

# Improving groundwater remediation

Dr. Elizabeth A. Edwards and Dr. Radhakrishnan Mahadevan of BioZone at the University of Toronto describe their project and why this is such important work.



## **How would you describe your project / what are you working on?**

We are working on trying to understand why several microbes working together can do so much more than individual microbes growing solo. We are working on a simple case of two microbes working together. Microbe #1 can transform toxic chlorinated solvents into a benign product, a function that actually helps all microbes around it, because they can't grow in the presence of this toxic solvent. In return, microbe #1 gets the specific nutrients it requires, such as hydrogen, acetate and amino acids, from its partner microbe #2 as it ferments sugars and fats. We also find that some microbes can make certain vitamins, like B12, while others can't, so these are also provided in exchange for different nutrients. Many other reciprocal exchanges exist that form the basis of very tight or essential relationships between different types of microbes. In our specific project, we read the genomes of our microbes to generate a list of all the possible chemical reactions in each one. Then, we use models to determine how all the chemical reactions fit together to help us identify the gaps and exchanges that might exist between our two microbes, and then run experiments in the lab growing the microbes to see if the model predictions are true.

## **What are the potential applications and what does this mean for the average person?**

Understanding these interactions makes it easier to predict how these ecosystems truly function, and what to do to help them along. These microbial ecosystems are literally everywhere. Our own interest is to accelerate bioremediation and wastewater treatment or enhance production of valuable products. But these kinds of inter-dependencies exist in our gut microbiomes, and in all plants, animals and environments where microbes exist.

For more information about this project: <http://www.ontariogenomics.ca/funding-opportunities/awarded-projects/spark-program/#metabolite-exchanges>

