9th Young Environmental Scientists Meeting

9 - 11 March 2020
Waco, Texas

"New Times, New Science"
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On behalf of the Society of Environmental Toxicology and Chemistry (SETAC), the North America Student Advisory Council (NASAC), Baylor University and the Department of Environmental Science, we would like to welcome you to the City of Waco, the heart of Texas, and to the 9th Young Environmental Scientists -YES- Annual Meeting! We are delighted that you can join us for this unique event where young scientists from all over the world come together on a mission to learn, network and present their research projects in an environment created by students, for students.

YES was established in 2009 to bring together young scholars working in the fields of environmental science, toxicology and chemistry. The first YES meeting was held in Europe and organized by the SETAC Europe Student Advisory Council. After four successful European meetings (2009 in Landau, Germany, 2011 in Aachen, Germany, 2013 in Kraków, Poland, and 2015 in Valjevo, Serbia), YES was brought to North America (University of Florida) in 2016 under the theme “Science in the Swamp”. The YES meeting is now an annual event, alternating between Europe and North America.

We have done our best to bring you a diverse program full of opportunities to immerse yourself in all kinds of academic, scientific and social activities. We sincerely hope that the 9th YES meeting exceeds your expectations and that it leaves you with a desire to continue to participate and contribute to the many activities the students of SETAC have for you. We would also like to take this opportunity extend an invitation to the SETAC North America 41st Annual Meeting, to be held in Fort Worth, Texas from 15-19 November. Please stay tuned for when abstract submission opens and do not forget to apply for one of the many student travel awards given by SETAC.

Once again, welcome to Waco and Baylor University. Please enjoy the presentations, short courses and all of the events prepared for you, but most importantly, do not forget to have fun!

Sincerely,

9th YES Organizing Committee
Bekah Burket
Kendall Scarlett
Marco Franco
Acknowledgements

This welcome would not be complete without thanking all of the individuals and organizations that have made this event possible. From the SETAC office, we extend our gratitude to Ms. Laura Swanson, Ms. Terresa (Tee) Murdoch and Mr. Dusty Kennedy, who really carry an enormous weight behind the scenes. We also thank the staff from the Department of Environmental Science at Baylor University, especially Mrs. Kristie Curttright whose willingness and patience to help us coordinate many logistics have allowed us to bring this meeting to you. We also thank all of our sponsors, SETAC regional chapters, and each of you, whose participation is what allows the YES meeting to thrive.

9th YES Organizing Committee

Bekah Burket, Chair
Kendall Scarlett, Local Organizing Committee Chair
Marco Franco, Scientific Committee Chair

Scientific Committee
Alex MacLeod
Alexandra Folcik
Alexis Khursigara
Amelia Atwell
Annie Krueger
Armando Elizalde Velazquez
Benjamin Castellon
Brittany Perrotta
Chi-yen Tseng
Christina Sanders
Chukwuka Ogbonn
Daniel Lucas
Daniela Arán
Ifeoluwa Grace Idowu
Iohanna Filippi
James Feller
Julie Krzykwa
Justin Scott
Kevin Stroski
Kristina Bitter
Lea Lovin
Macarena Rojo
Marina Mulenos George
Omar Cruz Santiago
Rachel Leads
Sanjana Banerjee
Tomas MacLoughlin

Local Organizing Committee
Abigail Henke
Andrea Santa Cruz
Ashley Ball
Fallon Bain
Haley Davis
Henry Lujan
Jaylen Sims
London Steele
Megan O’Brien
Megan Solan
Ricardo Ehalt
Sahar Pradhan
Sarah Guberman VerPloeg
Zachary Rundell

North America Student Advisory Council
Derek Green
Leah Thornton-Hampton
Tim Rodgers
Thank you to our YES 2020 Silver Sponsors!

KJ SCIENTIFIC  SMITHERS

Thank you to our YES 2020 Bronze Sponsors!

Agilent  FU  VWR™

Weeks EnTox

Erica Brockmeier

Mark your calendars for these upcoming events:

SETAC Europe 30th Annual Meeting
3–7 May 2020 | Dublin, Ireland
Open Science for Enhanced Global Environmental Protection

Nontarget Analysis for Environmental Risk Assessment
26–30 May 2020 | Durham, NC, USA
SETAC North America Focused Topic Meeting

Register by 25 March and save with early bird rates.
General Information

Waco, Texas, USA

Waco is located in central Texas, situated along the Brazos River and I-35, halfway between both Austin and Dallas. Referred to as “The Heart of Texas”, Waco is home to a wide variety of attractions bringing visitors from all over the world. Among Waco’s most notable and unique attractions is the Waco Mammoth National Monument, a 100-plus acre stretch of wooded parkland along the Bosque River where visitors may view the fossil specimens of Columbian mammoths discovered in Waco and is part of the National Parks System. Did you know that the city is also famous for being the birthplace of Dr. Pepper, home to the Texas Ranger Hall of Fame, as well as the Texas Sports Hall of Fame? Fans of HGTV will recognize Waco as the filming location for Fixer Upper and home base for Magnolia.

If time allows, check out the following Waco attractions:

- Cameron Park and Zoo
- Mayborn Museum Complex
- Waco Hippodrome Theatre
- Waco River Walk and Suspension Bridge
- McLane Stadium

For further information, visit https://wacoheartoftexas.com or talk to a local student!

Local Waco attractions, from top left: Magnolia Silos, McLane Stadium, Waco Mammoth National Monument and Waco Hippodrome.
About Baylor University

Baylor University was chartered in 1845 and is the oldest continually operating university in Texas. *U.S. News & World Report* ranks Baylor No. 79 on their annual review of colleges and universities and Baylor takes pride on their commitment to undergraduate, graduate and professional education programs.

The Baylor Sciences Building (BSB), pictured above, serves as the main venue for the 9th YES meeting. It houses six academic departments from the College of Arts and Sciences, and more than 10 interdisciplinary centers, such as the center for microscopy and imaging, the mass spectrometry center, and the molecular biosciences center.

Besides looking around the BSB, take the time to visit our gorgeous campus and major attractions such as Pat Neff Hall, the most historic building on campus with its roof covered in gold!

Baylor’s official mascot is a bear, and you might be surprised to find Lady and Joy, the two real bears housed in the Bear Habitat – the most visited place on campus.

Grab a campus map and wander around if time permits!
Baylor University is committed to maintaining a safe learning environment for our community.

For Emergency Assistance Call Baylor Police: +1-254-710-2222

Baylor Police: www.baylor.edu/baylor_police

Emergency Planning and Preparedness: www.baylor.edu/emergency

Additional campus maps can be found at https://www.baylor.edu/map/
<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>7:30</td>
<td><strong>Registration Opens</strong></td>
<td>BSB E-wing Atrium</td>
</tr>
<tr>
<td></td>
<td><em>Breakfast tacos from Rudy’s Waco</em></td>
<td></td>
</tr>
<tr>
<td>8:00</td>
<td><strong>Welcome Address: YES 2020 Organizing Committee</strong></td>
<td>BSB D.110</td>
</tr>
<tr>
<td>9:00</td>
<td><strong>Concurrent Sessions</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Alternatives to Animal Testing</td>
<td>BSB D.110</td>
</tr>
<tr>
<td></td>
<td>Environmental Modelling</td>
<td></td>
</tr>
<tr>
<td>10:00</td>
<td><strong>Coffee Break</strong></td>
<td>BSB Atrium</td>
</tr>
<tr>
<td></td>
<td><em>Light snacks provided</em></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Environmental Chemistry Users Group: Hosted by Agilent</td>
<td>BSB E.234</td>
</tr>
<tr>
<td>10:30</td>
<td><strong>Concurrent Sessions</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Emerging Topics of Concern in Environmental Toxicology and Chemistry</td>
<td>BSB D.110</td>
</tr>
<tr>
<td></td>
<td>Environmental and Analytical Chemistry</td>
<td>BSB D.109</td>
</tr>
<tr>
<td>12:30</td>
<td><strong>Lunch</strong></td>
<td>BSB Atrium</td>
</tr>
<tr>
<td></td>
<td><em>Rudy’s Waco BBQ</em></td>
<td></td>
</tr>
<tr>
<td>13:30</td>
<td><strong>Short Courses</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Data Visualization - Led by Dr. Ryan King</td>
<td>BSB D.114</td>
</tr>
<tr>
<td></td>
<td>Statistics for Environmental Data - Led by Dr. Amanda Hering</td>
<td>BSB D.109</td>
</tr>
<tr>
<td>15:30</td>
<td><strong>Coffee Break</strong></td>
<td>BSB Atrium</td>
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<tr>
<td></td>
<td><em>Light snacks provided</em></td>
<td></td>
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<tr>
<td>16:00</td>
<td><strong>Keynote Address</strong></td>
<td>BSB D.110</td>
</tr>
<tr>
<td></td>
<td>Alistair Boxall, PhD</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Department of Environment and Geography, University of York, UK</td>
<td></td>
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<tr>
<td>17:00</td>
<td><strong>Poster Social</strong></td>
<td>McLane Stadium Baylor Club</td>
</tr>
<tr>
<td></td>
<td><em>Light food options provided</em></td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Cash bar</em></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Alternatives to Animal Testing</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Emerging Topics of Concern in Environmental Toxicology and Chemistry</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Environmental and Analytical Chemistry</td>
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Daily Schedule Tuesday, March 10th

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Location</th>
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</thead>
<tbody>
<tr>
<td>7:30</td>
<td>Registration Opens</td>
<td>BSB E-wing Atrium</td>
</tr>
<tr>
<td></td>
<td>Breakfast kolaches from Czech Stop</td>
<td></td>
</tr>
<tr>
<td>8:00</td>
<td>Concurrent Sessions</td>
<td>BSB D.110</td>
</tr>
<tr>
<td></td>
<td>Environmental Risk Assessment and Engineering</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Freshwater Ecotoxicology</td>
<td>BSB D.109</td>
</tr>
<tr>
<td>10:00</td>
<td>Coffee Break</td>
<td>BSB Atrium</td>
</tr>
<tr>
<td></td>
<td>Light snacks provided</td>
<td></td>
</tr>
<tr>
<td>10:30</td>
<td>Concurrent Sessions</td>
<td>BSB D.110</td>
</tr>
<tr>
<td></td>
<td>OMICS in Environmental Science</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Terrestrial Ecotoxicology</td>
<td>BSB D.110</td>
</tr>
<tr>
<td>12:00</td>
<td>Lunch</td>
<td>BSB Atrium</td>
</tr>
<tr>
<td></td>
<td>Panera Bread</td>
<td></td>
</tr>
<tr>
<td>13:00</td>
<td>Short Courses</td>
<td>BSB D.114</td>
</tr>
<tr>
<td></td>
<td>Development of Resumes and CVs - Led by NASAC</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Scientific Writing: from Manuscripts to Grants</td>
<td>BSB D.110</td>
</tr>
<tr>
<td></td>
<td>- Led by Dr. Bryan Brooks</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Methods in Analytical Chemistry - Led by Agilent</td>
<td>BSB D. 105</td>
</tr>
<tr>
<td>15:00</td>
<td>Coffee Break</td>
<td>BSB Atrium</td>
</tr>
<tr>
<td></td>
<td>Light snacks provided</td>
<td></td>
</tr>
<tr>
<td>15:30</td>
<td>Tripartite Career Panel</td>
<td>BSB D.110</td>
</tr>
<tr>
<td></td>
<td>Karla Johanning (KJ Scientific)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Latonya Jackson (University of Cincinnati)</td>
<td></td>
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<tr>
<td></td>
<td>Ted Valenti (Syngenta)</td>
<td></td>
</tr>
<tr>
<td>17:00</td>
<td>Poster Social</td>
<td>McLane Stadium</td>
</tr>
<tr>
<td></td>
<td>Light food options provided</td>
<td>Baylor Club</td>
</tr>
<tr>
<td></td>
<td>Cash bar</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Environmental Risk Assessment and Engineering</td>
<td></td>
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<tr>
<td></td>
<td>Freshwater Ecotoxicology</td>
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<tr>
<td></td>
<td>OMICS in Environmental Science</td>
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<tr>
<td></td>
<td>Terrestrial Ecotoxicology</td>
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</tbody>
</table>
# Daily Schedule Wednesday, March 11th

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>7:30</td>
<td><strong>Registration Opens</strong></td>
<td>BSB E-wing Atrium</td>
</tr>
<tr>
<td>8:00</td>
<td><strong>Concurrent Sessions</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Marine Ecotoxicology</td>
<td>BSB D.110</td>
</tr>
<tr>
<td></td>
<td>Toxicology of Nanomaterials</td>
<td>BSB D.109</td>
</tr>
<tr>
<td>9:00</td>
<td><strong>Extended Short Courses</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Scientific Graphic Design - Led by Students of SETAC</td>
<td>BSB D.110</td>
</tr>
<tr>
<td></td>
<td>Field Techniques in Environmental Science - Led by Students of SETAC</td>
<td>Fieldtrip</td>
</tr>
<tr>
<td>12:00</td>
<td><strong>Lunch</strong></td>
<td>BSB Atrium</td>
</tr>
<tr>
<td></td>
<td><em>Jimmy John’s</em></td>
<td></td>
</tr>
<tr>
<td>13:00</td>
<td><strong>Extended Poster Session</strong></td>
<td>BSB 2&lt;sup&gt;nd&lt;/sup&gt; Floor E-wing Lobby</td>
</tr>
<tr>
<td></td>
<td>Marine Ecotoxicology</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Toxicology of Nanomaterials</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Late Breaking Abstracts</td>
<td></td>
</tr>
<tr>
<td>15:00</td>
<td><strong>Coffee Break</strong></td>
<td>BSB Atrium</td>
</tr>
<tr>
<td></td>
<td><em>Light snacks provided</em></td>
<td></td>
</tr>
<tr>
<td>15:30</td>
<td><strong>SETAC YES 2020 Group Photo</strong></td>
<td>BSB E-wing Atrium Stairs</td>
</tr>
<tr>
<td>16:00</td>
<td><strong>Keynote Address</strong></td>
<td>BSB D.110</td>
</tr>
<tr>
<td></td>
<td><em>Paul Van den Brink, PhD</em></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Department of Aquatic Ecology and Water Quality Management, Wageningen University &amp; Research, Netherlands</td>
<td></td>
</tr>
<tr>
<td>17:00</td>
<td><strong>Closing Ceremony &amp; Awards</strong></td>
<td>BSB D.110</td>
</tr>
<tr>
<td>18:00</td>
<td><strong>Closing Social: Cookout</strong></td>
<td>Cameron Park, Waco</td>
</tr>
<tr>
<td></td>
<td><em>Dinner from George’s Waco</em></td>
<td></td>
</tr>
</tbody>
</table>
### Detailed Platform Schedule: Monday, March 9th

#### Alternatives to Animal Testing | Marco Franco, Julie Krzykwa, Justin Scott | BSB D.110

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Presenter</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:00</td>
<td>An in silico Approach to Safer Chemical Design</td>
<td>Preston Griffin</td>
</tr>
<tr>
<td>9:15</td>
<td>In Silico-Guided Design of Environmentally-Benign Ionic Liquids for Biomass Processing</td>
<td>Samantha Vaccaro</td>
</tr>
<tr>
<td>9:30</td>
<td>Xenobiotic metabolism in fish liver and gill cell lines: biomarkers of CYP450 activity and oxidative stress</td>
<td>Marco Franco</td>
</tr>
<tr>
<td>9:45</td>
<td>Linking Aluminum Nanomaterial Induced Changes in Mitochondrial Ultrastructure to Alterations of Extracellular Flux: Structure/Function Validation of Mitochondrial Dysregulation</td>
<td>Henry Lujan</td>
</tr>
</tbody>
</table>

#### Emerging Topics of Concern in Environmental Toxicology and Chemistry | Kevin Stroski, Macarena Rojo, Armando Elizalde | BSB D.110

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Presenter</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:30</td>
<td>Remediating PFAS contamination of Water and Soil by Electron Beam Technology</td>
<td>Corinne Kowald</td>
</tr>
<tr>
<td>10:45</td>
<td>Bioaccumulation of carbamazepine, enalapril and sildenafil in fish under laboratory conditions</td>
<td>Macarena Rojo</td>
</tr>
<tr>
<td>11:00</td>
<td>Translocation, Trophic Transfer, Accumulation and Depuration of Polystyrene Microplastics in <em>Daphnia magna</em> and <em>Pimephales promelas</em></td>
<td>Armando Elizalde-Velazquez</td>
</tr>
<tr>
<td>11:15</td>
<td>Toxicity assessment of micro plastic pollution in fish</td>
<td>Elizabeth DiBona</td>
</tr>
<tr>
<td>11:30</td>
<td>Identification and Characterization of Bacterial Loads from Houston Watersheds</td>
<td>Folasade Adedoyin</td>
</tr>
<tr>
<td>11:45</td>
<td>Reduction of Pesticide Bioavailability with Charcoal and Clay-Based Sorbents</td>
<td>Sara Hearon</td>
</tr>
<tr>
<td>12:00</td>
<td>Ibuprofen: a new risk for <em>Chironomus riparius</em> populations</td>
<td>Ana Belén Muñiz-González</td>
</tr>
<tr>
<td>12:15</td>
<td>Assessment of human exposure to antibiotic resistance genes through wastewater-based epidemiology</td>
<td>Ruud Steenbeek</td>
</tr>
</tbody>
</table>

#### Environmental and Analytical Chemistry | Bekah Burket, Ifeoluwa Idowu, Tomas MacLoughlin | BSB D.109

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Presenter</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:30</td>
<td>Geo-Spatial analysis of chemical and land use characteristics of Cypress, Dickinson &amp; Mustang Bayous of Texas</td>
<td>Titilope Bukunmi-Omidiran</td>
</tr>
<tr>
<td>10:45</td>
<td>Chemical fingerprinting of polycyclic aromatic compound sources in sediments using gas chromatography mass spectrometry.</td>
<td>Ifeoluwa Idowu</td>
</tr>
<tr>
<td>11:00</td>
<td>Forensic fingerprinting of petroleum: comparative analysis of analytical techniques for rapid identification in oil spills</td>
<td>Alina Roman-Hubers</td>
</tr>
<tr>
<td>11:15</td>
<td>A simple method for the determination of methyl-triclosan in water samples</td>
<td>Tomas MacLoughlin</td>
</tr>
<tr>
<td>11:30</td>
<td>Quantifying Metal Contamination of Humans and Rodents in Yuma, Arizona</td>
<td>Camilla Checinski</td>
</tr>
<tr>
<td>11:45</td>
<td>Concentrations of lead and sediment inputs in the agriculturally dominated Upper Cache River Watershed, Arkansas</td>
<td>Amelia Atwell</td>
</tr>
<tr>
<td>12:00</td>
<td>Discussion</td>
<td></td>
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</table>

12
## Detailed Platform Schedule: Tuesday, March 10th

### Environmental Risk Assessment and Engineering | Iohanna Filippi, Daniel Lucas, Daniela Arán | BSB D.110

<table>
<thead>
<tr>
<th>Time</th>
<th>Topic</th>
<th>Speaker</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:00</td>
<td>Application of sewage sludge to soils contaminated with heavy metals - opportunity or risk? Changes in plants DNA damage and the expression of chosen genes</td>
<td>Marta Jaskulak</td>
</tr>
<tr>
<td>8:15</td>
<td>Mixture toxicity index to promote transition to green chemicals in Mexican crops</td>
<td>Chiara De Tomassi</td>
</tr>
<tr>
<td>8:30</td>
<td>Ambient Air Quality Monitoring in Two Metropolitan Cities of South-Western Nigeria</td>
<td>Koleayo Omoyajowo</td>
</tr>
<tr>
<td>8:45</td>
<td>Arizona Urban Fisheries: An Ecological Risk Assessment for Fish Toxicity and the Potential for Urban Pollution Spread in the Southwest Region via Waterfowl Migration</td>
<td>Daniel Lucas</td>
</tr>
<tr>
<td>9:00</td>
<td>Evidence of anthropogenic pollution in playground soil through-out Oklahoma City, Oklahoma</td>
<td>Sarah Hileman</td>
</tr>
<tr>
<td>9:15</td>
<td>In-Situ Passive Sampling to Measure Remedial Effectiveness at the Pacific Sound Resources Superfund Site</td>
<td>Alex Smith</td>
</tr>
<tr>
<td>9:30</td>
<td>Discussion</td>
<td></td>
</tr>
<tr>
<td>9:45</td>
<td>Discussion</td>
<td></td>
</tr>
</tbody>
</table>

### Freshwater Ecotoxicology | Alexandra Folck, Lea Lovin, Amelia Atwell, Christina Sanders | BSB D.109

<table>
<thead>
<tr>
<th>Time</th>
<th>Topic</th>
<th>Speaker</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:00</td>
<td>Can environmentally relevant concentrations of carbamazepine induce short-term sublethal effects on the hydrophyte <em>Myriophyllum quitense</em>?</td>
<td>Lucas Lombardero</td>
</tr>
<tr>
<td>8:15</td>
<td>The widespread used antiparasitic Ivermectin disrupts swimming behavior on the freshwater fish <em>Prochilodus lineatus</em> (Teleostei, Characiformes)</td>
<td>Ismael Esteban Lozano</td>
</tr>
<tr>
<td>8:30</td>
<td>Developing a comparative understanding of the aquatic toxicology of anatoxin-a in common fish models</td>
<td>Lea Lovin</td>
</tr>
<tr>
<td>8:45</td>
<td>Acute and chronic toxicity of sugarcane vinasse to the Neotropical cladoceran <em>Ceriodaphnia silvestrii</em></td>
<td>Laís Menezes da Silva</td>
</tr>
<tr>
<td>9:00</td>
<td>Monitoring biomarkers of effect and exposure in freshwater snails (<em>Pachychilus</em> sp.) in Ramsar wetland impacted by agriculture</td>
<td>Omar Cruz Santiago</td>
</tr>
<tr>
<td>9:15</td>
<td>Bioaccumulation kinetics of model pharmaceuticals in the freshwater Unionid Pondmussel, <em>Ligumia subrostrata</em></td>
<td>S. Rebekah Burket</td>
</tr>
<tr>
<td>9:30</td>
<td>Pharmaceutical Uptake Kinetics In Rainbow Trout From East Canyon Creek, An Effluent-Dominated Stream Influenced By Snowmelt In Park City, Utah, USA</td>
<td>Jaylen Sims</td>
</tr>
<tr>
<td>9:45</td>
<td>Discussion</td>
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</tbody>
</table>
### OMICS in Environmental Science | James Feller, Chi-yen Tseng, Kristina Bitter | BSB D.110

