



Annual Environmental Health Sciences Core Centers Meeting and Symposium

“Omics” Approaches in Environmental Health Sciences

October 19-21, 2008

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Environmental Health Sciences

October 19 – October 21
2008

Host Institution
CENTER OF EXCELLENCE IN ENVIRONMENTAL TOXICOLOGY
UNIVERSITY OF PENNSYLVANIA SCHOOL OF MEDICINE



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ANNUAL ENVIRONMENTAL HEALTH SCIENCES CORE CENTERS MEETING

October 19 – 21, 2008

Sunday October 19

- 2:30 PM – 5:30 PM** REGISTRATION (The Inn at Penn)
6:00 PM CENTER DIRECTORS RECEPTION AND DINNER (The Palm, Bellevue Hotel)
OTHER PARTICIPANTS – RECEPTION AND DINNER (The Inn at Penn)

Monday, October 20

- 7:30 AM – 8:30 AM** CONTINENTAL BREAKFAST – Biomedical Research Building II/III (BRB II/III)
On-site Registration
- 8:30 AM – 10:00 AM** OPENING SESSION, BRBII/III Auditorium
- 8:30 AM Welcome, Arthur Rubenstein, MBCh
Executive Vice President, University of Pennsylvania Health System
Dean, School of Medicine
- 8:40 AM Introduction, Trevor M. Penning, PhD
Professor of Pharmacology, Biochemistry & Biophysics, OB/GYN
Director, Center of Excellence in Environmental Toxicology
- 8:50 AM NIEHS Update, Samuel H. Wilson, MD
Acting Director NIEHS, Acting Director of the National Toxicology Program
- 9:20 AM NIH-Roadmap Initiatives, Alan Krensky, MD
NIH Deputy Director for the Office of Portfolio Analysis and Strategic Initiatives (OPASI)
- 10:00 AM – 10:30 AM** BREAK, BRBII/III Lobby
- 10:30 AM – 12:30 PM** CONCURRENT SESSION I, BRBII/III Auditorium
Organizer: Dr. Trevor Penning, PhD
- SYMPOSIUM ON “OMICS” APPROACHES IN ENVIRONMENTAL HEALTH SCIENCES – PART I**
- Introduction** Trevor Penning
- Genomics** *Nrf2 Directed Environmental Stress Response in Lung Diseases and Inflammation*
Shyam Biswal, PhD
Associate Professor, Department of Environmental Health Sciences
Division of Toxicological Sciences, Bloomberg School of Public Health, Johns Hopkins University
- Airway Gene Expression as a Biomarker of Host Response to Tobacco Smoke*
Avrum Spira, MD, MSc
Associate Professor of Medicine, Pathology and Laboratory Medicine
Director, Bioinformatics and Systems Biology Program, The Pulmonary Center, Boston University
- Genotyping** *Folate Genotypes and Phenotypes as Indicators of Nutritionally and Environmentally Driven Disease*
Alexander S. Whitehead, PhD
Professor of Pharmacology
Director, Center for Pharmacogenetics, University of Pennsylvania
- Testicular Germ Cell Tumors - Towards an Understanding of Genetic and Environmental Risk Factors*
Kate Nathanson, MD
Assistant Professor of Medicine, University of Pennsylvania

Monday, October 20 (cont.)

- 10:30 AM – 12:30 PM** **CONCURRENT SESSION II**, Houston Hall, Bodek Lounge, First Floor
COEC – Breakout I
- 10:30 AM – 12:30 PM** **CONCURRENT SESSION III**, 1412 BRB II/III
Center Administrators – Breakout I
Organizers: Sydney McGahan and Elizabeth Kopras
- 12:30 PM – 1:30 PM** **LUNCH**, BRBII/III Lobby
- 1:30 PM – 3:30 PM** **CONCURRENT SESSION I**, BRBII/III Auditorium
Organizer: Dr. Trevor Penning
- SYMPOSIUM ON “OMICS” APPROACHES IN ENVIRONMENTAL HEALTH SCIENCES-PART II**
- Proteomics** | ***Protein Damage by Reactive Intermediates: Targets and Stress Signaling***
Daniel C. Liebler, PhD
Professor of Biochemistry, Pharmacology and Biomedical Informatics
Director, Jim Ayers Institute for Precancer Detection and Diagnosis
Vanderbilt University School of Medicine
- Absolute Quantification of Cellular Kinase Activation***
Gene Ciccimaro, PhD
Applications Chemist, Proteomics, ThermoFisher Scientific
- Biomarkers** | ***Exposure and Biological Response Biomarkers of Cigarette Smoke***
Ian Blair, PhD
Professor of Pharmacology and Chemistry; Director, Program in Systems Biology, ITMAT
Director, Center for Cancer Pharmacology, Vice-Chair, Department of Pharmacology
Scientific Director, Abramson Cancer Center and the Penn Genomics Institute Proteomics Facilities
University of Pennsylvania
- Biomarkers of Airway Inflammation in Exhaled Breath***
Matthew Perzanowski, MPH, PhD
Assistant Professor of Environmental Health Sciences
Columbia University Mailman School of Public Health
- 1:30 PM – 3:30 PM** **CONCURRENT SESSION II**, 1412 BRBII/III
Center Administrators – Breakout II
Organizers: Sydney McGahan and Elizabeth Kopras
- 1:45 PM – 3:30 PM** **CONCURRENT SESSION III**, Houston Hall, Bodek Lounge, First Floor
COEC-Breakout-II
Organizers: Dr. Edward Emmett and Liam O’Fallon
- 3:30 PM – 5:30 PM** **POSTER SESSION AND RECEPTION**, Abramson 123
- 7:00 PM** **RECEPTION AND GROUP DINNER**, Egyptian Gallery,
University of Pennsylvania Museum

Tuesday, October 21

- 7:30 AM - 8:30 AM** **BREAKFAST**, BRBII/III Lobby
On-site Registration
- 8:30 AM – 10:30 AM** **SESSION I**, BRBII/III Auditorium
Organizer: Dr. Rey Panettieri
INTEGRATIVE HEALTH SCIENCES FACILITY CORE
- ***The CTSA at the University of Pennsylvania***
Garret FitzGerald, M.D.
Professor of Medicine & Pharmacology; McNeil Professor of Translational Medicine & Therapeutics; Chair, Department of Pharmacology; Director, ITMAT
 - ***CEET IHSFC***
Rey Panettieri, M.D.
Robert L Mayock & David A Cooper Professor of Medicine; Director, Airways Biology Initiative, Department of Medicine, University of Pennsylvania
 - ***Translational Research in Environmental Health***
Ted Emmett, M.D.
Director, COEC, Center of Excellence in Environmental Toxicology
 - Panel Discussion
- 10:30 AM – 11:00 AM** **BREAK**
- 11:00 am – 12:30 PM** **CONCURRENT SESSION I**, BRBII/III Auditorium
SYMPOSIUM ON “OMICS” APPROACHES IN ENVIRONMENTAL HEALTH SCIENCES-PART II
- Systems Biology** | ***Genomic Predictors of Exposure and of Responses to Environmental Agents***
Leona Samson, PhD
Director, Center for Environmental Health Sciences
Professor of Toxicology, and Biological Engineering, MIT
- Revealing Environmental Response Networks With Comparative Genomic Approaches in C. elegans***
Todd Lamitina, PhD
Assistant Professor, Department of Physiology
University of Pennsylvania
- Bioinformatics** | ***The Comparative Toxicogenomics Data Base***
Carolyn Mattingly, PhD
Investigator and Director Bioinformatics, Mount Desert Island Biological Laboratory
- 11:00 AM – 12:30 PM** **CONCURRENT SESSION II**, Houston Hall, Bodek Lounge, First Floor
COEC and IHSFC Combined Breakout
Organizers: Drs. Emmett, Panettieri, and Liam O’Fallon
- 12:30 PM – 1:30 PM** **LUNCH**, BRB II/III Lobby
- 1:30 PM – 3:30 PM** **CENTER AND COEC DIRECTORS MEETING AND RECOMMENDATIONS**, BRBII/III, Auditorium
- NIEHS Exposure-Biology Program
 - Discussion Topics and Recommendations
- 3:30 PM – 5:00 PM** **OPTIONAL COEC INFORMAL TOPIC SESSION**, BRB II/III Auditorium
- DEPARTURE**

MISSION

The Center of Excellence in Environmental Toxicology (CEET) was launched in 2005 and receives grant support from the National Institute of Environmental Health Sciences. It is one of only twenty-five designated Environmental Health Science Centers in the nation.

The CEET mission is to understand the mechanistic link between environmental exposures and diseases of environmental etiology. Understanding these processes can lead to early diagnosis, intervention and prevention strategies. The end result will be to improve environmental health and medicine in our region.

The CEET is a flexible entity that marshals excellence in basic, translational, patient oriented and population based research in the School of Medicine and Children's Hospital of Philadelphia to facilitate an integrative approach to environmental health/medicine. Although primarily housed in the School of Medicine, the fifty CEET Investigators belong to sixteen departments and five schools at the University of Pennsylvania.

The CEET marries its relevant research excellence to diseases of environmental etiology that affect our urban region. The CEET includes a research core in Lung and Airway Disease (asthma, lung cancer, mesothelioma, and chronic obstructive pulmonary disease) because of the poor air-quality and air-pollution in our region (ozone, fine particulate matter, allergens, SO₂, NO₂ and CO emissions). The CEET also has a research core in Endocrine and Reproduction Disruption because of the high incidence of adverse pregnancy outcomes that lead to low-weight birth and birth and developmental defects in our region. These organ-based cores are linked to our cores in disease mechanism, which include Oxidative Stress and Oxidative Stress Injury and Genes and the Environment.

The CEET enables its investigators to conduct predictive toxicology by employing Toxicogenomic and Toxicoproteomic approaches to identify the genomic and proteomic fingerprints that can be assigned to toxicant class, and to different stages of diseases of the environment. It is engaged in identifying and validating Biomarkers for these diseases.

The CEET aims to conduct research relevant to the forty-five Superfund Sites that permeate the region. Studies will elucidate: mechanisms of chemical toxicity; exposure levels, risk assessment and health hazard; bioremediation approaches; and effects on ecosystems and biodiversity.

The CEET works with and disseminates research findings to select local communities to empower them with new knowledge so that they are better informed to tackle issues of health disparities and environmental justice. To improve the environmental health of these and similar affected communities, the CEET is actively involved in the education of health care professionals (Residency Program in Occupational and Environmental Health, Nursing concentration in Occupational and Environmental Health, and Masters of Public Health Programs).

