Yike Shen, Ph.D.

Postdoctoral Research Scientist
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Education

Ph.D. Crop and Soil Science – Environmental Toxicology 08/2016 – 05/2020
Ph.D. dual major Environmental Science and Policy 08/2016 – 05/2020
Michigan State University, East Lansing, Michigan, USA
Advisor: Prof. Wei Zhang
Dissertation: Antibiotic Resistance and Bacterial Microbiome in Lettuce-Soil Systems
B.Sc. Environmental and Conservation Sciences 09/2013 – 06/2016
University of Alberta, Edmonton, Alberta, Canada

Experiences

Postdoctoral Research Scientist 06/2020 – present
Department of Environmental Health Sciences, Columbia University in the City of New York
Mentor: Andrea A. Baccarelli, MD, Ph.D.

- Streamlined wet lab for microbiome shotgun metagenomics and metatranscriptomics sequencing
- Automated bioinformatic workflow for microbiome shotgun metagenomics and metatranscriptomics analyses in high-performance computing clusters
- Investigated the associations of childhood and perinatal blood metals with children's gut microbiomes in a Canadian gestation cohort
- Applied representation learning to predict chemical ecotoxicity
- In charge of The Baccarelli Laboratory Amazon Web Service (AWS) and AWS RONIN cloud technical responsibilities

Graduate Research Assistant 08/2016 – 05/2020
Department of Plant, Soil, and Microbial Sciences, Michigan State University
Mentor, Advisor: Wei Zhang, Ph.D.
Committee members: Drs. Hui Li, Elliot Ryser, Ashley Shade

- Investigated the antibiotic resistance and bacterial microbiome in lettuce-soil systems
- Performed wet lab experiments to investigate *Salmonella* concentration, extract DNA, and run PCR and gel electrophoresis
- Performed uptake and accumulation experiment, extraction and analysis of antibiotics using LC-MS/MS
- Developed reproducible computational workflow to analyze high dimension ARGs data
- Automated large 16S rRNA gene amplicon sequencing data analyses in high-throughput computing clusters

Environmental Science and Policy Fellow 09/2016 – 05/2020
Environmental Science and Policy Program, Michigan State University
- Designed and analyzed an interdisciplinary survey on "Machine learning and statistical models to predict customers' willingness to buy and pay more for labeled products"
- Conducted an interdisciplinary literature review with four team members on "Nonpoint source pollution in the Raccoon River, Iowa a case study and its applications to Michigan"
- Conducted an interdisciplinary proposal with four team members"An integrated modeling framework of agricultural nutrient transport in Southeast Michigan"

Student Research Assistant, University of Alberta 06/2015 – 02/2016
Department of Renewable Resources
Mentor: Scott X. Chang, Ph.D.
- Performed various wet laboratory work

Research Interest

- One health
- Microbiome
- Machine learning
- Bioinformatics
- High dimensional data
- Multi-omics
- Environmental exposures

Publications

Dr. Shen highlighted in **bold**; Corresponding authors underlined; * denotes equal contribution
Published

1. **Shen, Y.**, Laue, H.E., Shrubsole, M.J., Wu, H., Bloomquist, T., Larouche, A., Zhao, K., Gao, F., Boivin, A., Prada, D., Hunting, D.J., Gillet,V., Takser, L., Baccarelli A.A. (2022). Associations of childhood and maternal metal exposure with children's gut microbiomes in a Canadian gestation cohort. *Environmental Health Perspectives* (In Press) DOI:10.1289/EHP9674.
2. Gao, F.; **Shen, Y.**; Sallach, J.; Li, H.; Liu, C.; Li, Y.; (2022). Direct prediction of bioaccumulation of organic contaminants in plant roots from soils with machine learning models based on molecular structures. *Environmental Science & Technology* DOI:10.1021/acs.est.1c02376.
3. Gao, F.*; **Shen, Y.***; Sallach, J.; Li, H.; Zhang, W.; Li, Y.; Liu, C. (2022). Predicting crop root concentration factors of organic contaminants with machine learning models. *Journal of Hazardous Materials* 424,127437
4. **Shen, Y.,** Hamm, J., Gao, F., Ryser, E.T., Zhang, W. (2021). Machine learning and statistical models to predict customers' willingness to buy and pay more for labeled products. *Journal of Food Protection* 84.9 (2021): 1560-1566.
5. **Shen, Y**., Ryser, E.T., Li, H., Zhang, W. (2021). Bacterial community assembly and antibiotic resistance genes in the lettuce-soil system upon antibiotic exposure. *Science of the Total Environment* 778, 146255.

