

## **Global Health, Justice and the Environment Conference**

**Wayne State University**

**September 10 & 11, 2019**

### **Poster Session Abstracts**

#### **1. Alex Haimbaugh, Wayne State University:**

*Environmental Contaminants in Detroit Waterbodies: Seasonal Snapshots*

Pharmaceuticals and personal care products (PPCPs), perfluoroalkyl substances (PFAS), and their degradation products are ubiquitous in the environment, including water used as drinking sources and for recreation. PPCPs predominantly enter waterways via sink drains and excretion after human use. PFAS enter mainly from industrial runoff. Additionally, pesticide runoff from agriculture increases near urban areas due to loss of natural habitats and increased infrastructure. Drinking water treatment plants are not designed to handle removal of these compounds, which persist in water, potentially affecting human and aquatic health. The Lake Huron to Erie corridor is a drinking water source for millions, contains important spawning habitats for numerous fish species, and serves as a heavily-used area for recreation. We collected surface water samples from six locations along the corridor to test for PPCPs, PFAS, and pesticides. We found a range of compounds including synthetic sweeteners, flame retardants, pesticides, and antibiotics, among others; primarily pharmaceuticals. We found contaminant loads generally increased down-river, and higher loads were typically detected in spring compared to fall. The highest concentrations detected by class were synthetic sweeteners. Our lab uses a zebrafish model to study impacts of contaminants of emerging concern. We expose zebrafish during a developmentally critical window to environmentally relevant concentrations of detected compounds from the Lake Huron to Erie corridor to assess phenotypic and genetic endpoints. Though these exposure studies are ongoing, results to-date show that acesulfame potassium (synthetic sweetener), gemfibrozil (cholesterol medication), and PFAS (perfluorooctanoic acid and perfluorooctane sulfonic acid) increase activity of larval fish.

**Authors:** Alex Haimbaugh, Bridget B. Baker, Tracie R. Baker, and Destiny Johnson, Wayne State University WATER Lab

#### **2. Belinda Aberle, Wayne State University:**

*There's so much pollution in Detroit! WSU College of Nursing Student Experiences from the CURES Environmental Health Justice Tour*

**Background:** Detroit has a long history of environmental injustice and health disparities. Nurses must have the assessment and advocacy skills to address the environmental health of clients and populations. In response, WSU CON faculty have partnered with CURES to empower future nurses to address these environmental injustices and health disparities. For three years, CURES has led undergraduate nursing student-group tours to Detroit's most salient toxic sites and most notable examples of successful environmental health-related resilience and advocacy. The future aim of this partnership is to measure nursing students' experiential learning using a formal pre and post evaluation of the experience and fully integrate the tour into the undergraduate community health nursing course. **Methods:** More than 200 students have participated in the three-hour tour and program evaluation since 2016. The post-tour survey has provided data on students' reported knowledge gained. A pre-post program evaluation is planned, to assess the program's learning outcomes. We will expand the tour groups to include all undergraduate nursing students during their community health course.

**Results:** The tour and its content are updated each semester with current environmental health sites, resources and data. The partners have preliminary data on students' learning experiences. Plans to include all BSN students will be formalized, including transportation logistics.

**Conclusions:** This tour and our academic-community partnership allows our undergraduate nursing students to attain competency on the issues of Detroit's environmental injustice, enabling best practices in individual environmental health assessment and in advocating for environmental justice.

**Authors:** Brian D. Smith II, CURES Community Relations Specialist, Masters of Urban Planning Candidate 2019; Carrie Leach, PhD, CURES Community Engagement Core Program Manager; Belinda Aberle, MSN, RN, APHN B-C, WSU CON Faculty clinical instructor and course coordinator; Barbara Williams, DNP, RN, WSU CON Clinical Instructor

**3. Jaime Steis Thorsby, Wayne State University:**

*Basement Flooding and the Role of Green Infrastructure in Mitigation Efforts*

In recent years, flooding in the City of Detroit has highlighted the need for further analysis into the causes and potential solutions for basement flooding caused by storm system overflows. In order to learn more about these issues, an engineering investigation was performed to collect data and develop a model of the storm sewer system in the Berg-Lahser neighborhood. Concurrently, a survey was conducted on residents to get a better understanding of the prevalence of flooding in resident's basements in this neighborhood. Utilizing the model and the results of the survey, analysis was then performed to investigate the role of green stormwater infrastructure in reducing resident's basement flooding. The results of this study show some prevalence of basement flooding in this neighborhood and show that strategically placed green stormwater infrastructure can have some effect on decreasing stormwater runoff and can have potentially beneficial effects on basement flooding.

**Authors:** Jamie Steis Thorsby<sup>1</sup>, Carol J. Miller<sup>1</sup>, Lara Treemore-Spears<sup>1</sup>, Natalie Lyon<sup>1</sup>, Byron Lane<sup>2</sup>

<sup>1</sup>Healthy Urban Waters, <sup>2</sup>Michigan Environment, Great Lakes and Energy

**4. Cameron Davidson, Wayne State University:**

*Acute and Long-term effects of environmental-like concentrations of combined exposure to benzene, toluene, ethylbenzene, and xylene*

Benzene, toluene, ethylbenzene, and xylenes (BTEX) are ubiquitous in low concentrations in urban environments and in relatively higher concentrations near industrial and high-traffic areas. We developed a preclinical model testing effects of environmental BTEX exposures on behavior in mice. Two BTEX inhalation exposure groups, adjusted for our exposure paradigm, represented either a 10-fold (ENV10: **B** 1, **T** 17, **E** 23, **X** 24 ppm) or 100-fold (ENV100: **B** 1, **T** 170, **E** 230, **X** 240 ppm) increase of previously documented levels in urban environments. A third group was exposed to the maximum allowable concentrations for occupational settings (OCC: **B** 1, **T** 530, **E** 225, **X** 530 ppm) (positive-control). Lastly there was an air-only control group (AIR: BTEX 0 ppm). Following 15 days' exposure (90 min, twice/day), adolescent male Swiss-Webster mice were assessed for activity, immediate and delayed memory (Y-maze), and motor coordination (gait, rotarod, and inverted screen tasks). Preliminary analysis revealed all BTEX groups (ENV10, ENV100 & OCC) showed increased activity, deficits in memory, and motor coordination compared to unexposed mice (AIR). Our preclinical model suggests that repeated BTEX exposures at environmental levels may have lasting effects on behavior.

**Authors:** Kevin W. Heslip (WSU), Michael M. Naddaf (WSU), John H. Hannigan (WSU), Scott E. Bowen (WSU)

**5. Claudia Allou, Michigan State University:**

*The health benefits of natural sounds: Identification of and initial steps to address knowledge gaps using soundscape mapping and health data from Detroit*

Emerging research indicates that contact with nature, often defined as the time a person spends in greenspaces (e.g., parks), or within view of greenery, can benefit human health. Another dimension of contact with nature exposure to natural sounds (e.g., birdsong) appears to be largely unexplored. To identify the research extent in this area, we first conducted a systematic review. Following a screening process, thirty-two articles were used to extract study details and findings, and only five of these quantified health outcomes rather than perception-based attributes. To address the little research examining the role of natural sound in human health we conducted a pilot study in Detroit (May-Aug 2018). We recruited 33 adults in one neighborhood. Participants completed a survey, including demographic data, perceived stress, depressive symptoms, neighborhood perceptions, as well as anthropometric measurements and blood test strips. To quantify the soundscape, we deployed Songmeters at four participants' homes and the neighborhood park. We listened to the recordings and annotated insect and bird sounds, from 5am-12pm for 4 days. Using counts of natural sounds, we estimated 'acoustic diversity', a sound diversity metric, at each site using a suite of acoustic indices (which quantify variation in the acoustic environment). We created a kriged soundscape map, assigned values to participants, and examined correlations with neighborhood characteristics and health. Our findings serve as an initial step in addressing the paucity of literature on the health benefits of natural sound.

**Authors:** Claudia Allou, Department of Geography, Environment & Spatial Sciences, Michigan State University  
Amber L. Pearson, Department of Geography, Environment & Spatial Sciences, Michigan State University  
Rachel Buxton, Department of Fish, Wildlife and Conservation Biology, Colorado State University  
Carlos Linares, Department of Fish, Wildlife and Conservation Biology, Colorado State University

**6. Rahul Mitra, Wayne State University:**

*Naturalizing Environmental Injustice: How Privileged Residents Make Sense of Detroit's Water Shutoffs*

Water insecurity disproportionately affects low-income, people of color, and other marginalized groups. In the US, urban-suburban conflicts in particular perpetuate environmental injustice, as with Detroit, MI -- which reels under massive infrastructure and distribution costs for a common water system that also services its wealthier suburbs. Starting in 2014, when mass water shutoffs affected more than 33,600 families who were unable to pay their bills, more than 142,000 households have been disconnected. Using Metro Detroit as a case study, our research addresses communicative sense-making of water access and scarcity among both urban and suburban residents. Specifically, we draw on 46 in-depth interviews with urban and suburban residents to examine how race, class and location-based privilege bolsters sense-making discourses that allow better-off residents to dismiss the concerns of water affordability and shutoffs to less-privileged residents. We first uncover three competing macro discourses of water access as life-giving, as undeniable right, and as commodity, and then unpack how these discourses constitute privilege in participants' micro-level sense-making frames. These sense-making frames include emphasizing personal responsibility, paradoxical roles of government as both problem and solution, general civic action, and narrow community bubbles. Collectively, these sense-making frames deny the real scope of Detroit's water crisis, preserve participants' sense of entitlement to water, de-humanize poor Detroiters unable to afford high water bills, and reduce water to a private commodity. Understanding how privilege works can bolster the efforts of environmental justice activists and community organizers.

