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Needle-free jet injection of a mixture of Japanese encephalitis DNA and protein vaccines: a strategy to effectively enhance immunogenicity of the DNA vaccine in a murine model.

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Abstract

Combined immunization with gene-based and protein-based vaccines can increase vaccine effectiveness. We previously demonstrated, using a murine model for Japanese encephalitis (JE), that simultaneous immunization with a DNA vaccine (pcJEME) by the intramuscular route and a protein vaccine consisting of subviral extracellular particles (EPs) by the subcutaneous route provided a synergistic increase in immunogenicities of these vaccines. Here, we investigated a novel immunization protocol consisting of a single inoculation with a mixture of DNA and protein vaccines using a needle-free jet injector. Immunization of ddY mice with 1 microg of pcJEME mixed with 1 microg of EPs or a 1/100 dose of commercial inactivated JE vaccine (JEVAX) induced neutralizing antibody titers of 1:40 to 1:80 (90% plaque reduction) 6 weeks after immunization, whereas immunization with DNA or protein alone only induced low titers (< or =1:10). Co-immunization with pcDNA3, a CpGcontaining vector of the vaccine plasmid, increased immunogenicity of JEVAX to some extent. IgG1/IgG2a isotype profiles supported increased production of EPs in pcJEME-inoculated mice by needle-free injection and an adjuvant effect of the vector on immunogenicity of JEVAX.

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