GENETIC AND ENVIRONMENTAL TOXICOLOGY ASSOCIATION
OF NORTHERN CALIFORNIA

FALL 2026 SYMPOSIUM

Climate Change and Public Health

Environmental Exposures and Emerging Health Risks

PROGRAM

Thursday, November 5, 2026 · 2:00 – 5:00 PM

CalEPA Headquarters, Sierra Hearing Room, 2nd Floor
1001 I Street, Sacramento, CA · In person and virtual

getanorcal.org

GETA Fall Hybrid 2026 Symposium

Climate Change and Public Health: Environmental Exposures and Emerging Health Risks

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Program

2:00 – 2:10 PM	Arrival and refreshments
2:10 – 2:20 PM	Opening remarks
2:20 – 2:50 PM	*Climate Change and Farmworker Health* **Carly Hyland, Ph.D., University of California, Berkeley**
2:50 – 3:10 PM	*Lightning talks* *Environmentally Relevant Ozone Exposure Increased Eosinophil Counts and Altered Transcripts Related to Mitochondria in Asthmatic Rhesus Macaques* **Lauren E. Adcock** *California's Amended Silica Standard and its Protection of Workers: Insights from Enforcement, 2024* **Amara Danturthi, MPH**
3:10 – 3:40 PM	*Coastal Wetland Deposition of Cathode Metals from the World's Largest Lithium-Ion Battery Fire* **Ivano Aiello, Ph.D., San José State University**
3:40 – 3:55 PM	Break and poster session
3:55 – 4:25 PM	*How Prenatal Climate Events are Potentially Impacting Child Neurodevelopment* **Rebecca Schmidt, Ph.D., University of California, Davis**
4:25 – 4:45 PM	Panel discussion: **Carly Hyland, Ivano Aiello, Rebecca Schmidt**
4:45 – 5:00 PM	Concluding remarks, poster session and networking

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Featured Speakers

Speaker #1:
Climate Change and Farmworker Health



Carly Hyland, Ph.D.
Assistant Professor of Cooperative Extension
UC Agriculture and Natural Resources
University of California, Berkeley
chyland@berkeley.edu

Biography:

Carly Hyland is an Assistant Professor of Cooperative Extension in the School of Public Health (Division of Environmental Health Sciences) at UC Berkeley. She conducts research and outreach focused on characterizing and mitigating the health impacts of climate change among agricultural and food systems workers. Examples of some of her projects include understanding the experiences and health impacts of farmworkers laboring through wildfires in Northern California and identifying interventions to mitigate heat stress among farmworkers in the San Joaquin Valley. Dr. Hyland employs mixed-methods and community engaged research methods in her work.

Abstract:

Farmworkers in California play a critical role in supporting national and global food supply chains, driving a nearly $60 billion annual agricultural economy that produces over a third of U.S. fruits and vegetables. Yet, farmworkers also have some of the greatest health inequities, including poor mental and self-rated physical health and high rates of chronic conditions such as diabetes and hypertension. These inequities are further exacerbated by climate change as farmworkers increasingly labor through heat waves, wildfires, and floods, often with inadequate regulatory infrastructure and access to health services. Further, many farmworkers are systematically excluded from safety net resources such as Medi-Cal or unemployment insurance due to their documentation status. This presentation will explore climate-driven threats to farmworker health in California, with examples focused on farmworkers' experiences working during wildfires and extreme heat and examine potential policy solutions to address the climate and socioeconomic drivers of health inequities in this essential workforce.

Speaker #2:
Coastal Wetland Deposition of Cathode Metals from the World's Largest Lithium-Ion Battery Fire



Ivano Aiello, Ph.D.
Professor and Chair
Civil and Environmental Engineering
Moss Landing Marine Laboratories
San José State University
ivano.aiello@sjsu.edu

Biography:

Dr. Ivano Aiello is a Professor of Geological Oceanography at San José State University and Moss Landing Marine Laboratories. His research integrates marine geology, sedimentology, geochemistry, and seafloor mapping to investigate Earth surface processes across coastal, marine, and deep-sea environments.

Current research focuses on the environmental impacts of the January 2025 Moss Landing lithium-ion battery fire through the EMBER (Estuary Monitoring of Battery Emissions and Residues) initiative. Other research interests include Monterey Canyon morphodynamics, silica diagenesis in hydrothermal sedimentary systems, coastal sediment transport, and environmental geochemistry.

Dr. Aiello combines field observations, laboratory analyses, remote sensing, GIS, and quantitative methods to study geological processes and their environmental implications. His work has been published in leading scientific journals and has been featured by national and international media.