**Authors:** Kelsey Husnick (PhD student), Mostafa Aniss (PhD student), and Rahul Mitra (Associate Professor) – Department of Communication, Wayne State University

**7. Jeneen Ali, Wayne State University:**

*An effective community intervention to reduce diabetes risk by addressing health disparities and food insecurity*

This study represents a partnership between Gleaners Community Food Bank, National Kidney Foundation of Michigan, and Wayne State University. The Diabetes Prevention Program (DPP) is an effective community-based intervention, known to reduce diabetes risk. However, program completion rates are known to be low in low-income communities. Cooking Matters (CM) teaches healthy meal preparation, grocery shopping on a budget, and nutrition. We hypothesize that by combining DPP and Cooking Matters curricula, more participants will complete the program and experience lower HgA1C values as compared to DPP alone. We observed a 76% completion rate, as compared to the <50% typically observed in low-income communities. Median HgA1C dropped 10.6% ( $p < 0.0001$ ), from prediabetic to normal levels. Further, all individuals who completed the study reduced their HbA1C values. In conclusion, healthy food support coupled with DPP is a more effective strategy for reducing diabetes risk in low-income communities than DPP alone.

**Authors:** Jeneen Ali (Wayne State University), Omar Abbas (Wayne State University), Shavonnea Brown (Gleaners Community Food Bank), Diane Cress (Wayne State University, Department of Nutrition and Food Science)

8. **Danielle Meyer, Wayne State University:**

*Developmental TCDD exposure results in multigenerational histological, transcriptomic, and methylomic abnormalities in male zebrafish gonads*

The industrial by-product TCDD (2,3,7,8-tetrachlorodibenzo-p-dioxin) is a potent environmental toxicant and model endocrine-disrupting chemical (EDC) with known teratogenic effects on humans, rodents and fish. Developmental exposure to some EDCs, including TCDD, is linked to the occurrence of adult-onset and multigenerational disease. Our lab uses zebrafish (*Danio rerio*) as a model to study these effects due to their short generation time, transparency in early development, and ease of early-life exposure. Previous work in this lab revealed decreased fertility in adult zebrafish exposed to TCDD as juveniles. Because the unexposed descendants of these fish (F<sub>1</sub> and F<sub>2</sub>) presented with reduced fertility mediated through the males, we examined the testes of TCDD-exposed males from all three generations, looking for changes in histopathology, gene expression, and whole genome methylation that could account for these reproductive deficits. Histological analysis indicated a shift in germ cell ratio towards immature spermatogonia in F<sub>0</sub> and F<sub>1</sub> generations, indicating delayed spermiation in exposed males and descendants. Microarray analysis of exposed testes indicated that genes involved in epigenetic modification as well as multiple reproduction and infertility pathways were affected across all generations, including testis development and spermatogenesis, lipid metabolism and steroidogenesis, oxidative stress response, citric acid cycle, peroxisome, and xenobiotic response. Upon whole genome methylation analysis, we found TCDD-induced methylation changes in reproductive genes as well as histone-modifying enzymes across multiple generations. Overall, we found that the interplay between these transcriptomic and epigenetic changes could account for the transgenerational impact on fertility due to developmental toxicant exposure.

**Authors:** Danielle Meyer, Wayne State University; Camille Akemann, Wayne State University; Katherine Gurdziel, Wayne State University; Bridget Baker, Wayne State University; Tracie Baker, Wayne State University

9. **Victor Carmona, University of Detroit Mercy:**

*An Exploration of Land Use and Poverty as an Integrative Model for Mitigating Chagas Disease in El Salvador*

Chagas disease is a neglected tropical parasitic disease that is caused by the protozoan *Trypanosoma cruzi* and that is transmitted by several insect vectors in the subfamily Triatominae. Research studies suggest that the vector ecology of Chagas disease may be impacted by anthropogenic changes to natural habitats. The objective of this study was to characterize linkages between poverty levels and diverse land use practices throughout El Salvador. Working at the municipal level, we used GIS to intersect map-layers containing poverty-indices and land use. The resulting intersect map was used to characterize the alpha-diversity of different agricultural, natural, and mixed land use types. We found that the richness, diversity, and equitability of municipal land use types changed with municipal poverty-level, size, population density, and population sex ratio. We also detected that changes in green-space, natural landscapes, and agricultural landscapes correlated with municipal socio-demographic considerations. Given the broad exploratory connections between the vector ecology of Triatominae and the socio-demographics of land use practices, we propose that a multidisciplinary approach will be more effective in mitigating Chagas disease in El Salvador.

**Authors:** Joyce Choi, University of Michigan, School of Natural Resources and the Environment, Ann Arbor, MI; Guillermo Recinos Paredes, María Fernanda Marín Recinos, Vianney C. de Abrego, Universidad de El Salvador; Centro de Investigación y Desarrollo en Salud; San Salvador, El Salvador

10. **Yongli Zhang, Wayne State University:**

*Fate and Transport of Microplastics During Drinking Water Treatment Processes*

Water pollution due to the widespread presence of microplastics is an urgent global problem. Recent studies of 159 tap water samples taken from several countries and 259 bottled water samples across 11 brands showed that 81% of tap water and 93% of bottled water contained MPs. This work aims at better understanding the occurrence, fate and partitioning of microplastics in water treatment systems, as well as the interactions of microplastics and water microbiome. Bench-scale experiments and field-water sampling were conducted to evaluate the removal efficiency and partitioning of microplastics in different water treatment processes, as particularly pertaining to sedimentation and filtration. In addition, the interactions of microplastics and water microbiome were investigated by studying bacterial growth, profile, and antibiotic resistance in water with and without the presence of microplastics. Results suggest that microplastics' densities / sizes and filtration materials can affect the removal efficiency of microplastics in water treatment systems. The presence of microplastics significantly enhances bacterial proliferation and antibiotic resistance. In addition, biofilms are easily formed on microplastic surfaces and are able to breakdown microplastics to smaller particles, posing significant challenges for the monitoring and detection of microplastics.

11. **Carrie Leach, Wayne State University:**

*There needs to be more dialogue between researchers and decision makers regarding environmental justice issues: Communicating Science Best Practices*

Background/aims: Scientists can contribute to environmental justice efforts by providing reliable and accurate information to assist decision makers and leader's problem solving around environmental health issues. While scientists are well equipped to communicate with academic audiences in scholarly venues, it is uncommon to have developed skills for engaging lay audiences. This project aimed to strengthen capacity amongst researchers to engage with advocates who can use the information to address environmental issues and improve public health. Methods: This project was a collaboration between the Community Engagement Cores of three Environmental Health Science Core Centers at Wayne State University, the University of Michigan, and Texas A&M. A review of existing resources and literature was conducted, followed by stakeholder and key informant interviews across three sites. The data were analyzed collaboratively to identify themes along with a community partner for member checking.

Results: The interview findings coalesced and addressed gaps in the literature and informed the development of "best practices" for communicating environmental health information. Those were piloted by translating scientific information and refined through community partner evaluation and synthesized into a one-page fact sheet. Finally, a primer was created to inform researcher interactions with legislators as well as a webpage to house the resources.

Conclusion: Along with development of skills in framing scientific research in a manner that is responsive to questions and concerns of decision makers, practical skills for interfacing with frontline communities and policy-makers are essential to ensuring that environmental health decisions are informed by the highest quality scientific evidence.

**Authors:** Carrie Leach, PhD, Program Manager, Community Engagement Core, CURES, Research Associate, Institute of Gerontology, Wayne State University; Nick Schroeck, JD, Co-Director, Community Engagement Core, CURES, Wayne State University, & Director of Clinical Programs, Associate Professor of Law, University of Detroit Mercy School of Law

**12. Colleen Linn, Wayne State University:**

*Groundwater quality in SE Michigan: Corridors towards exposure and conceptualizing municipal response*

Urban groundwater quality in the Great Lakes Basin is an issue largely overlooked due to the region's reliance on surface water resources for drinking water in urban areas. Attempting to remediate problems with groundwater quality requires the integration of several different fields as there are multiple perspectives to examine this issue. This project follows urban groundwater flows, especially in regards to the 1,4 dioxane plume in Ann Arbor, from a multidisciplinary perspective that combines engineering, pharmacology, and anthropology to holistically discuss groundwater quality issues in relation to urban sustainability. The Ann Arbor dioxane plume, which was the result of a decades-old industrialized site, has leached 1,4 dioxane into the groundwater. The plume is mobile, and has recently been detected in the city's surface water supply and in finished drinking water. This has encouraged residents to change their water routine and seek alternative sources of drinking water. Research of the project is still ongoing. Objectives include understanding preferential pathway modeling for groundwater, phenotypic and genomic effects of 1,4-dioxane exposure, and how cities and citizens manage groundwater amid drinking water contamination concerns. Findings of this project are aimed at tailoring responses and communication efforts by the scientific community, while illuminating the challenges cities and states face when responding to drinking water concerns.