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Presenter</th>
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</thead>
<tbody>
<tr>
<td>10:30</td>
<td>Assessment of the transcriptome in tree swallow (<em>Tachycineta bicolor</em>) nestlings from Great Lakes Areas of Concern</td>
<td>Chi Yen Tseng</td>
</tr>
<tr>
<td>10:45</td>
<td>The impacts of developmental thyroid disruption on immune function and the immune response in the fathead minnow</td>
<td>Leah M. Thornton Hampton</td>
</tr>
<tr>
<td>11:00</td>
<td>Biomonitoring in the Anthropocene: eDNA Assessment of Mining Remediation</td>
<td>James Feller</td>
</tr>
</tbody>
</table>

### Terrestrial Ecotoxicology | Kendall Scarlett, Omar Cruz Santiago, Sanjana Banerjee | BSB D.110

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>11:15</td>
<td>Ingested Aluminum Exposure in Honey Bees; Subspecies Show Varied Responses to Exposure</td>
<td>Ana M. Chicas-Mosier</td>
</tr>
<tr>
<td>11:30</td>
<td>Spermine ameliorates prolonged fluoride-toxicity in soil-grown rice seedlings by activating the defense and glyoxalase machineries</td>
<td>Aditya Banerjee</td>
</tr>
<tr>
<td>11:45</td>
<td>Modeling Dicamba Volatilization from Agricultural Fields using the Pesticide via Volatilization (PLoVo) Model</td>
<td>Supta Das</td>
</tr>
</tbody>
</table>

### Detailed Platform Schedule: Wednesday, March 11th

#### Marine Ecotoxicology | Alexis Khursigara, Rachel Leads, Alex MacLeod | BSB D.110

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>8:00</td>
<td>Incidence of Apoptosis in Larval Red Drum (<em>Sciaenops ocellatus</em>) Co-exposed to Crude Oil and Ultraviolet Radiation</td>
<td>Rachel Leads</td>
</tr>
<tr>
<td>8:15</td>
<td>Coral Reef Organisms: Differential Sensitivities to an Agricultural Pesticide</td>
<td>Haley Davis</td>
</tr>
<tr>
<td>8:30</td>
<td>Does crude oil exposure alter behavior in fish?</td>
<td>Alexis Khursigara</td>
</tr>
<tr>
<td>8:45</td>
<td>Discussion</td>
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</tbody>
</table>

#### Toxicology of Nanomaterials | Brittany Perrotta, Benjamin Castellon, Marina George | BSB D.109

<table>
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<tbody>
<tr>
<td>8:00</td>
<td>Nanoparticle uptake and elimination kinetics in mosquitofish, clams and two snail species in wetland mesocosms</td>
<td>Benjamin Castellon</td>
</tr>
<tr>
<td>8:15</td>
<td>Surface charge of biotransformed nanomaterials influence on human liver cell-line toxicity</td>
<td>Marina George</td>
</tr>
<tr>
<td>8:30</td>
<td>Engineered nanoparticles alter insect emergence and result in flux of metals from aquatic to terrestrial food webs</td>
<td>Brittany Perrotta</td>
</tr>
<tr>
<td>8:45</td>
<td>Classifying nanomaterials by their interaction with freshwater organisms from two trophic levels</td>
<td>Andrea Rivero Arze</td>
</tr>
</tbody>
</table>
## Poster Presentations

### Alternatives to Animal Testing | Marco Franco, Julie Krzykwa, Justin Scott | McLane Stadium Baylor Club

| M01 | Investigation of in vitro cytotoxicity and associated mechanisms of action of REEs using fish cell lines | Emmanuel Fleurbaix |
| M02 | Acrolein-induced epigenetic modification of vascular smooth muscle cells | Uchechi Grace Nwaiwu |
| M33 | Comparative Cytotoxicity of Parabens on Cell Lines (RTL, HepaRG, and CCL-141) | Ashley Ball |

### Emerging Topics of Concern in Environmental Toxicology and Chemistry | Kevin Stroski, Macarena Rojo, Armando Elizalde | McLane Stadium Baylor Club

| M03 | Polystyrene and tire rubber microplastics alter the gene expression on *Chironomus riparius* | Ana Belén Muñiz Gonzales |

### Environmental and Analytical Chemistry | Bekah Burket, Ifeoluwa Idowu, Tomas MacLoughlin | McLane Stadium Baylor Club

| M04 | Method Development and Native Contamination of Per- and Polyfluoroalkyl Substances (PFAS) in Fish and Invertebrate Feeding Materials | Rosie Rushing |
| M05 | A solution to water scarcity: HYDROUSA, closing the loops | Marc Castaño |

### Environmental Risk Assessment and Engineering | Iohanna Filippi, Daniel Lucas, Daniela Arán | McLane Stadium Baylor Club

| M06 | The Challenge of Measuring Activated Carbon Dose in Sediments | Jada Damond |
| M07 | Correlation of water quality data to fecal coliform data to assess human health risk in the White River, Arkansas | Jae Chester |
| M08 | Environmental impact monitoring of (underground) mining: Case study from copper-uranium mine | Kamrul Islam |
| M09 | Arsenic bioaccessibility from soil: Influence of soil particle surface area and IVBA method | Nnanyelugo Gerald Odezulu |
| M10 | Mercury Pollution in Chile: Current Status and Future Prospects | Constanza Merino Aburto |

### Freshwater Ecotoxicology | Alexandra Folcik, Lea Lovin, Amelia Atwell, Christina Sanders | McLane Stadium Baylor Club

<p>| M11 | Adaptation to warmer temperatures influence susceptibility to organic contaminants in <em>Daphnia pulex</em> | Adriana Townsend |
| M12 | Seasonal fluctuations of sex steroids in populations of yellow perch inhabiting three distinct Chesapeake Bay tributaries | Alexander MacLeod |
| M13 | Degradation of Microcystin-LR and Inactivation of M. aeruginosa in Water Using Electron Beam Technology | Alexandra Folcik |
| M14 | Assessment of Water Quality and Fish Assemblages in the Strawberry River, Arkansas | Andressa Alves Augusto |
| M15 | Presence of Fecal Indicator Bacteria, Human-Specific Fecal Bacteria, and Pathogens at Freshwater Recreational Beaches in Central Tennessee | Andrew Todd |</p>
<table>
<thead>
<tr>
<th>No.</th>
<th>Title</th>
<th>Author</th>
</tr>
</thead>
<tbody>
<tr>
<td>M17</td>
<td>The effect of increasing salinity of the behavioral and morphological toxicity of several pesticides in embryo-larval zebrafish</td>
<td>Audrey Willis</td>
</tr>
<tr>
<td>M18</td>
<td>Water quality of select tributaries of the Bayou DeView River, Arkansas, and effects on riverine water quality</td>
<td>Brittany Singleton</td>
</tr>
<tr>
<td>M19</td>
<td>Contaminant accumulation in small- and large-bodied fish species prior to the upgrade of a wastewater treatment system in Baker Lake, NU, Canada</td>
<td>Bronte McPhedran</td>
</tr>
<tr>
<td>M20</td>
<td>Investigation of sublethal effects of four commonly used pesticides on zebrafish larvae (Danio rerio)</td>
<td>Carina Lackmann</td>
</tr>
<tr>
<td>M21</td>
<td>Investigating potential alterations of growth and sex-related biomarkers in adult Gambusia affinis following exposures of early life stage fish to simulated confined animal feeding operations runoff</td>
<td>Caroline Matkin</td>
</tr>
<tr>
<td>M22</td>
<td>Developmental abnormalities induced by metformin and guanylurea in Danio rerio and Xenopus laevis embryos</td>
<td>Gustavo Axel Elizalde Velazquez</td>
</tr>
<tr>
<td>M23</td>
<td>Environmental Contextualization of Urea Toxicity in Aquatic Ecosystems</td>
<td>Kristen Honhart</td>
</tr>
<tr>
<td>M24</td>
<td>Selection preference in Hyalella azteca: Development of a behavioral assay for ecotoxicology</td>
<td>Kyle Deloe</td>
</tr>
<tr>
<td>M25</td>
<td>Daphnia magna Demonstrate the Fatal Toxicity of Stormwater Runoff During Each Season</td>
<td>Lauren Wedel</td>
</tr>
<tr>
<td>M26</td>
<td>Effect of pasture land use on subwatersheds of the Buffalo National River, Arkansas</td>
<td>Nicholas Craddock</td>
</tr>
<tr>
<td>M27</td>
<td>Examining the chemical profile of P. parvum: A light exposure study</td>
<td>Raegyn Taylor</td>
</tr>
<tr>
<td>M28</td>
<td>Photo-induced Toxicity of Organic UV Filters on Growth of Micro Green Algae (Scenedesmus acutus)</td>
<td>Taylor Walton</td>
</tr>
</tbody>
</table>

**OMICS in Environmental Science**  | James Feller, Chi-yen Tseng, Kristina Bitter  | McLane Stadium Baylor Club

| M29 | Cytochrome P450 Reductase induction in Mayfly larvae (Ephemeroptera sp.) due to Potassium Hydroxide in fracking wastewater in the Marcellus shale Region | Haley Moyer                             |

**Terrestrial Ecotoxicology**  | Kendall Scarlett, Omar Cruz Santiago, Sanjana Banerjee  | McLane Stadium Baylor Club

| M30 | Turning a liability into an asset: Can we use the opercula of invasive apple snail Pomacea maculata in biomonitoring of metal contamination in freshwater marshes? | Sanjana Banerjee                        |

**Marine Ecotoxicology**  | Alexis Khursigara, Rachel Leads, Alex MacLeod  | BSB 2nd Floor E-wing Lobby

<p>| M31 | Altered metabolic rate and developmental pace in pollution-tolerant populations of Gulf killifish (Fundulus grandis) | Haley Davis                             |</p>
<table>
<thead>
<tr>
<th>M32</th>
<th>Laboratory-scale ocean acidification experiment negatively impacted the regeneration capacity of the ragworm <em>Hediste diversicolor</em> (O.F. Mäller, 1776)</th>
<th>Md Khurshid Alam Bhuiyan</th>
</tr>
</thead>
<tbody>
<tr>
<td>LB01</td>
<td>Investigating the use of a novel ecotoxicological exposure method for amphibians</td>
<td>Adairre Castille</td>
</tr>
<tr>
<td>LB02</td>
<td>Determination of the heavy metals and arsenic in fish and water of Lake Balkhash, Kazakhstan</td>
<td>Aidyn Abilkas</td>
</tr>
<tr>
<td>LB03</td>
<td>Photoluminescence of K-doped Tungsten Oxide in Acetone</td>
<td>Aman Patel</td>
</tr>
<tr>
<td>LB04</td>
<td>Secreted PETase for Plastic Degradation</td>
<td>Amanda Patel</td>
</tr>
<tr>
<td>LB05</td>
<td><em>Now poster M33</em></td>
<td></td>
</tr>
<tr>
<td>LB06</td>
<td>Effects of Wastewater Treatment Plant Effluent Exposure in <em>Daphnia magna</em> and <em>Gambusia affinis</em></td>
<td>Eduardo Pocasangre</td>
</tr>
<tr>
<td>LB07</td>
<td>What happens when the ocean and toxic HABs mix? An experimental assessment</td>
<td>Felicia Osburn</td>
</tr>
<tr>
<td>LB08</td>
<td>Development of a quantitative method for analysis of per- and polyfluoroalkyl substances in water and bi-valve tissue</td>
<td>Kevin Stroski</td>
</tr>
<tr>
<td>LB09</td>
<td>The Establishment of a Dose-Response Curve Using the Inebriator in Honey Bees (<em>Apis mellifera L.</em></td>
<td>Kiri Li Stauch</td>
</tr>
<tr>
<td>LB10</td>
<td>Characterization of nanoparticle transformation in physiologically relevant fluids</td>
<td>Lauren Pitts</td>
</tr>
<tr>
<td>LB11</td>
<td>Altered expression and activity of phase I and II biotransformation enzymes in human liver cells by perfluorooctanoate (PFOA) and perfluorooctane sulfonate (PFOS)</td>
<td>Marco Franco</td>
</tr>
<tr>
<td>LB12</td>
<td>Differentially Expressed Proteins Indicate Importance of Photoperiod Conditions during Larval Development</td>
<td>Megan O’brien</td>
</tr>
<tr>
<td>LB13</td>
<td>Perfluorooctanoate (PFOA) and perfluorooctane sulfonate (PFOS) effects on phase I biotransformation enzymes in fish liver cells co-exposed to aryl hydrocarbon receptor (AHR) agonists</td>
<td>Megan Solan</td>
</tr>
<tr>
<td>LB14</td>
<td>Data Validation: Accuracy and Responsibility</td>
<td>Patrick Tyczynski</td>
</tr>
<tr>
<td>LB15</td>
<td>Manganese-oxide nanoparticle induced Parkinsonism on Neuronal and Glial Cell Models</td>
<td>Sahar Pradhan</td>
</tr>
<tr>
<td>LB16</td>
<td>Effect of nanoparticle mediated therapy for vector-borne disease control</td>
<td>Thelma Ameh</td>
</tr>
<tr>
<td>LB17</td>
<td>Effects of Furosemide on Danio rerio at Environmentally Relevant Concentrations</td>
<td>Zachary Rundell</td>
</tr>
</tbody>
</table>
Short Courses: Monday, March 9th

Data Visualization - Instructor: Dr. Ryan King (Baylor University)

Science communication continues to be of great importance, not only between scientists and professionals, but also among the general population. Presenting the results of comprehensive studies is imperative to facilitate the understanding of scientific research across disciplines. This short course will be directed to provide an overview of how data should be presented in a simple but informative fashion. Attendees will be provided knowledge of data processing and manipulation, and of selecting appropriate figures, schemes, and graphics to effectively present data. Special attention will be given to figure selection for publication purposes, either in scientific journals or conference presentations. The course will be provided in R, through the R-Studio platform.

Statistics for Environmental Data - Instructor: Dr. Amanda Hering (Baylor University)

Parametric statistics have historically been observed as the “working horse” to analyze environmental datasets. However, this family of statistical analyses requires assumptions that are difficult to find in environmental data, such as the necessity of having normally distributed data. The reality is that environmental data rarely meet these requirements, compromising the resulting observations if inappropriate tests are conducted. Therefore, this short course will focus on the use of non-parametric statistics for environmental data. Attendees will have the opportunity to work with datasets following non-normal distributions, and will be directed to select the best statistical approaches given the nature of the data. Examples covered will include the use of generalized linear models, with different family distributions, and will be conducted in R, through the R-Studio platform.
Short Courses: Tuesday, March 10th

Development of Resumes and CVs - Instructor: NASAC

As young scientists move forward in their careers, the opportunity to apply to new positions brings many challenges that will decide whether an individual is successful. One of the important stages in any career is the development of a simple and concise, yet informative and strong curriculum vitae, and its summarized version, the resume. In this short course, we will provide examples of successful resumes and CVs to the attendees, with the purpose of highlighting the most important features and sections of a CV, as well as advice when preparing a successful job application.

Scientific Writing: from Manuscripts to Grants - Instructor: Dr. Bryan Brooks (Baylor University)

Developing scientific writing skills comes with many challenges which are often ignored by young scientists and professionals, leading them to experience negative results when they attempt to share their work. Manuscript preparation is a particularly important and fundamental stage in many, if not all, scientific paths. Therefore, the first half of this short course will be directed at individuals seeking to learn how to properly develop a manuscript. The first half of this course will include sections on manuscript planning, subsection structuring (introduction, materials and methods, results, discussion, etc.), journal selection, search term optimization, and the submission, revision, and publication processes. The second half of this course will focus on characteristics of effective grant proposals. It will acknowledge that the search for funding represents one of the major challenges for the scientific community, especially among early career scientists, and that communicating the importance of scientific research is paramount in convincing funding sources to provide their support. With requirements from funding agencies becoming stricter over time, this course will provide example grant proposals that course attendees can use to characterize high-quality professional and technical documents, thereby enhancing their future likelihood of submitting successful proposals.

Methods in Analytical Chemistry – Instructors: Tarun Anumol and Stephan Baumann

Real-world environmental analysis often includes challenges not covered in textbooks. When developing or applying analytical methods to environmental analysis, new graduate students are often delayed by troubleshooting technical errors with software. Our vision for this short course is a panel discussion focused on troubleshooting real-world issues with samples, covering topics from matrix effects to computer order of operations. In this short course, a panel of experienced environmental chemists will discuss these common issues and engage in Q & A with course participants. Participants will have the option of submitting questions early, for a more effective discussion.
Short Courses: Wednesday, March 11th

Scientific Graphic Design – Instructor: Students of SETAC

Scientists and professionals often understand the word “graphic” as a way to present the results of scientific research, but also often ignore that non-scientists may find these graphics difficult to understand. As the necessity of effective scientific engagement continues to grow, the necessity of presenting scientific information to the general public increases in tandem. In this course, attendees will learn effective ways to present scientific information in simple, and understandable designs. The focus is to share information to create visual aids that not only will catch the attention of the public, but also facilitate the understanding of what is being communicated. This course if highly recommended for individuals interested in sharing their work in creative but meaningful ways.

Field Techniques in Environmental Science – Instructor: North America Students of SETAC

While laboratory experimentation is essential in the scientific investigation of environmental processes, field activities represent the most environmentally-relevant component of such investigations. The complexity of the environment requires standardization of techniques that can also be adapted to specific conditions. Therefore, this hands-on course will be provided to highlight common field activities in environmental assessments, and the appropriate way of conducting them. Attendees will learn processes such as water chemistry monitoring, stream discharge measurements, water sampling, and collection of freshwater macroinvertebrates. A short lecture will be given to attendees before heading to a nearby stream, where they will receive the necessary equipment to conduct their activities.
Keynote Address: Monday, March 9th

Alistair Boxall, Ph.D.
Department of Environment and Geography
University of York
United Kingdom

“Chemical Exposure Science for the 21st Century”

Alistair Boxall is Professor in Environmental Science in the Environment Department and Theme Leader of the 'Urban Living' Theme of the York Environmental Sustainability Institute. His research focuses on understanding emerging and future ecological and health risks posed by chemical contaminants in the natural environment. Dr. Boxall is a past member of the Defra Advisory Committee on Hazardous Substances and past Chair of the Pharmaceutical Advisory Group of the Society of Environmental Toxicology and Chemistry. He regularly advises national and international organizations on issues relating to chemical impacts on the environment and has published extensively on the detection, fate, effects and risks of emerging contaminants (including pharmaceuticals, nanomaterials and transformation products) in the natural environment. He was coordinator of the CAPACITIE project, a 3.5M Euro project on pollution monitoring in cities and academic coordinator of the 10.3 M Euro iPiE project on intelligent assessment of pharmaceuticals in the environment, he directed the York City Environment Observatory Initiative. He co-leads the Global Pharmaceutical Monitoring Project which is monitoring concentrations of pharmaceuticals in more than 200 river systems covering 102 countries. He received the 2016 Recipharm International Environmental Award for his work on the impacts of chemical contaminants on the environment and was identified as 2018 Highly Cited Researcher in the Agricultural Chemicals sector (Source: University of York).
Career Panel: Tuesday, March 10th

Karla Johanning, Ph.D.
CEO & Founder at KJ Scientific LLC

KJ Scientific LLC is an environmental testing chemical biotech company that focuses on using new technology to analyze chemicals (pesticides, personal care products, consumer goods, pharmaceuticals, etc.) for bioaccumulation (i.e. accumulation in living organisms’ tissues).

Latonya Jackson, Ph.D.
Assistant Professor of Biology at University of Cincinnati

Dr. Jackson researches the responses of aquatic organisms to environmental stressors, with a focus on the long-term effects of endocrine disrupting chemicals and other environmental contaminants on different fish species; the implications of such effects at the organism, population, and ecological levels; discerning mechanisms of toxicity; and linking laboratory results and field data to population- and ecosystem-level responses.