Abstract:

The January 2025 fire at the Vistra battery energy storage facility in Moss Landing, California, provided an unprecedented opportunity to examine the environmental dispersal and fate of materials released during a large lithium-ion battery fire. Environmental sampling conducted by EMBER (Estuary Monitoring of Battery Emissions and Residues) identified substantial enrichment of the cathode-associated metals nickel, cobalt, and manganese in nearby coastal wetlands. Spatial patterns indicate atmospheric deposition of battery-derived material followed by redistribution among soils and sediments, surface waters, and biota. Continued monitoring reveals that these environmental compartments respond differently through time, reflecting processes of retention, mobilization, transport, and biological uptake. This work demonstrates the importance of integrated, multi-compartment sampling following battery fires and provides an empirical basis for understanding the environmental fate of battery-derived contaminants and improving monitoring strategies following future battery energy-storage-system incidents.

Speaker #3:
How Prenatal Climate Events are Potentially Impacting Child Neurodevelopment



Rebecca Schmidt, Ph.D.
Professor
Department of Public Health Sciences
and the MIND Institute
University of California, Davis
rjschmidt@health.ucdavis.edu

Biography:

Dr. Schmidt is a tenured full professor and molecular epidemiologist with over 20 years of research experience in epidemiology, gene-environment interactions, epigenetics, maternal and child health, and a primary emphasis on neurodevelopment and autism. Her pioneering research focuses on how prenatal environmental and nutritional exposures interact with genomics, molecular mechanisms, and developmental programming to influence the neurodevelopmental outcomes of children. She further investigates epigenetic, transcriptomic, and metabolomic markers of autism to increase understanding of biological pathways potentially involved. She leads a large biorepository and several pregnancy and child development cohort studies, including the MARBLES autism pregnancy cohort, the B-SAFE wildfire pregnancy cohort, and the PEACH cohort site for the national ECHO Program.

Abstract:

Wildfires and extreme heat events are increasing in frequency and intensity, becoming a rising threat to human health globally. Pregnancy is a time of rapid development and growth vulnerable to environmental exposures with potentially long-term impacts on child health. Wildfire smoke crosses the placenta and is linked to neurodevelopmentally-relevant molecular changes. Heat exposure in pregnancy has been linked to neurodevelopmental harm.
In two California-based birth cohort studies, we found that higher prenatal wildfire-associated particulate matter (PM) was associated with increased childhood behavioral problems and autism diagnosis. In a state-wide study, we further found associations between prenatal heat and autism that were stronger for higher nighttime temperatures and in combination with wildfire smoke exposure.
Ongoing work seeks to clarify critical exposure windows, mediating biological mechanisms, and risk modification by protective measures. Pregnant women should be protected from these exposures as much as possible to safeguard the health of the next generation.

Lightning Talks and Posters

Lightning Talk #1 and Poster #1



Environmentally Relevant Ozone Exposure Increased Eosinophil Counts and Altered Transcripts Related to Mitochondria in Asthmatic Rhesus Macaques

Lauren E. Adcock[1,2], Pedro A. Hernandez[1,2], Gursharan K. Sanghar[1,2], Angela Linderholm[1,2], Melissa J. Teuber[1,2], Vivian Vo[1,2], Jie Li[3], Thais Sielecki[4], Christopher M. Royer[2], Lisa A. Miller[2], Melpo Christofidou-Solomidou[4,5], Angela Haczku[1,2]

[1]Pulmonary, Critical Care and Sleep Medicine, Department of Internal Medicine, UC Davis Health
[2]National Biomedical Research Institute
[3]Bioinformatics Core Facility, University of California, Davis
[4]LignaMed, LLC
[5]University of Pennsylvania