**Authors:** Colleen Linn, Anthropology; Brendan O'Leary, Engineering; Camille Akemann, Pharmacology @ Wayne State University

**13. Brendan O'Leary, Wayne State University:**

*Understanding urban water flow: Neighborhood scale shallow groundwater migration*

Groundwater plays a critical role in the water balance of the Great Lakes contributing between 22-42% of the total water input into the Great Lakes with precipitation and surface water runoff accounting for the remaining difference. In this way, groundwater impacts many systems that range from supplying drinking water, to industrial water supply, to transportation. Understanding groundwater is critical to assessing urban hydrology budgets and ultimately assessing the economic, health, and social implications. This project will establish an understanding of groundwater flow and transport in the Detroit region. Establishing estimates of groundwater flow will contribute to optimizing green stormwater infrastructure design, understanding groundwater contribution to the migration of subsurface pollution, and identify exposure pathways within communities in Detroit. Field observations are being conducted at Recovery Park in Detroit, Michigan. This project, centered at the Recovery Park, will serve as a model for evaluating neighborhood-scale urban shallow groundwater movement in Detroit. This model will help develop and assess the potential risks posed to urban environments and human health.

**Authors:** Brendan O'Leary, Sadaf Teimoori, Carol Miller - Civil and Environmental Engineering, Wayne State University

**14. Sadaf Teimoori, Wayne State University:**

*Groundwater in Detroit: Regional Modeling Analysis and Human Health Considerations*

The clay composition of near-surface sediments limits the occurrence of groundwater at depths ranging from three to ten feet beneath the ground surface in Detroit region. This shallow groundwater provides faster migration pathways for contaminants to transfer from groundwater to the unsaturated zone and the ground surface as chemical vapors, eventually resulting in Detroit's high preterm birth rate, according to the Michigan Department of Health and Human Services. Consequently, a comprehensive assessment of the groundwater and its contaminants migrating through the porous media seems to be necessary in Detroit region. In this project, we simulated a conceptual model of Detroit's four major watersheds, analyzed the groundwater flow direction, and investigated the probability of migration of contaminants. The results show that the region's shallow groundwater flows from northwest toward southeast, provides migration pathways for contaminants in this direction, and increases the probability of pollution in Detroit River supplying one of the most important source of drinking water for residents. Knowledge of the characteristics of a contaminated groundwater establishes a basis for more in-depth studies on source(s), migration, and final destiny of the contaminants, as well as an appropriate evaluation of human health aspects of the contaminants and subsequent remedial actions.

**Authors:** Sadaf Teimoori, PhD Student - Civil and Environmental Engineering, Wayne State University 2. Brendan O'Leary, PhD Student - Civil and Environmental Engineering, Wayne State University 3. Carol J. Miller, Professor - Civil and Environmental Engineering, Director - Healthy Urban Waters, Wayne State University

15. **James Graves, University of Detroit Mercy:**

*Pseudomonas aeruginosa* Bacteria and the Antibacterial Nature of Phage in Undergraduate Research

*Pseudomonas aeruginosa* is a gram-negative rod that is frequently associated with watery environments. *P. aeruginosa* is used in biodegradation studies, and it causes a wide variety of infections. Many infections result in antibiotic therapy treatment failures. The purpose of this investigation was to examine the antibacterial nature of phage (bacterial viruses) against antibiotic resistant *P. aeruginosa*. Antibigrams produced by the disk diffusion technique showed that *P. aeruginosa* strains examined had sensitivity to ciprofloxacin and gentamicin, but some grew up to disks of chloramphenicol, erythromycin and tetracycline. The host strain of bacteria used to isolate phage had been designated suitable for biodegradability testing and pathogen research. The phage was isolated from the sediment of a tributary of the Detroit River. The EnteroPluri-Test, which is a multiple biochemical test system, indicated that the host strain when inoculated in presence or absence of phage did not break down sugars. The effect of phage on growth of *P. aeruginosa* was assessed by measurement of culture optical density (OD) with a Klett-Summerson colorimeter. In LB (Luria-Bertani) medium after 24 hr incubation with phage a bacterial culture with OD 24 resulted, in contrast to a culture without phage with OD 127. In blood serum a bacterial culture with phage resulted with OD 35, in contrast to a culture without phage with OD 160 after 6 days. The antibacterial nature of phage under various environmental conditions should be investigated.

**Authors:** James F. Graves (F/S), Cameron M. Johns (UG) and Nathan A. Yaldo (UG) - University of Detroit Mercy

16. **Selena Hindi, University of Detroit Mercy:**

*Allium cepa* as a study-model for the role of biological complexity in urban water sustainability

Cities such as Flint, Michigan and Milwaukee, Wisconsin serve as contemporary examples of how a lack of understanding of the environmental chemistry of freshwater reservoirs can render potable water engineering systems unsustainable for local residents. In many cities, green engineering functions to increase aesthetic appeal without a broader consideration for recovering ecosystem processes. Our objective was to evaluate the role of biodiversity in the environmental quality of freshwater by using an aquaponic system with *Allium cepa* as a model system. We hypothesized that plant growth and development, macroinvertebrate behavior, and water quality would be affected by changes in biological complexity. We further characterize how biological complexity in an aquaponic systems has broad impacts on plant dynamics, macroinvertebrate behavior, and water quality. Our findings demonstrate how aquatic organisms can modify plant systems as well as water quality, and further suggest that biological complexity and diversity have the ability to ameliorate polluted water systems. We propose that green engineering infrastructure has the capacity to integrate and sustain ecosystem function recovery in urban contexts.

**Authors:** Selena Hindi, Amar Kurjakovic, Alina Jaafar, Emilee Hang, Victor Carmona, Ph.D., Wayne State University

17. **Lucas Debarba, Wayne State University:**

*Low-grade benzene exposure provokes glucose Intolerance, hypothalamic gliosis, and ER-stress in a sex-specific manner*

It is now increasingly accepted that insulin resistance, T2D prevalence and mortality have been associated with long- term exposure to air and traffic pollution. Benzene is a highly volatile liquid, and a constituent of crude petroleum and it is classified as a common airborne pollutant. We hypothesized that benzene, at levels below carcinogenic, contributes to insulin resistance and inflammatory responses linking persistent organic pollutants exposure to type 2 diabetes mellitus. For this purpose, C57BL/6 mice in inhalation chambers were exposed to benzene concentration of 50 ppm for 6h/day for 4 weeks. We found that under these conditions, exposure to benzene did not significantly influence mice body weight, neither had it trigger any toxic responses in these animals. Benzene-exposed male mice displayed significantly impaired glucose tolerance, higher fasting glucose and insulin levels. Consequently, we detected a significant elevation of hepatic genes associated with gluconeogenesis, *G6Pase* and *Pck1*, and lipid synthesis, *Sreb-1c* and *Sreb-2* in male mice as compared to controls. Female mice were completely resistant to the negative metabolic consequences of benzene exposure. Further sex differences were apparent in neuroinflammatory responses, with greater male vulnerability observed in the hypothalamus of benzene- exposed animals. Benzene exposure promoted hypothalamic gliosis and robust neuronal activation in the arcuate, paraventricular, ventromedial, and dorsomedial hypothalamic nucleus; and, significantly upregulated proteins associated with ER stress, IRE-1 $\alpha$ , XBP1, CHOP in the arcuate nucleus. Our results provide evidence that exposure to benzene induces metabolic imbalance, higher hypothalamic gliosis and ER-stress markers in a sex-specific manner.

**Authors:** <sup>1</sup> Debarba, LK., <sup>2</sup> Mulka, A., <sup>1</sup> Lima, JBM., <sup>1</sup> Awada, AA., <sup>1</sup> Didyuk, O., <sup>1</sup> Fakhoury, P. <sup>1</sup> Holland, M., <sup>1</sup> Ayyar, I., <sup>1</sup> Koshko, L., <sup>1</sup> Sacla, M., <sup>2</sup> Klueh, U., <sup>1</sup> Sadagurski, M.

<sup>1</sup>Department of Biological Sciences, <sup>2</sup>Biomedical engineering, IBio (Integrative Biosciences Center), Wayne State University

18. **Grace Mahasi, Wayne State University:**

*Substance Abuse Treatment Along the Northern Mexico Border: A Survey Prospectus*

**Aims:** Reducing substance abuse rates globally is a WHO Sustainable Development Goal. The number of individuals reported as problem users has held steady at 27 million since 2008; further, illicit drug use increased worldwide by 10% between 2006 and 2013 to 246 million individuals. Mexico's drug use rate, however, increased by 87%. Mexico's "sister cities" along the U.S. border carry some of the highest rates of substance abuse, but the epidemiological studies focused on this phenomenon have been few. With this in mind, we intend to identify motivators for seeking substance abuse treatment, which could have an amplifying effect on reducing substance abuse rates.

**Methods:** A U.S. study on urban, publicly-funded treatment programs found retention was dependent on race, gender, and employment status, similar to barriers facing residents of Mexico. Our study of individuals in treatment centers near the U.S.-Mexico border will survey participants' motivations and treatment progress. We will focus on behavioral factors in retention and readmission in treatment centers particularly along the northern border in order to inform public education initiatives to reduce recidivism.

**Discussion:** Consideration of socioeconomic implications of drug use in Mexico such as migration, violence and effects of the drug trade, as well as the cultural implications of medicinal traditions will be assessed.

