**Name** Robert G. Nichols

**Business Address** 306 Wartik Building

Eberly College of Science

Department of Biology

Penn State University, University Park, PA 16802

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Google Scholar h-index: **21**

**Education**

2014 – BS Toxicology, Pennsylvania State University, University Park, PA

2014 – Honors Toxicology, Pennsylvania State University, University Park, PA

Thesis: *Activation of the Aryl Hydrocarbon Receptor Modulates the Gut Microbiome*

2014 – BS Immunology and Infectious Disease, Pennsylvania State University, University Park, PA

2019 – PhD Molecular Toxicology, Pennsylvania State University, University Park, PA

Advisor: Dr. Andrew Patterson

Thesis: *Understanding the Effects of Environmental Pollutants on the Gut Microbiome*

2019 – Doctoral Minor Bioinformatics, Pennsylvania State University, University Park, PA

**Appointments**

Aug 2012-Jul 2014**Undergraduate Research Assistant**

The Pennsylvania State University

Department of Veterinary and Biomedical Sciences

Advisor: **Dr. Andrew Patterson**

Aug 2014-Dec 2019 **Graduate Student**

The Pennsylvania State University

Department of Veterinary and Biomedical Sciences

Advisor: **Dr. Andrew Patterson**

**Thesis Title:** *Understanding the Effects of Environmental Pollutants on the Gut Microbiome*

Jan 2017-Jan 2019**Big Data to Knowledge (B2D2K) pre-doctoral trainee**

The Pennsylvania State University

Department of Biochemistry and Molecular Biology

Advisor: **Dr. Andrew Patterson**

Summer 2017**Big Data Coursework for Computational Medicine (BDC4CM) Summer Fellowship**

Weill Cornell MedicineMedical College

Jan 2020-May 2023 **Post-doctoral fellow** (Supported by the USDA)

The Pennsylvania State University

Department of Biology

Advisor**: Dr. Emily Davenport**

May 2023 – Present **Assistant Research Professor**

The Pennsylvania State University

Department of Biology

PI: **Dr. Emily Davenport**

**HONORS AND AWARDS**

Society of Toxicology Graduate Student Travel Support Award- January 2019

Graduate Student Leadership Committee Travel Support (Society of Toxicology) – January 2019

**FUNDING**

**Completed**

2020-2023 USDA NIFA (Award # 2020-67034-31764) ($165,000)

*Investigating the effects of chronic, dietary, and environmentally relevant doses of chlorpyrifos on the gut microbiome of mice*

Role: PI

**Completed**

2017-2019 T32 (Grant# 1 T32 LM 12415-1)

Big Data to Knowledge training grant

Role: Trainee

**Submitted**

2022 Biocodex Microbiome Foundation

*Utilizing Novel gyrB Long Read Sequencing to Investigate the Cospeciation of Gut Microbial Taxa in Humans*

Role: PI

**COMMITTEES, SOCIETIES, AND OTHER PROFESSIONAL ACTIVITIES**

2016-2020 Society of Toxicology

2017-2019 Graduate Student Representative for the *In Vitro* and Alternative Methods Society of Toxicology Specialty Section

2017 Table Host for the 2017 *In Vitro* Toxicology Lecture and Luncheon

2018-2019 Member of the Graduate Student Leadership Committee for the Society of Toxicology

2018-2019 Member of the Communications Sub-Committee for the Graduate Student Leadership Committee for the Society of Toxicology

**Leadership and Service**

2019 **Grant Reviewer** for the NIAID/NIH Centers for Medical Countermeasures Against Radiation Consortium (CMCRC)

2021 **Grant Reviewer** for the NIAID/NIH Centers for Medical Countermeasures Against Radiation Consortium (CMCRC)

2023 **Grant Reviewer** for the NIAID/NIH Centers for Medical Countermeasures Against Radiation Consortium (CMCRC)

2024 **Grant Reviewer** for the NIAID/NIH Centers for Medical Countermeasures Against Radiation Consortium (CMCRC)

