Editorial

# Nanotechnology Against Coronavirus

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This editorial provides a summary of the nanotechnology against the novel coronavirus disease 2019 (COVID-19).

Nanotechnology has received a lot of attention in medical fields. Nanomaterials are a powerful tool for coronavirus vaccine and therapeutics advance. These materials play a major role in all aspects of drug delivery, vaccine design, and gene editing. Since the appearance of COVID-19, several nanotechnology researches works have been developed to find a vaccine for the treatment of coronavirus. Thus, nanoparticles (NPs), enables the development of next-generation designer vaccine technologies, can react as transporters for antigens delivery. NPS and viruses operate on the same scale (nanoscale).

The use of the nanostructured materials for coronavirus vaccines should take into account the type of nanoparticle: charge, specific surface area, and crystallite size. However, a liposome nanoparticle-based mRNA vaccine, approved by clinical trial, demonstrated its ability to prevent coronavirus disease.

The biotechnology company Ufovax has successfully extended its patented one component self-assembling protein nanoparticles (1c-SApNP) vaccine platform technology with enhanced manufacturability. This platform offers universal, workable, and best solution to prophylactic and therapeutic vaccines. It also offers a great opportunity in modern vaccine design. Besides, a nanotechnology platform involving liposomes, dendrimers, cationic nano-emulsions, and polysaccharide particles is used for enhancing the delivery and stability of vaccines.

The nanoparticles vaccine composed of virus-like particles (VLPs) fabricated from identical proteins, which are produced via the introduction of a single plasmid encoding the relevant gene into a C1 or CHO host cell accompanied by expression and purification.

In this context, Zhu and his team employed the nanoparticle platform to produce a vaccine against SARS-CoV-2. The group worked to improve the structure-based design of nanoparticles.

The nanoparticle vaccine can activate immune system cells to produce antibodies, which deactivate the coronavirus. Thus, nanoparticles showed their aptitude to target innate and adaptive immune systems at the cellular level.

Moreover, in clinical trials, just a few drugs have shown efficacy against coronavirus. Several nano-diagnostic tests for COVID-19 are currently developed including nano sensors involving carbon nanotubes (CNTs), quantum dots (QDs), iron oxide nanoparticles (IONPs), and gold nanoparticles (AuNPs). Similarly, IIT Madras created a nanotech coating used for textiles that can deactivate the coronavirus within a time of 5 min of contact.

Nanotechnology is an easy, fast, and cost-effective manufacturing process that can be applied to a wide range of vaccine products. Several peptide-based vaccines and peptide nanoparticles targeting chronic diseases are in the phase of clinical testing and development. The recent advances of nanotechnology in fighting COVID-19 contribute to the development of innovative vaccines.

Tackling any new version of coronavirus that emerges in the future is very easy due to some conservation between the advancement of research, the processes development, and the coronavirus. Information linked through the morphology of coronavirus, immunological response, and pathophysiology is required for nanotechnology researchers.

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