Theodore Valenti, Ph.D.
Technical Leader 1 at Syngenta Crop Protection

About Syngenta: We are a global leader at providing essential inputs to growers: crop protection, seeds, seed treatments and traits. We believe in delivering better food for a better world through outstanding crop solutions. We are devoted to helping growers do more with less. We take pride in meeting our commitments to our stakeholders. Our goal is to be the leading global provider of innovative products for every step of the agronomic process and to understand their interplay and optimize the results for growers and the food chain.
Paul Van den Brink, Ph.D.
Department of Aquatic Ecology and Water Quality Management
Wageningen University & Research
Netherlands

“Personal reflections on the top 4 of the 22 research questions which arose from the European horizon-scanning workshop”

Paul J. Van den Brink is a personal professor at the Aquatic Ecology and Water Quality Management Group of Wageningen University and a senior scientist at the research institute Wageningen Environmental Research, both belonging to the Wageningen University and Research. At Wageningen University Paul chairs the chemical stress ecology group which currently consists of himself and 11 PhD students. For both affiliations, he is involved in supervising and executing international projects on assessing the ecological effects of contaminants like pesticides, veterinary medicines and personal and home care products as well as those of multiple stressors, including drought, nutrients and salinization. Other research topics are the development of effect models (e.g. individual based, meta-population models and ecoinformatics, expert base models), Traits based Ecological Risk Assessment (TERA) and ecological risk assessment of chemicals in the tropics. Since 1995, Paul van den Brink has published over 220 ISI-listed papers (h-index = 47), for three of which he won an international prize. He also co-edited five books. Paul currently coordinates the EU funded Integrative Training Network ECORISK2050 which studies the effects of global change on the emission, fate, effects and risks of chemicals in aquatic ecosystems. In 2006 Paul won the LRI-SETAC Innovative Science Award of 100.000. He also organized and took part in many international workshops and courses. Paul van den Brink is presently a WIMEK board member which is part of the SENSE research school (www.sense.nl), an associate fellow of the Canadian River Institute, an honorary visiting professor at the University of York and a visiting professor at the South China Normal University. He is also a past-president of SETAC (Society of Environmental Toxicology and Chemistry; www.setac.org) World and Europe and a SETAC Fellow (Source: Wageningen University & Research).
Meeting Presenters

Adairre Castille
Aditya Banerjee
Adriana Townsend
Aidyn Abilkas
Alex Smith
Alexander MacLeod
Alexandra Folcik
Alexis Khursigara
Alina Roman-Hubers
Aman Patel
Amanda Wang
Amelia Atwell
Ana Belén Muñiz Gonzales
Ana Belén Muñiz Gonzales
Ana M. Chicas-Mosier
Andrea Rivero Arze
Andressa Alves Augusto
Andrew Todd
Anna Pieri
Armando Elizalde Velazquez
Ashley Ball
Audrey Willis
Benjamin Castellon
Brittany Perrotta
Brittany Singleton
Bronte McPhedran
Camilla Checinski
Carina Lackmann
Caroline Matkin
Chi Yen Tseng
Chiara De Tomassi
Constanza Merino Aburto
Corinne Kowald
Daniel Lucas
Eduardo Pocasangre
Elizabeth DiBona
Emmanuel Fleurbaix
Felicia Osburn
Folasade Adedoyin
Gustavo Axel Elizalde Velazquez
Haley Davis
Haley Davis
Haley Moyer
Henry Lujan
Ifeoluwa Grace Idowu
Ismail Esteban Lozano
Jada Damond
Jae Chester
James Feller
Jaylen Sims
Kamrul Islam
Kevin Stroski
Kiri Li Stauch
Koleayo Omoyajowo
Kristen Honhart
Kyle Deloe
Lais Menezes da Silva
Lauren Pitts
Lea Lovin
Leah M. Thornton Hampton
Lucas Lombardero
Macarena Rojo
Marc Castaño
Marco Franco
Marina George
Marta Jaskulak
Md Khurshid Alam Bhuiyan
Megan O'brien
Megan Solan
Nicholas Craddock
Nnanyelugo Gerald Odezulu
Omar Cruz Santiago
Patrick Tyczynski
Preston Griffin
Rachel Leads
Raegyn Taylor
Rosie Rushing
Ruud Steenbeek
S. Rebekah Burket
Sahar Pradhan
Samantha Vaccaro
Sanjana Banerjee
Sara Hearon
Sarah Hileman
Supta Das
Taylor Walton
Thelma Ameh
Titilope Bukunmi-Omidiran
Tomas M. MacLoughlin
Uchechi Grace Nwaiwu
Zachary Rundell
Investigating the use of a novel ecotoxicological exposure method for amphibians


United States Geological Survey

Traditional toxicity testing with amphibians in water exposures can be confounded by environmental variables such as ammonia from animal waste. A novel, slow-release drug delivery compound (â€œCarrierâ€ ) was tested in adult Northern leopard frogs (Lithobates pipiens; n=61), exposing them to neonicotinoids, the fastest growing insecticide class globally. Thiomethoxam (TMX) and clothianidin (CLO) were mixed with Carrier and injected intraperitoneally. After 28 days, stress biomarkers were measured, including serum cortisol and hematological neutrophil counts. An ELISA was optimized for use with common carp (Cyprinus carpio; n=9), having wide ranges of cortisol levels, then applied to exposed frog serum. Serum protein assay normalized results by nanograms cortisol per milligrams protein. We hypothesized that cortisol from 3 carp treatment groups experiencing increasing handling disturbance would reflect stressor applied. Standard curves for each assay were found to be statistically significant, indicating high assay reliability, as well as statistical significance by ANOVA among all carp groups (P < 0.0001). From low to high disturbance, cortisol:protein ratios were 13.5(SE2.4), 47.9(SE12.8), and 91.5(SE4.8). Thus, cortisol from frogs injected with TMX or CLO at 20 or 100 ppm compounded with the Carrier, Carrier-only, and uninjected reference animals was analyzed similarly, with ratios ranging from 0.57(SE0.10) â€“ 3.14(SE0.85). Frog cortisol levels were different (P=0.0025), with CLO100 > TMX100 = TMX20 > CLO20 = Carrier = uninjected. Neutrophil counts in total white blood cells is ongoing, currently ranging from 6.1%(uninjected) â€“ 10.6(CLO100)%. More biomarker data are forthcoming; initial results indicate the Carrier compound is useful for exposing amphibians to chemicals.

Spermine ameliorates prolonged fluoride-toxicity in soil-grown rice seedlings by activating the defense and glyoxalase machineries

Aditya Banerjee, Aryadeep Roychoudhury

Department of Biotechnology, St. Xavier's College (Autonomous), Kolkata

Rice irrigation in India and Bangladesh (two of the largest producers) is usually carried out using groundwater from deep-bored pipelines. Uncontrolled anthropogenic activity and subsided groundwater level have lead to large quantities of fluoride being extracted from the mineral bed. Thus, stretches of cultivable lands across India, Bangladesh and Pakistan are currently experiencing acute endemic fluorosis. We present the first report on the ameliorative roles of the higher polyamine, spermine (Spm) during prolonged fluoride-induced toxicity in the susceptible rice cultivar, IR-64. Application of Spm increased the overall growth in the stressed seedlings by significantly restricting fluoride bioaccumulation within the shoots and roots. The Spm-treated and stressed seedlings exhibited low chlorosis and induced activity of pyruvate dehydrogenase and nitrate reductase due to reduced accumulation and localization of reactive oxygen species (ROS) in the shoot and root. Spm-supplementation during stress reduced the levels of molecular damages by lowering malondialdehyde, electrolyte leakage and protein carbonylation, and lipoxigenase and protease activity due to effective detoxification of ROS by the antioxidants like proline, glycine-betaine, anthocyanin, flavonoids, phenolics and higher polyamines like Spm and spermidine. Excessive accumulation of the toxic methylglyoxal was reversed due to the activation of the glyoxalase system (comprising of glyoxalase I and II) and the ascorbate-glutathione cycle. Exogenous Spm also triggered the activity of superoxide dismutase, guaiacol peroxidase, glutathione peroxidase and phenylalanine ammonia lyase, which efficiently scavenged ROS in the stressed seedlings. Overall, Spm treatment mitigated the fluoride-induced injuries in IR-64 by reducing fluoride bioaccumulation and elaborately refining the various defence machineries.

Adaptation to warmer temperatures influence susceptibility to organic contaminants in Daphnia pulicaria
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In order to compare the susceptibility of two populations of Daphnia pulicaria to the pro-insecticide â€” chlorpyrifos,â€™ lab raised D. pulicaria are being investigated. Chlorpyrifos is the parent compound, and the biotransformed â€” chlorpyrifos-oxonâ€™ is the toxic compound. The two populations of D. pulicaria that are of particular interest differ in their genotype for a gene called Pgi, which is involved in glycolysis. Because of its involvement in glycolysis, it is reasonable to believe that the different genotypes will 1) differ in their susceptibility to chlorpyrifos and 2) be impacted at different magnitudes with increases in temperatures in addition to exposure. The lab-raised daphnids are currently raised in house (at Oklahoma State University), and therefore their genotypes are already known. The daphnids are being exposed first to the bioactivated form of the pro-insecticide (chlorpyrifos-oxon) at two different temperatures in order to remove differences in metabolic abilities between the two genotypes. Similarly, the daphnid populations are being exposed to chlorpyrifos-oxon and piperonyl butoxide (PBO) at two different temperatures. The PBO addition will block the organismsâ€™ ability to convert the toxic chlorpyrifos-oxon into a non-toxic metabolite. This experiment also helps to provide information about the susceptibilities of the two genotypes without influence from differing metabolic activities. The two genotypes are also being exposed to regular chlorpyrifos at two temperatures to further investigate the differences in susceptibility of the two genotypes.

Determination of the heavy metals and arsenic in fish and water of Lake Balkhash, Kazakhstan

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The lake Balkhash is a large, endorheic lake in the south-west of Kazakhstan divided into two basins, slightly differed in salinity. The purpose of this work was to assess pollution of lake Balkhash by heavy metals in the area close to the town Balkhash and located nearby metallurgic plant. Some heavy metals and arsenic became a matter of concern because of their toxicity and ability to accumulate in the aquatic food chain. Water samples were collected in polyethylene bottles, acidified to pH 2, and stored at 4Â°C. The tissues from four species of fish (Cyprinus carpio, Sander lucioperca, Rítilus caspicus, Abramis brama) were separated, frozen, digested in Multiwave Digestion System (Anton Paar, Multiwave Digestion System PRO), and analyzed by Inductively Coupled Plasma-Mass Spectrometry (iCAP-RQ, Thermo Scientific). The concentrations of Cu, Cr, Mn, Pb, Cd, Ni, and As were determined in water and muscles, gills and liver of fish by ICP-MS. The ion composition analysis of water samples was performed by Ion Chromatography ( Dionex ICS 6000, Thermo Scientific, USA). Arsenic was detected the maximum permissible concentrations (according to the European Directives values) in water, but not in fish tissues. Furthermore, we calculated bioaccumulation factors (BAF) that correlated the metal concentrations in water and biota. The mean log BAFs of each heavy metal in our study followed the order: for muscles Zn> Fe> Mn> Cu> Pb> Ni> As, for gills Zn> Fe> Mn> Cu> Pb> As> Cd, for liver Cu> Zn> Fe> Mn> Pb> Ni. Higher concentrations of lead have accumulated in the gills of A.brama (5-6 times higher than maximum permissible concentration - MPC) and R.Caspicus (3.5 times higher than MPC) and in the liver of C.Carpio (3 times higher than MPC). Significant amounts of cadmium have accumulated in the liver of all tested fish species (concentrations from 3 to 80 times higher than MPC). Zinc has accumulated in the gills and liver of all fish species in concentrations from 25 to 36 and from 35 to 70 MPC, respectively. Accumulation of copper was found in the liver of all fish species (2 to 20 times of MPC). In general, this study revealed the increased concentrations of Cd, Zn, Cu, and Pb in the liver and lead and zinc in gills but not in the muscles of tested fish.

In-Situ Passive Sampling to Measure Remedial Effectiveness at the Pacific Sound Resources Superfund Site

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During the 1998 remedial investigation for the Pacific Sound Resources (PSR) Superfund Site, dissolved-phased groundwater contamination and “fingers” of creosote-related Dense Non-Aqueous Phase Liquid (DNAPL) was observed to extend from the upland containment wall area towards the Marine Sediments Unit (MSU) within PSR. It was noted that both new NAPL detection and exceedances of cleanup goals in groundwater shoreline wells was present. Subtidal sediments were capped with borrow materials at depths of 7 feet (near shore) to 3.5 feet (offshore). In 2011, solid phase microextraction (SPME) in-situ passive sampling utilizing polydimethylsiloxane (PDMS) fibers as an adsorbent was secured to stainless steel rods presenting a cylindrical geometry to identify the freely dissolved porewater concentrations of 16 poly aromatic hydrocarbons (PAHs) and Dibenzofuran (DBF) for vertical profiling at 24 locations. The samplers were inserted at a depth of up to 34 inches below the cap surface in locations most likely influenced by contaminated groundwater discharge. Porewater concentrations remained low throughout the site (total PAHs < 1 Åµg/L). ∑PAH16 concentrations to the northwest portion of the site decreased to 100-200 ng/L in 2018 compared to 500-800 ng/L found in the 2011 sampling. Within the NE locations 11 out of 12 sampling sites showed modest increases in porewater concentrations from the 2011 analysis. Summed porewater concentrations of total PAHs are compared to the higher molecular weight PAHs (3+ ring PAHs) to identify mechanisms and the influence of hydrophobicity of the contaminants on mobility and cap integrity.

Seasonal fluctuations of sex steroids in populations of yellow perch inhabiting three distinct Chesapeake Bay tributaries


University of Maryland

Historically, the yellow perch Perca flavescens fishery was of economic and cultural importance in the Chesapeake Bay region, representing the first sign of spring and the first opportunity to fish. However, as Maryland’s western shore was urbanized, a reduction in the recruitment of anadromous fish was observed and this decline has continued. Over the last decade, ovarian abnormalities have been reported in yellow perch from the Severn River, MD. Likewise, a sharp reduction in hatching success has been noted, which suggests that the eggs are compromised, possibly from contaminants. This study sought to evaluate the reproductive state of yellow perch from three rivers with varying land uses: 1) the largely agricultural Choptank River (reference site) on the eastern shore of the Bay, 2) the extensively suburbanized Severn River watershed on the western shore, and 3) the moderately, but increasingly developed Mattawoman Creek watershed, also on the western shore. Yellow perch were collected at all three rivers, on three occasions per year (October, December, February) over 2 years (2017 “2019). The frequency of these sampling events represents a novel opportunity to observe the changing reproductive biology during critical stages of gonad development and have not been previously studied. All samples have been collected and are being processed for analyses across a suite of molecular biomarkers (gene expression), plasma hormones/proteins and tissue changes (histopathology). Sex steroids (estradiol and testosterone) were measured in female plasma using a sensitive enzyme-linked immunosorbent assay (ELISA). Preliminary data on the circulating sex steroids, estradiol and testosterone depict strong seasonality, further analysis will be presented.

Degradation of Microcystin-LR and Inactivation of M. aeruginosa in Water Using Electron Beam Technology

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Harmful algal blooms (HABs) occur in nutrient rich aquatic environments including lakes and other sources of drinking water and can pose serious threats to human health, animal health, and aquatic ecosystems. The cyanobacterium Microcystis aeruginosa is commonly associated with HABs and is responsible for producing various toxic secondary metabolites called microcystins. Microcystins are hepatotoxic heptapeptides with over 80 variants currently identified. Microcystin-LR (MC-LR) is the most prevalent and the most toxic of these variants. Current removal strategies rely on ozonation but may not be effective for both intra- and extra-cellular microcystins. It may also not be ineffective at remediating MC-LR contaminated sludges. Therefore, new treatment strategies are necessary to prevent human exposure. The underlying hypothesis is that high energy electron beam (eBeam) irradiation technology, an advanced oxidation/reduction process, is effective for the detoxification of microcystin-contaminated water, sludges, and sediments. Results indicate low eBeam doses fully degrade MC-LR and result in decreased binding to protein phosphatases in bioassays (MC-LR’s primary mode of action). Similarly, doses >2 kGy inactivate M. aeruginosa and prevent regrowth. Changes in gene expression are being investigated to understand possible stress responses in M. aeruginosa induced during treatment. Overall, the results indicate that eBeam treatment promotes complete breakdown of the MC-LR molecule and alleviates its toxicity. There is a need for further studies to understand the degradation pathway of MC-LR and how the toxin-producing cyanobacterial cell responds to increasing eBeam doses. These studies will provide a comprehensive understanding of eBeam as a water treatment technology to address harmful algal blooms.

Does crude oil exposure alter behavior in fish?

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Crude oil is a common environmental toxicant of concern in aquatic environments and the impact it has on marine fishes has been well studied. A majority of these studies have focused on cardiotoxicity and its downstream ecological effects. However, recent work has demonstrated that neurological function and behavior may be just as sensitive as the cardiotoxic endpoints. Transcriptomic work from larval red drum (Sciaenops ocellatus) has shown significant alteration in pathways related to neurological and cognitive function following oil exposure; this was accompanied by a reduction in brain size. Based on this information, several follow up studies sought to examine the influence that oil exposure may have on fish behavior and performance. In open field tests, acutely exposed larval red drum showed a reduction in thigmotaxis or “wall hugging” behavior and increased area explored compared to control conspecifics. Interestingly, small shoals of Atlantic croaker (Micropogonias undulatus) in an open field test also demonstrated differences in thigmotaxis based on the concentration of exposure and the number of individuals exposed while increasing nearest neighbor distance, suggesting a decrease in sociability. While these studies examined specific personality behaviors, recent work on zebrafish (Danio rerio) has examined the effect of oil on behavioral syndromes. Interestingly, preliminary data does not suggest a shift in behavioral syndromes following oil exposure, however there is a shift in the correlation between behavioral traits. These findings suggest that more research is needed to understand how sub-lethal exposure can impact fish behavior and downstream ecological performance.

Forensic fingerprinting of petroleum: comparative analysis of analytical techniques for rapid identification in oil spills

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Oil spills elicit extensive damage to the environment; identification of the potential source facilitates emergency response and mitigation. Petroleum substances have complex and variable composition of aliphatic/aromatic hydrocarbons as well as non-hydrocarbon molecules that depend on both the origins of crude oil and specific refining processes. Characterization of unknown samples of complex oil-based products is known as petroleum fingerprinting; one common technique is EPA-8270D method based on Gas Chromatography-Mass Spectrometry (GC-MS), measuring semi-volatile organic compounds and identifies n-alkanes and biomarkers. However, this technique suffers from both low throughput and limited resolution of the components in samples. In this study, we aimed to test whether Ion Mobility-Mass Spectrometry (IM-MS), a high throughput analytical technique, can be used for identification of complex oil substances. IM-MS is a rapid post ionization technique that enables untargeted chemical characterization, and can rapidly generate a high content, multi-dimensional profile. We compared the performance of historical oil fingerprinting information, GC-MS, and IM-MS on identifying 19 samples of crude oils from six geographically distinct on- and off-shore oil-producing regions in the Gulf of Mexico. Specifically, these data were used to construct hierarchal clusters to examine sample-to-sample similarities, and to determine which type of data allows for more accurate and confident determination of the origins of each sample. Compared to traditional fingerprinting methods or GC-MS, IM-MS method yields superior accuracy, precision and confidence in identifying a sample’s origin. Funding for this research was provided by a grant from National Academies of Sciences, Engineering, and Medicine’s Gulf Research Program.

Photoluminescence of K-doped Tungsten Oxide in Acetone

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Nano material K2W7O22 (KWO) is a ferroelectric semiconductor that has been shown to be sensitive to acetone at room temperature. This property makes KWO an effective component for an acetone breathalyzer with acetone being a bio marker for monitoring diabetes. Understanding the mechanism of the interaction of acetone and the KWO nano material can help optimizing the interaction to increase the sensitivity of the material. The study of the material using Raman spectroscopy reveals that the KWO nanomaterial displays photoluminescence at 630 nm wavelength in a saturated acetone environment. The photoluminescence signal is enhanced when the sample is continuously radiated with a 532 nm laser. The photoluminescence signal is observed in the presence of ethanol and acetone with oxygen gas. The photoluminescence signal was centered at the same wavelength for each environment, but the sample was most sensitive in saturated acetone. The strong photoluminescence of doped tungsten oxide at 630 nm via interaction with molecules has not been observed before. The emission of the PL is attributed to the electron transfer between acetone and the nano material.

Secreted PETase for Plastic Degradation

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The Nueva School

Plastics, composed by synthetic polymers, are accumulating in the environment at a staggering speed. Due to the modern lifestyle, more and more plastics are used in everyday life. In combination with their almost undegradable nature, plastics are causing an environmental disaster. Polyethylene terephthalate (PET) is one of the most abundant plastics used in packaging and textiles. PET is resistant to biodegradation and lasts centuries in the environment. Thus, besides discovering alternative material to replace PET usage, new ways to reduce the current buildup are urgently needed. Recently, Ideonella sakaiensis 201-F6, a newly discovered bacterium, was shown to be able to degrade PET and use it as a major energy source by
secreting an enzyme PETase (PET-digesting enzyme). Utilizing this enzyme to degrade PET may provide an environmentally friendly approach to reduce the buildup of PET in the environment. However, as the purified PETase has low activity and is structurally unstable, we tested whether it is possible to directly engineer the PETase expression in E.coli and tested the ability of this modified E.coli to degrade PET. Our work suggested that by employing genetic engineering method, modified E.coli can directly degrade PET in culture medium. This provides a basis for future studies to develop more economically feasible approach for degrade PET in an environmental friendly approach.

Concentrations of lead and sediment inputs in the agriculturally dominated Upper Cache River Watershed, Arkansas

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Nearly 50% of all assessed streams in the United States are impaired for not meeting their designated use with the leading cause being agricultural land use. One common practice in agricultural landscapes is stream channelization, a process that involves widening and deepening stream channels for increased hydraulic loading during flood events. This process can lead to increased stream sedimentation, reduced stream water quality, substrate homogenization, and negatively impact aquatic biota. Agricultural practices can also lead to increased pollutants, including pesticides and metals. Historically, lead arsenate was used as an insecticide throughout agricultural lands in the United States. In the Cache River Watershed, approximately 70% of the 230-km-long watershed is used for agricultural purposes with over 200 river-km are listed as impaired for not supporting aquatic life due to agricultural sedimentation with lead impairment also noted. The goal of the project is to monitor sediment and lead contributions and water quality of the Cache River Watershed. Turbidity, total suspended solids, and total lead have been analyzed bi-weekly from October 2017 to September 2018, in 12 tributaries of the Upper Cache River Watershed. When grouped by agricultural intensity, there is a significant difference in turbidity and total lead between low intensity and moderate or high intensities. These results suggest that the intensity of agricultural activities play an important role in the amount of sediment and lead contributions to the Cache River Watershed, which may also be contributing to the Mississippi River and ultimately into the Gulf of Mexico.

Polystyrene and tire rubber microplastics alter the gene expression on Chironomus riparius

Ana-Belén Muñiz-González, Víctor Carrasco-Navarro, Jouni Sorvari and José-Luis Martinez-Guitarte

UNED

The increased daily use of plastic has made its management and waste an essential environmental problem. Besides, the microplastics (MPs) come from two sources, primary MPs are generated by manufacturing and secondary MPs are produced by fragmentation and degradation of the plastics both. The plastic particles smaller than 5 mm are considered MPs (UNEP, 2016), and they are classified as emerging pollutants because a growing presence in the environment. As new pollutants, no rule has been developed to control their use. Despite the common occurrence of MPs in waters around the Globe, the toxicity caused by microplastics to aquatic organisms is not clear and varies depending on materials and concentrations. Some studies have focused on the effects of MPs on feeding and behaviour, while only a few have investigated the effects on gene expression. The lack of information related to aquatic invertebrates such as Chironomus riparius (Insecta) is even more alarming, even considering their essential role in aquatic food chains. Our aim was to evaluate the effects of MPs on the gene expression of C. riparius. Fourth instar larvae were exposed to 1 and 10 mg/L of polystyrene and tire rubber for 36 hours. The larvae were collected and frozen at -80 Â°C for subsequent RNA extraction and cDNA synthesis. Effects were evaluated using an array designed with genes related to the main metabolic pathways on invertebrates (endocrine system, detoxification response, stress response, immune response, and DNA repair) by Real-time PCR. The results showed an...
altered expression in genes related to the stress response (hsc70, hsp90, Gp93, hps60, hsp40, and hsp17), oxidative stress (SOD Mn), detoxification (Cyp12b1), and endocrine system (FKBP39). Overall, the results suggested that tire rubber MPs altered the gene expression of C. riparius to a higher extent than polystyrene MPs. This is the first study that evaluates the effects of MPs on C. riparius at gene expression level. Different processes have been altered showing the strong effects of small plastics particles on aquatic invertebrates, even without having effects on survival. 

This work has been funded by CICYT (SPAIN), CTM RTI2018-094598-B-I00, the Raija ja Ossi Tuuliainen foundation and The Kuopio Naturalistsâ€™ Society. A.B.M.G has a pre-doctoral contract from (UNED).

