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Bioengineering

Panda poop power

Microbes in pandas' guts can help in biofuel production

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GIANT PANDAS are well known for being rather different from other bears. Having a diet composed almost entirely of bamboo is one of the things that sets them apart. It is also what attracted the interest of Ashli Brown of Mississippi State University, in a search for more efficient ways to make biofuel.

Most of the nutrients found in bamboo are locked away in tough substances known as cellulose and lignin. Liberating those nutrients is an energy-intensive process that involves high temperatures and extreme pressures when carried out in a laboratory or by an industrial process. Indeed, it is the cost of doing so that makes producing biofuel out of cellulose- and lignin-rich materials, like discarded corn (maize) cobs and husks, less financially viable than generating biofuel directly from more readily digestible corn kernels. The kernels, however, can be used to feed people whereas the cobs and husks cannot. So a process that is able efficiently to turn what is a waste product into fuel could have great potential.

Given their diet, Dr Brown knew that giant pandas had to have legions of microbes in their gut that were strong enough to break cellulose and lignin down. If it was possible to identify those microbes and find the enzymes within them they might be used to improve biofuel production. So, Dr Brown and her colleagues got to work analysing piles of panda faeces for the presence of RNA strands belonging to the microbes.

The team then searched through microbial databases to identify the genre that these microbes belonged to and determine which known species they were most closely related to. This identification process allowed Dr Brown to run a comparative analysis that teased out minor differences between the microbes to reveal which ones carried the traits that made them particularly adept at breaking down the bamboo material.

This produced 17 microbes with the ability to digest cellulose and six that looked like good candidates for digesting lignin. The microbes were then tested in the laboratory. They were found to be capable of breaking down 65.4% of the tough materials they were given and transforming much of them into the sorts of energy-rich sugars that are readily fermented into bioethanol or biodiesel, Dr Brown told a national meeting of the American Chemical Society in Indiana this week.

Considering that most cellulose- and lignin-based materials end up as compost, or worse, in landfills, the ability to convert such a large percentage of them into potential biofuel products is encouraging. Dr Brown, though, is quick to point out that optimising the performance of the enzymes employed by the microbes so that they can be used commercially is going to be a long and hard job. But thanks to the giant panda being saved from extinction, it is one that could be well worth the effort.

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