RNA Vaccine

The Future of Medical Science and Vaccinology

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Introduction

An attractive approach to vaccination is presented by nucleic acid vaccines. These vaccines based on DNA or RNA encoded with specific antigen and generally regarded as safe, effective which can mimic live infection with low rise of reversion to virulence. RNA vaccines generally elicit humoral as well as cellular immune response. Personalized medicine is the new paradigm of medical science for targeting specific characteristics of each individual by using their genetic profile to identify particular nature of the medical condition and design a unique treatment for each patient. Cancer immunotherapy stimulates a host antitumor immune response which can able to lead tumor shrinkage for the improvement of clinical outcomes in cancer patients. Eradication of the large tumor by active immunotherapy is the biggest challenge, to overcome this challenge combination therapy of mRNA vaccine with radiation can be effective. mRNA as a vaccine have many advantages including large scale production under GMP conditions is comparatively easy and robust, that's why inexpensive in contrast to the other biopharmaceuticals. The tumor antigens are recognizing by the immune system and this is the basis for cancer immunotherapy development.

Designing of Cancer Vaccine

There are few things which are important for designing cancer vaccine:

1: The Right Antigen: Antigens which can be used to design cancer vaccines should preferably be the molecules that are altered among the normal cells and tumor cells to ensure that the immune response generation by vaccination will be able to target for destruction of tumor cells expressing the particular antigen dissimilar between normal cells and cancer cells.

2: The Right Adjuvant: Adjuvants are the diverse molecules which can activate antigen presenting cells for the stimulation of strong and vigorous cellular immune response.

3: The Right Immune Response: An operative vaccine must be able to produce and tolerate a powerful immune response which can safeguard eradication and prevent recurrence of existing tumors.

RNA Vaccine Technology

1) A person having disease. 2) Mutated DNA responsible for disease. 3) Isolated functional RNA from mutated gene. 4) RNA is injected in the body. This functional RNA encodes disease causing protein in the person's body known as an antigen, a pathogenic protein. This will stimulate the immune system. Inside the cells, the functional RNA translated into the active antigen, which will expressed on the surface of cells. 5) An antigen presenting cells express the active antigen to immune cells using signals. 6) Immune T-cells recognize the antigen and elicit an immune response (Cell Mediated Immunity). 7) B-cell response (Humoral Immunity). 8) Memory cells generated. 9) Person acquired the immunity against the coded antigen responsible for specific disease.

Personalized Medicine

Applications

Importance

mRNA Vaccine - An Inexpensive Biopharmaceutical

mRNA vaccines are generally safe, inexpensive with maximum flexibility having self-adjuvanting property including MHC haplotype restriction, direct entry only in cytoplasm for expression without integration into the genome. For the transcription of the functional mRNA as vaccine, cytoplasmic stability is important which can achieve by cap and poly-A tail modification. Because eukaryotic mRNA is basically composed of coding region which is flanked by 5' and 3' untranslated region (UTR), 5' 7-methylguanosine triphosphate cap and 3' poly A tail. Vaccination by using mRNA molecules which encode specific target antigen can induces an immune response after the presentation by antigen presenting cells.

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