The CEET will also disseminate its mission and its research findings to all stakeholders including community organizations, local, state and federal officials and agencies (Pennsylvania Department of Health, Pennsylvania Department of Environmental Protection, Environmental Protection Agency) to affect change in environmental health and public health policies.

Research Highlights

R1 Columbia University Health Sciences

Folate deficiency, hyperhomocysteinemia, low urinary creatinine and hypomethylation of leukocyte DNA are risk factors for arsenic-induced skin lesions

Gamble, Mary V¹, J. Richard Pilsner¹, Xinhua Liu¹, Habibul Ahsan², Vesna Ilievski¹, Vesna Slavkovich¹, Diane Levy¹, and Pam Factor-Litvak¹

¹Columbia University, New York, NY and ²University of Chicago, Chicago, IL

Arsenic(As) methylation relies on folate-dependent one-carbon metabolism and facilitates urinary As elimination. Poor methylation capacity is thought to confer greater susceptibility to As toxicity.

After determining that folate deficiency, hyperhomocysteinemia, and low urinary creatinine are associated with reduced As methylation, and that As exposure is associated with increased genomic methylation of leukocyte DNA, we asked whether these factors are associated with As-induced skin lesion risk. We conducted a nested case-control study of 274 cases who developed lesions 2 years after recruitment, and 274 controls in Bangladesh. The odds ratios (95% CIs) for development of skin lesions for participants who had low folate (<9 nmol/L), hyperhomocysteinemia, or hypomethylated leukocyte DNA at recruitment (< median) were 1.8 (1.1–2.9), 1.7 (1.1–2.6), and 1.8 (1.2–2.8), respectively. Compared to the subjects in the first quartile, those in the third and fourth quartiles for urinary creatinine had a 0.4 fold decrease in the odds of skin-lesions (p<0.01). These results suggest that folate deficiency, hyperhomocysteinemia, and low urinary creatinine are risk factors for As-induced skin lesions.

R2 Mount Desert Island Biological Laboratory

Identification of arsenic-mediated changes in developmental gene networks

Mattingly, Carolyn J and Antonio Planchart

Mount Desert Island Biological Laboratory, Salisbury Cove, ME

Exposure to chemicals is a risk factor in the complex interplay between genetics, the environment and human disease. Arsenic is a global environmental health threat and a known carcinogen. Despite the great potential for in utero exposure to arsenic worldwide, mechanisms of arsenic action and effects of low-level exposures on fetal development and disease susceptibility are virtually unknown. By leveraging the power of the zebrafish (*Danio rerio*) model, microarray technology and curated data from the Comparative Toxicogenomics Database (CTD; <http://ctd.mdibl.org>), we identified several gene networks that are perturbed by environmentally relevant levels of arsenic. Pathway analysis suggests that these networks are critical for embryonic development and are implicated in arsenic-associated diseases. We have validated the microarray results for a subset of networked genes by QRT-PCR. These results provide the groundwork for studying: a) the involvement of epigenetic modifications in arsenic mechanisms of action; and b) the effects of developmental exposure to arsenic on disease susceptibility later in life or in subsequent generations. This poster outlines our analysis process and results for an arsenic-modulated network.

Research Highlights

R3 Mount Desert Island Biological Laboratory

Environmental perturbation of ectoderm development in sea urchin embryos

Coffman, James A, Alison Coluccio, Peter Knowlton, Antonio Planchart, and Anthony J Robertson
Mount Desert Island Biological Laboratory, Salisbury Cove, ME

Ectodermal patterning in the sea urchin embryo involves anisotropic expression of the TGFbeta signaling ligand Nodal. Exposures to nickel, zinc, or hypoxia perturb Nodal expression, producing radialized ectoderm and consequently nervous system defects. Normally, anisotropic Nodal expression correlates with asymmetric mitochondrial distribution and requires activity of p38 SAPK. We hypothesized that redox signaling via p38 establishes the initial anisotropy in Nodal expression, and that environmentally-induced radialization is caused by perturbation of this system. To test this we asked how enzymatic modulation of mitochondrial H₂O₂ emission affects the activities of p38 and Nodal. Whereas quenching of mitochondrial H₂O₂ down-regulates both p38 and Nodal, augmentation of mitochondrial H₂O₂ up-regulates p38 without affecting Nodal, indicating that mitochondrial redox signaling via p38 is necessary but not sufficient for Nodal expression. Thus, ectodermal radialization in response to environmental exposures is likely to involve more than simple modulation of mitochondrial redox signaling. To obtain clues as to what else might be involved we are using microarrays to analyze gene expression patterns induced by radializing treatments.

R4 New York University School of Medicine

Studies of the mechanisms of nickel induced cancer and cardiovascular disease at the NYU NIEHS center

Costa, Max, Haobin Chen, Chuanshu Huang, Lung Chi Chen, Kaz Ito, Ike Wirgin, Judy Xiong, and Mort Lippmann
New York University School of Medicine, New York, NY

H. Chen and Costa have discovered a new class of enzymes that oxidatively demethylate histone H3 Lysine 9. JHDM2A uses Fe in its active site and Ni ions bind in its place to inhibit activity and enhance H3K9 diene in a number of gene promoters, resulting in inherited silencing of genes. Wirgin and Costa, have shown that Ni ions induce histone H3 methylation marks in tomocods *in vivo*. Xiong, and Costa, study the effect of Ni ions on nucleosome structure using Atomic Force Microscopy. Huang, and Costa have shown that Ni ions affect cell signaling through the K κ /p65-dependent pathway. Lippmann and Chen have found that the currently low concentrations of Ni in ambient air can significantly affect cardiovascular function in an animal model of atherosclerosis. Ito has shown that ambient air Ni concentration is significantly associated with excess daily mortality in US cities. Lippmann is characterizing the unusually high concentrations of Ni in New York City air, and the extent to which Ni is associated with excess mortality. Supported by ES10344, ES014454, ES005512, ES010344 from NIEHS.

Research Highlights

R5 Oregon State University

“Omics” of *in vivo* markers of oxidative stress

Maier, Claudia S¹ and Jan F Stevens²

¹Oregon State University, Corvallis, OR and ²Oregon State University and Linus Pauling Institute, Corvallis OR

Environmental exposures, diseases and aging affect the redox homeostasis resulting in the formation of small molecule oxidative stress markers and oxidative post-translational modifications of proteins. We demonstrate the use of chemical labeling approaches in conjugation with isotope dilution mass spectrometry techniques for the identification, characterization and quantitation of bioconjugates of reactive intermediate with glutathione and mercapturic acid (MA) as well as proteins. Using LC-MS/MS and synthetic stable isotope-coded standards more than 15 small molecule markers of oxidative stress, reflecting secondary metabolism of reactive lipid peroxidation products, are available to monitor changes in oxidative stress levels. These studies have resulted in the identification of MA metabolites of HNE and ONE as new urinary biomarkers of oxidative stress. In addition, we have introduced aldehyde-specific and stable isotope-coded affinity probes to identify, characterize and quantify protein targets of oxidative modifications in cell culture and animal models of oxidative stress and aging. Acknowledgment: NIH Grants R01AG025372, R01HL081721, S10RR022589 and P30ES000210.

R6 University of Arizona

Arsenic-induced biomarkers and epigenetic remodeling

Lantz, R. Clark¹, Bernard W Futscher¹, Scott Boitano¹, Taylor J Jensen¹, Petr Novak¹, Kylee E Eblin¹, Walter Klimecki¹, and Mercedes Meza²

¹Southwest Environmental Health Science Center, University of Arizona, Tucson, Arizona, USA;

²Institute Technological Sonora, Sonora, Mexico

Drinking water exposure to arsenic is associated with increased incidence of lung and bladder cancer. Using proteomics and genomics approaches, we have found that MMP-9 is altered as a function of exposure to environmental levels of arsenic. *In vitro* exposure of human airway epithelial cells resulted in increased levels of MMP-9. In lungs of mice, 8 week exposure to 50 ppb arsenic increased MMP-9 gene expression. Results were verified in human sputum and serum. We have tested the hypothesis that environmental arsenicals alter gene expression by acting as epimutagens. Results from an arsenic transformed urothelial cell line showed that arsenic exposure produces changes in histone acetylation and DNA methylation in human gene promoters. These epigenetic changes were functionally linked to the expression state of their associated gene. Early results from epigenomic microarray profiling of DNA from urine revealed DNA methylation differences between populations exposed to 5 or 45 ppb arsenic in their water. Overall, these results suggest that arsenicals may participate in tumorigenesis by altering the expression of proteins through epigenetic changes in select genes. Supported in part by NIEHS Center grant P30-ES-06694.

Research Highlights

R7 University of Cincinnati

Study of serum biomarkers of polyfluoroalkyl compounds in young girls

Pinney, Susan M¹, Frank M Biro², Lusine Yaghjian¹, Antonia M Calafat³, Gayle Windham⁴, M. Kathryn Brown¹, Lawrence H Kushi⁵, and Robert Bornschein¹

¹University of Cincinnati College of Medicine, Dept. of Environmental Health; ²Cincinnati Children's Hospital Medical Center; ³Division of Laboratory Sciences, National Center for Environmental Health, Centers for Disease Control and Prevention; ⁴Division of Environmental and Occupational Disease Control, California Dept of Public Health; ⁵Division of Research, Kaiser Permanente, Oakland, CA

Polyfluoroalkyl compounds (PFCs) and their salts, perfluorooctanoate (PFOA) and perfluorooctane sulfonate, have been reported to change mammary gland structure and function in laboratory animals.

In a study of pubertal maturation, we measured serum PFOA concentrations in 6-8 year-old girls from Greater Cincinnati (N=27) and the San Francisco Bay Area (N=28). Serum was assayed for PFCs using high-performance liquid chromatography-tandem mass spectrometry. Discovery of elevated PFOA concentrations in one area within Greater Cincinnati led to a second study (N=57).

The median values for PFOA differed by site (PFOA 4.7 ng/ml for California and 15.1 ng/ml for Greater Cincinnati), an unexpected finding. In the follow-up study, among 42 girls from the greater Cincinnati area with higher values (NKY), the elevation in serum PFOA persisted (median 17.4 ng/ml, range 6.9-42.6 ng/ml serum). Number of years lived in NKY (p=0.009), especially prior to 2003, and being breast fed (p=0.08) were associated with higher concentrations. Ongoing analyses are examining the relationship between PFOA serum concentration and BMI percentile, stage of breast development, serum triglyceride, or total, HDL and LDL cholesterol.