**Ibuprofen: a new risk for Chironomus riparius populations**

Ana-Belén Muñiz-González

**UNED**

In recent years, the consumption of drugs has increased the number of emerging pollutants. Ibuprofen, the most used active pharmaceutical ingredient worldwide, is the third most sold in Spain (SNS, 2008). In spite of that, 90% can be removed in wastewater treatment plants (WWTP) (Onesios et al., 2009). Due to its high use and chemical properties (ubiquity and lipophilicity) it is present in several environmental compartments such as sediment, surface and even drinking water (Santos et al., 2010; Tejon et al., 2010), with ranges from 0.01 to 85 μg / L (Aguire-Martinez et al., 2016; Blaise et al., 2006). Classified as a non-steroidal anti-inflammatory drug (NSAID) for rheumatic and fever treatment, the water ecosystems are the main receptors of ibuprofen having the potential to bioaccumulate in aquatic organisms. Previous studies mainly focused on physiological endpoints, observed effects on bacteria, algae, crustaceans, and fish (Ortiz de GarcÃ­a et al., 2014). However, poor information is available about gene expression, with only a few works in fish (Gravel and Vijayan, 2007) and Daphnia (Wang et al. 2016). C. riparius is an invertebrate with high relevance and an essential role in the food chain. Besides, it has been used to design standardized tests by OCDE (218, 233, and 235). The study aimed to evaluate the effects of ibuprofen at environmentally relevant concentrations (0.01, 1, and 100 μg / L) on the fourth instar C. riparius larvae exposed for 24 and 96 hours. Detoxification, stress, and immune system were analyzed by Real-time PCR while Glutathione-S-transferase (GST), Phenoloxidase (PO), and Achetilcolinesterase (AchE) enzymatic activities were also evaluated. Ibuprofen altered the expression of genes related to stress response (hsp24 and hsp27) and immune system (Prophenoloxidase (Proph) and Defensin (Def) at 96h). Besides, increased GST activity at 96h and PO for both times was observed. The results confirmed a strong effect of ibuprofen on the immune system and effects on the stress response, two essentials systems for the organism response to aggression. To sum up, ibuprofen has toxic effects in C. riparius even despite the low concentrations used. This work has been funded by the Ministerio de EconomÃ­a y Competitividad, CICYT (SPAIN), CTM RTI2018-094598-B-I00. A.B.M.G is the receiver of a pre-doctoral contract from the National University of Distance Education (UNED).

**Ingested Aluminum Exposure in Honey Bees; Subspecies Show Varied Responses to Exposure**

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Poor mining practices and soil acidification increase bioavailability and uptake of aluminum by flora. Plant products such as pollen and nectar are ingested by honey bees and stored in the hive where larval bioaccumulation can occur. This presentation discusses free-flight choice-making, captive survival, motility, and acetylcholinesterase activity experiments in honey bees exposed to aluminum. Using free-flight experiments, such as artificial flower patches and floral nectary analogs, color choice was determined to vary after exposure, but this was dependent on honey bee subspecies. Additionally, captive experiments in Apis mellifera mellifera have shown that exposure makes circadian rhythmicity unstable, causes hyperactivity, and decreases lifespan. Behavioral and free-flight data
have been corroborated by bee-head acetylcholinesterase enzyme activity and suggest a possible hormetic response in *Apis mellifera* mellifera and *Apis mellifera* linguistica, as well as the latter demonstrating possible tolerance effects. The severity of the response to aluminum exposure is tied to subspecies but effects of aluminum exposure have occurred across *Apis mellifera* spp. We conclude that aluminum exposure from floral products is likely a limiting factor to pollinator health and may contribute to population decline. This work also demonstrates that extrapolation of toxicant tolerance using honey bees as a model for other bee species may be dependent on the subspecies used and may be an insufficient technique.

**Classifying nanomaterials by their interaction with freshwater organisms from two trophic levels**

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**Institut national de l’environnement industriel et des risques (INERIS)**

The increasing production and use of nanomaterials (NMs) generate great concerns about their fate and behavior in the environment. Freshwater ecosystems are targeted as many domestic and industrial treated used waters end up there, and the NMs can get in contact with their biota. A main problem in the study of NMs ecotoxicity is that, the ecotoxicology tests for NMs are being carried on based in the available tests guidelines as the OECD’s, that means, without taking in count their peculiarity to have a confined physical shape that differentiates them from the ionic compounds. That is why there are still many untied ends regarding NMs regulation and there is still an ongoing search for NMs grouping. In this study, a set of 12 different NMs had been tested, putting them in contact with primary producers as freshwater microalgae (R. supracapitata, D. subspicatus and C. vulgaris) and primary consumers as microcrustaceans (C. dubia). The interaction was determined by flow cytometry for algae, and for both (microalgae and microcrustaceans) by dosage and microscopy observations, all data has been correlated to their composition as well to their physico-chemical properties as Zeta potential, size, crystalline form and hydrophobicity. The results allow to discriminate the NMs in groups of different type of interaction with the organisms and at the same time to be explained by their physico-chemical characteristics. These differences found in the way that some NMs interact with aquatic organisms from different trophic levels may be linked to their different bioavailability and can lead to a better understanding of NMs bioaccumulation and biomagnification.

**Assessment of Water Quality and Fish Assemblages in the Strawberry River, Arkansas**

Andressa Alves Augusto, Brook Fluker, Jennifer Bouldin

**Arkansas State University**

The Strawberry River is a tributary of the Black River within the White River basin in northern Arkansas. The river distance from source to mouth is about 177 km, it is considered by the ADEQ as an extraordinary resource and ecologically sensitive waterway and enormous environmental and economic significance. In order to protect the water quality, it is important to determine which tributary is adding to the impairment due to sedimentation. Water quality in eight tributaries (Piney Fork, Mill Creek South Big Creek, North Big Creek, Clayton Creek, East Cooper Creek, Reeds Creek, Sleep Bank Creek, and Caney Creek) were collected, from October 2016 to September 2019, prior to the confluence with the Strawberry River. Water quality variables included total suspended solids (TSS), turbidity, pH, conductivity, and dissolved oxygen. Site location and agricultural land use influenced sedimentation. Upstream sites had lower sedimentation values than downstream sites as the watershed transitions from the Ozark Highlands to the Delta Ecoregion. The major cause of the impairment is thought to be from excessive sedimentation due to agricultural runoff. A fish survey was also conducted in seven sites of the Strawberry River to assess population size and biodiversity at each site. This project will help us to monitor the water quality of this extraordinary resource, protecting over 100 species of fish and other indigenous species as they are being threatened by agriculture runoff.
Presence of Fecal Indicator Bacteria, Human-Specific Fecal Bacteria, and Pathogens at Freshwater Recreational Beaches in Central Tennessee

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Middle Tennessee State University

There are many human-made freshwater recreational beaches located in TN and across the US. The potential pathogen exposure and human health risk associated with frequenting these beaches is often monitored by testing the water for fecal indicator bacteria (FIB), such as Escherichia coli. Though beach sand has been shown to harbor high concentrations of FIB in some studies, sand is not typically monitored, and neither the sources of fecal contamination (e.g., human, cattle, geese, etc) nor the presence of actual human pathogens is usually investigated. The objective of this study is to assess the abundance of standard FIB, alternative FIB, and pathogens, as well as human gut-associated Bacteroides to assess human influence on fecal contamination, in sand and water at two central Tennessee recreational beaches. Sand core and water samples were taken during nine sampling events in the summer of 2018. Water and PBS extracts of sand samples were analyzed for S. aureus and MRSA (Methicillin Resistant Staphylococcus aureus) using selective agars, E. coli by Colilert®, and Bacteroides by qPCR. MRSA was found in 98% of sand and 94% of water samples. Escherichia coli was found in 98% of sand and 94% of water samples. The average for both MRSA and E. coli was > 100 CFU(MPN)/100g of sand for all dates. Ongoing qPCR analysis shows small quantities of human gut-associated Bacteroides at both sites in both sand and water. The presence of FIB at these sites demonstrates potential risk to beachgoers, even to those who stay out of the water.


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Arkansas State University

The Buffalo National River (BNR) is a 246 km (153 mi) free-flowing river, which was established as the first national river in 1972. Flowing through the Boston Mountains, Springfield, and Salem Plateaus, only 11% of the watershed is owned by the National Park Service. In 2012, the Arkansas Department of Environmental Quality approved the general permit of a 6,500-head swine concentrated animal feeding operation (CAFO) less than 10 km from the confluence of Big Creek and Buffalo River. Currently, several regions of the river are 303d listed as impaired and threatened waters, which has elevated the concern for nutrient contamination such as nitrogen compounds during low flow conditions. Eighteen of the 26 freshwater mussel species currently in the BNR are of conservation concern. Many declining mussel populations are characterized by a loss of recruitment indicated by the absence of juveniles. Although laboratory assays demonstrate that juvenile mussels are sensitive to un-ionized ammonia and nitrates, in situ experiments bridge the gap between statistical biological endpoints measured in the laboratory and real-world effects due to exposure. The goals of this study are: (1) measure the effect of nitrogen on the recruitment of juvenile mussels using a common species (Lampsilis reeveiana); (2) compare the toxicity of field-collected water samples to three standard aquatic bioassay organisms; (3) evaluate population trends of native mussels from Ponca to the confluence of the White River. These findings will support the Buffalo National River’s™s long-term watershed management and the conservation of its resident mussel populations.

Translocation, Trophic Transfer, Accumulation and Depuration of Polystyrene Microplastics in Daphnia magna and Pimephales promelas

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Texas Tech University
In recent years, reports of plastic debris in the gastrointestinal (GI) tract of fish have been well documented in the scientific literature. This, in turn, increased concerns regarding human health exposure to microplastics through the consumption of contaminated fish. Freshwater zooplankton Daphnia magna (hereafter Daphnia), and the fathead minnow Pimephales promelas (FHM), are well-known model species used in standard toxicological studies and ecological risk assessments, that provide a simple model for trophic transfer. The aim of this study was to assess the tissue translocation, trophic transfer, and depuration of two concentrations (20 and 2000-part ml−1) of 6 μm polystyrene (PS) microplastics particles between Daphnia and FHM. Bioconcentration factors (BCF) and bioaccumulation factors (BAF) were determined. Throughout the five days of exposure, PS particles were only found within the GI tract of both species. The BCF for Daphnia was 0.034 ± 0.005 for the low concentration and 0.026±0.006 for the high concentration. The BAF for FHM was 0.094 ±0.037 for the low concentration and 0.205±0.051 for the high concentration. Between 72-96 h after exposure all microplastic particles were depurated from both species. The presence of food had a significant effect on the depuration of microplastic particles from Daphnia but not for FHM. Based on the low BCF and BAF values for both species, rapid depuration rates, and null translocation of microplastic particles to organs and tissues from the GI tract, there is a low probability that microplastics will bioconcentrate and bioaccumulate under environmental conditions.

Comparative Cytotoxicity of Parabens on Cell Lines (RTL, HepaRG, and CCL-141)

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As recently as 2016, there has been evidence of the legacy contaminants parabens and their metabolites accumulating in wildlife species including birds, trout and bears but it has been known since the 70s that these compounds were capable of inducing cytotoxicity as a result of alteration of mitochondrial membrane permeability in mammalian hepatocytes. Now that research in alternative animal methods have produced a wider variety of cell lines derived from non-mammalian species, further toxicological comparative studies are possible evaluating the effects of parabens cytotoxicity. This study aims to comparatively evaluate the cytotoxicity of methyl-, ethyl-, propyl-, butyl- and benzyl-parabens for cytotoxicity in three cell lines: HepaRG (human liver cells), RTL-W1 (rainbow trout liver), and CCL-141 (Pekin duck embryo cells). This is the first comparative study to examine the toxicity of these compounds on these three in vitro systems. Based on previous mammalian studies we predict that the parabens with longer side chain lengths (butyl- and benzyl-) will show more significant cytotoxic effects than the parabens with shorter side chains (methyl-, ethyl-, and propyl-).

The effect of increasing salinity of the behavioral and morphological toxicity of several pesticides in embryo-larval zebrafish

Audrey Willis & Jordan Crago
Texas Tech University

Sea-level rise, groundwater depletion, and other results of global climate change have resulted in rapid changes within freshwater and estuarine ecosystems including shifts in salinity, pH, temperature, and dissolved organic material levels. It is imperative that we evaluate the combined effects of shifting environmental conditions and agricultural chemicals which are often present in freshwater ecosystems. To this end, we present a screening-level embryo-larval zebrafish behavioral and morphological assay to evaluate the effect a 2.5 ppth increase in salinity has on the toxicity of EPA pesticide benchmark levels of several classes of pesticides. An increase in salinity is sufficient to cause larval hyperactivity, and could modulate the behavioral or morphological effects of neonicotinoids, pyrethroids, organophosphates, and herbicides.
Nanoparticle uptake and elimination kinetics in mosquitofish, clams and two snail species in wetland mesocosms

Benjamin Castellon, Brittany G. Perrotta, Marie Simonin, Steven M. Anderson, Jane L. Cooper, Heileen Hsu-Kim, Emily S. Bernhardt, Ryan S. King, Cole W. Matson

Baylor University

Engineered nanoparticles (NPs) may pose a risk to human and ecosystem health. While there is a growing body of research on the toxicity of NPs, risk assessment of NPs still requires a better understanding of bioavailability of NPs at environmentally relevant exposure concentrations and in complex ecosystems. For improved modeling of uptake and bioaccumulation, there is especially a need for kinetics experiments. Here, we present results from a study in replicated outdoor wetland mesocosms exploring the bioavailability of NPs in eastern mosquitofish (Gambusia holbrooki), Asian clam (Corbicula fluminea), and two freshwater pond snails (Physella acuta and Lymnaea sp.). Over a 9-month study, these aquatic taxa were exposed to either: large (19 mg per week, primary particle size 185.3 nm) cerium dioxide (CeO2) NPs, small CeO2 NPs (19 mg, 3.8 nm), gold (Au) NPs (19 mg, 11.8 nm), copper hydroxide NPs from Kocide 3000 (35 mg, 118.3 nm), or controls with no NPs. We sampled quarterly for long-term NP uptake over the 9-month experiment (i.e. at 3, 6 and 9 months), as well as short-term (1 week) caged exposures in the mesocosms. Subsequently, all animals underwent a 7 day depuration period to quantify NP elimination kinetics. Our results indicate that Physella snails consistently took up the most NPs, followed by Lymnaea snails, clams, and fish. NP elemental composition was more important than size. The animals fully depurated Cu and both CeO2 NPs within 12 h, but were only able to depurate about 68% of the Au NPs even after 7 days.

Engineered nanoparticles alter insect emergence and result in flux of metals from aquatic to terrestrial food webs

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Freshwater ecosystems are exposed to engineered nanoparticles through discharge from wastewater and agricultural runoff. We conducted an experiment to examine the combined effects of chronic dosing of nanoparticles and nutrients on insect emergence. Three levels of nanoparticles (control, gold, copper) were crossed by two levels of nutrients (ambient vs. enriched nutrient dosing) in 18 outdoor wetland mesocosms. We estimated emergent insect abundance, community structure and flux of copper and gold nanoparticles from aquatic ecosystems to adjacent terrestrial environments, monthly over a nine-month experiment. We detected significant decrease in insect emergence after exposure to nanoparticles in some months and a flux of nanoparticles from treated mesocosms. These results have implications for terrestrial subsidies and contaminations in insectivorous terrestrial and riparian food webs.

Water quality of select tributaries of the Bayou DeView River, Arkansas, and effects on riverine water quality

Brittany Singleton & Jennifer Bouldin

Arkansas State University

Rowcrop agriculture is prevalent in Northeast Arkansas and the Cache River Watershed is prime cropland dominated by rice and soybeans. To measure the effectiveness of conservation practices implemented in the
watershed, weekly water sampling was performed for a 3-year period. The Bayou DeView is the main tributary of the Cache River and landuse includes 67% cropland. Outlets of seven subwatersheds of Cow Lake Ditch-Bayou DeView were monitored for water quality parameters from October 2016-September 2019. Specifically pH, temperature, conductivity, dissolved oxygen, turbidity, and total suspended solids were collected. Stream segments on and near the main channel of the Bayou DeView are impaired for dissolved oxygen, sulfates, and turbidity. The objective of this project was to compare variations among parameters between the Bayou DeView River channel and select tributaries. Input from each subwatershed is calculated to determine in which subwatershed to focus additional conservation practices. Improving water quality in the Cache River will reduce downstream contaminants that ultimately contribute to the Gulf of Mexico hypoxia.

Contaminant accumulation in small- and large-bodied fish species prior to the upgrade of a wastewater treatment system in Baker Lake, NU, Canada

Bronte McPhedran, Mark Hanson, Heidi Swanson

University of Waterloo

Wastewater treatment in the Canadian Arctic commonly occurs via lagoon-tundra wetland systems, in which wastewater is deposited and passively flows through a series of lakes and streams. While favored due to low maintenance and minimal infrastructure, Arctic population growth is placing pressure on systems that are constrained by extreme climates and lack of socio-economic support. Poor treatment could cause environmental degradation to once pristine aquatic systems and subsequently impair local fishing activities. My research aims to understand contaminant accumulation in fish downstream of the passive wastewater treatment lagoon in Baker Lake, NU, Canada, as part of a larger study examining ecosystem health pre- and post-treatment upgrade. To define the ecological state prior to upgrades, we will: 1) characterize contamination (pharmaceuticals, metals) along the system; 2) investigate mechanisms facilitating metal uptake in small- and large-bodied fish species, and; 3) analyze indicators of fish health (condition factor) in relation to effluent exposure. Water samples, sediment, zooplankton, benthic invertebrates, and small- and large-bodied fish were collected in 2018 and 2019 along effluent path lakes and reference sites. Samples will be analyzed for mercury, total metals, stable isotopes and, where applicable, nutrients and chlorophyll-a. Fish life history characteristics including age, sex, maturity, length, and weight will be determined. I expect metal concentration in fish to differ based on mechanism of uptake (food, water), life history (age, diet), and environmental conditions (water quality, proximity to source). By studying the system pre-upgrade, we aim to demonstrate that an improved wastewater system will increase overall ecosystem health.

Quantifying Metal Contamination of Humans and Rodents in Yuma, Arizona

Camilla Checinski & Jonathan Credo

Northern Arizona University

Yuma, Arizona is a prominent agricultural capital in the United States, producing more than 170 different crops. However, the amount of pesticides applied to maintain agricultural yields presents possible health concerns. Hair and fur can be used as a non-invasive biomarker to quantify the amount of metals and metalloids in humans and rodents. Hair was collected from 300 human volunteers by community health partners and fur was collected from wild-caught rodents. Samples were analyzed for Mn, Cu, Hg, Pb, and Cd. Hg and Pb were selected due to their historic use in fungicides, while Mn and Cu are still used in agrichemicals. These analytes are associated with detrimental human health effects. To remove exogenous contaminants, rodent fur was washed prior to analysis following an International Atomic Energy Agency (IAEA) protocol. Samples were analyzed using inductively coupled plasma mass spectrometry (ICP-MS) with Rh and Ir as internal standards and by Cold Vapor Atomic Absorption Spectroscopy (CV-AAS). Preliminary results from both human hair and rodent fur revealed that manganese, lead, and cadmium may have elevated levels in comparison to reported
The results suggest that the local wild-caught rodents appear to be a valid model for exposure based on the concentration of metals present in both rodent and human hair. This research is a part of a larger project funded by the Flinn Foundation to characterize the extent of exposure to pesticides and perchlorate, utilizing a One Health approach of quantifying concentrations in the environment, animals, and humans.

Investigation of sublethal effects of four commonly used pesticides on zebrafish larvae (Danio rerio)

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RWTH Aachen University

In recent years the debate about the usage of pesticides has increased widely. Biodiversity declines has not only been in observed in Germany but worldwide and are often linked to side-effects of pesticide usage. A vast biodiversity decline is not only a concern for entire ecosystems and food chains but could indirectly also impact ecosystem services. Due to for example rainfall, pesticides can end up in aquatic systems and thus potentially cause negative effects on non-target organisms. Improving the investigative tools for the assessment of pesticide effects is therefore necessary, to be able to understand their modes of action in more detail and extend the available data for pesticides already in use. An increased assessment however often calls for a higher usage of test organisms, resulting in a dilemma as it has been an important aim to minimize the usage of laboratory animals. In this study, the effects of four pesticides on zebrafish larvae (Danio rerio) are assessed: namely, insecticides thiacloprid, esfenvalerate and herbicides prosulfocarb and dimethenamid-p. As current regulations only include standardized toxicity testing of the active substances, important data is missing on the different modes of action and possibly varying toxicity of commercial formulations and therefore both are investigated in this study. A comprehensive test-battery has been used and a workflow established to assess multiple sublethal endpoints, e.g. fluorescence-based methods oxidative stress and MXR activity detection as well as behavioral changes and biomarker measurements with a minimal number of test organisms.

Investigating potential alterations of growth and sex-related biomarkers in adult Gambusia affinis following exposures of early life stage fish to simulated confined animal feeding operations runoff

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Confined animal feeding operations (CAFO) are a source of endocrine disrupting compounds in the aquatic environment through agricultural runoff and inadequate waste storage systems for swine, cattle, and chickens. The primary objective of this study is to understand if chronic CAFO runoff exposures to Gambusia affinis (western mosquitofish) during early life stages can potentially alter sexual differentiation leading to cellular abnormalities in the testis and ovary. Compounds commonly found in receiving streams near CAFOs and used in this study include 17ß-ethynylestradiol (EE2), trenbolone (TB), atrazine and their mixtures (MIX). Juveniles (0-7 days post hatch (DPH)) were exposed for 30 days to MIX A (50 ng/L EE2, 10 ng/L TB, and 150 ng/L atrazine), MIX B (250 ng/L EE2, 50 ng/L TB, and 1,500 ng/L atrazine), 50 ng/L or 250 ng/L EE2, 10 ng/L or 50 ng/L TB, or 150 ng/L or 1,500 ng/L atrazine. After a 30-day static renewal, fish were transferred to clean water and dissected when 60% of the individuals reached sexual maturity (77-82 DPH). Endpoints include: total fish length and weight, gonadosomatic index (GSI), hepatosomatic index (HSI), male sperm quality (motility and count), time to sexual maturity, whole blood genotoxicity, and gonadal histology. The treatment groups were not significantly different for total fish length, weight, GSI, HSI, or sperm motility. Intersex occurred in four treatment groups: Mix B, 10 ng/L TB, 50 ng/L TB, and 1,500 ng/L atrazine. Data analyses for sperm counts, time to sexual maturity, whole blood genotoxicity, and gonadal histology are on-going.
Assessment of the transcriptome in tree swallow (Tachycineta bicolor) nestlings from Great Lakes Areas of Concern

Chi Yen Tseng, Christine M. Custer, Natalie K. Karouna-Renier, and Cole W. Matson

Baylor University

Tree swallows (Tachycineta bicolor) have proven uniquely suited for assessing contaminant exposures and biomarker responses in birds from the Great Lakes, in response to polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), polychlorinated dibenzo-p-dioxins and dibenzo-furans (PCDD/PCDFs), polybrominated diphenyl ethers (PBDEs), and a variety of pesticides and other contaminants of emerging concern (CECs). In 2016, nestlings were collected from six locations on the Maumee River, representing different land uses. Transcriptome-wide gene expression projects were initiated in collaboration with the USGS and funded by the Great Lakes Restoration Initiative. RNA-Seq analysis was carried out on nestlings collected from the Maumee River. A tree swallow genome was assembled using linked-read technology and annotated against chicken genome. We assessed the in-situ transcriptomic effects of multiple environmental contaminants exposure to tree swallow nestlings in the Maumee River. Transcriptomic patterns between different sampling sites were correlated with different types of land uses and contaminant levels such as PBDEs and organochlorine pesticides, which was consistent with the findings of a metabolomics study of the same populations. Differentially expressed genes, associated gene ontology terms, and pathways were determined in the Maumee river and compared with other Great Lakes Areas of Concern with unique contamination profiles to explore the relationship between source of pollution, land use, and corresponding transcriptomic changes.

