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Gene Technology

Editorial

DNA Vaccine

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ABSTRACT

DNA vaccination is a technique in development that could protect against disease by injection with genetically engineered plasmid containing the DNA sequence encoding the antigen(s) against which an immune response is sought, so cells directly produce the antigen, causing a protective immunological response.

Keywords: DNA,Vaccine, Disease, immune response.

INTRODUCTION

It was discovered almost 20 years ago that plasmid DNA, when injected into the skin or muscle of mice, could induce immune responses to encoded antigens. Since that time, there has since been much progress in understanding the basic biology behind this deceptively simple vaccine platform and much technological advancement to enhance immune potency. Among these advancements are improved formulations and improved physical methods of delivery, which increase the uptake of vaccine plasmids by cells; optimization of vaccine vectors and encoded antigens; and the development of novel formulations and adjuvants to augment and direct the host immune response. The ability of the current, or second-generation, DNA vaccines to induce more-potent cellular and humoral responses opens up this platform to be examined in both preventative and therapeutic arenas. This review focuses on these advances and discusses both preventive and immunotherapeutic clinical applications.

How DNA vaccine produced: The construction of bacterial plasmids with vaccine inserts is accomplished using recombinant DNA technology. Once constructed, the vaccine plasmid is transformed into bacteria, where bacterial growth produces multiple plasmid copies.

Steps involved in preparation and application of DNA Vaccine:

Step 1: Selection of antigen sequence

Step 2: Isolation of selected antigen

Step 3: Cloning of vaccine antigen in plasmid

Step 4: Transformation and culture

Step 5: Plasmid purification,

Step 6: Formulations with adjuvants

Step 7: Vaccination/ Animal Experiments,

Step 8: Measurement of immune responses.

MECHANISM of DNA VACCINE

DNA vaccination is an interesting method of immunisation for its ability to induce CTL strong responses, and it also can activate other immune systems. The DNA vaccine achieves this goal by mimicking natural viral infections. The expression of foreign genes transmitted to an in vivo (such as the body of the mouse) results in the production of proteins, these proteins, such as proteins produced by viral genes, are processed and delivered to the immune system. The ultimate outcome of DNA vaccination is the production of non-living, non-proliferating and non-inflammatory antigens that not only stimulate the immunity of TCD8+ and TCD4+ cells, but also stimulate immune B cells. Details of the mechanisms of each DNA components of the vaccine are still being investigated and are still is not fully understood. Somatic cells (myocyte or keratinocyte) and antigen-presenting progenitor cells are two major types of cells that are at the onset of the immune response generated by the DNA vaccine.

USES of DNA VACCINE:

- DNA vaccines against cancer
- DNA vaccines against tuberculosis
- DNA vaccines against Edwardsiella tarda
- DNA vaccines against HIV
- DNA vaccines against anthrax
- DNA vaccines against influenza
- DNA vaccine and malaria

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- DNA vaccine against dengue

Is DNA VACCINE SAFE or Not?

Despite initial concerns that they might integrate into patients' genomes, DNA vaccines have proven remarkably safe; for instance, making them ideal in cancer immunotherapy or for vaccinating people with weakened immune systems.

ADVANTAGES of DNA VACCINES

They can be made in a short time span: It is easier to make large amounts of a gene than make proteins or grow up bacteria or viruses. Speed is important when making a vaccine to strains of bacteria or virus that are constantly mutating and changing.

DNA vaccines are easy to transport and store: DNA is a very stable molecule and does not need to be stored at low temperatures making transportation and storage cheaper and easier than conventional vaccines.

There is no risk to those who are making the vaccine: Some conventional vaccines require growing up the infectious bacteria or virus – and this carries a risk (all be it very small) to those who work making vaccine.

DISADVANTAGES of DNA VACCINE

- Limited to protein immunogens.
- Risk of affecting genes controlling cell growth.
- Possibility of inducing antibody production against DNA.
- Possibility of tolerance to the antigen (protein) produced.

Potential for atypical processing of bacterial and parasite proteins