Ozone (O_3) inhalation induces oxidative stress and exacerbates asthma but the role of mitochondrial function in these airway changes is poorly understood. We hypothesized that O_3-induced airway inflammation is associated with transcription of genes related to mitochondrial stress in asthmatic rhesus macaques. To address this question, we exposed asthmatic rhesus macaques of both sexes to the synthetic flaxseed-derived antioxidant LGM1506 (50 mg/kg) or placebo twice daily for 7 days prior to O_3 (0.3 ppm) or filtered air (FA) exposure (6 hours). Bronchoalveolar lavage (BAL) and bronchial brush samples were collected before dosing and 12 hours post-exposure. Bulk poly-A RNA-sequencing was aligned to Mmul10 (STARv2.7.10a); mitochondrial genes/pathways were identified with Human MitoCarta3.0. Differential expression, gene set enrichment (GSEA), gene-level Spearman correlation, and pathway-level GSEA correlations were performed. In BAL cells, O_3 significantly upregulated eosinophil percent ($p<0.0001$) and the oxidative phosphorylation (OXPHOS) pathway versus FA ($p<0.05$); LGM1506 lowered eosinophil counts ($p<0.0001$) and upregulated mitochondrial central dogma ($p<0.01$) and trafficking ($p<0.05$) pathways versus placebo in O_3-exposed macaques. Eosinophil counts were positively correlated with pathways for OXPHOS ($p<0.01$), Calcium uniporters ($p<0.05$), and Selenoproteins ($p<0.05$) and negatively correlated with Biotin utilizing protein pathways ($p<0.05$) in BAL cells. In bronchial brush cells, O_3 induced many pathways including OXPHOS ($p<0.0001$), mitochondrial dynamics ($p<0.01$), and ROS/Glutathione metabolism pathways ($p<0.01$); LGM1506 attenuated these pathways ($p<0.0001$, $p<0.05$, $p<0.05$, respectively). In bronchial brush cells, eosinophil counts were positively correlated with mitochondrial central dogma ($p<0.01$) and vitamin metabolism ($p<0.05$). O_3 drives compartment-specific mitochondrial stress responses in asthmatic macaques. Antioxidant administration prevents eosinophil infiltration, promotes mitochondrial trafficking and central dogma in immune cells, and suppresses oxidative stress pathways in bronchial epithelium. Mitochondrial pathway regulation correlated with airway eosinophilia, suggesting links between oxidative stress, mitochondrial dysregulation, and asthma severity. This data supports the correlation between environmental exposures and disease severity and explores a potential mitochondrial mechanism.

Lightning Talk #2 and Poster #2

California's Amended Silica Standard and its Protection of Workers: Insights from Enforcement, 2024



Amara Danturthi[1,2], Claire Romeu[3], Justine Weinberg[3], Amy Heinzerling[1], Rebecca Jackson[1], Robert Harrison[1], Ximena Vergara[1]

[1]Occupational Health Branch, California Department of Public Health, Richmond, CA
[2]Council of State and Territorial Epidemiologists, Applied Epidemiology Fellowship Program
[3]Public Health Institute, Richmond, CA

Over the last decade, cases of silicosis among stone fabrication workers in California have greatly increased due to the growing use of engineered stone (ES), which contains high levels of crystalline silica mixed with polyester resin and other materials. Silicosis is a chronic occupational lung disease that can be fatal; as of October 1, 2026, 660 ES silicosis cases and 35 deaths have been identified in California. In response to this epidemic, the California Division of Occupational Safety and Health (Cal/OSHA) amended its General Industry Standard for Respirable Crystalline Silica (RCS) in December 2023 (emergency) and December 2024 (permanent). We sought to describe Cal/OSHA silica inspection attributes and assess compliance with the amended silica standard.

We reviewed Cal/OSHA inspection files meeting any of the following criteria: 1) inspections performed in a relevant fabrication industry identified by North American Industrial Classification System codes, and if the fabrication operation was identifiable from online information; 2) inspections citing the RCS standard (section 5204); or 3) inspections that had an RCS/countertop fabrication emphasis. We abstracted additional information including employee/employer interviews, exposure control methods, and sampling data. Enforcement data from the Department of Labor Open Data Portal was used to populate the most recent inspection violation information. Descriptive statistics were performed in SAS to characterize these attributes.

Between December 29, 2023, and October 17, 2024, we analyzed Cal/OSHA inspection records for 62 fabrication operations. Nearly half of inspections occurred in LA County (n = 29, 46.8%) and more than half had <5 employees (n=39, 62.9%). Cal/OSHA performed air sampling at 23 operations (37.1%), with results exceeding the Permissible Exposure Limit at 15 (65.2%). More than a quarter of operations were issued an Order Prohibiting Use (n=17, 27.4%), indicating imminent hazards. Of 88 interviewed employees, only 24 received fit-testing (27.3%) or medical evaluations (n=13, 14.8%), and almost none reported wearing a Powered Air Purifying Respirator as required by the standard.

Our analysis of Cal/OSHA inspection data since the RCS standard was first amended shows widespread non-adherence by operations. Enforcement is one tool to protect workers at risk for ES silicosis, and inspection data can provide additional information to inform broader prevention strategies.