**Authors:** Grace Mahasi, Wayne State University; Julie Gleason-Comstock, Wayne State University

19. **Camille Akemann, Wayne State University:**

*Comparative phenotypic and transcriptomic responses to multiple endocrine disrupting chemicals in zebrafish*  
Endocrine disrupting compounds (EDCs) are emerging contaminants of concern found ubiquitously in the environment that can cause a wide range of adverse effects, the full extent of which are currently unknown. We used zebrafish as a model to determine and compare the effects of nine EDCs (4-nonylphenol, atrazine, bisphenol-A, chlorpyrifos, dieldrin, estrone, metformin, triclocarban, and triclosan). Zebrafish are an NIH accepted model system for human health that have 70% homology with the human genome, transparent larvae (allowing observation of internal development), large numbers of offspring, and a sequenced genome. We exposed zebrafish to 3 concentrations of EDCs for either 1 or 5 days during early development and identified adverse developmental and behavioral outcomes. RNASeq and pathway analyses was performed to determine specific gene expression changes, as well as the critical pathways affected. Many differentially expressed genes overlapped across chemicals and some of the main pathways affected include reproductive diseases, endocrine system disorders, and estrogen synthesis and regulation. This study brings us closer to identifying the full extent of adverse effects of EDCs and the mechanisms through which these effects occur.

**Authors:** Camille Akemann (Wayne State University Department of Pharmacology), Jeremy Shields (Institute for Environmental Health Sciences), Nemer Hijazi (Institute for Environmental Health Sciences), Zoha Siddiqua (Wayne State University Department of Pharmaceutical Sciences), Annelise Crabtree (Institute for Environmental Health Sciences), Adam Pedersen (Institute for Environmental Health Sciences), David Pitts (Wayne State University Department of Pharmaceutical Sciences), Tracie R. Baker (Wayne State University Department of Pharmacology and Institute for Environmental Health Sciences)

20. **Kezhong Zhang, Wayne State University:**

*Mechanisms of Airborne PM<sub>2.5</sub>-induced Non-alcoholic Fatty Liver Disease and Type-2 Diabetes*

**Background:** Air pollution is a world-wide challenge to public health. Accumulating evidence has confirmed a significant association between exposure to fine airborne particulate matter (PM<sub>2.5</sub>) and the increase of morbidity and mortality associated with metabolic disease. We pioneered in studying pathological effects and stress mechanisms of air pollution in the liver, the major detoxification and metabolic organ. Recently, we did a series of original works in defining: i) the integrated stress responses from endoplasmic reticulum (ER) and mitochondria triggered by PM<sub>2.5</sub> exposure in the liver; and ii) the pathophysiological roles of PM<sub>2.5</sub>-triggered organelle stress responses in metabolism and inflammation associated with metabolic disorders.

**Methods:** A mobile system that enables whole-body exposure to real-world PM<sub>2.5</sub> has been used to study adverse health effects of acute or chronic exposure to PM<sub>2.5</sub>. Both animal models and cultured cells were used to delineate the mechanistic basis underlying PM<sub>2.5</sub>-triggered metabolic disorders and the associated systemic disease.

**Results:** Our works demonstrated that inhalation exposure to airborne PM<sub>2.5</sub> induces an inflammatory unfolded protein response (UPR) in the liver, which is mediated through a regulatory cascade consisting of the inflammatory mediators known as toll-like receptors (TLRs) and the UPR transducers to promote hepatic inflammation and impair energy metabolism. PM<sub>2.5</sub>-triggered inflammatory stress response in the liver rely on mitochondrial alteration and increased presence of mitochondria-ER associated membranes (MAMs). Further, PM<sub>2.5</sub>-triggered inflammatory UPR disrupts hepatic glycogen storage, represses peroxisome proliferator-activated receptor (PPAR)  $\alpha$  and PPAR $\gamma$ , and impairs IRS1-mediated insulin signaling in the liver.

**Conclusion:** Chronic PM<sub>2.5</sub> exposure represents an independent risk factor that leads to pathologic liver phenotypes of non-alcoholic steatohepatitis (NASH) and obesity-independent type-2 diabetes (T2DM). PM<sub>2.5</sub>-triggered organelle (ER and mitochondria) stress responses in the liver are responsible for the pathogenesis of metabolic disorders caused by air pollution.

**Authors:** Ze Zheng<sup>1</sup>, Qinghua Sun<sup>3</sup>, Lawrence Grossman<sup>1</sup>, Kezhong Zhang<sup>1,2</sup>

<sup>1</sup> Center for Molecular Medicine and Genetics, <sup>2</sup> Department of Biochemistry, Microbiology, and Immunology, Wayne State University School of Medicine, Detroit, MI 48201, USA.

<sup>3</sup> Division of Environmental Health Sciences, College of Public Health, Ohio State University, Columbus, OH 43210, USA.

21. **Ijeoma Opara, Wayne State University:**

*Disrupting Silos & Creating Community—An Innovative Interprofessional Competency-Based Global and Urban Health and Equity (GLUE) program to Transform the Institutional landscape*

Background: GLUE is a successful interdisciplinary, multi-level learner curriculum created 2.5 years ago to meet the growing need for a structured competency-based global health education and experiences. It is based on the Consortium of Universities for Global Health (CUGH) interprofessional global health competency toolkit in order to provide standardization and structure to global health educational and professional development programs.

Methods: An interdisciplinary faculty coalition committed to best practices in global health education, research, service, and advocacy created the collaborative community of practice that is the Wayne State University Global Health Alliance (GHA). As the best interprofessional competency-based resource for teaching global health found after an extensive scoping literature review, WSUGHA chose the CUGH competencies as the framework for the GLUE curriculum. 39 competencies are taught over 16 domains, including “Social and Environmental Determinants of Health.” GLUE is comprehensive with monthly interactive reverse-classroom style seminars using evidence-based andragogy and multimodal teaching strategies; diverse guest speakers and small group activities; community engagement; and a mentored local or international capstone. Evaluation utilized International Learning Guidelines self-assessment and course evaluation surveys.

Results: GLUE course had 58 registered scholars with 27 graduates -25% medical students, 25% residents, 10% public health students, and 40% allied health professionals. Mid-term evaluations had overwhelmingly positive scholar feedback with a request for more small group activities. Graduate self-assessment demonstrated a statistically significant increase in knowledge, skills, and attitudes in Global Health systems, geopolitical forces, cultural awareness, and social/environmental determinants of health ( $P<0.05$ ).

Discussion: The CUGH interprofessional competency toolkit provides a useful framework to build a global health curriculum. GLUE is an effective competency-based model for best practice in global health curriculum development.

Authors: Ijeoma Nnodim Opara, MD, Department of Internal Medicine and Pediatrics, Wayne State University  
Laura Kline, PhD, College of Liberal Arts & Sciences, Global Studies, Wayne State University  
Kristiana Kaufmann, MD MPH, Global Health Alliance co-Director, Department of Emergency Medicine, Wayne State University

Jeffrey Van Laere, MD MPH, Department of Emergency Medicine, Henry Ford Health System, Wayne State University

Kent Anderson, MA, College of Liberal Arts & Sciences, Wayne State University

Jamey Snell, MD, Department of Pediatric Anesthesia, Children’s Hospital of Michigan

Amy Cortis, MD, Department of Emergency Medicine, Children’s Hospital of Michigan

Vijaya Arun Kumar, MD MPH, Department of Emergency Medicine, Wayne State University

Mark Zervos, MD, Department of Infectious Disease, Henry Ford Health System, Global Affairs, Wayne State University School of Medicine

22. **Ilham Saleh, University of Michigan Dearborn:**

*Building Youth Capacity to Address Environmental Health and Justice in Dearborn, MI*

**Background/Aims:** Dearborn Environmental Health Research to Action (EHRA) is a community-based research program that addresses residents' environmental health concerns in Southeast Dearborn, primarily through engagement with youth. Air pollution from cumulative exposures contributes to health disparities in this community, which is predominantly comprised of Yemeni-American residents and where approximately 1/3<sup>rd</sup> of the population is under 18 years old. We present design and assessment of an environmental health and justice youth academy (16-18 years old) delivered during summers 2018 and 2019.

**Methods:** Community, academic, government, faith-based, and health care representatives comprise of the EHRA steering committee. They designed the academy, which prepares fellows with basic knowledge and skills in environmental health-related epidemiology, monitoring, policy, and literacy, as well as policy advocacy skills. Fellows participate in community science with handheld air sensors and participatory mapping and generate risk communication products to share local environmental health concerns with diverse audiences in their community. Over the course of six daylong sessions, fellows complete pre-, post- and daily assessment surveys to assess the following: program satisfaction, career plans, and change in knowledge, skills, and civic engagement behaviors.

**Results:** Fellows reported an overall positive experience and feedback on the academy's interactive pedagogy, refinement of career goals, and marked increases in related knowledge of environmental health science and policymaking. Findings from summer 2018 informed programming in 2019, in which participatory mapping and a formal mentor program was added. Fellows have since presented lessons learned at community and statewide forms and are preparing materials for social media.

**Conclusions:** Health inequities are well documented in the U.S., but little attention is given to potentially disproportionate environmental health exposures experienced among Arab American communities. Further, while much environmental justice research and organizing is conducted by and with youth across the country, few have published effective models.

