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Editorial Note on Nanoparticles

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EDITORIAL NOTE

Vaccination, a process of introducing foreign antigenic material(s) in order to activate a host immune system, has been a key strategy to control diseases and improve quality of life in humans and animals. Despite the presence of some successful vaccines, many novel and modified diseases including Ebola virus disease, Zika virus disease, coronavirus diseases [middle eastern respiratory syndrome coronavirus (MERS-CoV), severe acute respiratory syndrome coronavirus (SARS-CoV), and 2019 novel coronavirus (2019-nCoV)], dengue fever, Marburg disease, malaria, and tuberculosis are in need of effective vaccines together with qualified adjuvants. While traditional adjuvants such as alum have been exclusively employed clinically to promote humoral responses, recent developments in adjuvant research have identified molecules, which are pathogen-associated molecular patterns, a few chemical compounds, and agonists of toll-like receptors, all of which induce strong immune responses.

With great advancements in the area of material science, a new era of innovative strategies for vaccine design has arrived, enabling the precise delivery of vaccines, the enhanced role of vaccine adjuvants, an increase in the sparing effect, better stabilization, and slow release at the induction site. Nanomaterials that modified to trigger antigen-specific immune responses could be categorized into liposomes and lipid-based nanoparticles, polymeric nanoparticles, gold nanoparticles, inorganic nanoparticles, virus-like particles, self-assembled proteins, and carbonbased nanoparticles.

As vaccine development pushes toward less immunogenic components such as nucleotide- based, peptidebased or sub-unit vaccines because of their side effects and the life-threatening risks of live attenuated vaccines, strategies to boost both innate and adaptive immune responses are increasingly needed.