A novel peptide delivery platform for mucosal vaccination based on group A streptococcus pili

PilVax is a L. lactis-based peptide delivery platform based on the well-studied FCT-2 pilus of group A streptococcus. Pili are hair-like bacterial cell surface protrusions with the main function in host cell adhesion. FCT-2 pilus mainly consists of the polymerised backbone pilin (Spy0128) that is structurally stable and highly immunogenic. Incorporating an antigenic peptide into the pilus structure increases immunogenicity via peptide stabilisation and amplification. PilVax also provides other benefits such as better safety, lower production costs and ease of administration, making it suitable for the lower socioeconomic settings where efficacious vaccines are most needed.

Surface accessible and variable loop regions of Spy0128 can be used for peptide insertion. The model peptide Ova was successfully incorporated into 3 different sites of Spy0128, and the modified PilM1 can be expressed on the surface of L. lactis. Structurally related but antigenically different pili can be used as the basis of PilVax. Also, more than 1 peptide can be inserted in frame within the same loop region or at different loops for delivering different peptides.

Intransal immunisation with PilVax-Ova induces both systemic and mucosal antibody responses in mice that were comparable to the Ova + CTB positive control, and significantly higher than Ova + PilM1 (Ova mixed with L. lactis expressing PilM1). PilVax-M2e-M2e (PilVax construct carrying two copies of the M2e peptide from influenza A virus hemagglutinin in tandem at the βE-βF loop region) elicited stronger antibody responses than Pilvax-M2e.