6. **Shen, Y**., Li, H., Ryser, E.T., Zhang, W. (2021). Comparing root concentration factors of antibiotics for lettuce (*Lactuca sativa*) measured in rhizosphere and bulk soils. *Chemosphere* 262, 127677.
7. **Shen, Y**., Stedtfeld, R.D., Guo, X., Bhalsod, G.D., Jeon, S., Tiedje, J.M., Li, H. and Zhang, W. (2019). Pharmaceutical exposure changed antibiotic resistance genes and bacterial communities in soil-surface- and overhead-irrigated greenhouse lettuce. *Environment International* 131, 105031.

Under review or in revision

8. Gao, F., Zhang, W., Baccarelli A.A., **Shen, Y**. (202_). Predicting Chemical Ecotoxicity by Learning Latent Space Chemical Representations. *Environmental Science & Technology Letters* (in major revision).
9. Chen, Z., Zhang, W., Peng, A., **Shen, Y**., Jin, X., Stedtfeld, R.D., Boyd, S.A., Teppen, B.J., Gu, C., Zhu, D., Luo, Y., Li, H. (202_) Antibiotic resistance genes and bacterial community assembly in soils exposed to antibiotics at environmentally relevant concentration. *Environmental Science & Technology* (revision under review).
10. Campana, A.M., Laue, H.E., **Shen, Y.**, Shrubsole, M.J., Baccarelli, A.A. (202_). The Gut Microbiota: Assessing the Influences of Environmental Chemicals Exposures on Human Health. *Environmental Pollution* (submitted).

In preparation

11. **Shen, Y.**, Zhao, E., Zhang, W., Baccarelli, A.A., Gao, F. (202_) Exploring relationships between molecular structures and pesticide dissipation half-lives with machine learning models. *Journal of Hazardous Materials* (to be submitted).
12. Laue, H.E.*, **Shen, Y.***, Bloomquist, T.R., Wu, H., Brennan, K.J.M., Raphael, C., Serme-Gbedo, Y.K., Abdelouahab,N., Bellenger, J.P., Burris, H.H., Coull, B.A., Weisskopf, M.G., Zhang, W., Takser, L., Baccarelli A.A. (202_). Associations of in utero exposure to non-prescription consumer products and childhood gut microbiome, implication for neurodevelopmental effects.

Proposed or Analysis in progress

……Coauthors to be add, order may change.

13. **Shen, Y.**, Gao, Feng., Domingo-Relloso, A., Kupsco, A., Wu, H., Haack, K., Zhang, Y., Fretts, A.M., Umans, J.G., Tellez-Plaza, M., Cole, S., Kioumourtzoglou, M.A., Baccarelli, A.A., Navas-Acien, A. Predicting incident coronary heart disease by learning latent space representation of individual blood DNA Methylation from the Strong Heart Study.
14. **Shen, Y.**, Gao, Feng., ……, Kioumourtzoglou, M.A., Baccarelli, AA. A decade of dedication: Bird-view of Normative Aging Study.
15. **Shen, Y.**, Gao, Feng, ……., Kioumourtzoglou, M.A., Baccarelli, A.A. Disease pattern recognition by learning latent space representation of the Normative Aging Study mixture exposures.
16. **Shen, Y.**, Bloomquist, T.R., Rauso, A., ……, Takser, L., Baccarelli, A.A. Evaluation of bacterial RNA quality and shotgun metatranscriptome sequencing.
17. **Shen, Y.**, Laue, H.E., ……, Campana, A.M., Bellenger, J.P., Takser, L., Posner, J., Baccarelli, A.A. Effects of Childhood Flame Retardants on Brain Function and Attentional Deficits in School-age Children – Brain Imaging, Neurobehavioral, and Gut Microbiome Studies in GESTE.

18. Liu, S., **Shen, Y.**, Busch, A., Almansa, X.F., Norton, J., Safferman, S., Zhang, W. (202_). Biosolid application increases nitrogen and phosphorus availability and microbial activities in agricultural soils: a bi-decadal meta-analysis (2000–2020).
19. Campana, A.M., Wu, H., **Shen, Y.**, Laue, H.E., Bloomquist, T.R., Posner, J., Takser, L., Baccarelli, A.A. (202_). Association between the and mid-childhood gut microbiome and neurocognitive outcomes in GESTE, a Canadian cohort Study.

