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A patient friendly nano vaccine: Exploring noninvasive delivery of influenza a nano vaccine

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Seasonal influenza, a respiratory virus prone to frequent mutations, primarily spreads through the mucosal route. Enhancing the immune response at the point of entry could be advantageous. To address this, our study delved into the immunogenicity of an adjuvanted microparticulate vaccine. We also explored a noninvasive mucosal delivery system via the intranasal route.

In our investigation, we encapsulated vaccine antigens for Influenza A H1N1 virus (i-Influenza A H1N1) and Influenza A H3N2 virus (i-Influenza A H3N2) within a biodegradable Poly (Lactic- co-glycolic acid) (PLGA) polymeric matrix. We prepared PLGA microparticles (MPs) through a double emulsion (w/o/w) technique, followed by lyophilization and comprehensive

Characterization before intranasal delivery. These adjuvanted vaccines were administered to mice for one prime (w0) and one boost (w3) through the intranasal route to evaluate *in vivo* vaccine efficacy.

Notably, following *in vivo* immunization, we observed a substantial increase ($p \leq 0.0001$) in both Influenza A H1N1 and Influenza A H3N2 specific serum IgG and IgA levels compared to the No treatment group. IgG subtype analysis revealed significantly elevated levels of serum IgG1 (Th- 2/antibody-mediated response) and IgG2a (Th-1/cytotoxic-mediated response) antibodies for both strains ($p \leq 0.01$). Additionally, noteworthy levels of antibodies (IgG and IgA) were found in the lungs, indicating mucosal immunity ($p \leq 0.0001$).

In conclusion, the *in vivo* assessment demonstrated that intranasal immunization stimulated the production of antigen-specific antibodies. Our future endeavors involve evaluating lung viral titers and cellular immune responses. Overall, intranasal immunization exhibits promising potential for revolutionary advancements in Nano vaccine development.