



Dr. Kari Dunfield

Professor

Environmental Microbiology

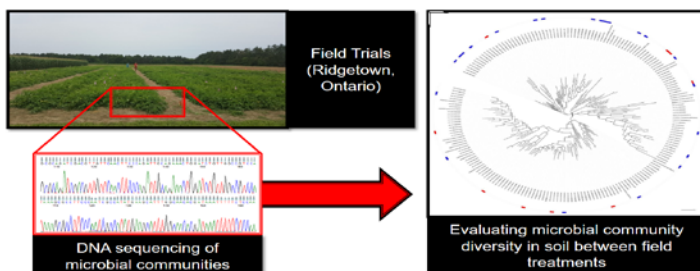
Canada Research Chair

School of Environmental Sciences

University of Guelph

Dr. Kari Dunfield received her BSc in Cellular Molecular Microbial Ecology at the University of Calgary, and earned her MSc in Plant Science and PhD in Soil Science at the University of Saskatchewan. Since joining the University of Guelph in 2004, she has been performing innovative research in environmental microbiology. Dr. Dunfield uses molecular techniques to study the impacts of human activities on soil microbial communities, and the resulting effect on soil function and health.

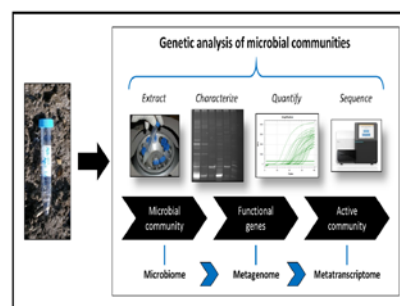
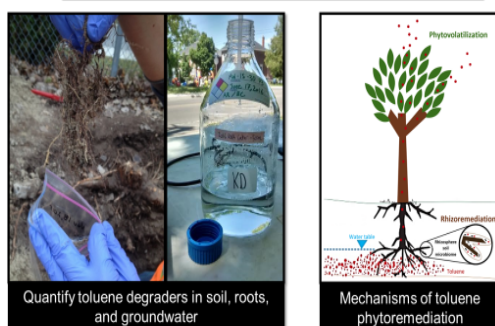
It is believed that a microbially diverse soil is a healthy soil. We aim to better understand the impact of agricultural production practices on the diversity of soil microbial communities, and overall soil health.



Her work is often multi-disciplinary and in collaboration with various scientists and university partners (Lincoln University, NZ, Algoma University, Univ of Manitoba, Dalhousie University). Dr. Dunfield's current research focuses on the anthropogenic impacts on soil ecosystems. Her first research focus examines the impact of agricultural practices (tillage and growing crops for biofuels) on soil microbial communities and soil health and soil ecosystem services, such as greenhouse gas emissions and nutrient cycling. The second focus involves the survival and transport of key microbes in soils, water, and associated with plants. Dr. Dunfield is looking at the presence and activity of toluene-degrading bacteria in a toluene contaminated shallow-fractured bedrock site under phytoremediation.

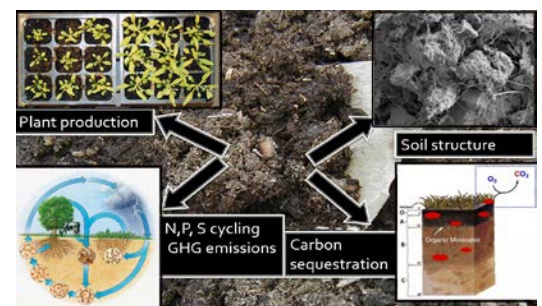
Soil microorganisms are responsible for many important soil functions such as biogeochemical cycling, contaminant remediation and plant growth. According to Dr. Dunfield, soil micro-organisms can impact soil ecosystem health and environmental sustainability.

Some plants, like poplar trees, can help remove pollutants from soil and water (phytoremediation), with assistance from environmental microbes. We are characterizing and quantifying these microbial communities in soil, roots, and groundwater to better understand their bioremediation processes.



