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Filamentous bacteriophage: an old tool for a new nanovaccine.

Filamentous phages are not lytic bacteria viruses that infect almost Gram-negative bacteria. They are widely distributed in many habitats of the world, having a constant relationship with human beings. Over the past three decades, phage research has had a renewed interest and bacteriophages have been employed in a large numbers of applications including therapy of bacterial infections, analysis of ligand-receptor interactions, and gene delivery.
We have exploiting the phage display technology to design a phage-based vaccine that express antigenic determinants at high density on the coat surface, together with a scFv directed against the dendritic cell surface receptor DEC-205, to target bacteriophages specifically to dendritic cells. The administration of targeted bacteriophages displaying antigenic epitope induces strong CD8 + T-cell responses in absence of adjuvant coadministration, and is able to protect mice from tumor growth in a model of tumor-engrafted mice. In addition, we observed induction of proinflammatory cytokines and type I interferon by fdsc-aDEC, in a mechanism dependent by TLR9 and MYD88 molecules.
RNA-Sequencing (RNA-Seq) analysis demonstrate a significant gene modulation in dendritic cells pulsed with targeted bacteriophages, indicating that filamentous bacteriophages activate many pathways linked to innate immunity. All these features make the phage a valuable tool to be used as a platform for antigen delivery in order to construct a vaccine that is able to activate and sustain a long-lasting adaptive immune response.

Key publications:

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