2019-Present **Reviewer** for Scientific Reports, Environmental Health Perspectives, Journal of Translational Medicine, Microbiome, Chemosphere, Nutrients, Toxicological Science, Microorganisms, Clinical and Translational Medicine, BMC Cancer, ISME Communications, Frontiers Microbiology, and Toxicology

**RESEARCH MENTORING DATES**

Taylor Purks 2016

Sean O’Rourke 2021

Erica Ryu 2021-Present

Jovial Joseph 2021

Aureo Zanon 2022

Maria Lovallo 2022-Present

Maria Elder 2022

Hanh Tran 2022-Present

Meera Gupta 2022-2023

Shivani Kumar 2023

Veronica Swartz 2023

Patricia Brocious 2023-Present

Xavier Mack 2023-2024

Luscinia Quance 2024-Present

**Conference and Meeting Presentations**

1. R. G. Nichols, L. Zhang, and A.D. Patterson (Nov 2015), “The Use of 16S and Whole Genome Sequencing to Complement Metabolomic Research” Illumina Users Group Meeting. University Park PA. [**Presentation**]
2. R. G. Nichols, L. Zhang, P.B. Smith, G.H. Perdew, and A.D. Patterson (March 2016), “Metagenomics Analysis of the Mouse Gut Microbiota Following Exposure to the Environmental Contaminant and AHR Agonist 2,3,7,8-Tetrachlorodibenzofuran” Society of Toxicology Annual Meeting. New Orleans LA. [**Poster**]
3. R. G. Nichols, L. Zhang, and A.D. Patterson (Nov 2016), “The Use of 16S and Whole Genome Sequencing to Complement Metabolomic Research” Microbiome Initiative Networking Event. University Park, PA. [**Poster**]
4. R. G. Nichols, L. Zhang, P.B. Smith, G.H. Perdew, and A.D. Patterson (March 2017), “Combining Bioinformatics and Metabolomics to Investigate how a Specific FXR antagonist can Modulate Non-Alcoholic Fatty Liver Disease” Society of Toxicology Annual Meeting. Baltimore, MD [**Poster**]
5. R. G. Nichols, L. Zhang, P.B. Smith, G.H. Perdew, and A.D. Patterson (April 2017), “Metagenomics Analysis of the Mouse Gut Microbiota Following Exposure to the Environmental Contaminant and AHR Agonist 2,3,7,8-Tetrachlorodibenzofuran” Spring Health and Environment Lecture. University Park, PA. [**Poster**]
6. R. G. Nichols, L. Zhang, P.B. Smith, G.H. Perdew, and A.D. Patterson (May 2017), “Combining Bioinformatics and Metabolomics to Investigate how a Specific FXR antagonist can Modulate Non-Alcoholic Fatty Liver Disease” Summer Symposium in Molecular Biology. University Park, PA [**Poster**]
7. R. G. Nichols, (Jan 2018), “Metabolomics and Microbiome Data Integration Through Network Analysis” Pennsylvania State University Microbiome Center Weekly Meeting. University Park, PA [**Presentation**]
8. R. G. Nichols, L. Zhang, P.B. Smith, G.H. Perdew, and A.D. Patterson (Feb 2018), “Combining Bioinformatics and Metabolomics to Investigate how a Specific FXR antagonist can Modulate Non-Alcoholic Fatty Liver Disease” BMMB Graduate Student Recruitment Event. University Park, PA [**Poster**]
9. R. G. Nichols,J. Zhang, P.B. Smith, G.H. Perdew, and A.D. Patterson (March 2018), “Metatranscriptomic and Metabolomic Investigation of Dietary 2,3,7,8-Tetrachlorodibenzofuran Exposure in Mice” Society of Toxicology Annual Meeting. San Antonio, TX [**Poster**]
10. R. G. Nichols (April 2018), “The Effect of AHR Agonists on the Intestinal Microbiome” Biomedical Big Data to Knowledge Spring Retreat. University Park, PA [**Presentation**]
11. R. G. Nichols (Oct 2018) “Using the Microbiome to Better Understand the Effects of Xenobiotics on the Host” Guest Lecture for Pennsylvania State University Genomics Course. University Park, PA [**Presentation**]
12. R. G. Nichols (Jan 2019) “Lecture 1” and “Lecture 2” VBSC 230 The Science of Poisons’. University Park, PA [**Presentation**]
13. R. G. Nichols, J. Zhang, P.B. Smith, G.H. Perdew, and A.D. Patterson (March 2019) “Incorporating Bacterial Metatranscriptomics to Validate Metabolic Changes Seen After Dietary 2,3,7,8-Tetrachlorodibenzofuran Exposure in Mice” Society of Toxicology Annual Meeting. Baltimore, MD [**Poster**]
