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Nanoparticles: The next generation delivery vehicle for DNA vaccines

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Abstract

Vaccination have led to eradication of those diseases which had once claimed millions of lives worldwide; however, it is accompanied with number of dis-advantages especially safety issues until the entry of DNA vaccines. The DNA vaccines have been emerged as best remedy for problematic diseases being capable of producing humoral and cellular immune responses as well as the safest vaccines so far. However, the magnitude of immune responses produced in primates is lower than that in experimental animals. There are several reasons are described theoretically for this limited efficacy and a number of novel approaches have been applied to boost their immune responses e.g. use of more efficient promoters and codon optimization, addition of traditional or genetic adjuvants, electroporation, intradermal delivery and various prime-boost strategies. One of these strategies is controlled antigen administration of plasmid DNA through microspheres and nanoparticles. This approach is accompanied with a number of advantages to overcome the limitations of traditional delivery systems in terms of stability, solubility and pharmacology. Furthermore, the surface structure of a virus highly resembles with a nanoparticle because of their geometrical regularities and nano-scale dimensions, therefore, the engineering of nanoparticles are based upon principles of natural virus attack which will be best tool for vaccine. There is evidence that these immune responses can be augmented by properly structured nano-sized particles (nanoparticles) that may avoid DNA degradation and facilitate targeted delivery to antigen presenting cells. Adsorption, formulation or encapsulation with particles has been found to stabilize DNA formulations. The use of nanoparticles for DNA vaccine delivery is a platform technology and has been applied for delivery of a variety of existing and potential vaccines successfully.

Biography

Dr. Muhammad Ali A. shah completed his PhD from Nanjing Agricultural University, China in 2009 with specialization in field of DNA vaccines. There are almost approximately 20 publications at his credit, which have been cited in more than 1,00 publications by other research groups throughout the world. He has co-authored one book as well. He has worked as Assistant professor and Associate professor in different universities of Pakistan where he has been involved in various teaching, research and administrative activities. Currently he is pursuing his Post-Doctoral studies in Biomedical Engineering at School of Biological Sciences & Medical Engineering, Southeast University, China. His research interests include immuno-therapeutics especially DNA vaccination and Nano vaccines against Infectious agents.