Katherine Roth

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EDUCATION

Cell and Molecular Biology Ph.D. Program, Environmental and Integrative Toxicological Sciences Program
Michigan State University, East Lansing, MI
Thesis: Regulation of hepatic macrophage activation following APAP-induced acute liver injury

8/2013-8/2019

Bachelor of Arts: Double Major in Molecular and Cellular Biology (Honors Program) and European History
Vanderbilt University, Nashville, TN
Honors Thesis: Regulation of type IV p-type ATPases by the fpk1 protein kinase network

8/2009-5/2013

MENTORING EXPERIENCE

Wayne State University, Center for Leadership in Environmental Awareness and Research (CLEAR)
Research Experience and Training Coordination Core (RETCC)
Project Administrator, Sept. 2022-current

- Leadership role in the implementation of training core component for trainees, including seminars and colloquiums, development of a certificate program, community service projects, and internships.
- Initiate and tracking project performance, including data collection and analysis of the successful completion of short- and long-term goals.
- Assisting with project reports to be shared with faculty, advisory board, students, and other project collaborators.

Michigan State University, Department of Physiology
Teaching Assistant
Human Physiology I (PSL 431) Aug-Dec 2014

- Two recitation lecture classes per semester with 30 students per class
- I was responsible for teaching the lecture, grading assignments, and proctoring weekly quizzes and exams.

Undergraduate Student Mentor

- Mentor to 7 undergraduate students
- I was responsible for development and organization of student projects as well as providing guidance on lab techniques, presentation of data, and general understanding of project significance.

RESEARCH EXPERIENCE

Postdoctoral Research

Institute of Environmental Health Sciences, Wayne State University

Supervisor: Dr. Michael Petriello

Project: Exposure to a mixture of legacy and emerging Per- and polyfluoroalkyl substances (PFAS) modulates lipid homeostasis

- Per- and polyfluoroalkyl substances (PFAS) are a class of ubiquitous man-made chemicals utilized for their surfactant properties in cookware, clothing, and carpets that are found prevalent throughout the environment.
- Although there may be upwards of 4000 versions of PFAS found in the environment, a handful of model PFAS have been associated with chronic diseases including steatosis, cardiometabolic disorders, and cancers in epidemiological studies.
- Determined that exposure to a mixture of legacy, replacement, and alternative PFAS induce alterations in lipid metabolism, including increased circulating cholesterol and bile acids.
- Current studies are investigating the association of exposure to a PFAS mixture with atherosclerosis risk and its mechanistic connection to bile acid excretion.

12/2019-present

Graduate Research

Cell and Molecular Biology Ph.D. Program, Environmental and Integrative Toxicological Sciences Program, Michigan State University

Supervisor: Dr. Bryan Copple

Thesis: "Regulation of hepatic macrophage activation following APAP-induced acute liver injury"

- Determined the role of the fibrinolytic enzyme plasmin in the regulation of macrophage activation during APAP-induced acute liver injury.
- Demonstrated *in vitro* plasmin's ability to directly activate macrophages, alone and in synergy with HMGB1, via a NF-kB-dependent mechanism.
- *In vivo* murine model of APAP-induced acute liver injury and liver failure used to demonstrate dichotomous role of plasmin in regulating macrophage function. Plasmin both activates macrophages during the inflammatory phase, as well as stimulating resolution of inflammation during the regenerative phase, as evidenced through changes in macrophage cytokine production, migration, and phagocytic capability.
- In addition, determined a role for hepatic stellate cells in macrophage activation after acute liver injury through a HIF-1α- and NF-kB-dependent mechanism.
- Generated and maintained a mouse line displaying hepatic stellate cell-specific conditional knockout of HIF-1α.

8/2013-8/2019

Undergraduate Research

Systems Biology and Bioengineering Undergraduate Research Experience (SyBBURE), Vanderbilt University (research advisors: Dr. John Wikswo and Dr. Kevin Seale)

- Quantitative study of how the microenvironments within microfluidic devices affect cell growth.
- Demonstrate control of complex biological systems using a microfabricated nanophysiometer platform.

- Analysis of the ability of the *GAL* Network in *S. cerevisiae* to manipulate gene expressions levels in a controlled response to extracellular signaling molecules at the level of single cells.

8/2010-5/2012

Undergraduate Honors Research
Department of Cell and Developmental Biology, Vanderbilt University (research advisor: Dr. Todd Graham)

- Analysis of the regulation of phospholipid flippases by the Fpk1 protein kinase network of flippase activators.

8/2010-5/2013

PRESENTATIONS

Oral

- Precision Environmental Health Science: The Genome X Environment Interface, Case Western Reserve & Wayne State University Joint Mini-symposium: "Per- and polyfluoroalkyl substances (PFAS) and cardiovascular risk." Roth, K., Yang, Z., Agarwal, M., Birbeck, J., Westrick, J., Liu, W., Petriello, MC. April 2022.