14. L. Zhang, R. G. Nichols, D.J. Ehresman, P.B. Smith, E. Hatzakis, B.D. Bagley, S.C. Chang, J.L. Butenhoff, J.M. Peters and A.D. Patterson (March 2019) “Perfluorooctane Sulfonate Alters Gut Microbiota-Host Metabolic Homeostasis in Mice” Society of Toxicology Annual Meeting. Baltimore, MD [**Poster**]
15. R. G. Nichols (Oct 2019) “Using the Microbiome to Better Understand the Effects of Xenobiotics on the Host” Guest Lecture for Pennsylvania State University Genomics Course. University Park, PA [**Presentation**]
16. R. G. Nichols (Oct 2019) “Coupling Metabolomics with the Gut Microbiome” Guest Lecture for Pennsylvania State University Genomics Course. University Park, PA [**Presentation**]
17. R. G. Nichols (Nov 2020) “Using the Microbiome to Better Understand the Effects of Xenobiotics on the Host” Guest Lecture for Pennsylvania State University Genomics Course. University Park, PA [**Presentation**]
18. R. G. Nichols (Nov 2020) “Coupling Metabolomics with the Gut Microbiome” Guest Lecture for Pennsylvania State University Genomics Course. University Park, PA [**Presentation**]
19. R. G. Nichols (Nov 2020) “Metatranscriptomics workshop” Pennsylvania State University Microbiome Center Weekly Meeting. University Park, PA [**Workshop**]
20. R. G. Nichols (Nov 2021) “Using the Microbiome to Better Understand the Effects of Xenobiotics on the Host” Guest Lecture for Pennsylvania State University Genomics Course. University Park, PA [**Presentation**]
21. R. G. Nichols (Nov 2021) “Coupling Metabolomics with the Gut Microbiome” Guest Lecture for Pennsylvania State University Genomics Course. University Park, PA [**Presentation**]
22. R. G. Nichols, B. Rimal, E. Davenport, A. D. Patterson (Feb 2022) Investigating the Effects of Chronic Dietary and Environmentally Relevant Doses of Chlorpyrifos on the Gut Microbiome of Mice” Keystone 2022 Symposia Conference. Banff, AB, Canada [**Poster**] [*Canceled due to COVID*]
23. R. G. Nichols, B. Rimal, E. Davenport, A. D. Patterson (June 2022) Investigating the Effects of Chronic Dietary and Environmentally Relevant Doses of Chlorpyrifos on the Gut Microbiome of Mice” Changing Microbiomes Symposium. University Park, PA [**Poster**]
24. R. G. Nichols (Nov 2022) “Using the Microbiome to Better Understand the Effects of Xenobiotics on the Host” Guest Lecture for Pennsylvania State University Genomics Course. University Park, PA [**Presentation**]
25. R. G. Nichols (Nov 2022) “Coupling Metabolomics with the Gut Microbiome” Guest Lecture for Pennsylvania State University Genomics Course. University Park, PA [**Presentation**]
26. R. G. Nichols (Nov 2023) “Using the Microbiome to Better Understand the Effects of Xenobiotics on the Host” Guest Lecture for Pennsylvania State University Genomics Course. University Park, PA [**Presentation**]
27. R. G. Nichols (Nov 2023) “Coupling Metabolomics with the Gut Microbiome” Guest Lecture for Pennsylvania State University Genomics Course. University Park, PA [**Presentation**]
28. R. G. Nichols (Nov 2023) “Utilizing Co-culture Techniques to Investigate the Direct and Indirect Effects of the Gut Microbiome on Colonic Cells” One Health Microbiome Center Weekly Meeting. University Park, PA [**Presentation**]
29. R. G. Nichols (Feb 2024) “Combining Metatranscriptomics and Metabolomics to Investigate the Effects of Xenobiotics on the Gut Microbiome” Illumina Users Group Meeting. University Park, PA [**Presentation**]
30. R. G. Nichols, B. Rimal, F. Hao, Y. Tian, N. Boyle, E. R. Davenport, and A. D. Patterson (July 2024) “Chlorpyrifos Modulates the Mouse Gut Microbiota and Metabolic Activity” Beneficial Microbes Conference. Madison, WI [**Poster**]
31. R. G. Nichols (Nov 2024) “Using the Microbiome to Better Understand the Effects of Xenobiotics on the Host” Guest Lecture for Pennsylvania State University Genomics Course. University Park, PA [**Presentation**]
32. R. G. Nichols (Nov 2024) “Coupling Metabolomics with the Gut Microbiome” Guest Lecture for Pennsylvania State University Genomics Course. University Park, PA [**Presentation**]

