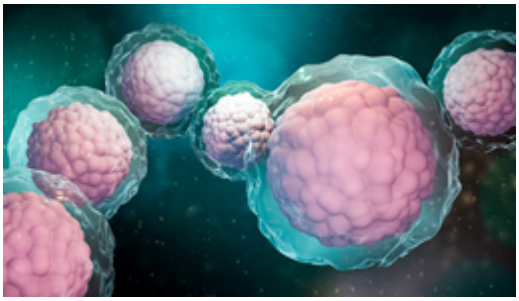
INNOVATION PARTNERSHIPS
UNIVERSITY OF MICHIGAN

Cancer Stem Cell Vaccination and Treatment

TECHNOLOGY NUMBER: 5486



Technology ID
5486

Category
Therapeutics and Vaccines
Life Sciences

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View online

OVERVIEW

Improved treatment from specific targeting of cancer stem cells (CSCs)

- Dendritic cell-based vaccine therapy
- Adoptive T cell transfer therapy

MODALITY

Cell-based immune therapies involving injectable dendritic cell vaccines and infusion of patient-specific cytotoxic T cells

INDICATION

Advanced or metastatic cancers (especially breast, pancreatic, colon, prostate, ovarian, lung, and brain tumors) with a focus on patients at risk of relapse due to CSC persistence

PUBLICATIONS

- "Cancer Stem Cell Vaccination With PD-L1 and CTLA-4 Blockades Enhances the Eradication of Melanoma Stem Cells in a Mouse Tumor Model"
- "Therapeutic Efficacy of Cancer Stem Cell Vaccines in the Adjuvant Setting"

INTELLECTUAL PROPERTY

- US10173074 "Cancer stem cell vaccination and treatment"
- EP2911748 "Cancer stem cell vaccination and treatment"
- CN104812446A "Cancer stem cell vaccination and treatment"

BACKGROUND

Cancer immunotherapy is designed to induce or augment the body's immune response such that the immune system will specifically target cancer cells for destruction. Approaches to induce an anti-tumor immune response can be divided into non-antigen specific and antigen-specific categories. Cancer immunotherapy using dendritic cells (DCs) has therapeutic efficacy in patients with advanced or metastatic disease, though only a fraction of treated patients show a sustained and significant response. Current approaches either use tumor-associated antigens (TAAs) or tumor extracts to generate DC vaccines or effector T cells used in adoptive transfer therapies.

However, most tumors show great heterogeneity and consist of cells that vary in their antigen expression profiles; thus, not all cells may not be effectively targeted by such bulk approaches. In particular, cancer stem cells (CSCs) are undifferentiated and do not express TAAs, and therefore evade such treatments. These cells, however, are also resistant to standard chemotherapy and are responsible for tumor metastasis and relapse. Thus, specific targeting of CSCs can provide a significant advancement in treatment of many types of cancers.

INNOVATION

Researchers at the University of Michigan Department of Surgery found that targeting cancer-initiating cells via dendritic-cell vaccination provides significant anti-tumor immunity. This CSC-targeted therapy is specifically designed for patients previously treated with standard chemotherapy or radiation, as these treatments have been shown to reduce overall tumor size and increase the proportion of cancer stem cells. This technology presents a therapeutic modality that may provide more efficacious and sustained response and improve patient progression-free survival. These dendritic cell vaccines are antigen presenting cells that can be loaded with tumor-specific antigens in vitro and injected into patients. They activate adaptive immunity and induce antigen-specific immune responses. Through adoptive T cell therapy, cancer-reactive T cells are harvested from the patient, expanded through polyclonal stimulation or exposure to specific agents, and infused back into patients.

Based on studies of aldehyde dehydrogenase (ALDH) activity, breast cancer, pancreatic cancer, colon cancer, prostate cancer, ovarian cancer, lung cancer, and brain tumors could also benefit from this approach as elevated ALDH activity has been found in all these CSCs, so these CSCs could potentially be isolated. It is also possible that other types of cancer could benefit from this therapy, where ALDH activity has not yet been investigated. In addition to using this technology as an active immune therapy, it can also be used to identify additional antigens differentially expressed on CSCs that can then be specifically targeted by pharmacologic agents.