New Jersey Water Resources Research Institute
Department of Environmental Sciences, School of Environmental and Biological Sciences

Annual Technical Report
2018

General Information

Products

Products:
2018NJ395B
• Stoler, A. 2019. Ecotoxicology effects of microplastic contamination in freshwater wetlands. Society for Freshwater Science, Salt Lake City, UT. (Oral presentation)
• Stoler, A. 2019. Ecotoxicology effects of microplastic contamination in freshwater wetlands. Northeast Partners in Amphibian and Reptile Conservation, Galloway, NJ. (Oral presentation).
• Belskis, A. and Stoler, A. 2019. Steep Stakes: effects of microplastic leachate on the reproduction and growth of zooplankton. Stockton University Undergraduate Research Symposium, Galloway NJ. (Poster presentation)
• Belskis, A. and Stoler, A. 2019. Steep Stakes: effects of microplastic leachate on the reproduction and growth of zooplankton. New Jersey Water Environment Association Conference, Atlantic City NJ. (Poster presentation)

2018NJ396B
• None

2018NJ397B
• Angel, Allyssa; 2019, Development of a Rapid, DNA-Based Field Test for Detection of Ranavirus, an Emerging Amphibian Disease, "in" American Society of Biochemistry and Molecular Biology, Orlando, Fl.
• Angel, Allyssa; Samin, Marzban, 2019, Development of Rapid DNA-Based Test for Detection of Ranavirus in the Field, "in" New Jersey Water and Environment Association, Atlantic City, NJ.
• Angel, Allyssa; 2019, Discovery of DNA Aptamers for the Selection and Identification of Ranavirus, “in" Montclair State University Student Symposium, Montclair, NJ.

2018NJ398B
• Cui, J. and Y. Deng (2019) “Ferrate(VI)-based Emergency Water Treatment in the Aftermath of Natural Disasters,” Association of Environmental Engineering and Science Professors (AEESP) 2019 Conference, Phoenix, AZ, USA, May 2019.
• Deng, Y. (2019) “Emergency Water Treatment (EWT) with Ferrate(VI) in Response to Natural disasters,” American Academy of Environmental Engineers and Scientists (AAEES) Awards Luncheon and Conference, Washington, DC, USA, April 2019.

2018NJ399B
• Li Yang; Xinjie Wang; Wanyi Fu; Wen Zhang; John Crittenden, 2019, Interactions between Nano/Micro Plastics and Suspended Sediment in Water: Implications on Aggregation and Settling. Water Research, 161 (15), 486-495.
• Fu Wanyi; Wen Zhang, 2019, Chemical Aging and Impacts on Hydrophilic and Hydrophobic Polyether Sulfone (PES) Membrane Filtration Performances. Polymer Degradation and Stability. Under review.
• Chen Chunzhao; Ling Chen; Ying Yao; Francisco Artigas; Qinghui Huang; Wen Zhang, 2019, Organotin Release from Polyvinyl Chloride (PVC) Microplastics and Concurrent Photodegradation in Water: Impacts from Salinity, Dissolved Organic Matter and Light Exposure. Environmental Science & Technology. Under review.
• Chunzhao Chen, Wen Zhang, Organotin Release from PVC Microplastics and Subsequent Photodegradation in Water Environment, NJWEA student poster, New Jersey, May 1st, 2019.
• Chunzhao Chen, Wen Zhang, Organotin Pollution in Estuaries and Complex Interactions with Microplastics, NJAWWA student poster, New Jersey, March 20st, 2019.
• Chunzhao Chen, Wen Zhang, Bacterial-Microplastic Interactions: Implications on Microplastic Degradation and Bactericidal Effects, The 5th Steven Conference on Bacteria-Material Interactions, New Jersey, June 12st, 2019.

2018NJ400B
• Deng, D.#, F. Li#, L. Ye, and M. Li* (2019). "Complete genome sequence of Azoarcus sp. DD4, a gram-negative propanotroph that degrades 1,4-dioxane and 1,1-dichloroethylene." Microbiology Resource Announcements. (accepted)
• Deng, D. #, F. Li#, C. Wu#, and M. Li* (2018). "Synchronic biotransformation of 1,4-dioxane and 1,1-dichloroethylene by a gram-negative propanotroph Azoarcus sp. DD4." Environmental Science and Technology Letters 5 (8), 526–532. (DOI: 10.1021/acs.estlett.8b00312)

