

Designing probiotics that ambush gut pathogens

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Researchers in Australia are developing diversionary tactics to fool disease-causing bacteria in the gut. Many bacteria, including those responsible for major gut infections, such as cholera, produce toxins that damage human tissues when they bind to complex sugar receptors displayed on the surface of cells in the host's intestine.

At the Society for General Microbiology's meeting at Heriot-Watt University, Edinburgh, today (8 September), Professor James Paton and colleagues from the University of Adelaide explained how they had added molecular mimics of these host [cell receptors](#) onto the surface of harmless [bacteria](#) capable of surviving in the human gut. If given during an infection caused by a toxin-producing bacterium, these "receptor-mimic probiotics" will bind the toxins in the gut very strongly, thereby preventing the toxins from interacting with receptors on host [intestinal cells](#) and causing disease.

Effective vaccines are not yet available for many diarrhoeal diseases; and trying to control or treat these diseases with antibiotics can lead to the development of drug-resistance. One advantage of this approach to treatment is that the [pathogenic bacteria](#) are unlikely to develop a resistance to it, as that would destroy the basic mechanism by which they cause disease.

A further advantage is that the receptor-mimic bacteria bind toxins more strongly than previous technologies in which synthetic receptors were displayed on inert silica particles. They are also more cost effective, as

the bacteria can be grown cheaply in large-scale fermenters.

"We initially developed this technology to prevent disease caused by strains of E. coli bacteria that produce Shiga toxin. These include the infamous E. coli O157 strain, which causes outbreaks of severe bloody diarrhoea and the potentially fatal haemolytic uraemic syndrome. Our prototype receptor mimic probiotic provided 100% protection against otherwise fatal E. coli disease in an animal model." said Professor Paton, "We have also developed similar receptor mimic probiotics that are capable of preventing cholera and travellers' diarrhoea. As well as being able to treat disease, these probiotics could be given to vulnerable populations following natural disasters to help prevent outbreaks of diseases like cholera".

Source: Society for General Microbiology

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