**Authors:** Ilham Saleh, University of Michigan-Dearborn, Natalie Sampson, University of Michigan-Dearborn, Carmel Price, University of Michigan-Dearborn, Karima Alwishah, University of Michigan-Dearborn, Farah Erzouki, ACCESS, Sara Gleicher, Beaumont Health, Dennis Archambault, Adel Mozip, Dearborn, David Norwood, City of Dearborn

23. **Cassidy Masserant, University of Detroit Mercy:**

*The role of maternal age on the variability of Michigan birth weights*

Low birth weight in infancy causes numerous life-long health issues following the initial neonatal period. The cause of low birth weights is multifactorial and has been attributed to factors such as tobacco and drug use, maternal stress, socioeconomic status, education of mother, and age of mother at time of birth. Across the United States, many states are beginning to see an increase in the number of births yearly that fall into low birth weight (LB) and very low birth weight (VLB) categories. The state of Michigan is one state that has experienced a surge in LB and VLB infants within the past five years. The objective of this study was to determine the effect of one known factor, maternal age, on LB and VLB infants in the state of Michigan. We hypothesized that the number of LB and VLB infants would be highest in the maternal age category of 15-20 years. Our data showed the highest number of live births with the birth weight category VLB and LB were mothers in the age group 20-24 and 25-29. The number of live births has decreased between 1989 and 2017. Further studies are required to evaluate the potential causes of the LB and VLB in the aforementioned age categories such as socioeconomic and/or minority status factors. Subsequent research into the social implications of a decrease in live births from 1989-2017 is required.

**Authors:** Cassidy Masserant, Cross Orow, Olivia Shaw, Victor Carmona, Ph.D., University of Detroit Mercy

24. **Victor Carmona, University of Detroit Mercy:**

*Drones as a Quantitative tool for the Study of Ecological Dynamics in a Neotropical Premontane Thorn Woodland*

The early adoption of drones (or unmanned aerial vehicles) in ecological studies has had tremendous success with qualitative research applications, such as for monitoring endangered species habitat. The quantitative application of inexpensive commercial drones to evaluate ecological landscapes and model forest dynamics has great potential to inform the forest management strategies in-real-time as well as integrate environmental justice issues in conservation biology. We employ digital-image analyses of distortion-corrected imagery captured with the convex lens of a Parrot-Bebop drone in order to quantitatively inform the reforestation management strategies of a high-elevation (2,500 m.a.s.l.) Oak-Pine forest in the western Sierra Madre of Mexico. Image polygon measurements and pixel hue intensities are used to measure elements at the landscape-level (e.g. patch size, shape, position, pixel diversity of the canopy, etc.) that are correlated with dynamics at the population-level (e.g. seedling density, cohort structure, herbivory, etc.). The resulting empirical models allow for the use of drone imagery to quickly infer canopy openness, variability of understory temperatures, seedling density, forest structure, and gall-infestation levels. We are working with natural area managers in Aguascalientes, México, to use drones to monitor cattle grazing frequency and intensity so as to incorporate the intermediate disturbance hypothesis into an inclusive forest-conservation management strategy that also empowers local communities sustainably.

*Authors: Victor Carmona, Department of Biology, University of Detroit Mercy*

25. **Dahlia Carmona-Valdivieso, International Academy East and University of Detroit Mercy:**

*The role of mollies in the biocontrol of mosquitos and the recovery of ecosystem services in urban rivers of El Salvador*

Anthropogenic impacts on biodiversity can alter the ability of natural environments to sustain ecosystem services and function. The objective of our study was to evaluate the impact of mollies (*Poeciliopsis gracilis*), a native freshwater fish species common to El Salvador, on mosquito larvae in urban aquatic systems. We placed mollies in artificial and control habitats under field conditions for one month and characterized changes in the abundance of mosquito larvae. We detected that mollies significantly reduced the abundance of mosquito larvae in standing water relative to control treatments. Our study shows that native molly populations serve as a biocontrol agent for mitigating diseases transmitted by mosquitos in El Salvador and further suggests that the recovery of polluted urban rivers and streams is paramount for preserving of ecosystem services.

*Authors: Dahlia Carmona-Valdivieso, International Academy East, Victor Carmona, University of Detroit Mercy, Tizziana V. Carmona, Titan Higher Education Consultants*

26. **Nirosha Ruwani Amarasekara, Wayne State University:**

*Antimicrobial resistance in locally-grown fresh produce*

Fresh produce is increasingly recognized as a source of antimicrobial-resistant bacteria. This study was aimed to determine the prevalence and abundance of antimicrobial resistance genes (ARGs) in locally-grown fresh produce. A total of 48 vegetable samples were collected from three Detroit urban gardens. Total DNA was extracted from the vegetable rinse. We targeted *bla*<sub>TEM</sub>, *Int1-1*, *sul2*, and *tetM* due to their high prevalence in the environment and high relevance to clinical outcomes. The relative abundance of ARGs was determined using qPCR, and the ARG profile was obtained using whole genome sequencing (WGS) on selected *E. coli* and *Enterococcus* isolates. The relative abundance of *bla*<sub>TEM</sub>, *Int1-1*, *sul2*, and *tetM* was  $2.09 \times 10^{-3}$ ,  $9.17 \times 10^{-2}$ ,  $4.92 \times 10^{-3}$ , and  $3.52 \times 10^{-3}$ , respectively. *Int1-1*, a gene marker for class 1 integron, showed higher abundance than the other three genes ( $p < 0.05$ ). Regardless of antimicrobial resistance (AMR) phenotypes, WGS showed multidrug efflux pump genes, beta-lactamase gene, and prophage in *E. coli*. *Enterococcus* isolates carried efflux pump genes, macrolides-lincosamides-streptogramins (MLS) resistance genes, tetracycline resistance genes, and transposons. The inconsistency between AMR phenotypes and ARG in bacteria may be due to the presence of unknown ARG and/or the lack of functionality of certain ARG in the isolates. The data suggest that locally-grown fresh produce may serve as a source and vehicle of AMR microorganisms. Mobile genetic elements, such as *Int1-1*, prophage, and transposons, may play an important role in AMR dissemination in the environment.

*Authors:* Nirosha Ruwani Amarasekara – Wayne State University, Abdullah Ibn Mafiz - Wayne State University, Liyanage Nirasha Perera - Wayne State University, Vidhya Bai Krishnoji Rao - Wayne State University, Yifan Zhang - Wayne State University

27. **Noribeth Mariscal, Wayne State University:**

*Diesel Emissions: Can green infrastructure (GI) improve the air quality in the most toxic zip code?*

The zip code, 48217, is considered the most toxic zip code in the state of Michigan. In this area of Southwest Detroit, the transportation of people and goods heavily relies on the combustion of diesel fuel. The community of the 48217 zip code is surrounded by Interstate 75, Fort Street, and a very accessible international border crossing which heavily impacts the amount of diesel-related transport that comes and goes into the city. Diesel engines give off pollutant emissions like carbon monoxides-CO, hydrocarbons-HC, particulate matter-PM, and nitrogen oxides-NO<sub>x</sub>. Emissions from diesel vehicles are reported to be more harmful than petrol vehicle emissions. Many researchers have investigated the health effects that can come from long term exposure to emissions from diesel engines. Drawing from a larger environmental engineering study, this study examines how the emissions from the combustion of diesel impact the Southwest Detroit community, in terms of health and the environment, and how green infrastructure (GI), such as vegetative barriers, may serve to mitigate the impact of diesel emissions and restore natural processes to create a healthier environment to its residents.

*Authors:* Noribeth Mariscal, Civil & Environmental Engineering, Wayne State University

28. **Mahfujul Haque, Wayne State University:**

*Evaluating Point of Care Testing in Community Pharmacies and Assessing the Implementation of a Pilot Program*

**Background** Pharmacists are increasingly offering services including medication therapy management and immunizations, placing pharmacists in a unique position to offer additional services such as point-of-care testing (POCT). Patients in urban settings often lack access to diagnostic testing for acute and chronic disease states, delaying treatment of common health conditions. There are few studies that have evaluated the practical implementation of POCT in communities.

**Objectives** To improve the timeliness of diagnostic testing and access to drug therapy for common medical conditions found in urban communities.

**Approach** Following a Mixed methods research design, Phase One of our project will conduct a KAP survey to understand how to implement POCTs among pharmacies located in Metropolitan Detroit. Pharmacists are provided with a video that demonstrates use of POCTs. Before and after viewing the video, pharmacists will complete a KAP survey, also gathering data about the helpfulness of the video. Results of the KAP survey will be used to inform the community pharmacy-based trial of POCTs. In Phase Two, we will conduct a quantitative evaluation of POCTs used in a representative sample of pharmacies from three groups: large chain, small chains and independent pharmacies. Data will be collected to evaluate POCT utilized, time to test result, timeliness of reporting results to healthcare providers and sustainability of tests.

**Expected Outcomes** Pharmacists in the Metropolitan Detroit area will demonstrate limited knowledge of point of care tests and will be engaged around education in the use of POCT that will support a pilot introduction in a community setting.

**Authors:** Samantha Langell, WSU PharmD Candidate, Mohammad Abdi, WSU Undergrad, Mahfujul Haque, WSU Undergrad

29. **Saher Yunus, Wayne State University:**

*Canada and Traffic Injuries: Young and Distracted Drivers*

**Background:** Each year, millions of people in the world die due to unintentional injuries and the majority are due to traffic accidents. Over 27% of injuries are due to this problem. Canada is no different, there has been a marked increase in distracted driving cases over the past decade. In a study done by the World Health Organization, distracted driving was the cause of over 10% of Canadian driving fatalities and injuries. This is a 17% increase over the past few years. As mobile phone ownership continues to increase; Canada has enforced fines and bans on phone use while driving.