Poster #3

California Cannabis Consumption Survey: A Foundation for Health-Based Pesticide Limits for Edible Cannabis

Anna A. Kalashnikova, Svetlana Koshlukova, Qiaoxiang Dong, Brendan Darsie, Julia C Tomassilli, Shelley DuTeaux and Jennifer (JT) Teerlink
Department of Pesticide Regulation, California Environmental Protection Agency, Sacramento, CA

Cannabis remains a federally illegal crop in the United States, and pesticide use on cannabis and pesticide residue on cannabis products cannot be regulated in the same way as other agricultural crops. This has left US states that have legalized cannabis to develop their own regulatory frameworks. In California, the Department of Pesticide Regulation (DPR) advises the Department of Cannabis Control on health-protective pesticide residue limits known as “action levels” for cannabis products, including edibles, beverages, and tinctures. A major challenge in establishing health-based action levels from pesticide residues in cannabis is the lack of both cannabis pesticide concentration data and cannabis product use and consumption data, both of which are essential for estimating pesticide exposure from cannabis use. When DPR initially developed its pesticide action level methodology, the department selected watermelon as a surrogate agricultural commodity because of its high consumption rates. This was the most health-protective strategy to account for the wide variety and consumption range of cannabis-infused edibles. However, this model lacked real-world relevance. To refine its methodology, DPR partnered with California State University, Sacramento (CSUS) to conduct the California Cannabis Consumption (C3) Survey in 2020 and 2023. The C3 Survey provides the first comprehensive dataset on cannabis consumption patterns in the California marketplace and supports the development of more accurate, health-based exposure scenarios.

Poster #4

Human Health Risk Evaluation of Pesticide Residues on Fresh Fruits and Vegetables in California: An Integrated Statewide Monitoring and Enforcement Program

H. M. Cherukury, I. Vaysertreyger, J. Adragna, D. J. Bonnar, B. Brown, A. Cox, B. Darsie, P. Dodmane, Q. Dong, M. Geier, J. Horvath, A. Kalashnikova, A. L. Rubin, S. Tiscione, C. Zhang, M. Armstrong, P. N. Lohstroh, S. E. Koshlukova, and S. Jones
Department of Pesticide Regulation, California Environmental Protection Agency, Sacramento, CA

To protect public health and enforce pesticide regulations, the California Department of Pesticide Regulation (DPR) operates the California Pesticide Residue Monitoring Program (CPRMP), a globally unique program that combines real-time health risk evaluation with regulatory enforcement. CPRMP samples both domestic and imported fresh produce to identify illegal pesticide residues and ensure compliance with US Environmental Protection Agency (US EPA) established tolerances. A pesticide tolerance is defined as the highest residue levels of a pesticide legally permitted on a specific commodity. Samples are collected statewide from wholesale and retail outlets, distribution centers, and farmers markets, with an emphasis on commodities frequently consumed by children and diverse demographic groups. Each sample is quantitatively analyzed for approximately 500 different pesticides to identify violations. Two types of violations are monitored by CPRMP: 1) “over tolerance” (OT), where residue levels exceed the established tolerance limit, and 2) “no tolerance established” (NTE), where a pesticide is detected on a commodity without an approved tolerance. DPR conducts rapid health risk evaluations for both types of violations to protect the public.

Poster #5

Developing Human Health Reference Levels for Pesticide Residues in Groundwater

Chunbo Zhang, David Bonnar, Brandon Brown, Qiaoxiang Dong, Mitra Geier, Anna Kalashnikova, Scott Tiscione, Peter Lohstroh, Svetlana Koshlukova, Shelley DuTeaux
Human Health Assessment Branch, Department of Pesticide Regulation, California Environmental Protection Agency, Sacramento, CA

In accordance with California's Pesticide Contamination Prevention Act (PCPA), the Department of Pesticide Regulation (DPR) established pesticide detection and response processes to prevent potential contamination of groundwater from legal agricultural use of pesticides. Detection of pesticides in groundwater following routine monitoring may trigger a request to DPR's Human Health Assessment (HHA) Branch for a human health risk evaluation. These evaluations are fit-for-purpose formal reviews that determine if the pesticide was detected after legal agricultural use and, if so, whether uses can continue with or without added restrictions. HHA evaluations establish one or more Groundwater Human Health Reference Levels (HHRLs) for screening pesticides in groundwater.

