

## **THE COVID NANOVACCINES**

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A true and unprecedented pharmaceutical triumph, the rapid development and deployment of Covid-19 vaccines is providing extraordinary benefits in the fight against the current pandemic, and arguably saving millions of lives. The leading vaccines employ a novel mRNA-based immunization strategy, which may open new horizons not only against infectious diseases, but also in cancer and other currently unsolved pathologies. The major factors that enabled the rapid success in the development and large-scale utilization of the Covid-19 vaccines were: 1) The readiness level of the required science and technological platforms, which were essentially ready-to-go at the beginning of the pandemic; and 2) The prompt dedication of massive resources by the US Government, that allowed for these platforms to be turned into actual products and clinical realities. One key platform, without which these mRNA vaccines would not exist, is the use of nanoparticles for the envelopment of the mRNA molecules, and their safe vectoring within the body. Without nanoparticle encapsulation, the mRNA would be readily destroyed by resident nucleases in the body, and yield no immunization benefit. Nanoparticle technologies for medical applications emerged in the early 1990's, and benefited from pre-scient work in liposomes and colloidal chemistry, which in themselves gave rise to the several innovation drugs that entered the clinic in oncology and other fields of medicine, benefiting millions of patients worldwide. Many other nanomedical platforms have since emerged and have been utilized as essential components of innovative drugs. In this presentation, the history of nanomedicine will be briefly reviewed, the application of nanotechnology platforms in RNA-based vaccines and drug will be summarized, and some future directions for the synergy between RNA therapeutics and vaccines will be discussed.