



TOX QUARTERLY

The Official Publication of UCR Mini-ETOX GSA



Tox Quarterly Newsletter Editor: John Hoang (if interested in helping out, please reach out to John!)
Content Provided by: John Hoang, William Troxel, Lillian Tran, Lillian On, & Benjamin Maki

ETOX Recruitment Day 2024

On February 22nd & 23rd, the ETOX program held its annual recruitment day, inviting prospective students to explore UC Riverside and learn about the campus and our program. ETOX faculty, administration, & graduate students came together to host students for a jam-packed-filled schedule of interviews, tours, and fun! Whilst the event is in the past, this doesn't mean you can't be involved next year! Be on the look out for emails or you can reach out to Dustin Domingo @ dustin.domingo@ucr.edu.



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Daniel Petras is an Assistant Professor of Biochemistry and is affiliated with the Biochemistry and Environmental Toxicology Graduate Programs.

UCR ETOX Faculty Spotlight: Daniel Petras

by John Hoang

Daniel Petras earned his PhD in biochemistry at the Technical University Berlin, and studied biotechnology at the University of Applied Sciences in Darmstadt and the Polytechnic University of Valencia in Spain. He did postdoctoral research at the University of California, San Diego and officially began his lab, the Functional Metabolomics Lab, in 2021 at the University of Tuebingen. His lab focuses on the development and application of mass-spectrometry-based tools to map and understand chemical exchange in complex biological systems.

Let's get to know Dr. Petras:

- 1. What is your research background?**
I completed my PhD in Biochemistry at the Technical University of Berlin, followed by a postdoctoral position at UC San Diego in metabolomics. Before attending college, I worked as a lab technician for a small biotech startup, where I used some of the first commercial LC-MS systems. Since then, mass spectrometry has been a central tool in my research, which has focused on studying venoms, natural product biosynthesis, metabolic exchanges in microorganisms, and host-microbe interactions.
- 2. What are your research interests?**
I am broadly interested in bioanalytical chemistry and the application of mass spectrometry tools to study chemical exchanges in microbial communities. Our research mainly focuses on environmental systems, including marine and soil microbial communities and the influence of anthropogenic pollution. We also study various host-microbe interactions, primarily in plants and humans.
- 3. What inspired you to go into research?**
Since elementary school, I was fascinated by my natural science classes, which were one of the few subjects I truly enjoyed during my early education. With a somewhat unconventional academic background, I graduated from middle school at 16 and pursued an apprenticeship as a laboratory assistant in chemistry, a typical professional training program in Germany that many choose instead of high school. The classes and teachers I had during that time really sparked my deep fascination with analytical and biochemistry.
- 4. What piece of advice do you wish you were given when you were a graduate student?**
Write, write, write from your first day in graduate school. Start early with protocols, method sections, publication-style figures, results, introduction sections for your chapters/future papers, and proposals. The more you practice, the better you get, and this is, in my experience, one of the hardest skills to master efficiently.
- 5. What do you like to do outside of the lab for fun?**
I enjoy cooking and baking, and I love the outdoors and the ocean, especially surfing and sailing.

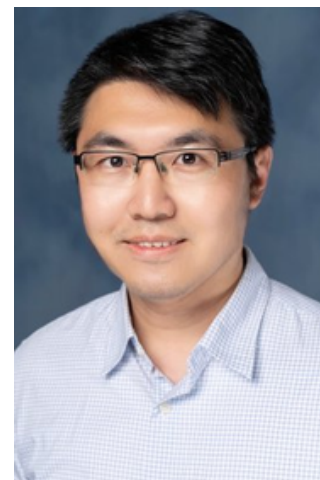
**Please join us in welcoming Daniel to UCR
and the ETOX program!**



UCR ETOX Faculty Spotlight: Wei-chun Chou

by John Hoang

Wei-chun Chou earned his PhD in biomedical engineering and environmental sciences from the National Tsing-Hua University in 2013. Following his PhD, he did postdoctoral research and training at Kansas State University. Dr. Chou then worked as a Research Assistant Professor at the University of Florida from 2021 to 2023. His lab utilizes machine learning and artificial intelligence to predict ADME-Tox properties of environmental chemicals.



Wei-chun is an Assistant Professor of Environmental Health and is affiliated with the Environmental Science and Environmental Toxicology Graduate Programs.