Mixture toxicity index to promote transition to green chemicals in Mexican crops

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In 2017, 47 thousand tons of pesticides were applied on Mexican agriculture land. The main environmental problem is that pesticides mobilize through environmental compartments (soil, water, air) reaching biotic elements, including human populations. To reduce risks to pesticide exposure, International organizations maintain a big data base of chemicals by its environmental and health hazard. In addition, Non-Profit Governmental Organizations contribute also with information and promote prohibitions of those high hazard chemicals in the World. We think that all this toxicological profile information should be promoting the transition to green chemicals. In this sense, our main aim is to integrate chemical and toxicological profiles of all pesticide used at national level in the most important crop in Mexico: the maize. Our proposal is to develop an index to identify those pesticides that contribute with the major risk. The Mixture Toxicity Index was obtained from databases filled not only with toxicological information, but also with long term effects on the entire ecosystem. MTI was then applied to mixture pesticides recommended from the National Institute of Forest, Agriculture and Livestock Research on corn crop in the thirty-one states of Mexican republic. This recommendation includes 74 pesticides. Of all Mexican republic states, San LuÁs PotosÁ had the highest MTI, while the state of Sinaloa has the lowest one. In conclusion, MTI is an important and innovative index, that can provide opportunities to adjust use of pesticides according to hazard risk, creating mixtures that have fewer impact on the environment and, consequently, on human populations.

Mercury Pollution in Chile: Current Status and Future Prospects

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Melimoyu Ecosystem Research Institute
Chile has great geological wealth, with its main economic activity being the extraction of different metals. With a long coastline, marine resources are important for local consumption but also for international use. In addition, a large mountain range with over 2,000 volcanoes runs along the country and is a natural source of mercury and it is known that the global transport of mercury reaches cold areas. A review in 2004 showed the historical use of mercury in Chile, but revealed a scarcity of information on mercury in Chile. Fifteen years later we strongly believe that an update in this area is necessary to evaluate the progress of the implementation of the Minamata Convention. Here, we review scientific literature on different mercury issues, classifying into two categories: environmental pollution and human contamination. In the environmental studies, most information is on mercury in abiotic matrices and there is not good spatial representation in the country. In the human studies, mercury analysis in hair was done in the 90’s, there was an evaluation of mercury and neuromotor function in children and artisan gold miners in one location, and was one study of dietary mercury two locations. There is a need for more studies to evaluate the exposure and effects of mercury, in the environment and in humans. Our conclusions are that we need: distinguish what percentage of mercury corresponds to natural sources versus anthropogenic emissions; generate plans that diminish industrial emissions and provide substitutions for products that contain mercury; standardize the analytical methodology.

Remediating PFAS contamination of Water and Soil by Electron Beam Technology

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PFASs (Perfluoroalkyl Substances) have been detected in human serum, water, soil, and food. There is evidence of biomagnification of these chemicals throughout the food chain in all areas of the world. The significance of this widespread contamination is twofold: PFASs are notoriously difficult to break down, and long-term exposure can result in numerous adverse health effects. Health problems stemming from PFASs include high blood pressure, thyroid disorders, low infant birth weight, and several types of cancer. The ability to remove and/or break down PFASs in order to remediate groundwater, drinking water, agricultural waters and agricultural soils is critically important today. Electron beam technology appears to provide a safe and cost-effective method of breakdown for organic pollutants. The underlying hypothesis that PFASs can be broken down using eBeam technology was evaluated through a series of experiments using lab-spiked and field samples at varying doses of irradiation. Lab-spiked and field samples were irradiated at a variety of doses ranging from 10 kGy to 2000 kGy to determine the appropriate dose to achieve complete breakdown. Samples were analyzed via LC-MS/MS after extraction with solid phase extraction cartridges. The analysis of both lab-spiked and field samples indicated that PFOA (Perfluorooctanoic Acid) was broken down by 87% at 50 kGy, while PFOS (Perfluorooctane Sulfonate) needed doses as high as 2000 kGy to achieve >90% breakdown. The initial success in PFAS breakdown using eBeam irradiation shows that there is great potential for this technology as a method for environmental remediation.

Arizona Urban Fisheries: An Ecological Risk Assessment for Fish Toxicity and the Potential for Urban Pollution Spread in the Southwest Region via Waterfowl Migration

Daniel Lucas & Beth Polidoro

University of Arizona

Recent research has indicated the presence of a variety of polycyclic aromatic hydrocarbons (PAHs), phthalates, and heavy metals in the waters of urban fisheries in the metropolitan cities of Phoenix, Arizona. Fish from three out of eleven ponds in the urban fishery program in Phoenix contained total PAH concentrations that have
demonstrated the potential to cause embryo mortality and growth abnormalities in some fish through acute exposure. Although six phthalates have been detected in fish stocked in Phoenix, a review of relevant literature suggests none were found in concentrations exceeding known fish toxicity thresholds. Additionally, the five pesticides detected in the study were not shown to be exceeding any known thresholds for fish toxicity. However, it should be noted that the majority of fish toxicological studies evaluate the concentrations of contaminants within the water and not those detected within the actual fish as is being referenced in this study. Bioaccumulation in waterfowl near the sampled urban fisheries was projected on the basis of the concentrations of the contaminants detected in the fish and the normal diet of the species sighted. Although Arizona lies at the edge of the Pacific flyway, twenty-six different species of migrating waterfowl were sighted throughout urban fisheries in the Phoenix area, with the greatest number of individual birds sighted at one time being 235. While each species varies in migration patterns and ranges, the species sighted have average migration ranges of approximately 400 to 1,200 miles.

**Effects of Wastewater Treatment Plant Effluent Exposure in Daphnia magna and Gambusia affinis**

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While the effects of effluent contamination have been tested and observed, there is scarcely any existing gradient exposure/effects to treated wastewater effluent that compares the effects of model invertebrate and vertebrate organisms. Treated effluent from wastewater treatment plants (WWTPs) is known to contain contaminants that may produce adverse effects on fish populations. Modern WWTPs are capable of filtering various contaminants such as heavy metals, organic compounds and solid wastes (also called biosolids), but certain synthetic organic compounds are still present in trace concentrations in the treated effluent. The aim of the present study is to investigate the possible consequences of short- and long-term exposures of different concentrations of treated effluent from a WWTP that services a large urban population on Daphnia magna and Gambusia affinis. An examination of 48 hours, 10 days, and one-month (multiple generations) experiments will examine exposure effects on Daphnia magna’s growth, survival, fecundity, and offspring survival. Daphnia magna, < 24 hours old will be continuously exposed to the treated wastewater effluent at different environmentally relevant concentrations, from 0 to 20 percent. Gambusia affinis will be exposed from less than < 24 hours old to 21 days old, measuring the same parameters as the D. magna. The following experiment was conducted using effluents collected from the point source of the Little Miami WWTP located in Hamilton County, Ohio. The preliminary experiment demonstrates that D. Magna survival rate decreases during the second generation of the individual studies. The data was significant for the F2 individual survival record, and there was no noticeable effect on the D. magna’s morphology or lengths. The parental generation fecundity data for the population experiment was significant between 100% effluent concentration and 20% effluent concentration â€” survival rates in the F2 individual decrease as the percentage of the effluent water increases. The survival rate appears to be the greatest in 100% effluent water concentration for the F2 population survival record. The chronic exposure done with Gambusia affinis have been completed and analysis of the Histopatology tests are to be completed in time to present at the YES2020 conference in Waco, Texas.

**Toxicity assessment of micro plastic pollution in fish**

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*Texas A&M University - Corpus Christi*

Microplastic pollution is of global relevance and concern. High microplastic exposure concentrations are known to cause adverse health effects in fish such as intestinal damage, microbiota dysbiosis, and disturbed lipid and energy metabolism in zebrafish, as well as altered mortality in goby fish. However, the degree of impact of environmentally relevant, chronic, low dose microplastic exposure is unknown. To fill in this knowledge gap, the Japanese medaka (Oryzias latipes) was used in a controlled laboratory experiment to determine the impact of microplastic fiber
ingestion on fish health. O. latipes larvae (7 days post hatching) and juveniles (one-month post hatching) were exposed to five concentrations of polyethylene terephthalate (PET) fibers for 21 days through the feed. Fish condition, gut integrity and digestive performance were measured to determine the overall fish health status. No differences were observed in larvae and juvenile growth. Potential damage of the gut tissue was analyzed by histomorphological observation of intestine mucus layer and cell types. The gene expression of digestive enzymes from gut tissue samples was quantified using RT-qPCR to determine the impact of microplastic ingestion on the digestive function. Comparison of the different developmental stages allowed the identification of more vulnerable stages for microplastic exposure. This study is one of the first to provide toxicology data for an environmental risk assessment of microplastic fiber exposure of wild fish in the Gulf of Mexico.

Investigation of in vitro cytotoxicity and associated mechanisms of action of REEs using fish cell lines

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University of Lorraine

Rare Earth Elements (REEs) are used in high-tech devices (solar panels, liquid-crystal display â¦) and other industrials activities (automobile, pharmaceutical â¦). During the last decades, an important release of this elements was detected in the freshwater ecosystems in order from ng/L to Âµg/L. Due to a lack of ecotoxicological data, no regulatory thresholds for environmental REE concentrations have been set so far. Additionally, REEs are often present in the environment in mixtures, making the task of the environmental hazard assessment even more difficult, due to possible antagonistic or synergistic actions. The aim of this research is to study the toxic effects and the associated mechanisms of action of REEs on living organisms. The experiments were carried out with REEs alone or in mixtures by using cellular approaches. Cytotoxicity of neodymium (Nd), gadolinium (Gd) and ytterbium (Yb) were performed on ZF4 (Danio rerio, ATCC® CTRL-2050), ZFL (Danio rerio, ATCC® CRL-2643) and RT-gill W1 (Onchorhynchus mykiss, ATCC® CRL-2523) cell lines. The inhibition of cell viability, determined by cytotoxic MTT assay was used as a toxic effect parameter for all experiments. After a kinetic of exposure of 96 h, dose-response curves were observed for REEs screening. Additive effects were also demonstrated on cell lines according with the theoretical prediction (CA model) for each mixtures in REEs. In further action, the mechanisms of actions of REEs were investigated with specific inhibitor targeting efflux pumps-ATP. First results could suggest the activation of mechanisms of antioxidant such as GSH (glutathione) for the detoxification of REEs at cellular level.

What happens when the ocean and toxic HABs mix? An experimental assessment

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One management approach to mitigating the effects of harmful algal blooms (HABs) is to flush freshwater environments, where they are formed, to downstream estuaries. However, the effect of increasing salinity on the growth and toxin production/leakage has not been widely studied. The production of nitrogen (N)-rich cyanotoxins such as microcystin has been shown to increase with N availability to blooms, but N is often the limiting nutrient in coastal marine ecosystems. To test how an increase in salinity will affect microcystin-LR production both over time and under differing N availabilities, we grew Microcystis in batch cultures for approximately a month under low (4) and high (50) N:P ratio environments. We then simulated flushing events to ocean water (OW) environments by spiking cultures with differing amounts of artificial OW (0-30%) after 21 days of growth. After, we monitored growth, carbon (C) and N stoichiometry, and toxin dynamics for 10 days. Similar to other studies, we found that N availability affected microcystin-LR production. In the high N:P treatments, salinity greater than 16% OW had a negative effect on toxin production and growth over time, but this was not seen for the low N:P treatments. Microcystin-LR concentrations were greatest when Microcystis was exposed to high N and low salinity. Combined, our results
suggest that the N:P of growth conditions determines how both time and salinity concentration will influence microcystin-LR production/leakage.

**Identification and Characterization of Bacterial Loads from Houston Watersheds**

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Watersheds are prone to bacterial contamination from wastewater treatment plants and animal feces (including agricultural run-off) in addition to chemical contaminations from industrial facilities. Houston has a complex watershed in which bayous intersect one another. This makes the city prone to flooding, as evidenced by the 2017 Hurricane Harvey flooding event. To evaluate bacterial loads in Houston watersheds, identification and characterization was done on soil samples collected during the July 2017/2018 summers and November 2017/2018 winters. Quantification of bacterial loads was determined using selective and differential media as well as a broad-based medium for total counts, respectively. Bacterial counts were determined using the spread-plate method. Isolated colonies were evaluated by biochemical tests such as: the Gram stain, catalase, and oxidase tests. The Biolog Microstation was used for identification of representative colonies and confirmed our ribotyping DNA sequencing data. It was observed that bayous closer to the densely populated urban center, such as Buffalo, Halls, Mustang and Horsepen, had significantly higher enteric bacterial loads during the winter when compared to samples collected during the summer season. Perhaps this was due to redistribution of flow of water from upstream to downstream after the flooding. We also considered proximity to wastewater treatment plants, recreational activities, and temporal temperature. Future studies will include metagenomics analysis and comparison of evolutionarily adapted environmental isolates to reference strains by evaluating their growth kinetics, biofilm formation, and responses to oxidative stress.

**Developmental abnormalities induced by metformin and guanylurea in Danio rerio and Xenopus laevis embryos**

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Metformin (MET) is the most common drug used to treat type 2 diabetes, but also it is used as an anticancer agent and as a treatment for polycystic ovary syndrome. This drug is not metabolized in the human body, and may enter into the environment through different pathways. In wastewater treatments plants (WWTPs), this contaminant is bacterially transformed to its main transformation product (TP) guanylurea (GUA). Furthermore, chlorination, phytoremediation and adsorption in graphene oxide (GO) are the only techniques that have shown high rates of removal. However, these treatments are not applied in all WWTPs. In consequence, huge amounts of MET and GUA are released in to the aquatic environment where they can exhibit different toxicities in non-target organisms. As MET and GUA toxic effects on embryonic development has been scarcely research, the aim of this work is to evaluate the embryotoxicity and teratogenicity produced by MET and GUA. For this purpose, Danio rerio and Xenopus laevis embryos will be exposed to environmentally relevant concentrations of MET and GUA for 22 days. Furthermore, lipoperoxidation (LPO), protein carbonyl content (PCC) and activity of superoxide dismutase and catalase enzymes will be evaluated at 72 hours of post fecundation in embryos exposed to MET and GUA.

**Altered metabolic rate and developmental pace in pollution-tolerant populations of Gulf killifish (Fundulus grandis)**

Haley Davis, Fallon Bain, Chad Mansfield, Benjamin Dubansky, Cole W. Matson
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Gulf Killifish (Fundulus grandis) from the Houston Ship Channel (HSC) and adjacent waterways have variable tolerance to polychlorinated biphenyls (PCBs) and polycyclic aromatic hydrocarbons (PAHs). Our research compares F. grandis populations from two sites in the HSC: the heavily contaminated Vince Bayou and a reference site, Smith Point. Gulf killifish from Vince Bayou have a recalcitrant aryl hydrocarbon receptor (AHR) pathway, at least partially resulting from a large deletion, which increases their resistance to PCB-induced cardiovascular teratogenesis. Larvae from Vince Bayou show evidence of an altered metabolic rate and growth rate. Preliminary evidence also suggests population differences in developmental pace. This study further aimed to quantify differences in embryonic development between Smith Point and Vince Bayou. Embryos from each population were separated into individual wells of a 96-well plate and imaged every 2 hours for the first 144 hpf. Developmental stage timing was determined for all embryos. Developmental pace data will be presented, and the ecological implications will be discussed.

Coral Reef Organisms: Differential Sensitivities to an Agricultural Pesticide

Haley Davis, Cheryl M. Woodley, Lisa May, Athena Burnett, Carl Miller, Zachary Moffit

NOAA

Neonicotinoid insecticides are an emerging contaminant of concern in areas with intensive coastal agriculture where they can be introduced into shallow marine ecosystems. The tolerance of four marine species to a selective systemic insecticide (imidacloprid) was determined using dose-response (50 ppm-50 ppb) acute toxicity tests. Species tested were a macroalga (Ulva sp.), an amphipod (Elasmopus levis), green sea urchin embryos (Lytechinus variegatus), and cauliflower coral (Pocillopora damicornis), representing different trophic levels in a coral reef ecosystem. Macroalgae, Ulva, did not show variation in growth rate in response to varying concentrations of imidacloprid during the 72-hour acute toxicity test. Elasmopus levis exhibited immobility at a LOEC of 10 ppb and mortality at 1 ppm. Lytechinus variegatus embryo development was not affected in the concentration range tested. Pocillopora damicornis showed a LOEC at 10 ppm for two endpoints: wound healing and health physioscores. The persistent polyp retraction is indicative of stressful conditions and inability to feed. Reduced wound healing ability is an indicator of impacts to multiple physiological processes and results in increased vulnerability to other threats such as algal overgrowth and disease. The mechanism of effect on corals is not yet fully understood, as cnidarians are not known to have nicotinoid acetylcholine receptors, its primary mode of effect in terrestrial arthropods. This study demonstrated differential species sensitivities to a systemic insecticide with macroalgae < sea urchin embryos < amphipods < coral. These data suggest that toxic effects of imidacloprid are seen when water concentrations reach ppb levels, but further work should be done considering the effects brought on by bioaccumulation and subsequent ingestion of imidacloprid.

Cytochrome P450 Reductase induction in Mayfly larvae (Ephemeroptera sp.) due to Potassium Hydroxide in fracking wastewater in the Marcellus shale Region

Haley Moyer & Amy Kutay

Lock Haven University of Pennsylvania

Mayflies (Ephemeroptera sp.) are bioindicators often used to monitor water quality and are known as pollution intolerant species. Bioindicators reflect health and deterioration or change in habitats. Over 600 species of mayflies exist nationwide and are found in water sources like streams, rivers and lakes. While presence tells about environmental health, they also produce enzymes that respond to toxic insults that are low-concentration, chronic, or not potent enough to eliminate organisms completely. This study focuses on induced enzymes as indicators of chemical change to the environment related to fracking in Pennsylvania. Previous studies at Lock Haven
determined a contaminant of local waterways as potassium hydroxide, which is known as a contaminant of fracking and will be used throughout the study. Marcellus Shale is an underground rock formation stretching from New York to Ohio, crossing though Pennsylvania. Over time, natural gas has built up between layers in rock and fracking is the process used to collect this resource. Wastewater at extraction sites is sent to treatment facilities before returning to waterways. Unfortunately, treatment centers cannot remove all contaminants, and can return them to the environment. Contaminants are often studied through analysis of soil and water and quantifying species densities of waterways near wastewater release sites. Mayfly metabolism includes cytochrome P450s (CYP450a), and sensitive metabolic enzymes. Upon exposure, these enzymes are produced to combat contaminants, metabolize them, and help facilitate removal. Objectives include determining effects of potassium hydroxide on CYP450s in mayflies, establishing a dose-response and monitoring CYP450s in exposed larvae.

Linking Aluminum Nanomaterial Induced Changes in Mitochondrial Ultrastructure to Alterations of Extracellular Flux: Structure/Function Validation of Mitochondrial Dysregulation

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The use of engineered aluminum nanomaterials as an additive in consumer and industrial products is increasing due to their special properties. Specifically, aluminum is highly utilized as a fuel additive, in automotive construction, and in a multitude of consumer products. There is a high risk of occupational, consumer, and environmental exposure, however the mitochondrial toxicity of aluminum and aluminum oxide nanomaterials is relatively unknown. There is a need to develop high throughput toxicological testing methods focused on elucidating aluminum nanoparticle (AINP) toxicities. The purpose of this study was to determine the extent of AINP induced changes in mitochondrial structure and perturbation of mitochondrial health to link together these two endpoints. To determine changes in mitochondrial health, three different epithelial cell-types from the upper airway with varying phenotypes were selected as a test system. The three phenotypes include primary cells (PTBE), cancer cells (A549), and asthma cells (DHBE). Mitochondrial ultrastructure was assessed via transmission electron microscopy while cellular mitochondrial biogenesis (i.e. ATP production) was measured using multiple assays on an extracellular flux analyzer. Differential dose-response patterns were seen in both the morphological and bioenergetic assessments. The alterations of mitochondrial shape and cristae structure integrity measured via transmission electron microscopy analysis was correlated to the resulting changes in mitochondrial coupling efficiencies as well as real-time ATP production. Furthermore, the techniques used to probe overall mitochondrial health and mitochondrial specific ATP production after exposure to environmental contaminants will become increasing important as the production of nanomaterials continues to increase.

Chemical fingerprinting of polycyclic aromatic compound sources in sediments using gas chromatography mass spectrometry

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Polycyclic aromatic compounds (PACs) are ubiquitous contaminants in the environment and many of them has been identified as known carcinogens. The associated toxicity of PACs makes monitoring and identification of sources of PACs in the environment important for assessing exposure to humans and wildlife. PACs sources in the environment include biogenic, petrogenic and pyrogenic and are generally a mixture of multiple sources mixed in environmental monitoring matrices. Most monitoring programs only analyze the PACs include the 16 EPA parent PAHs. When including all other unsubstituted and substituted PACs, there are thousands of potential congeners which
could be measured to assess both toxicity and source allocation. In this study, 59 river sediment samples obtained from all across southern Alberta, Canada were analyzed by gas chromatography tandem mass spectrometry (GC-MS/MS) and two dimensional high resolution time of flight mass spectrometry (GCxGCHRToFMS) for comprehensive PAC chemical fingerprinting. Chemical fingerprinting helps distinguish between different sources of PAH in the environment. Data collected by these two techniques was statistically analyzed to determine the chemical patterns (fingerprints) of the predominant sources in the river systems. In addition to the conventional use of native PAHs for source identification, patterns of individual alkyl PACs identified using the GCxGCHToFMS were also investigated to determine if additional source designation could be determined. Recent research has shown that these individual alkyl PACs can be more toxic than their unsubstituted analogs. Therefore, this information can aid in the evaluation of potential risk and used in risk assessment.

