Development of Respiratory Syncytial Virus Vaccine Using HBc Virus-like Particles to Induce Mucosal Immunity

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Background/Objective

Respiratory Syncytial Virus (RSV) is recognized as one of the most important viral pathogens leading to severe lower respiratory tract diseases and it causes an estimated 33.8 million RSV infections, resulting in 160,000 to 199,000 deaths per year worldwide. Currently there is no safe vaccine in clinical use. One of the most important factors for the development of RSV vaccine is the induction of TH1-biased immune response.

Method

Using optimal codons for Escherichia coli expression, we have successfully construct and express HBc virus-like particles (VLPs) and heptad region of RSV F protein containing antigenic site Ø, 2 and 4 (HRA). Intranasal immunization has been applied in C57BL/6 mice to test the immunity of the vaccine candidates. In order to enhance the immunity of the vaccine candidates, adjuvants such as CpG and poly I:C have been investigated.

Result

HBc VLPs mix with HRA is able to induce significant higher serum total IgG and IgG2a against FIRSV or HRA. Using CpG and poly I:C as mucosal adjuvants can enhance both systemic antibodies secretion (serum total IgG and IgG2a) and local mucosal antibodies generation (sIgA in lung washes). Splenocytes from sacrificed mice of vaccine groups can be re-stimulated with HRA, site Ø, 2 or 4 and secreted significant higher level of IFN-γ into culture supernatant.

Conclusion

Our results showed that intranasal immunization with HBc VLPs/HRA mixtures is able to induce both systemic and local immunity and this immune response is Th1 biased.