used these survey results to create an "Environmental Health: What Speech-Language Pathologists who Work in Early Intervention Need to Know" continuing education (CE) event at Northeastern University, which will take place on September 24th. Attendees of the CE event will take pre- and post-tests so that we can gauge the effectiveness of our program on enhancing SLP's knowledge of the effects of environmental exposures on children, as well as the role that EI SLPs can play in minimizing negative environmental exposures.

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14. Coal combustion residual (CCR) uptake and oxidative stress profiles in fathead minnows following dietary exposure to biofilm and plankton collected from a CCR-impacted lake

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Abstract:
The US produces 130 million tons of coal combustion residuals (CCRs) per year at coal-fired electricity generating utilities.1 In N.C., CCR wastewaters enriched in contaminants including selenium (Se) and arsenic (As) are discharged to freshwaters via the National Pollutant Discharge Elimination System but toxicity testing requirements may only assess fathead minnow mortality following 24 hr exposure to 90% concentrated effluent. Such assays fail to address the dietary routes of exposure by which many contaminants move up the food chain in receiving ecosystems. In order to provide a more nuanced understanding of potential toxicological consequences to organisms in these receiving waters, an adult fathead minnow feeding study comparing field-collected biofilm and plankton from a CCR-impacted lake and a reference lake was conducted. Biofilms (accumulated March-October 2015) and plankton (collected July 2016) were homogenized and freeze-dried, analyzed for trace elements by ICP-MS, and fed to female fish for 15-30 days. Mean concentrations of Se and As (mg/kg dw) in CCR-impacted lake samples were 8.51 and 40.3 (biofilm) and 7.53 and 19.3 (plankton) relative to 2.15 and 17.1 (biofilm) and 1.54 and 32.7 (plankton) in those from the reference lake. Subsequent to feeding, fish tissues will be assessed for trace element uptake and molecular assays of oxidative stress-related proteins will be completed. 1.ACAA. 2014 Coal Combustion Product (CCP) Production & Use Survey Report. (2014).

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15. Whole Health Hula Hooping

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Abstract:
The Community of Dorchester in Boston, MA has high rates of both asthma and obesity. The Community Outreach and Engagement Core in the Department of Environmental Health at Harvard University has developed several educational initiatives to reduce risk for these health ailments in this community including the Whole Health Hula Hooping Program. This 8 session program was developed for youth (ages 9-14) in the Dorchester Community and taught at the Boys and Girls Club of Dorchester. The program was designed to help participants reduce their risk for the development of asthma and obesity by providing a fun educational experience on whole body wellness. To spark interest in the program and to provide physical activity students were taught the art of hula-hoop dancing. The program also provided education and interactive activities on topics including nutrition, physical fitness, mindfulness and meditation, habit formation, and stress reduction. The participants were surveyed before and after the program to determine if they showed improvement in any of the focus areas including physical fitness, nutrition, and stress reduction. In addition to reporting enjoying the hula hoop dancing aspect of the program participants also showed improvement is all focus areas. Previous studies have suggested that improvement in these focus areas will reduce risk for the development of asthma or obesity.

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16. Ambient PM2.5 exposure in pregnancy, maternal prenatal antioxidant intakes, and infant autonomic response

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Abstract:
Factors disrupting fetal oxidant balance impact autonomic nervous system (ANS) development. We examined links among prenatal particulate matter (PM2.5), maternal antioxidant intakes, and infant ANS reactivity among 297 mother-infant dyads. Prenatal daily PM2.5 exposure was estimated using a spatio-temporal model. An index of prenatal total antioxidant intakes from a FFQ was derived. Antioxidant and PM2.5 exposures averaged over pregnancy were categorized as high/low using the median. Dyads completed the Repeated Still-Face Paradigm (SFP-R), a stressor protocol with cardiorespiratory monitoring, when infants were age 6 months. Mixed effects ANOVAs examined associations between high PM2.5 and low antioxidants on respiratory sinus arrhythmia (RSA, parasympathetic response) and T-wave amplitude (TWA, sympathetic response) at baseline and across SFP-R episodes. Interactions between PM2.5 and antioxidant status were also examined. We observed high PM2.5 to be significantly associated with lower baseline RSA ($p=0.04$) and decreased RSA reactivity to stress ($p=0.0001$); associations with antioxidant intakes were not significant for baseline RSA ($p=0.07$) or RSA reactivity ($p=0.16$). Infants of mothers with both high PM2.5 and low antioxidants showed the least RSA reactivity (interaction $p=0.06$). No significant changes in TWA were found. Thus, prenatal PM exposure may lead to autonomic dysfunction in offspring, particularly among infants of mothers with poor nutrition.

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17. Heavy Metal Analysis of Potable Water Sources: An Educational Activity to Introduce Undergraduate Students to Toxicology

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Abstract:
Early introduction to research is pivotal to kindling interest in fields such as toxicology and environmental health science. Of the contaminants in our environment, heavy metals have been relevant to human health historically, but have recently resurfaced as a cause for concern in the United States. To increase scientific literacy of toxicology and promote team-based learning, undergraduate students in the R25-funded program at Rutgers participated in an educational activity to assess heavy metal contamination of drinking water in NJ and surrounding areas. This project was part of a 10-week research program that included didactic sessions on the assessment of heavy metal concentrations in the environment. Twenty students were divided into four teams to determine a list of sites for sampling. Students were provided materials to collect specimens. Analysis of heavy metal concentrations was performed using inductively coupled plasma-mass spectrometry. Teams compared their results to the NJ Drinking Water Quality Standards. For samples that had detectable levels of heavy metals, concentrations ranged as follows: Al (0.5-81.0 ppb), As (0.21-0.81 ppb), Cd (0.1-1.8 ppb), Cr (0.1-1.2 ppb), Pb (0.05-9.2 ppb) Li (0.6-5.4 ppb), Mn (0.05-85.7 ppb), and Ni (0.20-87.5 ppb). A team-based water sampling exercise, which coupled toxicology, exposure, and environmental health science, was rated favorably amongst participants and fostered collaboration and networking.

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18. Endometriosis and Environmental Endocrine Disrupting Chemical Exposure: Bisphenol AF potentiates the development of endometriosis in a mouse model

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Abstract:
Endometriosis is a gynecological disease resulting from abnormal growth of endometrial tissue outside the uterine cavity. This disease causes chronic pelvic pain, extreme pain with menstruation, pain with intercourse, and/or infertility in 5.5 million women in the US. Endometriosis is affecting more and more women, but it is not known if this is due to disease awareness or environmental exposures from toxicant exposure. Bisphenol A (BPA), a well-studied endocrine disrupting chemical used to manufacture hard clear plastics, is known to have estrogenic activities. As BPA is removed from products, BPA analogues are replacing BPA. One such analogue is Bisphenol AF (BPAF) which can have stronger estrogenic activity than BPA. In our studies, we use a mouse model of endometriosis to examine if these endocrine disrupting chemicals potentiate endometriosis disease. Ovariectomized mice were fed a phytoestrogen reduced diet for 6 weeks with 30, 300, and 900 ppm BPA or BPAF. We find increased uterine weight and increased endometriosis lesion weight with BPAF, but not with BPA. Gene expression analysis from BPAF exposed endometriosis lesions is similar to what is examined with estradiol. Studies are currently underway to examine the concomitant effects of BPA/BPAF exposure and the endogenous hormone milieu on the potentiation of endometriosis using intact mice. Thus far, we conclude that BPAF exposure could play a role in the development of endometriosis in women.

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19. NYU: Community engagement, communications and global environmental health

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Abstract:
Our Center resources are utilized to provide unbiased information about environmental health risks to impacted communities and the public. One such community-based program partners with the Ramapough Tribal Nation (Northern NJ/NY State) who continue to be exposed to toxic waste from intentional dumping of paint sludge in the 1960s. COEC partners with Ramapough residents to hold educational programs on environmental hazards, scientific workshops for children, and community wellness programs. We also work with CBOs from NJ Passaic River Communities to assess the needs/concerns of residents and anglers living and/or fishing along the Superfund river site to determine the prevalence of sustenance fishing and fish consumption. The results informed COEC and CBOs to better target educational materials and advisory information for those directly impacted by the pollution. Findings also inform Center scientists who test metals and dioxin burdens in fish and their consumers. Recently, we aligned with the Rutgers NIEHS Center to work with one EJ community in this area, the Ironbound section of Newark. Globally, NYU COEC works with 3 Nigerian Universities, whose representatives have conducted surveys that gauge community health concerns where E-waste collection/recycling is active. COEC is working to expand the surveys to Ghana. Outcomes will guide future COEC initiatives to build community infrastructure leading to behavior modification and ultimately reduced health risks.

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20. Occupational and Environmental Levels of Metals and Poly Brominated Diphenyl Ethers in the Formal Electronics Recycling Industry Worldwide

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Abstract:
Recycling of electronics can be a source of exposure to a variety of toxic chemicals, including metals and poly brominated diphenyl ethers (PBDEs). A recent review of published literature on chemical hazards in the formal electronics recycling industry suggests that metal levels in workplace air and dust are often high enough to adversely affect the health of workers. PBDEs were also commonly found in the workplace and transported outside of the facilities into the environment. For this poster, we graphically summarized published levels found in the air and dust at formal electronics recycling facilities. Most concerning levels of metals found in the publications were for lead and cadmium. In the breathing zone of workers, the highest levels of lead (up to 549.3 microgr/m3) and cadmium (up to 698.4 microgr/m3) were documented at French facilities that processed cathode ray tubes. In workplace dust, levels of lead reached up to 206,000 mg/kg at a Chinese facility recycling printed circuit boards. The highest levels of PBDEs found in the publications were for BDE-209. In the breathing zone of workers, the highest levels of BDE-209 were up to 61 ng/m3 at a Swedish facility. In workplace dust, levels of Deca-BDE (containing #209) reached up to 180 microgr/kg at a Chinese facility recycling printed circuit boards and plastic casings. These data suggests that more mitigation of these exposures is needed in formal electronics recycling facilities.

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21. Mitochondrial Neurotoxic Pesticides Promote Epigenetic Dysregulation by Histone Hyperacetylation in Dopaminergic Neurons

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Abstract:
Recently, we demonstrated that environmental pesticide exposure induces histone hyperacetylation and enhances the susceptibility of dopaminergic neurons in cell models. We further reported that greenhouse pesticides, including tebufenpyrad, induce dopaminergic neurotoxicity by affecting mitochondrial dynamics. These observations promoted us to examine whether mitochondrially-impairing pesticides influence epigenetic histone acetylation. Western blot analysis revealed that exposing dopaminergic N27 cells to tebufenpyrad or the classic mitochondrial complex-1 inhibitor rotenone drastically increased histone H3 and H4 acetylation. Immunocytochemical analysis revealed that tebufenpyrad and rotenone exposure preferentially acetylate the lysine sites K23 and K5 on H3 and H4, respectively. Further studies by means of mitochondrially-defective transgenic N27 dopaminergic cells generated by CRISPR/Cas9 knockdown of the TFAM protein revealed hyperacetylation of histones H3/H4. Similarly, H3/H4 hyperacetylation was observed in the mitochondrially-defective transgenic MitoPark mouse model of PD. Importantly, hyperacetylation of H3/H4 was observed in nigral dopaminergic neurons from PD brains. Collectively, our data reveal a novel interplay between mitochondrial dysfunction and epigenetic dysregulation of core histone acetylation, which together may play a critical role in the etiology of environmentally-linked PD.

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22. Private well arsenic-testing outreach-pilot targets children, unborn babies through health care providers

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Abstract:
Arsenic in drinking water is colorless, odorless and tasteless, so its presence can only be determined by testing. More than 70% of New Jersey's household wells have not been tested for arsenic. Children and unborn babies are populations most at risk of adverse health impacts from arsenic exposure; a high priority is to target well owners serving this group with aggressive testing promotion outreach programs. Because health care providers are trusted communicators of health information, the Columbia SRP in collaboration with NJDEP and NJDOH has begun a pilot program in Hunterdon County to offer free drinking water tests for arsenic and lead to patients in ob/gyn and pediatric practices. The overall goal is to determine whether this is an effective approach that should be replicated for reaching these most vulnerable populations.The pilot will kick off with a Grand Rounds talk by Columbia SRP Director Joe Graziano at the Hunterdon Medical Center discussing the high prevalence of arsenic in local private wells and risks to unborn babies and children based in part on the Columbia SRP work in Bangladesh and New England. Together with NJDOH and NJDEP, we have created informational brochures and posters for doctor's offices, nurse's work stations and waiting rooms including information on how to take advantage of the free well water testing our labs at Columbia will offer and links for additional information on arsenic treatment options and health effects of arsenic exposure.

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Poster ID: P5648

23. Prenatal Exposure to Particulate Air Pollution and Anthropometry in Urban Children: Sensitive Windows and Sex Difference

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Abstract:
Prenatal air pollution exposure may be associated with childhood obesity. We applied an innovative method to identify sex-specific sensitive prenatal windows of exposure to $PM_{2.5}$ on anthropometric measures in children. Analyses included 240 full-term children in an ethnically mixed lower SES urban birth cohort. Mothers' prenatal daily $PM_{2.5}$ exposure was estimated using a validated satellite-based spatio-temporal resolved model. Body mass index z-score (BMI-z), fat mass, % body fat, waist & hip circumference were assessed at age 4.0±0.7 years. Using Bayesian distributed lag interaction models (BDLIMs), we examined sex differences in sensitive windows of weekly averaged $PM_{2.5}$ levels on these measures, adjusting for child age, maternal age, education, race, and pre-pregnancy BMI. BDLIMs showed significant positive relationships of $PM_{2.5}$ exposure at 10-20 wks gestation with BMI-z and at 12-24 wks with fat mass, only in boys. On the other hand, exposure at 12-29 wks was significantly positively associated with waist-to-hip ratio only in girls. Estimated cumulative effects across pregnancy, accounting for sensitive windows, were β=.21 (95%CI=.01-.37) for BMI-z and β=.36 (95%CI=.12-.68) for fat mass in boys, and β=.02 (95%CI=.01-.03) for waist-to-hip ratio in girls. In short, $PM_{2.5}$ exposure in early-to-mid pregnancy may be associated with anthropometry measures and modified by sex. Methods to better characterize vulnerable windows may provide insight into underlying mechanisms.

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Poster ID: P5663

24. Toxic Realities and their Ramifications for Community Engagement

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Abstract:
Research on the response of communities to environmental toxicity has richly described the struggles of citizens to identify unrecognized toxins, collect their own environmental health facts, and use them to lobby authorities for recognition and remediation. This study, however, seeks to shift the focus from facts to facticity—to examine the many, disparate types of knowledge that communities develop about toxicity and how they articulate with ideas of scientific and governmental authorities about what kinds of information are valid bases for policymaking. We analyzed oral history interviews conducted in 2013-14 in the small town of Ambler, Pennsylvania. Ambler, a nineteenth- and twentieth-century center of asbestos manufacture, is home to two massive asbestos waste sites, one of which was being remediated by the EPA (EPA) at the time of our research. The interviews demonstrate that even asbestos, a toxin with a well-established public narrative, is a fundamentally different object for different members of the Ambler community. For many of these individuals, the pursuit of citizen science is not a logical outgrowth of their toxicity-related experiences and their consequent concerns for the future. As such, our findings suggest caution in framing the community engagement efforts of environmental health agencies primarily as facilitations of citizen science; such an approach does not acknowledge the multiplicity of toxic realities.

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25. Gene-Environment Interactions in Silica-induced Autoimmunity

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Abstract:
Background: Occupational exposure to inhaled crystalline silica dust is associated with autoimmunity in man. We hypothesize that B cell dysregulation occurs in genetically susceptible individuals within ectopic lymphoid structures (ELS) that form during relevant environmental exposures, unleashing organ-damaging autoreactive B cells and autoAb.Methods: Wildtype (WT) and autoAb transgenic (Tg+) mice of B6 and genetically distinct lupus-prone NZB, MRL, and BXSB backgrounds were exposed to inhaled silica or vehicle. After 1-3 months, lung pathology and lymphocyte infiltration were scored. AutoAb levels were measured in bronchoalveolar lavage fluid (BALF), serum, and supernatants from cultured lung and spleen cells.Results: All WT and autoAb Tg+ silica-exposed strains showed extensive lung pathology with B and T cell infiltrates. The % lung area containing ELS after silica exposure varied by strain (WT BXSB>MRL>B6>NZB, $p=0.03$). Significant increases in autoAb production with silica exposure were observed in WT BALF, lung cell supernatants, and serum in a strain-dependent manner. Tg+ Ig levels in BALF were higher in silica- vs vehicle-exposed mice in the B6 and BXSB strains ($p<0.05$). Conclusions: Pulmonary exposure to silica leads to local B and T cell accumulation with ELS formation, and can enhance local and systemic autoAb production. These studies identify gene-environment interactions that promote B cell dysregulation and autoimmunity.

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26. Training Products on Biodisasters for Skilled Support Personnel

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Abstract:
Under an SBIR (Small Business Innovation Research) grant from the National Institute of Environmental Health Sciences, Gryphon Scientific developed a product suite to teach skilled support personnel how to work safely in disaster sites contaminated with biological agents. The World Trade Center clean-up focused national attention on the inadequate training for "skilled support personnel" (e.g. construction, demolition and transportation) deployed to remove debris or transport supplies during disaster relief operations. Since skilled support personnel do not routinely practice emergency response protocols, one-shot trainings - even with periodic refreshers-- are unlikely to be remembered when personnel are mobilized for disaster response. The product suite includes a 2-hour basic training course with 100+ slides and full audio, and a just-in-time refresher training accessible on mobile devices. Designed to supplement basic training in disaster response, the application focuses on health and safety practices relevant to disease transmitted by aerosolized agents, blood or bodily fluids, person-to-person contact, and insect and animal vectors. Training covers routes of exposure and applicable diseases, engineering and work practice controls, personal protective equipment and barriers, decontamination and disposal procedures, and post-exposure protocols.

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27. Developmental Neurotoxicity of Inhaled Ambient Ultrafine Particle Air Pollution: Parallels with Neuropathological and Behavioral Features of Autism and Other Neurodevelopmental Disorders

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Abstract:
Multiple epidemiological studies have linked air pollution to autism spectrum disorder (ASD), a linkage with plausibility based on the shared mechanisms of inflammation. Additional plausibility appears to be provided by findings from our studies in mice exposed from postnatal days 4-7 and 10-13 (human 3rd trimester equivalent), to concentrated ambient ultrafine (UFP) particles, considered the most reactive air pollution component, at levels consistent with high traffic areas of major U.S. cities and thus highly relevant to human exposures. These exposures, occurring during a period of marked neuro- and gliogenesis, produced a pattern of developmental neurotoxicity notably similar to multiple hypothesized mechanistic underpinnings of ASD, including its greater impact in males. UFP exposures induced inflammation/microglial activation, reductions in size of the corpus callosum and associated hypomyelination, aberrant white matter development with ventriculomegaly, elevated glutamate and excitatory/inhibitory imbalance, increased amygdala astrocytic activation, and repetitive and impulsive behaviors. These findings suggest the human 3rd trimester equivalent as a period of vulnerability to neurodevelopmental toxicity to UFP, particularly in males. UFP air pollution exposure may be a risk factor not only for ASD, but also for other neurodevelopmental disorders that share features with ASD, e.g., schizophrenia, attention deficit disorder, and periventricular leukomalacia.

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28. Air pollution and pulmonary health: Effects of short-term indoor air quality intervention with portable air purifier

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Abstract:
Air pollution exposure is associated with adverse cardiopulmonary effects. As improvement on outdoor air quality in China will takes a long time, this study investigates whether overnight use of an indoor air filtration device can lower indoor $PM_{2.5}$ and introduce health benefits. Seventy-two healthy non-smoking students who resided in the same building in Shanghai were recruited into a randomized, double-blind crossover study. Between November and December 2015, each subject received two overnight interventions (13-19 hours) by a true filtration device (pre-filter + HEPA filter + active carbon filter) and a sham filtration device (no filter) respectively, with the sequence randomized and a 2-week washout period scheduled in-between. The impact of filtration intervention was modeled with a mixed-effect linear model. Outdoor $PM_{2.5}$ level during the study had a median of 47 $\mu g/m^3$ and a range of 6.4 to 219.9 $\mu g/m^3$. True filtration can reduce indoor $PM_{2.5}$ concentration by around 70% compared to sham filtration. Overnight true filtration was shown to significantly lower pulmonary impedance (Z5) and pulse pressure (indicator of future adverse cardiovascular events) compared to sham filtration. The changes in other impulse oscillometry measurements, FEV_1, FVC, FeNO, arterial stiffness, myocardial perfusion (SEVR), interleukin-6, sP-selectin and vWF was indicative of beneficial health effect of true filtration, however it was not statistically different compared to sham filtration.

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29. The Effects of Multiple Environmenal Factors on the Bioaccumulation of Mercury in an Estuarine Amphipod

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Abstract:
Mercury (Hg) is a widespread global pollutant and neurotoxin that bioaccumulates and biomagnifies in aquatic food webs. Humans are most frequently exposed to Hg, particularly the more toxic form methylmercury (MeHg), through consumption of marine fish. Therefore, it is important to understand the environmental factors that influence bioaccumulation of mercury and how changes in climate will alter the fate of Hg in marine food webs. Environmental conditions that are predicted to change with climate include increases in temperature, precipitation, nutrient and carbon loading, and freshwater influx. Here, we used the estuarine amphipod, Leptocheirus plumulosus, to conduct single factor laboratory experiments to investigate the effects of organic carbon, temperature and salinity on Hg and MeHg bioaccumulation in amphipods feeding in estuarine sediments. In addition, we examined how the interaction of temperature and carbon impacted bioaccumulation in amphipods using two-factor experiments. Preliminary results indicate that salinity has little impact on bioaccumulation of Hg, while bioaccumulation of Hg increased as organic carbon decreased. The relationship with temperature and its interaction with carbon is more complex. A biogeochemical model of mercury in sediments is being developed to help interpret these observations and to provide a basis for predicting the net effect on mercury bioaccumulation of a changing climate.

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30. Bayesian non-parametric analysis of mixed-scale densities from epidemiologic studies

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Abstract:
In this work, we explore the use of retrospective density estimation in analyzing the association between correlated exposures of interest during critical windows of embryonic development and congenital heart defects. We introduce a non-parametric Bayes hierarchical model that allows borrowing of information across heart birth defect types by clustering similar defect-specific distributions and clustering exposure profiles within confounder profile clusters. All is achieved through the use of the nested Dirichlet Process and estimated via MCMC computation. The method is illustrated using data from a national case-control study, the National Birth Defects Prevention Study, and via simulations.

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31. Characterization of PBDE Exposure in Puerto Rican Pregnant Women: A Preliminary Analysis

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Abstract:
Polybrominated diphenyl ethers (PBDEs), synthetic flame retardants, are used in the manufacture of many consumer products. As a result, human exposure is ubiquitous. The Puerto Rico Testsite for Exploring Contamination Threats (PROTECT) is a prospective cohort designed to identify associations between environmental contaminants and adverse birth outcomes. In a preliminary analysis, we measured concentrations of 11 common congeners in serum collected in the second trimester of pregnancy (20-24 weeks gestation) from 48 PROTECT participants. We compared the distributions of PBDEs in PROTECT to previously reported levels (since 2010) in cohorts of pregnant women in the US and globally. Detection rates ranged from 2.1% (PBDE-17, -66, - 85, -154, -209) to 72.3% (PBDE-153). PBDE-47 and PBDE-153 were detected in the highest number of women (70.2% and 72.3%). Median levels were greatest for PBDE-47 (4.65 ng/uL) and PBDE-153 (3.87 ng/uL). Compared to other US-based cohorts of pregnant women, median levels of the following PBDEs were lower in the PROTECT cohort: PBDE-47, -99, and -100. Concentrations reported in international cohorts were similar in magnitude to those in PROTECT. The relatively low detection rates and differences in levels of PBDEs reported in our study compared to other US studies may reflect differences in the use of these chemicals in consumer products in Puerto Rico, as well as recent time trends as a result of the phase-out in the use of these chemicals in the US.

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32. Assessing PAH exposure with multiple approaches including silicone wristbands

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Abstract:
Currently there is a lack of inexpensive, easy-to-use technology to evaluate human exposure to environmental chemicals, including polycyclic aromatic hydrocarbons (PAHs). In this study, silicone wristbands were used within an established Columbia Center for Children's Environmental Health birth cohort and compared to conventional PAH exposure assessment methods: active air monitoring samplers housed in backpacks and urine samples. Wristbands and air monitoring backpacks were deployed simultaneously on 22 pregnant women for 48 hours. A spot urine sample was collected after 48 hours. The wristbands were analyzed for 62 PAHs, the polyurethane foam (PUF) and filter from the backpacks were analyzed sEPArately for 20 PAHs, and the urine samples were analyzed for eight hydroxy-PAHs (OH-PAHs). PAHs in the PUF and filter and OH-PAHs in the urine are correlated for 2 of the 8 comparisons (rs=0.53 and p=0.01; rs=0.44 and p=0.04). PAHs in the wristband and OH-PAHs in the urine are correlated for 4 of the 8 comparisons; 1-OH-phenanthrene and 1-OH-pyrene are strongly correlated with the associated PAHs in the wristband (rs=0.76 and p=<0.0001; rs=0.66 and p=0.0009). These results suggest that wristbands may be more predictive of PAH metabolites in urine than PUFs and filters in the backpack. To our knowledge, wristbands are the first external PAH exposure tool to strongly correlate with phenanthrene and pyrene urinary metabolites in a non-occupational study.

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33. Communicating Environmental Risk: A Community Assessment Survey

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Abstract:
Researchers have observed the importance of integrating community in the planning and siting of facilities that may hinder/promote the wellbeing of ecosystems and humans. Decisions made with public cooperation have higher credibility and greater public acceptance than decisions made through technocratic or regulatory processes and are linked to increased longevity, use, and appreciation of projects. I conducted surveys with residents in Census tracts surrounding two industrial sites where outside parties made proposals to introduce new land uses and went ahead with planning and funding the projects while community groups question whether residents' input was acquired. Both communities live near concentrated industrial pollution, have higher proportions of people of color and poverty, and are located in South Providence, RI. The purpose of the survey is to answer the question: Are there effective routes of back-and-forth communication between RI city and state officials and local residents that ensure residents' adequate knowledge about local environments and enable them to participate in local decision-making processes? The surveys glean what residents perceive as environmental risks, if perceptions coincide with education efforts, and if they are participating in decision-making. They also illuminate residents' awareness of proposed land uses, assess the reach of outreach efforts, estimate communities missed, and address effective means of reaching specific populations.

Poster ID: P5812

34. Behavioral and sociodemographic predictors of exposure to multiple chemicals associated with ADHD-related behavior in a low income community

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Abstract:
Cumulative risk assessment – an approach that combines "risks from aggregate exposures to multiple agents or stressors''– is increasingly recognized as a necessary strategy to identify modifiable risk factors for disease within communities. Although considerable effort has been made to develop methods to characterize health effects of simultaneous exposure to multiple chemicals, the challenges of exposure modeling under this cumulative risk assessment framework have been under-examined. Using data from an established birth cohort in New Bedford, Massachusetts, we developed regression models to explain variability in exposures to prenatal (e.g., lead (Pb), mercury (Hg), and organochlorines (DDE and PCB)) and post-natal (e.g. Pb) chemical exposures associated with ADHD-related behavior. Structural equation models were then used to adapt the exposure regression models to be parameterized with available public data. Variability in exposure was predicted by spatial distributions of socioeconomic, housing, and food consumption factors. Results from the models identified subpopulations (e.g. sociodemographic groups) at high risk of multiple exposures as well as geographical areas (e.g. census tracts) with large numbers of high risk subpopulations. Models provided insight into potentially remediable behaviors such as dietary habits (e.g. fish and organ meat consumption) that can contribute to the risk of exposure to multiple chemicals associated with ADHD-related behavior.

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35. Coupling Stress Responses from Circadian Control is Associated with Susceptibility to Mammary Carcinogenesis

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Abstract:
We previously demonstrated that methylselenocysteine prevents N-Nitroso-N-methylurea (NMU)-induced mammary carcinogenesis in the susceptible Fischer 344 (F344) rat by restoring intracellular NAD^+/NADH, increasing SIRT1 activity and resetting circadian expression of Period 2 (Per2). In the present study, we investigated how differential circadian responses to environmental stressors affect genetic susceptibility of rat strains to mammary carcinogenesis. Our results showed that compared to the resistant Copenhagen (COP) strain, mammary glands of the susceptible F344 rat show a 4-hour phase delay in circadian expression of Per2 at baseline. As a result, F344 rats failed to increase SIRT1 activity and circadian expression of Per2 and DNA damage responsive and rEPAir (DDRR) genes in response to NMU. Exposure of COP strain to the same carcinogenic dose of NMU had the opposite effect, enhancing SIRT1 activity, increasing circadian expression of Per2 and sustaining circadian expression of DDRR genes in mammary glands. These results indicate that the COP strain has an increased capacity to maintain NAD^+ levels and NAD^+-dependent SITRT1 activity under genotoxic stress. Although resistant to disruption of circadian control by genotoxic stress, jet-lag disrupted circadian expression of Per2 and DDRR genes in the COP rat. These results suggest that uncoupling of DDRR responses from circadian control by environmental stressors induces a promutagenic state that increases susceptibility to mammary carcinogenesis.

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36. Prenatal Arsenic Exposure in Relation to Maternal and Infant Cardiometabolic Outcomes: Findings from the New Hampshire Birth Cohort Study

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Abstract:
Arsenic exposure during pregnancy and early life may adversely impact maternal and infant health but limited data are available among populations with widely observed low level exposure. Since 2009, we have enrolled over 1,500 pregnant women who use a private well in New Hampshire, where arsenic levels above 10 µg/L (US EPA maximum contaminant level) have been detected. We are evaluating the relation between arsenic exposure during pregnancy and maternal and infant metabolic health. Our findings include associations of arsenic with increases in blood pressure in pregnancy with a 0.15 mmHg increase per month in systolic blood pressure per 5 µg/L increase in maternal urine arsenic ($p<0.02$). Findings also suggest that arsenic may impact risk of gestational diabetes with a positive association of toenail and water arsenic levels with gestational diabetes (OR: 4.5, 95% CI 1.2, 16.6 per 100% increase in toenail arsenic). Assessment of cardiovascular markers both in pregnant mothers and in newborns, suggests that maternal arsenic levels in pregnancy increases soluble intercellular adhesion molecule-1 (sICAM1) and soluble vascular adhesion molecule-1 (sVCAM1) levels in infant cord blood and sVCAM1 levels in maternal plasma. These combined observations suggest that arsenic exposure may affect cardiometabolic health among pregnant women and their newborns. Such changes have potential impacts on pregnancy and birth related outcomes, as well as long-term cardiovascular health.

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37. What Do Child Care Providers Know about Their Role in Protecting Children's Environmental Health?

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Abstract:
The goal of the Children's Environmental Health Research Center at Illinois is to study the effect of ubiquitous chemicals found in the environment and personal care products on children's neurological and reproductive development and function as well as their potential interaction with obesity or a diet high in saturated fats. The Center's Community Outreach and Translation Core is focused on communicating findings to stakeholders including parents, healthcare providers, policy makers, and child care providers. Child care providers are particularly important to target as most children in the United States under 5 years of age spend a significant number of waking hours in non-parental care. Recent analysis have indicated that endocrine-disrupting chemicals are present in child care settings but child care provider knowledge of their risks may be non-existent or nascent. Other than lead exposure, the focus on children's health in child care settings has been on more immediate safety issues. We surveyed and interviewed child care providers in rural, urban, and micro-urban settings regarding their current child care routines relevant to endocrine disruptor exposures and their understanding of the role these chemicals play in children's environmental health. Findings were used to develop messaging targeted to care providers illustrating strategies for reducing exposures to endocrine disrupting chemicals.

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38. Pathways to Health in Vulnerable Populations: CBPR as a Health Screening Intervention

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Abstract:
The Girasoles (Sunflower) Study uses community-based research to examine the physiologic response to heat stress, associated vulnerability factors, and resulting heat-related illness (HRI) symptoms in Florida farmworkers. In addition to contributing to a large physiologic biomonitoring database, Girasoles has proved to be a broad health-screening intervention and has provided valuable incidental findings for a vulnerable population. Data collected include blood pressure, fasting and non-fasting blood glucose, blood creatinine, blood urea nitrogen (BUN), and urine dipsticks. These measures occur multiple times per participant during the course of the study, which increases their validity. Out of 127 participants in two locations, 21 were referred for abnormal blood glucose, 17 for high blood pressure, 4 for anemia, 3 for urinary infections, and 3 for kidney alterations. In a population of workers who may not have access to regular health screenings for chronic health conditions such as diabetes, hypertension, or kidney disease, notification of "out of range" or "beyond normal range" findings in the course of research lead to referrals for local health care providers to recheck these incidental findings that may have otherwise been left undiscovered and uninvestigated.

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39. Understanding the relationship between environmental inorganic arsenic and prostate cancer

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Abstract:
Prostate cancer is the most common cancer and the second leading cause of cancer death among US men. There is clear racial disparity, with African Americans having substantially higher prostate cancer incidence and mortality than European Americans. We hypothesize that environmental exposures to inorganic arsenic (iAs) are linked to prostate cancer, an understudied and likely significant relationship that may underlie racial disparity. Toxic metals such as iAs typically consumed through drinking water are known carcinogens linked to prostate cancer, yet little is known about the role of iAs in prostate cancer aggressiveness especially among understudied groups such African Americans. Over 1,000 North Carolina (NC) men participating in a Prostate Cancer Project (PCaP), 50% of whom are African American, have clinically annotated stored urine specimens and are ideally suited to address this question. Our preliminary research demonstrates that many NC PCaP men live near wells contaminated with iAs and that some men have levels of arsenic in their urine greater than 233 parts per billion (ppb). We will present total and iAs measurements, describe iAs exposure in men with prostate cancer, and quantitatively assess the association of arsenic and influence of race in men well-characterized for prostate cancer aggressiveness. This research will inform identification of high-risk exposure groups and improve understanding of iAs dosage and influence on cancer.

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40. Development of methods to connect exposure to wildland fire particulate emissions to health outcomes: A case study from San Diego County, 2007

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Abstract:
Particulate matter emissions from wildland fire smoke have been linked to a variety of acute human respiratory and cardiovascular health effects. In a project sponsored by the National Institute of Environmental Health Sciences Interagency Working Group on Climate Change and Health Initiative, physically based models of wildland fire emissions and atmospheric transport were linked to population health outcomes using syndromic surveillance data obtained during the 2007 San Diego County wildfires. The goal was to better forecast and prEPAre for air quality events caused by wildland fire under current and projected future climate conditions. This poster reviews the initial study that included creation of the smoke exposure maps and development of modeling methods to connect emissions of particulate matter from wildland fires to respiratory health outcomes as assessed from syndromic surveillance emergency department visit data The status of new research is also reviewed that is linking the exposure maps to health outcomes using the richer health data from California Department of Health Care Services (DHCS) Medi-Cal claims files from San Diego County.This research serves as an example of how complex process-based models of fire emissions and smoke dispersion can be combined with a statistical modeling approach to determine realistic expectations of health outcomes and assess the impact fire could have on human health during past, current, and future wildland fire events.

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Poster ID: P5628

41. The Superfund Process: a Shared Journey of the Duwamish River Cleanup Coalition & UW Superfund Research Program

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Abstract:
The Lower Duwamish Waterway (LDW) is a five-mile stretch of the Duwamish River that flows into Elliott Bay in Seattle, Washington. Industrial and storm water discharge, as well as runoff from roadways and banks, have polluted the river for decades. The LDW has recently entered the Record of Decision (ROD) phase of cleanup. The Duwamish River Cleanup Coalition (DRCC/TAG) is the EPA Technical Advisory Group. The non-profit organization is involved in all aspects of the cleanup of the river, representing the priorities of the community and ensuring that the cleanup meets community standards. The University of Washington Superfund Research Program (UW SRP) has partnered with the DRCC since 2001. The UW SRP has supported boat tours of the river for communities impacted by the site that have included presentations by SRP researchers and trainees. Program staff also worked with DRCC members to organize a new coalition of community organization called the Northwest Toxic Community Coalition. SRP and DRCC staff partnered with the NWTCC and EPA Region 10 to develop an Air Pollution Workshop that included more that 30 community organizations. More recently, SRP and DRCC staff have partnered to develop an educational program for students from neighborhoods surrounding the Lower Duwamish site that includes visits to the UW and SRP labs. SRP and DRCC staff are also playing a key role in a fisher roundtable recently proposed by EPA. The roundtable is intended to function as a neutral and transparent forum that better serves the needs of all stakeholders.

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42. Neighborhood characteristics and health outcomes: Evaluating the association between socioeconomic status, tobacco store density, and morbidity in Baltimore City

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Abstract:
Introduction: Studies suggest that the health of an individual is influenced by the socioeconomic status (SES) of the community. When considering relationships between SES and health outcomes, evaluation of environmental factors that co-localize with SES is critical. We sought to determine factors that influence health outcomes, focusing on income levels, tobacco store density, and life expectancy.
Methods: We reviewed the 2011 Neighborhood Health Profile Reports of Baltimore City (55 communities). Summary statistics for household income, tobacco store density, and life expectancy are expressed as median (25th-75th percentile). We dichotomized communities at the median household income, comparing outcomes of interest within the two income categories by two-sample t-test. Linear regression models were used to investigate associations between tobacco outlet density and neighborhood income and life expectancy. Mean ± standard deviation where appropriate.
Results: The collective median household was $36,362 ($30225-$47744), tobacco outlet density was 22.5 per 10,000 persons (1.23-39.0), and life expectancy was 71.9 years (68.2-74.3). Lower versus higher-income neighborhoods had higher rates of tobacco store density (mean 34.19±4.56 versus 19.42±2.95, $p<0.001$) and lower life expectancies (mean 68.2±3.5 years versus 74.3±3.7 years, $p<0.001$). Each additional tobacco store per 22.5-tobacco store density was associated with an additional 2.66-year drop in neighborhood life expectancy ($p<0.001$).
Conclusion: We demonstrate strong associations between neighborhood household income and tobacco store density. The additional association between tobacco store density and lower life expectancy warrants attention, and may represent an opportunity for reduction in health disparities between neighborhoods through advocacy efforts and policy change.

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Poster ID: P5633

43. Low-level embryonic exposure to flame retardants and related compounds causes neurobehavioral impairment in zebrafish

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Abstract:
Zebrafish larval motility assays have become widely used for high-throughput neurobehavioral testing. These can be valuable, providing an index of integrated neural response in a living organism. But, it is important to determine how accurate larval assay is for predicting long-term neurobehavioral effects of developmental exposure. We have investigated this issue using the case study of developmental exposure to organophosphate flame retardants (OPFRs) and several related compounds with known neurotoxicity, namely the OP pesticide chlorpyrifos and two brominated FRs. Zebrafish embryos are exposed to low levels of individual chemicals at 5-120 hours post fertilization (hpf), when transferred to non-dosed water. At 144 hpf the larvae are tested for locomotor activity in response to alternating light and dark conditions. To determine the long-term effects, developmentally exposed adult zebrafish are tested in a behavioral battery with assays for anxiety-related behavior, sensorimotor response, social interaction, predator avoidance, and learning. The results show that some of the tested chemicals that cause early-life neurotoxic effects in larvae did not show persisting effects in adults. There were other cases where the larval motility assay did not detect effects at doses that were later found to disrupt adult behavior. This pattern of effects suggests that assays relying solely on larval activity screens may be inadequate for detecting long-term neurotoxic risks.