Support for this project provided by the National Institute of Environmental Health Sciences and the National Cancer Institute, to the University of Cincinnati/Cincinnati Children's Hospital Medical Center, Breast Cancer & the Environment Research Center (U01 ES12770), and Center for Environmental Genetics (P30-ES06096).

R8 University of Louisville

Identification and characterization of gender-specific differences in estrogen receptor beta-interacting proteins in lung adenocarcinoma cells

Klinge, Carolyn M, Margarita M Ivanova, Sabra M Abner, Yoannis Imbert, and William M Pierce, Jr.
University of Louisville School of Medicine, Louisville, KY

The higher risk of lung adenocarcinoma in women than in men suggests gender-dependent factors in the etiology of lung cancer. We previously reported that human lung adenocarcinoma cell lines from females respond proliferatively to estradiol (E2) and were inhibited by 4-hydroxytamoxifen (4-OHT) and ICI 182,780 (Faslodex). In contrast, cells from males were neither stimulated by E2 nor blocked by 4-OHT. Lower ER expression in males is not responsible for the observed phenotype. ERbeta > ERalpha. We tested the hypothesis that E2 selectively increases ERbeta interaction with proteins mediating estrogenic responses in lung adenocarcinoma cells from females not males. Affinity purification and tandem mass spectrometry was used to identify proteins differentially interacting with ERbeta in H1793 (female) and A549 (male) cells. Epidermal growth factor receptor (EGF-R) and CDC6 (cell division cycle 6) were confirmed as ERbeta-interacting by coimmunoprecipitation. Mucin 1 (MUC1) showed greater ERbeta interaction in H1793 (female) cells. Our goal is to identify proteins that may serve as biomarkers or as therapeutic targets to inhibit progression of lung adenocarcinoma in both women and men.

Research Highlights

R9 University of Louisville

Informatics-based decision support tool leveraging pharmacogenetics for predicting responses to biochemical challenges

Linder, Mark W, Kristen K Reynolds, and Roland Valdes, Jr.,

University of Louisville School of Medicine, Louisville, KY

Genotype information provides a powerful tool for predicting susceptibility and response to biochemical challenges. We have developed a computational decision support tool that uses subject-specific genotype and phenotype information to provide a rigorous technology for ongoing application of pharmaco- and toxico-genetics information in predicting personalized responses to pharmacotherapy or environmental challenge. We tested the efficacy of this computational tool using the drug warfarin as a model based on known polymorphisms associated with its metabolism (CYP2C9) and its biological response (VKORC1). The average (+SD) maintenance dose for each subject (4.56 ± 2.17 mg/d, range 1.2 – 12.0 mg/d) versus the maintenance dose calculated using the clinical decision support application (4.78 ± 1.99 mg/d, range 1.8 - 13.6 mg/d) demonstrated good correlation ($y=0.72x+1.53$, $r=0.78$). Our results validate that genotype-based estimates of warfarin maintenance doses and warfarin pharmacokinetic modeling are highly accurate. This approach provides a rigorous method for modeling the temporal and cumulative effects of repeated exposures and provides a basis for predicting personalized responses based on pharmacogenetic information.

R10 University of Louisville

Acrolein exposure induces cardiac dysfunction and cardiomyopathy

Prabhu, Sumanth D, Jianzhu Luo, Guangwu Wang, Tariq Hamid, Roberto Bolli, Sanjay Srivastava, and Aruni Bhatnagar

University of Louisville, Louisville, KY

Although the unsaturated aldehyde acrolein is present in air and water, little is known regarding its cardiac effects. In closed-chest mice and isolated myocytes, acrolein induced contractile dysfunction and myofilament impairment in association with acrolein adducts with sarcomeric proteins and energy metabolism proteins. Gavage-feeding of acrolein (5 mg/kg) 24 h prior to ischemia and reperfusion significantly increased myocardial infarct size. NO donor-induced cardioprotection was also abrogated by acrolein, and was associated with acrolein adducts with mitochondrial protein kinase C epsilon (PKC). Chronic gavage-feeding with 1 mg/kg/d acrolein, a dose approximating human oral aldehyde consumption, induced cardiac inflammation, hypertrophy, dysfunction, and cardiomyopathy. We conclude that acute exposure to acrolein induces protein modifications that impair contractile function, and disrupt PKC signaling and cardioprotection. Chronic environmental exposure to acrolein can induce myocardial inflammation and dilated cardiomyopathy. Analogous responses triggered by acrolein and related aldehydes may be symptomatic of toxicological states associated with ambient/occupational exposures and cardiac dysfunction. NIH Funding: ES-11860.

Research Highlights

R11 University of Medicine and Dentistry of New Jersey Robert Wood Johnson Medical School

Chemoprevention of mammary carcinogenesis by dietary methylselenocysteine (MSC): Effects on circadian rhythm and estrogen receptor beta cycling

Fang, Mingzhu¹, Xun Zhang², and Helmut Zarbl¹

¹*Environmental and Occupational Health Sciences Institute, Robert Wood Johnson Medical School, University and Medicine and Dentistry of New Jersey, Piscataway, NJ;* ²*University of Washington, Department of Environmental and Occupational Health, Seattle, WA)*

To define the molecular basis of MSC chemoprevention, we compared global gene expression profiles in mammary tissues of pubescent female rats maintained on a diet with (3 ppm Se) or without (0.1 ppm Se) MSC supplementation, with and without exposure to carcinogen. The results indicated that carcinogen ablated, and that dietary MSC restored, the expression of circadian genes in mammary cells. MSC-induced expression of circadian genes was also lost in all tumors that arose in NMU treated animals maintained on the MSC enriched diet, suggesting that a normal rhythm suppressed carcinogenesis. While neither carcinogen exposure nor dietary MSC altered blood melatonin levels, MSC dramatically increased the expression of the melatonin receptor in mammary cells, thereby increasing melatonin signaling. More importantly, MSC induced a 7-fold increase in the expression of Estrogen Receptor beta (ERbeta) in carcinogen treated mammary tissue. These findings suggested that MSC prevents mammary carcinogenesis through ERbeta-mediated effects on cell growth and differentiation. Future research will test the hypothesis that abnormal cycling of ERbeta, resulting from disruption of circadian rhythm, contributes to breast cancer in shift workers.

R12 University of Pennsylvania

Chemopreventive role of flaxseed in a mouse model of benzo-[a]-pyrene-induced lung carcinogenesis

Christofidou-Solomidou, Melpo¹, Stacy Gelhaus², Charalambos C Solomides³, Matthew Serota⁴, Ronald G Harvey⁵, Trevor Penning², Ian Blair², and James C Lee⁴

¹*Center of Excellence in Environmental Toxicology, University of Pennsylvania, PA;* ²*Centers for Cancer Pharmacology and Excellence in Environmental Toxicology, University of Pennsylvania, PA;* ³*Temple University Hospital, PA;* ⁴*University of Pennsylvania, PA;* ⁵*University of Chicago, IL*

Introduction: We evaluated the chemopreventive properties of flaxseed (FS), in a mouse model of tobacco-carcinogen-induced lung carcinogenesis. **Rationale:** FS was shown to have chemopreventive properties in breast, colon and prostate cancers, but it has never been tested in lung cancer. **Methods:** A/J mice (n=30 mice per group) were injected i.p. with Benzo-[a]-pyrene (B[a]P) (1mg) once weekly for 3 weeks and given a 10% FS or an isocaloric 0% FS control diet. Lungs were harvested at 5 and 6 months and evaluated for tumor load. **Results:** Lung tumor nodules were smaller in the 10% FS fed mice compared to 0% FS fed mice as confirmed by image analysis (p<0.03) and there was a trend towards decreased nodule size (p=0.09). The percentage of lung area infiltrated by tumor was 4.6% ± 0.7% for 0% FS and 1.9% ± 0.8% for 10% FS. Mouse weight, a sign of animal health, was higher in 10% FS fed mice than in controls that received B[a]P (23 ± 0.8g vs. 20 ± 0.7g, respectively, p<0.01). **Conclusions:** The selected dose and mode of administration of B[a]P generated a reproducible lung carcinogenesis model. Dietary FS retarded lung tumor growth and incidence while improving animal health. **Funding:** Grant 1 P30 ES013508-02 from the NIEHS.

Research Highlights

R13 University of Southern California

Southern California Environmental Health Sciences Center research highlights

Gilliland, Frank D¹, Tracy M Bastain¹, John R Froines², John M Peters¹, Duncan C Thomas¹, and Anna Wu¹
¹*University of Southern California*; ²*University of California, Los Angeles*

The Southern California Environmental Health Sciences Center (SCEHSC) was established in 1996 through funding from the National Institute of Environmental Health Sciences (NIEHS). Dedicated researchers and professionals from the University of Southern California and the University of California at Los Angeles have collaborated to create an interdisciplinary approach to the study and advancement of research in environmental health. The SCEHSC primarily focuses on using epidemiologic methods to study effects of the environment on the health of human populations. The SCEHSC is organized into an administrative core, four research cores, three facility cores, and a community outreach and education core, with the overall goal of understanding how environmental factors affect health and how personal factors modify response. This year, Center research highlights include the role of ozone and oxidant defense genes in asthma, measurement and predictors of on-road vehicle pollution, the role of organochlorines in breast cancer among African-Americans, and new statistical methods for assessing gene-environment interactions in genome-wide association studies.

R14 University of Texas Medical Branch

Synergy between aryl hydrocarbon receptor and constitutive androstane receptor activation promotes murine liver hyperplasia

Mitchell, Kristen and Cornelis “Kees” Elferink
University of Texas Medical Branch, Galveston, TX

Mechanisms of hepatocyte proliferation triggered by tissue loss are distinguishable from those that promote proliferation in the intact liver in response to mitogens. Previous studies demonstrate that exogenous activation of the aryl hydrocarbon receptor (AhR) suppresses compensatory liver regeneration elicited by surgical resection. The goal of the present study was to determine how AhR activation modulates hepatocyte cell cycle progression in the intact liver following treatment with the hepatomitogen, 1,4-bis[2-(3,5-dichloropyridyloxy)] benzene (TCPOBOP), a potent agonist for the constitutive androstane receptor (CAR). In contrast to the suppressive effects of AhR activation induced by 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) following liver resection, TCDD pretreatment resulted in a 30-50% increase in hepatocyte proliferation beyond that observed in the intact liver of TCPOBOP-treated mice. The enhanced proliferative response could be attributed to increased CDK4/cyclin D1 association and CDK4 activity, culminating in enhanced phosphorylation of retinoblastoma protein. Moreover, TCDD increased levels of CAR transcript and activity, which coincided with elevated levels of cyclin D1 transcript. Based on these findings, we conclude that AhR activation potentiates TCPOBOP-stimulated hepatocyte proliferation through a mechanism that may include increased CDK4 kinase activity as well as the potentiation of CAR expression and activity.