• Fei Li, 2020, Advancing Monitored Natural Attenuation and Bioremediation of 1,4-Dioxane: from Molecular Basis to Field Application, "PhD Dissertation," Department of Chemistry and Environmental Science, College of Science and Liberal Arts, New Jersey Institute of Technology, Newark, NJ. (in preparation)
• Deng, D., D. Pham, F. Li, J. Antunes, J. Hawks, and M. Li (August 16, 2019). Cometabolic Bioremediation of the Commingled Groundwater Contamination of Chlorinated Solvents and 1,4-Dioxane. 10th Chinese Eco-Environmental Chemistry Conference. Tianjin, China. (Talk)
• Deng, D., F. Li, C. Wu, and M. Li (May 16, 2019). Concurrent Biodegradation of 1,4-Dioxane and 1,1-DCE by a Gram-Negative Propanotroph Azoarcus sp. DD4. 2019 AEESP Research and Education Conference. Tempe, AZ. (Talk)
• Deng, D., D. Pham, F. Li, J. Antunes, and M. Li (July 15, 2019). A Catalysis- and Induction-Versatile Toluene Monooxygenase in Charge of the Oxidation of 1,4-Dioxane and 1,1-DCE in Azoarcus sp. DD4. Gordon Research Conference: Applied and Environmental Microbiology. South Hadley, MA. (Poster)
• Deng, D., F. Li, C. Wu, and M. Li (May 16, 2019). Concurrent Biodegradation of 1,4-Dioxane and 1,1-DCE by a Gram-Negative Propanotroph Azoarcus sp. DD4. 2019 AEESP Research and Education Conference. Tempe, AZ. (Talk)
• Li, M. (May 1, 2019). Untangling the robust versatility of soluble di-iron monooxygenases in initiating the biotransformation of emerging and legacy water pollutants. TransCon2019. Ascona, Switzerland. (Talk)
• Deng, D., F. Li, C. Wu, and M. Li (April 17, 2019). Concurrent Biodegradation of 1,4-Dioxane and 1,1-DCE by a Gram-Negative Propanotroph Azoarcus sp. DD4. 5th International Symposium on Bioremediation and Sustainable Environmental Technologies. Baltimore, MD. (Talk)
• Li, F., D. Deng, and M. Li (April 17, 2019). Comparison of Catalytic Behaviors between Two 1,4-Dioxane Degrading Monooxygenases. 5th International Symposium on Bioremediation and Sustainable Environmental Technologies. Baltimore, MD. (Talk)
• Deng, D., D. Pham, F. Li, C. Wu, S. Zhang, L. Axe, and M. Li (Oct 4, 2018). Combating emerging water contaminants using robust microbes. 2nd Workshop on Emerging Contaminants and Water Treatment Technologies. Totowa, NJ. (Talk)
• Deng, D., F. Li, and M. Li (Aug 22, 2018). Uncovering a novel bacterial monooxygenase that breaks down 1,4-dioxane. 256th ACS National Meeting. Boston, MA. (Poster)
• Deng, D., J. Antunes, F. Li, C. Wu, and M. Li (Aug 22, 2018). Kinetics and inhibition of cometabolic oxidation of 1,4-dioxane and co-contaminants by Azoarcus sp. DD4. 256th ACS National Meeting. Boston, MA. (Poster)
• Li, M., D. Deng, F. Li and C. Wu (Aug 21, 2018). Cometabolic Degradation of 1,4-Dioxane and Co-contaminants by a Novel Gram-Negative Propanotrophic Bacterial Isolate. 256th ACS National Meeting. Boston, MA. (Talk)
• Li, M., D. Deng, and F. Li (August 14, 2018). Uncovering a novel bacterial Monooxygenase that breaks down 1,4-Dioxane. ISME17. Leipzig, Germany. (Poster and e-Poster)

2018NJ401B
• Quispe J. Fenyk H. The effects of climate change on coastal ecosystems. Rutgers Environmental Stewards Program, Rutgers Cooperative Extension of Middlesex County, February 20, 2019
• Quispe J. Predicting Coastal Impacts from Sea Level Rise: Where Ocean and Land Collide, Invited Speaker at Membership Meeting, Lawrence Brook Watershed Partnership, Milltown, NJ, November 20, 2018
• Quispe J. Marsh Response to Sea Level Rise: Survival of Tidal Marshes in the Raritan River Jilin Graduate Student Research Forum, June 22, 2018, Jilin University, China
• Quispe J. Marsh Response to Sea Level Rise: Survival of Tidal Marshes in the Raritan River 10th Annual Sustainable Raritan River Conference June 2018 Rutgers University New Brunswick, NJ Poster and Invited Talk
• Quispe J. Marsh Response to Sea Level Rise: The Role of Tidal Marshes in Coping with Sea Level Rise and Coastal Acidification, RPPC May 2018, Rutgers University New Brunswick, NJ
• Quispe J. Marsh Response to Sea Level Rise: Survival of Tidal Marshes in the Raritan River, National Science Foundation Research Trainee Annual Meeting, September 27-28 2018, Arlington, VA Poster

Information Transfer Program

Information Transfer Program:
The New Jersey Water Resources Research Institute (NJWRRI) supports a diverse program of research projects. With oversight from the Advisory Council, which sets the Institute's Research Priorities, the available funds are divided between supporting faculty with 'seed' projects or new research initiatives and funding graduate students to

develop their thesis research. The funding is intended to initiate novel and important research efforts by both faculty and students, thus emphasizing new research ideas that do not have other sources of funding. We hope to support the acquisition of data that will enable further grant submission efforts and in the case of students, lead to research careers focused on cutting-edge research topics in water sciences.