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Poster ID: P5794

44. Redox proteomics and metabolomics of environmental metals, cadmium and manganese, and association with human health

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Abstract:
Cysteine (Cys) residues in protein are an important component of the interface between the environment and an individual. Multiple transition metal ions cause Cys oxidation and excessive oxidation is associated with toxicity. Impacts on the redox proteome are complex because the metals are present as mixtures and at variable concentrations. In this study, we examined redox proteome and metabolome responses to manganese (Mn) and cadmium (Cd) using cells and mice. Mn is a transition metal and essential nutrient for growth, and present in food at low doses. However excessive exposure disrupts redox and metabolic systems and causes toxicity. We found that human neuroblastoma cells treated with Mn at physiological levels stimulated mitochondrial oxidation. Mn decreased total protein thiol and oxidized the Cys proteome, suggesting that physiological concentration of Mn could impact redox control mechanisms. Redox proteomics and metabolomics of mouse lung fibroblasts, lung and liver tissues following exposure to levels of Cd found in the human diet show that Cd potentiates inflammation and fibrosis by altering redox proteome and metabolome. The results suggest that combined presence of multiple transition metal ions could affect human health by potentiating oxidative mechanisms. Future studies for integrative measures of functional pathway and network responses to metal ions and metal interactions are needed.

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45. Fluoride bioaccumulation and enamel fluorosis from chronic exposure through drinking water

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Abstract:
This work aims to study how F^- level in fingernail and urine predict the severity of enamel disorder in rural communities of the Ethiopian Rift Valley. We examined the dental fluorosis (DF) status of 386 individuals (10 to 50 years old) with groundwater F^- concentrations between 0.6 and 15 mg/L. The mean F^- levels in groundwater were 6.5 mg/L, while those in urine were 8.94 mg/L (range: 0.44–34 mg/L). More than 96% of urine samples had F^- at a level higher than the Biological Exposure Index (BEI) value of 2 mg/L. The mean fingernail F^- content was 5.1 mg/Kg (range: 0.52 to 34 mg/Kg). Individuals with F^- <2 mg/L in urine had ~1 mg/Kg of mean F^- in fingernail. There was a strong and significant correlation between F^- in drinking water and 12-hour urinary F^- excretion (r=0.75, n=287), fingernail F^- content (r=0.6, n=267), and mean individual measures of DF severity using the TF-index (r=0.51, n=386). We examined ~12,000 teeth for DF, and younger individuals (10 to 35 years old) had a much greater proportion (81%) of teeth showing signs of DF than older individuals (36 to 50 years old; 27.5% of teeth). The lower DF severity observed in the older individuals suggests that such individuals faced lower exposures in early childhood, which is the most critical period of risk to DF. The exceptionally high F^- bioaccumulation in individuals suggests the need for further research on other potential health effect of high F^- exposures, including skeletal and neurodevelopmental disorders.

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Poster ID: P5813

46. Is phytoremediation a good solution for remediation of asbestos contaminated sites?

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Abstract:
Asbestos is a colloquial term encompassing several fibrous silicates and cause mesothelioma and cancer of the lung. In the US, many site contaminated site occurs such superfund or naturally occurring asbestos (NOA) sites. Currently, the EPA protocol for treatment of asbestos contaminated sites is to move it and/or cap it. However, capped piles containing fibers pose threats to nearby human populations and new strategies should be explored mainly phytoremediation.Four locations were studied here: two in BoRit, a superfund site and two in Nottingham, a NOA site. To determine feasibility of phytoremediation, we evaluated: -Asbestos type and quantity. -Fertility using Fertility Capability Classification and determined soils properties.-Toxicity by an ecotoxicological test. Asbestos form differed between two sites with chrysotile at BoRit at both locations and anthophyllite at grassland at NOA. Limiting factor of fertility were higher in Nottingham than in BoRit. In ecotoxicological test, a lower effect on seed germination was observed. About root growth, an important variability between three species was found with 2-50 % of inhibition of control. Our results showed that it is important to taking into account all soils limiting parameters and not only pollutants. So, crops species seem to be an adequate species on phytoremediation. Our research proposes a novel approach to the remediation of asbestos-contaminated soil.

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47. Mechanism of rotenone mitotoxicity in *C. elegans*: role of the glyoxylate pathway

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Abstract:
We evaluated the effect of the pesticide rotenone, a known mitochondrial complex I inhibitor, on mitochondrial respiration (using the Seahorse XFe bioanalyzer), targeted metabolomics and ATP production with the nematode *C. elegans*. We observed no effect of rotenone on mitochondrial parameters such as spare capacity, proton leak or ATP-linked respiration, or on basal oxygen consumption rate. We had previously observed no effect of rotenone on the number of mitochondrial genome copies or damage to mitochondrial DNA; opposite results have been published by other groups. Targeted metabolomics showed increases in organic acids (lactate, pyruvate, malate) and the amino acid alanine, and major decreases in long chain acylcarnitines after exposure to rotenone. We hypothesize that *C. elegans* might be able to handle the effects of rotenone by bypassing the complex I inhibition it causes; the increase in malate suggests that the nematodes might be using the glyoxylate pathway to this end. To test this, we evaluated gene expression of the glyoxylate pathway enzyme isocitrate lyase (*icl-1*), and complex II subunits *mev-1* and *sdha-1*). All genes showed an induction equal or greater than 1.4-fold change compared to control. ATP measurements indicate an increase in complex II function after exposure to rotenone; however, no change is apparent for complex I. Our results suggest that the effects of the glyoxylate pathway should be considered when working with complex I inhibitors in *C. elegans*.

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48. Strengthening Capacity of Public Health Professionals to Inform Residents about Environmental Health Hazards in Homes

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Abstract:
More than two-thirds of people living in the United States live in a home with at least one housing condition hazardous to their health, including lead-based paint, mold, volatile organic compounds and other conditions of poor housing (National Center for Healthy Housing, 2009). To counter these conditions, the Community Outreach and Engagement Core (COEC) in the UNC Chapel Hill Center for Environmental Health and Susceptibility has trained more than 600 public health and housing professionals throughout NC, enabling them to advise clients on strategies to reduce environmental health hazards in homes. In partnership with the NC Childhood Lead Poisoning Prevention Program (NCCLPPP), the COEC works with local health departments and community clinics to enhance environmental health literacy among public health nurses, social workers, and community health workers who conduct clinical and home visits. Evaluation data from trainings and 30- to 90-day follow-up surveys indicate that these professionals are increasing their knowledge and sharing information with clients. Recently, the COEC has expanded its healthy homes partnerships to include the Catawba Indian Nation and, at the same time, is working with NCCLPPP to increase knowledge among immigrant populations in NC of lead contamination in spices, food and folk art.

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49. Environmental Health high school curriculum, a collaboration between the University of Wahington EDGE Center and ATHENA educators

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Abstract:
The Academy for Teaching About Health and Environment Associations (ATHENA) Project began in 2010 at the UW Center for Ecogenetics and Environmental Health (now Interdisciplinary Center for Exposures, Diseases, Genomics and Environment, EDGE). The ATHENA Project was developed to improve secondary education for Washington state students by collaborating with educators to integrate public high school curriculum with environmental health (EH) sciences concepts and content. Twenty Health and Career and Technical Education (CTE) high school teachers from Washington state attended the 2-day ATHENA Teacher Workshop in August 2016. Consumerism, Choices and Health was the theme. Six EDGE researchers presented on these EH topics: Nutrition, vitamins, cancer, lung health and ethics. ATHENA EH classroom lessons were paired with scientists' presentations. Teachers received classroom kits for two of the lessons. Alumni from the ATHENA Project partnered with the EDGE Community Outreach and Ethics Core in 2014 to develop EH lessons on these topics: UV Radiation and Sunscreen, Sugars and Artificial Sweeteners, Electronic Cigarettes, Genetically Modified Salmon, and Ethics. The ATHENA Project has reached 64 teachers in 37 Washington state school districts. ATHENA EH lessons will have been delivered to more than 4,400 students by June, 2017. Lesson materials are available for free download on the EDGE Center ATHENA webpage and in the PEPH Resource Center.

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50. Reduced Lung Function in Adult Mice after Exposure to Environmentally Persistent Free Radicals is Preceded by Vascular Injury

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Abstract:
Environmentally persistent free radicals (EPFRs) are formed during the combustion of waste at Superfund sites when pollutants are chemisorbed to redox-active transition metals. Nearby residents exposed to these EPFRs develop pulmonary inflammation, and in vitro studies show that bronchial cells exposed to EPFRs have increased secretion of IL-6, TNF- α and ROS. We hypothesized that EPFR inhalation in adult mice will lead to inflammation and increased ROS, resulting in decreased lung function and vascular injury. To investigate the effects of EPFRs on cardiovascular health and lung function, a novel whole-body inhalation system was developed to expose adult C57BL/6 mice to 0.5 or 1.5 mg/m3 of DCB230, for either 4hr, or for 4hr a day for 10 days prior to assessment of lung and vascular function. After 4hr of exposure to 1.5 mg/m3 of DCB230, plasma NO was reduced while ET-1 was increased, suggesting vascular dysfunction. Lung function was not altered. Following the 10 day exposure to 1.5 mg/m3 of DCB230, NO and ET-1 were increased and lung function was reduced, as indicated by a significant reduction in tidal volume. Bi-nucleated macrophages were also increased which is consistent with pulmonary stress. No changes in NO, ET-1 or lung function were noted for the 0.5 mg/m3 group at either time point. This time course suggests that the vasculature may be a direct target of injury after EPFR exposures, preceding alterations in lung function and perhaps inflammation.

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Poster ID: P5561

51. Exposure and Toxicity Assessment of EPFRs in Brain

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Abstract:
Exposure and Toxicity Assessment of EPFRs in Brain Farhana Hasan1, Annadora Bruce-Keller2, Slawo Lomnicki11. Department of Environmental Sciences, Louisiana State University, Baton Rouge, LA2. Pennington Biomedical Research Center, Louisiana State University, Baton Rouge, LAAbstract Air pollution has been suggested to increase the risk of the central nervous system diseases. Studies show that the chronic inflammation at the blood-brain barrier (BBB) might be the reason. Environmentally Persistent Free Radicals (EPFRs) with particulate matter (PM) are potential suspects in many diseases. The effects of different concentrations of EPFR exposure on brain and BBB injury were investigated. Preliminary data on mice exposed to inhalation of EPFR-PM for seven days, 1 hr/day have shown significant effects on BBB tight junction proteins. We observed a 50% increase in the activation of MMP-9 in the animals exposed to EPFRs compared to the control. Western blot analysis of glial cell markers in mice brains indicated lower expression of glial fibrillary acidic proteins, likely related to BBB damage. Recent animal studies show that EPFRs induce COX-2 and decrease syn-phospho protein expression in brain cells at high dose, while TLR4 expression increases both at high and low doses. The changes in expression of these proteins could indicate neurotoxicity. We suggest that this is a result of hydroxyl radicals generated by EPFRs and oxidative stress.

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52. Communities Actively Researching Exposure Study (CARES): An Academic-Community Research Partnership to address Manganese Exposure in Children

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Abstract:
Manganese (Mn) is both an essential element and neurotoxicant. Two communities in Ohio have the highest Mn exposure sources in the nation. The goal of this study is to address the communities' primary research question: "Does Mn affect cognitive development of children?" Children ages 7-9 were enrolled in the Communities Actively Researching Exposure Study (CARES) from Marietta, Cambridge, and East Liverpool, Ohio. CARES has been conducted using community-based participatory research principles. Community members have been engaged in the entire research process. We conducted neurodevelopmental measurements on children including neurocognitive, neuromotor, behavioral and social. Blood and hair were analyzed for Mn and lead (Pb) and serum was analyzed for cotinine. Both low and high Mn concentrations in blood and hair were negatively associated with child IQ scores. Serum cotinine was also negatively associated with child cognitive function. Community engagement has enhanced the research process and the translation of study findings for the communities.

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53. Increased Expression of Fmr1 is a Possible Mechanism Underlying Cd-Mediated Perturbation of Behavior

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Abstract:
Cadmium (Cd) is a ubiquitous environmental toxicant that has been implicated in the pathogenesis of diabetes, cardiovascular disease and neurological dysfunction. Zebrafish (Danio rerio) were used to examine the mechanisms underlying Cd effects on neurological development. Exposure to 60 ppb Cd from four hours post-fertilization (hpf) resulted in hyperactivity-like behavior in zebrafish larvae as measured by locomotor assays at five days. In order to identify possible mechanisms underlying Cd-mediated behavioral changes, we conducted a proteomic screen at 48 hpf. Cd exposure resulted in a 2.4-fold induction ($p = 0.018$) of the fragile X mental retardation protein (Fmr1). Hypermethylation of a CGG expansion in the five prime untranslated region of the human FMR1 gene results in silencing of protein expression and Fragile X Syndrome, an intellectual disorder on the autism spectrum. Decreased expression of FMR1 is also associated with hyperactivity and behavioral abnormalities in mice and humans. Little is known about the effects of Fmr1 overexpression or the potential for environmental exposures to influence expression of this gene. Genomic analysis revealed a highly conserved CG-rich region in the 5' UTR of the zebrafish fmr1 gene. Because Cd exposure causes global hypomethylation, we hypothesized that Fmr1 upregulation may result from hypomethylation of *fmr1* regulatory regions.

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54. In-Vitro Development of a Targeted Mass Spectrometry Protein Assay to Identify Early Stages of Pulmonary Response to Injury

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Abstract:
One of the greatest advantages of proteomics is its ability to provide specific, reproducible, and quantitative measurements for most proteins of interest. This study aims to use the guidelines created in the clinical mass spectrometry (MS) community to generate a robust targeted MS assay to be used for toxicity screening of various nanomaterials. A tri-cell culture was grown in an air-liquid interface and dosed with an aerosolized mitsui-7 MWCNT at both a 24hr and 96hr exposure. Cells and media were collected for each exposure. Both global and targeted methods were used to assess global proteome changes for each sample. Stable isotope labeling with amino acids in cell culture (SILAC) were used as an internal standard spike-in to normalize all proteomic results. Media samples were additionally tested in a targeted MS method to monitor 25 proteins of interest related to inflammatory and fibrotic response; including: TGF-β, IL-1β, IL-6, TNF-α, and several collagen proteins. The tri-cell culture exposed in an air-liquid interface proved to be a successful model for the assessment of cellular mechanistic response to pulmonary injury; as well as provide a more physiologically relevant platform for the development of a targeted MS toxicity testing assay. Further testing is currently being conducted to narrow down proteins that meet criteria set by the clinical MS community to be used as a robust toxicity testing assay.

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55. Air Quality Outreach at Childcare Centers in Asthma Prevalent Philadelphia Neighborhoods

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Abstract:
Philadelphia has 2-3 times higher asthma rates than the State of Pennsylvania. Studies evaluating contributors to asthma have found outdoor pollutants to be important. The EPA provides daily air quality information at airnow.gov at which, anyone can sign up to receive free alerts. The purpose of this study was to determine whether childcare providers knew about poor air quality alert resources and would use them to benefit children in their care. The outreach program was designed to share information about asthma prevalence, dangers of poor air quality, and air quality alert resources with staff at childcare centers in Philadelphia. Prior to the outreach presentation, a survey was administered to evaluate staffers' baseline understanding. Post surveys were administered a month later to evaluate changes. Summary statistics were calculated and pre/post knowledge was compared using a paired t-test. 116 staffers attended the presentations. 87 completed both pre/post surveys. 92% of staffers surveyed never or rarely used air quality alerts before the program. Post survey, 40% of respondents reported signing up for air quality alerts and 70% used the information to benefit children in their care. Additionally, there was a 10.8% mean increase in knowledge score post survey (95% CI: 8.3-13.3%, $p<.0001$). This easily administered program using freely available information was shown to be of interest to childcare providers and increased their knowledge to benefit children in their care.

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56. Inorganic arsenic and its methylated metabolites inhibit calcium influx during glucose-stimulated insulin secretion in pancreatic islets

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Abstract:
Chronic iAs exposure affects millions worldwide and has been associated with an increased incidence and prevalence of type 2 diabetes in multiple populations. However, the molecular mechanisms underlying the diabetogenic effects of arsenic are unclear. Previous studies have shown that iAs and its methylated metabolites impair glucose-stimulated insulin secretion (GSIS) in pancreatic beta-cells. Our goal was to determine how iAs and its methylated metabolites inhibit GSIS. Calcium influx is a key step in GSIS. It is triggered by depolarization of the cell membrane and activates exocytotic machinery that facilitates release of insulin into the blood. Here, we found that 48-hour exposure to iAs and its methylated metabolites decreased glucose-stimulated calcium influx in isolated murine pancreatic islets. Calcium influx was still diminished even after depolarization of the cell membrane by potassium chloride. Events downstream of calcium influx were also affected, such as calcium-dependent calpain activity. Methylated arsenicals were often more potent than iAs. Our results suggest that chronic iAs exposure inhibits GSIS, at least in part, by reducing calcium influx and modifying downstream, calcium-dependent steps involved in insulin vesicle exocytosis. Methylarsenite appears to be more diabetogenic than iAs, highlighting the role of iAs metabolism and factors regulating iAs metabolism (e.g., genetic polymorphisms or diet) in determining susceptibility to iAs-associated diabetes

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57. Serum 1,1-dichloro-2,2 bis(4-chlorophenyl)ethane (p,p'-DDE) concentrations in former farmworkers from the Lake Apopka region of Central Florida

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Abstract:
For more than 50 years, former marshland on the north shore of Lake Apopka was intensively farmed and organochlorine pesticides (OCPs) were routinely applied to control pests. Studies have revealed these OCPs had serious negative impacts on the reproductive health of area wildlife. Lake Apopka farmworkers exposed to the same OCPs report high rates of systemic lupus erythematosus (SLE) and other chronic illnesses. A pilot study of blood from 20 African- American and Hispanic former farmworkers, ages 42 to 85, examined OCP levels. Blood was sEPArated into serum, and extracts were analyzed for a suite of OCPs by GC/MS/MS using a modification of EPA method 525.2. Serum was analyzed for lipid concentration and the presence of anti-nuclear autoantibodies (ANA, one of the 11 criteria for the diagnosis of SLE). Samples from all participants contained p,p'-DDE and two contained p,p'-DDT. The mean concentration of p,p'-DDE was higher than the 90th percentile for people over age 20 from the NHANES studies between 1999 and 2004, reported as 1344 ng/g serum lipid. Values in seven participants were greater than the 90th percentile, with the highest at 10,000 ng/g lipid. Of the 18 who did not have a clinical diagnosis of SLE, 15 had positive ANA readings, a higher incidence than reported for other groups. Results confirm that Lake Apopka farmworkers were exposed to DDT and retain higher concentrations of its metabolite DDE in their blood than the average American.

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58. A Novel Bayes Approach for Predicting Breast Cancer Risk Given Family History, with Application to the NIEHS Sister Study

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Abstract:
Background: Breast cancer is a leading cause of cancer morbidity and mortality among U.S. women. Family history is a major risk factor for breast cancer. In the Gail model, widely used in clinical practice, family history is trichotomized as a 0/1/1+ variable. However, this paradigm loses information regarding family history and its impact on breast cancer risk. We develop a well-calibrated family history score that improves predictive power by utilizing more information regarding family history.Methods: A Bayes estimator of family specific lifetime breast cancer risk is derived that incorporates prior data from SEER (Surveillance, Epidemiology, and End Results) Program registries and is updated with information regarding family structure, breast cancer history of first-degree female relatives, and cumulative hazard experienced. We further calibrate this Bayesian score with known risk factors through the Cox proportional hazards model, and evaluate the performance through receiver operating characteristic (ROC) curve analysis.Results: In the Sister Study cohort, our proposed Bayesian family history score outperforms the 0/1/1+ family history score in terms of 5-year risk prediction. With further calibration, we find that our Bayes score used as a covariate in a Cox model adjusting for other known risk factors also increases predictive power compared to the Gail model.

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59. Elevated fetal cord blood cotinine levels associated with increased DNA methylation at the human metastable epiallele PAX8

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Abstract:
Metastable epialleles (MEs), or stochastically-methylated regions of the genome, are vulnerable to environmental stressors and may play a role in the developmental origins of health and disease (DOHaD). Methylation perturbations at MEs in developing mice have been extensively examined as contributors to metabolic disease later in life. Recently, human MEs were identified and found to exhibit altered methylation associated with the periconceptional availability of nutrients, in agreement with prior rodent studies. However, little is known about the vulnerability of MEs to environmental exposures such as tobacco smoke (TS). Considering recent evidence that nicotine represses DNA methyltransferase enzymes in the brain, we hypothesized that DNA methylation at the human ME PAX8 is altered by developmental exposure to TS. PAX8 encodes a master regulator transcription factor important to normal cellular function. Our data showed that the stochastic and interindividual variation in DNA methylation at PAX8 is consistent with PAX8 comprising a ME. Moreover, DNA methylation at PAX8 in cord blood increased with increasing cotinine levels (no exposure=0-<0.2 ng/mL, SHS exposure=0.2-<15 ng/mL, light smoking=15-<100 ng/mL, heavy smoking= >100 ng/mL). Methylation was significantly increased in the light and heavy smoking groups as compared to the no smoking group (p=0.005 and p=0.02, respectively). Our data suggests human PAX8 is vulnerable to developmental TS exposure.

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60. Using Hollywood to make protective policy on chemicals

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Abstract:
Addressing PCBs in buildings has come slower in the United States than in northern Europe. That may change. The Santa Monica-Malibu Unified School District just north of Los Angeles, California has become a location where parents have organized to force school administrators to remove PCBs from classrooms. Malibu Unites (later re-named America Unites for Kids), the parent-teacher advocacy group, has done a number of things that may lead to PCB removal in their school and perhaps in many others.The group has done its own independent testing of caulk inside rooms not included in school-sponsored testing. Malibu Unites President, Jennifer deNicola, and others have been active in seeking knowledge about PCBs. The group has used its star power (many members are professional actors and entertainers) to get support from the lobbying firm Brownstein Hyatt Farber Schreck to get meetings with the organization's president and board member, super model Cindy Crawford, at the Whitehouse and with many US SenatorsThe Iowa Superfund Research Program (isrp) has worked extensively with America Unites. Jennifer deNicola and another board member came to Iowa City to meet with our researchers, isrp helped put Ms. deNicola on the agenda at the Woods Hole workshop, several isrp researchers communicate regularly with the organization, and individuals in our center have advised the organization on how to take samples and which labs to use for analysis.

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61. Effect of bisphenol-A (BPA) on F2 Peromyscus californicus pup vocalizations

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Abstract:
Rodent species elicit vocalizations as a means of communication or to initiate parental care. This may be the case in species that cannot regulate their own body temperature, such as California mice (*Peromyscus californicus*), which are monogamous and biparental. Prior findings suggest that as California mice pups mature and approach weaning they vocalize less and parental care decreases. We have also observed decreased parental care in F1 male and female California mice that were developmentally exposed to the endocrine disrupting chemical, bisphenol A (BPA) or ethinyl estradiol (EE). Audible vocalizations and USVs in F2 pups from F1 BPA-exposed and control parents were examined in this study. Pups were recorded for 3 min with a high-frequency microphone. Once the recording finished, pups were placed back in the home cage with the parents and video recorded for 5 min before being placed back into the recording box where they were recorded for an additional 3 min. Recordings were performed twice per day (10.00 and 14.00 hrs) on post-natal days (PND) 2, 3, and 4 (early), 7 and 14 (mid), and 21 and 28 (late). Preliminary results show reduced call duration in pups whose mothers were exposed to BPA ($p=0.05$). Older (PND 21 and 28) BPA-exposed pups took less time to make their first call than control pups ($p=0.007$). At the early and mid-trial periods, BPA-exposed pups also called more frequently than control counterparts ($p=0.04$-0.06).

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Poster ID: P5643

62. Universal Exposure Surveillance: The Million Metabolome for Exposome Research

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Abstract:
"Sola dosis facit venenum." These words of Paracelsus, "the dose makes the poison", can lead to a cavalier attitude on potential toxicities of the vast array of low abundance environmental chemicals to which humans are exposed. Exposome research teaches that 80-85% of disease is linked to environmental exposures. The human exposome includes >400,000 environmental chemicals, most of which are uncharacterized related to human health. Mass spectrometry measures >200,000 chemical ions in human samples; most are unidentified. This crystalizes a grand challenge for exposure study and precision medicine: to develop reliable and affordable methods to routinely monitor the human chemical experience. If we could measure a million chemicals in a drop of blood for $50/sample, we could realistically consider a "Human Exposome Project" to define the cumulative lifelong exposures, e.g., environment, diet, behavior, and endogenous processes. To develop universal exposure surveillance methods, we developed advanced computational methods and ultra-high resolution mass spectrometry based methods to obtain probability based annotations and pathway associations linking exposures to chemical burden, human toxicity and disease. Results show direct links of exposures to chemical concentrations and correlation of plasma concentrations with disease risk biomarkers, suggesting that computational and analytical tools are filling the need for ambitious environmental health research goals.

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63. Influence of *in utero* exposure to metal mixtures on the Human Placental Gene Network and Fetal Growth

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Abstract:
We derived a placental gene network and assessed the influence of metal mixtures to delineate a fetal growth-related gene-environment signature in the Rhode Island Child Health Study. Weighted gene coexpression network analysis was performed on placental RNA-Seq data (n=200). Differences in module eigengene values across fetal growth categories were determined using a Kruskal Wallis test. Finally, we assessed the influence of metal mixture exposure on network modules and fetal growth by modeling maternal toe nail levels of 14 trace metals against the module eigengenes and fetal growth categories using weighted quantile sum (WQS) regression analysis.

We identified five fetal growth-related modules. Gene ontology enrichment analysis indicated that these modules are involved in cellular respiration, amino acid transport, gene expression, histone modification and gonadotropin/glucagon secretion. Based on WQS regression analysis, a metal mixture index predominated by contributions from cadmium, tin and lead was positively associated with increased odds of SGA status. Generalized linear regression models revealed an association between the SGA-related metal mixture index and the expression levels of *CREB3*, the hub gene of the cellular respiration module, and *GRHL1*, the hub gene of the gonadotropin/glucagon module.

This study represents the first comprehensive assessment of the influence of *in utero* environmental insults on fetal growth through placental genomics in a birth cohort study.

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64. Aggravating Factors of Asthma in a Rural Environment (AFARE)

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Abstract:
Air quality concerns have been identified by the community and regulators in rural Yakima Valley. Few studies have focused on environmental triggers of asthma in the rural, agricultural context. Using an established University of Washington - Yakima Valley community engaged research infrastructure (El Proyecto Bienestar), 59 school-aged children with asthma were assessed for up to two years (Sept 2010-October 2012) with daily measures of lung function and biweekly symptom questionnaires. There was high day-to-day fluctuation in PM2.5 concentrations measured at a central site with a median 24 hour concentration of 5.7 µg/m3 (range 0.3 - 92 µg/m3). Study monitors demonstrated high day-to-day and site-to-site variability in neighborhood scale NH3 concentrations. The regional median NH3 concentration was 23 ug/m3 (range 0.2 -238). Metrics of daily residential exposure to the multi contaminant plume emitted from animal agriculture were also constructed. Epidemiological analyses revealed reduced lung function (FEV1 – percent predicted) on the day following higher exposures to PM2.5, NH3, and the plume metric. Higher concentrations of PM2.5 were also significantly associated with increased asthma symptom reports (wheeze, nighttime waking, and activity limitation). This research suggests that ambient air contaminants in rural settings, including those associated with animal agriculture, may have public health impacts for vulnerable residents such as children with asthma.

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65. Preterm Birth and Potential Economic Benefits of Reduced Maternal Exposure to Fine Particulate Matter

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Abstract:
Preterm birth (PTB) is a leading predictor of infant mortality and morbidity and an important contributor to later-life disease and disability. A growing body of evidence suggests a relationship between a mother's exposure to environmental contaminants during pregnancy and PTB of her baby. Many policy actions to reduce exposure to these contaminants require benefit-cost analysis (BCA). Ideally, the health benefits of these policies are measured by willingness to pay (WTP) for risk reduction; however, the economics literature lacks an estimated WTP value for PTB. This poses a challenge for conducting accurate BCAs of reducing harmful environmental exposures, which hinders identifying and adopting the most efficient or protective policies. An alternative approach is to focus on the costs avoided when risk of PTB is reduced, which requires an estimate of the direct and indirect costs associated with PTB. This study outlines a potential framework to estimate the economic benefits arising from reducing PTBs resulting from environmental exposures. We present a case study of maternal exposure to fine particulate matter (PM2.5) to illustrate the potential health and economic benefits of reducing pollutant-related PTB. We utilize a recent meta-analysis and county-level air quality and PTB data to estimate the potential PTB benefits of a hypothetical reduction in PM2.5.

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66. Determining Male Reproductive Toxicity of Bolus Versus Continuous Exposure to Trichloroethylene

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Abstract:
Trichloroethylene (TCE) is an industrial solvent that was used as a degreasing agent. Even though TCE production has been reduced, groundwater contamination of this halocarbon remains a significant health concern as a male reproductive toxicant. Due to its high volatility, there is interest in understanding the effects of household exposure via vapor intrusion. Residential vapor intrusion of TCE can follow two exposure patterns; intermittent spikes in concentration and consistent low level exposure. The purpose of this study was to determine the impact of the two different exposure paradigms on sperm toxicity following a 90 day exposure. Rats were either exposed via drinking water or gavage to mimic consistent low dose exposure or a bolus dose, respectively, at an equal daily dose. The animals were allowed to recover for 0, 6 or 12 weeks to assess the impact on spermatogenesis. After approximately two months of exposure, the body weight for exposed rats was lower than control rats indicative of general toxicity. Immediately after the 90 day exposure, rats had reduced sperm motility but not reduced testis weights regardless of the exposure route. Rats exposed via gavage had reduced epididymal weights. The epididymal weight reduction was not observed in exposed animals following 6 weeks recovery. We conclude that both exposure paradigms produce male reproductive toxicity primarily acting on the epididymis with the single bolus dose demonstrating greater toxicity.

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67. MI-Environment: Promoting Climate-Related Health within Michigan's Vulnerable Communities

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Abstract:
Projected climate changes pose significant challenges to local decision-makers tasked with identifying, preparing for, and responding to climate-related human health impacts. To support diverse stakeholders in accessing and engaging with climate-related health promotion and decision-making materials, we created the MI-Environment platform, including a heat stress vulnerability assessment. The MI-Environment visualization tool assesses cumulative environmental exposure for Michigan and displays the corresponding data. In the Heat Stress Vulnerability analysis, we used a Geographic Information System (GIS) to combine future ensemble climate projections with remote sensing and demographic data into maps that allow users to understand the location and relative magnitude of climate vulnerability on three metrics: projected temperature, built environment, and population vulnerability. Working in partnership with community-based organizations, health practitioners, and researchers, we conducted feasibility testing to refine the MI-Environment tool and identify opportunities to intervene and improve health outcomes. We describe the engagement activities to illustrate how stakeholders used the MI-Environment tool, and we summarize key results and opportunities for future collaboration with the general public. We discuss the desired technical upgrades to the MI-Environment platform as a result of feedback from stakeholders to inform future efforts to plan for climate change.

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68. Associations of Early Life Water and Dietary Arsenic Exposure with Subsequent Growth and Neurodevelopment

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Abstract:
Exposure to high doses of arsenic via contaminated drinking water is known to adversely impact child growth and neurobehavioral development. However, less is known about the effects of lower doses of arsenic exposure typical of U.S. populations, which occur primarily through food instead of drinking water. The goals of our project are to assess diet and water as sources of arsenic exposure in pregnant women and their children and the relation of early life arsenic exposure with subsequent growth and neurodevelopment, within the New Hampshire Birth Cohort (NHBC) study. We evaluate arsenic exposure in mothers and children via drinking water and diet using urinary and toenail arsenic biomarkers. We then evaluate how those biomarkers are related to the children's growth and adiposity (weight, height, body mass index, waist circumference, skinfold thicknesses) and neurodevelopment (behavior, cognition, motor proficiency and symptoms associated with autism spectrum disorders). More than 1500 pregnant women have enrolled in the NHBC to date and ~15% have private wells with arsenic concentrations above the current maximum contaminant level of 10 µg/L. Work to date suggests that arsenic exposure via rice and rice products is a significant exposure pathway, and that other dietary items also contribute. Analyses of the relation of arsenic exposure with postnatal growth and neurobehavioral development through age 5 years are underway.

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69. The effects of perinatal exposure to phthalates and a high-fat diet on maternal behavior, indices of pup development, and periadolescent behavior

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Abstract:
Given that phthalates, a class of endocrine-disrupting chemicals, and fatty foods are ubiquitous in the developed world, it is important to study phthalates and a high-fat diet together. Here, we use a rat model of human prenatal exposure that extends from the prenatal period through postnatal day (P)10. Dams were fed high-fat (HF) or control (CON) diets and consumed a daily dose of a phthalate mixture based on human exposure from urinary metabolites at 0, 200, or 1000 µg/kg/day. Dams on a HF diet had higher caloric intake, gained more weight during gestation, and produced offspring with greater body weight at P10 and marginally at P25. Additionally, phthalate-treated dams tended to have larger litters, though there were no differences in the pup body weight at birth or in the sex ratio of the litter. Even though litter sizes were standardized, phthalate-treated males had lower body weights at P10 and P25. The relatively high dose of the phthalate mixture appeared to delay pubertal onset only in the HF males and precociously affect pubertal onset only in the CON females. Maternal behavior observations revealed that HF dams licked and nursed their offspring more and engaged in more nest reorganization. Interestingly, maternal licking positively correlated with pup social play behavior (i.e. wrestling, sniffing, & chasing) during the periadolescent period. In addition, the relatively low phthalate exposure group demonstrated less social play in both males and females.

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70. Community collaboration addressing cumulative impacts in port-adjacent communities

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Abstract:
The CEED COEC is focusing on cumulative impacts of multiple environmental stressors in communities adjacent to the seaport of Newark/Elizabeth, NJ, which have the greatest poverty rates, highest population densities, and largest Black and Latino populations in New Jersey. The largest East Coast seaport, it is rapidly expanding to handle increased volume from larger container vessels following widening of the Panama Canal. We partner with the Ironbound Community Corporation, Clean Water Action, NJ Environmental Justice Alliance, GreenFaith, and other Coalition for Healthy Ports members. We collaborate in community-based research on the health impacts of ship emissions and diesel exhaust, added to psychosocial stress, heat, flooding, and legacy environmental contamination. Projects include a large US EPA-funded study of effects of exposure to diesel exhaust and chronic psychosocial stress on asthma exacerbation in children, community-based air quality monitoring, indoor air quality in schools and homes, and effects of flooding and other disasters including heat stress and vulnerability. With our community partners, we provide information on local environmental health issues (e.g., lead in drinking water, asthma triggers, and common low-level chemical contaminants). New initiatives include facilitating integration of environmental health improvement efforts by community groups, local government, faith-based organizations, health providers, and regulatory agencies.

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71. Evaluating the capacity building outcomes of the HERCULES community grant program

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Abstract:
The primary aim of the community grant program of the HERCULES Exposome Research Center is to increase the capacity of community-based organizations to conduct activities to address local environmental health / exposome concerns. An evaluation of the first two years of the program examined four dimensions of community capacity: knowledge and skills, leadership opportunities, partnerships, and resources leveraged. Preliminary analyses of qualitative interviews with grantees suggest the community grants were successful in strengthening several dimensions of capacity. All grantees were able to describe how the grant strengthened knowledge or skills. The community grant process was also helpful in developing leadership skills at the individual and organizational-levels. Grantees described the process as confidence building, enhancing accountability, providing structure to their work, and building practical professional skills. For some being a grant recipient was a "catalyst" for the organization and provided a sense of credibility. For many the grant process was a beneficial experience in that it provided an opportunity for recipients to extend their community reach, build new relationships with other organizations, and contributed to sustainability of community projects. All of the organizations felt they would have benefited from more hands-on interaction and feedback. These findings led to efforts to improve to the grant program in the current and upcoming cycle.

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72. The Center for Research on Environmental and Social Stressors in Housing Across the Life Course

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Abstract:
The primary objective of the Center for Research on Environmental and Social Stressors in Housing Across the Life Course (CRESSH) is to understand and reduce environmental health disparities (EHDs) by conducting three fully-integrated research projects applying novel methods in epidemiology, exposure science, and cumulative risk assessment, with strong community engagement across the Center. We are focusing on multiple health outcomes across the life course with evidence for EHDs (birth outcomes, childhood growth rates, and cardiovascular mortality), across Massachusetts and in two low-income communities (Chelsea and Dorchester). CRESSH emphasizes the role of housing and the neighborhood environment, which can contribute to or modify exposures such as air pollution and temperature. We are developing novel geospatial data resources and developing constructs for housing, material hardship, neighborhood environment, and sociodemographics, which will inform multi-stressor epidemiological analyses. In addition, we are using innovative real-time monitors to estimate indoor exposures to multiple chemical and non-chemical stressors in Chelsea and Dorchester. Throughout the Center, we are using quantitative metrics to evaluate the presence of EHDs and we are simulating the benefits from hypothetical interventions. CRESSH includes strong bi-directional engagement with community partners and a pilot project program to develop junior investigators interested in studying EHDs.

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73. Immune Dysregulation and Autoimmune Responses in Tribal Communities Exposed to Mine Waste and Metal Contaminants

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Abstract:
The rural nature of tribal communities often results in exposure to potentially toxic metal mixtures from the numerous abandoned mines in the western United States. Biomonitoring data from our Navajo Birth Cohort Study (NBCS) demonstrate uranium exposures above national norms, the health effects of which are unknown. The Center for Native American Environmental Health Equity Research is addressing the relationship of metal exposures (using biomonitoring and direct environmental assessment) with immunologic outcomes in individuals exposed to legacy mine waste from three tribal communities (Navajo, Cheyenne River Sioux (CRST) and Crow). Unique but overlapping metal exposures within the communities will help us to identify the negative health impacts of specific metals and metal mixtures on immune outcomes related to biomarkers of autoimmunity and development of immune dysregulation. We have observed a higher than expected prevalence of anti-nuclear antibodies (ANA) in both the Navajo and CRST community members associated with exposures to mine waste. Preliminary studies using Navajo samples demonstrate increased levels of inflammatory cytokines (TNFα, IL-17 and IL-4) in individuals with higher levels of excreted urine uranium, indicating potential immune dysregulation related to exposure. We are using a combination of population studies, *in vitro* studies, and animal models to increase our understanding of the mechanisms by which metal exposures alter immune function.

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74. Aryl Hydrocarbon Receptor (AHR) Activation by 2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) Impairs Early Human B Lymphopoiesis

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Abstract:
The homeostasis of peripheral B cell compartment requires lifelong B lymphopoiesis from hematopoietic stem cells (HSCs). As a result, the B cell repertoire is susceptible to disruptions of hematopoiesis. Increasing evidence, primarily from rodent models, shows that AHR regulates hematopoiesis. To study the effects of persistent AHR activation by the environmental contaminant TCDD on human B lymphopoiesis, an in vitro human B cell developmental model was established. We found TCDD markedly suppressed the generation of pro-B and pre-B cells from human HSCs, indicating the impairment of B lymphopoiesis. Structure-activity relationship studies using dioxin congeners showed a correlation between AHR binding affinity and the magnitude of reduction of pro-B and pre-B cells. Moreover, addition of AHR antagonist reversed the TCDD-elicited reduction of pro-B and pre-B cells, suggesting that the impairment of B lymphopoiesis is mediated by the AHR. Gene expression analysis revealed a significant decrease in mRNA levels of EBF1 and PAX5, two critical transcription factors regulating B lymphopoiesis. In addition, binding of the ligand activated AHR to the putative dioxin response elements in the EBF1 promoter was demonstrated by EMSA-Western assays, suggesting transcriptional regulation of EBF1 by AHR. Taken together, this study demonstrates for the first time, impairment of human B lymphopoiesis by TCDD, and suggests that transcriptional alterations of EBF1 by AHR are involved.