Poster #6

Event-Scale Deposition of Atmospheric Microplastics in Snowfall of the Sierra Nevada in North America

Aleksandra Karapetrova[1], Win Cowger[1,2], Janice Brahney[3], Gwen Lattin[2], Hazel Vaquero[2], Angela Anguiano[2], Sonya Maple[4], Azure Fisher[1], William Porter[1], Edward Bair[5], Monica Arienzo[6], Xinping Cui[7], Andrew Gray[1], Jay Gan[1,8]
[1]Department of Environmental Science, University of California, Riverside, CA.
[2]Moore Institute for Plastic Pollution Research, Long Beach, CA
[3]Department of Watershed Sciences, Utah State University, Logan, UT
[4]Department of California Fish and Wildlife, Sacramento, CA
[5]Leidos, Inc., Reston, VA
[6]Division of Hydrologic Sciences, Desert Research Institute, Reno, NV
[7]Department of Statistics, University of California, Riverside, CA
[8]College of Agriculture and Biotechnology, Zhejiang University, Hangzhou, Zhejiang, China

Atmospheric deposition of microplastics (MPs) at an event-scale resolution can be measured in snowfall events, as snow scavenges atmospheric MPs and the snowpack serves as a repository for MP accumulation. We monitored MP deposition in freshly fallen snow, the snowpack, and dry deposition over the course of 6 months in the Sierra Nevada of North America. Average microplastic concentrations in fresh snow ranged from 11.8 to 37.5 p/L at remote sites, which were significantly less than the 68.3 to 92.9 p/L MP concentrations found at the anthropogenically impacted site. Average bulk deposition rates were estimated to be 267 to 3190 p/m2 /day at remote sites, significantly lower than the 3242 to 7480 p/m2 /day at the anthropogenically impacted site. HYSPLIT back-trajectory modeling characterized the potential regional transport of MPs from upwind regions that were predominantly agricultural and suburban areas, as well as localized anthropogenic activities that could significantly affect MP deposition rates in snowfall. This study introduces high-throughput FTIR analysis methods with a highlight on fiber spectroscopy, demonstrates the value of estimating MP fluxes at the meteorological event scale, reports MP deposition rates in a critical water resource, and provides a basis for future long-term atmospheric MP monitoring.

Poster #7

Investigating Harmful Algal Bloom Events and Illness Report Tracking at Clear Lake

Shannon R. Murphy[1], Karen Odkins[2], Marisa Van Dyke[3], Carly Nilson[3], Thomas Hayashi[4], Beckye Stanton[1]

[1]Office of Environmental Health Hazard Assessment California Environmental Protection Agency
[2]California Department of Fish and Wildlife
[3]State Water Resources Control Board California Environmental Protection Agency
[4]California Department of Public Health

Clear Lake is repeatedly impacted by harmful algal blooms (HABs) that occur when the overgrowth of cyanobacteria or eukaryotic algae poses a risk to humans, animals, or the environment. These HABs can disrupt water quality conditions and often produce toxins that are harmful to humans, domestic animals, and wildlife. HAB-related illness report tracking is critical to understanding the scope of human and animal health impacts, informing HAB monitoring and response actions, and minimizing the exposure risk to ultimately reduce the frequency and severity of harmful algal bloom (HAB)-related illnesses.

This presentation will provide an overview of how California investigates and tracks HAB-related illnesses in humans and animals at Clear Lake and across the state through the Interagency HAB-Related Illness Workgroup. We will review the impacts of HABs on human, animal and environmental health, and then discuss California's process for investigating HAB-related illnesses, making case determinations, and reporting HAB-related illnesses to the Centers for Disease Control and Prevention One Health Harmful Algal Blooms System (OHHABS). OHHABs serves as the national tracking database for HAB-related illnesses that occur in the US. Finally, we will synthesize the Clear Lake HAB-related illness event data for 2018-2023.

Poster #8

Toxic Effects of Lithium and Zinc on the Gill Tissue of *Mytilus californianus*

Reagan Ochalek
University of California, Davis, Davis, CA

The California Mussel (*Mytilus californianus*) is a critical species to the intertidal zone along the west coast of North America. As filter feeders, metal contamination in seawater poses a threat to the whole organism. Minimal studies have been conducted on live gill tissue to explore the organ-specific effects of zinc and lithium exposure. In this paper, I seek to bridge the gap in knowledge that exists in bivalve gill response to ZnSO4 and LiCl exposure, establish a method of quantitatively and qualitatively assessing the damage imposed by these metals, and exploring the toxic outcome of their combination. A movement study was conducted to observe the effects of metal exposure on cilia movement, then it was followed by a propidium iodide stain and fluorescent analysis. From these experiments, it was found that zinc is more toxic than lithium to mussel gills and there is no correlation between either metal at any concentration and how long the cilia are able to move. Further research is needed to understand the combined effects of zinc and lithium. The results suggest that the gills of *M. californianus* are able to uptake metal contaminants at concentrations far beyond the lethal dose established for the organism as a whole, suggesting that mussels can be "super accumulators" of metal contaminants. This excessive accumulation of metal contaminants is of concern when considered in a broader context, as these metals can be toxic not just to *M. californianus*, but to opportunistic feeders like the black oystercatcher, or the ochre star (their main predator).