**Methods:** Effective interventions would include increased education for these youth as enhanced educational modules part of the driving license process, increased speed and safety law enforcement and “safer” road strategies. However, a study showed inexperienced drivers were liable to make critical errors and their attitudes varied regarding phone use while driving. Young male adults were most vulnerable.

**Public Health Implications:** The drivers’ educational modules would include visual content illustrating the consequences of distracted driving. This strategy would address the SDG goals of reducing traffic deaths and injuries.

**Authors:** Saher Yunus, MPH, Wayne State University

30. **Jeremiah Shields, Wayne State University:**

*Evaluation of the Biological Effects of Volatile Organic Chemical Exposure in Zebrafish*

Volatile organic compounds (VOCs) represents an extensive class of chemicals that are becoming ubiquitous in nature due to industrial processes, building materials, and cleaning agents. VOCs present a substantial risk to human health as concentrations increase indoors, at landfills, industrial complexes, and especially in our groundwater. These exposure conditions in both short- and long-term durations can impact developmental, reproductive, and neurological systems in humans. To date, the biggest challenge in characterizing VOC toxicity has been due to technology limitations that create unsafe and unreliable exposure conditions. In collaborative efforts, we have designed an innovative sealed exposure system for safely containing a VOC and analyzing behavioral changes in aquatic organisms. This novel exposure system will utilize the zebrafish animal model for evaluating VOC toxicity. Using the zebrafish model, toxicant-induced behavioral changes, phenotypic abnormalities, and transcriptomic data can be compared to create profiles for not only screening VOCs, but also elucidate health concerns that could potentially translate to humans. Future studies will explore the synergistic effects of VOC mixtures and validate the translatability of these findings to humans.

**Authors:** Jeremiah N. Shields<sup>1</sup>, Zoha Siddiqua<sup>2</sup>, Shawn McElmurry<sup>3</sup>, David K. Pitts<sup>2</sup>, Tracie R. Baker<sup>1,2,3</sup>

<sup>1</sup>Institute of Environmental Health Sciences, Wayne State University School of Medicine and <sup>2</sup>Pharmaceutical Sciences, Wayne State University School of Pharmacy; <sup>3</sup>Civil and Environmental Engineering, Wayne State University

31. **Farhan Rahman, University of Detroit Mercy:**

*The impact of acid rain on plant allocation dynamics in urban environments*

Acid rain is formed when atmospheric pollutants react with atmospheric water, resulting in precipitation with pH 5.0 or lower that can also become more acidic in urbanized cities due to an increase in the post-combustion gases released into the atmosphere. Our objective was to characterize the impact of acid rain on the environmental sustainability of urban agriculture as a tool for improving food security. We hypothesized that the plant root dynamics would be impacted by both simulated urban acid rain levels as well as natural acid rain from urban point-sources. We cultivated shallot onions in growth chambers and exposed plants to different concentrations of nitric and sulfuric acid, as well as rainwater and groundwater. We found that simulated treatments of nitric and sulfuric acid rain as well as natural acid rain had parallel impacts on the growth and development of onion roots. We also detected that low-to-high concentrations of simulated acid rain composed with sulfuric acid as well as natural rainwater induced root growth in onion plants. We apply ecological theory, specifically the principle of allocation, to discuss how the chemical induction of plant growth by acid rain may result in a life history trade-off that reduces investment in plant-defense. Our predicted plant defense trade-off suggests that crop species in urban environments would be more susceptible to herbivory and as such would need to rely more heavily on agricultural pesticides to sustain food security. We further propose studies to evaluate applications of plant defense theory in an urban context.

**Authors:** Farhan Rahman, Macallan Kizy, Sami El-Nachef, Jayanth Nalluri, Victor Carmona, University of Detroit Mercy

32. **Yuncong Pang, University of Detroit Mercy:**

*TCE Groundwater Contamination Plume*

The world's largest plume of trichloroethylene (TCE) contamination has polluted drinking water wells in Mancelona, a rural, low-income community in northern Michigan. Mancelona has a population of 1,360 people and a median household income of \$34,688. The contaminated aquifer is estimated at 13 trillion gallons. Mount Clemens Industries, Inc., later known as Wickes Manufacturing, used TCE as a degreasing solvent and dumped it in the shallow sandy pits in Mancelona from 1947 to 1967. The TCE plume is venting into the Cedar River which flows into Lake Bellaire, which ultimately discharges into Lake Michigan. TCE levels as high as 500 ppb were detected in the 121 permanent monitoring wells that were installed to monitor TCE concentrations in groundwater and the change in TCE levels over time. The aim of this study is to model the extent of the TCE plume to help assess the environmental impact on the aquifer and the residents.

**Authors:** Yuncong Pang and Alexa Rihana-Abdallah, University of Detroit Mercy

33. **Priya Spencer, Wayne State University:**

*Promotion of a Patient-Centered and Community-Driven Medical Model to Combat Multi-Drug Resistant Tuberculosis in China*

Background:

To end the epidemic of tuberculosis (TB) by 2030 is an ambitious target of the World Health Organization under the Sustainable Development Goals. TB is the leading cause of death from a single infectious agent worldwide. Though the TB incidence rate has declined over the last few years, multidrug-resistant TB (MDR-TB) remains a major global health and China is among the 20 highest TB burden countries which account for 87% of the world's MDR-TB cases. Most new cases of MDR-TB in China are a result of direct transmission of resistant strains. In 2011, a project to control TB, Control and Prevention of Tuberculosis (CAP-TB) was developed by USAID in collaboration with Chinese health officials for implementation in the Yunnan Province. When CAP-TB ended in 2018, MDR-TB treatment success rate in Yunnan Province was 73% as compared to 50% in the rest of China.

Methods:

The CAP-TB project model is being utilized in a global pilot study to enhance patient-centered care for MDR-TB patients. Based on Chinese National Surveys, patients treated in hospitals or TB treatment centers are provided limited follow up support in an outpatient setting. The CAP-TB Model created by USAID is based on alternative patient-provider communication, including social media for follow-up.

Conclusion:

Follow-up and compliance with drug treatment appear to be a major challenge for MDR-TB patients. To address this, a model using social media incorporated into a public campaign appears to have been successful in increasing treatment compliance to reduce the spread of tuberculosis.

**Authors:** Priya Spencer, MBBS, Wayne State University; Julie Gleason-Comstock, PhD, MCHES, Wayne State University

34. **Jamiley Cheikh, University of Detroit Mercy:**

*Evaluating the Sustainability of Urban Green-Spaces using Google Maps*

Trees in urban environments are expected to grow at an accelerated rate due to climate change. However, while studies on urban green-space have largely focused on characterizing biotic interactions (e.g. pathogens, ecosystem services, etc.), more studies are needed evaluating how abiotic factors can be sustained in urban environments (e.g. nutrient cycling, storm water infiltration, etc.). We used Google Maps to count the number of trees, measure percent green-space adjacent to the roads, and quantify percent road-damage of 16 images from across the Metro Detroit area in Michigan. We hypothesized that improvements in urban green-space would be associated with lower levels of road-damage due to better infiltration of storm water runoff. We found that while roadside green-space did not correlate significantly with road-damage, the number of roadside trees correlated positively with road-surface damage. Our study suggests that urban planners need to better consider tree-species selection for city green-spaces and that the root systems of urban trees may play a role in the observed variation of road damage in Detroit. We propose that future studies on urban trees further evaluate the role of below-ground dynamics.

**Authors:** Jamiley Cheikh, Malak Elmokadam, Victor Carmona, University of Detroit Mercy

35. **Sidney Linck, Michigan State University:**

*Food justice issues on our doorstep – food security of Michigan State University students*

**BACKGROUND:**

College students have been long profiled for their ramen-based diets, but consistent and prolonged periods of food insecurity have adverse effects on health and academic performance. We set out to assess the prevalence of food insecurity among students at Michigan State University and identify the characteristics of that population, with the goal of designing programs within MSU that would help address inequities in our university food system.

**METHODS:**

Data was collected from both undergraduate and graduate students using a 45-item survey designed to measure key elements of food security, mental and physical health outcomes, demographic characteristics, and desired forms of intervention. It also included the USDA Six-item Short Form Food Security Survey Module to measure levels of security. The survey was sent to a random sample of 8,000 students and received 1,588 responses.

**RESULTS:**

Food insecurity does exist on Michigan State's campus – 24% of students who completed the survey were either categorized as low or very low food security, according to the USDA's survey measure, above the average rate for the U.S. of 12%. We explore demographic and academic factors that correlate with food insecurity.

**CONCLUSIONS:**

Food insecurity is a significant problem among college students at Michigan State University. Students lack time, money, and adequate food preparation resources, which impacts their food security status and health and academic success. More affordable healthy food options need to be made available on or near campus as well as resources for food preparation.

**Authors:** Sidney Linck, CSUS, MSU, Jenny Hodbod, CSUS, MSU, Michael Kaplowitz, CSUS, MSU

36. **Sara Alosaimy, Wayne State University:**

*Improving Outcomes for Patients at High Risk for Dual Human Immunodeficiency Virus (HIV) and Neglected Tropical Diseases (NTDs) in Brazil*

**Background/aims:** The number of people requiring interventions against NTDs in Brazil is highest in the region. HIV positive patients have higher NTDs acquisition rates and clinical failure. Despite the low relative prevalence of HIV, the rates continue to grow steadily. In 2017, Brazil provided free access to pre-exposure prophylaxis (PrEP) in high risk patients. Thus far, education, research and awareness were focused on large metropolitan cities with less emphasis on poverty areas with high NTD prevalence.