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75. The Caribbean Consortium for Research in Environmental and Occupational Health: Examining the Impact of Neurotoxicant Exposures on Maternal and Child Health in Suriname

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Abstract:
Suriname and other Caribbean Region countries suffer a triple public health burden: high perinatal mortality, environmental contamination potentially related to growing mining and agricultural development, and a lack of environmental policies. *The Caribbean Consortium for Research in Environmental and Occupational Health* (CCREOH) is designed to examine the impact of exposures to neurotoxicants on maternal and child health. Neurotoxicants of concern-Hg contamination: sediments (0.14-0.35 ug Hg/g); frequently consumed fish (0.17-1.64 ug Hg/g), 75% of fish > WHO's safe consumption level (0.5 ug Hg/g). Depth-wise, sediment cores showed decreasing Hg concentrations indicating higher Hg levels were associated with recent gold mining-related deposition; mean hair Hg 4.6 ug/g (range 1.1-9.1 ug/g) and 5.3 ug/g (range 1.0-14.1 ug/g) in women and children, respectively. Hg levels are of public and environmental health concern. Produce pesticide residues > Maximum Residual Levels (MRLs). Endosulfan, a banned pesticide, was detected in 1 of 8 samples in Tannia (mean 0.07 ppm, EU MRL 0.05 ppm). Organochlorines and pyrethroids were detected in 35% of samples. Through a transdisciplinary environmental epidemiologic cohort study of 1000 mother/child dyads from urban and indigenous regions, CCREOH targets EOH and dietary exposure assessments including the consumption of presumed nutraceuticals, and climate change as exposure sources beyond fish and produce, and birth and neurodevelopmental outcomes.

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76. Environment-Wide Association Study in Autism Spectrum Disorder

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Abstract:
Autism spectrum disorder (ASD) is a group of neurodevelopmental disorders characterized by deficits in social communication, language and repetitive behaviors. ASD is highly heritable with half of phenotypic variance explained by genetic factors. Over the past decade, the prevalence of ASD has increased quickly in US, which is not explained by younger age at diagnosis and inclusive diagnostic criteria. Analysis of environmental influences has not kept pace compared to widely studied genetic factors. Moreover, uncovering the influence of environmental factors could offer actionable results. To better investigate the role of the exposome in ASD, chemical profiles measured by gas chromatography-mass spectrometry/mass spectrometry and liquid chromatography-high resolution mass spectrometry in serum obtained from ASD patients, their family and individuals without ASD are used. These measures will be integrated in an Environment-Wide Association Study to identify exposures associated with ASD phenotypes in children. We will examine the relationship between maternal indicators of exposure associated with autism severity and phenotypic subgroups of ASD children. Furthermore, by integrating exposome information with existing genome sequencing and functional genomic profiles, we will derive new hypotheses regarding etiology of ASD for future investigation. Our project website(http://autismexposome.org) provides updates on our analytical strategies, current data and findings.

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77. Fluorescence Assays for Detection of Arsenic in Water and Foodstuff

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Abstract:
Arsenic (As) is a highly toxic element that exists in environment in different chemical forms. The detection of arsenic in natural water and foodstuff, such as rice and baby cereal remains a challenging task for analytical chemists. This study presents newly developed detection methods based on fluorescence assay for arsenic in aqueous solution, which is based on an enzyme-catalyzed reaction, the enzyme catalyzes a step in the reaction and generate a new fluorescence molecule, the detection range of arsenic will be determined by monitoring the change of fluorescence. The experiments has successfully detected arsenic in natural water at ppb level (down to 5ppb). This method holds great potential for detection of arsenic with concentration down to the standard level adopted by the EPA (10ppb in drinking water). The experiments has also successfully detected arsenic in rice at ppb level, which demonstrated the practical application of the developed assay in monitoring food safety.

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78. Dual-biofilm reactive barriers: Field tests of passive destruction of chlorobenzenes in discharging groundwater and wetland sediment

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Abstract:
At the Standard Chlorine of Delaware Superfund Site, groundwater flowing to a wetland and the wetland sediment itself contain persistent sources of chlorobenzenes (CBs) that contaminate the wetland surface and tidal creek, posing potential health risks for the local ecosystem and community. We conducted a field test to demonstrate the concept of a "dual-biofilm" reactive barrier, a passive in-situ remediation technology designed to sequester and degrade organic pollutants using anaerobic and aerobic CB-degrading cultures bioaugmented together on granular activated carbon (GAC). Two application methods of a reactive barrier matrix containing bioaugmented GAC, sand, and chitin were tested—one placed on the sediment as a thin cap and the second mixed into the shallow sediment to form a thicker reactive zone. The sand cap was less reliable with periods of freezing and low moisture, although CBs were attenuated. Sampling over 5 months showed that the total mass of chlorobenzenes in sediment samples of the reactive zones were as much as 80 to 94 percent lower than controls, while total dissolved concentrations in groundwater samples in the reactive zones were 50 to 99 percent lower than controls. Anaerobic conditions were indicated in reactive zones and control samples, but concentrations of ferrous iron, sulfide, ammonia, and methane often were distinctly higher in the reactive zones than controls. Distribution of anaerobic and aerobic CB-degrading bacteria is being evaluated.

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79. Indoor Environmental and Air Quality Assessment in Schools in mid-Atlantic Region

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Abstract:
To assess indoor environmental conditions and air quality within schools in the mid-Atlantic region prior to undergoing renovations, environmental and indoor air quality data including $PM_{2.5}$, CO_2, CO, and NO_2 were collected during a 2-week period in winter and/or spring in six schools. Data analysis was limited to school days/hours. Summary statistics of the data along with seasonal and daily variability were calculated. Daily medians of the measured parameters in classrooms and common areas were compared as well as Daily medians in similar location types (i.e. classroom and common area) across schools. It was also examined when/where the indoor air quality guidelines (e.g. WHO, ASHRAE) were not met. Of the 134 school room days of monitoring, 75 took place in spring and 59 in winter. Three of six schools were visited in both seasons. The ranges of daily median were 400 - 2381 ppm for CO_2, 0.0 - 0.9 ppm for CO, and 0.00 – 0.23 ppm for NO_2. $PM_{2.5}$ concentrations ranged from 1.34 to 23.48 $\mu g/m^3$. Seasonal variability of data was observed, particularly for CO and NO_2 with much higher levels in winter possibly due to the influence of higher ambient air levels in cold seasons. Variability was observed between-day, between-room, and between-school. To sum up, there was evidence of variability in indoor air quality in Mid-Atlantic schools with generally higher concentrations in the winter season. Future work should evaluate whether indoor air quality influences student performance.

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Poster ID: P5583

80. Prenatal Exposures to Bisphenol A and High Fat Diets are Associated with Increased Lipid Oxidation in Mice and Humans

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Abstract:
Prenatal programming of non-alcoholic fatty liver disease (NAFLD) can occur after exposure to endocrine disrupting chemicals. Modification by diet would be a low-cost, preventive measure for NAFLD, now affecting >50% of U.S. adults and >35% of obese children. In mice, we tested the hypothesis that Western (West) high fat diet (HFD) amplifies and Mediterranean (Med) HFD prevents lifelong metabolic effects of perinatal BPA. Mice, exposed to Control, West, or Med diet in the presence or absence of 50μg BPA/kg chow, were examined at postnatal day 10 (PND10) and 10 months (10M). Both HFDs increased liver 8-isoprostane at PND10 ($p<0.05$) but not at 10M. In contrast, BPA increased 10M liver 8-isoprostane ($p<0.05$) but not PND10. Despite no body weight differences, both HFDs increased ($p<0.05$) serum leptin and liver triglyceride levels. To test if the unexpected steatotic effect of Med diet occurs in humans, 250 mother-child pairs were evaluated at 8-14 yrs. Maternal urinary BPA from all 3 trimesters predicted increased adolescent serum 8-isoprostane ($p<0.05$). However, maternal adherence to a Med diet was only a significant predictor in 1st trimester ($p<0.05$). Adolescent metabolic risk, assessed via z-score markers, decreased ($p<0.05$) with an increase in 3rd trimester BPA, but increased ($p<0.05$) with puberty. This comparative assessment in mice and humans deepens understanding of the fetal programming effects of perinatal BPA and HFD on metabolic diseases, such as NAFLD.

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81. Collaborative Research to Action: Empowering an exposed community

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Abstract:
The Michigan PBB Research Registry consists of ~ 6,000 people exposed to polybrominated biphenyls following its accidental introduction into Michigan's animal feed (1973). After forty years, the PBB Registry was transferred to Emory University, allowing the research team to engage this community for the first time. Community engagement (CE) activities were initiated with goals of disseminating research findings to those affected, responding to educational needs, incorporating community input, and facilitating research participation. CE efforts have led to significant changes in outreach activities, research protocols, and research priorities: community health concerns were added to surveys, the age range for participation was expanded, and chemical workers/family who were removed from the Registry (1990s) due to multiple exposures were re-enrolled with new exposome methods incorporated to evaluate their complex exposures. Community concerns regarding generational effects and continued high-levels of PBB body burden led to a recently funded epigenetics study and clinical trial aimed at accelerating PBB elimination. These efforts evolved into a community-based participatory research partnership, where the community identified research questions, helped develop the research approach, and is an integral part of research decision-making. Characterization of the Registry, research findings including preliminary metabolomics and epigenetics, and the CE approach will be presented.

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82. Paraoxonases are important in modulating metal-induced oxidative stress

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Abstract:
Human environmental exposures to heavy metals such as manganese (Mn) or cadmium (Cd) are common and represent adverse risks to health, as they generate oxidative stress that can lead to neurotoxicity.The paraoxonases (PONs; PON1, 2 and 3) are a family of potent antioxidant and anti-inflammatory enzymes that have been related to a variety of oxidative stress-related diseases. PON1 is mainly found in high-density lipoproteins (HDLs). PON2 is present ubiquitously in endoplasmic reticulum and mitochondria. Estrogen-modulation of PON2 confers neuroprotection in females. Under conditions of oxidative stress, PON2 expression increases while PON1 expression decreases.A major aim of our research is to understand the effect of metal-induced oxidative stress on PON1 activity, and that of PON2 in modulating susceptibility to neurotoxicity.In vitro exposure of either plasma or pure PON1 to heavy metals resulted in significant inhibition of PON1 arylesterase activity, especially with the metals Cd, Mn, lead, mercury and zinc. In vivo exposures of Mn in wild-type and Pon2 knockout mice (Pon2-/-) significantly inhibited plasma PON1 activity compared to mice exposed to saline, with a greater inhibitory effect in Pon2-/- mice. Furthermore, in vitro exposure of plasma, HDL or pure PON1 with products of oxidative stress resulted in a significant decrease of PON1 arylesterase activity.We conclude that PON2 protects PON1 from the inhibitory effects of Mn-induced oxidative stress.

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83. Prenatal lead and stress effects on multiple neurotransmitters measured in several brain regions

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Abstract:
INTRODUCTION: Early exposure to lead (Pb) and prenatal stress (PS) has a profound and enduring impact on central nervous system development. This study sought to determine how Pb exposure and PS affects brain neurotransmitter physiology. METHODS: Female rats received 0 or 50 ppm Pb acetate in drinking water from 2 months prior to breeding through lactation and were then randomly assigned to non-stress or PS, yielding four treatment groups. Six neurotransmitters on the mesocorticolimbic pathway of 40 male and 40 female offspring were measured in each of five brain regions, resulting in 30 measurements/ rat. To take advantage of the correlated measurements, multiple outcome models were fit to investigate the effect of Pb, PS and Pb*PS interaction on the neurotransmitters. RESULTS: For both sexes, strong Pb effects were seen for multiple neurotransmitters in multiple brain regions, whereas stress and Pb*PS interaction effects were less frequent and less strong. Levels of most neurotransmitters decreased with Pb across all brain regions except for the hypothalamus where many levels increased. The strongest effects were in the nuclear accumbens, where Pb exposure was associated with lower levels of five neurotransmitters in females and six in males. CONCLUSIONS: The changes observed in neurotransmitter function suggest developmental exposure to Pb, PS and Pb+PS may modify the hormone-behavior relationships in a sex-specific manner lasting into adulthood.

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84. Deletion of C/EBPβ in Oncogenic Ras Driven Tumors Results in Rapid p53 Dependent Tumor Regression

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Abstract:
Ras is a small membrane bound GTPase which mediates extracellular signal transduction and is mutated in 30% of all human cancer where it is permanently "switched on". A well-studied model of Ras-induced tumorigenesis in mouse skin is the DMBA/TPA multi-stage chemical carcinogenesis protocol. Our lab has shown that the bZIP transcription factor CCAAT/enhancer-binding protein beta (C/EBPβ) can be activated downstream of oncogenic Ras as well as C/EBPβ being required for oncogenic Ras-mediated skin tumor development. To determine if C/EBPβ is required for oncogenic Ras-driven tumor survival we generated mice in which C/EBPβ could be deleted in preexisting skin tumors. Deletion of C/EBPβ in Ras-driven skin tumors resulted in rapid tumor regression associated with elevated levels of apoptosis and increased levels of the tumor suppressor p53 in the epithelial compartment where C/EBPβ had been deleted. To determine if p53 is required for tumor regression following deletion of C/EBPβ we generated mice in which both C/EBPβ and p53 could be co-deleted in skin tumors. Co-deletion of p53 and C/EBPβ prevented the tumor regression demonstrating that p53 is required for the observed regression. Our findings demonstrate that C/EBPβ can repress the levels and activity of p53 in oncogenic Ras-driven skin tumors and that deletion of C/EBPβ results in synthetic lethality through the amplification of the anti-tumor activity of p53 leading to apoptosis and rapid tumor regression.

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85. WGBS reveals autism-associated hypomethylation and differentially-methylated regions in umbilical cord blood samples from the prospective MARBLES study

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Abstract:
Autism spectrum disorders (ASD) have complex etiologies, likely involving multiple genetic and environmental insults in perinatal life. Genetic susceptibility can interact with environmental risk factors such as pesticides, air pollution, and persistent organic pollutants. The perinatal period is critical for both nutritional protective factors, such as the methyl donor folate, and interactions with genetic regulators of one-carbon metabolism. In this study, we investigated human umbilical cord blood samples from the MARBLES (Markers of Autism Risk in Babies - Learning Early Signs) prospective study by whole-genome bisulfite sequencing (WGBS) to identify DNA methylation differences predictive of ASD diagnosis by age three. ASD cord blood samples showed significantly lower global percent CpG methylation compared to typically-developing (TD) controls (ASD 76.6% vs TD 77.3%, $p = 0.01$; $n = 26$ ASD, 26 TD). This suggests a methylation deficiency in ASD during perinatal life, which could be a cumulative effect of genetic variants, environmental exposures, and/or shortage in methyl donors. Smaller differentially-methylated regions (DMRs) enriched for CpG islands were also identified in ASD cord blood (5,863 total DMRs). In addition to examining WGBS in association with ASD diagnosis and neurodevelopmental outcome measures, WGBS will be examined in relation to demographic, genetic, environmental, and nutritional information collected in the MARBLES study.

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86. hiPSCs-CM, new platform to study the effect of environmental toxins on cardiac fibrosis

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Abstract:
Cardiovascular diseases (CVD) remain the leading cause of morbidity and mortality in the United States. Fibrosis in the heart, which results in wall thickening is linked to many cardiac diseases. The underlying reason of cardiac fibrosis is the excessive proliferation of cardiac fibroblasts. It has been shown that environmental toxins like Arsenic and Mercury paly role in abnormal fibroblast proliferation in cardiac tissue. Cardiomyocytes (CM) exit from cell cycle early in development and remain post mitotic, which make them challenging to be used as a study-model in molecular cardiology field. Human induced pluripotent stem cells (hiPSCs), which are capable of differentiating to all three germ layers, are sparking interests to be used as a tool to study molecular mechanism of CVDs. Yet human induced pluripotent stem cells derived cardiomyocytes (hiPSCs-CM) need to be studied for full characterization, since these cells are not fully matured. MicroRNAs (miRs) are small non-coding RNAs that regulate gene expression post transcriptionally. They play a pivotal role in stem cell division, cardiogenesis, cardiac cells contractility and neuronal differentiation via gain or loss of function; the focus of this research is to generate more mature hiPSCs-CM by utilizing miR technology to create a disease – model platform to study the effect of environmental toxins on cardiac fibrosis.

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87a. Metabolic Activation of Nitroarenes by Human Aldo-Keto Reductases (AKR1C1-AKR1C3)

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Abstract:
Diesel engine exhaust is listed as a Group 1 carcinogen by the International Agency for Research on Cancer (IARC). Nitroarenes are major constituents of DEE and are detected in ambient air pollution. Nitroarenes require metabolic activation via nitroreduction to exert their mutagenic and tumorigenic effects. Identification of human enzymes involved in this process will be important for the assessment of individual susceptibilities to lung cancer. AKR1C3 displays nitroreductase activity towards cancer chemotherapeutic agent PR-104A and so we sought to determine whether AKR1C subfamily members could contribute to toxification of nitroarenes. We have determined that AKR1C1-AKR1C3 catalyze the nitroreduction of 3-nitrobenzanthrone (3-NBA), a representative nitroarene, using discontinuous UV-HPLC assays. Evidence for the formation of the intermediates was obtained by UPLC-HRMS/MS. Another representative nitroarene, 6-nitrochrysene (6-NC), has the unique characteristic that it can be activated by both monooxygenation and nitroreduction. Here we demonstrate that AKR1C1-AKR1C3 display dihydrodiol dehydrogenase and nitroreductase activity towards 6-nitrochrysene-1,2-dihydrodiol. Reaction products were characterized by LC-ion-trap mass spectrometry. The nitroreduction of diverse nitroarenes by AKR1C enzymes suggest that they may play a role in the activation of these diesel exhaust carcinogens.

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87b. Evaluating Cancer Risks for Eastwick: Analysis of Air Toxics and the Clearview Landfill

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Abstract:
Eastwick, PA is located near oil refineries, a Superfund site, and the Philadelphia International airport. Residents are concerned about their cancer risk from these pollution sources. In 2011, the Pennsylvania Department of Health reported that Eastwick had higher incidence of liver cancer than expected for Pennsylvania. In order to address community concerns, we performed a hypothesis-generating risk assessment to determine whether Eastwick had unique exposures that could account for high liver cancer incidence. We aimed to determine whether residents were exposed to known human carcinogens associated with liver cancer. Exposures from proximity to the Superfund site and air pollution in the region were considered. Web-based tools provided by the EPA were used to identify and prioritize toxic releases in the area. Data from the 2005 National Air Toxics Assessment (NATA) were used to estimate exposure and cancer risks of air pollution for the region, and this model was supplemented by local data provided by the Philadelphia Air Monitoring Network. The Remedial Investigation for the Lower Darby Creek Area Superfund was reviewed to analyze hazardous substances detected in surface soils in the neighborhood. We determined that air pollution exposures had decreased in the region during the past 10 years and liver carcinogens were no longer being detected by local air monitors. However, liver carcinogens have been detected in soil samples in the community and warrant further study.

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88. Identification of chemicals that mimic transcriptomic signatures associated with autism and other brain disorders.

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Abstract:
Retrospective epidemiological studies have associated environmental factors including pesticides with autism. There is therefore a significant public health need to identify the chemical risks for autism so that in the future, exposure to these chemicals can be minimized during critical periods of brain development. We sought to identify chemicals which mimic transcriptomic signatures of neurological disorders by exposing mouse cortical neuron-enriched cultures to a library of 294 environmental use chemicals. After grouping chemicals based on transcriptional similarity, we identified a certain group of chemicals that share the transcriptomic signature with autism. This cluster includes Rotenone, a pesticide associated with Parkinson's disease risk, and certain other fungicides including fenamidone, trifloxystrobin, famoxadone and pyraclostrobin, that produce transcriptional changes in vitro that are similar to those observed in human autism brain samples and in neurodegeneration. This study provides an approach to identify chemicals that transcriptionally mimic autism and other brain disorders. Further, we have now developed an innovative way to profile thousands of chemicals in a high-throughput fashion using RASL-seq (RNA-mediated oligonucleotide Annealing, Selection, Ligation with multiplex sequencing). RASL-seq has the potential to greatly accelerate the pace at which we can identify new candidate chemical risks for autism in a cost-effective way.

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89. Coping with risk and uncertainty: Household water and environmental health in the Ethiopian Rift Valley

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Abstract:
Water is a major source of health risks in low-income settings, and obtaining adequate clean water is often difficult and costly. In such settings, households may face tradeoffs between convenience of a water source and water quality. Households in the Ethiopian Rift Valley, in particular, experience high variability in water availability and heterogeneous risks related to fluoride contamination of groundwater, and pathogenic risks from diarrhea. Moreover, problems with cooperation and management of boreholes are a major challenge for these communities. This project explores the correlates of households' water sourcing and health outcomes in the Ethiopian Rift Valley. We combine multiple data sources: water quality assessments, health exams, household surveys and field experiments, and semi-structured interviews with key community informants; to explicate how risk aversion and local institutions affect water sourcing decisions. Our analysis reveals that (1) risk preferences are related to water sourcing behaviors and health outcomes and (2) water source choice is strongly correlated with health outcomes. A better understanding of the factors that drive household water choices and behaviors is critical to designing programs to mitigate the burden of poor water supplies, particularly in the face of climate change, as for rural communities in the Ethiopian Rift.

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90. Inflammasome activation as a biological outcome of mitochondrial toxicants.

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Abstract:
Inflammasome activation is a key innate immune system function. Once primed, Nod-like receptor, pyrin domain 3 (NLRP3) responds to various stimuli and assembles an inflammasome. The process involves potassium efflux, mitochondrial ROS, apoptosis-associated speck-like protein (ASC) aggregation, caspase-1 cleavage, and mature interleukin-1 beta (IL-1β) release. We proposed that environmental chemicals, via actions on mitochondria, can serve as stimuli for inflammasome activation and thus, influence diseases such as metabolic disorders and neurodegenerative diseases. Of 5 Tox21 mitochondrial toxicants: triethyltin bromide (TET Br), trimethyltin hydroxide (TMT OH), bis(tributyltin) oxide, tributyltin chloride, and triphenyltin hydroxide we identified 2 that disrupted mitochondrial membrane potential (MMP) in the absence of robust cell death. Their potential to trigger inflammmasome activation was examined. RAW264.7 macrophages were primed (LPS; 33ng/ml; 3hr) then exposed to TET Br (10 M) or TMT OH (1.25 M) for 6hr. At 20% 80% viability a observed of the cells as indicated by ASC aggregation, active caspase 1, and pyroptotic death. Cells released biologically active IL-1 as measured by IL-1 receptor activation. Pro-IL-1β rather than mature IL-1β was detected suggesting that IL-1R activation was related to released IL-1β. Overall the data showed a stimulation of IL-1 and an association between MMP disruption and inflammasome assembly with TET Br or TMT OH exposure. The potential for environmental compounds to trigger inflammasome activation highlights a mechanism for further study on the interaction between environmental exposures and inflammatory-related diseases

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Poster ID: P5568

91. A Sri Lanka Pilot Study of Cookstove Exposures and Respiratory Health Effects

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Abstract:
A pilot study was conducted in 53 homes in Sri Lanka to assess respiratory conditions associated with stove type ("Anagi" or "Traditional"), kitchen characteristics (e.g., presence of a chimney, indoor cooking area), and concentrations of personal and indoor particulate matter less than 2.5 micrometers in diameter (PM2.5). At each household, 48-hour continuous real-time measurements of indoor kitchen $PM_{2.5}$ and personal (primary cook) $PM_{2.5}$ concentrations were measured using the RTI MicroPEM™ personal exposure monitor. The measured median 48-hr average indoor $PM_{2.5}$ concentration for households with Anagi stoves was 64 µg/m^3 if a chimney was present and 181 µg/m^3 if not. For households using traditional stoves these values were 70 µg/m^3 if a chimney was present and 371 µg/m^3 if not. Linear mixed effects modelling of the dependence of indoor concentrations on stove type and presence or absence of chimney showed a significant chimney effect (65% reduction; $p<0.001$) and an almost significant stove effect (24% reduction; $p=0.054$). For cooks, the presence of at least one respiratory condition was significantly associated with 48-hr log-transformed mean personal PM2.5 concentration (PR = 1.35; $p < 0.001$). The prevalence ratio (PR) was significantly elevated for cooks with one or more respiratory conditions if they cooked without a chimney (PR = 1.51, $p = 0.025$) and non-significantly elevated if they cooked in a separate but poorly ventilated building (PR = 1.51, $p = 0.093$).

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92. Second Trimester Amniotic Fluid Bisphenol A Concentration is Associated with Decreased Birth Weight in Term Infants

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Abstract:
Bisphenol A (BPA) is an endocrine disrupting chemical with ubiquitous environmental exposure. Animal studies have demonstrated that in utero BPA exposure leads to increased adult body weight. Our aim was to characterize human fetal BPA exposure by measuring BPA concentration in second trimester amniotic fluid (AF) samples and to study its relationship with birth weight (BW) in full term infants. To achieve these goals, we developed a total BPA assay utilizing derivatization with pentafluorobenzyl followed by analysis with LC-ECAPCI-MS/MS with a limit of detection of 0.08 ng/mL and limit of quantification (LOQ) of 0.25 ng/mL. The mean BW of infants with AF BPA 0.40-2.0 ng/mL was 241.8 grams less than infants with AF BPA less than the LOQ after controlling for covariates (p=0.049). No effect was seen outside this range indicating a non-monotonic effect. Our data suggest that low level BPA exposure in utero decreases BW and needs further study.

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93. Translating Arsenic Science via Website Development Provides a Paradigm for Addressing Cutting Edge Science and Uncertainty

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Abstract:
Most adults in the US use websites on the internet to obtain reliable, fact-based information on public health issues. The Dartmouth Superfund Research Program (SRP), conducts research on human exposure to arsenic from drinking water and food, and has developed a website that provides comprehensive information on arsenic in food, water and other sources for a primary audience of families and caregivers. Through the development of this site we have learned that clear and actionable communication is challenging when scientific understanding of an issue is still developing, and arsenic science is far from conclusive. For example: the risk/benefit of recommendations around dietary arsenic have not been directly assessed; messages vary between organizations and over time as arsenic science moves forward; many important knowledge gaps exist.To address these challenges our website design process: involved arsenic experts and public health communicators from the outset; incorporated audience feedback at multiple stages of design; utilized our SRP network for national audience testing and to vet, review and sign-off on each web page; included statements to site visitors clarifying the limits of the information provided. The engagement of both arsenic experts and the intended audience helped us to identify gaps in the public understanding of arsenic and to determine the most effective ways to communicate both the science and best practices for protecting public health.

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94. Prenatal exposure to di-(2-ethylhexyl) phthalate alters fertility in female mice

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Abstract:
The effects of the plasticizer di-(2-ethylhexyl) phthalate (DEHP) are not well understood. Thus, we tested if prenatal exposure to DEHP impairs female fertility in the F1, F2, and F3 generations. Pregnant CD-1 mice were orally dosed with corn oil (control) or DEHP (20 µg/kg/day – 750 mg/kg/day) daily from gestation day 10.5 until birth. Pups born to these mice were the F1 generation. F1 females were mated with untreated males to obtain the F2 generation, and F2 females were mated with untreated males to produce the F3 generation. At 3, 6, and 9 months, mice were subjected to measurements of estrous cyclicity, time to pregnancy, sex ratio, and litter size. In the F1 generation, prenatal exposure to DEHP did not alter estrous cyclicity, time to pregnancy, litter size, or sex ratio. In the F2 generation, prenatal exposure to DEHP (200 µg/kg/day) decreased time to pregnancy and it (200 µg/kg/day and 750 mg/kg/day) increased the percentage of female pups/litter. In the F3 generation, prenatal DEHP exposure (20 µg/kg/day) decreased the time spent in diestrus at 6 months. Further, it (20 and 200 µg/kg/day) increased the time spent in estrus and it (20 µg/kg/day) decreased time in diestrus at 9 months. Further, DEHP exposure at 750 mg/kg/day increased the percentage of female pups/litter ($p \leq 0.05$). These data suggest that prenatal DEHP exposure may have transgenerational effects on reproductive outcomes such as time to pregnancy, time spent in estrus/diestrus, and sex ratio.

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95. Fate and transport of metals on Native American lands

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Abstract:
The Environmental Core of the Center for Native Environmental Health Equity Research works collaboratively with Native communities to ascertain community level exposures, health risks and remediation needs of abandoned mine waste sites on tribal lands.

Millions of tons of mine waste released into the Cheyenne River between the 1870's and 1980's is an ongoing exposure risk for the Cheyenne River Sioux Tribe of South Dakota. Our recent evaluations identified elevated As (90.0 – 394 mg/kg) in the riverbank sediments and floodplain soils. Co-occurring Fe and Mn were also elevated.

In August 2015, the Gold King Mine spill released a mixture of metals from a heavily mineralized area into the Animas River in southern Colorado impacting downstream communities, including the Navajo Nation. Animas River sediment samples collected 2 weeks after the spill showed Pb, Cu and Zn associated with clays, Fe-(oxy)hydroxides, and jarosite. Geovisualization of contaminant releases suggests long-term deposition of metals from other abandoned mines in the area.

Future work will assess metal stability and sediment transport after high-flow events. Our collaborations have unique implications to better understand the potential for chronic metals exposure caused by recurrent mobilization into surface water and sediments downstream from mine waste. This information is essential for determining the potential for metals exposure and to inform the tribes' risk reduction strategies.

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Poster ID: P5614

96a. Low-level methylmercury exposure through rice ingestion in a cohort of pregnant mothers in rural China

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Abstract:
Background: Rice ingestion is an important dietary exposure pathway for methylmercury. However there are few studies among pregnant mothers. Objectives: Our objective was to quantify dietary methylmercury intake through rice and fish among pregnant mothers living in southern China, where rice was a staple food and mercury contamination was considered minimal. Methods: 398 mothers were recruited at parturition, who donated scalp hair and blood samples. Mercury was measured in biomarkers, in rice samples from each participant's home, and in fish tissue purchased from local markets. Additional fish mercury concentrations were obtained from a literature search. Results: Dietary methylmercury intake from both rice and fish ingestion averaged 1.2 mcg/day, including on average 71% from rice ingestion (median: 87%, range: 0-100%), and 29% from fish/shellfish consumption (median 13%, range: 0-100%). Median concentrations of hair mercury, hair methylmercury, and blood mercury were 0.40 mcg/g, 0.28 mcg/g, and 1.2 mcg/L, respectively, and all three biomarkers were positively correlated with dietary methylmercury intake through rice ingestion (Spearman's rho=0.18-0.21, $p \leq 0.0005$), although the correlations were weak. In contrast, biomarkers were not correlated with fish methylmercury intake (Spearman's rho=0.04-0.08, p=0.11-0.46). Conclusions: Among pregnant mothers living in rural inland China, rice ingestion contributed to prenatal methylmercury exposure, more so than fish ingestion.

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Poster ID: P5802

96b. Maternal methylmercury exposure through rice ingestion and offspring neurodevelopment: A prospective cohort study

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Abstract:
Background: Dietary methylmercury (MeHg) intake can occur not only through fish ingestion but also through rice ingestion; however, rice does not contain the same beneficial nutrients as fish. Objectives: In rural China, where rice is a staple food, associations between prenatal MeHg exposure and impacts on offspring neurodevelopment were investigated. Methods: 398 mothers were recruited at parturition at which time a sample of scalp hair was collected. Offspring (n=270, 68%) were assessed at 12 months using the Bayley Scales of Infant Development-II, yielding age-adjusted scores for the Mental Developmental Index (MDI) and Psychomotor Developmental Index (PDI). Results: Among 270 mothers, 85% ingested rice daily, 41% never ate fish and 11% ingested fish at least twice/weekly. Maternal hair mercury (Hg) averaged 0.41 mcg/g. In unadjusted models, both MDI and PDI were inversely correlated with hair Hg. Associations were strengthened after adjustment for fish and rice ingestion and maternal/offspring characteristics for both the MDI [Beta: −4.9, 95% Confidence Interval (CI): −9.7, −0.12] and the PDI (Beta: −2.7, 95% CI: −8.3, 2.9), although confidence intervals remained wide for the latter. Conclusions: For 12-month old offspring from rural China, prenatal MeHg exposure was associated with statistically significant decrements in offspring cognition, but not psychomotor development. Results expose potential new vulnerabilities for communities depending on rice as a staple food.

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Poster ID: P5801

97. Highly fluorinated chemicals, phthalates, and zeranol effects on mammary gland development and pubertal timing in humans and a rodent model: rationale for chemical and dose selection

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Abstract:
Given that breast cancer is the most common invasive cancer worldwide and the leading cause of death in US women from their late 30s to early 50s, exploring preventative efforts is critical. As part of the NIEHS Breast Cancer and the Environment Research Program, we are investigating associations between several endocrine disrupting chemicals (EDCs) and breast density, hormone levels, and pubertal timing in a cohort of girls in Santiago, Chile. Parallel investigation of the same EDCs is being conducted in female rats exposed from weaning to PND42, and effects are being evaluated on mammary gland development and tumor susceptibility. Three classes of EDCs with diverse modes of action were selected - polyfluorinated alkyl substances (PFASs), phthalates, and zeranol and its metabolites. PFASs are surfactants used to coat textiles and food contact papers, phthalates are plasticizers and solvents used in household and food use applications, and zeranol is a growth promotor for meat. Dose levels and mode of administration of the EDCs mimic human exposure levels and common route of exposure (i.e. ingestion), and internal dose is being quantified in blood and urine from dosed animals. The chemicals and doses for the rodent study are: perfluorooctanoic acid (PFOA) (0.01 and 0.1 mg/kg of bw), butylbenzyl phthalate (BBP) (0.5 and 5 mg/kg of bw), and zeranol (Zer) 0.01 and 0.1 mg/kg of bw).

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Poster ID: P5754

98. Center for Children's Health, the Environment, Microbiome, and Metabolomics (C-CHEM2): Overview and Project 1-Characterizing Exposures in an Urban Environment (CHERUB) Study Preliminary Results

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Abstract:
Emory University's Center for Children's Health the Environment, Microbiome, and Metabolomics (C-CHEM^2) is a multi-component investigation designed to evaluate environmental exposures influencing the infant microbiome and leading to neurodevelopmental sequelae. In the first phase we collect environmental and biological data on toxicant exposures from samples collected at prenatal and home visits. C-CHEM$^{2'}$s first project, Characterizing Exposures in an Urban Environment, is designed to validate protocols for office and field sampling and determine the relationship between environmental media concentrations and biomarkers relevant to the microbiome of infants. Environmental and biological samples are taken from mothers during pregnancy and in-home environmental samples, prior to delivery. These samples will be analyzed for parabens, phthalates, alkylphenols, bisphenol A, organophosphate insecticides, pyrethroid insecticides, air pollutants (PAHs), and brominated flame retardants or appropriate metabolites. Presently, we have collected 70 first hospital visit and 38 second hospital visit urines from expectant mothers and followed that up with home visits gathering 23 urine sample, 29 dust samples, and 25 home air samples. We discuss results of the analysis of these samples and preliminary correlations between environmental concentrations and measured biomarker concentrations. We report potential modifications of protocols in accordance with field experience.

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99. Altered microRNA levels in circulating extracellular vesicles are associated with maternal air pollution exposure during pregnancy

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Abstract:
Particulate matter less than 2.5 microns in diameter (PM2.5) is a criterion air pollutant associated with adverse perinatal health outcomes, but the mechanisms are not well understood. Extracellular vesicles (EVs) in the blood are released by various cells and transfer molecular signals from cell-to-cell including microRNAs (miRNAs). We hypothesized that PM2.5 may alter miRNA levels in EVs (evmiRNAs) during pregnancy and program perinatal health effects.

Using a satellite-based model, we calculated trimester-specific PM2.5 averages for 100 pregnant women in Mexico City. EVs were isolated from maternal serum collected in the 2nd trimester. We assessed 754 evmiRNAs using the TaqMan OpenArray qPCR platform. We used linear regression to examine the associations between 1st and 2ndtrimester average PM2.5 and evmiRNA levels, adjusting for maternal age, socioeconomic status, and environmental tobacco smoke. Significance was defined as $p<0.05$ and an FDR q-value ≤ 0.4. Pathway analysis was performed to identify potentially altered signaling networks.
We found that the expression of evmiRNA miR-27b, 130b, and 197 was positively associated with PM2.5 exposure in the 2nd trimester. No evmiRNAs were associated with 1st trimester exposure. The gene targets of the three PM-associated evmiRNAs were enriched for cardiovascular function, and embryonic, and organ development (p=1x10-21).

In conclusion, altered evmiRNA levels in maternal serum during mid-pregnancy were associated with increased PM2.5exposure. Future research will focus on the role of evmiRNAs as mediators of fetal and maternal health outcomes.

Poster ID: P5554

100. Effects of pubertal exposure to PFOA, BBP and zeranol on endocrine organs of rats

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Abstract:
Breast cancer is a hormone dependent malignancy with increasing incidence. Although the reasons for this increase are unclear, epidemiological data show that humans are constantly exposed to endocrine disrupting chemicals (EDCs). We hypothesize that exposure to EDCs at critical window during the lifecourse, such as puberty, may affect different endocrine organs and change the susceptibility to breast carcinogenesis. Female rats were exposed to low levels of butyl perfluorooctanoic acid (PFOA), benzyl phthalate (BBP), and zeranol at different doses, individually and in combination, during their pubertal period (21-42 days of age). At 50 days, they were euthanized and mammary gland and endocrine organs were collected. The exposure to these compounds at environmental-mimicking doses did not alter the timing of vaginal opening and the estrus cycles were irregular in all groups, including control. ANOVA test showed no differences in uterus and ovaries weight. However we observed histological differences in the endometrium induced by BBP and PFOA, which are under quantitative analysis. The adrenal glands presented changes induced by BBP and zeranol. These changes are reflected on organ weight, thickness of the cortex versus the medulla, and patches of necrosis in the cortex mainly induced by zeranol. The mammary glands are under study. These preliminary results show that even in doses mimicking human exposures EDCs may have a significant effect on the endocrine system.

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101. Community Action to Promote Healthy Environments

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Abstract:
Community Action to Promote Healthy Environments (CAPHE) is a community based participatory research partnership working to develop a scientifically informed Public Health Action Plan (PHAP) to reduce air pollutant emissions, exposures, and adverse health effects in Detroit, Michigan, a community with historically high levels of air pollutants and larger numbers of vulnerable residents. The proposed poster describes the process used to strengthen the capacity of our partnership for working effectively together to develop a scientific foundation for the PHAP and translating that science into action steps. We will share selected results from partnership evaluations of this process, and describe their use as part of a formative evaluation process designed to contribute to strengthening of the partnership process. We will also share select findings from the scientific analyses conducted to inform the content of the PHAP, and the development of a PHAP Resource Manual that encompasses those findings, used to inform the work of the partnership in creating the plan. Examples will be provided of plan components that emerged from this process, including recommendations for action included in the PHAP. We will close with a discussion of opportunities and challenges associated with the translation of research to action, and lessons learned in the process that may strengthen future efforts to translate scientific evidence into action to promote environmental health and health equity.

