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[Cancer and Vaccines]

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Abstract

There has been an ongoing war between cancer cells and the human immune system, because of this there is now an emergence with cancer immunotherapy. Vaccines are an important thing to the human population and in the health world. They are used to prevent diseases and lessen the symptoms of the disease. So, is there a vaccine that can prevent cancer? A vaccine for cancer would be life changing for millions of people around the world, it would solve one of the most important health problems in the world. There is also some clinical research going on with cancer vaccines and their therapeutic effectiveness.

Introduction

As I stated before in my abstract vaccines are a very important thing in the medical world. One of the diseases that has not had a vaccine to prevent is cancer, and that is because it is such a complicated disease. Cancer cells are smart they adapt, mutate, and each tumor cell is unique in its own way which is why cancer has not been cured. Another reason is because our bodies recognize bacteria and viruses as something foreign in our body. However, with the cancer cells they closely resemble the cells in our body. While yes there are vaccines for Hepatitis B which can cause HBVF related liver cancer, there is no vaccine that will prevent all cancers. They are unfortunately not enough to beat the disease there are just ways to prevent diseases that could later on cause cancer, but not prevent the cancer itself. In the article it says, “Ideal cancer vaccines could overcome the immune suppression in tumor immunity and cellular” (Liu et al., 2022). However, it is hard to have an “ideal vaccine” because an “ideal vaccine” can differ from one cancer patient to the other cancer patient because antigen selection is an important part of the cancer vaccine design. Antigen-presenting cells (APCs) are also important in the immune activation induced by the tumor antigens, which that helps the anti-tumor immunity which is what the vaccine is trying to achieve. The resistance to cancer vaccines comes from intrinsic factors, mutations in pathways, downregulation, and lost tumor antigen expression. All of this could result in defective recognition of tumor cells by T cells. While there is intrinsic resistance there is also extrinsic resistance which “may be caused by immunosuppressive cells in the immune microenvironment, including myeloid-derived suppressor cells (MDSCs), tumor associated macrophages (TAMs), T regulatory cells (Tregs), protumor N2 neutrophils, and cancer-associated fibroblasts (CAFs) (Liu et al., 2022).

Intrinsic resistance is when a bacterial species is naturally resistant to a certain antibiotic or family of the antibiotic without the need for mutation or gain of further genes. Extrinsic resistance is bacteria acquire resistance gene from other bacteria which have already resistance for the harsh environment conditions.

Recent Progress

Vaccines have been around since the 1800 hundreds, but research for cancer vaccines did not start to develop until almost two hundred years later. The first cancer vaccine was based on tumor cells, and it was developed in the 1980's. What scientists did is they used tumor cells from the individual with the disease to treat the colon cancer. Then in the 1990s a tumor antigen melanoma associated antigen was identified, this had opened a door to use tumor antigens in the cancer vaccines. Another recent progress is back in 1990 the Bacillus Calmette-Guerin (BCG) which is a tuberculosis vaccine that acts as a general immune stimulant, and it became the first immunotherapy of any type approved by the FDA" (Dunn, 2023). It is now still used for the treatment of early-stage bladder cancer. Then a study in 2010 found that "dendritic cell-based vaccine (Sipuleucel-T) was successfully used to treat prostate cancer, proving the viability of cancer vaccines and creating great excitement in the cancer vaccines field" (Liu et al., 2022). This happens because sometimes the targets on patients' tumors are normal proteins that are being abnormally produced such as the prostatic acid phosphatase (PAP), which is over expressed by prostate cancer cells, which then lead to the 2010 vaccine. Fortunately, due to technology and the progression of cancer research, doctors can now identify targets on patients' tumors that can help distinguish cancer cells from their normal cells. Furthermore Covid-19 is a tragic thing that happened to the world however the outbreak urged the development of vaccine technology which brought cancer vaccines back into the public focus. Cancer vaccines use TAAs and TSAs which are tumor-associated antigens and tumor-specific antigens .They use the TAAs and TSAs to activate the patient's immune system. Since cancer is such a complicated disease more advanced approaches have to go to develop the vaccine.

Discussion

Based off of the information that I read between the two articles I think that the information is valid. Not only because they had their sources at the end of the paper, but because some things such as the 2010 vaccine lined up with both of the articles. These results do and do not answer the question of does cancer have a vaccine? In simple terms the answer is yes and no, the answer is unfortunately not as simple as yes or no. It is yes because the vaccines that prevent cervical cancer and head and neck cancer can be caused by human papillomavirus, or HPV and the HPV vaccine can prevent that. Whereas liver cancer can be caused by hepatitis B virus or HBV and the HBV vaccine can prevent that. There are vaccines that can prevent disease that cause cancer just as the ones listed above, but it doesn't necessarily stop cancer. Because someone can have the HPV vaccine but then later on get something such as lung cancer, so it can prevent some things but not everything. That is why the answer could be considered no, but the answer is also yes because there are "cancer vaccines" which are just used as immuno-therapeutics. What immunotherapy is it is the treatment of disease by activating or suppressing the immune system. Some people however may argue that this is not technically a cancer vaccine because it is aimed more towards the immune system. However, the question still remains somewhat unanswered is there a vaccine for cancer?

References

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