- Metabolic Disease Interest Group 2021, Wayne State University: "Exposure to a mixture of legacy, alternative, and emerging per- and polyfluoroalkyl substances (PFAS) results in sex-dependent modulation of liver injury and cholesterol metabolism." Roth, K., Yang, Z., Agarwal, M., Liu, W., Peng, Z., Long, Z., Birbeck, J., Westrick, J., Liu, W., Petriello, M. December 2021.

- Experimental Biology 2018 Annual Meeting, San Diego, California: "Critical Role of Plasmin in Macrophage Activation during Liver Injury." Roth, K., Albee, R., Joshi, N., Luyendyk, J.P., Copple, B., April 2018.
    - Institute for Integrative Toxicology Travel Award Recipient

- Experimental Biology 2016 Annual Meeting, San Diego, California: "Cross-talk Among Kupffer Cells and Hepatic Stellate Cells is Critical for Kupffer Cell Activation during Liver Injury." Roth, K., Albee, R., Copple, B., April 2016.
    - Environmental and Integrative Toxicological Sciences Travel Award

- Experimental Biology 2015 Annual Meeting, Boston, Massachusetts: "Kupffer cell activation by hepatic stellate cells Roth, K., Albee, R., Copple, B., April 2015.

Poster

- 48th Annual Midwest Pharmacology Colloquium: "Exposure of Hyperlipidemic Mice to a Mixture of Legacy, Alternative, and Emerging Per- and Polyfluoroalkyl Substances (PFAS) Modulates Cholesterol Metabolism." Roth, K., Yang, Z., Agarwal, M., Liu, W., Petriello, MC. June 2022.

- 3rd National PFAS Meeting: "Exposure of Hyperlipidemic Mice to a Mixture of Legacy, Alternative, and Emerging Per- and Polyfluoroalkyl Substances (PFAS) Modulates Cholesterol Metabolism." Roth, K., Yang, Z., Agarwal, M., Petriello, MC. June 2022.

- 3rd National PFAS Meeting Travel Award Recipient

- FLUOROS Global: "Exposure to a Mixture of Legacy, Alternative, and Replacement Per- and Polyfluoroalkyl Substances (PFAS) Modulates Lipid Metabolism in Normo- and Hypolipidemic Mice." Roth, K., Yang, Z., Agarwal, M., Liu, W., Peng, Z., Long, Z., Liu, W., Petriello, M. October 2021.

- 47th Annual Midwest Pharmacology Colloquium: "Exposure to a Mixture of Legacy and Emerging Per- and Polyfluoroalkyl Substances (PFAS) Modulates Lipid Metabolism in Mice." Roth, K., Yang, Z., Agarwal, M., Liu, W., Peng, Z., Long, Z., Liu, W., Petriello, M. June 2021.
  - 47th Annual Midwest Pharmacology Colloquium Poster Award Recipient

- Society of Toxicology 60th Annual Meeting, Virtual Meeting: "Exposure to a mixture of legacy and emerging per- and polyfluoroalkyl substances (PFAS) modulates lipid metabolism in mice." Roth, K., Lui, W., Peng, Z., Petriello, M., March 2021.

- Society of Toxicology 59th Annual Meeting, Anaheim California: "Exposure to a mixture of legacy and emerging Per- and polyfluoroalkyl substances (PFAS) modulates lipid homeostasis." Roth, K., Kraemer, M., Morris, A., Petriello, M., March 2020.

- The Liver Meeting, Boston Massachusetts: "Hepatic Stellate Cells are Required for Activation of Kupffer Cells by Necrotic Hepatocytes – A Role for Eicosanoids." Roth, K., Albee, R., Copple, B., April 2016. Poster of Distinction.
  - The Liver Meeting 2016 Presidential Poster of Distinction

- The 18th International Symposium on Cells of the Hepatic Sinusoid, Asilomar, California: "Regulation of Kupffer cell activation by hepatic stellate cells." Roth, K., Albee, R., Copple, B., November 2015
  - Environmental and Integrative Toxicological Sciences Travel Award

- The Sixth Q-Bio Conference, Santa Fe, New Mexico: "Analysis of the GAL network in *S. cerevisiae* to demonstrate biological control theory " Roth, K., Seale, K., Graham, T., Wikswo, J., May 2012.

- Biomedical Engineering Society 2011 Annual Meeting, Hartford, Connecticut: "Control of the GAL network in *S. cerevisiae* for use in biological control theory." Roth, K., Seale, K., Graham, T., Wikswo, J., 2011.

- Biomedical Engineering Society 2010 Annual Meeting, Austin, Texas: "The effects of media dilution on the growth rate of *Saccharomyces cerevisiae.*" Roth, K., Seale, K., Graham, T., Wikswo, J., 2010.

PUBLICATIONS

1. **Roth K**, Petriello MC. Exposure to per- and polyfluoroalkyl substances (PFAS) and type 2 diabetes risk. Front Endocrinol (Lausanne). 2022 Aug 5;13:965384. doi: 10.3389/fendo.2022.965384. PMID: 35992116; PMCID: PMC9388934.