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Poster ID: P5775

102. Early-life insecticide exposure and motor function infants

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Abstract:
The neurodevelopmental effects of early-life exposure to non-persistent insecticides are not well understood. Lab studies suggest that low dose organophosphate(OP) exposure may inhibit myelination, a process critical to motor development. The aim here was to investigate the effects of prenatal exposure to OP & pyrethroid(PYR) insecticides on infant motor function. 43 OP/PYR were measured using GC-MS/MS in cord blood plasma (n=230). Motor function was assessed at 6wk & 9mo using Peabody Developmental Motor Scales (PDMS-2). Linear mixed models were used to evaluate relationships between insecticides & raw PDMS subtest scores (reflexes, stationary, locomotion[loc], grasping, visual-motor integration[VMI]) & composite motor scores (gross[GM], fine[FM], total[TM]). 18/30 OPs & 13/13 PYR were detected. Infants with prenatal exposure to certain OP/PYR had significantly lower PDMS raw scores at 9mo: chlorpyrifos & reflexes (-0.5,p=0.04), loc (-2.0,p=0.02), VMI (-1.9,p<0.001), GM (-3.5,p<0.01), FM (-2.7,p<0.01), TM (-6.3,p<0.001); naled & VMI (-0.6,p=0.04), FM (-0.9,p=0.04); cyfluthrin & loc (-2.2,p=0.02), GM (-3.5,p=0.02), TM (-5.1,p=0.01); cis-permethrin & reflexes (-0.8,p<0.01), trans-permethrin & VMI (-1.4,p=0.04), and etofenprox & loc (-2.2,p=0.02). We found evidence of deficits in motor function in 9-month-old infants with prenatal exposure to certain OP and PYR. Neural pathways involved in motor skill acquisition may be vulnerable to the effects of commonly used insecticides.

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103. Prenatal phthalate exposures in relation to child temperament at 12 and 24 months

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Abstract:
Studies suggest links between phthalates and poorer neurodevelopmental outcomes. We hypothesized that prenatal phthalates may be associated with early temperament because temperament patterns may be precursors or modifiers of later psychopathology. We investigated this hypothesis in the Mount Sinai Children's Environmental Health study. Phthalate metabolites were measured in third trimester spot urine samples. Child temperament was assessed by parent completion of the Infant Behavior Questionnaire at 12-months and the Toddler Behavior Assessment Questionnaire at 24-months. We used multiple linear regression to examine associations between six phthalate metabolites and eleven temperament domains, adjusting for sex, HOME score, breastfeeding and maternal alcohol use, marital status, race, education, age, smoking, and urine creatinine. Most associations were small in magnitude and not statistically significant. At 12-months, there were borderline associations between phthalates and lower activity levels, particularly for dibutyl and butylbenzyl phthalate metabolites. Some phthalate metabolites were also weakly associated with higher duration of orienting and less smiling. At 24-months, higher concentrations of di-n-ocytyl and butylbenzyl phthalate metabolites were associated with higher social fear and lower pleasure. In conclusion, we found weak evidence for associations with temperament despite literature linking phthalates to later attention problems and internalizing.

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104. Nano-waste: Environmental health and safety (EHS) implications during thermal decomposition/incineration of nano-enabled products

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Abstract:
Little is known about the environmental health implications of released particulate matter over the lifecycle(LCPM) of nano-enabled products(NEPs).End-of-life of NEPs is critically important as an estimated 20,000T of nano-waste lands in incinerators every year globally.We assessed thermal decomposition of industrially-relevant nano-enabled thermoplastics,using an Integrated-Exposure-Generation-System(INEXS),allowing for physicochemical,morphological,and toxicological evaluation of the byproducts.Polymer matrices(PU,PE,PP,PC,EVA) enabled with nanofillers(CNTs,Fe2O3,TiO2) were investigated at nano-loadings(0.1-15wt%) at decomposition temperatures:500,800C.Nanofiller-release is observed for inorganic nanofillers and is nanofiller-loading-dependent.Most of the nanofiller stays in residual ash as loose nanoparticles,thus prone to release under weathering conditions.Chemistry of released LCPM is primarily organic(>99wt%) irrespective of nanofiller-presence.However,speciation of specific organic compounds like polycyclic aromatic hydrocarbons(PAHs) is affected by the nanofiller and its loading.CNT and TiO2 nanofillers enhance the total PAH content of LCPM and more importantly,the higher molecular weight and more toxic PAHs.Toxicological evaluation shows LCPM from PU-CNT has significantly higher toxicity than PU after 24h exposure to small-airway-epithelial-cells(SAEC).Findings raise concerns about exposure to released nanofillers and toxic byproducts at the end-of-life of NEPs.

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105. Toxicity Testing of Black Cohosh Extract, a Popular Botanical Product: from Tox21 qHTS Assays to Human Biomonitoring

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Abstract:
Black cohosh extract (BCE) is marketed for relief of gynecological ailments, yet its toxicity has not been well characterized. The National Toxicology Program (NTP) reported significant, dose-related increases in micronucleated reticulocytes (MN-RET) and erythrocytes (MN-E) in peripheral blood of female B6C3F1/N mice administered 15-1000 mg BCE/kg/day by gavage for 90 days. Also, a dose-dependent non-regenerative macrocytic anemia (NRMA) was observed. Both MN and NRMA can result from disruption of the folate metabolism pathway. The NTP used an in vitro approach to determine if results of the animal testing could be generalized to other BCEs and to investigate the mechanism of BCE-induced micronuclei. Thus far, 12 extracts and root powders have been shown to induce micronuclei in human lymphoblastoid TK6 cells, an effect that is most apparent when cells are grown in physiological levels of folic acid. Results of a collaborative study with Litron Laboratories suggest that BCE may induce MN through an aneugenic mechanism. To determine whether the effects seen in mice are also detected in humans, the NTP is assessing hematological endpoints including MN-RET frequencies and folate and cobalamin levels in women who use BCE products. BCE was inactive in 36 Tox21 qHTS assays, including assays for DNA damage. The comprehensive testing of BCE by the NTP, ranging from qHTS assays to human biomonitoring, demonstrates the benefit of all levels of testing for public health protection.

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106. Erectile Dysfunction and Exposure to Ambient Air Pollution in a Nationally Representative Cohort of Older Men

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Abstract:
Little is known about the association between air pollution and erectile dysfunction (ED), a disorder occurring in 64% of men over the age of 70, and to date, no studies have been published. To address this significant knowledge gap, we explored the relationship between ED and air pollution in a group of older men who were part of the National Social Life, Health, and Aging Project (NSHAP), a nationally representative cohort study of older Americans. We obtained incident ED status and participant data for 412 men (age 57-85). PM2.5 exposures were estimated using spatio-temporal models based on participants' geocoded addresses. The association between air pollution and incident ED was examined and adjusted logistic regression models were run. We found positive, although statistically insignificant, associations between PM2.5 exposures and odds of incident ED for all examined exposure windows, including 1 year (OR 1.18 95% CI: 0.82, 1.70) to 7 year (OR 1.20 95% CI: 0.90, 1.61) moving average IQR increases in PM2.5 exposures. Observed associations were robust to model specifications and were not significantly modified by any of the examined risk factors for ED. In conclusion, we found PM2.5 exposures to be consistently associated with higher odds of developing ED, although results did not reach nominal statistical significance. While more research is needed, our findings suggest a relationship between exposure to PM2.5 and incident cases of ED, a common condition in older men.

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107. Reprogramming of long non-coding RNAs (lncRNA) in prostate cancer cells by bisphenol A and its analogues

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Abstract:
Bisphenol A (BPA) is a prototype endocrine disrupting chemical ubiquitously present in the environment and a public health concern. Its estrogenic effects suggest it can reprogram developing human and animal tissues, such as the prostate. As a result, alternatives to BPA are being developed. Structural analogues of BPA have been detected in foods, thermal receipts and humans, with potential risk of effects similar to BPA. Since exposure to BPA has been shown to mediate epigenetic modifications in the DNA and chromatin organization, we determined whether BPA and its analogues alter the expression of lncRNA, major players in biological processes including chromatin organization and gene regulation. We hypothesize that chronic exposure to low-dose of BPA and its analogues, will change the epigenetic profile via lncRNA, leading to increased risk to prostate cancer (PCa). Here we show that exposure of PCa cells to low dose BPA and its analogues (BPS, TBBPA, DMBPA) increased centrosome amplification, promoted microtubule nucleation and regrowth at centrosomes, and enhanced anchorage-independent growth, all of which characterize cancer initiation and progression. The lncRNA profile of the BPA/analogue exposed PCa cells was determined. Using genome-wide interrogation of the transcriptome, we identified 4 lncRNAs whose expression is changed on exposure to BPA and all 3 analogues in PCa cells. We validated the changes in their expression and correlated them with PCa.

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108. A novel fluorescent protein based PIG-A mutation assay

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Abstract:
Accumulation of somatic mutations caused by both endogenous and exogenous exposures is a high risk for human health and may cause cancer. Efficient detection of somatic mutations is crucial for risk assessment of the exposure and is important for a wide range of fields, from basic research to regulatory agents. Previously, mutations in genes such as HPRT and TK have been studied to determine the genotoxicity caused by exposures, but these assays are very time consuming. Flow cytometry-based assays for the detection of PIG-A mutations have been developed, which avoid the time-consuming process of clonal expansion; however, this assay has several limitations, including the lack of suitable antibodies for different species and cell types, which greatly restrict its applicability. Here, we present a modified PIG-A mutation assay that uses expression of GPI-anchored fluorescent proteins, where the presence of fluorescence on the cell membrane is dependent on the expression of wild type PIG-A. Using our modified PIG-A mutation assay, we achieve complete separation of wild type cells and spontaneously mutated cells, in which the presence of a PIG-A mutation has been confirmed via proaerolysin selection and gene sequencing. This novel technology is a widely applicable assay for accurate and efficient testing of genotoxicity.

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109. Evaluating Protein Oxidation in Aquatic Species: Different Assays Applied to Oysters and Fish Exposed to Environmental Stressors

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Abstract:
Aquatic pollution is a worldwide concerning theme, threating both wildlife and human health. Many contaminants can cause oxidative damage and the analysis of such oxidation events can identify potential cellular targets and metabolic events under possible disruption. In this context, oysters Crassostrea brasiliana, Crassostrea gigas and zebrafish were acutely exposed to different stressors with potential pro-oxidant activity, followed by analysis of protein oxidation using fluorescent probes, 1DE SDS-PAGE and fluorescence spectroscopy. Oysters C. brasiliana were exposed during 24 h to sanitary effluents, which caused oxidation of thiol groups in hemolymph proteins: dominin, actin and segon were identified as major targets. Oysters C. gigas were exposed up to 4 days to peroxides, copper or Vibrios species, and only sub and moderate lethal levels of copper and Vibrio alginolyticus caused cavortin thiol oxidation, the major hemolymph protein. Zebrafish larvae and embryos were exposed for 24 h to paraquat (PAQ), 2,3-dimethyl-1,4-naphtoquinone (DNAQ) or 9,10-phenanthrenequinone (PHEQ): although PAQ caused impaired cellular redox state, no protein thiol oxidation or carbonylation were detected. Ongoing analysis with DNAQ and PHEQ exposure may help to elucidate if protein oxidation is associated to early-life deformities and mortality. Taken together the data point to protein oxidation as an important mechanism of toxicity of several cellular stressors in different species.

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110. Effects of nicotine on the gut microbiome and its metabolic functions

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Abstract:
The human gastrointestinal (GI) tract is colonized with 10 to 100 trillion microbes, which encode 100-fold more unique genes than human genome. These microbes, known as gut microbiome, have strong association with host health and can be readily influenced by environmental factors. Moreover, it has been well established that environmental toxicants are able to induce gut microbiome perturbations and consequently affect associated functions. Nicotine exposure, mainly from cigarette smoking, is linked to a number of adverse health outcomes. Therefore, it is of significance to investigate how nicotine exposure affects gut microbiome and its metabolite profile since any alteration could potentially promote or attenuate the impact of metabolic disorders caused by nicotine exposure. In this study, we combined 16S rRNA sequencing, metagenomics sequencing, and mass spectrometrybased metabolomics to detect the alterations in the gut microbiome and its associated metabolite profile due to nicotine exposure. Interestingly, 16S rRNA sequencing result indicates that the alteration of the gut microbiome composition turns out to be dose- and gender-dependent. In addition, metagenomics sequencing identified a number of perturbed metabolic pathways that are correlated with metabolite profile changes captured by metabolomics. In conclusion, we have demonstrated that nicotine exposure can induce gut microbiome perturbation and affect related metabolic functions in C57/BL6 mice.

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111. Computational metabolomics: a framework for systematic study of the exposome

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Abstract:
Improved analytical technologies and better data extraction algorithms for high-resolution mass spectrometry have enhanced the coverage of chemical detection for metabolic profiling and environmental biomonitoring, including detection of low abundance environmental chemicals and their metabolites. Here we introduce a computational framework for reliable detection, annotation, and network analysis of high-resolution metabolomics data. Our recently published methods, xMSanalyzer (Uppal et. al, 2013) and MetabNet (Uppal et al. 2015), include utilities for improving coverage of quantitatively reliable metabolites detected in individual biological samples and for performing network analysis of human exposures. Here we introduce xMSannotator, an R package that uses Human Metabolome Database (HMDB), The Toxin and Toxin Target Database (T3DB), LipidMaps, Kyoto Encyclopedia of Genes and Genome (KEGG), and ChemSpider SOAP APIs for ACToR, Comparative Toxicogenomics Database, and ToxCast for putative identification of metabolites. The software uses a multi-criteria integrative algorithm for assigning confidence levels to metabolite annotations. Our results demonstrate that together, computational tools allow reliable detection of environmental chemicals in individual biological samples and facilitate the ability to gauge the physiological relevance of the environmental chemicals and their metabolites.

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112. Community Engagement and Research Translation in Puerto Rico's Northern Karst Region: The PROTECT Superfund Research Program

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Abstract:
Puerto Rico Testsite for Exploring Contamination Threats (PROTECT) is a multi-project initiative to study contamination and exposure threats to pregnant women and infants in Puerto Rico (PR). We examine environmental factors in preterm birth in a cohort of 1,100 women with a goal of 1,800. PR has the highest incidence of preterm birth among any US jurisdiction. PROTECT seeks to understand how TCE and phthalates can affect preterm birth, and develop strategies to attenuate and mitigate exposure. PROTECT Community Engagement Core's (CEC) goals are to engage participants in the study area via bi-directional communication processes that enable stakeholders to offer perspectives and information, build trust and capacity, and develop community-based participatory research projects. Increased medical care and public health prevention are valuable outcomes of participation, especially work on Zika prevention. CEC provides participants with "report-back" of personal exposure data, in collaboration with Silent Spring Institute, offers information on avoiding contaminants, and training for health professionals on environmental factors. PROTECT's work with multiple community partners builds trusting relationships that provide valuable resources for participants, unlike traditional cohorts in which people are passive rather than active participants. Lessons from such engaged cohorts should be widely promoted among researchers to provide more democratized, justice-based forms of research.

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Poster ID: P5566

113. Metabolomics in Nonalcoholic Fatty Liver Disease: Pathway to Precision Medicine

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Abstract:
Background: Nonalcoholic fatty liver disease (NAFLD) affects 7 million children in the U.S. We sought to apply high-resolution metabolomics to identify key perturbed metabolic pathways in NAFLD and to further refine this into predictive models for disease identification and classification. Methods: Stored samples were utilized from children carefully phenotyped for NAFLD by MRI or liver biopsy. Samples were analyzed in triplicate using ultra-high resolution metabolomics on a Thermo Fisher Q Exactive mass spectrometer, coupled with C18 reverse phase liquid chromatography. Differences were determined by independent t-tests and visualized using Manhattan plots. Untargeted pathway analyses using Mummichog were performed to identify pathways that were most dysregulated in NAFLD. Biomarker selection was completed using PLS-DA and ROC analysis. Results: Amino acid pathways were among the top differentiating pathways between children with NAFLD and matched children without NAFLD. Using untargeted discovery methods, a multi-metabolite NAFLD panel was developed to predict presence of disease with a ROC curve of 0.89 (cross validation 0.86). Conclusions: Our long term goal is to create an affordable approach that can be used for predicting NAFLD susceptibility, diagnosis, risk stratification, response to therapy and prognosis. Using metabolomics to identify disease specific pertubations is a viable approach to advance clinical care in NAFLD.

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Poster ID: P5744

114. Childhood polybrominated diphenyl ether (PBDE) exposure and neurobehavior in children at 8 years

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Abstract:
Prenatal polybrominated diphenyl ether (PBDE) exposure was associated with IQ decrements and increased attention deficit/hyperactivity disorder behaviors in children; however, data is limited for the role of postnatal exposures. We investigated the association between childhood PBDEs and Full-Scale Intelligence Quotient (FSIQ) and externalizing behaviors at 8 years, using data from 208 children in the Health Outcomes and Measures of the Environment (HOME) Study, a prospective birth cohort. Child serum PBDEs were measured at 1, 2, 3, 5, and 8 years; missing concentrations were estimated via multiple imputation. We measured FSIQ using the Wechsler Intelligence Scales for Children-IV. The Behavior Assessment System for Children-2 was used to assess externalizing behavior. We used multiple informant models to estimate associations between repeated PBDEs and child neurobehavior and to identify windows of susceptibility. Postnatal PBDEs (-28, -47, -99, -100, and -153) at multiple ages were inversely associated with FSIQ. BDE-153 at 2, 3, 5, and 8 years were related to lower FSIQ with statistical significance, in particular -7.71-points (95% CI -12.48, -2.93) and -5.63-points (95% CI -10.83, -0.43) for a 10-fold BDE-153 increase at 3 and 8 years, respectively. Multiple PBDE congeners at 8 years were associated with higher hyperactivity and aggressive behaviors at 8 years. Postnatal PBDEs were associated with FSIQ decrements and increases in hyperactivity and aggressive behaviors.

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115. Analyzing patterns of co-exposure

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Abstract:
Exposure science plays a crucial role in investigating the health effects of mixtures by toxicologists and epidemiologists. The latter need to understand patterns of co-exposure to consider confounding and colinearity, as well as the similarity between populations. Here we discuss correlations within and between populations. 1) Methods for portraying such data include correlation matrices (& heat maps) as well as dendrograms that we constructed using the average linkage of the distance defined as one minus the absolute value of the Spearman correlation coefficients. 2) We compare co-exposure patterns between populations using the Mantel statistic: the Spearman correlation of the elements in the lower triangular forms of the correlation or dissimilarity matrices (with p-values computed using permutations). We illustrate these methods using serum concentrations of a set of lipophilic persistent organic pollutants from a Boston cohort, comparing the pattern of correlations with NHANES. In the Boston cohort, serum concentrations showed two major clusters: PentaBDEs and other compounds, organochlorine pesticides (OCs) and PCBs. The latter contained two main subclusters, lower and higher molecular weight PCBs. As NHANES 2003-4 measured these compounds in two different population subsamples, the comparison with the Boston data was restricted to PBDEs and OCs. The Mantel test yielded an overall correlation of 0.7 (p=0.002), indicating a moderately strong similarity between the two.

Poster ID: P5651

116. Exposure to Production-Related Contaminants in Bovine Milk and the Impact of Organic vs. Conventional Production Methods

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Abstract:
Purpose: To determine if production-enhancing chemicals are present in milk and if levels differ by production method used. Methods: 3 brands of 2% organic milk, 3 of 2% conventional milk and one each of whole milk were collected from retail stores in 9 U.S. regions in August 2015. Mean pesticide levels were estimated using a gas chromatography-tandem mass spectrometry-based method previously developed and validated in Dr. Barr's lab. Antibiotic and hormone levels were estimated using high performance liquid chromatography-tandem mass spectrometry. Results: Residuals of all pesticides tested were detected in conventional milk but in organic samples atrazine, diazinon, chlorpyrifos, cypermethrin, permethrin level were below the level of detection. Hexachlorobenzene and ppDDE were far lower in organic vs. conventional samples ($p<0.001$); there were no difference in ppDDT. Mean IGF-1 was 378 ppb and bovine growth hormone (BGH) was 22.7 ppb, more than 8 and 20 times higher, respectively, in conventional samples ($p<0.001$). No antibiotics were detected in organic samples but amoxicillin, oxytetracycline, sulfamethazine, aulfadimethoxydine, and aulfathiazole were detected in conventional samples. Conclusion: Conventional milk production methods result in residues of many antibiotics and pesticides not present in organic samples and in significantly higher levels of GH and IGF1. The extent to which these chemicals accumulate and/or have a biological impact on consumers is unknown.

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117. Accurate quantification of specific biomarkers for mesothelioma

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Abstract:
High mobility group box-1 (HMGB1) is a non-histone chromosomal protein that is highly conserved in eukaryotic cells. It is known to play a regulatory role in inflammatory immune responses and has recently proved to be a potential novel therapeutic target in malignant mesothelioma (MM). HMGB1 normally locates in the nucleus. During cell necrosis due to asbestos fibers, HMGB1 undergoes acetylation followed by translocation from the nucleus to the cytoplasm, and then secreted to extracellular space, where it binds to and activates pro-inflammatory mediators. A recent study revealed that serum levels of HMGB1 were increased in asbestos-exposed individuals as compared to controls using an ELISA kit. This finding indicates the potential usage of serum HMGB1 levels in assessing asbestos exposure in human populations. In agreement with this finding, serum levels of HMGB1 have also been reported to be elevated in MM patients using an ELISA kit. Herein, we developed a stable isotope dilution HPLC-MS method, which has higher sensitivity and specificity compared with currently available ELISAs, to accurately quantify the HMGB1 levels in serum. Glu-C digestion of HMBG1 yields specific peptides including two nuclear localization signal (NLS) fragments. These two key peptides are highly acetylated, which prevents HMGB1 from reentering the nucleus. Thus, detection and accurate quantification of these two highly acetylated peptide may provide a useful biomarker to assess the progress of MM.

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118. The Effects of Air Pollution on Severity of Pneumonia in a Metropolitan Area

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Abstract:
Particulate matter (PM) exposure increases risk of emergency department visits and hospitalizations for lower respiratory infection. PM < 2.5 µm (PM2.5) are of greatest concern. We assess if proximity to PM2.5 sources is a predictor of severe illness in children hospitalized with community-acquired pneumonia (CAP). Children <18 years hospitalized with CAP were enrolled in the Etiology of Pneumonia in the Community (EPIC) study in Memphis, TN from 2010-2012. For PM2.5 exposure, we assessed the effect of 3 and 4 mile proximity of patient residence to major individual PM2.5 emission sources. Residential addresses for CAP cases were geocoded using Geographical Information System (GIS). GIS, spatial analysis, and logistic regression models were used to evaluate the relationship between outcomes and PM2.5 controlling for age, gender, race/ethnicity, insurance type, tobacco smoke exposure and asthma. PM2.5 values during the study period were 2-41.6µg/m3. Residence within 4 miles of PM2.5 source was significantly associated with ICU admission (OR 1.97, 95% CI 1.03-3.78) and residential proximity within 3 miles of PM2.5 source (OR 1.74, 95% CI 1.01-2.97) with prolonged length of stay. Close proximity to major PM2.5 individual emission sources increased risk of severe illness, in children <18 years admitted with CAP, supporting existing evidence of the harmful effects of PM2.5 exposure on the respiratory health of children.

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Poster ID: P5593

119. Center for Children's Health, the Environment, The Microbiome and Metabolomics (C-CHEM2): Engaging Stakeholders, Fostering Relationships, and Creating a Social Media Campaign

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Abstract:
A powerful quality of C-CHEM2's Community Outreach and Translation Core is that we do not just incorporate stakeholder input, but it's the point from which we lead. The C-CHEM2 Stakeholder Advisory Board (SAB) consists of 12 members, individually invited to participate based on their involvement/advocacy surrounding maternal child health or environmental health. At the first SAB meeting, the SAB decided to change the outreach and information sharing approach from an educational video game, to instead focus on social media platforms. A Social Media workgroup of interested SAB members met on several occasions and ultimately decided to create a film to introduce C-CHEM2 and its SAB members to the target audience, as well as highlight community concerns regarding environmental health, environmental justice, and poor prenatal outcomes among AA women in the Atlanta metropolitan area. C-CHEM2 staff and SAB members participated in various pre-production planning meetings. In the film, scenes from Atlanta's neglected urban neighborhoods serve as a backdrop to staff, SAB members, community representatives, and research participants discussing food, household hazards, environmental justice and maternal child health. SAB members participated in a pre-screening of the film in order to provide feedback before the final edit and submission to the NIEHS film festival. Continued guidance from the SAB will oversee the release of video clips from the film for the planned social media campaign.

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120. General Suspect Screening for Potential Novel Chemicals in Pregnant Women in Northern California

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Abstract:
Introduction: In utero exposure to multiple environmental chemicals can adversely impact health throughout the lifespan. We used liquid chromatography-quadrupole time-of-flight mass spectrometry (QTOF/MS) to perform a general suspects screening for the presence of 725 Environmental Organic Acids (EOAs) and investigated if suspect EOAs differ by demographics in terms of detection frequency (DF) or relative concentration (measured by peak areas). Methods: We analyzed samples from 83 pregnant women in their 3rd trimester receiving care at UCSF's San Francisco General Hospital and Mission Bay Medical Center, using the Agilent QTOF/MS 6550 instrument. We examined demographic differences in DF and peak areas of candidate compounds using a Fisher's exact test, generalized linear model, or Kruskal-Wallis Rank Sum test. Results: We detected, on average, 58 (SD: 8) suspect EOAs in each woman (range: 34-83), the majority of which were matched to phenols and phenolic pesticide metabolites. There were 15 suspect EOAs with high DF (≥80%), over half of which were potential novel chemicals that have not been previously biomonitored. We found differences by education or household income in DF for several suspect EOAs as well as in relative concentration for some highly detected suspect EOAs. Conclusion: Non-targeted analysis provides a viable method to screen for a broad spectrum of chemicals and to identify ubiquitously present and thus priority chemicals for targeted method development.

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Poster ID: P5652

121. Arsenic Exposure and Impaired Glucose Homeostasis: The Role of Adequate vs Elevated Folate Intake

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Abstract:
Recent studies suggest that the capacity to metabolize iAs predicts risk of diabetes.In settings without fortification of grains with folate, folate supplements have been shown to enhance iAs metabolism and excretion. However, effects of dietary folate on iAs-associated health outcomes have not been examined in settings with food folate fortification. This analysis used data from a cross-sectional study of adults exposed to iAs contaminated drinking water in Chihuahua, Mexico. Multivariable linear regression models were used to estimate the effects of exposure to high (> 50µg/L) vs. lower water iAs combined with folate intake (in dietary folate equivalents, DFEs) defined as adequate (320-800 DFEs), elevated, or low, on FPG as well as 2-hour glucose (2HG) among non-diabetic individuals. After multivariable adjustment, compared to participants exposed to lower water iAs with adequate dietary folate, there was a small but significant increase in FPG among those exposed to high water iAs with adequate folate (1.89±0.99 mg/dL, P<0.10). However, individuals with high water iAs combined with elevated folate intake had a large and significant increase in 2HG (12.29±4.13 mg/dL, P<0.05). Among individuals exposed to lower water iAs (<50µg/L), those with elevated folate intake also had a significant increase in FPG (2.66±1.44 mg/dL, P<0.10). Results suggest that elevated intakes of folate may exacerbate impairments in glucose homeostasis among individuals exposed to water iAs.

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122. Association of groundwater constituents with distance to unconventional gas wells and topography in NE Pennsylvania

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Abstract:
Unconventional gas development (UGD), including those developed by hydraulic fracturing (HF), has potential to serve as a "bridge fuel" to a less carbon-intensive future. Public disputes on hydraulic fracturing have been polarizing, and scientific research, especially studies on environmental impacts, has been lagging behind the rapid application of these relatively new techniques. In this study, we hypothesized that levels of constituents in groundwater are associated with the distance to gas wells. To test this hypothesis, over the past three years, we have collected about 100 groundwater samples from private wells in NE Pennsylvania. Concurrently, realizing that large datasets were needed for identifying the impacts, we have analyzed available data from other studies, including the study by Cabot, which collected 1701 samples from NE Pennsylvania. By analyzing Cabot data, we found that elevated level of certain constituents (e.g., Cl, Ca, Fe) in groundwater is significantly ($p<0.001$) associated with the distance to UGD activity; groundwater in valley settings was more subject to change than in upland settings, possibly caused by enhanced mixing of shallow and deep groundwater in valleys and potentially induced by drilling and HF processes. If persistent, these changes indicate potential for further impacts on groundwater quality. Therefore, there is need to support large studies to investigate long-term effects of UGD on groundwater quality and possible health outcomes.

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Poster ID: P5563

123. In Utero Exposure to Bisphenol A Induces Reprogramming of Mammary Development and Tumor risk in MMTV-erbB-2 Transgenic Mice

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Abstract:
This study aimed to investigate the effects of in utero exposure to Bisphenol A (BPA) on mammary tumor development in MMTV-erbB-2 transgenic mice. Pregnant MMTV-erbB-2 mice were subcutaneously injected with 0, 50 ng, 500 ng and 250 µg/kg body weight BPA daily between day 13 and day 19 of gestation. We found that in utero exposed mice in the low dose (50 and 500 ng) groups, but not the high dose group (250 µg), displayed earlier vaginal opening and prolonged estrous phase, suggesting a dose dependent pro-estrogenic effect. Whole mount analysis showed that mammary glands of mice with in utero exposure to low dose BPA had a longer ductal extension at 6 weeks and increased lateral branching/alveolar structures at 10 weeks, which was more significant in the 500 ng group but less evident in the high dose group. Molecular analysis of mammary tissues indicated that in utero exposure to BPA induced concurrent activation of the receptor tyrosine (RTK) pathway and the estrogen receptor (ER) pathway. Mice in the 500 ng group but not in the high dose group, developed tumor earlier than the mice in the control group. Flow cytometry analysis indicated that in utero exposure to BPA induced alterations in mammary epithelial cell subpopulations. Our data demonstrated that in utero exposure to BPA may promote mammary tumor risk in erbB-2 transgenic mice through the activation of the erbB-2 and ER pathways and reprogramming of mammary development.

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124. Understanding how to communicate health information to adolescents in Northern Manhattan and the South Bronx

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Abstract:
The Columbia Center for Children's Environmental Health (CCCEH) Community Outreach and Translation Core (COTC) has a longstanding engagement in the Northern Manhattan and the South Bronx communities. For nearly two decades it has worked to translate research findings and educate the community on a variety of environmental exposures, particularly during vulnerable windows of susceptibility. This project aims to build on COTC's previous work and focus on messages of cancer prevention, especially environmental risk factors for breast cancer. Prior to developing a cancer prevention campaign, we are conducting a series of focus groups to better understand how to effectively communicate health information including cancer prevention messages. Focus group members are adolescents recruited from the CCCEH prospective birth cohort study initiated in 1998 to study the effects of air-pollutants in African-American and Dominican mothers and children living in Northern Manhattan and the South Bronx. We are conducting, separately for each gender, 4-6 focus groups consisting of 7-9 individuals between the ages of 16-18 years old. We hope to gain insight into their current health priorities including underlying motivations for health behaviors and potential preventive action. Focus group discussions will be transcribed and analyzed qualitatively. Information from the focus groups will facilitate the development of more effective and tailored cancer prevention campaigns for adolescents.

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Poster ID: P5630

125. The Case for Universal Screening of Private Well Water Quality in the U.S.: Evidence from Arsenic

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Abstract:
The 1974 Safe Drinking Water Act regulates >170,000 public water systems to protect health, but not >13 million private wells. State and local government requirements for private well water testing are rare and inconsistent; the responsibility to ensure water safety remains with individual households. Over the last two decades, geogenic arsenic has emerged as a significant public health concern due to high prevalence in many rural American communities. We build the case for universal screening of private well water quality around arsenic, the most toxic and widespread of common private water quality parameters of concern. We further argue that achieving universal screening will require policy intervention, and that testing should be made easy, accessible, and in many cases free to all private well households in the United States. Our research has identified behavioral, situational and financial barriers to households managing their own well water safety, resulting in far from universal screening despite traditional public health outreach efforts. We also observe significant socioeconomic disparities in arsenic testing and treatment when private water is unregulated. Testing requirements can be a partial answer to these challenges. Universal screening would reduce population arsenic exposure greater than any promotional efforts to date.

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126. A Quantitative CouNT Assay for Carbon Nanotube Detection

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Abstract:
The enormous potential of carbon nanotubes (CNT) and their successful incorporation in commercial products including bulk composite materials have dramatically increased their production. As with many new materials, toxicology concerns are being raised with CNTs regarding their interactions with humans and any safety hazards and environmental health risks CNTs may pose. CNT exposure levels (inhalation and respiration) and occupational health for workers in large scale manufacturing and subsequent handling facilities are of particular concern. However, understanding the effects of CNTs is complicated by the large diversity of structures, sizes, and surface functionality of CNTs. For the same reason, sensitive and accurate detection and quantification of multiple carbon nanotubes species in solution, water, air and other medium has been impossible. To date, the best analytical tool is the current NIOSH Method 5040 which can only measure Total Carbon (TC) or Elemental Carbon (EC) for air samples collected on a filter. Electron microscope is often used to verify CNTs. To address this analytical need and enable the community to better understand the effects of carbon nanotubes in and on the environment, Luna developed an easy to use, quantitative CouNT assay based on a unique CNT-specific affinity reagent to detect and measure carbon nanotubes. The CouNT assay can detect at ppb level a variety of CNT forms while able to differentiate CNTs from other carbonaceous materials.

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Wednesday, December 7, 2016

127. The Puerto Rico Testsite for Exploring Contamination Threats (PROTECT) Program

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Abstract:
The Puerto Rico Testsite for Exploring Contamination Threats (PROTECT) Center studies exposure to environmental contamination in Puerto Rico and its contribution to preterm births. Preterm birth is the leading cause of neonatal mortality in the U.S., and is associated with chronic health conditions and developmental disabilities. The study is conducted in Puerto Rico because of its high preterm birth rate (11.4%) and because of the extent of hazardous waste contamination on the island (more than 200 contaminated sites). The overarching goal of PROTECT is to employ an integrated, cross-disciplinary approach to study the fate, transport, exposure, health impact and remediation of contaminants, such as phthalates and chlorinated solvents as both suspect and model agents in the high preterm birth rates. To achieve that goal, PROTECT encompasses five research projects: Project 1 is a molecular epidemiology study of phthalate exposure and preterm birth; Project 2 explores toxicant activation of pathways of preterm birth in gestational tissues; Project 3 focuses on discovery of xenobiotics associated with preterm birth; Project 4 studies dynamic transport and exposure pathways of contaminants in karst groundwater systems; and Project 5 focuses on the development of a solar-powered remediation process for contaminated groundwater. Through these integrated studies PROTECT delivers new knowledge and technology in the area of contaminants of interest to the Superfund Research Program.

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Poster ID: P5806

128. Fish from the New Bedford Harbor Superfund Site exhibit resistance to both *ortho*- and non-*ortho*-substituted PCBs

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Abstract:
Killifish (*Fundulus heteroclitus*) inhabiting the New Bedford Harbor (NBH) Superfund Site have evolved resistance to the toxic and biochemical effects of non-*ortho* (dioxin-like) polychlorinated biphenyls (DL-PCBs) and other compounds that act via the aryl hydrocarbon receptor (AHR) signaling pathway. However, the majority of PCBs in NBH are *ortho*-substituted (non-DL) PCBs (o-PCBs), and the impacts of these o-PCBs on fish populations are not well understood. To determine whether the NBH killifish population has adapted to o-PCBs, we performed a series of experiments involving exposure of killifish embryos and adults from NBH and a reference site (Scorton Creek; SC) to 2,2',4,4',5,5'-hexachlorobiphenyl (PCB-153), a model o-PCB. PCB-153 was not acutely embryotoxic to developing F2 killifish embryos (SC or NBH) at concentrations up to 28 µM. RNA-seq showed that SC embryos exposed to PCB-153 (28 µM for 6 hr at 10 days post fertilization) had changes in the expression of genes involved in glucose homeostasis. However, NBH embryos were much less sensitive to these effects of PCB-153. When adult killifish from SC and NBH were exposed to PCB-153 (20 mg/kg) and sampled 3 days later for gene expression, many more genes were affected in forebrains of SC fish than in NBH fish, in a sex-specific manner. Together, these results demonstrate that NBH killifish have evolved reduced sensitivity to o-PCBs, suggesting complex adaptation to chemical mixtures at a Superfund site. [Supported by P42ES007381 and U.S. EPA.]

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Poster ID: P5748

129. UC Davis Environmental Health Science Center Community Outreach & Engagement: Dimensions of Engaged Research

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Abstract:
The Community Outreach and Engagement Core (COEC) of the UCD Environmental Health Science Center seeks to foster scientific collaboration among our Center's researchers and vulnerable communities of the Central Valley of California. The COEC is a resource for faculty and community in the process of creating research partnerships that make our Center's cutting edge environmental health science research relevant and applicable to the challenges facing communities. The COEC works closely with a Community Stakeholders Advisory Committee (CSTAC) of leading environmental justice and health advocates to ensure that the EHS research is informed by and includes the meaningful participation of affected communities. This poster will feature the work of two of our community-engaged research projects on drinking water quality and human health, and on the effects of pesticides on the central nervous system. We will showcase our Environmental Health Science Academy Day and our 'Question and Answer with an Environmental Health Scientist' video webinars as innovative models for building stronger university-community collaborations. We will also illustrate our methods to identify new research opportunities and collaborations between our CSTAC and researchers through panels and diverse group breakout exercises. We will highlight the collaborative processes that are leading to successful community-engagement events and the sparking of community-engaged research partnerships.

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Poster ID: P5719

130. Evaluating the performance of gas sensors over a 1 year period in Oakland, CA

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Abstract:
Low-cost electrochemical NO, NO_2, CO and O_3 as sensors were evaluated in the Bay Area Near Roadway Sensor (BANRS) Study for use in future health effects studies of traffic-related air pollution (TRAP) exposure. Sensors were collocated at the Bay Area Air Quality Management District's (BAAQMD) near roadway monitoring site along a major truck-trafficked freeway in Oakland, CA for approximately one year. After adjustment for interferences from temperature and relative humidity, of the various sensors, the highest R^2 values were observed for hourly NO that ranged from 0.64 and 0.94 for different months. For hourly CO, the R^2 values ranged from 0.50 and 0.95. The R^2 values for hourly NO_x were lower, ranging from 0.43 to 0.82. The correlations between the low-cost sensors and regulatory instruments were improved for longer 24-hour time averaging periods. The sensors performed well in terms of identifying consistent diurnal patterns in pollutant levels as those observed from the BAAQMD instruments. Moreover, hourly sensor readings were correlated with real-time data on total traffic and truck-specific. The low-cost sensors performed well, in some cases over several months, but some sensors failed. The failures were fairly obvious from time series plots of the data. This suggests that future deployments will need to consider routine and more frequent maintenance and replacement of low cost sensors for longer-term monitoring studies.

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131. In utero pyrethroid pesticide exposure and child cognitive development from 6 to 36 months in the MARBLES longitudinal cohort

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Abstract:
Introduction: Pyrethroid (PYR) pesticides are neurotoxicants but little is known about effects of in utero exposure on child development. We assessed prenatal PYR exposure and child cognitive development from 6-36 months.
Methods: Mother-child pairs (n=134) in the MARBLES cohort of children at high risk for ASD were studied. Maternal urine samples comprising a spot urine and a pooled sample of 3 spot urines (each at least a week apart) from each of trimesters 2 and 3 were analyzed for PYR metabolite 3-phenoxybenzoic acid (3PBA). Linear regression models of average 3PBA concentration during pregnancy in relation to Mullen Scales of Early Learning (MSEL) scores were fit with weights to account for the intra-pregnancy correlation and the variable numbers of samples collected per pregnancy.
Results: The median specific gravity (SG) adjusted 3PBA concentration= 0.78 ng/ml and ICC= 0.34. In weighted analyses adjusted for SG, child's sex, prenatal vitamin use and maternal education, greater 3PBA predicted significantly lower MSEL Composite (β= -0.79, p=0.003), Visual Reception (β= -0.80, p=0.001), and Fine Motor (β= -0.32, p=0.02) scores at 6 months.
Conclusion: We observed lower MSEL scores at 6 months, but this effect was attenuated by 12 months in this high-risk population. In utero 3-PBA concentrations may or may not have a transient impact on development that resolves by 12 months. Results will be updated with a larger sample and more rigorous measurement error modeling methods.