**Proposed Method:** We aim to explore a feasible solution to decrease negative dual NTDs and HIV infections. We reviewed eligibility criteria for free PrEP, data pertaining to PrEP acquisition. We also compared NTDs acquisition factors and HIV prevalence areas in Brazil. We propose that by increasing education and awareness regarding free PrEP in high poverty areas that are at high risk for NTDs and have low PrEP consumption, we would significantly decrease dual HIV and NTDs infection.

**Discussion:** Several characteristics can impact low PrEP accessibility. These factors overlap with NTDs risk factors. Tackling low PrEP acquisition in areas with high NTD and HIV is key in improving clinical outcomes of NTDs.

**Conclusion:** Increased awareness of free PrEP in poverty areas in Brazil can improve clinical outcomes for patients with NTDs infection by preventing HIV acquisition.

**Authors:** Sara Alosaimy, Anti-infective Research Lab, Eugene Applebaum College of pharmacy, Wayne State University

37. **Darrin Hunt, Wayne State University:**

*Common reed management as a model for sustainable, community-led invasive species solutions in urban parks*

Background/aims, methods, results, conclusion (250 word limit):

This interdisciplinary study aims to document social perceptions and ecological impacts of the common reed (*Phragmites australis*), an invasive wetland plant prevalent in southeast Michigan public parks. Public parks offer essential services to residents and provide social and ecological value to the community. This project examines stakeholder perceptions of common reed invasions in wetland areas of two Detroit area parks, Belle Isle State Park and Lake St. Clair Metro park. Interviews and surveys were used to dissect participants' opinions regarding the necessity and effectiveness of invasive species management in public parks. Additionally, ecological assessments were conducted in highly utilized areas of each park and compared to historic bioassessment and chemical treatment data. This study found that resource constraints have limited the management of invasive species, and that each park relies on partnerships with local volunteer organizations for the distribution of educational materials relating to environmental problems associated with invasive plants. Due to different levels and types of park use, and varying stakeholder perceptions about the common reed, each park requires a unique strategy of community engagement suited to parkgoer perceptions to support management outcomes. With our recommendations, both parks could enjoy improved common reed management in popular recreation areas over time. This project creates an interdisciplinary model that increases the understanding of stakeholder perceptions of the invasive common reed (*Phragmites australis*) in public green spaces. The findings from this study will contribute to better management of ecological resources at public parks and support the larger interdisciplinary conversation about invasive plants.

**Authors:** Darrin Hunt (Biological Sciences), Jaraslava Pallas (Anthropology), Natalie Lyon (Urban Planning), Wayne State University.

38. **Saadia Taj, Wayne State University:**

*Impact of buprenorphine, an opioid maintenance drug, on female fertility and pregnancy outcomes in a rodent model*

**Background:** During the current opioid crisis, opioids have become a national health issue, affecting many individuals including expectant mothers and women in their reproductive years. Due to inclusion restrictions in clinical trials for women who might be pregnant or wanting to conceive, there is lack of knowledge about the consequences of opioid-maintenance therapy (e.g. buprenorphine, BUP) exposure on menstrual cycles, female fertility, and pregnancy outcomes. Therefore, our translational model addresses some of these issues in rodents. **Methods:** We began BUP exposure to adult female rats (N=30) at least 7 days before conception and continued it throughout the postpartum period to mimic the human situation of a woman being maintained on BUP before conception. Both therapeutic (0.3 mg/kg, s.c.) and overexposure (1 mg/kg) BUP doses were compared to a saline control. Females were bred in-house with drug-naïve adult males. Estrus cycle, ability to conceive, length of gestation, litter size and other litter characteristics were evaluated.

**Results:** There were no significant differences found between either of the three groups for the length of time it took to conceive, length of gestation or for litter size ( $p > .05$ ). However, high dose pups had an increased mortality rate after birth compared to both other groups ( $p < .05$ ), that may have been due to maternal neglect.

**Conclusion:** More research is necessary to further evaluate the effects of BUP exposure on dams and their offspring to protect expecting mothers and their children from potential harmful effects of opioid-maintenance therapies that lack proper validation in this vulnerable human population.

**Authors:** Saadia Taj- Undergraduate Student, Chela Wallin- Graduate Student, Susanne Brummelte- Principal Investigator; Department of Psychology, Wayne State University

39. **Fadak Aljabery, University of Detroit Mercy:**

*The community structure and diversity of urban trees in Palmer Park, Detroit*

Urban trees in Detroit have a long and complex history spanning root damage to infrastructure, constraints in management strategies as well as budget allocation, and losses to insect-infestations, which have contributed to the present ratio of 1 tree for every 3 people living in the metropolitan area. We were interested in characterizing the community of tree species in Palmer Park, which is floristically comprised of three distinct forest habitats (southern swamp, mesic southern forest, and dry-mesic southern forest) and is one of seven urban forests that persist in the Detroit area. Our objectives were: (1) to use static life-tables to evaluate the cohort structure of tree species via Gentry methods for plant surveys, and (2) to use rarefaction techniques to contrast the alpha- and beta-diversity of tree species found across the three forest habitats. We are currently conducting the tree species surveys (10 transects, each 100m x 2m) at Palmer Park and will use the transect information to conduct the diversity analyses using the software EstimateS. Characterizing the structure and diversity of urban trees is an important first step in the exploration of how ecosystem services (e.g. stormwater infiltration, nutrient cycling, etc.) can be recovered and sustained in urban environments.

**Authors:** Fadak Aljabery and Victor Carmona, Ph.D., University of Detroit Mercy

40. **Yarnise Hines, University of Detroit Mercy:**

*Methodologies for Evaluating Pollinator Deserts in Detroit*

The diverse green-infrastructure across the Detroit area is estimated to be comprised of more than 1,500 gardens to larger-scale farms that are operated at the individual, school, and community levels. However, in the exploration of urban agricultural systems it is also important to consider the habitat requirements of the pollinator communities needed to sustain food sovereignty. Our working hypothesis is that the pollen baskets located on the hind legs of honeybees can be used to characterize the diversity of floral resources in urban habitats by means of geographic information systems. We identified and outline three different methodologies for evaluating pollen morphology using optical and molecular techniques. Scanning electron microscopy would allow for the visual inspection of individual pollen grains. Florescent microscopy would allow for the use of software assisted Z-stacking to construct visuals of pollen grains in small batches. Barcoding would use molecular techniques to identify all pollen species sampled, including hybridized plant species. We characterize the workflow for each technique and discuss the short-term and long-term tradeoffs for the experimental procedures. The characterization of pollinator deserts offers an opportunity to evaluate urban green-infrastructure in its ability to integrate ecological functions as well as broaden the scope of sustainability initiatives.

**Authors:** Yarnise Hines and Victor Carmona, Ph.D., University of Detroit Mercy

41. **Alymamah Mashrah, Wayne State University:**

*Women in Ethiopia: a Proposal to Use Mobile Phone Apps to Reduce HIV Infection*

**Background:** Approximately 1.2 million people live with HIV/AIDS in Ethiopia, with a higher prevalence rate among women. Women in Ethiopia face a major disparity regarding access to education. Attainment of the WHO Sustainable Development Goal to ensure reproductive health care services is proposed through with an Arabic mobile phone intervention. In 2017, the number of mobile subscriptions in Ethiopia was over 60 million.

**Methods:** Community health workers could be trained to offer a free educational app with age-appropriate messaging for adolescents and couples. Content would focus on HIV/AIDS information and safer sex practices.

**Public Health Implications:** The goal would be an increase in HIV awareness and decrease in HIV rates in women in Ethiopia. Changing sexual behaviors of men, who may control mobile phone use, and empowerment of their female partners may require increased access to sexual health education programs overtime as well as recognition of cost-effective public health strategies.

**Authors:** Alymamah Mashrah, MPH Candidate, Wayne State University

42. **Zoha Siddiqua, Wayne State University:**

*Detection of endocrine disrupting chemicals (EDCs) responsible for the 'estrogenic' properties of water*

The Detroit River receives a large number of contaminants from treated wastewater effluent, combined sewer overflows, urban and agricultural runoff, and landfill leachate. These contaminants include *contaminants of emerging concern (CECs)* that are not typically regulated and/or monitored and the extent of their impact is not well understood. Some CECs disrupt normal endocrine function and have been called *Endocrine Disrupting Chemicals (EDCs)*. Feminized aquatic vertebrates have been reported all over the world, particularly near areas where there is significant urban or agricultural impact on the environment, and this has been attributed to EDC activity (e.g., reports of elevated vitellogenin levels in male fish, a yolk protein and biomarker for estrogen exposure). Our hypothesis is that a bioassay system based on the waterflea and zebrafish can be used for a molecular identification tool and can detect estrogenic and anti-androgenic activity in water using behavioral, morphologic, and differential gene expression data.

Nine structurally diverse CECs that are known or suspected to be estrogenic and/or anti-androgenic were selected: 4-nonylphenol, atrazine, chlorpyrifos, dieldrin, bisphenol-A, estrone, metformin, triclocarban and triclosan. The two organisms were found to be sensitive to environmentally relevant concentrations (e.g., parts per trillion range, ppt) and a large number of significant alterations in gene expression were detected for all 9 CECs using QuantSeq. This study has clearly demonstrated the feasibility of the two-organism bioassay approach to identifying EDC activity in water and pathway analysis is currently underway to enable further development of the bioassay as an EDC detection tool.