**Peer Reviewed Publications**

1. L. Zhang, R.G. Nichols, J. Correll, I.A. Murray, N. Tanaka, P.B. Smith, T.D. Hubbard, A. Sebastian, I. Albert, E. Hatzakis, F.J. Gonzalez, G.H. Perdew and A.D. Patterson (2015). Persistent Organic Pollutants Modify Gut Microbiota-Host Metabolic Homeostasis in Mice Through Aryl Hydrocarbon Receptor Activation. Environmental Health Perspectives, 123, 679-688. doi:10.1289/ehp.1409055. PMID 25768209 [322 Citations]
2. L. Zhang, E. Hatzakis, R.G. Nichols, R. Hao, J. Correll, P.B. Smith, C.R. Chiaro, G.H. Perdew and A.D. Patterson (2015). Metabolomics Reveals that Aryl Hydrocarbon Receptor Activation by Environmental Chemicals Induces Systemic Metabolic Dysfunction in Mice. Environmental Science & Technology, 49, 8067-8077. doi: 10.1021/acs.est.5b01389. PMID 26023891 [99 Citations]
3. F. Li, X.W. Yang, K.W. Krausz, R.G. Nichols, W. Xu, A.D. Patterson and F.J. Gonzalez (2015). "Modulation of colon cancer by nutmeg." Journal of Proteome Research 14: 1937-1946. PMID 25712450 [55 Citations]
4. C. Jiang, C. Xie, F. Li, L. Zhang, R.G. Nichols, K.W. Krausz, J. Cai, Y. Qi, Z.Z. Fang, S. Takahashi, N. Tanaka, D. Desai, S.G. Amin, I. Albert, A.D. Patterson and F.J. Gonzalez (2015). Intestinal farnesoid X receptor signaling promotes nonalcoholic fatty liver disease. The Journal of Clinical Investigation*, 125*, 386-402. doi:10.1172/JCI76738. PMID 25500885 [716 Citations]
5. L. Zhang, C. Xie, R.G. Nichols, S.H.J. Chan, C. Jiang, R. Hao, P.B. Smith, J. Cai, M.N. Simons, E. Hatzakis, C. D. Maranas, F. J. Gonzalez and A. D. Patterson. (2016). Farnesoid X Receptor Signaling Shapes the Gut Microbiota and Controls Hepatic Lipid Metabolism. mSystems*, 1*, e00070-00016. doi:10.1128/mSystems.00070-16 [ 104 Citations]
6. I.A. Murray, R.G. Nichols, L. Zhang, A.D. Patterson and G.H. Perdew (2016). "Expression of the aryl hydrocarbon receptor contributes to the establishment of intestinal microbial community structure in mice." Scientific Reports 6: 33969. PMID 27659481 [75 Citations]
7. Nichols, R. G**.** Hume, N. E. Smith, P. B. Peters, J. M. & Patterson, A. D. (2016). Omics Approaches to Probe Microbiota and Drug Metabolism Interactions. Chemical Research in Toxicology, acs.chemrestox.6b00236. doi: 10.1021/acs.chemrestox.6b00236. PMID 27782392 [10 Citations]
8. K.H. Huang, R.G. Nichols, I. Albert, A. Sebastian, A.D. Patterson, and A.C. Ross, (2017). Gut microbiota increased by omega-3 fatty acids is negatively correlated with hepatic lipid metabolism-associated genes in mice with high carbohydrate diet-induced steatosis. The FASEB Journal *31*, 654.653-654.653. [2 Citations]
9. T.D. Hubbard, I.A. Murray, R.G. Nichols, K. Cassel, M. Podolsky, G. Kuzu, Y. Tian, P. Smith, M.J. Kennett, A.D. Patterson, and G.H. Perdew. (2017). Dietary broccoli impacts microbial community structure and attenuates chemically induced colitis in mice in an Ah receptor dependent manner. Journal of Functional Foods *37*, 685-698. [90 Citations]