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132. Examining the Feasibility of Engaging Community Navigators to Promote Residential Radon Testing and Follow-up among African American and Latino Women attending a Women's Health Awareness Program in North Carolina

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Abstract:
Radon exposure is the second leading cause of lung cancer deaths in the United States, following cigarette smoking. African Americans are more likely to be diagnosed with lung cancer compared to whites, have poor lung cancer outcomes and generally are less likely to get lifesaving information and resources to reduce cancer risks. Community Navigators (CN)s identify opportunities to raise awareness about cancer risks and eliminate barriers to ensure communities have access to cancer information, screenings, and care. We examined the impact of CN on the return of residential radon testing kits disseminated at the annual Women's Health Awareness Day conference sponsored by the National Institute of Environmental Health Sciences. Radon test kits and education were provided to 272 conference attendees. CNs followed up to identify and eliminate barriers to returning the kits. Barriers to returning radon home test kits included limited knowledge of radon environmental exposure, perceived cost, cultural factors, and housing concerns. Poor awareness, communication, and education around radon exposure and lung cancer risk factors were substantial. There is significant need to raise awareness in diverse communities about residential radon exposure and lung cancer risks. Linking CN to community outreach activities can provide meaningful follow-up, increase awareness and screenings, and potentially decrease lung cancer incidence and mortality in diverse communities.

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Poster ID: P5745

133. Cadmium exposure perturbs the gut microbiome and its metabolic profile in mice

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Abstract:
Cadmium (Cd) is ubiquitous environmental pollutant and has adverse effects to human health. Urinary Cd has been found to related with increased risk of diabetes and hypertension; exposure to Cd is also linked to other diseases, such as peripheral artery disease. Through dietary intake, Cd will interact with the microbes in gastrointestinal tract, which can affect the structure and function of the gut microbiome. Accumulative evidence indicates that the gut microbiome is vital to human health. The aim of this study is to investigate the structural and functional effects of Cd exposure on gut microbiome. In this study, C57BL/6 male mice were treated with 100 ppm Cd for 13 weeks via drinking water. Gut microbiome community structural difference between control and Cd-treated mice was determined using 16S rRNA gene sequencing, and the functional perturbation was assessed by fecal DNA metagenomics sequencing and HPLC-MS. A higher microbial diversity in control mice after 13-week treatment was observed compared to Cd-treated mice, indicating that exposure to Cd inhibit the development of gut microbial diversity. In addition, gut microbial composition Cd-treated mice was significantly altered, and the shifted gut microbes in the two group were different. Moreover, dissimilarity in functional genes and fecal metabolic profiling between control and Cd-treated mice showed that Cd exposure affect gut microbiome functionally through the modification of microbial genes and metabolites.

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Poster ID: P5769

134. Pediatric Phthalate and Phenol Exposure Profile and Potential Impacts on Pubertal Timing in Chilean Girls

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Abstract:
Endocrine disrupting chemicals (EDCs) are exogenous compounds that can antagonize or mimic the effects of the body's endogenous hormones. Given EDCs ability to disrupt normal endocrine homeostasis, there is concern that pediatric exposure may impact pubertal timing, which has implications for subsequent cardiovascular health and cancer risk. To appraise this influence, we examined urine metabolite concentrations of 29 phenols and phthalates in 200 Chilean girls of the Growth and Obesity Cohort Study (total N=1195) at breast tanner stages B1 and B4 (median ages=7.9 and 11.3 years, respectively). We found that levels of M-PB, mBzP2, mECPP, mEHHP, mEOHP, and mEP2 were significantly higher at B1 than at B4. Conversely, BP-3 concentrations were lower at B1. We compared these trends to those among adolescent U.S. girls in the 2011-2012 cycle of NHANES. Similarly, DEHP metabolites mECPP, mEHHP, and mEOHP were higher in girls 6-9 years than those 10-13 years in NHANES. Neither Mexican-American nor other Hispanic ethnicity modified this association with age. The concentrations of six EDCs were moderately correlated (Spearman Rho: 0.22-0.33) between B1 and B4 in the Chilean girls, including: mBzP2, mECPP, mEHP, mEP2, MHiBP and miBP. BMI did not significantly impact metabolite levels in either the U.S. or Chilean cohorts. We have begun to assess the impact of EDC levels on pubertal timing in the Chilean study. These results will be juxtaposed with findings among U.S. populations.

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135. TCDD Alters Sex Ratio Determining Gene Expression in Mouse Testis

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Abstract:
Paternal exposure to the persistent organic pollutant, 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) is associated with a skewed sex ratio towards a greater proportion of female offspring. This research aims to characterize the testicular expression of genes known to regulate the sex ratio of offspring and to determine whether exposure to TCDD alters that expression. WT male C57BL/6 mice were injected weekly with TCDD (wk 1: 2000 ng/kg, wks 2-3: 400 ng/kg) or corn oil vehicle. Overall body weights were not different between treatment groups; however, liver:body weight and liver:testes weight ratios were slightly, but significantly, increased by 15 and 6%, respectively. Up-regulation of aryl hydrocarbon receptor (AHR) target genes, Cyp1a1 and Ahrr in the liver and testis of mice exposed to TCDD confirmed that the AHR transcription factor-signaling pathway was activated in both organs. Importantly, TCDD-treated mice exhibited a 30% increase and 20% decrease in the testis mRNA expression of genes involved in the determination of offspring genotypic sex, Sycp3-like Y-linked (Sly) and Slx, respectively. This led to a 40% reduction in the Slx:Sly expression ratio compared to vehicle controls. Finally, while Slx was not detected in the liver, Sly gene expression was enhanced by 40% in the livers of TCDD-treated mice. These data suggest that TCDD disrupts the expression of offspring sex determining genes, which may contribute to TCDD-mediated alterations in offspring sex ratio.

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136. Gentamicin Resistance in Campylobacter from Conventionally-Grown Turkeys in Eastern North Carolina

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Abstract:
Introduction: Poultry is a major vehicle of Campylobacter, a leading human foodborne pathogen. In certain clinical cases antibiotic treatment with aminoglycosides like gentamicin may be required. First reported in 2007, numerous gentamicin resistance genes are now known in Campylobacter.Purpose: Campylobacter isolated from conventional turkey production were investigated to determine prevalence and genetic basis of gentamicin resistance. Methods: Campylobacter was isolated from turkey feces, ceca and flies from commercial turkey farms. PCR was used to determine the presence of the gentamicin resistance genes aph(2”)-If or aph(2”)-Ig, and whole genome sequencing (WGS) was used to examine two strains of feces and fly origin. Results: From 2013-2016, 90.1% (2249/2497) of isolates were resistant to gentamicin. Of these, 340 isolates were analyzed to determine the resistance gene. The majority (99%) of these isolates carried aph(2”). WGS of two strains revealed a novel IS1595-family mobile element harboring aph(2”)-If.Significance: Gentamicin resistance in Campylobacter from the turkey production ecosystem is much more prevalent than previously recognized. Flies with these resistance genes may serve as vectors for dissemination of antibiotic resistance throughout the environment.

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137. Ozone exposure modeled across primary cell donors reveals the role of MAPK signaling in governing response heterogeneity and inflammatory adaptation

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Abstract:
Exposure to the ubiquitous air pollutant ozone results in inflammation which exacerbates cardiopulmonary morbidity and mortality; however, repeated ozone exposures reduces pro-inflammatory and oxidative stress markers in the airway. While this phenomenon, known as "ozone adaptation," has been observed for decades, the mechanisms and health implications of ozone adaptation remain unclear due to inter-individual variability and lack of exploratory models. We developed a primary bronchial epithelial cell exposure model that recapitulates ozone adaptation in vitro that allowed us to describe molecular mechanisms associated with this phenomenon. In doing so we also identified a relationship between single ozone exposure responses and the capability of cells to adapt to multiple exposures in the ozone-responsive genes IL-8, IL-6, COX2, and HMOX1. Cells from donors exhibiting the most robust gene induction also demonstrated the greatest adaptive effects following subsequent exposures. Contrary to previous hypotheses, adaptation was not associated with net changes in oxidative stress response. Instead, we found that the MAP kinases ERK and p38 play a critical role in determining the response magnitude and adaptive potential of ozone-responsive genes. This discovery is an important step toward elucidating the molecular mechanisms associated with the adverse health effects of O3 exposure, predicting susceptible populations, and identifying strategies for therapeutic intervention.

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Poster ID: P5693

138. miRNAs as Common Regulators of the Transforming Growth Factor (TGF)-β Pathway in the Preeclamptic Placenta and Cadmium-treated Trophoblasts: Links between the Environment, the Epigenome and Preeclampsia

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Abstract:
Preeclampsia (PE) is a pregnancy disorder characterized by high blood pressure and proteinuria that can cause adverse health effects in both mother and fetus. There is no current cure for PE other than delivery of the fetus. While the etiology is unknown, poor placentation of the placenta due to aberrant signaling of angiogenic factors has been postulated as causal factors of PE. In addition, environmental contaminants, such as the metal cadmium (Cd), have been linked to placental toxicity and increased risk of developing PE. Here, we use a translational study design to investigate genomic and epigenomic alterations in both placentas and placental trophoblasts, focused on the angiogenesis-associated transforming growth factor-beta (TGF-β) pathway. Genes within the TGF-β pathway displayed increased expression in both the preeclamptic placenta and Cd-treated trophoblasts. In addition, miRNAs that target the TGF-β pathway were also significantly altered within the preeclamptic placenta and Cd-treated trophoblasts. Integrative analysis resulted in the identification of a subset of Cd-responsive miRNAs, including miR-26a and miR-155, common to preeclamptic placentas and Cd-treated trophoblasts. These miRNAs have previously been linked to PE and are predicted to regulate members of the TGF-β pathway. Results from this study provide future targets for PE treatment.

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Poster ID: P5756

139. Integrating a Tailored CBPR Curriculum to Address Environmental Health Science Literacy and Disparities in Marginalized Communities

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Abstract:
The Transdisciplinary Research Consortium for Gulf Resilience on Women's Health (GROWH) targets health disparities among disaster prone communities on the Gulf Coast by linking communities to environmental health researchers through community based participatory research (CBPR). Funded by the National Institute of Environmental Health Sciences (NIEHS) in response to the BP Gulf Oil Spill, GROWH's Community Outreach and Dissemination Core (CODC) comprised of Tulane University, Mary Queen of Vietnam CDC (MQVN), Bayou Interfaith Shared Community Organizing (BISCO), and the Louisiana Public Health Institute (LPHI), seeks to strengthen community resilience in vulnerable Gulf Coast populations. The CODC designed a CBPR curriculum to fit the unique needs of the Bayou and immigrant communities. The CODC collaboratively developed and implemented a seven module CBPR curriculum covering types of research (traditional and CBPR), research ethics, forming and sustaining CBPR partnerships, and dissemination and translation techniques. Seven day-long sessions were held monthly. Adult learning techniques were employed to strengthen the community academic partnership and ensure timely, cohesive disparity research. This presentation will describe the transformation of a traditional benchmark science to a 'real world' community dissemination CBPR process, with a rare insight into the communication requisites of Southeastern Louisiana Vietnamese immigrant and Bayou communities.

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140. Impact of ferromanganese alloy plants on household dust exposures: characterizing manganese and additional metals of concern

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Abstract:
Previous studies have reported neurological deficits among communities living adjacent to ferromanganese alloy plant operations. The primary exposure of concern from these operations is manganese, a neurotoxicant, but other toxic metals are also used in ferroalloy production whose exposures are less well characterized. We measured concentrations of metals (manganese, lead, copper, chromium) in indoor and outdoor household dust of adolescents residing in Brescia, Italy, an area with a history of ferromanganese plant activity. Samples were collected from homes (n = 625) in three areas (Bagnolo Mella [BM], Valcamonica [VC] and Garda Lake [GL]), each with differing intensity of ferromanganese plant operations. As follow-up to previous work on a subset of our sample(1), we assessed contamination from plant activity and examined associations of household dust metals with internal biomarkers of exposure. Manganese concentrations and loadings in indoor and outdoor dust were highest in the area of current plant activity and lowest in the area with no history of plant activity, consistent with previous findings(1). For the other metals, dust levels were not associated with site, and no consistent patterns emerged between dust measures and internal biomarkers. Our results suggest that ferromanganese plant activity is not associated with exposure to lead, copper, and chromium, and that other sources of metals may exist in this area.1 Lucas et al., 2015. Env Research 138.

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Poster ID: P5734

141. NextGenSS - Putting next generation sensors and scientists in practice to reduce wood smoke in a highly impacted, multicultural rural setting

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Abstract:
Low-cost portable air pollution sensors are increasingly used by communities interested in learning more about their air quality. Building on a longstanding University-community partnership in the rural and agricultural Yakima Valley, WA, students are engaged to conduct wood smoke research in their highly impacted community using low cost sensors. Widespread biomass burning for residential heating, forest fires and stagnant weather conditions contribute to significant particulate matter exposures. UW air pollution researchers have partnered with Heritage University (HU) Environmental Science faculty and secondary school educators whose students reflect the community's population of predominately Yakama Nation and Latino immigrant families. This project enhances an ongoing EnvironMentors program, which pairs HU undergraduates with local secondary students and culminates in a presentation at a National Fair. Students will formulate and test hypotheses on wood smoke exposure using a combination of next-generation PM sensors and advanced research instruments. In order to facilitate this process, an *Introduction to Community Sensing* curriculum will be provided and facilitated by UW researchers. The projects provide an opportunity to understand spatiotemporal variability, intervention approaches, and health impacts. Students will disseminate findings to their families, elders, and community members. Evaluation will include an environmental literacy and needs assessment, student experience using sensors and validated field measurement data. A project advisor committee representing key community leaders provides ongoing feedback and informs research to action strategies.

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142. Towards the Quantitative Apportionment of Personal Exposure to Strong Sources of Household Air Pollution

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Abstract:
Over 40 percent of the global population relies on the burning of solid fuels for cooking. The associated emission of pollutants, e.g. particulate matter (PM), contribute to overall household air pollution (HAP) exposures, which is responsible for 4.3 million deaths annually. Many current studies are designed to measure and reduce exposure to PM from cookstoves to improve health. However, it is difficult to differentiate between exposure to cookstove smoke and other strong PM sources, which contributes to the uncertainty associated with defining the relationship between stove emissions and health outcomes.A sample chamber was developed for the controlled introduction of source specific PM. Real-time and integrated PM2.5 samples were collected using the RTI MicroPEM. Samples were collected from multiple strong PM sources commonly found in homes in developing countries; candles, kerosene lamps, mosquito coils, and cigarettes.Various MicroPEM-specific metrics were calculated for a range of PM concentrations from each source. Preliminary data indicate it is possible to differentiate exposure to cookstove and kerosene emissions using the MicroPEM's measure of filter pressure drop. This metric was applied to an exposure data set from Sri Lanka and used to calculate the contribution of kerosene combustion to total HAP exposure. Nine percent of study samples were identified as having burned kerosene, accounting for 23.6% [95%CI 0.205, 0.266] of total PM exposure on average.

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143. Prenatal PBDE exposure and child neurodevelopment in the HOME Study

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Abstract:
Polybrominated diphenyl ethers (PBDEs), a class of flame retardants, are persistent organic pollutants capable of disrupting gonadal and thyroid hormones. We aim to examine the developmental neurotoxicity of PBDEs in children. In the Health Outcomes and Measures of the Environment Study, a prospective birth cohort with enrollment from 2003- 2006, we examined the associations between maternal serum PBDE concentrations at 16 weeks gestation and thyroid hormone levels and child neurodevelopment. Thyroid hormones were measured in maternal serum at enrollment and in cord serum. Neurobehavior was assessed at ages 1, 2, 3, 5, and 8 years for cognitive function, behavior, executive function, and reading skills. We observed a positive association between maternal PBDEs and maternal total and free thyroxine (TT4, FT4, with BDE-28 and -47) and triiodothyronine (TT3, FT3, with BDE-47). A 10-fold increase in maternal Sum4BDEs (-47, -99, -100, -153) was associated with decreased Full-Scale IQ at ages 5 and 8 years (β=-5.3 points, 95% CI: -10.6, -0.1 at age 8) and increased Externalizing Problems (aggression and hyperactivity) at ages 2-8 years (β=3.5 points, 95% CI -0.1, 7.2 at age 8). Poorer behavior regulation in children ages 5 and 8 years was found with increased maternal BDE-153 concentrations. Decrements in Reading Composite scores was noted at 8 years with increased Sum4BDEs concentrations. These findings suggest that prenatal exposures to PBDEs are developmentally neurotoxic.

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144. Patterns of mercury and organic co-contaminants in marine and freshwater fish

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Abstract:
Fish consumption advisories have been established throughout the US for freshwater and coastal ecosystems. Most of the fish consumption advisories in the US are for mercury (81%), but significant numbers of others have been established for organic contaminants including PCB's and their congeners, chlordane, DDT, and others. Although the advisories are contaminant specific, humans are exposed to multiple contaminants through fish consumption. Past studies have focused only on individual contaminants, in particular mercury, without relating those exposures to others such as organic contaminants. Using publically available datasets in which multiple contaminants were measured in individual fish samples, we examined the relationships between different contaminants (metals, pesticides, PCBs, PAHs, and PFCs) from the EPA's Environmental Monitoring and Assessment Program (EMAP) in lakes, National Coastal Assessment (NCA), and National Rivers and Streams Assessment (NRSA). Preliminary results indicate species-specific relationships between contaminants and some general differences between freshwater species and marine species. Across datasets, Hg correlates with PCBs, DDT formulations, and some pesticides (e.g., dieldrin, aldrin, chlordane). We will examine the co-occurrence of mercury and organic contaminants in fish from a range of ecosystems in order to begin to evaluate the risk of human exposure to multiple contaminants posed by eating fish.

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145. Arsenic exposure increases pathogenicity of gut bacteria

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Abstract:
Gut microbiota plays an important role in energy production, immune system development, xenobiotics biotransformation and so forth. Gut microbiome perturbation or dysbiosis has been reported to be associated with a number of human diseases. Environmental factors, like antibiotics, can alter the normal composition of gut microbiome and increase the possibility of pathogen infection. Likewise, arsenic, as a widely distributed environmental contaminant, has also been demonstrated to alter the gut microbiome in our previous study. Here, we further investigate whether arsenic can affect pathogenicity of gut bacteria. We applied 16S rRNA gene sequencing and metagenomics sequencing to explore the arsenic-induced disturbance of gut microbiome compositions and functional genes. The compositions of gut microbiome have been significantly altered in both 100ppb and 100ppm arsenic-treated C57BL/6 mice. In addition, metagenomics results reveal that multiple pathogenicity-related genes have been increased after arsenic treatment. Genes involved in stress response were also widely altered and the carbohydrates metabolism was also changed in arsenic-exposed mice. Arsenic-induced alteration of functional genes in gut bacteria might increase bacteria virulence and the possibility of pathogen infection.

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146. A Personal Particulate Matter Exposure Monitor to Support Exposure and Health Studies for Sensitive Groups

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Abstract:
Recent advances in exposure assessment technologies brings the ability to reduce exposure misclassification bias and provide the data to accurately assess correlation between the environmental stressor and adverse health outcome. The MicroPEM technology, in an unobtrusive, wearable package, provides personal exposure data for particulate matter (PM) both in real-time and at an integrated level that can significantly enhance the understanding of exposure-health outcomes relationship. The MicroPEM has been successfully deployed for sensitive cohorts in four exposure studies, including children who previously lived in storm-affected areas, inner city asthmatic children, senior citizens in a high cancer incidence area, and asthmatic pregnant mothers. Successes and improvements will be discussed using data quality indicators and practical considerations for deploying the MicroPEM in each study. The ability to link exposure data to the specific health outcome of interest will be also discussed. Additional facets to be discussed include prediction of inhaled dose from the accelerometer and nephelometer data, compliance with study protocols as measured by an accelerometer, automatic nephelometer calibration and relative humidity correction, comparison of data from the MicroPEM and other exposure monitors, MicroPEM performance in high concentration environments, system cycle options to obtain 7-day samples, and feasibility of conducting large scale mail-out studies.

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147. Assessing the impact of environmental toxicants on Kras-mediated lung cancer initiation and progression

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Abstract:
KRAS is the most commonly mutated proto-oncogene in lung adenocarcinoma. Oncogenic mutations in KRAS contribute to malignant transformation in many organs, but KRAS mutation is an initiating event in lung adenocarcinoma. Although, KRAS activation leads to signaling through many pathways, signaling through the MAPK pathway appears to be critical for lung adenocarcinoma initiation. Additionally, amplification of this pathway is often associated with disease progression. MAPK signaling and tumor progression are both affected by cell exogenous environmental signals such as growth factors, chronic inflammation, or tobacco smoke. Recent work by our lab has shown that amplification of the MAPK pathway leads to transformation of previously dormant oncogenic Kras-expressing cells. Additionally, we demonstrated that amplification of the MAPK pathway was sufficient to drive adenoma progression to carcinoma. We hypothesize that environmental stimuli that induce MAPK signaling can promote the transformation of otherwise dormant $Kras^{G12D}$-expressing cells. It will be important to test the role of MAPK signaling in mouse models of lung tissue damage. This work elucidate whether malignant transformation in these models is mediated through environmental stimulants of MAPK signaling, which would could provide a viable therapeutic target for patients at risk for lung cancer development due to exposures to environmental toxicants.

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148. Sensation of Ultraviolet Radiation in C. elegans

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Abstract:
Following exposures to environments such as ultraviolet (UV) radiation, which cause cellular damage, animals stop feeding and moving and go to sleep. I am studying the mechanism of somnolence following UV exposure by making use of the nematode Caenorhabditis elegans. Previous work in the lab has established that exposure of C. elegans to toxic environments results in cellular stress, which then triggers sleep. Stress-induced sleep (SIS) is dependent on epidermal growth factor (EGF) acting on an EGF receptor tyrosine kinase. The binding of EGF to its receptor on a single neuron, ALA, activates this neuron and induces SIS. Following its activation by EGF, ALA releases FLP-13 neuropeptides that lead to SIS by silencing wake-promoting neurons. My current experiments are aimed at identifying the cells or cell types that are damaged by UV radiation and release EGF to trigger ALA activation and sleep.

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149. Pathophysiologic Mechanisms Underlying Cardiorespiratory Effects of Ozone in Healthy Adults

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Abstract:
Introduction: There is increasing evidence of an association between ozone and cardiovascular disease, but the underlying mechanisms and relative contributions of residual O_3 versus indoor O_3 reaction products to O_3-associated toxicity are not understood. This study uses an electrostatic precipitator (ESP) air purification intervention to elucidate cardiopulmonary responses to O_3 and products of indoor O_3 chemistry.

Methods: Exposures to O_3-associated pollutants were manipulated for 89 office workers living together on a work campus in China with an O_3- and O_3 chemistry product-generating ESP. Indoor and outdoor O_3 and co-pollutants were monitored to estimate total exposures. Subjects were measured for biomarkers of cardiopulmonary pathophysiology at 4 time points each separated by 2-3 week intervals.

Results: Biomarkers of pulmonary inflammation, systemic oxidative stress, systolic and diastolic blood pressure, and platelet activation were significantly associated with total O_3 exposure at levels below regulatory standards. Ongoing Bayesian analyses show that no biomarkers were independently significantly increased in association with ESP use. This suggests that total O_3 exposure, primarily driven by ambient concentrations, is the main exposure associated with these biomarker responses, rather than indoor O_3 or O_3 chemistry products produced by the ESP.

Conclusions: These findings provide insights into biological mechanisms by which O_3 can enhance cardiopulmonary disease risk.

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150. SafetyNEST: Transforming Prenatal Care for Healthier Babies

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Abstract:
"Exposure to toxic environmental chemicals during pregnancy and breastfeeding is ubiquitous and is a threat to healthy human reproduction…Preventing exposure to environmental chemicals is a priority for reproductive health professionals everywhere" (FIGO, 10/2015).

Due to a lack of training, tools, and expertise, few reproductive health professionals counsel pregnant women about the risks of chemical exposures. The current landscape for environmental health counseling is fragmented and impersonal. There's an abundance of information online that is fear-based and difficult to implement for most pregnant women. We are missing two opportunities: 1) To educate pregnant women with simple health-based messaging while they are uniquely positioned to make important changes to promote the health of their pregnancy; and, 2) To equip health professionals with evidence-based tools to counsel patients about reducing exposures to environmental chemicals. SafetyNEST is transforming prenatal care by equipping health providers and pregnant woman with a one-stop, highly engaging and personalized health education toolkit designed to reduce toxic chemical exposures in the workplace and at home. The platform is a central hub for reproductive health professionals and pregnant women to engage, learn, track, and share credible content that's easy to access and relevant via the web, mobile, and printed resources that are distributed through health professionals and alliances.

Poster ID: P5669

151. Methods development for analysis of Ambler, PA death certificates to determine how asbestos related diseases may have been recorded over time

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Abstract:
Asbestos exposure can result in death by causing pulmonary asbestosis, lung cancer, and mesothelioma collectively referred to as asbestos-related diseases (ARD). Ambler, PA at one-time the world's largest asbestos product manufacturing site, had resulting extensive accumulation of asbestos-containing waste materials (ACM) open to the community. We have identified a cohort of the 4,524 residents of Ambler at the time of the 1930 census, classified into groups with occupational, paraoccupational or residential related asbestos exposures at that time.1930 was chosen because ACM production was near peak, waste piles accumulated, full census available data and a sufficient time for mesothelioma to manifest. Through study of this cohort from a period of very active exposure we plan to characterize long-term mortality experience related to different exposure sources, and the interaction of social and environmental factors. Mortality information including death certificates have been obtained from many sources. Mesothelioma presents particular problems with coding over the years, and was first included with a separate, specific code in ICD-10 in 2015. Our aim is to develop a method to identify malignant mesothelioma on death records and create a framework for future researchers to increase the sensitivity of identifying this rare disease. We will present the results of applying this framework to the first 995 death certificates.

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Poster ID: P5742

152. STAT1 Regulates Pulmonary Fibrosis in Mice after Exposure to Multi-Walled Carbon Nanotubes through Suppression of TGF-β1 Production and Signaling

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Abstract:
Multi-walled carbon nanotubes (MWCNT) pose a risk for pulmonary fibrosis due to their fiber-like shape, but physico-chemical features, like rigidity, could also confer fibrogenicity. The anti-fibrogenic transcription factor, signal transducer and activator of transcription-1 (STAT1), halts fibroblast growth. STAT1 deficient ($Stat1^{-/-}$) mice are susceptible to pulmonary fibrosis. We hypothesized that $Stat1^{-/-}$ mice exhibit a differential fibrogenic response to tangled (t-) vs. rigid (r-) MWCNT above that in wild-type ($Stat1^{+/+}$). $Stat1^{+/+}$ and $Stat1^{-/-}$ mice were exposed to t- or rMWCNT (4 mg/kg) via oropharyngeal aspiration and lung tissues were collected after one and 21 days. Both mRNA and protein samples were analyzed for fibrogenic mediators. rMWCNT caused mucous cell metaplasia, epithelial cell proliferation, and larger granulomas in the lungs of mice compared to tMWCNT. Both MWCNTs induce acute neutrophilia, however only rMWCNT induce chronic neutrophilia. $Stat1^{-/-}$ mice treated with rMWCNT had higher TGF-β1 protein levels in bronchoalveolar lavage fluid, lung Smad protein levels, and airway collagen deposition after 21 days than $Stat1^{+/+}$ mice. r- and tMWCNT induce different pulmonary fibrogenic responses that are exaggerated by STAT1 deficiency, emphasizing the importance of tube rigidity and genetic susceptibility. The mechanism of STAT1 susceptibility to MWCNT-induced fibrosis appears to be through dysregulated TGF-β1 production and signaling.

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153. Associations of prenatal exposure to phthalates and bisphenol A with measures of cognitive function in 7.5-month-old infants participating in the Illinois Kids Development Study (I-KIDS)

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Abstract:
Phthalates and phenols are endocrine disruptors with potential neurodevelopmental toxicity, but few studies have assessed their impact on infant cognition. Looking behaviors were assessed in a subsample of full-term infants (>37 weeks; n=72) born to mothers in a prospective pregnancy cohort of mostly white women (80%) who had a low-risk pregnancy. Phenol and phthalate metabolites were measured in a pool of 5 urines collected across pregnancy; urinary concentrations were similar to other US pregnant populations. At 7.5 months, infants' visual recognition memory was tested. In familiarization trials, they saw 2 identical faces side-by-side; in test trials the familiar face was paired with a novel face. Exposure associations with average fixation time (processing speed), gaze shift rate between faces (visual attention) and novelty preference (recognition memory) were analyzed using general linear models. Models were adjusted for infant age and sex, household income, maternal IQ and education, breastfeeding, and urine specific gravity. Urine monoethyl phthalate was associated with decreased novelty preference (β=-1.71%/interquartile range [IQR]); urine bisphenol A (BPA) was associated with longer fixation duration (β=0.158s/IQR). There were no associations with other phthalate or phenol biomarkers. These findings suggest that prenatal exposure to BPA and diethyl phthalate may negatively impact infant cognition in this study population but need corroboration in a larger sample.

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154. Community Outreach and Translation Initiatives from the Columbia Center for Children's Environmental Health

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Abstract:
The Columbia Center for Children's Environmental Health has established a body of research showing that exposure to common urban pollutants throughout the sensitive fetal and early childhood periods can result in multiple adverse effects on the health and well-being of children. The Center's Community Outreach and Research Translation Core (COTC) communicates study findings to policymakers and educates community members about environmental threats and the steps parents can take to protect children's health. The success of the Center's community outreach and translation initiatives is based on an 18 year working partnership between Center staff and the highly respected community organization, We Act for Environmental Justice (WEACT). The COTC has undertaken four projects to fulfill our primary goals of (1) translate and disseminate research findings on the health impacts of air pollution and toxic chemicals to community residents, policy-makers, and the public; and (2) engage community members in communicating their environmental concerns to Center members. Our multi-level approach has led us to undertake the following projects (1) evaluation of environmental health mobile applications; (2) creation of a teen advisory board that will guide youth outreach activities; (3) review and analysis of policies related to air pollution in NYC; (4) translation of findings to key stakeholders. We will report on the progress of each of these projects with special attention to the community engagement component of each initiative.

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155. Placental expression of IFNγ and TNF-superfamily receptors associated with maternal cadmium and selenium biomarkers

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Abstract:
Trace metals have been suggested to play important roles in pregnancy outcomes and fetal growth. Selenium (Se) may protect against, whereas higher cadmium (Cd) may increase the risk of negative pregnancy outcomes. Cd and Se also have conflicting influences on cellular redox balance which can induce cytotoxicity and tissue damage. We hypothesized that maternal Cd and Se would be associated with the expression of cytotoxic signaling receptors in placental tissue, and that these metals or expression patterns were related to decreased birth size. In a sub-sample (n=173) of the Rhode Island Child Health Study (RICHS), we tested whether maternal Cd and Se concentrations and their interactions were associated with the expression levels of IFN-gamma receptor (2 genes) and TNF-superfamily (TNFSF) (21 genes reduced to six factors) via robust linear models. Higher Se was associated with lower odds of intrauterine growth restriction (IUGR) (OR = 0.27, p = 0.045), whereas higher Cd may increase odds of IUGR, conditional on low Se (OR = 3.32, p = 0.071). The placental expression levels of IFNGR1 and multiple TNF-SF factors (primarily loaded with TNF-alpha receptor) exhibited potential Cd*Se interactions (p-values < 0.05); these expression patterns were also associated with decreased birth size. Our findings suggest that maternal Cd and Se may influence cytotoxic signaling in the placenta which may in turn be related to fetal growth.

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156. The environmental Benefits Mapping and Analysis Program—Community Edition (BenMAP-CE)

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Abstract:
The environmental Benefits Mapping and Analysis Program—Community Edition (BenMAP-CE) is an open-source PC-based tool that quantifies the number and economic value of air pollution-related premature deaths and illnesses. The U.S. EPA first developed the tool in 2003 and then re-built it in 2013 in an open-source software platform, with the goal of fostering a global community of users and developers. BenMAP-CE is pre-loaded hundreds of concentration-response relationships from U.S. and Chinese epidemiological studies that analysts may apply to quantify ozone and fine particle related premature deaths, hospital and emergency department admissions, non-fatal heart attacks, asthma attacks, lost days of school and work, acute respiratory symptoms and upper and lower respiratory symptoms. The tool also contains the demographic and baseline health data to quantify incidence and the economic unit values needed to estimate the dollar benefits of avoiding these adverse outcomes in the U.S. and China. The newest version of the program contains an easy-to-use module that applies data from the Global Burden of Disease study to quantify the benefits of reducing PM2.5 levels in any country in the world. The program also includes a module that estimates the change in life expectancy at birth resulting from improved air quality in the U.S.

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157. Integration of Multi-Omics Data Reveal Dynamic Oxidative Stress Responses to Manganese in Human SH-SY5Y Neuroblastoma Cells

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Abstract:
Manganese (Mn) occurs naturally in the environment at low doses and is essential for normal cellular processes, while excessive Mn exposure also causes neurotoxicity. We therefore employed a dose response design with human neuroblastoma SH-SY5Y cells to gain a mechanistic understanding of mitochondrial-cellular signaling networks over a physiologic to minimally toxicological range of Mn. We treated cells with different $MnCl_2$ doses for 5h and found that cellular Mn accumulation was similar to literature values for human brain at ≤10 µM and increased to toxicological concentrations at ≥50 µM. Mn increased mitochondrial hydrogen peroxide (H_2O_2), antioxidant superoxide dismutase activity and oxidation of protein thiols in a dose dependent manner. In addition, data analysis from multi-omics platform -high resolution mass spectrometry-based metabolomics, transcriptomics by RNA-sequencing, and redox proteomics by redox ICAT-based mass spectrometry was performed. Results show that Mn significantly altered 284 metabolites, 798 transcripts and 100 protein peptides. Central hubs altered by Mn include mitochondrial dysfunction, oxidative stress responses, energy metabolism, protein folding, cytoskeleton remodeling, tyrosine and butanoate metabolism. Therefore we show that Mn induced mitochondrial oxidative signaling and cellular neurotransmitter metabolism exhibit critical dynamic determinants that could either protect or exacerbate the emergence of neurological disorders.

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158a. The Teen Research and Education in Environmental Science (TREES) summer program for high school students

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Abstract:
In 2007, the Center of Excellence in Environmental Toxicology launched a community outreach education program for high school students called Teen Research and Education in Environmental Science (TREES) summer program. Graduate student mentors, returning high school student mentors, and faculty members volunteer their time to guide the students one-on-one and as a group. TREES includes daily lectures on environmental issues or "survival" skills, such as laboratory safety, library and internet research, ethics, writing, and presentation skills. TREES students also take part in two activities with undergraduates in our parallel STEER program. All attend a weekly "cutting edge" faculty lecture and a weekly field trip to and environmental site. TREES begins with two weeks of structured laboratory exercises to teach basic lab techniques. The basic training leads to the most unique aspect of the program: an individually guided research project on a topic chosen by the student. The students then present their individual research project in an oral symposium. TREES scholars have been highly successful in science fairs with most winning local awards, a number winning national honors, and several publishing their work. About 80% of the students major in STEM fields in college with about 25% majoring in environmental science, far above the national average. A half-dozen alumni are now in graduate school with three pursuing graduate degrees in environmental sciences.

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158b. Short Term Educational Experiences for Research (STEER) program for undergraduate students

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Abstract:
Each summer, the Center of Excellence in Environmental Toxicology runs a community outreach education program for undergraduate students interested in environmental health science called the Penn Undergraduate Environmental Health Scholars Program through the Short Term Educational Experiences for Research (STEER) grant. Approximately 8 students are accepted each year into this 10-week program. The heart of the program is working one-on-one with a faculty member on an environmental health research project. Each student is matched up with a faculty mentor, based on stated interests and career goals. The student-mentor relationship usually endures long after the program ends, with research often continuing into the school year. There is a weekly "Cutting Edge" lecture from faculty mentors. Past lecture topics have included endocrine disruptors, environmental justice, integrated pest management, natural toxins, and tobacco carcinogenesis. Other activities include a career panel and a discussion on responsible conduct of research. STEER also includes a weekly field trip to environmental sites. Past locations have included superfund sites, environmental justice communities, wastewater treatment facilities, wildlife refuges, and local gardens. Field trips and lectures take place with the TREES high school students (STEER scholars serves as role models for them). At the end of the program, the STEER scholars present their work in an oral symposium.

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159. Translational Science in the Latin American and Caribbean Region: PAHO Foundation Approach to Addressing Environmental Health Disparities in the Region

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Abstract:
Many of the environmental health threats faced in the US are present in Latin America and the Caribbean (LAC) but are exacerbated by a multitude of social, cultural, educational and political challenges coupled with limited access to quality healthcare services. The PAHO Foundation (PF) mission is to collaborate with experts and partners to develop programs that have a positive impact on the intractable public health problems threatening the health and prosperity of people in LAC. Key drivers of environmental health threats in LAC include climate change, water and air pollution, and the overuse and misuse of pharmaceuticals and pesticides, in both the health and agricultural sectors. PF is implementing country and/or region-specific programs to establish sustainable solutions to critical health issues, including antimicrobial resistance (AMR) and neglected tropical diseases such as Dengue and Zika. These programs will engage communities at risk, while working with ministries (health, agriculture, and education) to create policies and seek resources that lead to sustainable change. This poster will describe PF initiatives that translate best practices in environmental health research. This includes novel antibiotic research and linkage with a commercial rapid, accurate, and actionable bioinformatics identification and characterization system for pathogen detection and AMR. This poster will also explore benefits to the LAC from future partnerships between PF and NIEHS.

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160. Effects of prenatal tobacco smoke exposure on attention regulation and language acquisition in early childhood

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Abstract:
Maternal smoking during pregnancy and prenatal environmental tobacco smoke (ETS) have been associated with adverse cognitive outcomes; however, significant gaps in research remain. Few studies have assessed exposure using prenatal cotinine levels, and less is known about the specific domains of cognitive functioning affected. Further, many studies do not control for maternal IQ, an important confounder. We followed 232 mother-child dyads from pregnancy to 4-6 years-old who are part of a Durham, NC based birth cohort. Prenatal smoke exposure was quantified using plasma cotinine biomarkers. Multiple regression models were used to estimate associations between tobacco smoke exposure and performance on the NIH toolbox. During pregnancy, 18% of women had cotinine levels consistent with ETS exposure and 19% had levels consistent with active smoking. After adjustment for confounds, including maternal IQ and ADHD symptoms, prenatal cotinine concentrations (ln transformed) were associated with worse performance on attention (Flanker Inhibitory Control and Attention Test; $\beta = -0.81$, $p = 0.01$) and language (Picture Vocabulary; $\beta = -0.41$, $p = 0.04$) tasks. Stratification by race indicated a significant association for African American (N=129) but not Caucasian (N=79) children on the attention task (interaction p-value = 0.04). Findings suggest prenatal tobacco smoke exposure may be related to poorer attention regulation and language acquisition, especially among African American youth.