Research Highlights

R15 University of Washington

Gene expression profiles in zebrafish brain after acute exposure to domoic acid at symptomatic and asymptomatic doses

Lefebvre, Kathi A¹, Susan C Tilton², Theo K Bammler², Richard P Beyer², Sengkeo Srinouanprachan², Patricia L Stapleton², Frederico M Farin², and Evan P Gallagher²

¹*Marine Toxins Program, NOAA Fisheries/Northwest Fisheries Center, 2725 Montlake Blvd. East, Seattle, WA;*

²*Department of Environmental and Occupational Health Sciences, University of WA, Seattle, WA*

Domoic acid (DA) is a neuroexcitatory amino acid that is naturally produced by some marine diatom species. The impacts of DA exposure at levels below those known to induce signs of neurobehavioral excitotoxicity have not been well characterized. We examined the transcriptome of whole brains from zebrafish (*Danio rerio*) receiving intracoelomic injection of DA at both symptomatic and asymptomatic doses. Zebrafish exposed to high-dose DA (1.2 µg DA/g) exhibited clinical signs of excitotoxicity (EC50 0.86 µg DA/g) within 5 to 20 min of intracoelomic injection. All zebrafish receiving low-dose DA (0.47 µg DA/g) or vehicle had normal behavior. Microarray analysis yielded 306 differentially expressed genes (1.5-fold, $p \leq 0.05$) represented by signal transduction, ion transport, and transcription factor functional categories. Transcriptional profiles were suggestive of neuronal apoptosis. Potential molecular biomarkers of neuropathic injury, including the zebrafish homolog of human NDRG4, were identified and may be relevant to DA exposure levels below that causing neurobehavioral injury. These data provide a basis for identifying pathways of DA-induced injury and biomarkers of asymptomatic and symptomatic DA exposure levels.

R16 Vanderbilt University

Identification of 4-hydroxynonenal targets in plasma proteins using click chemistry

Liebler, Daniel C¹, Hye-Young Kim², Simona G Codreanu¹, Keri A Tallman², and Ned A Porter²

Departments of ¹Biochemistry and ²Chemistry, Vanderbilt University, Nashville, TN

Lipid peroxidation has been implicated in DNA and protein damage in living systems. 4-Hydroxynonenal (HNE) is one of the most widely studied secondary oxidation products from polyunsaturated fatty acids, and HNE adducts have been associated with inflammatory pathologies and diseases. A challenge in characterizing protein damage by HNE and similar lipid electrophiles is the difficulty of detecting adducts in the presence of excess unmodified protein. We have developed HNE analogs that can be biotinylated using “click” cycloaddition during sample workup. This allows affinity capture of HNE-modified proteins or peptides for shotgun LC-MS/MS analysis. We applied this approach here to explore plasma proteins modified by omega-alkynyl-HNE (aHNE).

Research Highlights

R17 University of Wisconsin-Milwaukee

Selenomethionine reduces visual deficits due to developmental methylmercury exposures

Weber, Daniel¹, Victoria Connaughton², John Dellinger², David Klemer¹, Ava Udvardia¹, and Michael Carvan¹

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Selenium is involved in defenses against oxidative stress and MeHg-induced neurotoxicity. Zebrafish embryos (<2 h post fertilization, hpf) were exposed to combinations of 0.0–0.30 μ M MeHg and/or selenomethionine (SeMet) until 24 hpf. Uptake of MeHg was nearly linear. SeMet co-treatment reduced its uptake. MeHg caused reduced visual responsiveness to a rotating black bar in adult fish; SeMet did not induce deficits except at 0.3 μ M. SeMet:MeHg ratios of 1:1 or 1:3 were indistinguishable from controls. No gross MeHg-induced histopathology occurred in retina or optic tectum. Whole-cell, voltage-gated, depolarization-elicited outward K⁺ currents of bipolar cells in retina of adult MeHg-treated zebrafish resulted in a larger outward K⁺ current amplitude in the delayed rectifying IK current; the transient IA current displayed a smaller amplitude among cells in these fish. Developmental co-exposure to SeMet reduced but did not eliminate the MeHg-induced increase in IK response; IA responses increased to match control levels. Gene expression analysis in exposed embryos revealed changes in expression of genes associated with neurological structure and function.

Junior Investigator

J1 Columbia University Health Sciences

Exhaled NO among 7-year-old children who attended head start in New York City

Perzanowski, Matthew S, Adnan Divjan, Robert B Mellins, Stephen M Canfield, Maria J Rosa, Ginger L Chew, Inge F Goldstein, and Judith S Jacobson
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Fractional Exhaled Nitric Oxide (FENO) has been proposed as a marker for airway inflammation in cohort studies of asthma. Children recruited in NYC Head Start centers at age 4 years were brought to a clinic for offline FENO and lung function testing at age 7. Children with specific IgE to inhalant allergens (>0.35 IU/ml) at age 7 were considered seroatopic. Of 149 participating children, 106 had complete questionnaire data, achieved a valid FENO test and had not taken relevant medication on the test day. The 30 children with a report of wheeze in the previous 12 months had higher FENO concentrations than the 76 without (means 18.3 vs. 13.3 ppb, $p=0.030$). In a multivariable regression model adjusting for seroatopy and FEV1% predicted, FENO was significantly associated with current wheeze ($p=0.044$). FENO at age 7 years was positively associated with domestic ETS exposure at age 4 ($\beta=0.28$, $p=0.005$). Given its association with current wheeze, independent of seroatopy and lung function, FENO may be a valid and convenient outcome measure for inner-city cohort studies of asthma. The positive association of ETS exposure at age 4 with FENO at age 7 suggests a long-term detrimental effect of ETS exposure on the airway of young children.

J2 Duke University

In vitro metabolism of polybrominated diphenyl ethers by human and fish liver cells

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Polybrominated diphenyl ethers (PBDEs) are brominated flame retardant chemicals that accumulate and are potential toxicants. In this study we compared the metabolism of two PBDEs in carp liver microsomes and human hepatocytes. Human hepatocytes were incubated with a 10 μ Molar media solution containing either BDE 99 or BDE 209 for 48 hours. Carp liver microsomes were incubated with the same congeners but at lower concentrations (0.2 to 0.35 μ Molar) for up to 24 hours. Hepatocytes exposed to BDE 99 resulted in the formation of oxidative metabolites and included 2,4,5-tribromophenol, two monohydroxylated-pentabrominated diphenyl ethers and an unidentified tetrabrominated metabolite. No metabolites were observed in hepatocytes exposed to BDE 209, possibly suggesting the formation of non-extractable covalent metabolites. In contrast, carp liver microsomes reductively debrominated both BDE 99 and 209 to congeners with fewer bromine atoms. These results suggest that the human liver likely does metabolize some BDE congeners *in vivo* and that oxidative and reductive pathways are the primary metabolic pathways for PBDEs in humans and fish, respectively.

Junior Investigator

J3 Duke University

Ozone-induced airway hyperresponsiveness is associated with tumor necrosis factor alpha (-308A) minor allele

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Exposure to ozone can contribute to exacerbations of pre-existing airway disease and directly lead to airway hyperresponsiveness in vulnerable individuals. Murine and human studies suggest that tumor necrosis factor-alpha (TNF) contribute to airway hyperresponsiveness. Therefore, we hypothesized that TNF plays a central role in ozone-induced airway hyperresponsiveness in both mice and humans. Murine studies confirm the role of TNF in ozone-induced airway hyperresponsiveness and support that lung macrophages are a key source of this pro-inflammatory cytokine. To determine the role of TNF in human subjects, we performed controlled chamber ozone exposures. Pulmonary physiologic response to ozone was characterized using both spirometry and methacholine challenge. Interestingly, each of these phenotypes appear partially independent suggesting unique host factors can regulate each of these pulmonary responses to ozone. To characterize the role of TNF, we determined the frequency of putative gain-of-function minor alleles in the promoter region of TNF. Subjects bearing at least one minor allele of TNF(-308A) [rs1800629] was associated with enhanced methacholine-induced AHR after exposure to O₃. Our observations support a central role of TNF in air pollutant-induced airway hyperresponsiveness in both rodents and humans.

J4 Harvard University (School of Public Health)

Development and application of a novel genome-wide human RNAi library

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Genome-wide gene inactivation methods, such as those based on RNA interference (RNAi), are powerful tools for functional genetics studies. Using a large collection of mostly unique human expressed sequence tags (ESTs), we have developed a novel RNAi library. We used a multi-step procedure to enzymatically convert the ESTs into DNA sequences that express short hairpin RNAs (shRNA) as the gene inactivating agents. The new library contains about 6×10^5 individual shRNA clones, representing an average of over 20 distinct targeting shRNAs for each of the 28,000 human genes in the whole library. Such a shRNA coverage is significantly higher than that of most current shRNA libraries. We showed that about half of the randomly selected shRNAs suppress target gene level by more than 50%, with 10% of the clones reducing target expression by more than 90%. Our current efforts are focused on applying this newly developed RNAi library to study the toxicity associated with exposures to environmental metals such as lead, manganese and arsenic. In particular, we are using the RNAi library together with phenotype-based cell assays to identify human genes, whose inactivation leads to altered susceptibility to metal toxicity.