Two faculty initiated projects were awarded in FY2018, and five grants-in-aid were awarded in FY2018 to graduate students who are beginning their research. We expect that the research is exploratory and is not supported by other grants. The intent is that these projects will lead to successful proposals to other agencies for further support. The larger goal of the research component of the Institute's program is to promote the development of scientists who are focused on water resources issues of importance to the state.

In FY2018, the NJWRRI continued to emphasize the development and upkeep of the website and e-based communications with stakeholder groups. We also continued to participate in the New Jersey Water Monitoring Council, a statewide body representing both governmental and non-governmental organizations involved in water quality monitoring. Finally, in FY2018, the NJWRRI successfully launched a new partnership with the New Jersey Department of Health (NJDOH) to offer a new program titled “Fostering the Growth of Private Well Researchers at New Jersey’s Universities” and fund two junior faculty projects. This program has continued into FY2019 and is currently funding two new junior faculty projects.

Student Support

Student Support:
Undergraduate: 20
Masters: 1
Ph.D.: 4
Post-Doc: 1

Notable Achievements and Awards

Notable Achievements:

2018NJ395B
None to report.

2018NJ396B
None to report.

2018NJ397B
• ASBMB Graduate Student and PostDoctoral Research Travel Award. American Society for Biochemistry and Molecular Biology (ASBMB). April 2019.

• 3rd place winner in Graduate Student Poster Pitch Competition. New Jersey Water and Environment Association (NJWEA). March 2019.

2018NJ398B
None to report.

2018NJ399B
None to report.

2018NJ400B
Our new isolate, DD4, which can effectively degrade 1,4-dioxane and co-occurring pollutants, has been reported by a number of public media, such as Chemical & Engineering News (C&EN) and Science Daily.
1) Fluence (Nov 15, 2018). Bacterium Shows Promise in Groundwater Remediation.

https://www.fluencecorp.com/bacterium-shows-promise-in-groundwater-remediation/. (Web News)
2) Freshwatersystems.com (Oct 18, 2018). New Bacterium Removes Two Harmful Contaminants from Groundwater. https://www.freshwatersystems.com/blogs/blog/new-bacterium-removes-two-harmful-contaminants-from-groundwater. (Web News)
3) Lab Roots (Oct 11, 2018). This bacterium can fight dangerous groundwater contaminants. https://www.labroots.com/trending/earth-and-the-environment/12987/bacterium-fight-dangerous-groundwater-contaminants. (Web News)
4) Science Daily (Oct 9, 2018). Newly-Discovered Bacterium Rids Problematic Pair of Toxic Groundwater Contaminants. https://www.sciencedaily.com/releases/2018/10/181009115019.htm. (Web News)
5) NJIT News & Media (Sept 28, 2018). Newly-Discovered Bacterium Rids Problematic Pair of Toxic Groundwater Contaminants. https://news.njit.edu/newly-discovered-bacterium-rids-problematic-pair-toxic-groundwater-contaminants. (Web News)
6) Chemical & Engineering News (August 2, 2018). Persistent pollutant broken down by sludge microbe. https://cen.acs.org/environment/pollution/Persistent-pollutant-broken-down-sludge/96/i32. (Journal and Web News)

2018NJ401B
None to report.

Projects

Assessment of the Occurrence, Toxicity, and Biotransformation of Disinfection Byproducts of 1,4-Dioxane

Project Type: Annual Base Grant **Project ID:** 2018NJ400B

Project Impact: Bioremediation of 1,4-dioxane is strongly challenged by the concurrent contamination of chlorinated solvents, particularly 1,1-dichloroethylene (1,1-DCE), a potent inhibitor of archetypic 1,4-dioxane degraders (e.g., Pseudonocardia and Mycobacterium). Vegetative growth and aggregation behavior of these Gram-positive Actinomycetes also hinder their field application. A new Gram-negative bacterium Azoarcus sp. DD4 was isolated from an activated sludge sample. Notably, DD4 can sustain the concurrent co-oxidation of 1,4-dioxane and 1,1-DCE using propane as the primary substrate without observable formation of clumps. Microcosm assays prepared with source zone groundwater samples from a contaminated site indicated DD4 can efficiently remove dioxane to