10. Y. Tian, R.G. Nichols, J. Cai, A.D. Patterson, and M. Cantorna (2018). Vitamin A deficiency in mice alters host and gut microbial metabolism leading to altered energy homeostasis. The Journal of Nutritional Biochemistry *54*, 28-34. [71 Citations]
11. G. Li, C. Xie, S. Lu, R.G. Nichols, Y. Tian, L. Li, D. Patel, Y. Ma, C.N. Brocker, T. Yan, K.W. Krausz, R. Xiang, O. Gavrilova, A.D. Patterson, and F.J. Gonzalez (2017). Intermittent Fasting Promotes White Adipose Browning and Decreases Obesity by Shaping the Gut Microbiota. Cell Metabolism *26*, 672-685.e674. [735 Citations]
12. Zhang, L. Nichols, R. G. & Patterson, A. D. (2017). The aryl hydrocarbon receptor as a moderator of host-microbiota communication. Current Opinion in Toxicology*, 2*, 30-35. doi: 10.1016/j.cotox.2017.02.001 [36 Citations]
13. R.G. Nichols, J. Cai, I. A. Murray, I. Koo, P.B. Smith, G.H. Perdew, A. D. Patterson (2018). Structural and Functional Analysis of the Gut Microbiome for Toxicologists. Current Protocols of Toxicology. [9 Citations]
14. Y. Tian, R.G. Nichols, P. Roy, W. Gui, P.B. Smith, J. Zhang, Y. Lin, V. Weaver, J. Cai, A.D. Patterson, M. Cantorna (2018). Prebiotic Effects of White Button Mushroom (Agaricus bisporus) Feeding on Succinate and Intestinal Gluconeogenesis in C57BL/6 Mice. Journal of Functional Foods. [41 Citation]
15. P. Pathak, C. Xie, R. G. Nichols, J.M. Ferrel, S. Boehme, K.W. Krausz, A.D. Patterson, F.J. Gonzalez, J.Y.L. Chaing (2018). Intestine farnesoid X receptor agonist and the gut microbiota activate G-protein bile acid receptor-1 signaling to improve metabolism. Hepatology. [490 Citations]
16. Y. Tian, J. Cai, W. Gui, R.G. Nichols, I. Koo, J. Zhang, A. Mallappa, and A.D. Patterson (2018). Berberine Directly Impacts the Gut Microbiota to Promote Intestinal Farnesoid X Receptor Activation. Drug Metabolism and Disposition, dmd.118.083691. [98 Citations]
17. L. Sun, C. Xie, G. Wang, Y. Wu, Q. Wu, X. Wang, J. Liu, Y. Deng, J. Xia, B. Chen, S. Zhang, C. Yun, G. Lian, X. Zhang, H. Zhang, W. H. Bisson, J. Shi, X. Gao, P. Ge, C. Liu, K.W. Krausz, R. G. Nichols, J. Cai, B. Rimal, A.D. Patterson, X. Wang, F.J. Gonzalez and C. Jiang (2018) Gut microbiota and intestinal FXR mediate the clinical benefits of metformin. Nature Medicine *24*. [884 Citations]
18. J. Cai, R.G. Nichols, I. Koo, Z.A. Kalikow, L. Zhang, Y. Tian, and J. Zhang (2018). Multiplatform Physiologic and Metabolic Phenotyping Reveals Microbial Toxicity. mSystems *3*, 1-14. [10 Citations]
19. Liu, Q., J. Cai, R. G. Nichols, Y. Tian, J. Zhang, P. B. Smith, Y. Wang, C. Yan and A. D. Patterson (2019) A Quantitative HILIC–MS/MS Assay of the Metabolic Response of Huh-7 Cells Exposed to 2,3,7,8-Tetrachlorodibenzo-p-Dioxin. *metabolites, 9*(118). doi:10.3390/metabo9060118 [15 citations]