Teaching Assistant Experiences

- SHARP Python Boot Camp, Columbia University — Summer 2021
- SHARP Epigenetics Boot Camp, Columbia University — Summer 2020
- CSS 340: Applied Soil Physics, Michigan State University — Spring 2018 and Spring 2019
- CSS 330: Soil Chemistry, Michigan State University — Spring 2019
- RenR 299: Environmental and Forestry Spring Field School, University of Alberta Spring 2015

Skills

Computational: R, Python, Linux, Unix, Shell Script, and High-Performance Computing Clusters, Amazon Web Service, GitHub
Data analysis: big data analytics, metagenomics data analysis, machine learning, data visualization
Laboratory: DNA and RNA extraction, PCR, sequencing, gel electrophoresis, molecular biology, bacterial culture, chemical hygiene, laboratory safety, hazardous waste; biosafety principles (level 1 and 2), and lab security awareness

Presentations

Presenter highlighted in **bold**

A. Voluntary Conference Presentations

1. **Yike Shen,** Hannah E. Laue, Martha J. Shrubsole, Haotian Wu, Tessa R. Bloomquist, Annie Larouche, Kankan Zhao, Feng Gao, Amélie Boivin, Diddier Prada, Darel J. Hunting, Virginie Gillet, Larissa Takser, Andrea A. Baccarelli. 2021. Association of childhood and maternal metal exposure with children gut microbiome in a Canadian gestation cohort. International Society for Environmental Epidemiology. New York, NY. August 24, 2021 (spotlight oral presentation). (held online due to COVID19)
2. **Yike Shen,** Hannah E. Laue, Martha J. Shrubsole, Haotian Wu, Tessa R. Bloomquist, Annie Larouche, Kankan Zhao, Feng Gao, Amélie Boivin, Diddier Prada, Darel J. Hunting, Virginie Gillet, Larissa Takser, Andrea A. Baccarelli. 2021. Association of childhood and maternal metal exposure with children gut microbiome in a Canadian gestation cohort. American Society of Microbiology Conference – ASM World Microbe Forum, June 21, 2021 (poster presentation). (held online due to COVID19)
3. **Yike Shen,** Elliot Ryser, Hui Li, Wei Zhang. 2020. Bacterial Community Assembly and Antibiotic Resistance Genes in the Lettuce-Soil System upon Exposure to Anthropogenic Antibiotics. American Society of Microbiology Conference – ASM Microbe 2020. Chicago, IL, June 18, 2020 (poster presentation). (held online due to COVID19).
4. **Yike Shen,** Elliot Ryser, Hui Li, Wei Zhang. 2019. Uptake and Accumulation of Antibiotics and Associated Impact on Bacterial Microbiome and *Salmonella* Survival in Lettuce. ASA - CSSA-SSSA International Annual Meeting. San Antonio, TX, November12 (oral presentation).

5. **Yike Shen**, Joseph Hamm, Feng Gao, Wei Zhang. 2019. Machine learning and statistical models to predict customers' buy and pay preferences for labeled products. Environmental Science and Policy Research Symposium 2019. East Lansing, MI, Oct 28 (oral presentation).
6. **Yike Shen,** Elliot Ryser, Hui Li, Wei Zhang. 2019. Understanding *Salmonella* Survival and Microbiome Changes in Lettuce Production under Antibiotic Stress. US-China Environment and Sustainability Forum at the University of Michigan. Ann Arbor, MI, October 2 (poster presentation).
7. **Yike Shen**, Elliot Ryser, Hui Li, Wei Zhang. 2019. Antibiotic resistance genes, microbiomes and *Salmonella* survival in lettuce exposed to antibiotics via soil surface irrigation. American Chemical Society National Meeting #257. San Diego, CA, August 25-29 (oral presentation).
8. **Yike Shen**, Robert D. Stedtfeld, Xueping Guo, Gemini D. Bhalsod, Sangho Jeon, James M. Tiedje, Hui Li, and Wei Zhang. 2018. Pharmaceutical Exposure Changed Bacterial Community and Antibiotic Resistance Gene Profiles in Surface- and Overhead-Irrigated Greenhouse Lettuce. American Chemical Society National Meeting #256. Boston, MA, August 19-23 (oral presentation).
9. **Yike Shen**, Gemini D. Bhalsod, Xueping Guo, Sangho Jeon, Tiffany Stedtfeld, Robert D. Stedtfeld, James M. Tiedje, Hui Li, and Wei Zhang. 2017. Antibiotic Stress Changed Microbial Community and Distribution of Antibiotic Resistance Genes in Surface and Overhead Irrigated Greenhouse Lettuce. 4th International Symposium on the Environmental Dimension of Antibiotic Resistance. East Lansing, MI, August 13-17 (poster presentation).
10. **Yike Shen**, Gemini D. Bhalsod, Xueping Guo, Luxi Yang, Sangho Jeon, Robert D. Stedtfeld, James M. Tiedje, Hui Li, and Wei Zhang. 2017. Distribution of antibiotic resistance genes in surface and overhead irrigated greenhouse lettuce. American Society for Microbiology Conference - Innovative Microbial Ecology for Mitigation of Antibiotic Resistance and Bacterial Diseases. Crystal City, VA, March 22-25 (oral presentation).

