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A single dose of HIV DNA vaccine induces long lasting potent HIV-specific T cell responses in Rhesus macaques

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Background

Use of HIV DNA vaccines in rodents revealed enthusiastic strong and long lasting immune responses (IR) specific to all expressed HIV antigens. However, "le désarroi" began when these constructs were used in human and non-human primates and their immunogenicity was found to be very weak. To face this désarroi, HIV DNA immunizations were rapidly associated with heterologous boosts with recombinant viruses and purified proteins. However, efforts in many labs were pursued to develop strategies that increase the immunogenicity of these vaccines. Among these strategies we have chosen to transpose as close as possible in Rhesus Macaques, the conditions of immunization we used in mice [1,2].

Materials and methods

We used a single high dose of our $\Delta 4SHIV_{KU2}$ DNA vaccine to immunize 5 Rhesus monkeys and performed a longitudinal analysis of induced IR using multi-parametric flow cytometry based assays.

Results

Interestingly, our data showed that all 5 macaques developed long-lasting, potent T cell immune responses in their peripheral blood cells (PBMC). A peak of primary responses was observed during the 4 weeks post-immunization, and then the response underwent a contraction phase and later reemerged in absence of any boost. The great majority of vaccine-specific $CD4^+$and $CD8^+$T cells did not produce IFN-γ but showed high Ag-specific proliferation capacities. In addition, proliferative $CD8^+$T cells expressed the lytic Granzyme B. In contrast however, no antibody response specific to any HIV antigen was detected. By examining the safety issues we found that this vaccination strategy was not associated with detectable proviral integration in the PBMC of immunized animals and no autoantibody to DNA was detected in sera of these animals.

Conclusion

Altogether, this first comprehensive analysis with an HIV DNA vaccine alone given in a single shot demonstrated for the first time the capacity of this strategy to induce potent, long-lasting and polyfunctional T cell responses specific to HIV antigens in NHP.

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