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INFECTION

Rice yields new oral therapy for rotavirus infection

Rotavirus-associated diarrhoea is life threatening in immunocompromised individuals and in children in developing countries. Although rotavirus vaccines are available, they are only licensed for use within a narrow age window. Passive immunotherapy is the only currently available intervention that offers immediate protection, but production and purification of the antibodies is costly.

Now, Yoshikazu Yuki, Daisuke Tokuhara and colleagues from the University of Tokyo, Japan, have developed a new system in transgenic rice to produce a high-yield, water-soluble antibody for prophylaxis and treatment of rotavirus-associated diarrhoea.

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Yuki and co-workers generated transgenic rice that expressed the neutralizing variable domain of a rotavirus-specific llama heavy-chain antibody fragment (termed MucoRice-ARP1). MucoRice-ARP1 was overexpressed in rice seeds to produce it at high levels; the production of major rice endogenous storage proteins was simultaneously suppressed to provide the required space for ARP1 in the rice seeds.

This construct was designed to be water soluble and, as MucoRice-ARP1 originates from edible rice seeds, the obtained rice powder can be used directly without the need for antibody purification.

Immunocompetent and immunodeficient mice infected with rotavirus and given an oral dose of MucoRice-ARP1 dissolved in water had considerably reduced viral load than control mice (that received either saline or rice powder dissolved in water).

The researchers went on to test the stability of the antibody. Of note, the antibody retained its neutralizing ability after long-term storage (>1 year) and boiling. Moreover, mice were still protected even after the antibody was heat treated at 94°C for 30 min.

"MucoRice-ARP1 offers a novel approach to the prevention and treatment of rotavirus-induced diarrhoea during outbreaks, and might provide an alternative to vaccination for individuals in whom live attenuated vaccines are contraindicated," Yuki explains. "This technology can also be extended to the production of antibody fragments against other enteric pathogens, including norovirus," Yuki adds.

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CORRECTION

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In the version of this article initially published online, the first author of the original article was incorrectly listed as Yoshikazu Yuki instead of Daisuke Tokuhara. The error has been corrected for the print, HTML and PDF versions of the article.