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161. Metagenomics Analysis Reveals Compound-Specific Impacts of Organophosphate Malathion and Carbamate Aldicarb on Gut Microbiome and its Functional Capacity

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Abstract:
Gut microbiome has a tremendous potential to impact health and disease. Environmental toxicants from various chemical families have been shown to alter gut microbiome. In order to evaluate and compare the impact of organophosphate and carbamate insecticides on gut microbiome, we use a combination of 16S rRNA sequencing and metagenomics sequencing to examine the impacts of two widely used insecticides, organophosphate malathion and carbamate aldicarb, on gut microbiome structure and functional capacity. Our results showed that aldicarb and malathion perturbed the gut microbiome trajectory and metagenomic profile in a compound-specific manner, with stronger response being observed in aldicarb treated animals. The disrupted metagenomic capacity is related to various biological processes, including metabolism of aromatic compounds, amino acids and derivatives, cofactors, vitamins, prosthetic groups and pigments, virulence, disease and defense, stress response and etc. These findings may provide novel understanding of the role of gut microbiome in the toxicity of organophosphate and carbamate insecticides.

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162. Exposure to Disaster, Neighborhood Environmental Characteristics, and their Associations with Behavioral Difficulties in Children

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Abstract:
Previous research suggests a negative association between the Deepwater Horizon Oil Spill (DHOS) and mental health of women residing in southeastern Louisiana. The objective of this study was to examine the association between exposure to the DHOS and behavioral difficulties in these women's children, and assess if it varied by neighborhood disorder. Longitudinal data from the Women and their Children's Health Study (2012–2016) were used to test associations in 275 children ages 10-17 at baseline. Neighborhood audits captured signs of community decline (e.g., abandoned buildings) and litter. Children self-reported DHOS exposure and prosocial and problem behavior using the Strengths and Difficulties Questionnaire (SDQ). Generalized estimating equations were applied to linear regressions to estimate associations between DHOS exposure, neighborhood disorder, and total behavioral difficulties scores. Less than half (47.8%) of children reported DHOS exposure and 12% had high SDQ scores at follow-up. DHOS exposure and litter were associated with increased total difficulties ($\beta = 1.53$, 95% CI: 0.30, 2.71 and $\beta = 1.86$, 95% CI: 0.29, 3.44, respectively) after adjustment for child race, sex, and age; annual household income; maternal depression; and interview dates. However, community decline and litter were not effect modifiers of DHOS exposure. Results suggest that neighborhood environment does not affect the association between DHOS exposure and children's behavior difficulties.

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163. Effect of Source Material on PAH Bioavailability to Humans and Ecological Receptors

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Abstract:
PAHs are released into soils within different sorption domains that may influence bioavailability. In this study, a number of baseline soils were constructed with a range of source materials (organic solvent, soot, coal tar pitch, and fuel oil). A subset of the contaminated soils was also treated with biochar. The constructed soils were used to assess PAH dermal bioavailability to humans simulated by in vitro uptake into pig skin. We discovered that the PAH dermal uptake was not significantly correlated with soil PAH concentrations, but positively correlated with, and even predictable by equilibrium aqueous concentration of the PAHs. Reduced dermal uptake was also observed for biochar amended soils. A diffusion based model can be used to explain the dermal uptake process. To measure PAH uptake by ecological receptors, a bioaccumulation study was carried out by growing adult earthworms in the constructed soils and the same soils after treatment with biochar. The assimilation efficiency of PAHs into earthworms and the overall uptake of PAHs were both found correlated with equilibrium aqueous concentration and not total concentration of PAH in soil. Overall, we show that PAH source materials have a dominating influence on partitioning and bioavailability, highlighting the importance of using native field soils in bioavailability and risk assessments.

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164. Hepatic glutathione adduction and depletion by plant toxin biliatresone supports environmental etiologies of biliary atresia

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Abstract:
Biliary atresia is a non-genetic extrahepatic cholangiopathy that is the most common indicator for pediatric liver transplant worldwide. Although human etiologies remain unclear, epidemiological analysis has implicated an unknown prenatal or neonatal infection or toxic exposure. The plant toxin biliatresone has been used with animal models to induce the biliary atresia phenotype and investigate the underlying disease mechanisms. Liquid chromatography—mass spectrometry measurements of the antioxidant glutathione reveal that biliatresone ingestion by larval zebrafish results in dramatic depletion of reduced glutathione (GSH) in the liver within 4 hours, with subsequent recovery by 12 hours. Co-administration with 13C3-L-cysteine demonstrates that GSH synthesis is responsible for the replenished GSH reserve. Biliatresone-GSH adducts were detected in the zebrafish tissue and treatment media, indicating GSH adduction and elimination as a possible mechanism for the observed GSH depletion. Similar effects on GSH were observed with a synthetic analog to biliatresone, but without the bile duct toxicity, and the cholangiocyte-specific nature of biliary atresia remains unclear.

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165. Economic Analysis Resources for Environmental Health Researchers

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Abstract:
NIEHS has a strategic plan goal that aims to evaluate the economic impact of policies, practices, and behaviors that reduce exposure to environmental toxicants, through prevention of disease and disabilities, and invest in research programs to test how prevention improves public health and minimizes economic burden. To support this goal we have been working to identify environmental health economic analysis resources for our research community. This poster will showcase a variety of resources that are available and will highlight examples of environmental health economic analysis from our research portfolio. Resources to be highlighted will include reports on the economic benefits of the Worker Training Program; a searchable, curated, annotated bibliography of environmental health articles that include economic analysis; the EPA's BeneMap program; and more. We invite you to stop by the poster to learn more and to pick up materials to take home with you.

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166. Stunting is associated with blood lead concentration among Bangladeshi children aged 2-3 years

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Abstract:
Background. Lead toxicity is of particular public health concern given its near ubiquitous distribution in nature and established neurotoxicant properties. Similar in its ubiquity and ability to inhibit neurodevelopment, early childhood stunting affects an estimated 34% of children under 5 in low- and middle-income countries. Both Pb and stunting have been shown to be associated with decreased neurodevelopment. The association between lead exposure and stunting has been previously established in the literature, yet limited data are available on susceptibility windows. Methods. Whole blood lead samples were collected from rural Bangladeshi children at delivery (umbilical cord blood) and at age 20-40 months (fingerstick blood). Stunting was determined using the Child Growth Standards developed from the World Health Organization Multicentre Growth Reference Study. Results. Median (IQR) cord and fingerstick blood lead levels were 3.07 (1.55-6.3) µg/dl and 4.2 (1.65-7.6) µg/dl, respectively. In adjusted multivariable regression models, the odds of stunting at 20-40 months increased by 1.12 per µg/dl increase in blood lead level (OR = 1.12, 95% CI: 1.02-1.22). No association was found between cord blood lead level and risk of stunting (OR = 0.97, 95% CI: 0.94-1.00). Conclusions. There is a significant association between stunting and lead exposure at age 20-40 months that persists when controlling for study clinic site.

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167. Low-dose arsenic disrupts innate immune signaling in human primary bronchial epithelial cells

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Abstract:
Arsenic exposure is a global health concern because of its multiple adverse health effects, including lung disease. Arsenic in drinking water is associated with increased respiratory infection in U.S. populations, however, the mechanism by which these levels of arsenic exposure disrupt respiratory function is unknown. Inorganic arsenic (iAs), the primary form of arsenic in groundwater, is metabolized in vivo to organic arsenic species monomethlyarsinous acid (MMA), and dimethylarsinic acid (DMA). Foods such as rice and fruit juices are additional exposure sources, and can contain both iAs and organic arsenic. We exposed differentiated primary human bronchial epithelial cells (HBECs) at an air-liquid interface to 0, 5, 10 or 50 ppb of a mixture of arsenic species detected in serum (50% DMA, 25 % MMA and 25% iAs). Following 6 days of arsenic exposure, we challenged the airway cells with Pseudomonas aeruginosa (Pa), a gram-negative opportunistic bacterial pathogen, and examined whole-genome mRNA expression in the HBECs. Neither exposure to the arsenic mixture (0-50 ppb total arsenic) nor Pa increased cytotoxicity. The arsenic mixture significantly increased expression of oxidative stress response genes and secretion of proinflammatory cytokines. In contrast, genes associated with antimicrobial defense and antigen presentation were significantly decreased in arsenic-exposed HBECs. Disruption of these biological processes is predicted to increase susceptibility to lung infection.

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168. Building Capacity for Impacted Communities to Understand and Respond to Well Water Contamination in North Carolina

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Abstract:
In NC, where a third of the population gets its drinking water from private wells (USGS, 2014), a subset of private wells has concentrations of arsenic and other contaminants exceeding Safe Drinking Water Act (SDWA) standards (Sanders et al., 2011). Although the SDWA regulates waterborne contaminants in municipal water systems, no ongoing monitoring is required for private wells in NC. Further, in 2014, the third largest coal ash spill in the US released close to 39,000 tons of ash, which can include toxic metals and other hazardous constituents, in the Dan River in Stokes County, NC. Subsequently, residents of several communities were directed by state agencies not to consume their well water. To understand well sampling results and potential health implications, these residents reached out to the Research Translation Core (RTC) of the NC Center for Environmental Risk Analysis, UNC's Superfund Research Program. The RTC, in partnership with a statewide coalition of impacted communities, is conducting a study to understand how private well owners in these communities are using well water and how local issues influence their use of well water. This assessment is the first phase of a long-term prevention and intervention strategy focused on encouraging testing of private wells and identifying alternatives when wells are contaminated. Initial results from the pilot project will be shared along with lessons learned from engaging with communities that have contaminated wells.

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169. Developmental Cadmium Exposure Causes Delayed Zebrafish Otolith Formation

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Abstract:
Cadmium (Cd) is a transition metal found ubiquitously in the earth's crust and is extracted in the production of other metals such as copper, lead, and zinc. Human exposure to Cd occurs through food consumption, cigarette smoking, and the combustion of fossil fuels. Exposure to Cd has been shown to cause nephrotoxic, neurotoxic, osteotoxic, carcinogenic effects. Developmental animal studies and epidemiological studies have linked prenatal Cd exposure to reduced birth weight and hyperactivity. In this study we show that zebrafish developmentally exposed to 30 - 60 parts per billion (ppb) Cd from four hours to seven days post-fertilization are hyperactive and have delayed otolith formation and skeletal calcium deposition. The delay in otolith formation is characterized by a decrease in size of both the Saccule and Utricle with the Saccule decreased by as much as 50%, in a dose dependent manner. Removal of Cd allows the otoliths to recover by one month of age. This finding is concerning as the Saccule is vital for auditory perception and children with inner ear dysfunction have a high prevalence of behavioral disorders that include hyperactivity. While the mechanism of how Cd caused this developmental disruption is still unclear its possible link to behavior needs to be examined more closely.

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170. Long Noncoding RNA LincRNA-p21 is the Major Mediator of UVB-Induced and p53-Dependent Apoptosis in Keratinocytes

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Abstract:
LincRNA-p21 is a long noncoding RNA and a transcriptional target of p53. LincRNA-p21 regulates; gene expression in cis and trans, mRNA translation, protein stability, and p53-dependent apoptosis and cell cycle arrest in doxorubicin-treated MEFs. p53 plays a key role in the response of keratinocytes to UVB-induced DNA damage by inducing cell cycle arrest and apoptosis. In skin cancer development, UVB-induced mutation of p53 allows keratinocytes upon successive UVB exposures to evade apoptosis and cell cycle arrest. We hypothesized that lincRNA-p21 could have a key role in UVB-induced apoptosis and/or cell cycle arrest in keratinocytes and loss of lincRNA-p21 function results in the evasion of apoptosis and/or cell cycle arrest. We observed lincRNA-p21 transcripts are highly inducible by UVB in keratinocytes and mouse skin. LincRNA-p21 is regulated at the transcriptional level in response to UVB primarily through a p53-dependent pathway. Knockdown of lincRNA-p21 blocked UVB-induced apoptosis in keratinocytes and lincRNA-p21 was responsible for the majority of UVB-induced and p53-mediated apoptosis. Knockdown of lincRNA-p21 had no effect on cell proliferation in untreated or UVB-treated keratinocytes. We observed a mutant p53 allele expressed in mouse skin showed a significant inhibitory effect on UVB-induced lincRNA-p21 transcription and apoptosis. We conclude lincRNA-p21 is highly inducible by UVB and has a key role in triggering UVB-induced apoptotic death

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171. Metabolomic Responses to Phthalate Treatment in a Placental Cell Model (BeWo): Preliminary Analysis and Future Directions

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Abstract:
The contribution of environmental toxicant exposure to adverse pregnancy outcomes such as preterm birth and preeclampsia is a significant public health concern. Phthalate esters (PEs) are environmental toxicants used as plasticizers in a wide array of consumer products and human exposure is ubiquitous. Although epidemiology studies have found associations between exposure to PEs and preterm birth and preeclampsia, the exact role that PEs play in the etiology of these adverse birth outcomes is unclear. In order to elucidate potential mechanisms of PE toxicity in female reproductive tissues, we utilized a metabolomics based approach to identify responses in a placental cell model (BeWo) after treatment with a PE metabolite commonly found in human blood and urine samples (MEHP). BeWo cells were cultured for 24 hours in the presence of vehicle control (DMSO) or MEHP (90 or 180µM). Cell media and cells were then collected and analyzed using untargeted metabolomics analysis via liquid chromatography/mass spectroscopy. Preliminary analysis revealed that metabolites associated with processes such as glutathione metabolism (ascorbic acid), amino acid metabolism (isoleucine, 2-methylmaleic acid, acetoacetic acid) and purine metabolism (2'-deoxyinosine) were significantly decreased by MEHP treatment (ANOVA, $p<0.05$). These initial findings offer new insight into potential mechanisms of phthalate toxicity in the placenta and provide a promising direction for future research.

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172. The impacts of short-term temperature exposures on risk of sudden cardiac death in women

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Abstract:
Studies have reported associations between temperature extremes and increases in cardiovascular mortality. Little is known, however, of the impact of temperature on sudden cardiac death (SCD) risk. We conducted a time stratified case-crossover analysis of the association between SCD and temperature. Cases were identified from a prospective cohort study of women and validated by medical record review and next-of-kin reports. Control days were matched on day of the week, month, and year. Hourly temperature information was obtained from the MERRA project. Regional spatial smoothing generalized mixed models for each day 1999-2011 predicted temperature at the geocoded home address of each woman. The average temperature for each of the 0-7 days prior to the event and multi-day lags were examined in separate models. Splines were used to assess deviations from linearity. There were 221 SCD cases matched to 744 control days. Temperature on the day of the event (lag0, OR=0.58; 95%CI: 0.56, 0.60 per IQR increase) and on the previous day (lag1, OR=0.69; 95%CI: 0.67, 0.72) were associated with decreased odds of SCD, with no evidence of deviations from linearity. Temperature at lags of 3-7 days demonstrated statistically significantly deviations from linearity, with small increases in risk below the median temperature and larger increases at higher temperatures. Our results suggest a complex temporal pattern of temperature impacts on the odds of SCD.

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173. Translational Research at the Columbia Center for Children's Environmental Health

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Abstract:
The Columbia Center for Children's Environmental Health was established in 1998 as one of the first such Centers funded by NIEHS and EPA. The ensuing years have seen major advances in our understanding of the role of air pollutants, pesticides, chemicals in food, consumer products, and personal care products in neurodevelopmental disorders, obesity, and asthma in children. Our studies of children in underserved communities in New York City have revealed significant contributions of prenatal exposures to these adverse outcomes, manifesting as developmental impairment or illness from early childhood through adolescence. The results have informed public policy at the local and national levels. Based on monitoring and biomarker data acquired over the past 19 years from New York City pregnant women and children, the Center is poised to analyze trends in pollutants over time and their relationship to specific policy changes and regulations instituted over the same period. Some of these policies have led to lower levels of ambient pollution (e.g., polycyclic aromatic hydrocarbons (PAH)). Other policy interventions have resulted in the phase out or removal of a chemical or class of chemicals from the consumer market (e.g., chlorpyrifos (CPF), polybrominated diphenyl ethers (PBDE), and bisphenol-a (BPA)). However, in some circumstances, chemical alternatives have been introduced as replacements (e.g., pyrethroid pesticides, other halogenated flame retardants, and bisphenols –s and –f) that have either unknown toxicity or with toxicity that is similar or great than that of its precursor. Our Center has the historical and contemporary perspective to evaluate and document environmental policy's failures--including the introduction of "regrettable substitutes"--as well as its success stories.

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174. Exposure to Flame Retardant Chemicals in the Home and Increased Risk for Papillary Thyroid Cancer

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Abstract:
Thyroid cancer is the fastest increasing cancer in the US, and recent studies suggest environmental factors may be responsible. Exposure to flame retardant chemicals (FRs) also is increasing, raising concerns about potential health impacts, as animal studies indicate thyroid disruption and carcinogenicity. We are conducting a case controlled study investigating the impact of FR exposures on papillary thyroid cancer (PTC) occurrence and severity (52 PTC cases and 52 matched controls). Because levels of FRs in household dust are strongly correlated with personal exposure, we visited participants' homes and collected dust and blood samples. Participant information was collected via questionnaire, and tumor histology data were abstracted from medical records. Our results suggest that higher levels of some FRs, particularly BDE209 and organophosphate flame retardants (PFRs) in dust are associated with increased PTC odds. Those with household dust BDE209 concentrations above the median were 2.7 times as likely to have PTC (95% confidence interval (CI): 1.1, 6.6) compared to those with low BDE209. Associations differed by the presence of the BRAFV600E mutation; those with the highest levels of BDE209 were 10 times as likely to have PTC and be negative for the mutation (95% CI: 1.1, 92.5). PFRs, in contrast, were more strongly associated with larger, more aggressive tumors. Our results suggest exposure to FRs may well be associated with the occurrence and severity of PTC.

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175. Maternal Nutrition and Early Childhood Behavioral Outcomes in NEST

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Abstract:
Background: The Newborn Epigenetic STudy (NEST) was created to examine how environmental exposures and nutrition during pregnancy and childhood affect development and gene expression in children.

Objective: To examine associations between maternal diet and child behavioral outcomes.

Methods: We analyzed data from NEST for 334 mother/infant (mean age = 14 months, range = 12 – 24 months) pairs who completed an Infant-Toddler Social and Emotional Assessment (ITSEA) and a maternal food frequency questionnaire concerning diet at or near conception. We used logistic regression to assess associations between maternal dietary exposures and behavioral outcomes adjusting for maternal education, smoking, obesity, age, diabetes status, folate and energy and fiber consumption, paternal age, as well as race, household income, preterm status, child birth weight, parity, breastfeeding status, and child age.

Results: Maternal Mediterranean diet adherence was associated with favorable behavioral outcomes in the depression (OR = 0.39; 95%CI = 0.19 - 0.83)), atypical (OR = 0.42; 95%CI = 0.20 - 0.89), and maladaptive (OR = 0.36; 95%CI = 0.17 - 0.74) domains of the ITSEA as well as autism spectrum behaviors (OR = 0.43; 95%CI = 0.21 - 0.91).

Conclusions: In this ethnically diverse cohort, maternal adherence to a Mediterranean diet in early pregnancy was associated with favorable child behavioral outcomes.

Poster ID: P5710

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176. Diffusive Gradient in Thin-Film Passive Samplers as Indicators of Mercury Bioavailability and Methylation Potential in Sediments

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Abstract:
Diffusive gradient in thin-film (DGT) passive samplers are widely used for in-situ quantification of trace metal such as mercury (Hg). However, they have not been tested for their ability to predict Hg bioavailability to microorganisms that produce methylmercury, a potent neurotoxin. This study tested the efficacy of DGT samplers through a series of anaerobic sediment microcosms amended with isotopically labelled endmembers of inorganic Hg (dissolved Hg(NO3)2, Hg-humic acid, Hg-sorbed to FeS, HgS nanoparticles) with a known range of bioavailability. A DGT sampler was also incubated with the slurry mixture, and the net production of MeHg and Hg uptake into the DGT sampler was quantified for each Hg endmember. During the 5 day incubation, the amount of MeHg (as a % of the total) depended on the type of Hg added, and followed the general order from highest to lowest net MeHg production: dissolved Hg ≈ Hg-humic > Hg-adsorbed to FeS > nano-HgS. For each time point in the incubation (from 0.5, 1, 2, 3, and 5 days), the mass of Hg uptake in the DGT from each endmember correlated with the %MeHg. In contrast, the concentrations of filter-passing Hg (<0.2 um) and the thiol-extractable fraction of Hg did not correlate with %MeHg values. These results indicate that in-situ deployment of DGTs could be used, in conjunction with biomarkers of the methylating community, to determine MeHg production potential in contaminated ecosystems and inform decisions for remediation.

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177. Low dose cadmium stimulates myofibroblast differentiation and lung fibrosis by activation of SMAD and nuclear thioredoxin-1

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Abstract:
Increasing evidence suggests that exposure to dietary cadmium (Cd) can impact human health. Submicromolar Cd can alter cellular redox control mechanism, contributing to stimulation of pulmonary diseases. Our hypothesis is that low dietary Cd levels stimulate pulmonary fibrosis via activation of SMAD transcription factor and promoting myofibroblast differentiation. Using human fetal lung fibroblasts (HFLF), we found that two differentiation markers, α-Smooth-Muscle-actin and Extra-Domain-A-containing fibronectin, were significantly elevated at transcriptional and translational levels by low-dose Cd (0.5, 1.0 and 2.0 µM). An increased formation of stress fibers in HFLF was also observed. To examine Cd effects on redox signaling, HFLF was transfected with nuclear exporting- or localized-signal conjugated thioredoxin (Trx)-1. Results show that Cd increased SMAD activity by 3 fold and induced translocation of Trx1 from cytoplasm to nucleus. Overexpression of cytoplasmic Trx1 diminished Cd induced SMAD activation, while overexpression of nuclear Trx1 mimicked the Cd effect. This suggests that low-dose Cd stimulates myofibroblast differentiation via translocation of Trx1 to nuclei followed by activation of SMAD and downstream fibrosis markers. We conclude that low dietary exposure to Cd presents a potential risk for pulmonary fibrosis by affecting redox signaling mechanism. The improved understanding of this mechanism can provide therapeutic targets to maintain pulmonary health.

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178. Evaluating the HERCULES-Stakeholder Advisory Board Partnership: Strengths, Areas of Improvement, and Priorities

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Abstract:
An important mechanism for bidirectional dialogue between the Atlanta community and HERCULES Exposome Research Center is the Stakeholder Advisory Board (SAB). The HERCULES SAB includes concerned citizens and representatives from diverse non-profit organizations, academic partners, and city, county, state, and federal government agencies. The evaluation included a SAB member survey and two focus groups with SAB members. All members who had attended at least one SAB meeting were invited to complete a self-administered survey (n=30). Six SAB members attended the focus group representing academia, government, and other institutions and nine SAB members attended the group representing CBOs, nonprofit organizations, and individuals. Participants reported that their involvement in the SAB has provided personal, organizational, and community benefits. Accomplishments include bringing communities and researchers together to advance environmental health through activities such as the Community Forum, Environmental Resource Guide, community-grants, and the Proctor Creek Collaborative Health Survey. Priorities identified for improvement included 1) increase HERCULES faculty connection with SAB, 2) promote community-scientist collaborative research, 3) broaden the communication and translation of Exposome research, 4) expand the geographic diversity of the SAB, and 5) review SAB function and decision making. These findings and subsequent actions by HERCULES and its SAB will be presented.

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179. Adjuvant Effects of Multi-walled Carbon Nanotube Sensitization with House Dust Mite Allergen Lead to an Exaggerated Asthmatic Phenotype in Mice

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Abstract:
Multi-walled carbon nanotubes (MWCNTs) have numerous applications in emerging technologies and there is evidence that they can have harmful effects upon inhalation. Of particular susceptibility are individuals with asthma, a lung disease characterized by a TH2 immune response and mucus cell metaplasia. We hypothesized that intranasal (IN) exposure to tangled (t) or rigid (r) MWCNTs would sensitize the immune system to cause an asthma-like phenotype upon subsequent challenge with MWCNTs. C57BL6 mice were dosed by IN aspiration on days 0, 2, 4, 14, 16 and 18 with vehicle, HDM allergen, t or rMWCNTs, or a combination of HDM and each MWCNT; n=29. Bronchoalveolar lavage fluid (BALF) from HDM/MWCNT treated mice showed elevated leukocyte influx, with HDM treatment causing eosinophilia which was enhanced by MWCNT co-exposure. Serum IgE was enhanced in the rMWCNT/HDM group, but not the tMWCNT/HDM group, over vehicle and HDM. BALF levels of OPN, IL-13 and IL-1β were not altered, while CCL2 was increased by HDM/tMWCNT treatment. Lung histology showed little effect of MWCNT treatment alone, while HDM caused lymphocyte influx, airway wall thickening and enhanced mucus production; these inflammatory effects were enhanced by HDM/MWCNT co-exposure. In conclusion, sensitization of mice with t or rMWCNT caused a strong adjuvant-like effect with HDM to promote an allergic inflammatory phenotype suggesting that t or rMWCNT represent a health risk to individuals with allergic airway disease.

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180. The impact of essential trace elements in follicular fluid and urine on IVF outcomes; a pilot study

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Abstract:
Purpose: A hypothesis-generating pilot study exploring associations between essential trace elements measured in follicular fluid (FF) and urine and in vitro fertilization (IVF) endpoints. Methods: We recruited 58 women undergoing IVF between 2007 and 2008 and measured cobalt, chromium, copper, manganese, molybdenum and zinc in FF (n=46) and urine (n=45) by inductively-coupled plasma mass spectrometry. We used multivariable regression to assess the impact of FF and urine trace elements on IVF outcomes adjusted for age, body mass index, race and cigarette smoking. Results: The average number of oocytes retrieved was positively associated with higher urine cobalt, chromium, copper and molybdenum concentrations. FF chromium and manganese were negatively associated with the proportion of mature oocytes, yet urine manganese had a positive association. FF zinc was inversely associated with average oocyte fertilization. Urine trace elements were significant, positive predictors for the total number of embryos generated. FF copper predicted lower embryo fragmentation while urine copper was associated with higher embryo cell number and urine manganese with higher embryo fragmentation. Conclusions: Our results suggest the importance of trace elements in both FF and urine for intermediate IVF endpoints. The results differed using FF or urine with possible implications for design of clinical and epidemiologic studies. These initial findings will form the basis of a larger, future study.

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181. Radical containing combustion derived particulate matter activate aryl hydrocarbon receptor and enhance Th17 pulmonary inflammation

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Abstract:
Thermal remediation of Superfund waste sites generates pollutant particles containing environmentally persistent free radicals (EPFRs). Our previous studies demonstrated that acute exposure to EPFRs results in Th17-specific immune responses and pulmonary neutrophilia. Further, in a mouse model of asthma, these responses were enhanced suggesting exposure to EPFRs as a risk factor for the development and/or exacerbation of steroid insensitive asthma. Aryl hydrocarbon receptor (AhR) has recently been shown to play a role in the differentiation of Th17 cells. In the current study we determined whether exposure to EPFRs results in Th17 polarization in an AhR dependent manner. Exposure of A549 epithelial cells and bone marrow DCs to EPFRs resulted in increased *Cyp1a1* and *Cyp1b1* gene expression in an oxidative stress and AhR dependent manner. Further, in vivo exposure to EPFRs resulted in oxidative stress and increased *Cyp1a1* and *Cyp1b1* gene expression. To determine whether AhR activation induces Th17 immune responses, mice were exposed to EPFRs in the presence or absence of AhR antagonist and lung Th17 responses were analyzed. EPFR exposure resulted in a significant increase in the percent Th17 cells accompanied by increase in IL17A and IL22 and pulmonary neutrophils, whereas a significant decrease in the percent Th17 cells was observed in mice treated with AhR antagonist. Collectively, these results demonstrate a role for EPFR-induced AhR activation in pulmonary Th17 inflammation.

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182. Communicating Research with Infographics

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Abstract:
In order to communicate recent research in a compelling and easy to read format, the Community Outreach and Engagement Core developed infographics on environmental health topics. These include near-roadway air pollution, diesel exhaust, lead, urban parks, and the Children's Health Study. The infographics are web-based, and link to journal articles and research collections. The paper handout versions have also been used with community partner organizations in Southern California, and have been translated into Spanish. The infographics are accessible for lower reading levels, and aim to increase the environmental health literacy of those are the "recognize" stage. The materials incorporate concepts from public health communication and data visualization.

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183. Prenatal phthalate exposure, childhood IQ, and working memory in the Mount Sinai Children's Environmental Health Cohort

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Abstract:
Gestational phthalate exposure has been associated with behavioral and cognitive deficits suggestive of reduced executive functioning. Clinical impairments in executive functioning may influence the interpretation of performance on intelligence tests. We examined whether gestational exposure to phthalates was associated with disparities in performance on intelligence test domains, with particular emphasis on comparisons with working memory (WM), as indicators of impaired executive functioning. We enrolled primiparous women and obtained phthalate biomarkers from spot urines collected in the 3rd trimester (n=404). We administered the Wechsler Intelligence Scale for Children-fourth edition between 7-9 years (n=132). We used generalized linear models to examine associations between phthalate metabolite concentrations, intelligence domain scores, and disparities in performance between WM and other intelligence domains. Mothers were largely non-white, under 25, and not college graduates. There were few associations between prenatal phthalate exposures and IQ measures in childhood. In models restricted to boys, phthalate metabolites were generally positively related to verbal comprehension (VC) scores and relative impairments in WM compared to VC. Results of models restricted to girls showed variability around mostly null results. Further research better describing longitudinal changes in associations between prenatal phthalates and cognitive domains should be pursued.

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184. Characterizing the Adipogenic Potential of Indoor Contaminants and Household Dust Using 3T3-L1 Cells

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Abstract:
The prevalence of metabolic disorders, such as obesity, is currently of great concern. The 3T3-L1 mouse preadipocyte cell line has proven useful as an *in vitro* screen; following exposure to adipogenic chemicals, these cells differentiate into adipocytes and accumulate triglycerides. This work utilizes 3T3-L1 cells to assess the adipogenic activity of 40 semi-volatile organic compounds (SVOCs) including polybrominated diphenyl ethers (PBDEs), alternate brominated flame retardants (BFRs), organophosphate flame retardants (OPFRs), pesticides, and other chemicals that are commonly detected in house dust. Several OPFRs, including isopropylated triphenyl phosphate (ITP), triphenyl phosphate (TPP), Firemaster® 550 (FM550), and tert-butyl-phenyl diphenyl phosphate (TBPDP) exhibit significant triglyceride accumulation, with EC50s (concentration for half maximal differentiation) of 0.7, 2.0, 7.0, 2.1 µM, respectively. Four pesticides exhibited significant triglyceride accumulation, with EC50s of 0.1-1.50 µM. Preliminary data suggest that the transition from PBDEs to greater use of BFRs and OPFRs may result in greater exposure to obesogens. In addition, several house dust extracts exhibit significant triglyceride accumulation or cell proliferation at concentrations as low as 10.0 µg equivalence. This work aims to better characterize indoor exposure to adipogenic chemicals and potentially contributing to weight accumulation in humans and animals.

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185. Interpreting and Communicating Short-term Sensor Data

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Abstract:
Highly time-resolved (e.g., 1-minute) information on local concentrations of O_3 and $PM_{2.5}$ from low-cost portable air quality sensors is becoming increasingly available. There is a need for guidance on the appropriate interpretation and communication of these data because the scientific evidence does not indicate health impacts following such short-term exposures. Using data from Village Green benches and regulatory monitors, EPA has developed draft sensor breakpoints for O_3 and $PM_{2.5}$, and corresponding sensor messages, as a tool for the public to better understand patterns of pollution and human exposure. Goals of the current project are to guide the interpretation of sensor data and encourage this interpretation to be consistent with available health effects evidence and air quality information. Future efforts will incorporate lessons learned and potentially expand the development of sensor breakpoints and messages to additional pollutants, including other criteria pollutants and some hazardous air pollutants.

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186. Global Environmental Health and NIEHS

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Abstract:
Global Environmental Health (GEH) may be defined as research, education, training, and research translation directed at health problems that are related to environmental exposures and transcend national boundaries. The goal is to improve health for all people by reducing the environmental exposures that lead to avoidable disease, disabilities and deaths. GEH is a core element of the NIEHS Strategic Plan and much of our extramural research works to understand environmental exposures that contribute to global health and health disparities. The National Institute of Environmental Health Sciences (NIEHS) Division of Extramural Research and Training (DERT) defines GEH as:

Training grants with the intent to build capacity in foreign countries OR

Research grants occurring/occurred in a foreign country AND collecting environmental samples OR studying a foreign population.

Using the DERT definition, in 2016, NIEHS funds approximately 106 different research and/or training projects in the area of Global Environmental Health. The funded research focuses on many different topics such as training and capacity building of foreign investigators, children's environmental health, climate change, and e-waste. This poster will provide background on a few targeted trans-National Institutes of Health programmatic efforts in GEH, the NIEHS GEH program goals, membership, and future directions.

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187. NIEHS Institutional Training Program Outcomes and Impacts

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Abstract:
NIEHS has trained over 6,000 individuals since the mid-1970s in the Institutional Training Grant (T32) program. CareerTrac (CT) is a multi-tenant, fully scalable, web-based database that provides a repository for long term trainee outcomes. CT enables investigators and NIH staff to assess the value of our biomedical research training programs. This poster presents key data from the NIEHS T32 program, including prior academic degrees, field of training, publications, honors and awards, products and policies, employment, as well as application and grant data for the trainees. Employment data feature job sector (academia, government, industry, not-for-profit, other), job emphasis (administration, clinical, policy, research, training, other) and tenure track status are also explored. This poster highlights the value of having both broad and deep outcome data available for program management purposes.

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Poster ID: P5810

188. Metagenomic analysis of mobile elements and phage in trichloroethene (TCE) dechlorinating communities

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Abstract:
Chlorinated solvents, such as perchloroethene (PCE) and trichloroethene (TCE) can pose long-term threats to ecological and public health as they are carcinogens and persistent in groundwater. *In situ* bioremediation of these compounds commonly relies on *Dehalococcoides mccartyi*, the only known organism capable of complete sequential dechlorination of PCE/TCE to nontoxic ethene. *D. mccartyi* has very specific metabolic needs supplied by other members of the microbial community. However, little is known about the microbial interactions between *D. mccartyi* and the other key members of these communities. Here we present an in-depth analysis of the microbial species in three TCE dechlorinating communities, one inoculated with California groundwater operated for decades in semi-batch mode, one inoculated from the semi-batch culture but grown in a continuous-flow reactor, and a third inoculated with groundwater from the east coast. Our main focus was on mobile elements and phage in the communities. Phage-like scaffolds were identified in all three metagenomic datasets, and many of the binned genomes contained plasmid related genes. Due to interest in mixed contaminants, arsenic metabolism in the communities was also investigated, revealing that the majority of binned genomes harbor components of the ars operon. Further analysis of these communities will provide insights into novel microbial functions and interactions, crucial to efficient and robust bioremediation at Superfund sites.

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189. Survival analysis with measurement error in a cumulative exposure variable: radon progeny in relation to lung cancer mortality

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Abstract:
Exposure variables in occupational and environmental epidemiology are usually measured with error. This error tends to flatten the estimated exposure-response relationship. In this paper, we extend the risk set regression calibration (RRC) method for Cox models for cumulative exposure variables to obtain consistent point and interval estimates of relative risks corrected for exposure measurement error. We show that the RRC methodology originally developed for use with an external validation study can be generalized to internal validation study designs as well. We then analyzed the New Mexico uranium miners cohort with follow-up from 1956 to 2012. The exposure data were collected using several different methods of measurement, some of which had a substantial amount of error. We compare results from the standard analysis of the effect of cumulative radon exposure on lung cancer mortality to measurement error corrected results in a subset of 2,337 miners observed during the time period when exposure was measured either by work area samples and personal exposure estimates provided by the mining companies. The correlation between these two methods of measurements was 0.33. After adjusting for bias due to exposure measurement error, the multivariate-adjusted hazard ratio for lung cancer mortality in relation to cumulative radon exposure (100 WLM) was estimated to be 4.69 (95%CI 2.21-9.95), substantially higher than the estimate obtained from the standard analysis ignoring measurement error (HR=1.35, 95%CI 1.21-1.50). User-friendly software implements this method is publicly available on the senior author's website.

Poster ID: P5751

190. Adverse birth outcomes associated with exposure to informal e-waste recycling metal mixture exposure

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Abstract:
Electronic waste is the fastest growing waste stream in the world, expected to rise to 50 million tons per year by 2018. Although methods to properly recycle e-waste exist, many sites around the world use primitive methods leading to environmental contamination and affecting human health. Guiyu, a rural town in Shantou, China, once labeled the "e-waste capital of the world," has been recycling e-waste since the mid-1990s. The Electronic waste Recycling and Community Health Study enrolled 899 pregnant women residing in Guiyu and a non-recycling control site 30 miles away, Haojiang, from 2011-12. The women completed a questionnaire and gave biological samples for Pb, Cd, Cr, and Mn assays using AAS. Pb, Cd, and Cr in maternal blood and Cd, Cr, and Mn in maternal urine were significantly higher in Guiyu than Haojiang. The geometric mean (GM) of maternal blood Pb was 6.7µg/dL in Guiyu (range: 1.9-27.1), higher than 3.8µg/dL in Haojiang (range: 0.9-16.1). In cord blood, only Pb was significantly higher in Guiyu versus Haojiang, with a GM of 5.2µg/dL and 3.2µg/dL, respectively. Neonates in Guiyu had smaller covariates adjusted head circumference (mean: 34.3 vs. 35.3cm, adjusted β: -0.6 [95% CI -1.0, -0.3]) and Ponderal Index (mean: 23.5 vs. 25.5 kg/m^3, β: -2.0 [-2.6, -1.4]), compared with neonates in Haojiang. In conclusion, primitive e-waste recycling is associated with high exposure to heavy metals and adverse birth outcomes.

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191. The Dangers Behind The Label

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Abstract:
The average adult uses personal care products containing between 85 and 168 ingredients on their bodies every day. Many of these ingredients are also found in common household items such as cleaning products. It is safe to assume that most consumers do not know the majority of ingredients contained within these products, many of which are endocrine disrupting chemicals (EDCs). EDCs have the ability to disrupt hormonal signaling in the body and are associated with increased risk of some cancers, neurodevelopmental disorders, reproductive defects, and obesity. Recent studies have shown that changing product use can reduce exposure to EDCs. One of the most effective ways to avoid exposure to endocrine disruptors is by reading drug fact/ingredient labels, however many consumers don't know what to look for. By highlighting key ingredients to avoid such as triclosan, phthalates, and fragrance/parfum, consumers will be able to make informed decisions when buying products. In order to facilitate consumer understanding of product labels, we propose a poster-size version of a typical label, swapping out the information in the "ingredients", "directions", and "usages" panels with clear instructions on how to properly read and interpret the information. Ultimately, educating the public on making safer choices will empower them to live a healthier lifestyle by limiting their exposure to environmental hazards and increase awareness of how the environment affects health and well-being.