Junior Investigator

J5 New York University School of Medicine

Serum taurine levels and coronary heart disease in postmenopausal women

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Epidemiologic data on the health effects of taurine (2-aminoethanesulfonic acid) are limited, despite that taurine has become a key ingredient in energy drinks. We are conducting a prospective case-control study nested in the New York University Women's Health Study (NYUWHS), a prospective cohort study of 14,274 healthy women, to evaluate the association between taurine and risk of coronary heart disease (CHD). We first evaluated the long-term reproducibility of serum taurine in three yearly serum samples of 30 participants in the NYUWHS. The intraclass correlation coefficient of taurine was 0.48 (95% CI, 0.26-0.68), and the coefficient of variation was 7%. Based on these data, pre-diagnostic serum taurine is being measured in two yearly samples for each of approximately 200 cases and 200 matched controls. Preliminary analyses of the ongoing study showed that mean serum taurine was positively related to dietary fiber intake ($p = 0.04$), and was lower in hypertensive (133.16 nmol/ml) than normotensive women (141.91 nmol/ml, $p = 0.06$). This will be the first prospective study to evaluate the association between taurine and CHD. The study is supported by NIH grants ES000260, CA16087, CA098661 and AHA grant 0835569D.

J6 Oregon State University

A systems approach to nanotoxicology

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Oregon State University, Corvallis, OR

Nanotechnology will undoubtedly offer revolutionary benefits to society. Already, over 600 consumer products have exploited the unique properties of nanoscale materials. Our concern is that evaluations on the environmental, health, and safety aspects of these materials are lagging behind this rapid commercialization. Multi-disciplinary research strategies need to be developed immediately to address this urgent need. Knowledge of nanomaterial-biological interactions will likely only be arrived at upon inclusion and consideration of the entire body of data produced from global efforts in this research area. To address these needs in the nascent field of nanobiotechnology, we have established a collaborative knowledgebase of Nanomaterial-Biological Interactions (NBI). The NBI serves as a repository for annotated data on nanomaterial physicochemical characteristics and nanomaterial-biological interactions defined at multiple levels of biological organization. Relevant computational and analytic data mining tools are being developed and incorporated into the NBI to provide the framework to conduct species, route, dose and scenario extrapolations and identify key data required to predict the biological interactions of nanomaterials.

Junior Investigator

J7 University of Arizona

In vitro models of human variation in arsenic environmental toxicology

Klimecki, Walter, and Alicia Bolt

University of Arizona, Tucson, AZ

While much ado is made regarding the objective of translating toxicology research to real-world human populations, a longstanding disconnect exists between the need to limit inter-individual variation in mechanistic, experimental models and the striking degree to which inter-individual variation exists in humans. Our goal is to build an *in vitro* model of human tissue that will allow us to explore toxicologically relevant phenotypes in human tissue samples that are homogenous, similar in tissue derivation, allow for extended laboratory experimentation, and allow sampling large numbers of humans. We have used EBV-immortalized human lymphoblastoid cell lines (LBLs) for this purpose. We have characterized an initial set of LBLs for various toxicologically relevant phenotypic markers, notably the effect of exposure to a relatively low level (0.75 μ M) of sodium arsenite (As₃) on population doubling time, necrotic and apoptotic cell death, cell cycle distribution, and DNA synthesis. This poster will focus on the utility of LBLs to model human phenotypic variation. FUNDING: Pilot Project, ES ES06694, ES007091

J8 University of Cincinnati

Persistent hypomethylation in the promoter of Nsbp1 in mouse uteri neonatally exposed to diethylstilbestrol or genistein

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Neonatal exposure of CD-1 mice to diethylstilbestrol (DES) or genistein (GEN) induces uterine adenocarcinoma in aging animals. Here, we aimed at discovering novel uterine genes whose expression is altered by such early endocrine disruption via an epigenetic mechanism. Neonatal mice were treated with 1 or 1,000 μ g/kg DES, 50 mg/kg GEN, or oil (control) on days 1–5. One group of treated mice was sacrificed before puberty on day 19. Others were ovariectomized or left intact and killed at 6- and 18-months of age. Methylation-sensitive restriction fingerprinting was performed to identify differentially methylated sequences associated with neonatal exposure to DES/GEN. Nucleosomal binding protein 1 (Nsbp1) was selected for further study because of its central role in chromatin remodeling. Clustering analysis of the methylation status of Nsbp1 promoter in the entire set of 120 samples representing the treatment-by age-groups was performed to determine the frequencies of methylation and their joint occurrences. Our data support the paradigm that manifestation of early-life epigenetic reprogrammed gene expression in the mouse uterus is dependent on adult ovarian steroids and changes over the course of natural aging of the animal.

Junior Investigator

J9 University of Louisville

Rat Mcs1b is a comparative genetic model of a human breast cancer susceptibility locus

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Breast cancer susceptibility is controlled by genetic, epigenetic, and environmental components. Human SNP rs889312 marks a breast cancer susceptibility allele on chromosome 5. Potential candidate modifier genes are located in a ~280 Kb linkage disequilibrium (LD) block containing rs889312. Genetic models may be useful to study this complex disease associated locus. Rat Mcs1b is a mammary carcinoma susceptibility (Mcs) quantitative trait locus (QTL) that was initially mapped to 16 cM of rat chromosome 2. This was done by introgression of Copenhagen (COP) Mcs1b onto a susceptible Wistar-Furth (WF) genetic background. In WF.COP congenic lines, Mcs1b-COP alleles decrease mammary tumor multiplicity compared to Mcs1b-WF alleles. Additional WF.COP congenic lines, containing different COP chromosome 2 segments of the initial 16 cM Mcs1b region, have been tested to fine-map Mcs1b. Mcs1b-COP has been delimited to ~1.2 Mb of rat chromosome 2. This fine-mapped rat Mcs1b region is orthologous to the human LD block containing breast cancer risk associated SNP rs889312. Rat Mcs1b may be useful to determine candidate genes, molecular genetic mechanisms, and genotype by environmental interactions controlling breast cancer susceptibility.

J10 University of Medicine and Dentistry of New Jersey, Robert Wood Johnson Medical School

Acute changes in heart rate variability in Type II diabetics following a highway traffic exposure

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To investigate mechanistic explanations for previous associations between acute cardiovascular events and traffic/driving exposures, we assessed the feasibility of measuring in-vehicle pollutant levels and examining acute changes in multiple biomarkers in older type II diabetics, following a 2 hour car ride on a heavily truck congested highway during the morning rush. We measured biomarker levels and subject-reported stress pre-exposure, post-exposure, and the next morning after the car ride. Compared to pre-exposure levels, we found significant 20-34% reductions in r-MSSD and high frequency HRV the next morning, and a significant 93% increase in the low to high frequency HRV ratio (LFHFR) immediately post-exposure. We found non-significant decreases in SDNN and increases in LF and von Willebrand factor concentration the next morning, but no change in serum nitrite or blood pressure. These HRV changes were unchanged when excluding subjects who reported stress, and were most-strongly associated with in-vehicle UFP counts. Thus, this pilot study demonstrates the utility of this highway exposure design to document and evaluate acute changes in biomarkers following real-world traffic/commuting exposures in susceptible populations.

Junior Investigator

J11 University of Pennsylvania

Identification and quantification of candidate protein biomarkers of preterm birth by liquid chromatography/tandem mass spectrometry

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Preterm labor is defined as presence of uterine contractions causing cervical dilations before term gestation (between 20 and 37 weeks). Preterm labor precedes almost half of preterm births (PTB) and is the leading contributor of perinatal morbidity and mortality. Early identification of at-risk women can alleviate this problem, and hence the need for novel biomarkers. Our study utilizes SILAC methodology to develop labeled proteome standard which models human cervical-vaginal fluid (CVF) proteins. Secreted proteins from human endocervical (End1) and vaginal (VK2) cells labeled with [¹³C₆¹⁵N₂]-Lysine and [¹³C₆¹⁵N₁]-Leucine were characterized by liquid chromatography/tandem mass spectrometry (LC-MS/MS). An LC-multiple reaction monitoring/MS (LC-MRM/MS) assay was developed to quantitate 15 promising biomarkers for PTB. This assay was applied to investigate CVF samples, five each, obtained from pregnant women that delivered at term (Control) or preterm (PTB). This methodology has identified three proteins that were significantly elevated in preterm CVF samples as compared to the Controls. Future work will validate these PTB biomarkers in a larger cohort of human patients.

J12 University of Pennsylvania

Pathway differences in benzo[*a*]pyrene DNA-adduct formation in H358 human bronchoalveolar cancer cells

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Centers for Cancer Pharmacology and Excellence in Environmental Toxicology, University of Pennsylvania, Philadelphia, PA

To understand the mechanisms of lung carcinogenesis through metabolic activation, B[*a*]P was used as a model PAH. Activation of B[*a*]P by CYPs 1A1/1B1, to B[*a*]PDE is one of the most widely accepted pathways of metabolism. Induction of the CYP1 family in H358 cells requires pretreatment with TCDD. An unexpected increase in B[*a*]PDE-DNA-adduct formation was observed in cells not subjected to TCDD. For all biochemical experiments, a stable isotope dilution LC-MS assay was used to analyze B[*a*]PDE-dG-DNA and B[*a*]P metabolites. After 12 h there is still a significant level of B[*a*]P-7,8-dihydrodiol present; however, H358 cells pretreated with 10 nM TCDD (6 h) followed by 2 μM (-)-B[*a*]P-7,8-dihydrodiol (12 h) have no detectable B[*a*]P-7,8-dihydrodiol. Microarray analysis was performed on H358 cells (n = 4, each treatment) on an Affymetrix Human Gene 1.0 ST Array. Gene expression data reveal that CYP1A1 and 1B1 are significantly induced with 10 nM TCDD treatment, 81 and 12-fold, respectively. Interestingly, these CYPs are also induced with 2 μM B[*a*]P-7,8-dihydrodiol treatment alone, 16 and 7.6-fold, respectively. Differences in gene expression (TCDD vs. B[*a*]P-7,8-dihydrodiol treatment) may explain discrepancies in adduct formation.

Supported by 1F32ES016683 and P30 ES013508

Junior Investigator

J13 University of Rochester

Cell-cell interactions: the organic cation transporter-3 modulates neurodegeneration in the nigrostriatal dopaminergic system

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Using three different animal models of parkinsonism (MPTP, paraquat and methamphetamine), we report that astrocytes contribute to the degeneration of the nigrostriatal dopaminergic structures by regulating the levels of toxic cations through the organic cation transporter 3 (OCT3). OCT3 in the nigrostriatal astrocytes was detected by immunohistochemistry and laser capture microdissection. Bi-directional transport activity of OCT3 was confirmed and, to assess the role of astrocytic OCT3 in inducing dopaminergic cell death by releasing toxic molecules, OCT3-WT and OCT3-KO mice were injected with MPTP to introduce the cation MPP⁺ (active metabolite of MPTP) into astrocytes. Lower striatal levels of MPP⁺ in these mutant mice were confirmed by *in vivo* microdialysis, consistent with less neurotoxicity. To assess the role of OCT3 in attenuating dopaminergic damage by removing toxic molecules from the extracellular space, paraquat and methamphetamine (to induce dopamine efflux) were used. An increased loss of striatal dopaminergic terminals was detected in the mutant mice. This study highlights a novel mechanism that contributes to neurodegeneration as seen in Parkinson's disease. (NIH Grants RO1-ES014899, P30-ES01247, and T32-ES07026).