Let's get to know Dr. Chou:

- 1. What is your research background?**
I earned my Ph.D. in Biomedical Engineering and Environmental Sciences from National Tsing-Hua University in 2013. I then completed extensive postdoctoral training at the Institute of Computational Comparative Medicine at Kansas State University, where I honed my expertise until 2021. Before joining UC Riverside, I served as a research assistant professor at the University of Florida.
- 2. What are your research interests?**
My research lies at the intersection of computational technologies and environmental sciences, with a particular focus on physiologically based pharmacokinetic (PBPK) modeling, machine learning, and artificial intelligence (AI) applications. My work harnesses machine learning and AI models to predict the absorption, distribution, metabolism, excretion, and toxicity (ADME-Tox) properties of environmental chemicals, significantly contributing to human health risk assessment. I am also pioneering the use of generative AI to reconstruct unidentified chemicals' structures and predict combined toxicity through non-target analysis. In nanomedicine, my computational models aim to improve tumor drug delivery efficiency.
- 3. What inspired you to go into research?**
From a young age, I was always curious about everything. This natural curiosity drives me to find answers through rigorous studies. I am particularly interested in environmental health, wanting to understand how chemicals influence humans and what kinds of interactions can induce disease. However, the mechanisms are quite complex. Thus, my goal is to formulate the mechanisms and tackle environmental health challenges through computational models.
- 4. What piece of advice do you wish you were given when you were a graduate student?**
Reflecting on my journey, I wish I had sought interdisciplinary collaborations earlier in my graduate studies. Such collaborations have proven invaluable for tackling complex research questions and advancing scientific knowledge.
- 5. What do you like to do outside of the lab for fun?**
I enjoy playing tennis and video games with my family and value spending quality time with friends and family.

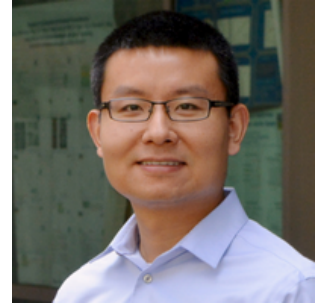
**Please join us in welcoming Wei-chun to UCR
and the ETOX program!**



TALES OF TOXICOLOGY

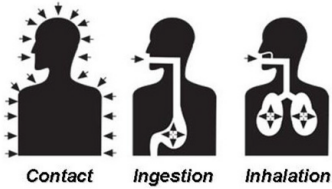
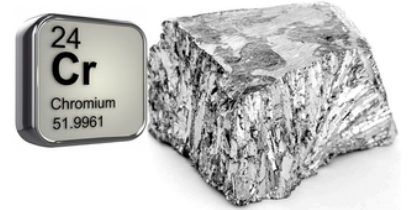
by William Troxel

A new segment focused on contaminants worked on by our faculty! In this issue, Dr. David Eastmond and Dr. Haizhou Liu tell all about Chromium.



What is Chromium?

Chromium (Cr) is a heavy metal found in natural & man-made sources. The common forms are trivalent (III) & hexavalent (VI), with +3 & +6 charges, respectively. Cr(III) is an essential trace element found in plants & animals. Cr(VI) is found in natural erosion & from pollution sources. The latter is water-soluble & can contaminate groundwater.



Cr(VI)'s exposure routes include the lungs, skin, & gastrointestinal tract. It mostly reduces to Cr(III) in the intestines. Cr(VI) absorbs into the body by mimicking a sulfate/phosphate ion & passing anion-exchange channels. In contrast, Cr(III) is harder to bio-absorb. Cr(VI) undergoes systemic circulation & accumulates in the lungs, liver, bones, & kidneys. ~60% of ingested Cr is excreted by the urinary system after 8 hours.

How can we be exposed to Chromium?

How does Chromium induce toxicity?

Cr(VI) reduces inside cells by reacting with nucleophilic ascorbate, glutathione, & protein cysteines to Cr(III). This produces reactive oxygen species like hydrogen peroxide & stressing cell membranes, proteins, & DNA. Other damage mechanisms include chromosomal breaks & DNA adducts, increasing the chance for protein mutations. Many oxidative stress responses, calcium mobilization, metabolism, protein synthesis, cell regulation, & cancer formation genes may also undergo epigenetic dysregulation.



What was Dr. Eastmond's involvement in Chromium toxicity research?

Dr. David Eastmond at UC Riverside published a paper in 2008 & a review in 2012 on Cr(III) genotoxic risks. In it, he compared Cr(III) & Cr(VI). In 2022, the EPA formed a new IRIS panel to review Cr(VI)'s carcinogenicity. Because of his previous work, he was invited onto the panel. The final report, published in 2023, reviews Cr(VI) research & the reported doses causing health effects. If accepted, it may guide future EPA policy, such as lowering the federally allowable Cr(VI) in American water sources. As of April 2024, the report is under a revised assessment. Contact david.eastmond@ucr.edu to learn more