2. Roy B, Yang Z, Pan G, **Roth K**, Agarwal M, Sharma R, Petriello MC, Palaniyandi SS. Exposure to the Dioxin-like Pollutant PCB 126 Afflicts Coronary Endothelial Cells via Increasing 4-Hydroxy-2 Nonenal: A Role for Aldehyde Dehydrogenase 2. *Toxics.* 2022 Jun 16;10(6):328. doi: 10.3390/toxics10060328. PMID: 35736936; PMCID: PMC9230950.

3. **Roth K**, Yang Z, Agarwal M, Liu W, Peng Z, Long Z, Birbeck J, Westrick J, Liu W, Petriello MC. Exposure to a mixture of legacy, alternative, and replacement per- and polyfluoroalkyl substances (PFAS) results in sex-dependent modulation of cholesterol metabolism and liver injury. Environ Int. 2021 Dec;157:106843. doi: 10.1016/j.envint.2021.106843. Epub 2021 Aug 31. PMID: 34479135; PMCID: PMC8490327.

4. Yang Z, **Roth K**, Agarwal M, Liu W, Petriello MC. The transcription factors CREBH, PPARa, and FOXO1 as critical hepatic mediators of diet-induced metabolic dysregulation. J Nutr Biochem. 2021 Sep;95:108633. doi: 10.1016/j.jnutbio.2021.108633. Epub 2021 Mar 28. PMID: 33789150; PMCID: PMC8355060.

5. Miller CJ, Runge-Morris M, Cassidy-Bushrow AE, Straughen JK, Dittrich TM, Baker TR, Petriello MC, Mor G, Ruden DM, O'Leary BF, Teimoori S, Tummala CM, Heldman S, Agarwal M, **Roth K**, Yang Z, Baker BB. A Review of Volatile Organic Compound Contamination in Post-Industrial Urban Centers: Reproductive Health Implications Using a Detroit Lens. Int J Environ Res Public Health. 2020 Nov 25;17(23):8755. doi: 10.3390/ijerph17238755. PMID: 33255777; PMCID: PMC7728359.

6. **Roth, K.**, Imran, Z., Liu, W., Petriello, M. Diet as an exposure source and mediator of Per- and polyfluoroalkyl substance (PFAS) toxicity. *Frontiers in Toxicology*. December 2020. 2: 2673-3080.

7. **Roth, K.**, Strickland, J., Copple, B.L. (2020) Regulation of macrophage activation in the liver after acute injury: Role of the fibrinolytic system. World J Gastroenterol. 28;26(16):1879-1887.

8. **Roth, K.**, Rockwell, C., Copple, B.L. (2019) Differential sensitivity of Kupffer cells and monocyte-derived macrophages to bacterial lipopolysaccharide. Clinical and Experimental Gastroenterology and Hepatology. 1(1).

9. **Roth, K.**, Strickland, J., Joshi, N., Deng, M., Kennedy, R., Rockwell, C., Luyendyk, J., Billiar, T., and Copple, B. (2019) Dichotomous role of plasmin in regulation of macrophage function after acetaminophen overdose. American Journal of Pathology. 189(10):1986-2001.

10. **Roth, K.** and Copple, B.L. "Mechanisms of Liver Fibrosis" in *Comprehensive Toxicology* (Third Edition), edited by Charlene A. McQueen, Elsevier Inc., 2017.

11. **Roth, K.** and Copple, R. (2015) Role of Hypoxia-Inducible Factors in the Development of Liver Fibrosis. Cellular and Molecular Gastroenterology and Hepatology. 1(6): 589-597.

12. Mochizuki, A., Pace, A., Rockwell, C.E., **Roth, K.J.**, Chow, A., O'Brien, K.M., Albee, R., Kelly, K., Luyendyk, J.P., and Copple, B.L. (2014) Hepatic stellate cells orchestrate clearance of necrotic cells in a HIF-1α-dependent manner by modulating macrophage phenotype in mice. J. Immunol. 192:3847-3857.

AWARDS

2022	3rd National PFAS Meeting Travel Award
2022	Postdoctoral Research Award – Wayne State University
2021	47th Annual Midwest Pharmacology Colloquium Poster Award
2019-2021	OVPR External Postdoctoral Fellowship
2015-2018	NIEHS Training Grant in Environmental Toxicology Predoctoral Fellow
2018	Institute for Integrative Toxicology Travel Award
2016	The Liver Meeting 2016 Presidential Poster of Distinction
2016	Environmental and Integrative Toxicological Sciences Travel Award
2015	Environmental and Integrative Toxicological Sciences Travel Award
2009-2013	National Merit Scholarship
2009-2013	Scandalaris Merit Scholarship

SCIENTIFIC APPOINTMENTS

2021-current	Postdoctoral Member – Society of Toxicology
2015-2018	Doctoral Student Member – American Society for Investigative Pathology
2010-2013	Undergraduate Student Member – Biomedical Engineering Society