Poster #9

Risk and Exposure Assessment of Non-agricultural Uses of Imidacloprid

Andrew L. Rubin, Anna A. Kalashnikova, Mitra C. Geier, Brendan Darsie, Puttappa Dodmane, Scott Tiscione, Daisy Dong, Pete Lohstroh, Eric Kwok, Svetlana Koshlukova, and Shelley DuTeaux
Department of Pesticide Regulation, California Environmental Protection Agency, Sacramento, CA

Imidacloprid is a systemic and contact neonicotinoid insecticide. It is one of the most widely used pesticides worldwide, applied to soil, foliage and animals to control insects on crops, pets, and turf. Imidacloprid's pesticidal action is attributed to its binding to insect nicotinic acetylcholine receptor (nAChR) causing overstimulation and paralysis. In mammals, signs include incoordination, tremors, decreased activity, reduced body temperature, and at sufficiently high doses, death. The developing nervous system is the most sensitive target. In this assessment, the California Department of Pesticide Regulation (DPR) evaluated the potential human health effects and risks from occupational and non-occupational exposure to imidacloprid in non-agricultural settings. These included (1) professional handlers in landscape, residential, and recreational settings; (2) use of home (consumer) products; (3) post-application exposures to non-applicators; and (4) dietary and aggregate exposures.

Poster #10

Probabilistic Dietary Exposure Analysis of Imidacloprid Residues in Food and Drinking Water: Use of Federal and State Pesticide Residue Monitoring Data for Refining Exposure

P. Dodmane, S. Tiscione, A. Kalashnikova, S. Koshlukova, and S. DuTeaux
Department of Pesticide Regulation, California Environmental Protection Agency, Sacramento, CA

Imidacloprid is a neonicotinoid insecticide that acts by blocking the nicotinic acetylcholine receptors in the insect nervous system. In mammals, signs of toxicity include incoordination, tremors, decreased activity, reduced body temperature, and at sufficiently high doses, death. Imidacloprid is widely used on a variety of crops and the U.S. Environmental Protection Agency (US EPA) has established tolerances (maximum allowable residues) on more than 100 commodities or commodity groups for the combined residues of the parent imidacloprid and its metabolites containing the 6-chloropyridinyl moiety. However, established tolerances do not consider a comprehensive dietary exposure from consumption of all these commodities. In this evaluation, dietary exposure to imidacloprid residues in food and drinking water from legal uses was calculated for multiple populations, including sensitive subpopulations. Accurate exposure estimation is essential for realistic risk assessment and protection of public health; therefore, DPR conducted a highly refined probabilistic approach to calculate acute dietary exposure to imidacloprid.

Poster #11

Screening-Level Cumulative Health Risk Evaluation: Exposures to Acetamiprid, Clothianidin, Dinotefuran, Imidacloprid and Thiamethoxam residues from Non-Agricultural Uses

Puttappa Dodmane, Svetlana Koshlukova, Scott Tiscione, John Adragna, and Shelley DuTeaux.
Department of Pesticide Regulation, California Environmental Protection Agency, Sacramento, CA

Neonicotinoid insecticides are widely used to control sucking and chewing insects on crops and companion animals. Due to their systemic activity, they are extensively used for soil applications, seed treatments, and foliar treatments. All neonicotinoids share a key structural feature with both nicotine and acetylcholine enabling binding to and blocking nicotinic acetylcholine receptors (nAChRs) in the insect nervous system. Mammalian signs of exposure include incoordination, tremors, decreased activity, reduced body temperature and at sufficiently high doses, death; the developing nervous system is the most sensitive target. In 2024, California Assembly Bill 363 (AB 363) directed the Department of Pesticide Regulation (DPR) to evaluate the cumulative impact on human health from non-production, non-agricultural outdoor use of multiple neonicotinoid pesticides. This cumulative analysis focused on five neonicotinoids (acetamiprid, clothianidin, dinotefuran, imidacloprid, and thiamethoxam) and considered multiple exposure pathways relevant to the bystander population, including children.