Trivalent chromium: assessing the genotoxic risk of an essential trace element and widely used human and animal nutritional supplement
David A. Eastmond, James J. Heneghan, Ronald J. Dennis
Abstract
Trivalent chromium (Cr(III)) is recognized as an essential nutrient, and is widely used as a nutritional supplement for humans and animals. Recent reports of the reduction of dietary-derived hexavalent chromium (Cr(VI)) to Cr(III) in vivo have highlighted the concern that Cr(III) may also be genotoxic. Cr(III) compounds in vivo have been reported to be genotoxic, but this effect may not be generalizable under certain conditions, raising the question of the relative hazard posed by Cr(III) and Cr(VI) compounds in vivo. We have conducted a critical review of the genotoxicity of Cr(III) compounds to determine whether recent findings provide a sufficient weight of evidence to update the risk assessment of the ability of Cr(III) to induce genotoxicity. The general comparative review conducted during the period 1980-2004. The extensive literature on genotoxic effects of Cr(III) compounds includes many instances of conflicting observations, with both negative and positive findings often reported in similar test systems. Outcomes of in vivo tests conducted with Cr(III) in cultured cells are again widely reported in the literature. However, the chromium compound tested. The in vivo data show that Cr(III) has the potential to react with DNA, and to cause DNA damage in cell culture systems, but under experimental conditions. Cr(III) is not genotoxic in vivo under the conditions tested. The available in vivo data suggest that genotoxic effects may be confined to specific tissues or animals exposed to Cr(III) in a non-physiological manner. Cr(III) compounds are not genotoxic in vivo. However, recent studies of Cr(III) supplements do not appear to be warranted at this time. Thus, the current notion that hexavalent chromium effects in vivo under high-dose conditions, including genotoxicity, appear to outweigh the beneficial role of chromium, effects in vivo as normal or modestly elevated physiological intake levels.

What was Dr. Liu's involvement in Chromium toxicity research?

Dr. Haizhou Liu's lab at UCR has two Cr(VI) research foci. The first is fate & transport. Cr is in iron pipes as an anti-corrosive & in the ground from historical accumulation. The Inland Empire is a hotspot for Cr. Different variables may control Cr fate & transport including pH & temperature, making it key to understand pipe corrosion & water chemistry. The second is remediation. Cr(VI) is soluble in water, while Cr(III) precipitates out. Selectively controlling the conversion may help remediate drinking water sources. UV irradiation is a means to reduce Cr(VI) to Cr(III). Dr. Liu's lab is looking for more students to aid in this critical work. Reach out at haizhou.liu@ucr.edu

Hexavalent chromium in drinking water: Chemistry, challenges and future outlook of nano- and photocatalytic-based treatment
Haizhou Liu, et al.
Abstract
Chromium (Cr) typically exists in either trivalent and hexavalent oxidation states in drinking water, i.e., Cr(III) and Cr(VI), with Cr(VI) of particular concern in recent years due to its high toxicity and new regulatory standards. This Account presented a critical analysis of the sources and occurrence of Cr(VI) in drinking water in the United States, analyzed the equilibrium chemistry of Cr(VI) species, summarized important redox reactions relevant to the fate of Cr(VI) in drinking water, and critically reviewed emerging Cr(VI) treatment technologies. There is a wide occurrence of Cr(VI) in US source drinking water, with a strong dependence on granular sources, mainly due to naturally weathering of chromium-containing aquifers. Challenges regarding traditional Cr(VI) treatment include chemical cost, generation of secondary waste and inadvertent re-generation of Cr(VI) after treatment. To overcome these challenges, reductive Cr(VI) treatment technologies based on the application of stannous tin or electron-releasing titanium dioxide photocatalyst hold extreme promise in the future. To moving forward in the right direction, three key questions need further exploration for the technology implementation, including effective management of residual waste, minimizing the risks of Cr(VI) re-occurrence downstream of drinking water treatment plant, and promote the socioeconomic drivers for Cr(VI) control in the future.

Interested in being the next feature? Please contact anyone in the mini-GSA!



Graduate Student News, Resources, & Updates

Congratulations to Dr. Alexa Canchola for defending her thesis titled: "Thermal Transformation of Vitamin E Acetate During E-cigarette Vaping: Dynamic Chemistry and Toxicity" on March 5th, 2024!



What's poppin' in the ETOX community:

1. Wonsik Woo & John Hoang presented their recent research at the 2024 Society of Toxicology Meeting.
2. Rebecca Yates, Ali Refaei, and John Hoang attended the most recent Southern California Society of Environmental Toxicology and Chemistry Meeting.