The widespread used antiparasitic Ivermectin disrupts swimming behavior on the freshwater fish Prochilodus lineatus (Teleostei, Characiformes)

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Ivermectin (IVM) is an antiparasitic drug widely used to treat parasites of humans, livestock, and fish. IVM is excreted unchanged (90 %) in dung of treated animals. Residues may affect nontarget organisms living in water bodies close to dung depositions areas. Laboratory toxicity tests provide inexpensive and accurate methods for assessing a chemical’s potential to affect fish behavior; however endpoints related with locomotor activity have not been previously analyzed. We analyze the swimming behavior on the Argentinian native fish Prochilodus lineatus exposed to sublethal concentrations of IVM. Water renewal and IVM stability time were evaluated by HPLC-UV. Four treatments were tested: control (C), vehicle (Cv), 0.5 µg / L (IVM 1) and 1.5 µg / L (IVM 2), both environmental relevant concentrations. At the end of the exposure, using Ethovision XT14 and Tracker 5.04 software, each aquarium was video-recorded during 10 minutes assessing: routine swimming speed, total distance traveled, % of movement, water column use and burst swimming. In a tablet pc-mounted in a side of the aquarium, a black oval animation simulating a frontal silhouette of an attacking predator was projected to trigger the escape response. The escape motion for the burst swimming was recorded at 400 fps in order to determine the acceleration and speed during evasion. Results were evaluated using one way ANOVA and principal component analysis. Routine swimming, total distance and burst swimming showed significant decrease (IVM 2). IVM impairs swimming activity and displacement that might have direct effects on fitness and consequences at population level.

The Challenge of Measuring Activated Carbon Dose in Sediments

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Activated carbon (AC) is used as an amendment for in-situ remediation of persistent organic pollutants (POPs) in contaminated sediments. In-situ application of AC at a dose of 1-5% by weight has been demonstrated to significantly reduce bio-uptake into aquatic food webs. The most important factors in the success of the technology are the application of the correct dose of AC, uniformity of the dose in the treated area, and persistence of the applied AC dose over time. However, there is no standard method to measure the amount of AC in sediment, and researchers have used a variety of techniques including measures of total organic carbon, loss on ignition, traditional black carbon determination, and a specialized method for AC. In this work, two different carbon treatments (AC
and Biochar) were measured for the amount of black carbon after several years of implementation in multiple field pilot studies. Three analytical methods (loss on ignition, total organic carbon, and specialized AC measurement) were compared for the efficacy of measuring the amount of black carbon present in the sediments for several different sites. A comparison of the accuracy and precision of each method and recommendation for adoption is presented in this study. Accurate measurement of AC in sediments as demonstrated in this study is necessary to build confidence in the adoption of in-situ remediation of sediments.

Correlation of water quality data to fecal coliform data to assess human health risk in the White River, Arkansas

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Pollution of streams and rivers in the United States is damaging the environment and risking the health of humans in recreational areas. Fecal coliform bacteria are an indicator bacteria for dangerous diseases such as Escherichia coli, hepatitis, and salmonella. The most common way to contract these diseases via polluted water is by oral ingestion or through breaks in the skin. Assessing and correlating water quality for fecal coliform bacteria can pinpoint locations where humans are at risk for contracting harmful diseases. Northern Arkansas is known globally for recreational fishing, which can be a risk to health if fishing in polluted waters. Fifteen tributary sites of the White River in Arkansas were tested twice a month to assess water quality parameters such as temperature, pH, dissolved oxygen, conductivity, turbidity, total suspended solids, total nitrogen, total phosphorus, and fecal coliform bacteria. Additionally, three of those sites where fishing is common were also chosen for a study to swab fish for fecal coliform bacteria on the skin of the fish. All site and swab samples were also tested for shiga toxin-producing E. coli from December 2018 forward. Statistical analyses were performed to determine the correlation between water quality parameters and fecal coliform bacteria. Geographic analyses were also performed to determine if land use was correlated to the aqueous fecal coliform counts in the stream.

Biomonitoring in the Anthropocene: eDNA Assessment of Mining Remediation

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To better understand ecosystem responses to anthropogenic stress, new biomonitoring methods are needed that assess biodiversity in a quick and cost-efficient manner. The emerging field of environmental DNA (eDNA) potentially offers such an approach, as it may provide rapid, low-cost identification of species present in an area. To test the effectiveness of this new technology, eDNA was collected from various stream locations within The Wilds Conservation Center (Cumberland, OH). This area has active acid-mine drainage from historical coal-mining operations and the stream sites here include both remediated and unremediated sections. The goal of this proof-of-principle study is to estimate biodiversity and community structure at each stream using eDNA from water samples. This will be compared to data from electrofishing and surveys of macroinvertebrates. Additionally, leaf litter bags were used as a novel source of DNA to compare to the eDNA signal from water samples. Water quality parameters (pH, metals, conductivity) were assessed at all sites for comparison to derived community structures. Our working hypothesis is AMD reduces biodiversity and simplifies community structure at locations closest to an AMD source. These simplified community structures can then lead to reductions in ecosystem functions such as carbon cycling as measured by leaf litter decomposition rates. Results from this study will provide a wealth of species information to be used in future remediation efforts by The Wilds. Knowing which levels of AMD correspond to desired community structures can help create AMD benchmark levels for successful management of remediation sites.
Pharmaceutical Uptake Kinetics In Rainbow Trout From East Canyon Creek, An Effluent-Dominated Stream Influenced By Snowmelt In Park City, Utah, USA

Jaylen L. Sims, S. Rebekah Burket, Marco E. Franco, Lea M. Lovin, Kendall R. Scarlett, Ruud Steenbeek, Craig Ashcroft, Michael Luers, Ramon Lavado, and Bryan W. Brooks

Baylor University

Whether seasonal instream flow dynamics influence uptake of select pharmaceuticals by fish is not well understood, specifically for urban lotic systems in semi-arid regions with flows influenced by snowmelt. We examined uptake of select pharmaceuticals in rainbow trout (Oncorhynchus mykiss) caged upstream and at incremental distances downstream (0.15, 1.4, 13 miles) from a municipal effluent discharge to East Canyon Creek in Park City, Utah, USA during summer and fall of 2018. Fish were sampled over 7-d to define uptake kinetics. Water and fish tissues were analyzed via isotope dilution LC-MSMS. Several pharmaceuticals were consistently detected in water, fish tissue and plasma, including carbamazepine, diphenhydramine, diltiazem, and fluoxetine. Pharmaceutical levels in water ranged up to 151 ng/L for carbamazepine, whereas the effluent tracer sucralose was consistently observed at low ug/L levels. During both summer and fall experiments at each of three downstream locations from effluent discharge, rainbow trout rapidly accumulated these pharmaceuticals; tissue levels reached steady state conditions within 24 â€“ 96 hrs. In additional, in situ bioaccumulation factors (BAFs) were calculated for diphenhydramine, diltiazem, and fluoxetine, and compared to model predictions. Such observations are consistent with our recent laboratory bioconcentration studies, which collectively indicate inhalational exposure from water governs rapid pharmaceutical accumulation by fish in inland surface waters.

Environmental impact monitoring of (underground) mining: Case study from copper-uranium mine

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The present industrial society is heavily dependent on minerals. Mining for minerals is the major activities through which the minerals are extracted from earth and after subsequent refinements valuable metals are produced. In each of the steps involved in the metals processing, starting from the excavation of ore to final metal production, has environmental impact which is often irreversible in nature. The environmental impact from mining is obvious but a mining entity should aim to minimize. In this regard, monitoring the environmental impact from various mining activities is crucial. For a long time, this kind of monitoring was done based on field based observations which was expensive and highly time consuming. Recent advancements in remote sensing (RS) technology creates an opportunity to utilize the satellite data to monitor environmental impacts from mining effectively. For example, underground mining activities could affect the geology or morphology of a site which could alter the movement of ground water, drainage basin and watershed. RS based digital elevation model could be used to monitor such change. The goal of this study is to monitor the environmental impact of underground mining using remote sensing approach. More specifically this study will consider the environmental impact from (a) morphometric change, (b) intensity of land use change, (c) tailings and its movement, (d) change in vegetation cover, (e) water withdrawal and (f) emission. The Olympic Dam mine is selected as a case study site which is one of biggest producers of uranium and copper in the world.

Development of a quantitative method for analysis of per- and polyfluoroalkyl substances in water and bi-valve tissue

Stroski, Kevin; Sims, Jaylen; Burket, Bekah; Brooks, Bryan

Baylor University
Development of a quantitative method for determination of per- and polyfluoroalkyl substances (PFAS) in both surface water and bi-valve tissue was undertaken utilizing liquid chromatography (LC) tandem mass spectrometry (MS/MS). Four PFAS compounds were optimized including perfluorohexane sulfonic acid (PFHxS), perfluorooctane sulfonic acid (PFOS), perfluorodecanoic acid (PFDA) and perfluoroundecanoic acid (PFUdA) within a relatively short runtime (15 minutes). Linear range on the instrument was between 0.5 to 50 ng/L for all compounds. Solid phase extraction with weak-anion exchange (WAX) cartridges were used for extraction and generated method detection limits (MDLs) between 0.19 to 0.38 ng/L in water samples. Tissue MDLs are currently under analysis comparing both acid digestion and flash freezing methods. Once validated, the two methods will be used to verify water concentrations from a laboratory bioaccumulation study in both water and bi-valve tissue. Methods will also be expanded to include 20 more PFAS compounds including fluorotelomer sulfonates and short-chain PFASs which are more indicative of the current PFAS contamination profiles. The final 24 compound mixture has been chosen based on recent EPA guidelines regarding aqueous film forming foam contamination as well as technical mixtures available in the standards market.

The Establishment of a Dose-Response Curve Using the Inebriator in Honey Bees (Apis mellifera L.)

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Honey bees (Apis mellifera) are exposed to ethanol when they forage in their natural environment. Ethanol occurs in plant nectar as a result of the fermentation process. Originally the presence of ethanol was thought to be an aversive stimulus to bees as it indicates plant decay; however, studies show that bees will actively seek out ethanol. This presentation discusses the establishment of a dose-response curve for the inebriator system with honey bees exposed to ethanol. The inebriator was originally created and used for ethanol research with fruit flies (Drosophila melanogaster). This apparatus is a vapor ethanol delivery system; the ethanol is vaporized through an air pump bubbler system. The ethanol vapor is then delivered to a bee in a test tube through plastic tubing for a specific period of time. Following the ethanol dosing, bees had their hemolymph drawn and gas chromatography analysis was conducted. This presentation will discuss the methodology for the use of this system in research with honey bees.

Ambient Air Quality Monitoring in Two Metropolitan Cities of South-Western Nigeria

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Air Pollution is one of the biggest threats in the world today. In this study, ten (10) air quality parameters which include temperature, wind speed, carbon monoxide (CO), volatile organic compounds (VOCs), hydrogen sulphide (H2S), nitrogen dioxide, sulphur dioxide, nitrogen monoxide, and particulate matter (PM2.5 and PM10) were considered. Measurements at ten different sampling points in Lagos (majorly around Olusosun dumpsite) and in Ogun (majorly around Lafarge cement factory, Ewekoro) each, was taken using standard air quality monitors. In all sampling locations in Lagos, CO ranged from 1.20±0.13 to 8.95±3.52 (exceeded the limit of 5.00 ppm); VOC ranged from 0.05±0.03 to 1.87±0.81 (exceeded the limit of 0.008 ppm). PM2.5 ranged from 377.16±60.34
to 815.40±80.04 (exceeded the limit of 25μgm-3). Whilst low levels of CO were generally observed but PM levels were above the WHO standards in Ewekoro, Ogun state. The temperature, relative humidity and wind speed measured in all sampling stations were within WHO Standard. The concentrations of particulate matter at all the seasons exceeded WHO guidelines. Based on the findings in this study, it could be adjudged that residents around these study locations may be predisposed to physiological disorders due to high levels of CO, VOC, PM2.5 and PM10. Hence, continuous monitoring of air quality for all cities should be done to ensure compliance with recommended regulations for health risk assessment and appropriate environmental policies should be enacted or enforced.

Environmental Contextualization of Urea Toxicity in Aquatic Ecosystems

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Pennsylvania State University

Salinization of freshwater ecosystems due to chloride-based deicer use during winter months has commenced exploration into alternative deicing formulations. An alternative formulation advertised as eco-friendly is a urea-based formula, which is both effective and nontoxic. Spring runoff and rainfall that follow winter applications wash urea into freshwater ecosystems, where hydrolysis converts urea into ammonium, a toxic chemical. Urea-based deicers demonstrate an order of magnitude greater toxicity to aquatic invertebrates than chloride-based deicers due to this hydrolysis reaction. Hydrolysis of urea in aquatic environments is dependent on environmental condition (i.e, temperature, bacterial community), such that toxicity of urea-based deicers in aquatic environments is ecosystem dependent. To better understand the specific effects of ammonium toxicity in aquatic environments, 10-d toxicity tests were performed on Chironomus dilutus under varying environmental conditions to determine the rate at which urea is hydrolyzed to ammonium and the relationship of this hydrolysis to toxicity. Preliminary data suggest that although the 10-d lethal concentration 50 (LC50) for urea, and ammonium derived from urea hydrolysis, are not different when lab derived or field collected sediments are used, the rate of the hydrolysis reaction varies significantly between the two systems. As such, standard time-based LC50s likely fail to encapsulate the full risk associated with urea-based deicers, suggesting an activity-based hazard metric is required. Further testing of urea hydrolysis under different environmental conditions will be performed in an attempt to acquire the rate of hydrolysis and derive activity-based toxicity benchmarks, thus removing environmental context from estimates of risk.

Selection preference in Hyalella azteca: Development of a behavioral assay for ecotoxicology

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Pennsylvania State University

Sublethal effects associated with pollutants are often overlooked in ecotoxicology yet have significant environmental implications. In comparison to lethality, study of sublethal effects, such as behavioral changes, can provide insight into toxicology effects that occur below lethal concentrations but result in lethality through indirect means. Despite the importance of behavioral effects of toxicants, no reliable assays exist for evaluating behavioral endpoints, particularly in aquatic species. The objective of this study was to determine if Hyalella azteca exhibit preferential selection to substrates as an estimate of this speciesâ€™ behavioral response to contaminants. By designing a two-choice test chamber, avoidance and preferential selection behaviors were tracked, observed, and measured. Individual H. azteca were given a choice between field-collected sediment and sand and monitored for 10
minutes. Experiments with individuals were repeated twice to determine intraindividual variation. Preliminary results suggest that H. azteca do indeed exhibit selection preference behavior, suggesting this assay serves a viable means to explore sublethal behavioral effects of toxicants. Establishing a viable behavioral assay lends future opportunity to make determinations as H. azteca environmental preference and how contamination alters these preferences. Behavioral changes caused by substances ranging from pharmaceuticals to industrial contaminants can be studied using this experimental design, allowing for a more realistic view of the impact of pollution on the environment. The design of this study has the potential to progress ecotoxicology in that the focus is not strictly on lethality, but rather a more encompassing ecological approach.

**Acute and chronic toxicity of sugarcane vinasse to the Neotropical cladoceran Ceriodaphnia silvestrii**


*University of Sao Paulo*

Vinasse is a byproduct of the ethanol production process. Despite the benefits of using vinasse in agricultural areas, this residue has a high potential for environmental contamination, especially as it is a product characterized by low pH, high nutrient and metal contents, as well as high biochemical oxygen demand. In this sense, the objective of this work was to evaluate the effects of vinasse on the survival and reproduction of native cladoceran Ceriodaphnia silvestrii, an important bioindicator of tropical freshwater aquatic ecosystems. The experiments were performed with 48-hour acute and 7-day chronic evaluation when C. silvestrii were exposed to vinasse dilutions. The data obtained were analyzed using Statistica 7.0 software. Acute toxicity tests showed an EC50-48h (mean ± SD) of 0.46 Å± 0.008 percentage of vinasse in the test solution. For the chronic tests five concentrations between 0.025 and 0.2% of vinasse were used and the results showed a significant increase in the production of neonates in four of the five concentrations. In the last tested percentage of vinasse (0.2%) reproduction was affected, producing 9 Â± 3 neonates (mean Â± SD) while control produced 15 Â± 1 (mean Â± SD). Vinasse is rich in micronutrients and organic matter, so low percentages may favor the homeostasis of organisms. However, even at low concentrations harmful effects occurred. Thus, it is possible to signal vinasse as a dangerous contaminant for the stability of the ecosystems exposed to it.

**Characterization of nanoparticle transformation in physiologically relevant fluids**

Lauren Pitts, Marina R. Mulenos, Christie M. Sayes

*Baylor University*

Nanoparticles are increasingly used in biomedical applications due to their high surface area to volume ratio, ease of surface functionalization, and inherent ability to be excreted. Metal nanoparticles of like surface charge have been shown to display repulsive tendencies; but at physiologically relevant pH, these same particles form a double layer enabling particle stability. When nanomaterials travel through the body to their target site, they encounter many different aqueous environments which may alter colloidal stability. We hypothesize that nanoparticles will become increasingly unstable as the physiologically-relevant fluid they encounter becomes increasing complex. Specifically, the stability of the nanoparticles will be directly related to (1) pH, (2) the concentration of proteins in the biofluid, and (3) the ionic strength of the surrounding matrix. To test this hypothesis, we compared three different
surface-functionalized silver nanoparticles that result in positive, negative, and neutral surface charge, which was confirmed through electron microscopy and spectroscopic techniques. Each particle system was incubated in different physiologically-relevant environments: acidic stomach fluid, neutral blood serum, and basic surfactant fluid. Negatively charged particles were noted to undergo the most significant transformations, whereas the particles with neutral surface charges were seen to have the least transformation. The information obtained from these studies will provide crucial insight into colloidal stability of biotransformed nanoparticles, provide read-across comparisons between metal-based and polymeric-based nanoparticles, and aid in filling the literature gap in nanoparticle colloidal stability and how it affects nanoparticle biotransformation.

Daphnia magna Demonstrate the Fatal Toxicity of Stormwater Runoff During Each Season

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First season rain events carry high levels of pollutants, where they are deposited directly from surrounding storm water sewer systems to nearby receiving waterways. Seasonal first flushes of storm water demonstrate high levels of pollutants such as heavy metals, organic compounds, and snow-melting agents. Acute toxicity tests were run on populations of the invertebrate, Daphnia magna, to demonstrate the toxicity of storm water runoff in Cincinnati, Ohio. First flush seasonal rainfall was collected during each season of 2019 and diluted to 25%, 18%, 9% and 3%. Mortality was highest in Spring sewer water in dilutions as small as 3%. D. magna support the ecological food chain of aquatic ecosystems. The health and vitality of all levels of the food chain are dependent on the survival of D. magna and other invertebrates, and toxic storm water runoff is becoming malignant to the higher order consumers of the food chain.

Developing a comparative understanding of the aquatic toxicology of anatoxin-a in common fish models

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Toxins released during harmful algal blooms present risks to global health and the environment. Anatoxin-a is a globally found neurotoxic cyanotoxin that has been shown to have effects on growth, reproduction, and survival of aquatic organisms. Few studies, however, have characterized this toxin’s behavioral effects in fish, so we looked at these responses in two fish species. Four replicates of zebrafish and three of fathead minnow larvae were exposed to anatoxin-a fumarate at concentrations of 0.01, 0.1, 0.5, 1, and 1.5 mg/L for 96h, they were then analyzed for swimming behavior using a ViewPoint ZebraBox. Additional larvae were collected for gene expression and protein analyses. We found that duration and total distance of fathead minnows busting speed (>20 mm/s) was significantly lowered (p< 0.1) by anatoxin-a in 0.1, 1, and 1.5 mg/L treatments, while the opposite occurred with zebrafish which showed an increased trend in bursting behavior though this was not statistically significant. This shows that fathead minnows may be more sensitive than zebrafish to this toxin. No significant effect was found for the change in movement from periods of dark to light. We further examined gene expression focusing on genes related to oxidative stress, DNA damage, and neurotoxicity. Such a comparative understanding of cyanotoxin effects in aquatic organisms is beginning to address key data gaps, and is necessary to support more robust assessment and management of cyanobacterial blooms, which are increasing in magnitude, frequency and duration at the global scale.

The impacts of developmental thyroid disruption on immune function and the immune response in the fathead minnow

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Current evidence suggests that thyroid hormones (THs) may impact development of the immune system. However, studies that explore the role of THs in immune development are limited, and the mechanisms leading to alterations in immune function are poorly understood. It is important to elucidate the role of THs in immune development given that many environmental contaminants have been shown to disrupt TH homeostasis and may also have negative impacts on the immune system. As such, the main goal of this study was to determine the long-term consequences of early life stage (ELS) hypothyroidism on immune function. To achieve this goal, fathead minnows (FHMs, Pimephales promelas), a newly developed model for immunotoxicity, were exposed to the model thyroid suppressant propylthiouracil (PTU) from <1 to 30 days post hatch and reared under normal conditions until adulthood. FHMs were infected with Yersinia ruckeri and monitored for 14 days to determine pathogen resistance. At eight hours post injection, the immune response was assessed via a suite of endpoints (i.e. bacterial load, hematocrit, spleen index, leukocyte counts). Respiratory burst and phagocytic cell activity were also assessed. No significant alterations were detected for most endpoints measured. However, phagocytic cell activity was significantly reduced in female fathead minnows exposed to PTU, suggesting that immune cell function or cellularity may have been impacted by ELS hypothyroidism in a sex-specific manner. The potential impact of ELS hypothyroidism will be further explored via the assessment of the renal transcriptomic response in female FHMs.

Can environmentally relevant concentrations of carbamazepine induce short-term sublethal effects on the hydrophyte Myriophyllum quitense?

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Carbamazepine is one of the most prescribed human pharmaceutical drug worldwide. It has been proposed as an anthropogenic activity marker to assess water quality due to its low removal capacity in wastewater treatment plants and its frequent occurrence in aquatic ecosystems. Carbamazepine has a high potential of bioaccumulation in macrophytes. However, its sublethal effects on non-target aquatic plants are poorly reported. The objective of this study was to assess whether low levels of carbamazepine induces short-term sublethal effects on the hydrophyte Myriophyllum quitense, using photosynthetic and oxidative stress biomarkers. Plants of M. quitense (n = 6 per treatment) were exposed to increased concentrations of carbamazepine (0, 0.1, 1.0, 10, 20, 100 µg/L) in individual glass jars of 0.34 L for 48 hs, under natural photoperiod (10 h light / 14 h darkness). A battery of biomarkers, which included total chlorophyll, chlorophyll a and b, carotenoids content, catalase and guaiacol peroxidase activity and lipid peroxidation (malondialdehyde content) was evaluated. The results were analyzed by the non-parametric Kruskal-Wallis test and by Dunn test. A significant increase in the malondialdehyde content was observed at the lowest tested concentration (0.1 µg/L, p<0.05). Overall, carbamazepine did not induce significant changes in the measured photosynthetic pigments and enzymatic biomarkers. The present study provides the first results of the potential sublethal effects on the hydrophyte M. quitense in a short-term exposure to environmentally relevant concentrations of carbamazepine. This is a starting point in order to understand the ecotoxicological effects of this emerging contaminant in aquatic macrophytes.