Poster #12

Targeted Mitochondrial Genome Damage Modulates the Innate Immune System Through Exported Nucleic Acids

Anthony Rios[1], Anal Jana[2], Yu-Hsuan Chen[2], Linlin Zhao[1,2]
[1]Environmental Toxicology Graduate Program, University of California, Riverside, Riverside, CA
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Alkylating agents are a prevalent class of natural and anthropogenic pollutants that react to form lesions on biomolecules and may be encountered through contact with contaminated air, water, edible products, and soil. While exposure can have global deleterious effects on cells when damage is severe, subcritical exposure can lead to reactionary cellular processes that may have a greater impact on cellular health than the initial damage itself. Mitochondrial DNA (mtDNA) damage can impair metabolic function and trigger innate immune signaling by releasing mitochondrial nucleic acids. However, the consequences of selective mtDNA alkylation on mitochondrial DNA and RNA output remain poorly understood. To explore this, we present a mitochondria-targeted chlorambucil-derived alkylating probe (mtChl) and characterize its effects in human bronchial epithelial BEAS-2B cells. qPCR and ddPCR analysis demonstrate that mtChl preferentially reduces mtDNA copy number and integrity without inducing nuclear DNA damage, while a non-alkylating analog did not affect these metrics. We showed that low-dose mtChl treatment increased mtDNA fragmentation without measurable bioenergetic impairment, whereas higher exposure increased endonuclease IV-sensitive lesions. These higher doses decreased mitochondrial membrane potential and oxygen consumption as determined by the Agilent Mito Stress Test, and altered expression of mitochondrial dynamics-associated genes. In addition, mtChl treatment increased cytosolic mtDNA and mtRNA abundance, J2-positive double-stranded RNA accumulation, and promoted activation of recognition/response pathways that upregulated type I interferon and inflammatory genes. Pharmacological inhibition of voltage-dependent anion channel- and mitochondrial permeability transition pore-associated processes reduced cytosolic mtDNA and mitochondrial RNA abundance, hinting at a non-apoptotic release mechanism. Innate immune responses were attenuated in mtDNA-depleted (ρ 0) BEAS-2B cells. These findings demonstrate that mitochondrial insult alone can induce global stress responses and that mtChl can be leveraged as a useful tool compound for investigating how mtDNA alkylation couples mitochondrial genome injury to mitochondrial nucleic acid output, innate immune signaling, and subsequent loss of organelle efficiency.

Poster #13

Quaternary Ammonium Compounds used as disinfectants (dQACs) cause significant cell injury in vitro and Inflammation ex vivo and in vivo in mouse lung

Claire B. Montgomery-Bowie, Hannah Zhang, Sandipan Datta, Ren Adcock, Jean Chen, Gino Cortopassi

Dept. Of Molecular Biosciences, Univ. of California, Davis, Davis, CA, USA

While human exposure to Quaternary Ammonium Compounds used as disinfectants (dQACs) increases risk for asthma five-fold and Chronic Obstructive Pulmonary Disease about 40% (COPD), exposure to non-disinfectant QACs (ndQACs) of different chemical structure used as antistatics in laundry and hair care products have not been shown to increase risk for respiratory disease. We observe that while dQACs 1) dose-dependently inhibit mitochondrial Oxidative Phosphorylation (OXPHOS); 2) increase AMP-Kinase; 3) decrease mTORC1; and significantly kill airway cells at 10uM and 30uM, that ndQACs do not do 1, 2, and 3 and are non-lethal at these concentrations.

We have recently shown that dQACs Benzalkonium Chloride (BAC) and Dimethyldibenzylammonium Chloride (DDAC) are 100-fold more toxic when inhaled than ingested. Further we find that, as a likely result of their dose-dependent induction of cell injury, dQACs increase inflammatory cell influx and induce pulmonary inflammation. We addressed this gap in knowledge using in vitro and in vivo methodologies including testing of A549 (human alveolar epithelial type II cell line) and immuno-histochemistry (IHC) of in vivo exposed mouse lungs. Exposure to BAC or DDAC showed a significant effect on A549 and BEAS-2B cell viability, with an LD50 of approximately 5uM. In fixed mouse lung tissue, an increase in macrophage and neutrophil activation was seen, with an increase in CD68+ macrophages and MPO+ neutrophils. These data show that exposure levels causing 1-5uM blood levels may cause cell death, excess cellular influx, and immune cell activation. These findings support the hypothesis that aspiration of dQACs causes more lung injury than dermal or gut penetration and that airborne dQAC exposure could underlie significantly increased human risk for pulmonary disease.