Resources:

With the ETOX symposium slowly approaching and many preparing to attend conferences to showcase their work. Here are some resources to help you with poster printing:

1. Digital Print Services - UCR Campus Business Services
 - Lead time: approx. 3 days
 - Price: Estimated \$81.12 for 48 in by 48 in (stain finish photo paper) -> you can add a poster tube for \$8.50!
 - Contact Info: Mindy Moore, Marketing Coordinator: (951) 827-4792
2. Poster Printing Services - Orbach Library (1st floor, Room 121)
 - Lead time: Most single posters can be printed during the 15-minute appointment.
 - Price: \$20 for 42in x up to 48 in.
 - Recommended to schedule an appointment (9AM - 4PM)
 - Walk-in possible M-F 12PM-4PM, but subject to staff availability
 - Contact info: Andrew Morales, RS Dept. Assistant: (951) 827-6423

Updates:

1. The annual ETOX symposium will be on May 24, 2024 from 8:30 AM - 7 PM. The day will feature current student research, a raffle to support the ETOX mini-GSA activities, and fun games throughout the day!
2. The ETOX mini-GSA is currently looking for students to fill the roles of GSA representative and newsletter coordinator! Please contact John Hoang (jhoan073@ucr.edu) if you want to participate in the ETOX mini-GSA! Even if you don't want hold a position, feel free to reach out and provide your feedback! We always want to hear your voices.



Graduate Student & Faculty Publications

Avila-Barnard, S., Ha, M., Nemarugommula, C., Wiegand, J. L., Ke, H., De Souza, A., ... & **Volz, D. C.** (2024). Tris (1, 3-dichloro-2-propyl) phosphate disrupts cellular metabolism within human embryonic kidney (HEK293) cells. *Journal of Hazardous Materials*, 466, 133660.

Tian, L., **Woo, W.**, **Canchola, A.**, Chen, K., & **Lin, Y. H.** (2024). Correlation gas chromatography and two-dimensional volatility basis methods to predict gas-particle partitioning for e-cigarette aerosols. *Aerosol Science and Technology*, 58(6), 630-643.

Zhao, W., Hussen, A. S., Freudenthal, B. D., Suo, Z., & **Zhao, L.** (2024). Mitochondrial transcription factor A (TFAM) has 5'-deoxyribose phosphate lyase activity in vitro. *DNA repair*, 137, 103666.

Omaiye, E. E., Luo, W., McWhirter, K. J., Pankow, J. F., & **Talbot, P.** (2024). Ultrasonic Cigarettes: Chemicals and Cytotoxicity are Similar to Heated-Coil Pod-Style Electronic Cigarettes. *bioRxiv*, 2024-02.

Shi, Q., Cao, M., Xiong, Y., Kaur, P., Fu, Q., **Smith, A.**, **Yates, R.** & **Gan, J.** (2024). Alternating water sources to minimize contaminant accumulation in food plants from treated wastewater irrigation. *Water Research*, 255, 121504.

Graduate Student & Faculty Grants and Awards

1. **Dr. Wei-chun Chou** has received an R03 from the National Institutes of Health, funding research regarding artificial intelligence in nanomedicine!
2. A paper published by **Dr. Changecheng Zhou** has been selected as one of National Institute of Environmental Health Sciences' "Papers of the Year"! Check out the paper here: <https://doi.org/10.1016/j.envint.2023.107769>
3. **William Troxel** was a 2024 NSF GRFP Honorable Mention.
4. Emeritus Professor **David Eastmond** was selected for the Women in Toxicology Special Interest Group Mentoring Award at the most recent Society of Toxicology Meeting.
5. **John Hoang** received a travel award from Southern California SETAC.

Upcoming External Events

1. **Workshop: Silent Spring 2.0: Adverse impacts of neonicotinoid pesticides on human and wildlife health: May 21, 2024 7:00 AM - 11:00 AM**
<https://events.teams.microsoft.com/event/f31139cd-de5d-4677-b84e-352f5ad50a75@e202cd47-7a56-4baa-99e3-e3b71a7c77dd>
2. **Mass Spectrometry Symposium @ UC Riverside: June 7th, 2024 9:00 AM - 5:00 PM**
<https://www.cs.ucr.edu/~mingxunw/symposium/>



Environmental Toxicology Symposium

Join ETOX Faculty and Students for the 2024 Annual Graduate Student Symposium!

Friday, May 24th, 2024 in Glen Mor K106/108 UC Riverside Main Campus
8:30 am to 8 pm
Catered event!

RSVP Now




2024 ETOX SYMPOSIUM

ETOX-GSA RAFFLE!

A MONETARY DONATION WILL EARN YOU TICKETS!

\$1 - TICKET
\$5 - 6 TICKETS

PRIZES INCLUDE \$5 COFFEE BEAN GIFT CARDS, CITRUS GIFTS, DINING CARDS, AND MORE!

Venmo: @Lillian-Tran-7
 OR cash the day off!

All proceeds go to GSA events for next year!



ETOX Mini-GSA End of the Year Social

ENTX-MINI-GSA PRESENTS

Ice Cream SOCIAL

6.5.2024 | 1PM
 GEOLOGY COURTYARD



Thank you for reading! Until next time!