Opinion

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Brief note on promising clinical applications of nanosized-immunomodulators

Abstract

Nanotechnology based techniques have been used extensively exploited for finding solutions for achieving conventional delivery of nanosized immunomodulators administered via oral, intravenous or inhalation route to treat lung diseases and cancers for the sustained and controlled release of different type of chemically entrapped peptides, nucleic acids as well as drugs to the targeted site with their improved efficacy. As well as, proposed nanosized drug delivery procedures are also found to suitable for enhancing cellular and humoral immune responses via their respective uptake by the mucosa as well as gut associated lymphoid tissue and the phagocytic cells when encounter with any foreign chemical or biological compounds called antigen. Hence, nanosized immunomodulators are found to have greater surface-volume ratio and variable surfaces for specific delivering of the immunomodulators to specific cells when opted for oral, intravenous and inhaled immunotherapies and carried out for sustained immunostimulations with their respective advantages and other associated limitations.

Keywords: immunostimulations, immunomodulators, nanosized drugs

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Introduction

In advanced biomedical research and innovations, highly specific targeted based treatments have been considered the major challenge for multifaceted regulatory concern for various immune processes. Hence, nanotechnology is found to considered most promising alternative to carry out delivery of chemically modified or biochemically modified components as immunomodulators immunomodulatory molecules via enhancing their shelf lives, effective sustained release and further their nontoxic biodegradation.[1–3] Nanosized-immunomodulatory components/molecules are found to have enhanced bioavailability when studied in *in-vivo* stability against enzyme degradation and serum inactivation.[4] Administrations of nanosized liposomes having entrapped immunomodulators named, cytokines like IFN- α, IFN-g, TNF-α or IL-2 increase the plasma absorption period for the payload delivery of loaded molecules which encourages the preferred retention and accumulation of immunomodulators at the sites of tumors to enhance permeability and retention effect. These kinds of specific cytokines and growth factors works as mixture of immune stimulants to boost immune cell functions while delivered with the assistance of nanoengineered particles which prepared by advanced genome editing and biochemical modification that can be employed for delivery of nucleic acids like siRNA to repair specific disease associated genes *in vivo*.[5,6] A previous finding based on delivery of nanodiscs loaded with immunogenic cell death (ICD)-inducing agent have been found to have improved pharmacokinetic characteristics and associated with upregulation of unexpected immunostimulatory signals of certain pathological conditions due to persisting tumors and potent T cell responses against tumor-associated antigens.[7] Poly (lactic-co-glycolic acid) (PLGA) is considered the most effective biodegradable polymeric nanoparticles and has been approved by the Food Drug Administration; US for safe drug delivery systems of loaded drugs due to having controlled and sustained- release, low toxicity, and biocompatibility while chosen for administration in patients for the treatment of diseases/illness. PLGA based nanoparticles using TLR 4/7/8 ligands as immunoadjuvants with SIVsmE660 was proposed for intravaginal administration in designed clinical trials which was showed improved defense mechanism in selected primates.[8] In previous report, promising nasal delivery of vaccines called inhaled/nasal vaccines was proposed having high efficacy which composed of naked plasmid-DNA that prepared by using polymeric nanocarriers.[9] Advanced/novel delivery nano-vehicles are also proposed called, chitosan-based nanocarriers for enhancing the immunogenicity by mucosal delivery of pneumococcal DNA vaccines which was showed improved mucosal, systemic, and cellular immune responses in chosen the immunized mice groups for clinical trials protocols.[10] Hence, in last two decades, immunomodulators loaded nanosized vehicles or carriers may found to have most promising clinical prospective or biomedical strategies of various future immunotherapeutic practices for eliciting body immune system or activating disease tolerance against threatening pathological diseases like HIV, tuberculosis, type-1 diabetes or multiple sclerosis and rheumatoid arthritis.

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Conflicts of interest

The author declares that there is no conflict of interest.

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