J14 University of Rochester

Physicochemical properties of nanoparticles that affect their toxicity

Elder, Alison

University of Rochester

Nanosized particles (NP, <100 nm in diameter) possess unique physicochemical properties that make new advances possible in electronics, diagnostics, and therapeutic agents. One unique feature of NPs is that the surface area and, therefore, the number of reactive molecules at the particle surface increases as particle size decreases. Building on knowledge from the study of ambient air pollution ultrafine particles, we hypothesize that the oxidative stress in cells and tissues that has been shown to occur in response to NP exposure is a function of the physicochemical properties of the NP surface. To test this hypothesis, we have designed studies that evaluate NP deposition in specific regions of the respiratory tract, their translocation to extrapulmonary tissues (e.g. central nervous system), and their effects in target organs. These *in vivo* studies are accompanied by thorough physicochemical characterizations of the NP used, evaluations of NP interactions with proteins from tissue and cellular extracts, and *in vitro* studies to better characterize NP uptake and response mechanisms. The ultimate goal is to correlate NP physicochemical characteristics and dose with the *in vivo* and *in vitro* outcome measures.

Junior Investigator

J15 University of Southern California

Glutathione-S-Transferase (GST) P1, GSTM1, exercise, ozone and asthma incidence

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University of Southern California

We hypothesized that GSTP1, GSTM1, exercise and ozone exposure have inter-related effects on asthma pathogenesis. We examined associations of the null variant of GSTM1 and four SNPs in GSTP1 with new-onset asthma in a cohort of 1,610 school children. Children's exercise and ozone-exposure status were classified using participation in team sports and community-specific ozone levels, respectively.

A two SNP model (rs6591255,Ile105Val) best captured the association between GSTP1 and asthma. Compared to children with common alleles for both the SNPs, the risk of asthma was lower for those with the Val allele of Ile105Val (HR 0.60, p-value<0.05) and higher for the variant allele of rs6591255 (HR 1.40, p-value<0.05). Asthma risk increased with level of exercise among Ile105 homozygotes but not among Val105 carriers (p-value=0.02). Risk was highest among Ile105 homozygotes who participated in ≥ 3 sports in the high-ozone communities (HR 6.15, p-value<0.05). GSTM1 null was independently associated with asthma and showed little variation with air pollution or GSTP1 genotype. Children who inherit a Val105 variant allele may be protected from the increased risk of asthma associated with exercise in high-ozone communities.

J16 University of Texas MD Anderson Medical Center

Alcohol consumption and breast cancer development

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University of Texas at Austin

Objective: In women, alcohol consumption increases breast cancer risk and decreases type-2 diabetes risk. Our hypothesis is that alcohol consumption increases breast cancer development and decreases type-2 diabetes risk by a similar mechanism.

Methods: To determine glucose regulation and insulin sensitivity, we performed the insulin tolerance tests (ITT) and glucose tolerance tests (GTT) in mice which had free access to water or 20% w/v ethanol in the drinking water. To determine the effects of alcohol consumption on mammary tumor development, mice were injected subcutaneously with mammary tumor tells. Furthermore, to establish if alcohol has a direct effect on the metastatic ability of breast cancer cells, we determined the effects of alcohol on the invasiveness of T47D human breast cancer cells on *in vitro* studies.

Results: Animal studies show that alcohol consumption improves insulin sensitivity and promotes mammary tumor development. Alcohol consumption may have a direct effect on breast cancer cells, since results from *in vitro* studies shows that alcohol increased the metastatic phenotype of breast cancer cells in a dose dependent manner.

Conclusions: In summary, we show that alcohol consumption improves insulin sensitivity, promotes tumor development and increases the metastatic phenotype of breast cancer cells.

Junior Investigator

J17 University of Washington

Serum cholinesterase inhibition in relation to paraoxonase status among organophosphate-exposed agricultural pesticide handlers

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Low paraoxonase (PON1) activity is associated with increased risk of neurotoxic effects from exposure to various organophosphate (OP) insecticides in animals. The goal of this study is to validate the role of PON1 as a determinant of susceptibility to neurological effects of OPs. Blood samples were collected from 163 agricultural pesticide handlers and tested for PON1 Q192R genotype and level of PON1 expression as determined by arylesterase (AREase) activity. Percent change in BChE activity from baseline levels was evaluated in relation to PON1 status. Relative to participants with high AREase activity, participants with low AREase activity experienced a significantly greater degree of BChE inhibition (means of -3.27% and -8.44%, respectively; $P=0.017$). Greater BChE inhibition was also observed among PON1 Q192 homozygous individuals relative to PON1 R192 homozygous individuals (means of -8.08% and -3.80%, respectively). These results suggest that individuals with low AREase activity and individuals who are homozygous for PON1 Q192 may be at greater risk of BChE inhibition following OP exposure, and support the hypothesis that PON1 status is a determinant of susceptibility to OP-related effects.

J18 University of Wisconsin - Milwaukee

Environmental impacts of nanomaterials on freshwater organisms

Klaper, Rebecca

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Our laboratory examines the potential impact of nanomaterials on various aquatic model organisms that are important both as toxicological models and ecological indicator species. Our work to date has involved examining the toxicity of nanomaterials to *Daphnia* based on their core structure and functionalization and sublethal impacts on *Daphnia* in the form of behavioral and physiological changes. We are currently examining the impact of various nanoparticle exposures on the expression of physiologically-important genes. In addition, we have a U.S. Environmental Protection Agency sponsored project to examine the impacts of surface modifications on the immunotoxicity and immune response in the trout primary immune system. Data from each of these areas will be shown in the poster.

Junior Investigator

J19 Vanderbilt University

Gene-environment interactions between the Huntington's Disease gene and manganese exposure

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¹*Department of Neurology, Vanderbilt Kennedy Center, and Center in Molecular Toxicology, Vanderbilt University, Nashville, TN;* ²*Department of Nutrition, The University of North Carolina-Greensboro, Greensboro, NC*

Huntington's Disease (HD) is caused by expansion of a polyglutamine-tract in the HD protein (HTT) leading to degeneration of the corpus striatum. We hypothesized that metal ions will exhibit gene-environment interactions with mutant HTT if they share common pathophysiological mechanisms (e.g. mitochondrial dysfunction and oxidative stress). Using a striatal cell model of HD we tested mutant and wild-type cells for sensitivity to metal ion toxicity. We report here an unexpected gene-environment interaction in which mutant cells are resistant to manganese (Mn) toxicity. Furthermore, primary neuronal cultures recapitulated this gene-environment interaction. To understand the cellular basis of this interaction we have tested whether Mn transport or storage might be influenced by mutant HTT. We find that net cellular accumulation of Mn is significantly decreased in mutant cells under both basal and Mn exposure conditions. Interestingly, this phenotype correlates with a substantial decrease in the levels of the Mn-dependent enzyme superoxide dismutase 2 (SOD2), which plays a key role in limiting oxidative stress within the mitochondria. We propose that HTT plays a fundamental role in regulating Mn levels *in vivo*.

Community Outreach and Education Core

C1 Columbia University Health Sciences

COEC activities of the Center for Environmental Health in Northern Manhattan (CEHNM): the Northern Manhattan Community Action for a Renewed Environment (CARE) Collaborative

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¹*WE ACT For Environmental Justice, Inc., New York, NY*; ²*Columbia University Health Sciences, New York, NY*

The Northern Manhattan CARE Collaborative is a partnership among more than 25 community organizations, government agencies, environmental groups, universities, medical centers, and non-governmental organizations committed to improving the environmental health of Northern Manhattan. The work is funded through a cooperative agreement with the U.S. Environmental Protection Agency and WE ACT for Environmental Justice, Inc. The goals of the project are (1) to build a multi-stakeholder group of community members to identify, rank and prioritize environmental health hazards in Northern Manhattan and (2) to build community power through education and advocacy in relation to environmental health issues of priority. During the past year, a steering committee for the Collaborative was formed and met several times to plan activities which include but are not limited to an environmental health issue survey, strategies for outreach in the 4 targeted community areas and collaborative activities to expand support of the initiative. Technical assistance and support during the project period will be provided by CEHNM in addition to other Collaborative members.

C2 Duke University

Duke University Center for Comparative Biology of Vulnerable Populations (CCBVP): neighborhood health outreach and translation

Miranda, Marie Lynn, Jeffrey A Davis, and Martha H Keating
Nicholas School of the Environment, Duke University, Durham, NC

The mission of the COEC is to provide communities with tools that promote preventive environmental interventions to protect public health. These interventions include environmental health outreach and education directed at families with children; building the capacity of disadvantaged communities to understand and prevent environmental health risks; and providing a bridge between campus research and community action.

Two projects focused on neighborhood health are: helping a community assess the public health impact of discharges from an industrial facility; and developing a GIS-based tool to assess the built environment. Faculty and staff at Duke have been assisting a Durham community with issues related to a polluted stream by participating in stakeholder meetings, providing maps, explaining toxics release information, and collecting and analyzing environmental samples. The COEC also continues to expand a community assessment tool to provide detailed data describing the built environment of Central Durham. This dataset is interfaced with a spatial analysis of public health in Durham yielding insight into built environment influences on health, and is also provided to communities to help them advocate for their neighborhoods.

Community Outreach and Education Core

C3 Harvard University (School of Public Health)

To eat or not to eat, that is the (health) question: “a sea of troubles?”

