

Cancer Vaccines: Another Tool to Treat Cancer

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Vaccines are a boon to humanity, for treating various diseases. Take, for instance, the case of polio. WHO (World Health Organization) and a number of physicians brought the incidence of polio to 1/10th, which saved several millions of handicapped persons. Similarly, vaccines can also be used to treat cancer, the emperor of all diseases. Considering that cancer is not a single disease, but a bunch of a number of diseases, there is a need for several modalities of treatment. We have the surgery, radiation, and chemotherapy as main modalities. There are also hormone therapy and other. Cancer vaccines could be added to the list of cancer treatments and are gaining momentum. The two FDA (Food and Drug Administration) approved prophylactic vaccines are: one for hepatitis B virus for liver cancer and the other for human papillomavirus (HPV), accounting for about 70% of cervical cancers. Vaccination against HPV has further driven the incidence lower and has been successful in many countries. It has saved 10s of thousands of young women from the suffering and horrible effects of cervical cancer. Similar decline is also seen for liver and colon cancers.

In addition to cancer prevention vaccines given to healthy individuals, there are also cancer treatment vaccines that are administered to cancer patients to eradicate cancer cells by strengthening the immune system [1]. There are various types of cancer vaccines: tumor cell vaccines, DC vaccines, protein/peptide-based cancer vaccines, genetic vaccines. Tumor cell vaccines include autologous tumor cell vaccines and allogenic tumor cell vaccines. Genetic vaccines include DNA vaccines, RNA vaccines, viral-based vaccines.

More than 0.5million (approximately one per minute) American men and women died of cancer in 2005, and it is only increasing. We need more tools in the arsenal of treatment for cancer. Cancer vaccines could be a potential promising modality. These vaccines could be uploaded using electrical pulses, which enhance their uptake by opening pores in the cellular membranes, which are in general

impermeant or poorly permeant to many drugs. In a DNA vaccine treatment [2], administering two pulse parameters, a) one 1200V/cm, 100 ms pulse and b) eight, 120V/cm, 20 ms pulses, 50 ug plasmid DNA in 50 uL sterile phosphate buffer saline (PBS), was injected into male C57 BL/6 mice with prostate cancer. Cliniporator (IGEA, Modena, Italy) and 4 mm gap electrodes were used for this purpose. The results indicated that DNA plasmid electroporation vaccine strategy can effectively activate tumor specific immune responses. *In-vivo* electroporation-mediated cancer vaccination is a safe and effective modality for treating prostate cancer and has the potential to be used as a neo-adjuvant or adjuvant therapy. It is also reported that we can use electrical pulses as a vaccine delivery system and a natural adjuvant to intradermal administration of plasmid DNA. Reports also have indicated that using electroporation, it is possible to facilitate DNA vaccination that enhances the production of vaccine antigen in mice and larger models [3].

Cancer vaccines could be considered as a modality in the future of medicine. It is possible to monitor, improve, and transform clinical performance using know-how already in existence, such as electroporation-mediated cancer vaccine therapies. This way, we can effectively use the existing abilities we got already. Of course, like any other therapy, cancer vaccine therapy will also have side effects and has to be proven for more applications. Various clinical trials attest to its promising future.

References

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Received April 07, 2018; Accepted April 09, 2018; Published April 13, 2018

Citation: Sundararajan R (2018) Cancer Vaccines: Another Tool to Treat Cancer. *J Nanomedine Biotherapeutic Discov* 8: e149. doi: [10.4172/2155-983X.1000e149](https://doi.org/10.4172/2155-983X.1000e149)

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