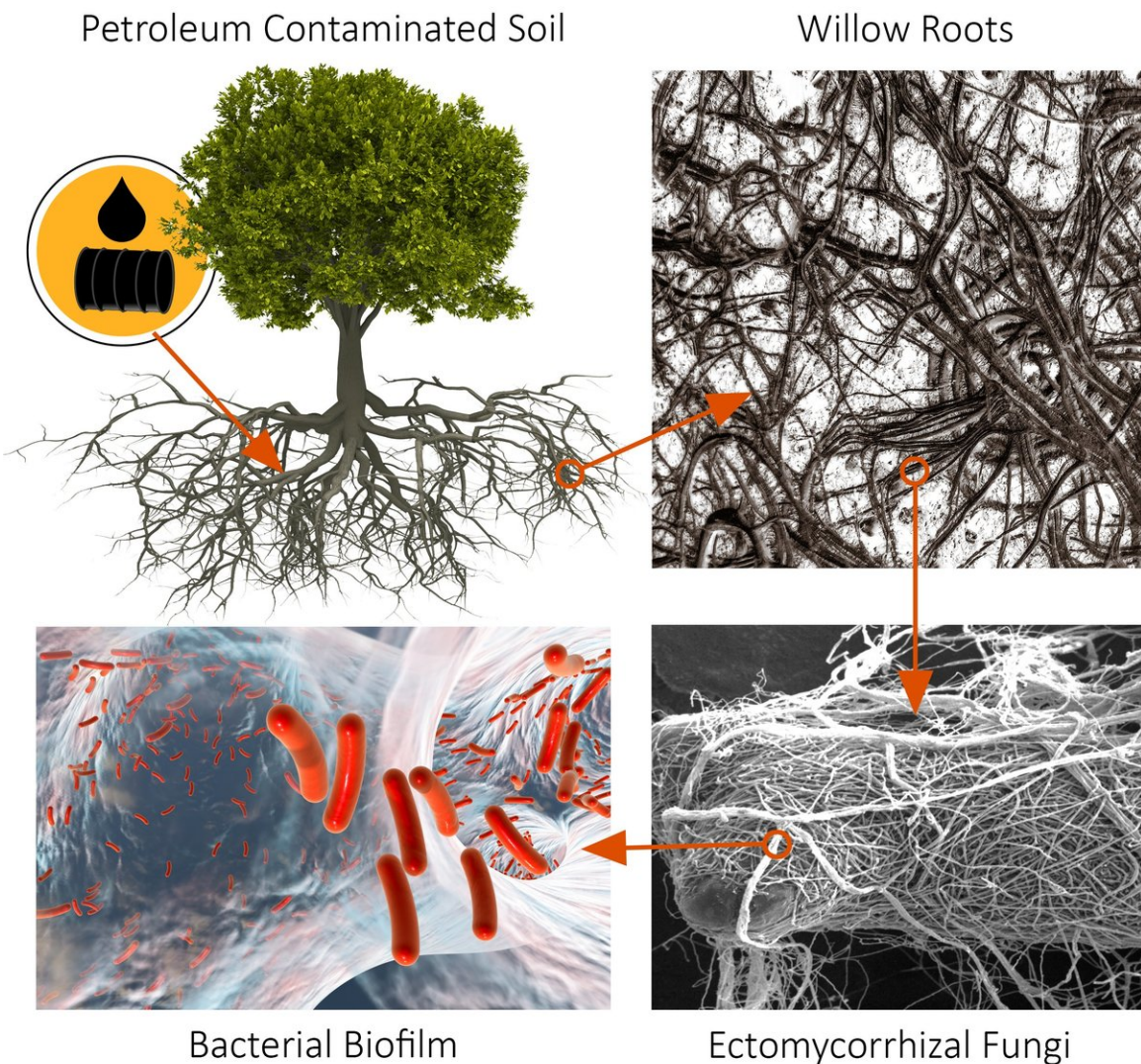


# Plants, fungi and bacteria work together to clean polluted land

March 28 2018



New genetic evidence suggests willow trees may tolerate pollution by providing sugars to symbiotic fungi surrounding their roots; the fungi, in turn, provide

nutrients to hydrocarbon-degrading bacteria. Credit: Ectomycorrhizal Fungi image by Dr. Hugues Massicotte, Forest Ecology and Management, University of Northern British Columbia

Highly complex interactions among roots, fungi and bacteria underlie the ability of some trees to clean polluted land, according to a novel study by bioinformatics and plant-biology experts from McGill University and Université de Montréal.

Fast-growing trees, such as willows, are known to tolerate and even rejuvenate soil contaminated with [petroleum by-products](#) or heavy metals. The clean-up of soil in this way is known as phytoremediation, and the process is commonly attributed to "secondary metabolism"—the production of specialized compounds in plants that helps them cope with environmental stress.

New findings by the Montreal researchers, published in the journal *Microbiome*, suggest that a more intricate symbiosis of microbial life underpins willows' ability to thrive in these stressful conditions. Using advanced techniques for analyzing the simultaneous expression of genes from multiple organisms in an ecosystem, the scientists examined the roots of willows grown on a polluted site in suburban Montreal. They found that complex interactions among a range of ectomycorrhizal fungi—which form symbiotic sheaths around the roots of plants—and certain bacteria appeared to drive the degradation of hydrocarbons in the ground.

"We normally approach genetics by limiting the investigation to single organisms or domains of life," says Emmanuel Gonzalez, lead author of the study and bioinformatics specialist at the Canadian Centre for Computational Genomics at McGill. "What was so surprising here was

that, by looking for the genetics of all the life below-ground, the biological picture actually became easier to see. This also suggests that such complex mutualistic interactions may be the natural norm outside of the laboratory."

Nicholas Brereton, a research fellow at Université de Montréal's Plant Biology Research Institute and senior author of the study, adds that "our initial mind-set was that bioinformatics and biology could be more profoundly integrated to see the diversity of function within a challenged [root](#) system. This quite quickly led to technical improvements in how we could observe gene expression across multiple life-forms, leading to new environmental biology discoveries. We hope these findings showcase how powerful cross-disciplinary dialogue can be for revealing the incredibly intricate solutions present in the natural world."

**More information:** "Trees, fungi and bacteria: tripartite metatranscriptomics of a root microbiome responding to soil contamination," E. Gonzalez et al, *Microbiome*, published 21 March 2018. [microbiomejournal.biomedcentra ... 86/s40168-018-0432-5](#)

Provided by McGill University

Citation: Plants, fungi and bacteria work together to clean polluted land (2018, March 28) retrieved 26 April 2024 from <https://phys.org/news/2018-03-fungi-bacteria-polluted.html>

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