Backus, Ann S

Harvard University (School of Public Health), Boston MA

The Massachusetts Department of Public Health (MDPH) seeks to craft an advisory regarding the consumption of marine fish. The MDPH and the Harvard NIEHS Center teamed-up to apply current research to the question: Can population and nutrition studies help us inform the public about the health risks and benefits of eating marine fish? A facilitated workshop with presentations and panelists covered PCBs, Omega-3 fatty acids, child development; neurodevelopment; nutrition, pregnancy, and childhood health; and cardiovascular health. Health outcomes such as attention behaviors, ADHD, pregnancy outcomes, adiposity, atopy, arrhythmias, neurological development, and sudden cardiac death were presented in terms of PCB and Omega-3 consumption. The panelists responded to the following questions: Can we define susceptible populations? Can we define a concentration of PCBs at which the health risks clearly outweigh the health benefits? What public health messages are most effective?

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C4 Massachusetts Institute of Technology

Museum-based exhibits and biology programs for outreach

Vandiver, Kathleen M, Bevin P Engelward, Amy F Fitzgerald

Massachusetts Institute of Technology, Cambridge, MA

Science museums offer an excellent platform for DNA education because of their diverse clientele. Museums also serve schools by offering programs and in this manner they support teachers who teach DNA biology. Additionally since molecular biology is such a rapidly expanding field, museums now offer teacher professional development by hosting university lecturers and summer workshops for teachers. The development of MIT Museum's exhibit and classroom space in molecular biology began in November 2005 and was completed in 2007 with two CEHS pilot project grants. “The Learning Lab: the Cell” is now available to teach how DNA directs the synthesis of proteins. It employs a refreshing and inviting hands-on approach, utilizing LEGO molecules designed specifically for this purpose. Groups of students can transcribe and translate a gene, producing a polypeptide chain that can be folded up and inserted into a cell membrane. The space also functions as gallery for visitors. In addition, the MIT Museum annually hosts a joint environmental health science activity sponsored by MIT's CEHS and the Harvard School of Public Health during the April Cambridge Science Festival. This project was supported by NIH-NIEHS P30-ES002109.

Community Outreach and Education Core

C5 Mount Desert Island Biological Laboratory

Short term participation by Maine high school students in environmental health sciences research

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In 2008, the Mount Desert Island Biological Laboratory (MDIBL) and the NIEHS Center for Comparative Toxicology at MDIBL initiated a summer fellowship program for Maine high school students through the NIEHS Short Term Educational Experience for Research (STEER) program. The MDIBL STEER program (ES016254) employs the principle of capturing a student's sense of discovery by hands-on, hypothesis-driven research. Educational methods include classroom training in environmental health concepts and research techniques, real problem-based learning in the form of hypothesis-driven research, and synthesizing activities including writing and public speaking.

STEER joins MDIBL's existing hands-on student research training programs, but provides a specific research training program in the environmental health sciences. The scientific theme is "Pathways of Chemical Action in Human Disease", which seeks to elucidate the mechanisms of toxicity and pathways of excretion of environmental toxicants at the cellular and molecular level. The majority of student activities take place in the laboratory where they work daily with their mentor and the investigator's laboratory staff on an independent research question.

C6 New York University School of Medicine

NYU Community Outreach and Education Core: Education, information and clinical translation

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While not previously funded due to financial constraints, we maintained some COEC programs and initiated others that enhance our abilities to propose outreach, educational, and clinical translational activities in our renewal. We partnered with the John's Hopkins' Center for Talented Youth Program to translate how toxicology really "works". Thirty 5th graders, and their parents, attend our Program where they have "hands-on" workshops concerning air pollution, microbiology, and DNA. Public knowledge gaps about environmental health continue to be filled through our Web-based Environmental Health Education efforts. Center Investigators reach out to the community by participating as speakers at a NY Science Café that attracts ≈30-50 community members and provides them a short presentation on a timely-scientific topics (i.e., World Trade Center disaster, air pollution, and genetic susceptibility) followed by discussion. Also, we recently partnered with the Bellevue/NYU Occupational & Environmental Medicine Clinic. Through these "bench-bedside-community" initiatives and community-guided/educational actions, our NYU Center's scientific expertise links with the needs and interests of the local communities in and around NYC.

Community Outreach and Education Core

C7 Oregon State University

Oregon partnership to improve environmental health in the home (EH@Home)

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Innovative and collaborative approaches to environmental health education and outreach from Oregon State University will leverage funding, combine expertise, and impact the health of a greater number of Oregonians. The EH@Home project will create a unique opportunity by bridging two established organizations within Oregon State University – the OSU Extension Service and the Environmental Health Sciences Center. This partnership will focus on indoor air quality, drinking water quality education, nutrition, risk, and household chemicals. The approach focuses on novel ways to incorporate environmental health education and resources into current Extension Service programs to make a difference in the health of their communities. The project includes in-person educational events as well as incorporating web technology, such as podcasting, video, social networks, and blogs.

C8 University of Arizona

COEC informs American Indians, Hispanics, and student pharmacists about SWEHSC themes and addresses community environmental health questions

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The SWEHSC COEC serves as a non-biased source of scientific information; provides environmental health educational resources; and supports connections between investigators and the community. These activities are based on the “Synergistic Cascading” model of outreach, the “Capacity Building” partnership model, and the “Progressively Developing” evaluation. With the Gila River Indian Community, the Asthma Information Walk and other existing materials are being used in a public environmental health education campaign. Graduate students of SWEHSC investigators are participating in some of these events. Methods developed will be used in Mexico, to inform Yaqui community members about the health effects of arsenic. With members of the Hispanic community, the COEC has a long-standing project regarding TCE contamination. Students at local schools are learning about arsenic contamination, TCE exposure, toxicology, lead poisoning, asthma and allergies, and the health effects of household chemicals, from pharmacy students of the COEC elective course, Environmental Health Literacy / Service Learning. The COEC summer internship program teaches environmental health research and over 50% of SWEHSC investigators have hosted interns.

Community Outreach and Education Core

C9 University of Cincinnati

2008 NIEHS Town Meeting, your home, your health, your voice

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The Center for Environmental Genetics, housed in the University of Cincinnati Department of Environmental Health, joined the National Institute of Environmental Health Sciences (NIEHS) in hosting a town meeting, entitled “Your home, your health, your voice,” on September 15, 2008 at the National Underground Railroad Freedom Center in downtown Cincinnati, Ohio. The goals of this meeting were to give community members information about the ways that substances such as lead, mold and second-hand smoking in their homes affect their health, and to give the community the opportunity to voice their concerns about environmental health issues to local researchers and NIEHS. Participants included community action groups, local health departments, NIOSH, science communication specialists, and staff and faculty from the University of Cincinnati and Cincinnati Children’s Hospital Medical Center.

In this article, we describe the mechanisms employed to encourage community participation, and measures taken to increase community knowledge and build bridges between academic and community groups. A discussion of the repurposing of materials is also included.

C10 University of Louisville

Genes, environment, culture and disease: development of a community-based educational program in Shelbyville, Kentucky

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The primary goal of the CEGIB COEC is to educate residents on the importance of interactions among genes, environment, culture, and disease. Our current focus area is the fast-growing Hispanic community of Shelbyville, Kentucky. This community lacks many basic social and economic support structures and consequently, continues to function at a disadvantage in terms of health promotion and health literacy. We are working to empower the community with sound medical and scientific information on the role of genes in health and disease, and how environmental factors and lifestyle practices can significantly influence health outcomes. Strong partnerships are now in place with community-based organizations and six community leaders, trained as lay health workers and, self-identified as “Promotoras de la Salud Ambiental”, have begun to engage residents in a comprehensive health assessment survey. Their presence in the community has been received enthusiastically and generated considerable community support. The ultimate goal of the intervention is to build a self-sustainable educational program that persists within the community long after the intervention is completed.

Community Outreach and Education Core

C11 University of Medicine and Dentistry of New Jersey, Robert Wood Johnson Medical School

Community Outreach and Education Core

Hemminger, Laura E

University of Medicine and Dentistry of New Jersey-School of Public Health

COEC's primary Target Audience is the Research Attentive which include community members who have a high level of interest and want to stay well informed on a particular environmental health issue due to their or a family member's illness, or increased risk due to exposures in the workplace. COEC has established partnerships with organizations serving the Research Attentive, including state chapters of the American Cancer Society, the American Lung Association and the American Parkinson's Disease Association, as well as the New Jersey Work Environment Council. These partnerships provide an ideal communication channel through which to disseminate Center research. COEC will participate in events and programs sponsored by the partners, provide translated research information and host an informal research discussion session for the partners' staff and volunteers. The discussion sessions will bring together the Research Attentive and Center researchers to facilitate two-way communication and collaboration. The Research Attentive will share their concerns about the particular illness and its association with environmental factors and researchers will briefly present their research. COEC is supported by the NIEHS (Grant P30 ES05022).

C12 University of North Carolina – Chapel Hill

Empowering North Carolinians to reduce the impact of outdoor air quality on health

Graves, Neasha B, Kathleen Gray, and Amy MacDonald

University of North Carolina-Chapel Hill

The UNC Center for Environmental Health and Susceptibility COEC focused on empowering diverse audiences to reduce the effect of poor outdoor air quality on health. A centerpiece of this work was a TV campaign, in partnership with WTVD ABC-11, that reached families in twenty-one central NC counties, raising awareness of the damaging health effects of poor air quality and encouraging action to improve it.

Related outreach included sharing interactive activities that could be used with patients, such as models of impaired lungs, with nursing consultants and other health professionals at local and regional meetings. We used these activities with vulnerable populations in underserved communities, including parents of children in a local Head Start program and minority church summer camps. One of our physicians conducted grand rounds at two major medical centers to inform peers of the connection between climate change and health, emphasizing asthma.

As advisors to the NC Asthma Program in the Division of Public Health, we helped the program incorporate the latest environmental health research into the activities of the NC strategic asthma plan. We also assisted in coordinating and conducted workshops at the annual NC Asthma Summit.

Community Outreach and Education Core

C13 University of Pennsylvania

Successful community-first communication model for the remediation of Perfluorooctanoate

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¹Center of Excellence in Environmental Toxicology, University of Pennsylvania, Philadelphia, PA; ²Sutter East Bay Medical Foundation, Oakland, CA; ³University of Pennsylvania, Philadelphia, PA; ⁴Ohio State University, Columbus, OH; ⁵Decatur Community Association, Cutler, OH

This poster describes the successful development and implementation of a plan to communicate results of a community research study to both individuals participating in the study and the community as a whole. The community, through its Community Advisory Committee at a meeting open to all residents, developed a set of principles for communication and identified the principal targets. The model involved communicating information and results to the affected residents and the community before other groups such as the media. The communication plan and sequence is outlined. The plan was well-received, and appeared to both alter the usual industry-community power balance and increase community adoption of study recommendations. This study was supported by grant ES12591 from the Environmental Justice Program of the NIEHS and by P30 Core Center grant ES013508.

