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Editorial Open Access

Alternative Vaccine Strategies for Cervical Cancer

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Editorial

Cervical cancer, caused by Human Papillomavirus (HPV) is the third largest cause of female mortality over the world with an estimated 500,000 cases and 270,000 deaths annually [1]. Nevertheless there are only two vaccines are available in the world market to protect cervical cancer. Gardasil® (Merck, USA)) and Cervarix® (GlaxoSmithKline, UK) are both Virus Like Particle (VLP) based vaccines and administered intravenously in liquid form along with other adjuvants such as aluminum hydroxyphosphatesulfate, sodium chloride, polysorbate 80 etc [2]. When launched onto the market in 2007 and 2010, the vaccines Cervarix and Gardsil were considered as highly effective and complete safe vaccines. However, the cost of the vaccine itself, the expensive storage system, need for an expert to administer the vaccines tremendously inhibits the mass use of the vaccines globally. Also the antigens in the vaccines are Virus-Like Particles (VLPs), which are grown in the insect (Gardasil) or yeast cells (Cervarix) from the DNA obtained from Human Papillomavirus [2,3]. Growing VLPs is a complicated process and requires special research facilities where virus can be handled with highest safety. Unfortunately most of the resource poor countries where cervical cancer mostly prevails are unable to afford the huge burden of cutting edge technology and conduct sophisticated research. Therefore finding an alternative option to VLP based vaccine is becoming an important research challenge. More importantly, recent controversy over the side effects of both vaccines also calls for a demand to develop an alternative vaccine formulation which will be able to address all the above mentioned issues.

Human Papillomavirus (HPV) vaccines can also be formulated using bacteria, peptides, DNA as antigen. Peptides can be a suitable antigen for HPV vaccines. Peptides, obtaining from Human Papillomavirus (HPV) E6 and E7 oncogenes can be an effective antigen to develop a therapeutic vaccine for HPV induced cancers. These peptide sequences derived from the oncogenic E6 and E7 viral proteins have been shown to represent suitable Tumor Associated Antigens (TAAs) for cervical cancer and considered as ideal candidates for developing therapeutic vaccines [4-6]. Besides the oncogenic peptides, synthetic peptides representing these TAAs also have been tested in numerous ways in human patients and mouse cancer models and have been found to generate anti-tumor T cell responses capable of exhibiting anti-tumor effects [7-9]. A new synthetic peptide vaccination strategy called TriVax has been developed recently [10]. It has been found to be effective in generating vast numbers of antigen-specific T cells. This vaccine consists of synthetic peptide corresponding to the minimal T cell epitope and showed persistent T cell responses that were therapeutically effective against established HPV16-E7 expressing tumors. Another synthetic long peptide (SLP) derived from HPV16 E6 and E7 oncoproteins has been developed to be used for therapeutic purpose [11]. This is a nano-particle based formulation, which is prepared by double emulsion solvent evaporation technique and loaded with a Synthetic Long Peptide (SLP) and a Toll like Receptor 3 (TLR3) ligand (poly IC).

DNA vaccine can be another alternative to fight HPV infection as this has been emerged as an attractive approach for antigenspecific T cell-mediated immunotherapy to combat cancers. DNA vaccine can be effectively used against cervical cancer. The goal of DNA based vaccine is to generate strong E6/E7-specific T cell mediated immune responses. Intradermal administration of DNA vaccines via a gene gun represents an efficient way to deliver DNA vaccines into professional antigen-presenting cells in vivo. Professional antigen-presenting cells, such as dendritic cells, are the most effective cells for priming antigen-specific T cells. Using the gene gun delivery system, it has been tested several DNA vaccines that employ intracellular targeting strategies for enhancing MHC class I and class II presentation of encoded model antigen HPV-16 E7 and the results shows that this type of vaccine can also be effectively used against HPV infection [12].

A live bacterial-based HPV vaccine can also be an alternative which is comparatively inexpensive. The potential value of live attenuated Shigella flexneri 2a sc602 strain-based HPV16L1 as a high-efficiency, low-cost HPV16L1 mucosal vaccine has been evaluated [13]. The study proves that sc602/L1 bacteria based vaccine may have significant protective effect on HPV infection.

The current vaccines are virus-like particle (VLP) based and for prophylactic use only. However, by using different antigens such as oncogenic peptide, synthetic peptide, DNA, bacteria it is possible to develop an efficient prophylactic and/or therapeutic vaccines which will be able to address all the issues associated with current vaccines.

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