Bioaccumulation of carbamazepine, enalapril and sildenafil in fish under laboratory conditions

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CIM-CONICET-UNLP
Wastewater effluents are the main source of Human Pharmaceuticals (HP) in surface water bodies. Carbamazepine (CBZ), enalapril (ENA) and sildenafil (SIL) had been detected in water bodies of Argentina at concentrations ranging 0.59-26.72 µg/L and in muscle of feral fish from Río de La Plata basin with commercial interest, ranging 1.41-26.8 µg/Kg. This study aimed to assess the bioaccumulation of CBZ, ENA, and SIL in the widespread native species C. decemmaculatus exposed to concentrations 200, 500, and 100 µg/L, respectively, during 96 h with partial test media renewal every 48 h. HPs extractions were carried out by using the Rotatory Extractor method. Direct injection after 0.22 µm filtration was done for water chemical analyses. Analytical determinations in water and muscle were performed by HPLC-MS. The average concentration in fish corresponding to the last time of exposure for CBZ, ENA, and SIL was: 203 ± 28.9 (N=3) µg/Kg, 2.16 ± 1.86 (N=3) µg/Kg and 102 ± 7.31 (N=3) µg/Kg, respectively. The empirical Bioconcentration Factors (BCF) at 96 h calculated for each one was: 0.9, 0.004 and 0.8.

The uptake of HPs was evidenced and the obtained concentrations were in the order of those found in feral fish. However, for the high levels of HP assayed in this study, the empirical BCFs obtained were low, indicating no bioaccumulation.

A solution to water scarcity: HYDROUSA, closing the loops

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Catalan Institute for Water Research (ICRA)

Overpopulation and climate change can contribute to put water scarcity on the spotlight as one of the main global problem nowadays and in the future. Therefore, the development of new strategies to obtain freshwater from non-conventional sources is increasingly required. The European project HYDROUSA aims at evaluating innovative, regenerative and circular solutions for nature-based water management of Mediterranean coastal areas, closing water loops; nutrient management, boosting the agricultural profile; based on circular value chains. HYDROUSA considers different non-conventional water sources (like greywater, rainwater, seawater, etc.) as well as conventional ones (treated urban wastewater) to obtain freshwater. However, micropollutants are not completely removed by the conventional wastewater treatment technologies. Since these substances, can have consequences for the environment or humans even at low concentrations, water reuse activities should be carefully evaluated. Thus, it is very important to track them through the water cycle and determine their source as well as removal efficiency and fate. Therefore, it is of vital importance to elaborate comprehensive analytical methods capable of detecting and quantifying micropollutants even at concentrations of ng/L. This way we will also be able to evaluate the most efficient water treatment train to be applied in three Greek islands, in terms of removal of micropollutants. Furthermore, an important fraction of the reclaimed water produced in the project will be used to irrigate crops. Thus, methods of extraction will also be developed to analyse the possible micropollutants that could leak/uptake into cultivated crops and vegetables.

Xenobiotic metabolism in fish liver and gill cell lines: biomarkers of CYP450 activity and oxidative stress

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The use of fish cell cultures has proven to be an effective tool in the study of environmental and aquatic toxicology. Valuable information can be obtained from comparisons between cell lines from different species and organs. In the present study, specific chemicals were used and biomarkers (e.g. 7-Ethoxyresorufin-O-deethylase (EROD) activity and reactive oxygen species (ROS)) were measured to assess the metabolic capabilities and cytotoxicity of the fish hepatic cell lines Hepa-E1 and RTH-149, and the fish gill cell lines RTgill-W1 and G1B. These cell lines were exposed to β-naphthoflavone (BNF) and benzo[a]pyrene (BaP), the pharmaceutical tamoxifen (TMX), and the organic peroxide tert-butylhydroperoxide (tBHP). Cytotoxicity in gill cell lines was significantly higher than in hepatic cells, with BNF and TMX being the most toxic compounds. CYP1-like associated activity, measured through EROD
activity, was only detected in hepatic cells; Hepa-E1 cells showed the highest activity after exposure to both BNF and BaP. Significantly higher levels of CYP3A-like activity were also observed in Hepa-E1 cells exposed to TMX, while gill cell lines presented the lowest levels. Measurements of ROS and antioxidant enzymes indicated that peroxide levels were higher in gill cell lines in general. However, levels of superoxide were significantly higher in RTH-149 cells, where no distinctive increase of superoxide-related antioxidants was observed. The present study demonstrates the importance of selecting adequate cell lines in measuring specific metabolic parameters and provides strong evidence for the fish hepatocarcinoma Hepa-E1 cells to be an excellent alternative in assessing metabolism of xenobiotics, and in expanding the applicability of fish cell lines for in vitro studies.

Altered expression and activity of phase I and II biotransformation enzymes in human liver cells by perfluorooctanoate (PFOA) and perfluorooctane sulfonate (PFOS)

Marco E. Franco, Grace E. Sutherland, Maria T. Fernandez-Luna, Ramon Lavado

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Exposure assessments for perfluorooctanoate (PFOA) and perfluorooctane sulfonate (PFOS) have been mostly limited to the quantification of these chemicals in different environmental matrices, but only a few studies have addressed toxicological aspects associated with them. It has been suggested that both PFOA and PFOS are highly stable chemicals that are not metabolized, yet previous reports have described abnormal activity of important biotransformation pathways. The goal of the present study was to investigate the effects of PFOA and PFOS on phase I and II biotransformation enzymes at the gene expression and activity levels, and by using the well-established human liver HepaRG cell line. Cells were exposed to a wide range of PFOA and PFOS concentrations for 24 or 48 hours, prior to quantifying the expression and activity of three cytochrome P450 enzymes (CYP1A2, CYP2C19 and CYP3A4) and two conjugation enzymes (glutathione-S-transferase (GST-M1) and UDP-glucuronosyltransferase (UGT-1A1)). Expression of all CYP enzymes was significantly reduced from exposure to both PFOA and PFOS after 48 h and from concentrations as low as 40-50 ng/L, with CYP3A4 also presenting the lowest activity. Among the conjugation enzymes, the expression of UGT was significantly reduced only by PFOA after 48 h of exposure. While the specific chemico-biological interactions of these compounds with gene expression and biotransformation pathways is not clear, the results from this study suggest that the interference of PFOA and PFOS with phase I and II biotransformation enzymes could potentially lead to adverse outcomes resulting from the inability of biotransformation pathways to function as needed.

Surface charge of biotransformed nanomaterials influence on human liver cell-line toxicity

Marina George, Henry Lujan, Lauren R Pitts, Christie M. Sayes

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Interest in silver nanoparticle biotransformation has grown due to the roles they play in maintaining the sterility of biomedical products, food storage bags, and personal care products. While the literature has extensively studied the adverse health outcomes of silver nanoparticles, these studies were limited to engineered nanoparticles. There is a need to investigate the toxicity of biologically transformed nanomaterials. Ionic silver nanoparticles elicit toxicological effects at high and low concentrations; however, it is unclear if biotransformed nanoparticles illicit the same responses. Here, we studied biotransformed silver nanoparticles of either positive, negative, or neutral charge. Each nanoparticle system was incubated in physiologically relevant environments: acidic stomach fluid, neutral blood serum, and basic surfactant fluid. Their effects were studied on human hepatoma cells, HepG2. Endpoints of viability, oxidative stress, and DNA and mitochondrial damage were measured. Our results indicate that
the positive and negative nanoparticles biotransformed with acidic stomach fluid increased oxidative stress in the cells due to their increased ion production. Nanoparticles incubated in neutral blood serum produced a net negative surface charge due to protein corona formation. The nanoparticle protein corona complexes were seen to decrease in adverse effects due to the protective protein corona masking potentially disruptive mechanisms from occurring. The nanoparticles incubated in basic surfactant fluid had negligible effects compared to the other biotransformed nanoparticles. Additionally, surface charge influenced the uptake mechanism, confirmed by hyperspectral imaging. Monitoring the toxicological effects of biotransformed nanoparticles along their product life cycle is necessary to accurately describe real life exposure scenarios.

Application of sewage sludge to soils contaminated with heavy metals â€“ opportunity or risk? Changes in plants DNA damage and the expression of chosen genes

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Problem with heavy metal-polluted soils is increasing significantly throughout the world, as a result of industrialization, mining operations, improper waste and water treatment. Study was designed to evaluate the effects of using different types of sewage sludges on plants stress levels after its application on soil contaminated by heavy metals. The main aim of the study was to compare and evaluate the sensitivity of different stress markers in plants exposed to soil supplemented with sewage sludge to develop more accurate toxicity tests which can be used across different taxonomic groups (brassicaceae, babaceae and poaceae). Moreover, the differences in application of sewage sludge after different treatments on plants stress markers were shown. The toxicity assessments were conducted using selected measurement endpoints: germination index, plants biomass roots length, the activity of guaiacol peroxidase, content of chlorophyll, the level of DNA damage, the expression rate of selected genes involved in metal detoxification and photosynthesis: rubisco (rbcL), ABC transporters, phytochelatins (PCS), and metallothioneins (MTs). Presented study showed that the incorporation of ecotoxicological tools in risk assessment of sewage sludge application on soils especially the expression of metal chelators and level of DNA damage indicates the phytotoxic effects faster (after 48h) than standard toxicity tests where significant changes started to occur after not earlier than 7-10 days from the initial exposure. Finally, results showed the increase in soil toxicity after supplementation with sewage sludge containing trace metals even when the soil physical and chemical properties were improved but that action which shows the importance of the implementation of more sensitive toxicity tests before large scale sewage sludge application onto land.

Laboratory-scale ocean acidification experiment negatively impacted the regeneration capacity of the ragworm Hediste diversicolor (O.F. MÃ¶ller, 1776)


University of Cadiz

Global warming and elevated level of atmospheric CO2 resulted changes in the seawater conditions causing ocean acidification (OA). The impact of OA poses a serious threat to marine species worldwide, including the deep sea to coastal estuaries. Polychaetes are the class of segmented worms that highly abundant in estuarine areas. They are facing wide range of environmental pollutants and coping with stress situations. Until recently, very less is known regarding the effect of OA and elevated temperatures on the marine organism, especially on marine polychaetes. Here, we undertook investigation of the changes in temperature (15 Â°C and 25 Â°C) and pH (8.1, 7.5 and 7.0) on the behavior, feeding rate, capacity of tissue regeneration as well as mortality rate of the coastal polychaete.
(ragworm Hediste diversicolor) under controlled laboratory conditions during a period of 28 days. The results showed that the organisms exposed to the high level of acidic conditions of pH (7.5 and 7.0) and temperature (25 °C) noticed with a slower tissue regeneration capacity, higher mortality rate, lower feeding rate and slower burrowing rate than that of the ambient conditions. Based on the future oceanic climatic conditions some physiological changes were observed in this ragworm. Our study highlighted the adverse effect of future OA and global warming on the marine polychaete, results clearly show the physiological changes of H. diversicolor. These findings seem to have marine ecological consequence, because polychaetes established links between producers and consumer in the marine food chain.

Differentially Expressed Proteins Indicate Importance of Photoperiod Conditions during Larval Development

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Circadian clocks are key to understanding homeostatic mechanisms in most organisms, especially during development. By eliminating light sources in embryonic zebrafish (Danio rerio), this study seeks to characterize the changes to the proteome in the absence of light and elucidate which regulatory pathways are differentially affected by this environmental modification. Embryos (6 - 96 hpf) were exposed and collected in 16/8 light/dark and 24-hour darkness cycles. Pre-liminary results show no statistical differences in mortality or hatching rate between the two conditions. Delayed pigmentation was observed in 26% of embryos (24 hpf) in under dark conditions, and approximately 3% of embryos experienced developmental delay. Protein content was determined via BCA assays and total protein content in lysed homogenates decreased over time (n=5, p<0.05). Protein quality was confirmed using SDS-PAGE prior to shotgun proteomic preparation. Following lysis of embryos, lysates were acidified and de-salted using the filter aided sample preparation (FASP) protocol. Protein digestes were quantified using the MSE Waters LC/MS/MS. Shared proteins averaged 40% with unique proteins ranging from 22-37%. Furthermore, a PCA revealed distinct groupings based on time and rearing condition. Differentially expressed proteins (DEP) were observed consistently between light and dark conditions, ranging from 72-136. With FDR correction of 5%, DEP ranged from 17-130 indicating importance of rearing conditions on protein expression. Pathway analysis is ongoing. Thus, this study provides a valuable dataset for future investigations into importance of circadian rhythm and development, and also establishes baseline changes to rearing conditions prior to the addition of a photoreactive compound.

Perfluoroctanoate (PFOA) and perfluorooctane sulfonate (PFOS) effects on phase I biotransformation enzymes in fish liver cells co-exposed to aryl hydrocarbon receptor (AHR) agonists

Megan E. Solan, Marco E. Franco, Ramon Lavado

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The presence of perfluorinated substances in the environment, especially in aquatic ecosystems, continues to be of concern for human and environmental health. Previous studies have suggested that several of these compounds do not undergo biotransformation due to their chemical stability, yet PFOS- and PFOA-exposed organisms have presented abnormal activity of important biotransformation pathways. Given the fundamental role of biotransformation in biological organisms and the significant distribution of perfluorinated substances in aquatic environments, the present study was designed to investigate the influence of PFOA and PFOS on phase I biotransformation enzymes in fish using the rainbow trout liver RTL-W1 cell line. Cells were exposed and co-exposed to environmentally relevant concentrations of PFOA, PFOS, and Benzo[a]pyrene (BaP). Cells were evaluated for cytotoxicity and activity of CYP1A, via EROD activity bioassays, following a 24 and 48 h exposures. Preliminary
data suggests that PFOS but not PFOA decrease CYP1A activity even in presence of agonists (BaP) and beta-naphthoflavone (BNF) in liver cells. These observations have significant implications for organisms that may be exposed to other environmental pollutants for which biotransformation is necessary, especially in detoxification mechanisms. The inability of biotransformation pathways to function as needed could significantly increase adverse outcomes, compromising the stability of fish populations inhabiting PFOA- and PFOS-polluted environments.

Effect of pasture land use on subwatersheds of the Buffalo National River, Arkansas

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The Buffalo National River was designated as the United States’ first national river in 1972 and was designated as an Extraordinary Resource Waterway by the Arkansas Department of Environmental Quality in 2008. This means that the Buffalo National River is valued for its ecological and economic resources, putting it under an extra blanket of protection by the state of Arkansas as well as the protections granted to it by the federal government. The ADEQ identified the economic resources of the BNR as primary and secondary contact recreation (full contact activities and water-related activities respectively) and as a domestic, agriculture, and industrial water resource. This agricultural land use (along with municipal discharge) is listed as the most likely source of contamination of Bears Outlet â€” Buffalo River 10â€”digit HUC according to the ADEQ 2016 303(d) list. The conditions listed as the cause for this subwatersheds impairment are Total Dissolved Solids (TDS), Dissolved Oxygen (DO), and Temperature which are all possible side effects of pasture use near streams and rivers because of soil and nutrient runoff. Due to the use of pastures near the Buffalo National River and its subwatersheds, it is necessary to measure water quality parameters of the subwatersheds at their headwaters and outlets to determine if excess nutrients or soil runoff is entering the subwatersheds due to high pasture land use.

Arsenic bioaccessibility from soil: Influence of soil particle surface area and IVBA method

Nnanyelugo Gerald Odezulu, N.G. Odezulu, Y.W. Lowney, M. Kozuch, L.D. Stuchal, S.M. Roberts

Decades of research has clearly established that there are site- and soil-specific factors that control the bioavailability of arsenic from soil, and that these factors should appropriately be factored into human health risk assessment (HHRA) of contaminated sites. Guidance from the U.S. EPA and several State agencies provide useful information regarding inexpensive “in vitro” methods to estimate the bioavailability of arsenic from soils, and the process for incorporating the in vitro bioaccessibility (IVBA) data into HHRA. The animal research that establishes the relative oral bioavailability of arsenic from soils, and which underlies the IVBA methods, was largely conducted using soils sieved to < 250 um. Recently, the U.S. EPA updated their guidance on assessing exposures to chemicals in soil at contaminated sites, and now recommends that HHRA of contaminated soils focus on soil particles < 150 um. This research evaluates soils from several arsenic-contaminated sites to assess the effect of two different IVBA methods on soils from diverse regions and arsenic sources. For a matched set of soils, the research also evaluates the effect of particle size. The findings and implications for HHRA of arsenic in soil will be addressed.

Monitoring biomarkers of effect and exposure in freshwater snails (Pachychilus sp.) in Ramsar wetland impacted by agriculture

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Macroinvertebrates, such as gastropods (snails), have a very important role in wetland ecosystems, in addition, are considered bioindicators of ecosystem health. This group of mollusks have been used to assess exposure to heavy metals and pesticides. In this sense, the objective of this research was to monitor biomarkers in freshwater snails (Pachychilus sp.): AChE (Acetylcholinesterase), GST (glutathione s-transferase), MDA (malondialdehyde, oxidative stress), MTs (metallothioneins) and condition factors, during three seasons (dry, rains and post-rains) in a Ramsar wetland (San Luis Potosí, MX) impacted by agricultural activity. 30 organisms were randomly selected at three wetland sampling stations, which were sacrificed to obtain the tissue. Tissue of snails were homogenized to obtain the post-mitochondrial fraction, in which the activity of AChE, GST, MTs and MDA was determined by UV-Visible spectrophotometry in a microplate reader. While the condition factor was obtained by the residuals of the linear regression of the weight and size of the organisms. The biomarkers showed clear differences by seasons. AChE activity decreased significantly in the dry and rainy season, while GST and MDA increased their activity in these seasons (p<0.05). MTs were increased only in the post-rainy season (p<0.05). The condition factor did not show differences between seasons. The multivariate analysis showed patterns with biomarkers between seasons and sites, creating an index that indicated a possible exposure in seasons where pesticides are applied more frequently in crops adjacent to the wetland. We concluded that Pachychilus spp. it can be used as a biomonitoring organism of contaminated aquatic ecosystems.

**Data Validation: Accuracy and Responsibility**

Patrick Tyczynski, Lucy Conklin, Rosemary Mayo

*M-I SWACO, a Schlumberger company*

Lab reports from commercial laboratories may come in many sizes and on all types of topics related to scientific analysis. Data that support legally defensible conclusions require special attention to ensure the integrity of the reporting process. These may be based on analytical chemistry, ecotoxicology (freshwater, marine, terrestrial), assessment of chemical exposure and so much more. Commercial laboratories have certifications which may vary with their purpose and quality assurance and control is part of their service. It is important that the consumer understands that a lab report is more than just a final result and that final responsibility for the accuracy of the data rests with the end user. Developing a data validation system using recognized techniques is the pathway to protecting critical decision related to regulatory compliance. The objective for this poster is to provide an overview of commonly missed items in a general lab report as well as provide an outline of tools that could aid in the process of reviewing the details. Many consumers may not be familiar with the intricacies of the data and therefore an awareness of the potential for gaps is necessary. Finally, as a consumer, it is important to highlight that the reverse is necessary when submitting samples for analysis to a commercial laboratory. The consumer should be aware of the proper sampling procedures as well as provide appropriate levels of documentation and labeling through a Chain of Custody or Certificate of Authenticity in order to ensure that the information in a lab report will be easily traceable and understandable. A good understanding of sample submission and lab report validation will benefit the commercial laboratories and the consumers, whether they are young scientists, very experienced, somewhere in between or in the many other scopes of the business world that ties everything together.

**An in silico Approach to Safer Chemical Design**

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Animal-based testing of chemicals has proven key in developing effective methods for diagnosing and treating diseases that result from chemical exposure. However, animal studies are prohibitively expensive in both economic and ethical terms to conduct toxicity testing on every new chemical on the market. As a result, over 85% of the 700+ commercial chemicals introduced into domestic market each year have little or no health and safety
data. To fill this gap, in silico tools can be used to screen existing chemicals and predict their adverse effects on living systems and the environment. Compared to animal tests, these tools offer greater speed at much lower cost; however, reliability of their predictions remains questionable. To address this challenge, we have developed an in silico framework to aid with molecular design of industrial chemicals that ensures minimal biological activity against predetermined targets while retaining high efficacy of desired function. Our approach relies on direct modeling of molecular interactions, mimicking proven methods from computational drug discovery. Specifically, we modified computational methods used in lead optimization of drug candidates to effectively “design out” unwanted biological activity by means of rational structural modifications of industrial chemicals. The goal of our study is to expand and validate our protocol on multiple chemical classes and targets, focusing on prominent organophosphate insecticides. To offer applicability beyond specific targets, our approach incorporates the Rule of Three, which has been extensively validated as used by industry as a set of robust design guidelines to ensure minimal ecotoxicity of industrial chemicals.

**Incidence of Apoptosis in Larval Red Drum (Sciaenops ocellatus) Co-exposed to Crude Oil and Ultraviolet Radiation**

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Polycyclic aromatic hydrocarbons (PAHs) are ubiquitous in the environment as a result of both natural and anthropogenic activity. Exposure to ultraviolet (UV) radiation can significantly increase the toxicity of crude oil PAHs to aquatic organisms through photo-induced toxicity. Red drum (Sciaenops ocellatus) are an important fishery resource in the Gulf of Mexico and in the southeastern Atlantic Ocean. Co-exposure to UV radiation significantly increases the toxicity of crude oil to red drum larvae, leading to increased mortality. However, less is known about the sub-lethal effects of photo-induced PAH toxicity on early life stage red drum. The present study investigated the incidence of cell apoptosis in early life stage red drum (24 hours post fertilization) following co-exposure to crude oil (0.29-0.30 µg/L ∑PAH50) and UV radiation. Larvae were sampled following 24 h and 48 h exposure and apoptosis was quantified using a TUNEL assay. Transcriptomic effects were assessed using RNA sequencing. Apoptotic fluorescence significantly increased in the eyes following 24 h and 48 h exposure to crude oil with and without UV. Apoptotic fluorescence was greatest in the skin following 24 h and 48 h exposure to crude oil with UV, indicating photo-induced toxicity. Consistent with these phenotypic responses, pathways associated with phototransduction, eye development, and dermatological disease were among the top predicted pathways impacted in red drum larvae co-exposed to oil and UV. These results suggest that increased apoptosis is one sub-lethal effect of photo-induced PAH toxicity in larval red drum which may impair development and physiological function.