20. Cantorna, M. T., Y.-D. Lin, J. Arora, S. Bora, Y. Tian, R. G. Nichols and A. D. Patterson (2019). "Vitamin D regulates the microbiota to control the numbers of RORγt/FoxP3+ regulatory T cells in the colon." Frontiers in immunology 10: 1772. [53 Citations]
21. R. G. Nichols, J. M. Peters and A. D. Patterson (2019). "Interplay between the host, the human microbiome, and drug metabolism." Human genomics **13**(1): 1-10. [82 Citations]
22. R. G. Nichols, J. Zhang, J. Cai, I. A. Murray, I. Koo, P. B. Smith, G. H. Perdew and A. D. Patterson (2019). "Metatranscriptomic analysis of the mouse gut microbiome response to the persistent organic pollutant 2, 3, 7, 8-tetrachlorodibenzofuran." Metabolites 10(1): 1. [15 Citations]
23. Zhang, L., B. Rimal, R. G. Nichols, Y. Tian, P. B. Smith, E. Hatzakis, S.-C. Chang, J. L. Butenhoff, J. M. Peters and A. D. Patterson (2020). "Perfluorooctane sulfonate alters gut microbiota-host metabolic homeostasis in mice." Toxicology 431: 152365. [57 citations]
24. Tian, Y., W. Gui, I. Koo, P. B. Smith, E. L. Allman, R. G. Nichols, B. Rimal, J. Cai, Q. Liu and A. D. Patterson (2020). "The microbiome modulating activity of bile acids." Gut microbes 11(4): 979-996. [184 Citations]
25. Tian, Y., W. Gui, B. Rimal, I. Koo, P. B. Smith, R. G. Nichols, J. Cai, Q. Liu and A. D. Patterson (2020). "Metabolic impact of persistent organic pollutants on gut microbiota." Gut microbes 12(1): 1848209 [38 Citations]
26. R. G. Nichols and E. R. Davenport (2021). "The relationship between the gut microbiome and host gene expression: a review." Human genetics 140(5): 747-760. [152 Citations]
27. Liu, Q., L. Zhang, E. L. Allman, T. D. Hubbard, I. A. Murray, F. Hao, Y. Tian, W. Gui, R. G. Nichols and P. B. Smith (2021). "The aryl hydrocarbon receptor activates ceramide biosynthesis in mice contributing to hepatic lipogenesis." Toxicology 458: 152831. [16 Citations]
28. L. Sun, Y. Zhang, J. Cai, B. Rimal, E. R. Rocha, J. P. Coleman, C. Zhang, R.G. Nichols, Y. Luo, B. Kim, Y. Chen, K.W. Krausz, C.C Harris, A.D. Patterson, Z. Zhang, S. Takahashi, F.J. Gonzalez (2023) Bile salt hydrolase in non-enterotoxigenic Bacteroides potentiates colorectal cancer. Nature Communications, vol 14, pp 1-18 [54]
29. R.G. Nichols, B. Rimal, F. Hao, J.M. Peters, E.R. Davenport, A.D Patterson (2024) Chlorpyrifos modulates the mouse gut microbiota and metabolic activity. Environment International, vol 192, pp 109022
30. R.G. Nichols and E.R. Davenport (2025) Clade-specific long-read sequencing increases the accuracy and specificity of the gyrB phylogenetic marker gene. mSystems: e01480-24.

**Publications in Progress**

1. Nichols, R. G., Rimal, B., Hao, F., Mallappa, A., Davenport, E., Patterson, A. D. (2023) “Chronic Exposure to Low Doses of Chlorpyrifos Negatively Impact the Gut Microbiome of Mice”