**Authors:** Zoha Siddiqua<sup>1,6</sup>, Tracie Baker<sup>2,5</sup>, Camille Akemann<sup>2,6</sup>, Manahil Monshi<sup>1</sup>, Lakshmi Neha Alla Reddy<sup>1</sup>, Katherine Gurdziel<sup>7</sup>, Jeremiah Shields<sup>5</sup>, Karim Alame<sup>1</sup>, Danielle Meyer<sup>2</sup>, Andrea Wahls<sup>3</sup>, Fadie Saad<sup>1</sup>, Judy El-Nachef<sup>1</sup>, Merna Antoon<sup>1</sup>, Raquel Nakhle<sup>1</sup>, Emily Crofts<sup>5</sup>, Nemer Hijazi<sup>5</sup>, Maha Hamid<sup>1</sup>, Husein Nasser<sup>1</sup>, Shawn McElmurry<sup>3</sup>, Donna Kashian<sup>4</sup>, David Pitts<sup>1</sup>

1. Department of Pharmaceutical Sciences, 2. Department of Pharmacology, 3. Department of Civil and Environmental Engineering, 4. Department of Biological Sciences, 5. Institute of Environmental Health Sciences, 6. Transformative Research in Urban Sustainability and Training (T-RUST), 7. Applied Genomics Technology Center

43. **Treesa Antony, Wayne State University:**

*The Heart Truth Campaign for Asian-Indian Women: A National Red Saree Day*

Background: Cardiovascular disease mortality among Asian-Indian women is higher than Caucasian women. Cardiac awareness campaigns often do not target Asian-Indian women.

Purpose: To explore the efficacy of implementing the American Heart Association's 'Go Red for Women' cardiac awareness event in an Asian-Indian cultural setting.

Methods: Changes were made to culturally adapt the program. The red dress theme was changed to red saree, an Asian-Indian women's attire. Women completed the "What to do during a heart attack" quiz prior to and after the one-hour education session. The percent of correct answers prior to and after the intervention was compared. Women also completed a risk calculator to quantify their heart attack risk profile.

Results: 30 out of the 41 women (73%) had one or more risk factors for heart attack. Statistically significant ( $p < .05$ ) percent improvement was found for 9 of the 10 items about heart attack. The greatest percent change was found in the understanding that women tend to do worse after a heart attack when compared to men (27.9%), heart attack is the leading cause of mortality among women (19.6%) and that atypical symptom presentation such as nausea (20.6%) and fatigue (17.9%) is a symptom of heart attack among women.

Implications: Go Red for Women campaign must be culturally adapted and tailored into multi-cultural groups of women to enhance cardiac risk awareness. Culturally focused programs can foster inclusiveness, participation, and increased awareness.

**Authors:** Treesa Antony, DNP, RN-BSN, Clinical Instructor, Wayne State University, College of Nursing; Sandra Oliver-McNeil, DNP, ACNP-BC, AACC; Associate Professor; Wayne State University College of Nursing; Nicole Murn, DNP, CNM, Clinical Instructor, Wayne State University College of Nursing

44. **Adam Pedersen, Wayne State University:**

*Don't feed the fatberg! An assessment of "flushable" consumer products and their contribution to fats, oils, and grease accumulation in sewer systems*

Discharge of raw sewage into the environment creates multiple hazards to humans, natural resources, and aquatic organisms. One particular cause of such events is the blockage of sewer systems by dense conglomeration of fats, oils, and greases (FOGs) and solid consumer products, including disposable wipes. A recent massive sewage blockage in Macomb County, Michigan, now coined a “fatberg,” extended over 100 feet long, weighed about 19 tons, lead to untreated sewage being diverted into surrounding waterbodies, and threatened raw sewage backup into thousands of homes. Significantly, the EPA has noted that approximately 47% of sanitary sewer overflows in the U.S are due to these formations. To address this issue, we designed a study which investigates the role of flushable consumer products in fatberg formation, while simultaneously documenting real-time build-up and removal of these products at a local pumping station. The results of this study indicate the persistence of such products in the environment, as well as where they can accumulate and accelerate fatberg forming processes. Further investigation is warranted towards the development of control strategies to mitigate extensive human health and environmental consequences.

**Authors:** Adam Pedersen- Institute of Environmental Health Sciences, Wayne State University; Michelle Gorelle-Walsh College; Abraham Soto- Initiative for Maximizing Student Diversity; Jamie Steis Thorsby- College of Engineering, Wayne State University; Carol Miller- College of Engineering, Wayne State University; Steve Rozycki- Macomb County Public Works; Tracie R. Baker- Institute of Environmental Health Sciences, Department of Pharmacology- School of Medicine, Richard Barber Interdisciplinary Research Program

45. **Claire Sheppard, University of Detroit Mercy:**

*Morphological response of Triatoma dimidiata (Hemiptera: Reduviidae) to anthropogenic land-use in El Salvador, Central America*

Chagas disease is caused by the parasite *Trypanosoma cruzi*, which is transmitted by insect-vectors in the taxonomic subfamily Triatominae, and affects approximately eight million people world-wide. Current mitigation strategies for Chagas focus on insecticides, infrastructure improvements, and management of symptoms, which are largely unsustainable in underserved communities where the disease is widespread. Transmission patterns of vector-borne diseases are known to respond to habitat change, as such the objective of our study was to evaluate how the physical characteristics of *Triatoma dimidiata* would change in relation to land use in El Salvador. We hypothesized that the color and morphology of *T. dimidiata* would change in relation to municipal levels of urban and natural green space, natural green space, agricultural space, as well as municipal diversity, richness, and evenness of land use types. Our results characterize how *T. dimidiata* color and morphology respond to anthropogenic changes to natural and agricultural environments, which are reflective of a highly adaptable population primed to respond to environmental change. Mitigation studies of Chagas disease should exploit the relationships between anthropogenic land use and *T. dimidiata* morphology to evaluate how the transmission pattern of *T. cruzi* and Chagas disease symptomology are impacted.

**Authors:** Claire Sheppard, Madelyn Bastin, Megan Kehrig and Victor Carmona, Ph.D., University of Detroit Mercy; Maria F. Marín-Recinos, Justus Liebig University; Agrobiotechnology Program; Giessen, Germany; University of Michigan; School of Natural Resources and the Environment; Vianney C. de Abrego, Universidad de El Salvador; Centro de Investigación y Desarrollo en Salud; San Salvador, El Salvador

46. **Marsha Richmond, Wayne State University:**

*From DDT to Endocrine Disruptors: Environmental Chemicals and Public Health*

In 1962, Rachel Carson warned about the impact of pesticides on the environment and public health. *Silent Spring* helped launch the modern environmental movement, the founding of the Environmental Protection Agency in 1970, and the banning of DDT in the US. Soon, however, a new health threat emerged with the discovery that PCBs—“miracle” industrial chemicals with multiple uses as insulators and heat retarders—not only had dire health effects but persist in the environment and, by entering the food chain, in the body of humans and other organisms. Although banned in 1977, PCBs were not easily eradicated, early examples of what we now call “forever chemicals.” By 1991, Theo Colborn and a group of bio-medical researchers proposed a new understanding of how environmental chemicals impacted health. Whereas Carson pointed to cancer, they now spoke of “endocrine disruption.” The 1991 Wingspread Consensus Statement warned that man-made chemicals “have the potential to disrupt the endocrine system of animals, including humans” (Colborn and Clement 1992), which was more insidious, given that they affect developing organisms. However regulating such lucrative industrial chemicals has proven difficult, despite growing evidence of their harm. This poster explores the impact of Colborn et al’s 1996 book *Our Stolen Future: Are We Threatening Our Fertility, Intelligence, and Survival? A Scientific Detective Story* and the continuing debate over endocrine disruption.

**Authors:** Marsha L. Richmond, Ph.d. Department of History, Wayne State University

47. **Anna Maria Petriv, Wayne State University:**

*Health consequences of developmental and chronic exposures to nanoplastics in a zebrafish (Danio rerio) model*

Microplastics are a ubiquitous pollutant detected not only in marine and freshwater bodies, but also in tap and bottled water. Despite human and animal exposure to MPs, there has been minimal assessment of the corresponding health risks and ecological impact. To address this, we have designed a study which assesses the health consequences of exposure to two sizes of microplastics using zebrafish, an NIH-validated model organism ideal for studies in developmental toxicology. At early developmental timepoints, we exposed zebrafish to a dosing range (1-10,000 parts per billion), encompassing environmentally relevant concentrations. Using fluorescence, we determined dose-dependent increased accumulation in the liver and GI tract of exposed fish and quantified changes in survivorship, behavior, and developmental abnormalities in exposed fish. The uniquely broad scale of this study provides crucial multidimensional characterization of the health effects of microplastic exposure, which will inform the development of control strategies to mitigate such effects.

**Authors:** Anna-Maria Petriv- Institute of Environmental Health Sciences, Richard Barber Interdisciplinary Research Program; Adam Pedersen- Institute of Environmental Health Sciences; Danielle Meyer- Department of Pharmacology-School of Medicine, Richard Barber Interdisciplinary Research Program; Abraham Soto- Initiative for Maximizing Student Diversity; Yongli Zhang- College of Engineering, Wayne State University; Tracie R. Baker- Institute of Environmental Health Sciences, Department of Pharmacology- School of Medicine, Richard Barber Interdisciplinary Research Program