Work flow to study microbes in situ

We utilize a variety of advanced, culture-independent molecular techniques, looking at DNA and RNA, to investigate soil microbial communities



Soil Ecosystem Services

The goal in my lab is to improve our understanding of soil ecosystem services in order to promote the development of sustainable farming and bioremediation practices that protect the environment.

Selected Papers and Theses

Selected Publications

- Allen, A., Borchartd, M., Kieke, B., Dunfield, K., & Parker, B. (2017). "Virus occurrence in private and public wells in a fractured dolostone aquifer in Canada," *Hydrogeology Journal*. Hydrogeology Journal 25 (4), 1117-1136
- Fraser, T., Lynch, D. H., Gaiero, J., Khosla, K. & Dunfield, K. E. (2017). Quantification of bacterial non-specific acid (*phoC*) and alkaline (*phoD*) phosphatase genes in bulk and rhizosphere soil from organically managed soybean fields. *Applied Soil Ecology*, 111, 48-56, <http://dx.doi.org/10.1016/j.apsoil.2016.11.013>.
- Habtewold, J., Gordon, R.J., Wood, J.D., Wagner-Riddle, C., VanderZaag, A.C., & Dunfield, K.E. (2017) Dairy Manure Total Solid Levels Impact CH₄ Flux and Abundance of Methanogenic Archaeal Communities. *Journal Environmental Quality*. 46: 232-236.
- Bent, E., Nemeth, D., Wagner-Riddle, C., & Dunfield, K. (2016). Residue management leading to higher field-scale N₂O flux is associated with different soil bacterial nitrifier and denitrifier gene community structures. *Applied Soil Ecology*, 108, 288-299, doi: <http://dx.doi.org/10.1016/j.apsoil.2016.09.008>.
- Day, N. J., Dunfield, K. E., & Antunes, P. M. (2015). Temporal dynamics of plant-soil feedback and root-associated fungal communities over 100 years of invasion by a non-native plant. *J of Ecology*, 103: 1557-1561.
- McCall, C. A., Bent, E., Dunfield, K. E., Habash, M. (2016) Metagenomic comparison of antibiotic resistance genes associated with liquid and dewatered biosolids. *Journal of Environmental Quality*, 45 (2), 463-470, doi: 10.2134/jeq2015.02.0067
- Munroe, J., McCormick, I., Deen, B., Dunfield, K. (2016) Effects of 30-years of crop rotation and tillage on bacterial and archeal ammonia oxidizers. *Journal of Environmental Quality*. 45 (3), 940-948. doi: 10.2134/jeq2015.06.0331
- Thompson, K., Bent, E., Abalos, D., Wagner-Riddle, C., & Dunfield, K. (2016). Soil microbial communities as regulators of *in situ* N₂O fluxes in annual and perennial cropping systems. *Soil Biology & Biochemistry*, 103, 262-273.
- Arnaud, E., Best, A., Parker, B. L., Aravena, R., & Dunfield, K. (2015). Transport of *E. coli* through a Thick Vadose Zone. *JEQ*, 44(5), 1424. <http://doi.org/10.2134/jeq2015.02.0067>
- Best, A., Arnaud, E., Parker, B., Aravena, R., & Dunfield, K. (2015). Effects of Glacial Sediment Type and Land Use on Nitrate Patterns in Groundwater. *Groundwater Monitoring & Remediation*, 35(1), 68-81. <http://doi.org/10.1111/gwmmr.12100>
- McCall, C. A., Jordan, K. S., Habash, M. B., & Dunfield, K. E. (2015). Monitoring Bacteroides spp. markers, nutrients, metals and Escherichia coli in soil and leachate after land application of three types of municipal biosolids *Water Research*, 70, 255-65.
- Gaiero, J.R., McCall, CA, Thompson, KA, Day, NJ, Best, AS and Dunfield KE. 2013. Inside the root microbiome: bacterial root endophytes and plant growth promotion. *Am J Botany*. 100: 1738-1750
- Full list of papers available on Google Scholar: Kari E Dunfield