Tumor Treatment and Prevention with Cancer vaccines

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Perspective

Cancer immunotherapy refers to a variety of current and prospective treatment techniques for eradicating tumours by triggering antitumor immunity in the patient. Immune checkpoint blockade (ICB) therapies and chimeric antigen receptor (CAR)-engineered T-cell immunotherapies have been approved by the FDA, however they are not effective in all cancer patients. Cancer vaccines have not yet had the same clinical impact as other vaccines, but they have preventive and therapeutic potential, and they may give lifelong immunity against cancer recurrence, making them a possible component of future combinatorial immunotherapies.

Cancer vaccination is difficult due to a variety of obstacles, and two review papers in this Special Issue provide insight into a variety of immunological and technological issues. Because of the limited antigenicity of cancer cells, immune evasion pathways that block T-cell activation, suppress the TME, and others, differences in ideal effector mechanisms to resist microbial pathogenesis (often antibodies) and eliminate cancer (often cytotoxic CD8+ T-cells), and many other factors, developing prophylactic and therapeutic vaccines for cancer is far more difficult than developing vaccines for viral or bacterial diseases. Indeed, Sliker and Campbell talk about the issues posed by the constantly changing TME, as well as the downstream effects on the While cancer vaccines are more difficult to develop than vaccines for viruses, malignancies caused by viruses [hepatitis B virus (HBV) and human papillomavirus (HPV)] offer a great possibility for primary cancer prevention through viral-directed vaccines. FDA-approved vaccines have successfully prevented HBV and HPV infection, the leading viral drivers of hepatocellular and cervical cancer, respectively. Vaccines have the potential to confer lifelong immunity against infection, reducing the huge worldwide burden of these cancers. In immunosuppressed solid organ transplant recipients with post-transplant lymphoproliferative illness, a study by Ahmed et al. suggests that the Epstein–Barr virus (EBV) protein BZLF1 may be a good target for dendritic cell (DC)-based vaccines (PTLD). Despite the success of vaccinations in preventing viral infections, therapeutic vaccines targeting viral antigens for the treatment of malignancies of viral origin have had limited success. More research is needed to understand the cause mechanisms of these malignancies, which will aid in the creation of therapeutic vaccines for the treatment of these cancers at various stages of development, according to the researchers. While success in avoiding cancers caused by HBV and HPV has been achieved, population health measures are needed to enhance vaccination use in the United States and around the world and vaccine efforts for other cancer-causing diseases remain difficult. Cancer immunotherapy has given many a fresh lease on life. Cancer vaccines, while not yet widely successful, could be a valuable addition to oncologists' immunological toolkit.

The recent SARS-CoV-2 pandemic has reignited interest in vaccine development, which could have ramifications for cancer vaccine development. Vaccinations are an excellent way to avoid pathogen-related diseases in the long run, but developing therapeutic vaccines for existing tumours remains a difficulty. Because other types of immunotherapy, such as ICBs and adoptive T-cell treatments, aren't always beneficial in all patients, combining them with cancer vaccines could be a promising area for treatment and prevention of metastatic disease. Cancer vaccines that are prophylactic, therapeutic, and customised have a lot of promise, but there is still a lot of work to be done to reach that potential.