Production of anti-viral vaccines using probiotic bacteria

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The mucosal surfaces throughout the body are constantly exposed to microorganisms. The mucosal surfaces accommodate a large part of the body's immune system. For effective vaccination, it is believed that direct immunization on mucosal surfaces will be more effective than the more conventional systemic immunization. Certain probiotic bacteria provide significant adjuvant effects that may be utilized for the desired immune response. Virus-like particles (VLPs) are complexes of viral proteins that without being infectious are efficient in mimicking the natural viral structures. While presenting the patterns of viral antigens, the VLPs have been shown to efficiently interact with dendritic cells and be effective in triggering the B and T-cell immunity. HIV-1 Gag is one of the most highly conserved structural antigens and contains several immunodominant T- and B-cell epitopes. Mosaic Gag protein matches 74% of 9-amino-acid potential epitopes in global Gag sequences thus maximizing the coverage of potential T-cell epitopes for a viral population.

The current study aimed to develop probiotic strains of *Lactobacillus plantarum* NC8 and *E. coli* Nissle 1917 that produced recombinant mosaic HIV-1 Gag protein as VLPs.

For the transient expression of the mosaic HIV-1 Gag protein (GagM), the gene-carrying expression vectors were transformed into the *L. plantarum* and in probiotic *E.coli* Nissle 1917. Protein expression of the GagM was shown to lead to the formation of the VLPs of the recombinant HIV-1 Gag proteins. This was confirmed through immunoblotting and transmission electron microscopy (TEM).

Our study shows that probiotic lactobacteria can be developed to express HIV-1 Gag VLPs, which may be used for VLP production and potentially for vaccine delivery. Further evaluation of the concept is merited.