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192. Expanding Knowledge of OEH in the Gulf Coast Region

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Abstract:
In the aftermath of the Deepwater Horizon oil spill, the Association of Occupational and Environmental Clinics (AOEC), along with the Center for Gulf Coast Environmental Health Research at Tulane University School of Public Health and Tropical Medicine (Tulane), has been working with a number of Federally Qualified Health Centers (FQHCs) in the Gulf Coast region to try to address the health occupational and environmental health (OEH) concerns of community members and to help primary care clinicians better understand the impact of OEH factors on their patients health. Since 2013, AOEC staff and members have participated in outreach efforts to engage the FQHCs in the region. A key component to this outreach has been the development of Case Studies in Environmental Medicine (CSEM). These CSEM have been available (with CME/CE credit available) for self-instruction on the Tulane website as well as presented by AOEC staff at clinics involved in the project, professional meetings and in classrooms. They address the most frequently mentioned environmental issues raised during community interactions that are potentially related to health concerns, such as possible reproductive effects from the Deepwater Horizon oil spill, dispersants used during the oil spill clean-up, seafood consumption, and an overview of OEH. The work is funded by the Gulf Region Health Outreach Program.

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193. Air Pollutant Quinones Impair Mitochondrial Function in Human Airway Epithelial Cells Using Seahorse Extracellular Flux Technology

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Abstract:
Air pollution is a global public health concern linked to cardiopulmonary morbidity and mortality. Quinones are components of ambient particulate matter (PM) air pollution and may contribute to health effects through oxidative mechanisms. Mitochondrial dysfunction has been proposed to underlie PM-induced oxidative stress. 1,2-naphthoquinone (1,2-NQ) is an electrophile that can bind macromolecules and redox cycle to produce reactive oxygen species (ROS). We have previously shown that 1,2-NQ activates inflammatory signaling pathways in human airway epithelial cells (HAEC) through mitochondrial ROS production. In the present study, we utilized extracellular flux analyses to characterize 1,2-NQ-induced disruption of mitochondrial function in HAEC. 1,2-NQ caused an increase in the oxygen consumption rate (OCR) largely attributable to cytosolic redox cycling. In permeabilized-cell and isolated mitochondria preparations, 1,2-NQ impaired Complex I-linked substrate utilization, specifically the oxidation of pyruvate but not glutamate, suggesting inhibition of pyruvate-specific uptake and/or metabolism. These findings show that redox-active air pollutant quinones can elicit ROS production through redox cycling and mitochondrial dysfunction simultaneously in HAEC. Accurate toxicologic interpretation of OCR requires consideration of alternative sources of oxygen consumption. THIS ABSTRACT OF A PROPOSED PRESENTATION DOES NOT NECESSARILY REFLECT EPA POLICY.

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194. Using the Mental Models Approach for Arsenic Risk Communication: Creation of an Expert Model

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Abstract:
Communication about environmental health risks can be complicated. Researchers try to highlight the important, but potentially intricate, aspects of the science, while the lay-audience is left to decipher such messages using their existing knowledge and personal beliefs. Communication related to complex risks, like arsenic, can be particularly challenging.

The "mental models" approach utilizes a five step process to create research-based messages that are understandable and useable by the public (Morgan MG, Fischhoff B, Bostrom A, Atman CJ. Risk communication: a mental models approach. Cambridge, UK: Cambridge University Press; 2002.). The Dartmouth Toxic Metals Superfund Research Program Community Engagement Core has focused on steps one and two of the approach: creation of an expert model followed by community level interviews. The expert model aims to create a single pooled description of the combined understanding of the scientific community in the form of an influence diagram. Creation of the arsenic expert model has shown the complicated and interrelated nature of arsenic themes and has reintroduced experts to the larger context within which they work. This model served as the foundation for our community level interviews. Interview analysis will highlight the commonalities and differences between the experts and the affected community and identify opportunities for both improved communication and community-relevant research.

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195. Communicating Cumulative Health Risks to the Community in Chester, PA

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Abstract:
Chester is small city in Delaware County, PA comprised of a predominantly low-income African American population. This community has a high concentration of industrial facilities, a number of waste-processing plants and substantial traffic from the I-95 interstate highway. The majority of solid waste for Delaware County and surrounding areas is incinerated in Chester. In addition, many Chester residents live in old housing stock which results in environmental exposures, such as poor indoor air quality, lead, mold and pesticides. The members of this community express concerns about the health effects of living amid toxic substances, and complain about frequent illnesses, which they perceive as likely associated with environmental factors. We were motivated to assess the cumulative health risks in Chester that may result from exposure to industrial air toxics. We collected data revealing social determinants of health, health outcomes, and toxic air exposures in Chester. Our data show that indeed Chester, more than her neighboring communities and Pennsylvania as a whole, is overburdened by the emission of industrial toxicants into the ambient air. Moreover, the risk for developing cancers and respiratory illnesses is higher in Chester than her neighbors in Delaware county and Pennsylvania as a whole. We have developed an infographic to communicate our findings to the community in an attempt to provide insight into the many exposures and risks.

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196. Disposition of Chiral Polychlorinated Biphenyls in Lactating Mice and Their Offspring: Implications for PCB Developmental Neurotoxicity

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Abstract:
Chiral polychlorinated biphenyl (PCB) congeners have been implicated in PCB developmental neurotoxicity. These congeners are metabolized by cytochrome P450 (P450) enzymes to potentially neurotoxic hydroxylated metabolites (OH-PCBs). This study explores the enantioselective disposition and toxicity of two environmentally relevant, neurotoxic PCB congeners and their OH-PCB metabolites in lactating mice and their offspring following dietary exposure of the dam. Female mice (8 weeks old) were fed daily, beginning two weeks prior to conception and continuing throughout gestation and lactation, with 3.1 µmol/kg bw/d of racemic 2,2',3,5',6-pentachlorobiphenyl (PCB 95) or 2,2',3,3',6,6'-hexachlorobiphenyl (PCB 136) in peanut butter; controls received vehicle (peanut oil) in peanut butter. PCB 95 levels were higher than PCB 136 levels in both dams and pups, consistent with the more rapid metabolism of PCB 136 compared to PCB 95. In pups and dams, both congeners were enriched for the enantiomer eluting second on enantioselective gas chromatography columns. OH-PCB profiles in lactating mice and their offspring varied according to congener, tissue and age. Developmental exposure to PCB 95 vs. PCB 136 differentially affected the expression of P450 enzymes, neural plasticity (arc and ppp1r9b) and thyroid hormone-responsive genes (nrgn and mbp). The results suggest that the enantioselective metabolism of PCBs to OH-PCBs may influence neurotoxic outcomes following developmental exposures.

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197. Novel Bisphenol A-related biomarkers for endometrial cancer prognosis

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Abstract:
Bisphenol A (BPA) is a known environmental estrogen and has been found biologically active in many systems even at a dose lower than the reference dose set by US EPA. However, its potential impact on estrogen-sensitive endometrium remains largely unknown. In this study, we exposed Sprague Dawley rats with different doses of BPA (0 to 25000ug/kg/day) starting from gestation day 6 until one year. We selected uterus tissues at estrous phase for RNA-sequencing. Pairwise comparisons against the control group reveals specific BPA associated genes in each group. Analyses from two effective doses as well as from all doses suggest that immune cytokines are the common upstream regulators. In particular, interleukin-1beta is the key regulator for the common BPA-associated genes. To further investigate clinical relevance of this study, we analyzed the patient survival from a The Cancer Genome Atlas (TCGA) cohort of 333 endometrial cancer patients with the BPA genes. Two groups of samples were stratified by the genes using average clustering method. Intriguingly, we found one group of patient sample had significant worst overall and recurrence-free survival. Overall these findings strongly suggest that those genes may actively participate in human endometrial cancer development and progression. Preliminary in vitro data suggest that BPA may act through interleukin-1beta and significantly alter cancer cell survival.

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198. Critical windows of tobacco smoke chemical exposure causing long-term behavioral effects in rats

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Abstract:
Tobacco smoke exposure even at low doses from environmental tobacco smoke during development has been associated with neurobehavioral dysfunction in children. To examine critical developmental windows of exposure, we examined in rats the relative importance of three periods of tobacco smoke extract (TSE) exposure: pre-mating, early gestation and late gestation. Female rats were exposed to TSE at a dose delivering 0.2 mg/kg/day nicotine (sc) during ten days before mating or during the first ten days or the second ten days of gestation. Controls received the DMSO vehicle. Male and female offspring were assessed on tests for locomotor activity, anxiety, fear and cognition starting in adolescence and continuing into adulthood. During adolescence, significant locomotor hyperactivity and more anxious-type behavior in the elevated plus maze was seen after late gestational TSE exposure. During adulthood, modest, but significantly improved performance on the signal detection attentional task was seen in rats with a history of either early or late gestational TSE exposure. Interestingly, TSE exposure before mating also produced some significant behavioral effects in the offspring, including decreased habituation locomotor activity during adolescence, locomotor hyperactivity in adult males and reduction in radial-arm maze working memory errors. The results reinforce findings of persistent emotional and cognitive effects after developmental exposure of rats to TSE.

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Poster ID: P5689

199. High-Resolution Metabolomics Assessment of Military Personnel: Evaluation of Analytical Strategies for Chemical Detection

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Abstract:
Objective: To identify high-resolution metabolomic (HRM) analytical strategies for maximizing coverage of serum metabolitesMethods: Thirty non-identified Department of Defense Serum Repository (DoDSR) samples were analyzed using ultra-high resolution mass spectrometry with three complementary chromatographic phases and four ionization modes. Chemical coverage was evaluated by number of ions detected, matches to known metabolites and quantitative precision. Results: Individual HRM platforms could identify up to 58% of all chemicals in the KEGG metabolite database. Combining two analytical methods increased chemical coverage to 72%, and included coverage of most major human metabolic pathways and chemical classes. Chemical detection and feature quality varied by analytical configuration.Conclusions: Dual chromatography HRM with positive and negative electrospray ionization provides an effective generalized method for metabolic assessment of military personnel.

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Poster ID: P5727

200. A cross-disciplinary evaluation of evidence for multipollutant effects on cardiovascular disease

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Abstract:
The current single-pollutant approach to regulating ambient air pollutants is effective at protecting public health, but efficiencies may be gained by addressing issues in a multipollutant context since multiple pollutants often have common sources and individuals are exposed to more than one pollutant at a time. We performed a transdisciplinary (i.e., epidemiology, experimental) review of the effects of multipollutant exposures on cardiovascular effects. A broad literature search for references including at least two criteria air pollutants (PM, O3, NOX, SOX, CO) was conducted. References were culled based on discipline then searched for terms related to cardiovascular disease. Most multipollutant epidemiologic and experimental studies examined PM and O3 together. Epidemiologic and experimental studies provide some evidence for O3 concentration modifying the effect of PM, although PM did not modify O3 risk estimates. Experimental studies of combined exposure to PM and O3 provided inconsistent evidence for additivity, synergism, and/or antagonism depending on the endpoint. Evidence for other pollutant pairs was even more limited. Overall, the evidence for multipollutant effects was often inconsistent, and the limited number of studies inhibited making a conclusion about the causal nature of the relationship between pollutant combinations and cardiovascular disease. Views expressed here are those of the authors and do not necessarily reflect the views or policies of the EPA.

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Poster ID: P5765

201. Engaging Community Gardeners in Reducing Soil Contamination and Pesticide Exposures in North Carolina

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Abstract:
Community gardens are experiencing a revival, including in some impoverished areas, with the potential for increased food security, healthy produce, social capital, and environmental awareness. However, risks may also exist for some vulnerable community residents. At the Duke Superfund Research Center (SRC), we are focused on early life exposures and their later life consequences. Community gardens are often located on abandoned or compromised residential or industrial sites, where garden soil may contain persistent soil contaminants (metals, PCBs, others). Participants, particularly children, may be at risk from those contaminants and pesticides used in gardens. Despite widespread concern over these issues, research on the extent of these problems is lacking. The Duke SRC began an innovative, multidisciplinary and participatory research project to examine community gardeners' exposures and the best options for remediation and/or exposure reduction. Our poster will show results from a spatial analysis using multiple geodatabases (EPA C-FERST, EJ SCREEN) to analyze the extent of these issues in North Carolina, which will help us identify potential community garden partners to explore feasible options for remediation and exposure prevention. Results will lead to a social marketing campaign that: informs gardeners about site-specific risks; provides tools for analyzing risk factors; and creates a decision tree for choosing remediation and/or exposure prevention strategies.

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Poster ID: P5676

202. First trimester blood cadmium and lead levels are associated with cardiometabolic risk markers in children

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Abstract:
Rationale: In adults, lead and cadmium exposure is associated with risk markers for cardiovascular and metabolic disease, which are top causes of mortality in the US. There is evidence supporting the developmental origins of these conditions, however data linking lead and cadmium exposure to these risk markers in children are limited.

Methods: We measured blood lead and cadmium in 310 pregnant women as part of the Newborn Epigenetics STudy (NEST), a Durham-based pre-birth cohort. Regression models were used to determine if first trimester exposure to these metals is associated with subclinical risk markers of cardiometabolic function at age 4-5 years.

Results: We identified associations of first trimester blood cadmium with obesity (β=3.2, se=1.2, p=0.006) and slower heart rate (β=-3.9, se=2.0, p=0.05) at age 4-5 years, and have also previously reported associations with lower birth weight ($p<0.05$). The inverse associations with heart rate were stronger in children born to women with the highest blood levels of both lead and cadmium. Lead was associated with higher blood pressure and rapid adiposity gains. Geographic clusters of elevated cadmium and lead levels have also been previously reported.

Conclusion: Our data provide early evidence for risk of elevated subclinical markers of cardiometabolic dysfunction associated with exposure to cadmium and lead that is discernible in young children and suggests potential synergy of these metals increase this risk.

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Poster ID: P5752

203. Arsenite and cadmium promote the development of mammary tumors

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Abstract:
Previous studies demonstrate that the metal cadmium and the metalloid arsenite activate estrogen receptor-alpha by forming a high affinity complex with the ligand binding domain of the receptor and that environmentally relevant doses of cadmium have estrogen like activity in vivo. The results of this study show that an environmentally relevant dose of arsenite also has estrogen like activity in vivo. Similar to estrogens, exposure of ovariectomized animals to arsenite induced a significant increase in the expression of the progesterone receptor (2.7-fold), GREB1 (3.1-fold), and c-fos (2.1-fold) in the mammary gland and complement C3 (2.4-fold), c-fos (2.9-fold), and cyclin D1 (1.5-fold) in the uterus. The increase in gene expression was blocked by an antiestrogen suggesting that the estrogen receptor mediates the effects of arsenite on gene expression. Virgin female animals were fed a diet that mimics environmental exposure to either arsenite or cadmium and challenged with the carcinogen dimethylbenzanthracene. When compared to control diet, mammary tumor incidence increased 2.0- fold [95% CI:1.1-3.6] and 1.8-fold [95% CI:1.0-3.2], respectively, median time to tumor onset decreased (P=0.001 and P=0.044, respectively) but total number of tumors or tumor multiplicity did not differ. Together with previously published results, the data provide evidence that environmentally relevant amounts of arsenite and cadmium mimic estrogen effects in vivo and promote mammary tumorigenesis.

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204. Increasing environmental health literacy via A Story of Health multimedia eBook and continuing education course

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Abstract:
ence. A Story of Health multimedia eBook and continuing education (CE) course were designed to harness the power of storytelling to improve environmental health literacy for health professionals and others. The peer-reviewed eBook uses fictional stories to convey how multiple environmental factors affect health across the lifespan, encourage inclusion of anticipatory guidance, and stimulate policy changes. Readers can explore risk factors for asthma, developmental disabilities and childhood leukemia. A chapter on reproductive health/infertility will soon be released. This story features the latest research about environmental factors associated with risk for male and female infertility as well as those promoting a healthy pregnancy. We have drawn content from the collective expertise of the PEHSU network and the NIEHS Children's Centers, among others. Each story is enriched with illustrations, videos, and links to hundreds of online resources and references. Free CE's are offered through the CDC/ATSDR. The eBook provides an alternative method of developing competency in environmental health, as it can be accessed online and reviewed at an individual's time and pace. Over 4900 health professionals have registered for the course and evaluations have been overwhelmingly positive.

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205. HUWE1 interacts with PCNA to alleviate replication stress

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Abstract:
Defects in DNA replication, DNA damage response, and DNA rEPAir compromise genomic stability and promote cancer development. In particular, unrEPAired DNA lesions can arrest the progression of the DNA replication machinery during S-phase, causing replication stress, mutations, and DNA breaks. HUWE1 is a HECT-type ubiqui- tin ligase that targets proteins involved in cell fate, survival, and differentiation. Here, we report that HUWE1 is essential for genomic stability, by promoting replication of damaged DNA. We show that HUWE1-knockout cells are unable to mitigate replica- tion stress, resulting in replication defects and DNA breakage. Importantly, we find that this novel role of HUWE1 requires its interaction with the replication factor PCNA, a master regulator of replication fork restart, at stalled replication forks. Finally, we provide evidence that HUWE1 mono-ubiquitinates H2AX to promote signaling at stalled forks. Altogether, our work identifies HUWE1 as a novel regulator of the replication stress response.

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206. A Diverse NIEHS Worker Training Program and Evaluating its Effectiveness

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Abstract:
Since 1987 the International Chemical Workers Union Council Center for Worker Health and Safety Education in Cincinnati, Ohio and its multi union Consortium has built an NIEHS funded nationally recognized HAZMAT training in chemical emergency response. This includes Dept. of Energy, Disaster Response, Plume Modeling, CPR/First Aid, developing worker trainers, Infectious Disease, Flint Lead in Drinking Water and Spanish awareness classes.
Published results of the 4-day emergency response class compared worker activities before and 14-18 months post class with statistically significant improvements post training for training coworkers, use of resources, attempts at improvements, success rates for those attempting change, and overall success. Stratified recent data between reported access or no access to health and safety web sites show that the non-web group had half the activity as the web users pretraining but similar results post training, pointing to the continuing need for worker training.
We suggest training significantly improves workers' self-confidence, with increased activism and high success rate leading to an increase in successful workplace change. The program facilitates the ability of previously inactive participants to learn from active participants or directly fosters successful activism, even though some training impacts may be limited by other external features. Data stability shows post training participants stay motivated and successfully implement changes.

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207. The Temporal Relationship Between Application of Personal Care Products and Blood Serum Concentrations of 1,3,4,7,8-hexahydro-4,6,6,7,8,8-hexamethyl-cyclopenta[g]benzopyran (HHCB)

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Abstract:
People intentionally apply personal care products with fragrances to their skin, yet our understanding of the extent of absorption into the human body is woefully incomplete. Most personal care product fragrances contain polycyclic musks, of which the most common is 1,3,4,7,8-hexahydro-4,6,6,7,8,8,-hexamethyl-cyclopenta[g]benzopyran, HHCB. It is lipophilic, bio-accumulative and a suspected selective estrogen receptor modifier. HHCB has been detected in the blood of people of all ages. There have been previous studies that show the positive association between HHCB levels and use of personal care products. Yet, in order to gain a better understanding of the temporal relationship between HHCB exposure and serum levels, this study would recruit 96 individuals, 72 to be exposed to HHCB, and 24 for a control. The 96 individuals would have their blood serum concentrations analyzed before exposure, to any personal care products containing HHCB, and then again at intervals of 24, 48 and 120 hours after application of a lotion with HHCB. With the baseline of HHCB concentration in the lotion established, and the concentrations of HHCB in serum collected from the 24 person sample group, a 2 sample t-test would be performed to compare the mean levels of HHCB across individuals and across the three sample groups, all in comparison with the control group. This study and the statistical analysis would provide a better understanding of the metabolism of HHCB in the human body.

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208. Dynamics and Aggregation of Asbestos in Water

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Abstract:
Micro- and nano- sized particles are an emergent contaminants produced due to the high interest in the industrial synthesis of colloidal particles with carefully designed shapes and surface properties. Asbestos fibers, rod-like particles of known toxicity, have been suggested to be able to transport significant distances in groundwater in the field, but we understand very little about the transport relations and aggregation kinetics of asbestos and other shaped contaminants. We present multiple microscopy methods to achieve real-time observations of the dynamics of asbestos fibers, suitable for analysis from nano-meter to micro-meter resolution over a range of timescales from milli second to multi hour. We find that fiber diffusion is size-dependent and anisotropic, in agreement with theoretical predictions for the Brownian motion of rods. These diffusing fibers collide and grow into aggregates that are very sparse and non-compact. Their morphologies and growth rates that differ markedly from previous experiments that used near-spherical particles. We experimentally show that the growth and structure of aggregates composed of silica rods are remarkably similar to those of asbestos fibers, and both are significantly different from silica spheres, showing that particle shape exerts a primary control that is independent of colloid material properties.

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209. Assessment of Links Between Contamination in Karst Groundwater and Water Quality in Drinking Water Systems

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Abstract:
Having high vulnerability for contamination and large capacity to store and rapidly convey pollutants, groundwater systems in karst regions may serve as a significant route for contaminant exposure. This study assesses links between contaminants in a karst aquifer in northern Puerto Rico and those in drinking water. It focuses on chlorinated volatile organic compounds (CVOC) and phthalates because of their ubiquitous presence in the environment and the potential public health impacts. The work integrates historical data collected from regulatory agencies and current field measurements of groundwater and tap water. Contaminant distributions and cluster analysis is performed using GIS. Correlations between detection frequencies and contaminant concentration in source groundwater and tap water point of use are assessed using Pearson's Chi Square and T-Test analysis. Detection frequencies are generally higher for total CVOC in groundwater than tap water samples, but greater for phthalates in tap water than groundwater samples. Spatial correlation analysis indicates that association between tap water and groundwater contamination depends on the source and type of contaminants, spatial location, and time. Full description of the correlations may, however, need to take into consideration variable anthropogenic interventions.

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210. Exposure to Particulate Matter Air Pollution and Risk of Multiple Sclerosis in Two Large Cohorts of US Nurses

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Abstract:
Background: We conducted, to our knowledge, the first prospective study of particulate matter (PM) exposure and MS risk in two prospective cohorts: the Nurses Health Study (NHS) and the Nurses Health Study II (NHS II).Methods: Cumulative average exposure to different size fractions of PM up to 2 years before the onset of MS was estimated using spatio-temporal models. We used multivariable Cox proportional hazards models to estimate the hazard ratios (HR) and 95% confidence intervals (CI) of MS associated with each size fraction of PM independently. We conducted additional sensitivity analyses stratified by smoking, region of the US, and age, as well as among women who did not change residence during the study. Analyses were adjusted for age, ancestry, smoking, body mass index at age 18, region, tract level population density, latitude at age 15, and UV index.Results: We did not observe significant associations between air pollution and MS risk in NHS or NHS II. Among women in the NHS II, the HR comparing the top vs. bottom quintile of PM was 1.11 (95% Confidence Intervals (CI): 0.74, 1.87), 1.04 (95% CI: 0.73, 1.50) and 1.09 (95% CI: 0.73, 1.62) for PM10 (≤10 microns in diameter), for PM2.5 (≤2.5 microns in diameter), PM2.5-10 (2.5 to 10 microns in diameter) respectively, and tests for linear trends were not statistically significant. No association was observed in the NHS.Conclusions: In this study, exposure to PM air pollution was not related to MS risk.

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211. Functional genomics of heavy metal resistances in the foodborne pathogen Listeria monocytogenes

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Abstract:
Metal contamination is becoming an increasing problem due to both naturally occurring and man made sources. Metals do not degrade over time. They can accumulate in water, soil, in plants,and other organisms. Such accumulation can critically alter the natural microbiota, selecting for microbes that can tolerate or mitigate the toxic effect of these metals. Listeria monocytogenes is a foodborne pathogen found ubiquitously in nature that is able to cause severe disease (listeriosis)in humans and other animals, Listeria can be resistant to copper and zinc and to very high levels of cadmium and arsenic, creating the possibility that high environmental levels of these metals could select for this pathogen. Both copper and zinc are utilized by the host immune system to combat invading microbes, and pathogens inured to high levels of these metals could potentially be better able to tolerate host immune responses. Our work involves characterizing a penicillin-binding protein implicated in copper tolerance as well as a large mobile genetic element which contains genes associated with resistance to cadmium, arsenic and zinc. These genes are widely distributed and conserved among L. monocytogenes and other bacteria. We have observed that not only do these genes facilitate Listeria's survival in the presence of these toxic metals, but that their function can also have an impact on virulence and the ability to form biofilms, which is key in environmental persistence of Listeria.

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212. The PhenX Toolkit: Standard Phenotype and eXposure measures for pregnancy research

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Abstract:
The PhenX (Phenotypes and eXposures) Toolkit is a Web-based catalog of measures: https://www.phenxtoolkit.org/. It contains well-established, broadly validated measures of phenotypes and exposures for use in epidemiologic and biomedical research. It provides detailed protocols and tools to help investigators integrate PhenX measures into studies, with the goal of standardizing data collection, ease of interpretation, and comparability across studies. The Pregnancy Working Group (WG) used the PhenX consensus process to choose and recommend a standard set of pregnancy-related measures. The WG was assembled to include expertise in obstetrics, maternal-fetal medicine, pediatrics, reproductive genetics, epidemiology, biostatistics and toxicology. At a one day in-person meeting, members presented their recommendations for high priority pregnancy measures and associated protocols for collecting data.

The WG identified a set of pregnancy measures and corresponding protocols for inclusion in the PhenX Toolkit. Measures such as gestational age, mode of conception, mode of delivery, environmental biomarkers, and others complement current PhenX Toolkit measures (e.g., diet, depression). When data can be combined and compared across multiple studies, the potential for meaningful results is greatly increased. The PhenX Toolkit provides the research community with high-quality, well-established, low-burden measures to accomplish this aim.

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213. Investigating the Relationship between Perfluorooctanoate and Body Mass Index in Young Girls in the Greater Cincinnati and San Francisco Bay Area

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Abstract:
Perfluorooctanoate (PFOA) is an endocrine disrupting chemical with ubiquitous exposure in the US. Cross-sectional studies of the effect of PFOA on BMI have produced disparate findings possibly related to age.Hypothesis: Exposure to PFOA results in decreased BMI in young girls.Methods: Through the NIH Breast Cancer and the Environmental Research Centers (BCERC), we conducted a study of polyfluoroalkyl compound (PFC) biomarkers in girls from Greater Cincinnati (CIN, N=353) and San Francisco (SFBA, N=351). PFOA concentration in the first serum sample was analyzed for 704 girls, age 6-8 years. Mixed effects models were used to analyze the effect of PFOA on BMI, waist-to-height and waist-to-hip ratios and PFOA concentration in this longitudinal cohort, including Age*PFOA interaction.Results: Median serum PFOA concentrations were 7.3 (CIN) and 5.8 (SFBA) ng/mL, above the US population median for children 12-19 years (3.8 ng/mL, NHANES, 2005-2006). Log-transformed serum PFOA had a strong inverse association with BMI in the CIN girls (p=0.0002) and the combined two-site data (p=0.0008) and the joint inverse effect of PFOA and Age*PFOA weakened at age 10-11 years. However, in the SFBA group alone, the relationship was not significant (p=0.1641) with no evidence of changing with age.Conclusions: PFOA is associated with decreased BMI in young girls but the strength of the relationship decreases with age. Site heterogeneity may be due to greater perinatal exposure in CIN.

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214. Design of the Agricultural Health Study of Memory in Aging

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Abstract:
Some, but not all, epidemiological studies have reported that pesticide exposure is associated with higher risk of dementia and Alzheimer's disease (AD), in particular. Prior research has been limited by lack of detailed information on pesticide exposure and often relied on retrospective recall, sometimes decades after exposure. The Agricultural Health Study (AHS) addresses many of the limitations of prior studies. It has prospectively collected detailed information on pesticide use from licensed private pesticide applicators (i.e. farmers) in North Carolina and Iowa since 1993. The initial phase of data collection, Phase 1, collected data on about 52,400 private pesticide applicators (mean age 45) from 1993 to 1997. Phase II (1999-2005), Phase III (2005-2010) and Phase IV (2013-2015) collected updated information on use of specific pesticides, farming practices such as types of pesticide application and use of protective gear, and changes in health status. A sizeable portion of the AHS participants has now reached the age of increased risk for dementia. Thus, the study now provides a unique opportunity to evaluate associations between pesticide use and AD in a cohort of pesticide applicators with well-characterized exposures. We describe the design of the Agricultural Health Study of Memory in Aging (AHS-MA), an ongoing study that will examine long-term pesticide use and risk of AD, and the role of AD, inflammatory, and pesticide metabolism genes in this association.

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215. Nitrate Ingestion from Drinking Water and Diet and Pancreatic Cancer among Postmenopausal Women

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Abstract:
Nitrate and nitrite are precursors of N-nitroso compounds, which are probable human carcinogens and cause pancreatic tumors in animals. Few studies examined nitrate in drinking water and pancreatic cancer. Processed meats contain added nitrite and are inconsistently associated with pancreatic cancer. We used the Iowa Women's Health Study Cohort (1986-2011) to investigate the association between drinking water nitrate, dietary nitrate and nitrite, and pancreatic cancer. We identified 313 incident pancreatic cancer cases in this cohort of 34,235 postmenopausal women. Historical monitoring data was used to estimate average nitrate and total trihalomethanes (TTHM) level and number of years exceeding one-half the maximum contaminant level (MCL; nitrate: 5mg/L) for participants indicating they drank public water >10 years (N=15,706). We estimated hazard ratios and 95% confidence intervals for pancreatic cancer risk using Cox regression and assessed effect modification by TTHM, smoking status, and vitamin C intake. Nitrate in drinking water was not associated with pancreatic cancer, whether measured by average nitrate levels or years >1/2 MCL. We observed no interaction between nitrate levels and smoking, vitamin C, or TTHM on pancreatic cancer risk. Dietary nitrate and nitrite overall were not associated with pancreatic cancer risk. High nitrite intake from processed meat was borderline significantly associated with pancreatic cancer risk.

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216. Translational Science: The Spectrum of Participation and the Role of the Stakeholder in Theory and Practice

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Abstract:
Promoting bidirectional communication and collaboration between researchers and stakeholders, particularly community members, is critical for advancing research translation and achieving environmental health justice. When a mutual sense of interest, purpose, and trust are shared, stakeholders can build partnerships to produce co-generated solutions. Many factors influence the dynamics and growth of these relationships. The University of Arizona Superfund Research Program's Research Translation Core (UA-SRP RTC) is dedicated to understanding stakeholder needs and expectations in translational efforts and to teaching these participatory approaches in formal and informal settings. Using current UA-SRP RTC activities, we examine the level of participation and role of stakeholders. Example activities include the: a) Center for Environmental Sustainable Mining, b) Cooperative Extension's private well water workshops, c) Gardenroots: A Citizen Science Garden Project, and d) Dewey-Humboldt, AZ Community Advisory Board. As these activities have developed, we have demonstrated that there is a participatory spectrum and the role of stakeholders may change over time. We have identified methods that both scientists and nonscientists can use to overcome barriers to research translation and foster growth. The end result is that the UA-SRP RTC is successfully training students, community members, and other stakeholders in translational studies and public participatory approaches to research.

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217. Serum Pesticide Levels and Cognitive Function in Elderly Individuals who? Differ by Race/Ethnicity: Potential Role in Health Disparities in Alzheimer Disease

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Abstract:
Risk of Alzheimer's disease (AD) is reported to be higher among older Hispanics and African-Americans. Although the exact reasons for this disparity are not known, differences in genetic and socioeconomic factors are thought to contribute. Here, we sought to determine whether serum pesticide levels were associated with race/ethnicity differences in cognitive function of elderly individuals using data from the National Health and Nutrition Examination Survey (NHANES), a nationally representative health survey of the resident, civilian, non-institutionalized US population. Cognitive function was assessed in a total of 776 individuals aged 60-84 using the Digital Symbol Substitution Test (DSST). Exposure-response relationships between DDT, DDE and DSST scores were determined using regression models. Of the 776 individuals, 667 completed the DSST task including 396 Non-Hispanic Whites, 142 Mexican-Americans and 87 Non-Hispanic Blacks. The lowest scores on the DSST were observed in the highest category of DDT and DDE. We observed a significant inverse relationship between cognitive function and increasing serum concentrations of DDT (-2.2, p = 0.019). When stratified by race/ethnicity, the inverse relationship between DDT was statistically significant only among Mexican Americans (-3.3, p=0.02). A similar effect was observed with DDE (-1.9, p=0.04). These data suggest that pesticide exposure, may contribute to the reported increased risk of AD in Mexican-Americans.

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218. Mouse food as a source of PAH contamination

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Abstract:
Polycyclic aromatic hydrocarbons (PAH) are ubiquitous environmental pollutants generated from incomplete combustion and charring or barbecuing food. They possess both carcinogenic and endocrine-disrupting properties and may be associated with asthma, obesity and cancer. Despite the accumulating human data supporting an association between PAH and breast cancer (BC), there have been few animal studies, and none that have examined time windows of environmental toxic exposure on BC risk. Our objective was to determine whether food is a source of PAH contamination in a mouse model of prenatal airborne PAH exposure on BC risk. Our approach was to measure the PAH pyrene contamination in commercially available and commonly used mouse diets to improve our experimental models. We compared levels of pyrene by GC-MS analysis in PicoLab® Diet 5053/5058; AIN-93G Growth Diet. We found that pyrene levels were 2.2 and 7.5 fold higher in 5053 and 5058 diets respectively when compared to AIN-93G diet (0.166ng/g). The higher pyrene levels in 5053/5058 diets may be from the cooking process as the ingredients were exposed to direct fire natural gas with temperatures between 250F-275F. In contrast, cooking AIN-93G diet used dry heat with temperature between 85F-93F. Overall this report suggests that it is critical to choose the right mouse diet with no PAH contamination for controlled mouse airborne PAH exposure experiments.

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219. Inorganic arsenic levels in rice are correlated with urinary arsenic: A pilot study quantifying aggregate arsenic exposure in the Health Effects of Arsenic Longitudinal Study (HEALS)

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Abstract:
The body of epidemiologic research evaluating inorganic arsenic's (iAs) toxic effects largely comes from populations exposed to iAs in drinking water (wAs). However, iAs in food, especially rice, may also be an important source of exposure. Consumer Reports magazine found troubling levels of iAs in US rice (mean total As=254+/-123 ug/kg, %iAs ranged from 11-81%), and other studies have linked rice intake to higher urinary As (uAs), but studies have not yet assessed whether iAs in rice is associated with internal dose in the same study population. The goal of this pilot study was to better characterize aggregate As exposure by studying whether As species and levels from uncooked (raw) and cooked rice were associated with wAs and uAs. We randomly recruited 200 HEALS participants in Araihazar, Bangladesh and collected samples of raw and cooked rice, water, and urine. wAs ranged from 0-253 ug/L (median=3 ug/L). The mean level of total As in raw rice was 227+/-126 ug/kg and in cooked rice was 234+/-192 ug/kg. iAs was the major species in both raw (82+/-6%) and cooked rice (85+/-8%). Cooked rice iAs was correlated with raw rice iAs ($r=0.4$, $p<0.0001$) and wAs ($r=0.61$, $p<0.0001$). Urinary As was correlated with raw rice iAs ($r=0.24$, $p=0.02$), cooked rice iAs ($r=0.71$, $p<0.0001$), and wAs ($r=0.69$, $p<0.0001$). Levels of total As in Bangladesh-grown rice were comparable to levels in US-grown rice; however, the percentage of iAs in rice from Bangladesh was strikingly higher compared to the US.

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220. Manganese Promotes α-Synuclein Protein Misfolding, Exosome-Mediated Release of Protein Aggregates and Neuroinflammation: Relevance to Translational Research in Environmental Metal Neurotoxicology

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Abstract:
Environmental exposure to excessive manganese (Mn) results in manganism, a debilitating movement disorder that shares many Parkinsonian clinical features. Alpha-Synuclein protein (αSyn) aggregation is considered a key pathophysiological feature of Parkinson's Disease (PD). Recently, we showed that Mn interacts with αSyn to alter the metal's neurotoxicity. Herein, we further characterized the effect of Mn on αSyn misfolding and a prion-like cell-to- cell transfer of misfolded αSyn in experimental Parkinsonian models. Using cell models, we show that Mn exposure induces secretion of αSyn through exosomes, which were further endocytosed into microglia where they induce inflammasome activation, thereby contributing to dopaminergic neurotoxicity. Our bimolecular fluorescence complementation (BiFC) studies in animal models revealed that Mn exposure increases αSyn cell-to- cell transmission, resulting in dopaminergic neurotoxicity. Notably, stereotaxically delivering αSyn-containing exosomes into the striatum initiated Parkinsonian-like pathological features in mice. In terms of translational relevance, our preliminary studies showed that serum exosomes collected from welders exposed to Mn have higher misfolded αSyn content and more of the inflammasome marker ASC. Collectively, these results demonstrate that Mn exposure promotes the exosomal release of αSyn, which subsequently evokes pro-inflammatory and neurodegenerative responses in cell culture and animal models.

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221. Independent and Interactive Effects of Prenatal Cotinine Exposure and Maternal Depression on Birthweight

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Abstract:
Prenatal smoking and depression are linked to low birthweight, heightening the risk for morbidity and mortality in infancy and childhood. However, few studies have examined the risk of both exposures during pregnancy. Using a prospective sample of pregnant women (N=850) from a birth cohort in Durham, NC, the current study examined the independent effects of cotinine and prenatal depression on birth weight, as well as the interaction between both risk factors. Demographics, maternal health factors, depressive symptoms, and birth information were collected via self-report measures and medical record abstraction. Prenatal blood samples were assayed for cotinine. Controlling for relevant covariates, multiple regression analyses indicated that both cotinine (β=-.13, t(701)=-4.32, p<.001) and depression (β=-.07, t(733)=-2.33, p=.02) independently predicted lower birthweight. A significant interaction was also observed between cotinine and depression (β=-.24, t(701)=-2.44, p=.02), where cotinine was predictive of birthweight for depressed women (β=-.17, t(369)=-4.47, p<.001), but was not a significant predictor for non-depressed women. Results replicate findings linking prenatal cotinine and depression to lower birthweight. Further, results suggest that depressed smokers may be at especially high risk. Findings can inform targeted interventions and assist medical providers with identifying women at increased risk for poor perinatal outcomes.

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222. An AHR-mediated Amplification Loop that Enforces Cell Migration in Triple Negative Human Breast Cancer Cells

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Abstract:
Endogenous ligand-activated AHR plays an important role in numerous biological processes. As the known number of AHR-mediated processes grows, so too does the importance of determining what endogenous AHR ligands are produced and how their production is regulated. Our studies were designed to determine if and how ER-/PR-/Her2- breast cancer cells produce AHR ligands. We postulated that: 1) malignant cells produce tryptophan-derived AHR ligands through the kynurenine (KYN) pathway, 2) these metabolites drive AHR-dependent cell migration, 3) the AHR controls the rate-limiting KYN pathway enzymes, and 4) environmental AHR ligands mimic the effects of endogenous ligands. The data indicate that human breast cancers express significant AHR and TDO levels and that representative cell lines express TDO and produce sufficient intracellular KYN xanthurenic acid to chronically activate the AHR. TDO over-expression or excess KYN accelerates migration in an AHR-dependent fashion. Environmental AHR ligands TCDD and B[a]P mimic this effect. AHR knockdown or inhibition significantly reduces Tdo2 expression. These studies identify, for the first time, a complete, amplification loop in which physiologic concentrations of endogenous or environmental AHR ligands drive AHR-dependent up-regulation of Tdo2, which, in turn, enforces endogenous AHR ligand production within the tumor cell. The net biologic effect is an increase in tumor cell migration, a measure of tumor aggressiveness.