C14 University of Pennsylvania

Summer mentored research experiences in environmental health

Field, Jeffrey M, Richard Pepino, Maria K Wolf, and Linda A McCauley

Center of Excellence in Environmental Toxicology, University of Pennsylvania, Philadelphia, PA

The University of Pennsylvania Center for Excellence in Environmental Toxicology offers an interdisciplinary summer mentored research program for undergraduates and high school students. The 3 over-arching objectives are to: 1) recruit stellar Penn undergraduate students for participation in a structured summer educational and experiential program focusing on environmental health programs of research at Penn, 2) provide a structured summer educational and experiential environmental health program for select high school students from primarily disadvantaged backgrounds, 3) and provide mentorship opportunities in the defined areas of environmental exposures and health effects associated with lung and airway disease, endocrine and reproduction disruption, gene-environment interactions, and oxidative stress. The program also aims to develop communication skills through presentations to mentors and peers, to analyze quantitative and qualitative data to improve decision-making, and to identify the relationship between scientific research and the political and policy consequences. Supported through the NIEHS Short-Term Educational Experience (STEER) Program (ES016146).

Community Outreach and Education Core

C15 University of Rochester

Rochester's Healthy Home: a hub for neighborhood health

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Home based environmental hazards are major contributors to diseases such as lead poisoning and asthma that disproportionately affect low income and minority children. Traditional outreach techniques (health fairs, provider visits, etc.) may not be effective with these groups. However, home visits have been successful in reducing home health hazards. In partnership with several community groups, we have created a model Healthy Home, an interactive 'museum' housed in an inner city Rochester residence. The Healthy Home project was initiated in 2004 and opened to the public in 2006. The Healthy Home provides residents, property owners, contractors, and community groups with hands-on demonstrations of low-cost methods for reducing home hazards. It also educates visitors about the health impacts of these hazards and refers visitors to resources for addressing hazards in their homes. After two years of operation, 2000 people have visited the Healthy Home. This poster will highlight the Healthy Home's effectiveness in educating diverse visitors, recruiting new partners, and incubating new community health initiatives.

C16 University of Southern California

"Moving Forward" - a conference on healthy solutions for communities impacted by trade, ports and goods movement

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Marine ports, railyards and warehouses are expanding in dozens of U.S. communities to accommodate rising international trade. The L.A. area ports are at the epicenter of health concerns over emissions from poorly regulated ships, locomotives and trucks. The Southern CA Environmental Health Sciences Center, through its Community Outreach and Education Core (COEC), has been at the forefront of describing the local environmental health impacts of global trade. In 2007 the COEC sponsored an international gathering aimed at communities impacted by ports and freight transport. The COEC and 20 community partners formulated the two-day agenda. More than 550 participants attended from 16 states and 4 countries, including EJ groups, academics, COECs, labor union reps, school nurses, government and elected officials. Center scientists shared research findings; community groups shared successes and challenges; and attendees brainstormed protective strategies. There was widespread agreement of need for a national communications network. Materials are on the COEC's academic/community collaborative website: www.TheImpactProject.org. Funding: NIEHS grants #5P30ES007048, P01ES009581, R826708-01 and RD831861-01; U.S. EPA; and 6 foundations.

Community Outreach and Education Core

C17 University of Texas Medical Branch

Addressing air quality and health effects in Southeast Texas

Ward, Jonathan B, Sharon A Petronella, Edward G Brooks, and John Sullivan
University of Texas Medical Branch, Galveston, TX

Air quality and associated health effects have been a long standing problem in Southeast Texas. The UTMB COEC has participated in addressing air quality issues, in collaboration several community partners, by participating in research, community education, and community service. Research activities have included participation in the Houston mayor's Task Force on Air Quality, a study on state air quality standards, a COEC study of air quality and lung function in life guards, GC-SURE, our EJ project on lead and asthma in homes in Houston (COAL), and membership on the board of the Texas Environmental Research Consortium. Education programs included air quality warning flag systems for the Galveston beaches and for schools, asthma education, information for Texas legislators, participation in public forums on air quality, and comments on regulations proposed by the USEPA. We have partnered with community groups in Galveston, Houston, Port Arthur, and Corpus Christi to address local air quality problems with advice and community education. We assisted the Community in Power Development Association in Port Arthur regarding a permit to allow incineration of TCCD waste imported from Mexico. Support: P50-ES006676, R25 ES012595.

C18 University of Texas MD Anderson Cancer Center

EHS Outreach in Rural Communities

Fuchs-Young, Robin
The University of Texas M.D. Anderson Cancer Center

The goals of CRED COEP are to develop/maintain programs that: 1) promote careers in EHS and public health, 2) respond to community needs and translate Center research to lay audiences and policy makers, 3) facilitate center research through outreach to study populations. The Summer Undergraduate (SURP) and High School Research Programs offer students a chance to perform research under the mentorship of Center faculty. In 2007, the COEP received a NIEHS STEER grant to support the SURP. COEP and Center scientists attend HESTEC (Hispanic Engineering, Science and Technology), initiated to address the critical shortage of scientists/engineers, to encourage students to pursue research careers and provide bilingual information about causes and prevention of environmental disease. Through the HHMI-funded CENTIPEDe (Community Education Networks to Integrate Prevention of Environmental Disease) Project, COEP provides increased access to scientific information for the students and residents of the rural communities. We have conducted experiments, provided demonstrations, and discussed scientific careers with over 1200 students. Community Science Night promotes scientific literacy and draws residents to programs about goals of EHS research.

Community Outreach and Education Core

C19 University of Washington

Successful strategies for assessing your center's research strengths and outreach capacity

Sharpe, Jon F, and Kelly A Fryer-Edwards,
University of Washington, Seattle, WA

Over the past year, the COEC at the Center for Ecogenetics and Environmental Health (CEEH) has completed a significant administrative reorganization and undertaken a variety of new initiatives. Our Ethics and Outreach Core (EOC) brings together a diverse group of faculty, education professionals, and research assistants dedicated to exploring the ethical, legal, and social implications of research and communicating these along with research results to a broad range of audiences. Doing this effectively, however, requires a thorough and up to date understanding of what Center investigators are doing, both in terms of research and research translation. The CEEH has over 100 affiliated investigators, all of whom share an interest in the impacts of gene-environment interactions on human health. Beyond that, however, their research areas are extremely diverse. In order to effectively assess such a daunting breadth of research strengths and opportunities for public engagement, the EOC realized that new tools and approaches were needed. These have included initiating 1-on-1 interview, developing a web-based outreach survey, creating a new, more robust investigator database, and hosting a series of topic-based discussion forums.

C20 University of Wisconsin - Milwaukee

Middle school science education partnership award program

Petering, David
University of Wisconsin-Milwaukee, Milwaukee, WI

The Center has sponsored a middle school science education program for 12 years. It is jointly focused on teacher professional development and enhancement of student inquiry-based learning. Both thrusts of the program are based on a series of modules that offers authentic laboratory experimentation, emphasizes national science content and inquiry standards, infuses environmental health related experiments, and utilizes aquatic organisms of biomedical models. Teacher professional development (TPD) employs a 1 week intensive summer workshop, during which teachers learn about (a) how experimental scientific research is conducted, (b) the science and methodology of doing the experiment modules, (c) environmental health, (d) suggested pedagogical approaches in the classroom, and (e) means of module evaluation. The TPD and student arms of the program include full year-long scientific and educational support for introducing students to the modules. Students from the Milwaukee Public School District and surrounding areas have successfully and enthusiastically conducted extended periods of focused experimentation using the modules, according to evaluation results.

Community Outreach and Education Core

C21 Wayne State University

Environmental health education programs for urban gardeners and child care providers

Xu, Xiaoxin Susan, Sheila O'Brien, and Raenita Glover

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HEALTHY HOMES=HEALTHY KIDS (HH=HK): The HH=HK, is a program teaching environmental health improvement and prevention to community groups and Child Care providers in the Detroit area. Started in 2002, the HH=HK program targets specific areas of environmental health including, Pesticides (PE), Look-a-Likes (LL), Indoor Air (IA), Indoor Water (IW), Heavy Metals (HM) and Food Safety (FS). Knowledge surveys are used to evaluate the pre and post knowledge of participants. 115 people in the 15 workshop presentations given by COEC from 2006-2008, on average, improved their scores in PE, FS, and LL sections by 14.2%. Average scores for IA, IW, and HM increased by 26.6%.

LEAD IN GARDENS: Another of WSU COEC's projects involves engaging community gardeners in environmental health impacts. This program teaches urban gardeners about lead and its environmental impact. In each presentation we stress the importance of awareness, hygiene and nutrition. In the Summer of 2008 WSU COEC pilot tested this program with 39 volunteers from the Earthworks Garden in Detroit, Michigan. The response was overwhelmingly positive.

WSU COEC's methods and outreach are effective in providing materials and resources for low-cost Environmental Health hazard prevention in and around the home. COEC works to evaluate methods of educating the community on environmental health issues and continues to seek new methods and topics to communicate to the public. Supported by NIEHS 5P30ES006639

C22 University of Iowa

Outreach and education in Iowa during the 2008 Midwest Floods

Thorne, Peter S

University of Iowa, Iowa City, IA

In June 2008, the Midwest experienced a catastrophic flood affecting seven states in the region. Of these, central Iowa was most heavily hit, from the smallest towns to the metropolitan areas of Cedar Rapids, Coralville, and Iowa City. EHSRC experts were called upon by local government and aid organizations to provide education, outreach, and research to meet the needs of the general public. Center members participated in a public health panel, gave a series of interviews and provided information to television, radio and print media, as well as to church groups and individuals throughout the disaster.

Topics addressed included conditions for safe re-entry of flooded buildings, mold hazards, mold mitigation, infectious disease hazards, injury prevention, mental health, and air monitoring. A Public Service Announcement entitled, "Mold Hazards and Safety Tips for Clean-up" was also developed by the University of Iowa with EHSRC Director Peter Thorne and posted on numerous local websites, including www.ehsrc.org and YouTube. In addition, center members procured and distributed donated respirators to homeowners, clean-up crews, hospitals, businesses, and the Red Cross in the Iowa City/Cedar Rapids region.

NOTES

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www.med.upenn.edu/ceet/

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