Poster #14

Glucagon-like peptide-1 receptor agonists as dual therapeutics for obesity-related asthma and metabolic dysfunction

Destiny R. Gomez[1], Angela Linderholm[1], Lisa Franzi[1], Amir Zeki[1], Nicholas J. Kenyon[1]
[1]University of California, Davis, Davis, CA

Asthma affects over 300 million people worldwide and is strongly associated with obesity; nearly 60% of U.S. adults with severe asthma are obese. In these patients, asthma is often severe and difficult to control, with reduced responsiveness to beta-2 adrenergic agonists-the mainstay of treatment. Glucagon-like peptide-1 (GLP-1) receptor agonists, widely used for diabetes and obesity, show promise for reducing airway inflammation, asthma exacerbations, and improving lung function; however, the mechanisms linking obesity and asthma that could enable targeted therapies, and the role of endogenous GLP-1 signaling in the lung, remain poorly understood. We hypothesized that GLP-1 receptor agonists attenuate airway constriction in mouse airways by activating GLP-1 receptors on lung endothelium, stimulating endothelial nitric oxide synthase (eNOS) activity and nitric oxide (NO) production. NO diffuses into adjacent airway smooth muscle (ASM) cells and activates soluble guanylyl cyclase (sGC), promoting conversion of GTP to cGMP, which activates protein kinase G (PKG) and leads to reduced intracellular calcium and ASM relaxation.

Building Logistics

CalEPA Headquarters, 1001 I Street, Sacramento, CA 95814

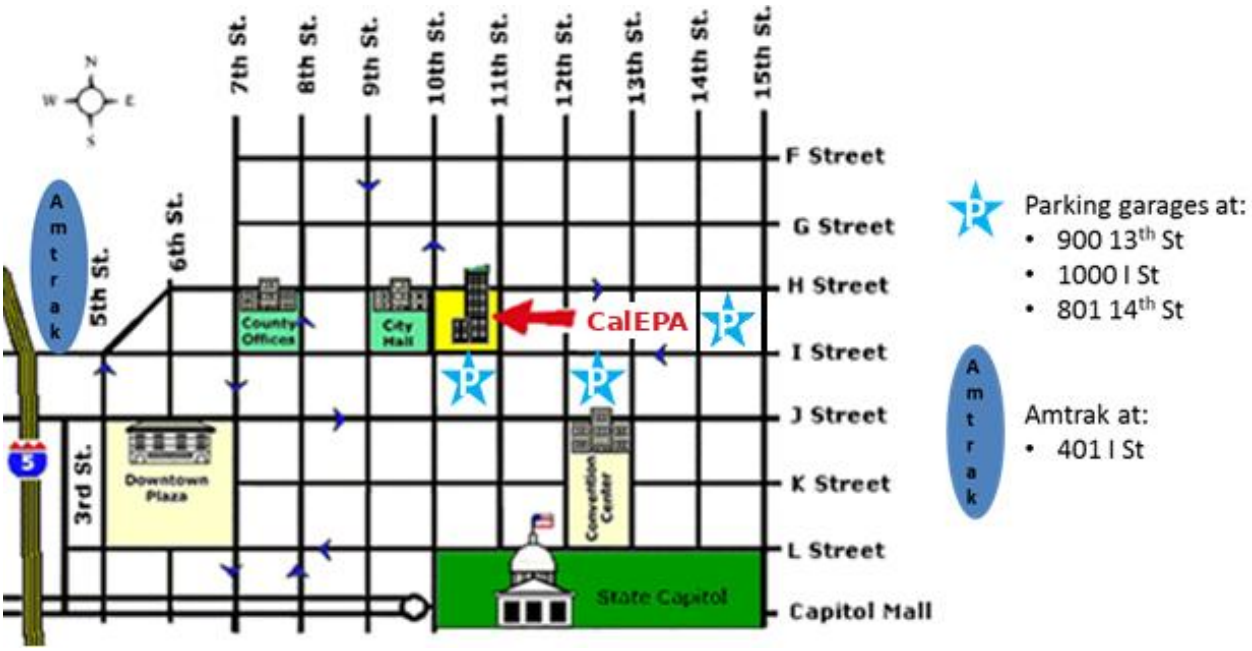
Entrance: 10th and I Streets. Check in with security in the main lobby to get a badge.

Room: Sierra Hearing Room, 2nd floor (stairs or elevator).

Parking: We recommend City Hall Garage, 1000 I St. Other garages are marked on the map.

Train: Sacramento Valley Amtrak station (401 I St) is about six blocks away.

Directions: calepa.ca.gov/headquarters-sacramento/location



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