**Examining the chemical profile of P. parvum: A light exposure study**

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*Baylor University*

While Prymnesium parvum causes massive fish kills, the toxin(s) responsible for these events is (are) not confirmed. Suspected toxins have been reported in literature, and our previous work showed a positive relationship between prymnesins and acute toxicity to fish. To further investigate this finding, four cultures of P. parvum were split between three light exposure scenarios—lab dark control, field dark, and field light. Acute toxicity to larval fathead minnow was measured for each experimental unit and light treatment (12 total) by calculating 24-hour LC50 values. Dose-dependent responses were seen for experimental units kept in the dark, regardless of temperature, but acute toxicity to fish disappeared in samples exposed to light. Suspect screening and non-targeted analysis was also performed on every treatment group using liquid chromatography-high resolution mass spectrometry. Several prymnesins were identified and their concentrations compared against light treatment scenarios and acute toxicity to fish.
Method Development and Native Contamination of Per- and Polyfluoroalkyl Substances (PFAS) in Fish and Invertebrate Feeding Materials

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Per- and Polyfluoroalkyl Substances (PFAS) have been found to have a number of health effects on humans, including increased risk of cancer.1 PFAS are ubiquitous in the environment due to their widespread use in consumer and commercial products, specifically in Aqueous Film Forming Foams (AFFFs). PFAS have been shown to bioaccumulate. However, less is known regarding the specific uptake and elimination kinetics for PFAS in water for fish and invertebrates. Prior to determining uptake and elimination kinetics, method development, along with native contamination studies, are necessary. PFAS analysis and extraction methods were created for 24 PFAS, including perfluoroalkyl acids, sulfonates, sulfonamides, and sulfonamido acids, from the PFAS in Non-Drinking Water List provided by the Environmental Protection Agency. Initial native contamination studies have been developed for a variety of fish food and feeding screens. Determination of PFAS in fish food is necessary to ensure that the sole exposure route of PFAS in fish and invertebrates is via water, instead of through dietary uptake. Thus, future uptake and elimination kinetics studies for fish and invertebrates from water can be determined.

Assessment of human exposure to antibiotic resistance genes through wastewater-based epidemiology

Ruud Steenbeek, F. Been, P.H.A. Timmers

Antibiotic resistance is an emerging global health crisis, driven largely by overuse and misuse of antibiotics. This causes problems for human health, where antibiotics and antibiotic resistance genes can reach surface waters, enter the food chain and potentially reach drinking water sources. This results in 700,000 deaths of resistant infections every year, but estimations are made that this will increase to 10 million deaths in 2050. A method to obtain information about antibiotics in wastewater is wastewater-based epidemiology (WBE). But unfortunately, the relationship between occurrence of antibiotic and its metabolites and resistance genes in the aquatic environment and the role of the wastewater treatment plants on the release of antimicrobial resistant genes into the environment are still poorly understood. In this study the influent and effluent of wastewater treatment plants as well as receiving waters were analyzed. 13 antibiotic resistance genes, Integrase Class 1 and 16S rRNA concentrations were quantified using multiplex quantitative real-time PCR (qPCR) assays and the concentration of 34 antibiotics using LC-MS/MS were analyzed. This opened a new line of research and potential application of WBE, as monitoring human exposure to antibiotic resistance and its relation to antibiotic use through wastewater analysis. It also identified if wastewater treatment plants (WWTP) mitigate or aggravate antibiotics and antibiotic resistance genes to surface waters. Our observations identify the importance of understanding the relationship between the occurrence of antibiotics and the antibiotic resistance genes and demonstrate the usefulness of WBE for analyzing antibiotics in the aquatic environment.

Bioaccumulation kinetics of model pharmaceuticals in the freshwater Unionid Pondmussel, Ligumia subrostrata

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Few studies have examined bioaccumulation of pharmaceuticals by freshwater bivalves; however, our laboratory's recent field studies of effluent-dependent wadeable streams indicate bioaccumulation of multiple pharmaceuticals in bivalves. In addition to being important priorities for conservation biology (~70% of
freshwater mussel species in North America are endangered or threatened), the presence of robust bivalve populations provides important ecosystem services by improving water quality and clarity in lotic systems. Unfortunately, factors influencing bioaccumulation of pharmaceuticals by bivalves are not well understood. In the present study, we investigated bioaccumulation kinetics of model acidic and basic pharmaceuticals in the freshwater pond mussel, *Ligumia subrostrata*. Specifically, when compared to fish, we have observed some of the highest levels of antidepressants in bivalves in the field. In this laboratory study, we evaluated bioaccumulation kinetics following exposure to a weak acid, acetaminophen (mean measured (±SD) = 4.66 ± 0.32 µg/L), and a weak base, sertraline (mean measured (±SD) = 2.89 ± 1.14 µg/L) during a 14-day uptake experiment. Following exposure, mussels were transferred to contaminant free water to measure depuration for 7 days, which supported derivation of bioaccumulation kinetic parameters. Pharmaceutical concentrations were evaluated in water and tissue at 11 time points, and samples were analyzed via isotope dilution LC-MS/MS. By day 14, mussels accumulated orders of magnitude higher concentrations of sertraline (31.72 ± 8.17 µg/g) compared to acetaminophen (0.32 ± 0.05 µg/g). Considering these laboratory observations and our recent field studies, bioaccumulation differences between fish and bivalves potentially result from differences in exposure, biotransformation, and elimination.

**Manganese-oxide nanoparticle induced Parkinsonism on Neuronal and Glial Cell Models**

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Manganese (Mn), is an essential element involved in metabolic regulation of carbohydrates and lipids. Excessive exposure to Mn is reported to increase ROS generation and clinical studies show chronic exposure to Mn has resulting in neurotoxicity, specifically, with Parkinsonism. These Parkinson-like neurobehavioral abnormalities have also been recognized with manganese oxide nanoparticles in animal models. Parkinson’s disease (PD) is a neurodegenerative disorder, which exhibits the preferential loss of dopaminergic neurons in the substantia nigra pars compacta (SNpc), this dopaminergic loss results in clinical motor symptoms. In vitro models, to characterize PD, often utilize a glial or neuronal cell design, these two approached helps elucidate the involvement of inflammatory or biochemical signaling. These models often utilize neurotoxins such as 6-hydroxydopamine (6-ODHA), which mimic which mimic the biochemical characteristics of PD, inducing oxidation and mitochondrial stress through ROS generation, of which nigral cells are especially vulnerable due to the lack of synthesis of glutathione peroxidase in the SNpc. For this present study, Normal Human Astrocytes (NHAâ€™s), differentiated and undifferentiated SH-SYSY neuroblastomaâ€™s were used in an exposure with manganese oxide nanoparticles and a positive control, 6-ODHA. Proliferation, whole cell analysis, metabolic quantification and gene expression was measured for pre- and post-treatment. Results indicate exposure to manganese oxide nanoparticles similarly induces a biochemical response to this model as treatment with 6-ODHA, by directly effecting dopamine through transporters. The impact of these results is the furthering characterization glial cells in PD models, as well as mitochondrial dysfunction as more specific mechanism for PD.

**In Silico-Guided Design of Environmentally-Benign Ionic Liquids for Biomass Processing**

Samantha Vaccaro & Jakub Kostal

*George Washington University*

Over 90% of materials feedstocks are derived from oil and gas. However, due to depletion of natural resources, increasing greenhouse emissions and awareness of the need for sustainable development, transformation of biomass to valuable materials and energy (i.e. valorization) has emerged as a preferred alternative. Developing â€˜greenâ€™ processes for biomass valorization has been a critical challenge in sustainable development, hindered by cost, biodegradability and toxicity concerns. Here, our goal was to develop functional and environmentally-benign methods for the deconstruction of cellulose in biomass feedstocks. Specifically, we aimed to inform
the design of novel ionic liquids that meet the criteria for “green” cellulose processing using an integrated in-silico-in-chemico approach. Ionic liquids, salts that are liquid at or near room temperature, have unique properties that enhance their ability to solvate the complex structure of cellulose by disrupting the vast network of hydrogen bonding. Imidazolium-based ionic liquids, specifically, have the ability to hydrolyze cellulose into glucose monomers. To that end, we relied on density functional theory to gauge the thermodynamics of the imidazolium decarboxylation reaction for a series of analogs, and computed the kinetic and thermodynamic propensity of the generated free carbene to cleave ether bonds in cellulose. Calculations were experimentally validated. By considering a series of imidazolium analogs in various solvents, and by integrating the Rule of Three, which is used to assess ecotoxicity of industrial chemicals in the design process, we outlined a design framework to guide development of novel, environmentally-benign ionic liquids for cellulose processing.

Turning a liability into an asset: Can we use the opercula of invasive apple snail Pomacea maculata in biomonitoring of metal contamination in freshwater marshes?

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The apple snail Pomacea maculata is an invasive species that has recently been introduced and is now present in several Louisiana marsh areas. The introduction and range expansion of this species are bound to have a variety of ecological consequences. One potential effect is that the presence of this species will modify the biogeochemical cycling of metals in freshwater environments. However, the introduction may also have a favorable aspect by providing us with a species that may be well suited for biomonitoring for environmental contaminants such as heavy metals. A novel method, Particle Induced X-Ray Emission (PIXE) was employed to investigate if a hard tissue such as snail operculum may be used for studying metal pollution in wetland environments. Quantification of metal levels by this method can also provide information on patterns of elemental distribution. Laboratory bred snails were exposed to low or high concentrations of the metal lead (Pb) for 6 weeks, following which levels of Pb were quantified in the operculum using an MeV ion microprobe with 3 MeV protons. Two regions of the snail operculum were identified and scanned for PIXE analyses- the central region as the nucleus and the peripheral region as the cortex. The X-ray spectra were analysed using the GeoPIXE® software. The results indicate that growth of the operculum takes place from the nucleus outwards. Data also show that Pb becomes incorporated in the operculum following exposure.

Reduction of Pesticide Bioavailability with Charcoal and Clay-Based Sorbents

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Widespread use of pesticides has resulted in the accumulation of pesticide residues in the environment due to their persistence and stability. To reduce potential exposures, we have developed broad-acting clay-based materials that can be used to reduce the bioavailability and toxicity of diverse chemicals. In this study, activated charcoal (AC), calcium montmorillonite clay (CM) and acid-processed calcium montmorillonite clay (APM) were used to determine their potential as sorbents of dieldrin, an organochlorine insecticide, and glyphosate, an organophosphorous herbicide. We used adsorption isotherms, thermodynamics, and dosimetry studies to determine the capacities and affinities of the clays, enthalpies of the binding reactions, and potential doses of sorbent that could protect against high exposures. Cultures of Hydra vulgaris were used to determine the ability of sorbents to protect a living organism from pesticide toxicity. Additionally, soil and plant models were used to determine sorbent ability to reduce pesticide bioavailability in soil and to reduce plant uptake of pesticides from soil. Adsorption isotherms for all sorbents of dieldrin fit a Langmuir model. Isotherm results for APM showed high enthalpy (suggesting chemisorption) and high capacity (Qmax = 0.45 mol kg⁻¹), indicating tight binding of dieldrin. Inclusion of CM and APM resulted in the highest reduction of dieldrin toxicity (60 and 70%, respectively) in the hydra. Further work indicated that AC,
CM and APM can significantly reduce the bioavailability of dieldrin from soil (p≤0.01). Inclusion of 1% AC and CM significantly reduced residues of a toxic glyphosate metabolite (AMPA) in corn sprouts (60%), confirming that these sorbents can reduce uptake of glyphosate from soil and water. These results suggest that the tested charcoal and clays can be effective sorbents of dieldrin and glyphosate and may be included in the diet and/or garden soil to protect against environmental exposures. These sorbents and combinations of sorbents can be further developed to bind other environmentally relevant chemicals and chemical mixtures. (Supported by NIEHS SRP P42 ES0277704)

Evidence of anthropogenic pollution in playground soil through- out Oklahoma City, Oklahoma

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Polycyclic aromatic hydrocarbons (PAHs) and metals are generally ubiquitous in the environment and have been found to be of concern with regards to human health. PAH and metal contamination may correspond with atmospheric deposition, and in urban environments soils may contain elevated levels of both categories due to proximity to sources like vehicular traffic. Sampling in the Oklahoma City Metropolitan Area has indicated that PAH accumulation (and especially carcinogenic PAHs or cPAH concentration) has been significant, and in many cases cPAH load has been measured above the USEPAâ€™s residential soil screening level of 110ppb. The Oklahoma City Metropolitan Area varies in urban landscape causing school proximity to major areas of traffic to differ. Included in this initial sampling were soils from public elementary school playground areas. Because schools in this metropolitan range tend to have a high degree of concern, there is the potential for oral exposure to these contaminants in sensitive age groups by way of hand-to-mouth actions involving soil. Recent data from playground soil at elementary schools throughout the Oklahoma City Area have shown elevated but varied cPAH levels. This preliminary investigation has also shown metals to be present, but in lower levels. These sites should be further investigated to determine potential sources of contamination.

Modeling Dicamba Volatilization from Agricultural Fields using the Pesticide via Volatilization (PLoVo) Model

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Dicamba is a synthetic systemic herbicide, widely used around the world because of its versatility in noxious and invasive weed control. This herbicide has the tendency to volatilize and it can undergo vapor drift and deposit on non-target fields, causing crop damage and yield loss. For instance, Dicamba alone has damaged about 3.6 million acres of off-target crops in United States in 2017. While only a handful of field studies were conducted to chemically measure dicamba volatility, no quantitative prediction is available in the form of modeling to identify the factors that trigger the volatilization of dicamba. To better understand dicamba volatilization and vapor drift potential, we have used a visual screening tool, developed by our research group to predict the volatilization and vapor drift potential of dicamba herbicide from an agricultural field. The screening tool uses the environmentally relevant partition coefficients and the mass-balance distribution of pesticides between soil, plant, air, and water to calculate 24-h cumulative volatilization losses. We have found that, at least ~20% of applied dicamba will volatilize within 24 hours of spraying if the ambient air temperature remains at 30 Â°C and more importantly, current recommended wind speed (1.3 - 4.5 m s⁻¹) for dicamba application can cause more than 10 % cumulative dicamba loss within 24 hours of application, which suggest more careful investigation of wind speed effects to control dicamba volatilisation and off-target injury. This modeling approach could be used to aid future decision-making regarding dicamba herbicide regulation and use in agriculture sector.
Photo-induced Toxicity of Organic UV Filters on Growth of Micro Green Algae (Scenedesmus acutus)

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As the use of personal cosmetic care products (PCCPs) with organic ultraviolet (UV) filters are increasing, so is the exposure risk of these compounds to aquatic ecosystems. This study focuses on the inhibition growth effect of 6 common UV filters found in PCCPs on the freshwater microalga, Scenedesmus acutus. Fluorescence of chlorophyll was used as a measure of growth during a 96-h exposure period and growth inhibition was utilized as the endpoint. All UV filters inhibited growth with increasing concentration, except for avobenzone, which did not decrease reproduction at any treatment level up to water solubility. Lowest observed effect concentrations were greater than 100 ppb without UV light. Homosalate was the most toxic and avobenzone was the least toxic. Further testing will compare each of the UV filters under UVA and non-UVA conditions to see if UVA radiation increases toxicity.

Effect of nanoparticle mediated therapy for vector-borne disease control

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The spread of vector-borne pathogens by arthropod hosts continue to cause human, animal and plant diseases of public health and economic importance. Using the integrated vector management approach, this study utilizes nanoparticles as potential targeted anti-pathogenic agents for the control of citrus greening disease. Candidatus Liberibacter asiaticus, the bacterial pathogen of citrus greening disease is spread by the Asian citrus psyllid (Diaphorina citri Kuwayama). Symptoms of the disease include blotchy mottle, yellow shoots, and improperly developed fruits. The significant decrease in edible fruit production caused by the disease has led to decreased productivity of citrus farms causing significant economic loss to the citrus industry. Silver nanoparticles were synthesized, and surface functionalized with charged and uncharged groups. The resulting nanoparticles were characterized using dynamic light scattering, transmission electron microscopy and atomic force microscopy. Ultraviolet-visible spectroscopy of nanoparticles was done to characterize the differences in surface coating of the nanoparticles followed by Fourier-transform infrared analyses for functional group characterization. Exposure studies carried out on the psyllid vector show differential accumulation of silver nanoparticles based on surface coating. Inductively coupled plasma mass spectrometry show that negatively charged silver nanoparticles coated with citrate had the highest accumulation concentration (8.27 μg/L) after 96 h of exposure through an artificial feeding media compared to positively charged and uncharged silver nanoparticles. The result obtained from this study are indicative that other arthropods would have similar responses to nanoparticle exposure and that this approach of disease control may be translatable to other vectors of pathogenic diseases.

Geo-Spatial analysis of chemical and land use characteristics of Cypress, Dickinson & Mustang Bayous of Texas

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Urban flooding is increasing with increase in intense rain and surface runoff events, which impacts the water quality and overall health of bayou watersheds. The objectives of this study are, 1) To determine and map the elemental concentrations in the soil and water samples collected along the Cypress, Mustang, Dickinson bayou watersheds of Greater Houston metropolitan area and 2) To analyze the land cover changes of the selected watersheds
using remote sensing. Soil and water samples were collected in triplicate from 9 locations across the 3 watersheds in Summer and Fall of 2018. The samples were analyzed for concentrations of P, K, Ca, Na, Mg, Fe, Cd, As, Pb, Cu, Cs, Sr, Se using the Inductive coupled plasma mass spectrometer (ICP-MS) and C, N, with the Total Carbon and Nitrogen (TCN) analyzer and Hg using Direct Mercury Analyzer (DMA). Landsat imagery of the watersheds were obtained from the United States Geological and survey (USGS) Global Visualization (Glovis) viewer. Watershed boundary files were downloaded from the National Hydrography Datasets (NHD). Spatial analysis was conducted using the ESRI ArcGIS 10.3 software and the ERDAS ERmapper software. The chemical analysis data revealed a significant increase of Ca, Mg, Sr in water samples collected along the upstream locations of Mustang bayou compared to downstream. Higher amounts of Pb was found in Dickinson bayou soil samples. Our research revealed that a decrease in vegetation surface and an increase in impervious surface is contributing to increased surface runoff and flooding therefore increasing chemical contamination in watersheds.

A simple method for the determination of methyl-triclosan in water samples

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Triclosan (TCS) is a bactericide widely used in personal care products such as shampoo, deodorants, and toothpaste. Along with its metabolite, methyl-triclosan (MeTCS), they can reach surface water through wastewaters, as they are not removed in traditional wastewater treatment plants. Although TCS is easily degraded by photolysis, MeTCS is much more persistent. While TCS can be directly analyzed by LC-ESI-MS, MeTCS must be analyzed by GC-ECD/MS, given low ionization by ESI and thus undesirable limits of detection. A fast and simple extraction method was developed using low temperature partitioning for waste and bioassay water samples, the later where fish were exposed to TCS. A 1-mL aliquot was placed in a 2-mL vial, followed by 200 μL of a 10% NaCl solution and 100 μL of toluene. The vial was shaken in a vortex mixer for 30 seconds, allowed to stand for 2 minutes and placed in a freezer, here the organic solvent (top layer) did not freeze. A volume of 3 μL was injected in a GC-μECD. Recovery on spiked samples was 82% ± 2%. Method was linear in the range tested (1 to 500 μg.L⁻¹), with a Relative Standard Deviation-RSD <2% and a Relative Error-RE <15%. Sample extraction repeatability had a standard deviation <8%. Method limit of detection and quantification were 0.05 and 0.1 μg.L⁻¹, respectively. The proposed method is simple â€” as little sample preparation is required, and fast â€” less than 5 minutes for sample, and achieving low limit of detection in the type of samples studied.

Acrolein-Induced Epigenetic Modification Of Vascular Smooth Muscle Cells

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Acrolein, an alpha-beta unsaturated aldehyde, and a very reactive toxic compound are released into the environment from different sources. As a pervasive environmental pollutant, acrolein poses a serious environmental health threat. The main sources of acrolein that are pertinent to human health include combustion of fossil fuels, cigarette smoke, overheating of frying oil, etc. Humans are exposed to acrolein through inhalation, ingestion, and dermal contact. The aim of the study is to determine the effect of acrolein on histone acetylation and methylation in VSMCs and to establish the beneficial effect of NAC in prevention of acrolein toxicity through blockage of modification of histones. VSMCs were cultured in a complete medium consisting of DMEM supplemented with 20% fetal bovine serum, 100 Units of penicillin and 100 Âµg/ml Streptomycin at 37Â°C atmosphere with 5% CO2. Cells were treated with 3Âµg/ml acrolein, in the presence and absence of 0.2 mM NAC for 6 hours. At the end of the treatment, cytotoxicity was measured using tetrazolium- colorimetric assay. generation of free radicals by fluorometric methods, histone H3 modification by ELISA, and protein expression by western blotting. Results indicated that exposure of VSMC to 3Âµg/ml of acrolein resulted in 99% decrease in cell viability and addition
of 0.2Mm of NAC preserved of VSMCs from toxic effects. Absence of NAC, acrolein increases level of ROS and addition of NAC abolished high level of ROS. We concluded that acrolein causes toxicity through epigenetic modification of H3 histones and NAC is effective in inhibiting the effects of acrolein.

Effects of Furosemide on Danio rerio at Environmentally Relevant Concentrations

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Furosemide is a potent diuretic commonly used to treat edema in humans. It is a widespread contaminant in many waterbodies, however, information is limited on furosemide’s effect on aquatic organisms. This study examines its effects on growth, behavior, and water retention in zebrafish (Danio rerio). Embryos (4-6 hours post-fertilization) were exposed to environmental concentrations of furosemide derived from environmental exposure data (EED) for seven days using a modified FET test. Concentrations ranged from 0.053-60,000 µg/L in addition to a positive control of 5.8 g/L NaCl, with limited mortality observed in the experiment. Although no significant differences were observed in the behavioral responses examined, an increased trend in fast movements and a decreased trend in resting time was observed. To evaluate water loss due to furosemide exposure, zebrafish were weighed then dried for 3 days at 60°C. Water loss was calculated based on differences before and after drying with water loss varying between 12-28 %. Significant increases in mass were recorded for the highest concentration (p < 0.05). Although small, initial results suggest that following exposure, zebrafish retain water. As this was unexpected, studies are ongoing. In parallel, growth data is being analyzed and will be correlated to mass in order to look at furosemide’s impact on development. As furosemide is found in numerous water bodies, future work will also examine these endpoints under higher salinity conditions.