

Bioremediation company hits a new high with a cocktail of fungus and bacteria

Flinders University's biotechnology company, Flinders Bioremediation Pty Ltd, has been awarded more than \$160,000 of government funding to assist in full-scale development of a cocktail of microbes and fungi that will "eat" persistent toxic pollutants such as coal tars.

The project funding consists of \$110,000 from the Federal Government's Biotechnology Innovation Fund and \$55,000 from the State Government's Bio Innovation SA seed fund over 18 months. Flinders University's Faculty of Science and Engineering has contributed a further \$55,000.

Managing Director of Flinders Bioremediation, biologist Dr Nick McClure, said the grants will help develop industrial-scale bioremediation processes for sites polluted with coal tars and similar pollutants.

Polycyclic aromatic hydrocarbon (PAH) pollutants, of which coal tars are a common form, are difficult for microbial action to break down, chiefly because their physical "stickiness" means they are not readily soluble in water.

"Bugs basically like their food in a water base; things which are highly insoluble and repel water are not good for microbial attack," Dr McClure said.

"Current treatments are very effective for easy pollutants like gasoline, diesel and fuel oils, but for some of the more complex organic pollutants like DDT or the PAHs, bioremediation processes are limited and inconsistent in how well they work."

A collaboration with the Victoria University of Technology has devised a new approach, using the combined attributes of more than one bioremediation agent.

"Instead of using one specific organism, this involves two or even more," Dr McClure said.

"The key components are a fungus and a bacterium. The individual components of the package don't work, but if you put them together in the right mix, it is effective."

Whereas the smaller molecules of diesel or gasoline can be taken up by bacteria and used as a food source, the larger PAH molecules resist this. Fungi on the other hand, secrete enzymes outside their cells which start to degrade the complex chemicals of the target pollutants.

"What we think is happening with the fungus-bacterium combination is that while the fungus is probably starting the attack, probably through extra-cellular enzymes, it isn't so efficient at taking the products in and continuing the breakdown. But the bacterium is; it sweeps up after the fungus, producing a complete breakdown.

"People have tried for many years to get single bugs to degrade these coal tars, but the VUT group seems to have had more success with their particular combination than anyone else.

So far, however, the efficacy of the mixture has been demonstrated only at laboratory scale.

"Now what we need to do is to take it to pilot and then full scale. The grant is really to fast-track that commercialisation process."

The aim of the grant extends well beyond the pure science, Dr McClure said.

"The grant includes components to assist better patenting and protection of the intellectual property as well as marketing, including exploring what linkages we can set up with international companies to promote the use of this technology," he said.

"It's not just for the science, it's for the industry development."

Dr McClure said the projected activities would represent a major jump in progress for Flinders Bioremediation.

"To date we've really been reliant on consulting activities to generate a cash-flow. And even though we're at the stage where we're making money, in the longer term we want to concentrate on the development of technology and intellectual property that can be licensed to other people to use, and which will generate much better returns.

"We want to make the most of our university links to generate cutting edge technology, rather than just applying existing systems locally."

While it is often difficult to estimate demand for remediation because of the general reluctance to reveal the extent of environmental problems, a solution to coal tar pollution would certainly be internationally popular because it is a problem in all developed countries, Dr McClure said.

"It's a huge problem in the US and Europe, and anywhere people have burned fuel oils for any purpose,

such as gas production, at oil refineries or in the production of bitumen and asphalt."

"The big question now is whether we can scale up the process to become economically viable – can it handle thousands of tons of soil rather than the contents of a test tube in the lab?"

If the project is a success, further funding may be sought to help in setting up a facility in South Australia to produce the fungal and microbial agents.



Dr Nick McClure