B. Invited Oral Presentations

1. **Yike Shen**, Feng Gao, Marianthi-Anna Kioumourtzoglou, Andrea A. Baccarelli. Deep Learning based Network Analysis in the Normative Aging Study. December 10, 2021. Invited by Columbia University Data Science and Health Initiative.
2. **Yike Shen.** GESTE Microbiome. Université de Sherbrooke, Quebec, Canada. June 22, 2021. Invited by Dr. Larissa Takser.
3. **Yike Shen.** Assessing Antibiotics, Antibiotic Resistance Genes and Microbiome in Lettuce and Food Safety Related Consumer Preference.
    a. EMBLab, Westlake University, Hangzhou, Zhejiang, China. January 17, 2020. Invited by Dr. Feng Ju.
    b. Institute of Nuclear-Agricultural Science, Zhejiang University, Hangzhou, Zhejiang, China. January 16, 2020. Invited by Dr. Haiyan Wang.
    c. College of Environmental Science and Engineering, Nankai University, Tianjin, China. January 14, 2020. Invited by Dr. Zeyou Chen.
    d. Institute of Plant Protection, Chinese Academy of Agricultural Sciences, Beijing, China. January 13, 2020. Invited by Dr. Yuanbo Li.
    e. Institute of Soil-Water Resource and Environment, Zhejiang University, Hangzhou, Zhejiang, China. January 6, 2020. Invited by Dr. Bin Ma.

f. The International Youth Scholars Forum of Zhejiang A&F University, Zhejiang A&F University, Hangzhou, Zhejiang, China. December 28, 2019. Invited by School of Environmental and Resource Sciences.

4. **Yike Shen** and Wei Zhang. The T concept of research in Environmental Dimension of Antimicrobial Resistance – Perspectives from an interdisciplinary Environmental Scientist in training. Institute of Soil-Water Resource and Environment, Zhejiang University, Hangzhou, Zhejiang, China. December 25, 2017. Invited by Dr. Bin Ma.

Research Grants

- Representation learning in high dimensional epigenomics, metagenomics, and exposomics data in predicting health outcomes; NIEHS R01 – planned
- Deep Learning based Network Analysis in the Normative Aging Study; Columbia University Data Science and Health Initiative – writing in progress

Review Service

- Environmental Research
- Science of the Total Environment
- Food Chemistry
- BMC Genomics
- Environmental Pollution
- Frontiers in Microbiology

Awards

Awards from Michigan State University:

- Graduate Research Assistantship 2016 – 2020
- Institute for Integrative Toxicology Summer Travel Award 2017 – 2020
- Dissertation Completion Fellowship 2019
- Graduate School Travel Funds 2019
- College of Agriculture and Natural Resources Food Systems Fellowship 2019
- Environmental Science and Policy Program Travel Grant 2017,2019
- Environmental Science and Policy Doctoral Recruitment Fellowship 2016

External Awards

- ASM Travel Grant (American Society for Microbiology) 2017
- First Class Standing (University of Alberta) 2015, 2016
- Undergraduate Research Grant (Natural Science and Engineering Research Council of Canada - CREATE Grant) 2015
- ALES Student Engagement Fund (University of Alberta) 2015
- ZAFU - UofA (ALES) Award (University of Alberta) 2013
- National Scholarship of China (Ministry of Education in China) 2013

Languages

- English
- Chinese