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223. Temporal Trends and Variability of Phthalate Exposure among Pregnant Women in a High-Risk ASD Pregnancy Cohort

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Abstract:
Phthalates have potential for toxicity relevant to ASD (autism spectrum disorder) etiology in human studies as well as in studies with laboratory animals. Phthalates are metabolized and excreted quickly, with elimination half-lives on the order of hours. The goal of this study is to evaluate temporal trends and variability of phthalate exposure among pregnant women in a high-risk ASD pregnancy cohort. We analyzed 16 phthalate metabolites in 717 urine samples collected from 195 pregnant women in MARBLES. On average, 3 samples were collected from each mother during second and third trimesters. MARBLES is a prospective investigation, enrolling pregnant women who already have a child with ASD. We used specific gravity to adjust for urinary dilution. Among 16 metabolites, a decreasing trend was found for metabolites of diethyl phthalate (DEP) and di-2-ethylhexyl phthalates (DEHP) from 2007 and 2013. During the same period, metabolites of di-isononyl phthalate (DNP) and 1,2-Cyclohexane dicarboxylic acid, diisononyl ester (DINCH) were increased. Intra-individual variability of phthalate metabolite is high and different degrees of temporal variability were found by metabolites and by participants. A novel approach is being developed to better understand phthalate exposure of pregnant women over the course of pregnancy. Further statistical analysis to investigate whether prenatal phthalate exposures are associated with ASD is followed.

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224. Interaction between mono-(2-ethylhexyl) phthalate and all-trans retinoic acid in rat fetal testis in vitro

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Abstract:
Phthalate esters (phthalates) disrupt the development of fetal testicular germ cells and seminiferous cord morphogenesis, even in the absence of an anti-androgenic effect. Exogenous retinoic acid exposure in vitro also causes disrupted testis organization and germ cell death. Phthalates bind peroxisome proliferator activated receptors (PPARs), which can engage in crosstalk with retinoic acid receptors (RARs). We hypothesized that phthalates disrupt seminiferous cord development by interfering with RAR signaling. Gestational day 15 Sprague Dawley rat testes were exposed in vitro to 10^{-6} M all-trans retinoic acid (ATRA), 10^{-4} M mono-(2-ethylhexyl) phthalate (MEHP), alone and in combination, or 1:4000 DMSO vehicle, and collected after 1 (QPCR) or 3 d (histology/IHC). ATRA-exposed testes showed a lack of seminiferous cord development with abnormal distribution of smooth muscle actin (SMA) and anti-Müllerian hormone (AMH)-positive cells, while MEHP and co-exposure treatments had significantly more intact seminiferous cord structure. The co-exposure caused germ cell death, measured by cleaved capase-3 IHC, and additive changes in gene expression, including significant up-regulation of the RAR target retinol binding protein 1. Therefore, phthalates have the ability to influence RAR signaling in whole testis in vitro. These data support the hypothesis that crosstalk between PPAR and RAR signaling is a mechanism for phthalate effects on fetal testis development.

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225. Task-Based Analysis of Black Carbon Exposure in Midwest Farmers during Harvest

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Abstract:
Black carbon (BC) particles are implicated in producing negative human-health and climatological effects. A 1 µg/m^3 increase in BC exposure has been shown to be associated with exhaled nitric oxide in elderly populations with asthma or COPD, and small increases (0.4 µg/m^3 log BC) in exposure in children ages 8-11 result in decreased intelligence test scores. BC personal exposures in 16 farmers were measured over 20 sampling days using a real-time personal BC monitor (calibrated to a standard reference method) during harvest. 30-second averaged samples were taken at a flow-rate of 50 ml/minute as task-types and times were recorded by a third-party observer. Average task-based and time-weighted concentrations were analyzed from 13 identified task-types. A significant difference was found in average BC concentrations between tasks ($p < 0.001$). In both analyses, farmers' exposure to tractor, combine, or loader-tractor's exhaust from a recently or currently running machine resulted in the highest BC exposure (task-based geometric mean = 15.36 µg/m^3, GSD = 3.31). Additionally, daily BC concentrations and peak exposures were analyzed, with daily arithmetic means ranging from 0.23-13.2 µg/m^3, and an average total daily exposure of 2.67 µg/m^3. Peak exposures ≥ 100 µg/m^3 occurred frequently (40% of visits). Therefore, farming should be considered as an occupation to be studied further in BC exposure assessments.

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226. Oceans and Human Health: Harmful algal bloom dynamics and mechanisms of toxin action

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Abstract:
Harmful algal blooms (HABs) are a growing threat to public health in coastal areas of the U.S. and worldwide. Dinoflagellates, diatoms, and other classes of algae produce an array of potent neurotoxins that cause neurobehavioral and neurologic disorders. Acute exposures through consumption of contaminated seafood are known to cause paralysis and death, but longer-term consequences of chronic or developmental exposure to HAB toxins are poorly understood. Accurate predictions of the intensity, duration, location and toxicity of blooms promise enormous benefits for public health. In an integrated set of research projects, we are employing novel autonomous biosensor technologies to understand the population dynamics of the toxic dinoflagellate Alexandrium fundyense and the toxic diatom Pseudo-nitzschia spp., and to explore the cellular and epigenetic mechanisms of action of their toxins, saxitoxin and domoic acid, respectively, after low-level exposures to these and other seafood contaminants during development. Key findings include: 1) new insights into processes and mechanisms underlying the onset and termination of A. fundyense blooms, 2) advances in robotic, in situ monitoring and rapid response sampling of A. fundyense and Pseudo-nitzschia spp. blooms, and 3) elucidation of cellular and molecular mechanisms by which developmental exposure to low levels of domoic acid and polychlorinated biphenyls can have long-term impacts.

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Poster ID: P5709

227. Sub-slab depressurization systems for vapor intrusion mitigation - some aspects of design

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Abstract:
This study examines various aspects of design of an active sub-slab depressurization system (ASSD) typically used in mitigation of vapor intrusion scenarios. A three-dimensional finite element model of a typical residential building with a steady influx of vapor contaminant entering the structure via vapor intrusion (VI) was considered. Various VI scenarios were modelled to give a holistic view of the factors that influence the ASSD energy requirements and performance. The importance of the soil and sub-slab characteristics with and without presence of an ASSD were considered. By implementing certain practices during installation of an ASSD and/or construction of a building, it is possible to increase performance of the mitigation system while reducing operational energy costs.

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228. Impact of Hospital Waste on Drinking Water Quality: Disinfection Byproduct Formation Implications from Anthropogenic Contributions

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Abstract:
Waste streams from hospitals and medical facilities are often not regulated any differently from other municipal wastewater sources even though they may contain biologically active chemicals that are not removed by conventional wastewater treatment plants. As the effluents from these plants often feed into downstream drinking water sources it is imperative to determine the fate of these medical residues not only for their potential direct impact on human and ecosystem health but also because they may react with disinfectants used in water treatment to form disinfection byproducts (DBPs). As an example, if iodinated contrast agents reach drinking water sources, total iodide levels may increase and lead to cyto-and genotoxic iodinated DBP formation when chloramine, a common disinfectant, is used. This study has identified hospital waste-impacted surface waters in North Carolina which likely contain organic iodide and are used as source drinking waters. The impact of this organic iodide as a DBP precursor has been further investigated through the analysis of iodinated trihalomethanes and haloacetic acids and an assessment of the iodide mass balance in source and treated waters. This research highlights the need for increased source water protection and the potential use of enhanced treatment of hospital waste due to the increased levels of drinking water DBP precursors.

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Poster ID: P5729

229. Time after Mother's day flower harvest and children's health: Potential short-term neurobehavioral alterations associated with pesticide exposures

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Abstract:
Background: Exposures to cholinesterase inhibitor pesticides (e.g. organophosphates [OP]) have been associated with children's neurobehavioral alterations. Animal studies have observed transient alterations in neurobehavioral in relation to pesticide exposure; however, limited evidence regarding transient effects exists in humans.Methods: We estimated the associations between neurobehavioral performance and time after Mother's Day flower harvest (the end of a heightened pesticide usage period) among 308 4-to 9-year-old children living in floricultural communities in Ecuador in 2008. Children's neurobehavior was examined once (NEPSY-II: 11 subtests covering 5 domains) between 63-100 days (SD: 10.8 days) after Mother's Day harvest (blood acetylcholinesterase activity levels can take 82 days to normalize after irreversible inhibition by OPs). Results: The mean (SD) neurobehavioral scaled scores across domains ranged from 6.6 (2.4) to 9.9 (3.3). Children examined sooner after Mother's Day had lower neurobehavioral scores than children examined later, in the domains of (score difference per 10.8 days, 95%CI): Attention/Inhibitory Control (0.38, 0.10-0.65), Visuospatial Processing (0.60, 0.25-0.95) and Sensorimotor (0.43, 0.10-0.77). Conclusions: Our findings, although cross-sectional, suggest that neurobehavioral performance alterations associated with a spray season may normalize (perhaps back to basal levels) with greater time during the low exposure period.

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230a. Estimating and Valuing Health Impacts of Formaldehyde Exposure to Improve Decision-Making

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Abstract:
Asthma is pertinent to government and industry decision-making about formaldehyde in building products; exposure is prevalent and the health costs of asthma may be significant. Methods: We applied the Navigation Guide systematic review methodology to evaluate the question: Is exposure to formaldehyde associated with diagnosis, signs, symptoms, exacerbation, or other measures of asthma in humans? We incorporated established economic valuations related to asthma to quantify the costs related to formaldehyde exposure in the U.S. population. Results: We assembled a multi-disciplinary review team; developed the protocol; searched the literature; and identified relevant human studies using pre-specified inclusion/exclusion criteria. To date, we have identified 1,544 relevant records, 8 of which met our inclusion criteria. We will: complete the literature search; assess the internal validity of individual studies; rate the quality and strength of the entire body of available evidence; derive effect estimates from a subset of studies using meta-analysis; and apply the effect estimates in combination with established economic valuations to estimate the quantified costs of asthma effects from formaldehyde exposure. This presentation will describe the complete results and conclusions, including recommendations for improved methods for decision-making about environmental chemicals.

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230b. Exploring the Association between Developmental PBDE Exposure and IQ/ADHD Effects: Application of the Navigation Guide Systematic Review Methodology

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Abstract:
PBDEs are ubiquitous in the environment and people. Methods: We applied the Navigation Guide methodology to answer the question: Does developmental exposure to PBDEs in humans affect: 1) IQ; or 2) ADHD? We developed a protocol; searched the literature; identified relevant human studies; evaluated potential risk of bias for each study; and rated the quality and strength of the overall body of evidence. Results: Twelve of 1,824 studies identified met our inclusion criteria. Nine studies measured IQ, most were "low" or "probably low" risk of bias, and overall the evidence was of "moderate" quality. Meta-analysis found a decrement of 1.53 loss of IQ points (95% CI: -2.73, -0.33) per approximately 2-fold increase in PBDE exposure. The strength of the body of evidence was "sufficient." Seven studies measured ADHD, most were "low" or "probably low" risk of bias; overall the evidence was of "moderate" quality. Studies showed inconsistent relationship between PBDE exposures and the risk of ADHD; the data were not amenable to meta-analysis. The strength of the body of evidence was "insufficient." Conclusion: The effect of developmental PBDE exposure on IQ was approximately 5-6 points IQ reduction for every 10-fold increase in PBDE exposure (lead is ~6 points of IQ reduction per 10-fold increase in child blood lead levels). There is a need to pursue stronger policies, regulations, and market actions to limit chemical exposures that pose threats to neurodevelopment.

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Poster ID: P5799

231. In Utero Epigenetic Programming and Asthma Pathogenesis

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Abstract:
Epidemiological evidences suggest asthma has its origins in the early life. It is speculated that epigenetic modifications induced by in utero exposure alter the airway inflammation and airway structure of the offspring. In this study, we hypothesize that maternal exposure to allergens alters the epigenome of the fetus and modulates the allergen sensitization and lung development of the neonate. We utilized an experimental asthma model and examined the gene-specific DNA methylation patterns in successive generations. Female mice (F0) were exposed to house-dust-mite (HDM) before conception and during early pregnancy or during the period of pregnancy and lactation. Male progeny (F1-F3) were sensitized and challenged by HDM when they reached 5 weeks of age. We demonstrated that in utero exposure to allergen impacts the inheritance of airway hyperresponsiveness (AHR) phenotypes in the third successive generation (F3). Moreover, the changes in the offspring's lung function were associated with IFN_{γ} (Th1 cytokine) and ACSL3 (gene involved in fatty acid metabolism) DNA methylation. Strikingly, the inheritance of AHR and gene-specific methylation patterns changed according to the windows of in utero HDM exposure. In summary, we demonstrated that in utero HDM exposure alters the epigenome of the fetus and modulates the development of AHR of the neonate. The dynamic nature linking the maternal factors to the long lasting epigenetic mechanisms warrants further study.

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232. Mercury in suspended particulates from the Penobscot Estuary in Maine

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Abstract:
Mercury contamination from a former chemical manufacturing site near Orrington, ME has heavily impacted the Penobscot River and Estuary, causing closure of the lobster fishery. Mercury (Hg) is exported from the point source as suspended particulate, and is 4-times higher in the river reach below the point source relative to the reach upstream. In estuaries, mercury in the suspended particulate fraction of the water column, but not the underlying sediment, have been shown to be predictive of Hg concentrations in fish. Characterization of suspended particulates is key to understanding the mobility and bioavailability of Hg in this system.

To assess the character and elemental distribution of the suspended load in the estuary, water samples were taken at low and high tide from four sites: above and below the point source, and over a gradient of salinity from the river to the estuary. Samples were filtered through two pore sizes (0.2 µm and 20 µm) and analyzed for Hg and methyl Hg. A gradient of increasing Hg was evident between the "above point source" site and the more saline site in the estuary only in the larger-sized suspended particulate. Preservation of the samples in Lugol's solution followed by microscopy revealed most of the particulate was detrital in nature, with a small fraction of diatoms. Suspension of this larger floc material plays an important role in mobility of Hg in this system.

Poster ID: P5767

233. Chromatographic Performance with High Resolution Metabolomics in Human Exposome Research

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Abstract:
Metabolomics is a rapidly growing field that enables an agnostic approach to study environmental exposures and health outcomes while providing insight into chemical space. Increased scan speed and mass accuracy of high-resolution mass spectrometers has now made detection of upwards of 10,000 ions (unique, reproducible m/z features) routinely attainable in a high-throughput manner. With the increasing numbers of features detected and demand for greater throughput, chromatographic lifespan becomes critical for efficient workflow. This study evaluated change in metabolite retention time to monitor variability in m/z feature detection. Plasma samples were extracted with acetonitrile and analyzed in triplicate by liquid chromatography interfaced to a high-resolution mass spectrometer (Dionex Ultimate 3000 paired with Thermo High Field QExactive; m/z range from 85-1275 at 120k resolution). The data evaluated were from samples analyzed with HILIC (Thermo Accucore, 100 x 2.1 mm, 2.6 µm and 50 x 2.1 mm, 2.6 µm) in +ESI mode and C18 (Thermo Accucore, 100 x 2.1 mm, 2.6 u) column in –ESI mode. Results show that the HILIC column produces very reproducible features based on retention time throughout the entire run. Retention time is a good indicator to monitor the chromatographic performance throughout the experimental study on an ultra-high resolution mass spectrometer.

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234. Using reverse-isotopic labeling of Lymnaea stagnalis to understand Cu bioavailability

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Abstract:
As part of a project to evaluate remediation of acid mine drainage at the Central City/Clear Creek superfund site in Colorado, we traced the flux of Cu in isotopically-labeled freshwater snails (Lymnaea stagnalis) that were fed metal-rich material collected from sediment in the Nork Fork of Clear Creek. The isotopic signature of the snails was reversed by culturing them in a sub-lethal concentration of 65Cu-enriched water for five weeks. Various amounts of metal-contaminated material were mixed with diatoms (Nitzschia palea) to produce a series of dietborne-metal concentrations, and each mixture was collected on a filter to create a mat the snails ate. Using mass balance and isotopic-ratio conversions, uptake and depuration of Cu was traced during a 48-h feeding exposure. We evaluated biodynamics of three types of metal-contaminated particles: (1) loosely-coated floc, (2) armored coating on the rocks, and (3) a mixture of the floc and armored coating. The uptake rate of Cu was greatest from the loosely-coated floc, followed by the mixture of loose and armored material and the armored coating alone. As the concentration of Cu increased, the food-ingestion rate decreased drastically for loosely-coated floc. Finally, Cu assimilation efficiency, which is an index of the bioavailability of metals, remained around 40-50% and did not differ significantly among the three types of metal-rich material. We conclude that the physical form of metal-contaminated food can be important.

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Poster ID: P5692

235. Development of Urinary Biomarkers for Human Exposure to Petrogenic Polycyclic Aromatic Hydrocarbons (PAHs) Resulting from the Deepwater Horizon Oil Spill

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Abstract:
The EHSCC at UTMB and Penn collaborate on the Gulf-Coast Health Alliance: health Risks related to the Macondo Spill (GC-HARMS). This consortium is conducting a human health assessment of gulf communities that may have been exposed to sea-food contaminated with petrogenic PAH. A critical component of this assessment is to identify and validate biomarkers of exposure. As a first step, the metabolism of nine representative petrogenic PAH (6-alkylated and 3-oxygenated) in human hEPAtoma (HepG2) and small intestine (CaCo2) cells was examined. Analytes were identified by RP-HPLC coupled with in-line fluorescence detection, ion-trap mass spectrometry (MS) and Obitrap HRMS to gain exact mass to 5 ppm. Common metabolites identified irrespective of the PAH examined included catechols and their conjugates, dihydrodiols, and evidence for bis-electrophiles which contained a diol-epoxide and o-quinone within the same structure. Urine from a convenience set of 10 gulf residents were compared to archival control urine samples from a non-exposed group for these metabolites. We found evidence for O-bis-methyl-retene -bis-catechol, 1-methyl-phenantherene-trans-dihydrodiol, and tetrahydroxy-5-methyl-chrysene-1,2- or 7,8-dione only in the gulf residents but not in the control samples. ROCs showed that these analytes had greater than 90% specificity and sensitivity to distinguish between the two groups. Further work will determine whether these are the first human biomarkers of oil exposure.

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Poster ID: P5749

236. Nonlinear Manganese Accumulation in the Brain Tissue of Welders

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Abstract:
Welders are exposed to many metals that become neurotoxic at high doses, including manganese (Mn). Mn has been shown to cause neurological problems, such as parkinsonism and dystonia, and various behavioral deficits when present at high doses. Directly measuring the concentration of Mn and other neurotoxic metals in the brain is difficult if not practically impossible, and surrogate measures are needed. This study sought to examine: (1) if T1 relaxation rates (R1) across various brain regions could quantify Mn concentrations in the brain more accurately than a commonly used measure, the pallidal index (PI), and (2) the dose-response relationship between the R1 values and Mn exposure estimated by the number of hours spent welding in the past 90 days (HrsW).Data from 41 welders and 40 controls were analyzed, and results suggest a nonlinear relationship between R1 values, with R1 values increasing only after a critical HrsW value is reached. R1 values in higher exposed welders were significantly higher than in controls and in lower exposed welders in several regions, even after controlling for a number of potential confounders. This supports the conclusion that Mn accumulation can be assessed more sensitively by R1 than by PI. Moreover, the nonlinear relationship between welding exposure and Mn brain accumulation is novel and should be studied further and considered in future policies.

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Poster ID: P5644

237. Training Research Responders for Emergency Operations (TREO)

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Abstract:
The Disaster Research Response Project (DR2), developed by NIEHS in collaboration with the National Library of Medicine is charged with providing readily available data collection tools and response protocols as well as a response network of trained Research Responders (RRs) familiar with those tools. However, there are few available disaster prEPAredness training tools for RRs. Training Research Responders for Emergency Operations (TREO) is a 3D, virtual, interactive learning simulation for RRs prEPAring to deploy. TREO teaches RRs about the structure and function of Incident Command Systems through a virtual deployment to a chemical spill site. RRs can use the tool at their convenience – either in advance or as just-in-time training. For our Phase I effort, we conducted needs assessments with disaster researchers and emergency managers and developed the TREO prototype in the OpenSim environment. We conducted usability testing of TREO with disaster researchers, including pre- and post-training assessments to evaluate knowledge gains and retention. Based on this feedback, we plan to add curriculum elements to TREO's game-like environment and make it mobile device-compatible. The potential commercial application of TREO goes well beyond the NIEHS network to include schools offering disaster management curricula, public/private research organizations, independent researchers, and state and local agencies that may conduct or contract for disaster research.

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238. Identification of Environmental Chemicals that Elevate 7-Dehydrocholesterol Levels Utilizing Predictive Modeling

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Abstract:
The accumulation of 7-dehydrocholesterol (7DHC) is detrimental to many biological and developmental processes, as observed in the disorder Smith-Lemli-Opitz syndrome. We recently reported that 5% of the compounds within the NIH clinical collection significantly elevate 7DHC levels. This suggested a novel environmental exposure that could lead to toxicity, especially at times of critical neurological development. In order to determine whether other chemical exposures impact 7DHC levels, we sought to develop a predictive model that could identify these potentially harmful chemicals. Using 30 compounds known to elevate 7DHC levels, a predictive model based on the Surflex-Sim technique, which utilizes 3-D molecular alignment, was developed. The resulting pharmacophore model had three key features: 1) a halogenated aromatic group, 2) a centrally located nucleophilic group, and 3) a heterocyclic group. This predictive model and a QSAR model were applied to the Vanderbilt Discovery Collection chemical library. The top 50 consensus hits from both models were exposed to the neuroblastoma cell line, Neuro-2A, at 1 uM for 24 hours in triplicate and assayed for 7DHC and cholesterol levels. Compared to control, cholesterol levels were not affected; however, 58% of the tested chemicals significantly elevated 7DHC levels. This approach provides the necessary first steps towards the development of an accurate predictive model for chemical exposures that elevate 7DHC levels.

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Poster ID: P5750

239. The Effects of Polychlorinated Biphenyl Exposure on a Compromised Liver

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Abstract:
Exposure to environmental toxicants namely polychlorinated biphenyls (PCBs) is correlated with liver diseases. The liver is crucial for xenobiotic and endobiotic metabolism. However, the responses of an injured liver to subsequent environmental insults has not been investigated. The current study aims to evaluate the role of a compromised liver in PCB-induced toxicity and define the implications on overall body homeostasis. Male C57Bl/6 mice were fed either an amino acid control diet (CD) or a methionine-choline deficient diet (MCD) during the 12-week study. Mice were exposed to either PCB126 (4.9 mg/kg) or the PCB mixture, Arcolor1260 (20 mg/kg) and analyzed for inflammatory/calorimetry/metabolic parameters. Consistent with literature, MCD diet-fed mice demonstrated steatosis, indicative of a compromised liver. Mice fed the MCD-diet and subsequently exposed to PCB126 showed observable wasting syndrome leading to mortality. PCB126 and Aroclor1260 exposure worsened hEPAtic fibrosis exhibited by the MCD groups. Interestingly, PCB126 but not Aroclor1260 induced steatosis and inflammation in CD-fed mice. Mice with liver injury and subsequently exposed to PCBs manifested metabolic perturbations and displayed extra-hEPAtic toxicity such as upregulated circulating inflammatory biomarkers. The results indicate that environmental pollution can exacerbate toxicity caused by diet-induced liver injury which may be partially due to dysfunctional energy homeostasis.

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240. China national ambient air quality standard and air quality improvement after its Implementation

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Abstract:
China national ambient air quality standard (NAAQS) was initially promulgated in 1982 and has undergone revisions in 1996, 2000.

Since 2000 year, with the quickly economic development, the air pollution were more and more serious, while the assessed result of air quality according to the standard was always not consistent with factual pollution situation. As a result, China MEP started to revise the NAAQS from 2008 and issued it in 2012. The most significant revision in the 2012 standard is the addition of a $PM_{2.5}$ and O_3 8 hours limit value. According to the new standard, the ambient air quality exceeds the standard in almost 90% important cities while 10% according to the old standard.

To attain the standard, from China central government to local governments, they all afford great strength and various measures to reduce pollutants emission and improve air quality. After four years, how much China air quality has been improved? This poster will also use the air quality data including PM_{10}、 $PM_{2.5}$、 SO_2、 NO_2、 O_3、 CO in 2014-2015 and 2009-2010 to show the air quality change.

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Poster ID: P5774

241. Translating CIRCLE Research to the Public using an Interactive Infographic Web Page

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Abstract:
The Center for Integrative Research on Childhood Leukemia and the Environment (CIRCLE) recently launched a website aimed at a diverse audience: fellow researchers, funders, parents, and the public. One goal is to enhance environmental health literacy by translating CIRCLE research findings into practical messages that empower individuals to protect children's health. We created an interactive infographic illustrating putative risk factors for childhood leukemia commonly found within homes (http://circle.berkeley.edu/exposures-of-interest/). The page shows a "dollhouse" cartoon with an exposure of interest highlighted in each room: pesticides (attic), cigarette smoke (study), paint (nursery), polybrominated diphenyl ethers (living room), folate (kitchen), and polycyclic aromatic hydrocarbons (garage). Clicking on a room reveals a short message about a leukemia risk factor found within. Clicking again provides more detailed information about the relevant CIRCLE research findings. At EHS FEST we will recreate this interactive web page as a "lift-the-flap" poster presentation. Audience members would be encouraged to examine each room of the house, learning about risk factors for childhood leukemia as they go. We would value feedback from other grantees who are engaged in research translation.

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Poster ID: P5764

242. Asbestos manufacturing locations and geographic clustering of mesothelioma among residents of Pennsylvania

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Abstract:
Context: Ambler, PA is one of the largest asbestos waste sites in the U.S. Community and occupational exposure to asbestos occurred in Ambler from the 1800s to the 1980s. Known health effects of asbestos exposure observed at high exposure levels in work settings raise the possibility of effects from community exposure and may lead to clustering of mesothelioma cases.Methods: Mesothelioma patient data from the Pennsylvania Cancer Registry (PCR) were obtained and geocoded to residential addresses for the entire state for 1993-2013. Census tract mesothelioma rates were calculated, and the results were evaluated for spatial autocorrelation and clustering.Results: 3,875 mesothelioma cases were identified, with a median age at diagnosis of 74 years. The majority were male, white and non-Hispanic. Moran's I statistic and LISA revealed the presence of spatial autocorrelation in the Ambler area. Clusters in multiple parts of the state were identified using the Besag-Newell method. In addition, both the Besag and Newell and the Kulldorff method identified clusters in the Ambler area. Conclusions: There is preliminary evidence that cases of mesothelioma are clustered in distinct locations in Pennsylvania. Next steps are underway to account for complexities including the long induction period, residential mobility, deaths from related conditions, and the modifiable areal unit problem. This will help to understand the risks of community level exposure to asbestos.

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Poster ID: P5687

243. Genetic contribution to variation in DNA methylation at maternal smoking-sensitive loci in exposed neonates

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Abstract:
Epigenome-wide DNA methylation association studies (EWAS) have identified highly replicable genomic loci sensitive to maternal smoking during gestation. The role of inter-individual genetic variation in influencing DNA methylation (DNAm), leading to the possibility of confounding of such associations, has not been assessed. We investigated whether the DNAm levels at the top ten CpG sites previously associated with maternal smoking during gestation were associated with individual genetic variation at the genome-wide level. GWAS between DNAm at the top 10 CpG and genome-wide SNPs were performed in 736 case and control participants of the California Childhood Leukemia Study. Three maternal-smoking sensitive CpG sites in newborns were associated with SNPs located proximal to each gene: cg18146737 (GFI1) with rs141819830 (p = 8.2x10-44), cg05575921 (AHRR) with rs148405299 (p = 5.3x10-10), and cg12803068 (MYO1G) with rs61087368 (p = 1.3x10-18). For cg18146737, variation at rs141819830 confounded the association between maternal smoking and DNAm in our data (the regression coefficient changed from -0.02 [p =0.139] to -0.03 [p = 0.015] after including the genotype). Further studies using DNAm at these CpG sites that aim to assess exposure to maternal smoking during gestation should include genotype at the corresponding SNP. New methods are required for adequate and routine inclusion of genotypic influence on DNAm in EWAS to control for potential confounding.

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Poster ID: P5779

244. The Contribution of Mercury Exposure and Diet to Child Immune Status in Communities Impacted by Regional Gold Mining in Madre de Dios, Peru

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Abstract:
Childhood heavy metal exposure is a major environmental health hazard that has implications for immune health. In laboratory studies, mercury has been observed to alter general and specific immune functions, however the results in human populations have not been consistent between studies. Our objective was to further examine the impact of mercury exposure on child immune health, particularly considering diet as a modifying factor. In this study region (Madre de Dios, Peru) regional gold mining has increased the input of mercury and possibly other heavy metals into the environment. In a cohort study of children 8 years old and under (n=163) and their parents, we measure heavy metal exposure in hair and toenail biomarkers. General (total IgG, mtDNA) and specific (H. influenzae, measles, pertussis, tetanus, diphtheria, hEPAtitis B) immune outcomes were measured from serum. Antibody concentrations were determined using ELISA (enzyme-linked immunosorbent assay) and BAMA (binding antibody multiplex assay). mtDNA content was determined using quantitative real-time PCR. Average hair mercury values were 3.5ppm in adults and 2.9ppm in children, above the USEPA benchmark dose (1.2ppm) for adverse developmental outcomes. There was a trend of decreasing antibody concentration with increasing hair mercury. For certain antibodies (total IgG, diphtheria, tetanus) nutritional status in terms of serum folic acid and hemoglobin was deemed important.

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Poster ID: P5732

245. Measuring the external organic chemical exposome using non-selective passive sampling devices and high-resolution chemical analysis

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Abstract:
Environmental exposure to chemicals is usually estimated from single time point measurements (grab samples) of a pre-defined list of target chemicals. However, there is often high temporal variability in exposure that renders grab samples unsuitable for estimating chronic exposure and there are many more chemicals beyond those of even the most exhaustive list of target chemicals. To help overcome this dual challenge to our current assessment of chemical exposure, we have developed a non-selective passive sampling device (nsPSD) that accumulates both polar and non-polar organic chemicals (log Kow range 0.2-8.0) from water and combined this with analysis using both target chemical and non-target chemical methods. We will present data on the quantitative measurement of over 500 organic chemicals in water using a targeted analytical approach based on gas chromatography (GC) and liquid chromatography (LC) mass spectrometry (MS). In addition, we analyzed the same nsPSD extracts using higher resolution methods: GCxGC time-of-flight (TOF) MS and LC coupled to high-resolution accurate mass (HRAM) MS. As expected, the LC-based methods capture more of the polar chemicals and the GC-based methods capture more of the non-polar chemicals. We also found that the nsPSD we developed revealed exposure to many more chemicals compared to existing PSD designs or grab water samples. Our nsPSD provides a much more complete picture of the external organic chemical exposure than existing methods.

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246. Early life exposure to bisphenol A (BPA) results in dose-, generation-, and sex-specific adverse physiological outcomes in adulthood

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Abstract:
Early life environment can impact disease risk later in life, a concept known as the developmental origins of health and disease (DOHAD). Our lab is investigating the effects of perinatal exposure to the ubiquitous endocrine disrupting compound bisphenol A (BPA) on multiple physiological endpoints in adulthood. Chronic, low-dose dietary exposure to BPA results in multiple adverse phenotypes. F1 and F2 generation male mice exhibit elevated body fat, glucose intolerance, and impaired insulin secretion. Depending on the dose, the pancreas of F1 and F2 BPA-exposed male mice display reduced beta-cell mass or abnormal mitochondrial function in islets. In addition to altered metabolic health, F1 adult males exposed to BPA throughout gestation and lactation exhibit reduced bone strength as measured by four-point bending, while females are unaffected. Finally, behavior testing in F1 adult males demonstrates a more depressed-like state as measured by the forced swim test. Neither behavioral nor skeletal changes persisted into the F2 generation. Following the identification of functional changes in mice exposed to BPA, ongoing work is focused on identifying gross morphological as well as molecular changes in physiologically relevant tissues to identify mechanisms contributing to the observed phenotypes. Taken together, our physiologically relevant exposure paradigm has resulted in sex-, dose-, and generation-specific metabolic, skeletal, and cognitive health consequences.

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247. Differential Genetic Susceptibility to Lung Inflammatory and Toxicity Changes in Carbon Nanotube Exposures and the Associated Gene Networks

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Abstract:
The risk of environmental and occupational exposures to fibrous nanoparticles has risen in recent years due to continuing increases in the manufacture and widespread applications of carbon nanotubes (CNTs). The hazard potential of CNTs has been demonstrated in experimental lung exposure studies using mice; however, the role of host genetic background in susceptibility to toxicity has not been investigated. In this work, common inbred mouse strains were exposed to CNTs via oropharyngeal aspiration and lung pathology and cellular infiltration were evaluated for inter-strain sensitivity/resistance. C57Bl/6 mice developed significantly more extensive type II pneumocyte (T2P) hyperplasia, alveolar wall thickening, and alveolar infiltrate compared to resistant DBA/2 mice. Surprisingly, DBA/2 but not C57Bl/6 mice were extremely sensitive to increases in leukocytes recovered in BAL fluid. Investigation of F1 hybrids suggested a likely multigenic nature of the inheritance of sensitive/resistant phenotypes. Underlying global gene expression patterns in the sensitive/resistant strains indicated possible regulatory networks underpinning susceptibility. The impact of exposure on gene networks regulating various aspects of immune response and cell survival was limited in resistant DBA/2 mice compared to C57Bl/6. These findings show a genetic basis of susceptibility to carbon nanoparticle exposures and indicate the likelihood of differences in genetic susceptibility among humans.

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248. Aquifer Redox Geochemistry Determines Corrinoid Pools that Affect Activity of Corrinoid-auxotrophic, Organohalide-Respiring Bacteria

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Abstract:
Organohalide-respiring bacteria use corrinoid-dependent reductive dehalogenases (RDases) to break carbon-chlorine bonds. Dehalococcoides mccartyi (Dhc) strains possess RDases that detoxify chlorinated ethenes to benign ethene. Remarkably, Dhc strains cannot de novo synthesize corrinoid and depend on corrinoid salvage. Methanogens, acetogens, and other microbes produce various corrinoids; however, Dhc strains have specific requirements, and only specific corrinoids support Dhc activity. Microcosms established with solids collected from contaminated sites demonstrated the effects of prevailing redox conditions on the predominant corrinoid type(s). Different redox conditions were established by amending microcosms with sulfate, goethite, nitrate, manganese dioxide, lactate, lactate plus 2-bromoethane sulfonate, or tetrachloroethene. Corrinoids produced under these different redox conditions were analyzed using HPLC-UV/Vis spectroscopy and UPLC-MS. Dimethylbenzimidazole (DMB)-type corrinoid dominated under ferric iron-, sulfate- and nitrate-reducing conditions but were not produced in methanogenic incubations. Further, the quantities of cobalamin (i.e., a corrinoid with DMB as the lower base) produced varied considerably under different redox conditions. This refined understanding of how geochemical conditions determine structural alteration in the corrinoid pool provides valuable information for preventing human exposure to harmful groundwater contaminants.

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249. Evaluating product labels and ingredient composition of nail polishes to inform safer alternatives

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Abstract:
Nail salon owners, manicurists, and consumers alike struggle to determine the safety of various nail polishes. To identify potential chemical hazards that manicurists, primarily young, female, and Vietnamese, are disproportionately exposed to, we first interviewed five nail salon owners about nail products in commerce. For 15 popular brands, we researched the labels and safety data sheets (SDS) on the websites or from the manufacturers directly. We found diverse labeling across the industry, likely due to competition on safety claims. The common "3-Free" labels denote the absence of the highly publicized "toxic trio": toluene, dibutyl phthalate, and formaldehyde. Most recently, some brands adopted labels of "5-Free," "7-Free," or even "10-Free," but these labels are not uniformly defined across brands. These ever-transforming labels may provide false reassurances because of regrettable substitution. For example, 7 of the 15 researched color polishes, all 3-Free, use an alternative toxic plasticizer, triphenyl phosphate (TPP). One brand that does not report TPP only discloses one chemical and "proprietary formula" on the SDS, even though an online product profile lists 34 ingredients and "colorants." Some companies now market their polish as "all-free," "non-toxic," "natural," or "safe," despite concerning ingredients on the SDS. Future work will analyze a representative sample of polishes for plasticizers to inform safer alternatives and targeted interventions in nail salons.

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250. Bayesian Belief Networks in Environmental Health Risk Assessment: Advancing Dose-Response Methodology

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Abstract:
Risk assessment requires methods to quantify the relationship between exposure to hazardous agents, and negative health outcomes. Regulators currently rely on two approaches to understand these relationships. For non-cancer health outcomes, a reference dose is set above which risk is presumed present; for cancer outcomes, a slope factor is derived to quantify a linear relationship between exposure and cancer risk.Our work focuses on using Bayesian belief network (BBN) models to better understand dose-response relationships in risk assessment. BBNs are directed acyclic graphs that encode relationships between variables in the form of conditional probability tables. They maintain a visually intuitive structure while allowing for flexible, in-depth investigation of variable interaction. BBNs can model interactions of exposure to toxicants, metabolism, and health outcomes without the need for the limiting assumptions underpinning current approaches.We demonstrate this potential through analysis of data from a 200-member maternal-child birth cohort collected in an arsenic-endemic region of Mexico. We construct a BBN model to predict birthweight for gestational age (BWGA) from demographic information, exposure to arsenic in drinking water, and levels of arsenic metabolites in urine. The BBN model significantly outperforms both reference dose and slope factor approaches in predicting BWGA. Our results suggest that BBNs offer promise in improving the risk assessment process.

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251. Placental DNA Methylation in Relation to Maternal Periconceptional Prenatal Vitamin Use and Child Outcomes in the MARBLES Prospective Autism Study

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Abstract:
Maternal use of prenatal vitamins containing methyl donors like folic acid could alter placental methylation in persistent ways that influence neurodevelopment, especially during a period of dynamic methylation and reprogramming around conception. MARBLES mothers who had a child with autism spectrum disorder ASD were interviewed about prenatal vitamin use during a new pregnancy. Placentas were collected for the younger siblings who were followed until they were 3 years old and clinically diagnosed with ASD or typical development TD. MethylC-seq was performed on DNA isolated from 20 ASD and 21 TD male placentas using Illumina next-generation sequencing on HiSeq 2000 machine with one sample per lane using single-end 100 bp sequencing. We identified differentially methylated regions (DMR) using a DMR finder approach based on bsseq R package. Two DMRs showed significant differences after FDR correction between ASD and TD selected by DMR finder based on MethyC-seq data and validated by pyrosequencing. One DMR that was hypomethylated in ASD compared with TD showed a positive association between prenatal vitamins taken during the first pregnancy month and percent methylation. The other DMR was hypermethylated and its methylation tended to be negatively associated with prenatal vitamin intake. Both DMRs were also associated with Mullen cognitive scores. Maternal periconceptional prenatal vitamin use could alter placental DNA methylation at sites relevant to neurodevelopment and ASD.

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252. Bending the Curve: Educating pregnant women, their families, and medical trainees regarding environmental impacts on reproduction

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Abstract:
Research has demonstrated links between exposures to environmental toxins and impacts on human health. Some studies linking toxins to health impacts may be covered in the popular media; however, physicians may not be aware of emerging environmental issues. There is growing concern about the current state of environmental and public health education in US medical schools, both in terms of what is taught and the lack of emphasis placed in the curriculum. Our COTC has endeavored to increase the awareness of environmental impacts on reproductive health on multiple levels, from the consumer or patient, to medical students and subspecialists. We have worked with curriculum designers on multiple levels to encourage inclusion of environmental health in relevant locations in the curriculum. This has included the curricula offered by our community-centered women's health resource center, undergraduate medical education curriculum, medical school electives, and postgraduate training in obstetrics and gynecology and maternal fetal medicine. Although these educational settings are vastly different, and the learners range from those without a high school diploma to board-certified OB/GYNs, many of the curricular elements overlap. Overlapping elements include the concepts of the developmental origins of health and disease, the precautionary principle, endocrine disruption, and specific reproductive toxins to be avoided.

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