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Immunotherapy: Open Access

Perspective

The Role of Immunotherapy to Fight Against Cancer and Its Development in Oncology

Gyri Christine*

Department of Immunology, University of Cambodian Mekong, Phnom Penh, Cambodia

DESCRIPTION

Cancer remains one of the leading causes of death worldwide and despite advances in treatment, many forms of the disease remain resistant to conventional therapies. However, the advent of cancer immunotherapy has revolutionized the field, offering assurance for patients with otherwise intractable malignancies. Immunotherapy harms the body's own immune system to fight cancer and its development represents a significant breakthrough in oncology.

Understanding the immune system's role

The immune system is a complex network of cells, tissues and organs that work together to defend the body against foreign invaders like bacteria, viruses and other pathogens. It also plays a crucial role in identifying and destroying abnormal cells, including cancer cells. However, cancer can evade the immune system through various mechanisms, such as producing proteins that suppress immune responses or hiding from immune detection.

Immunotherapy aims to overcome these challenges by boosting the natural ability of the immune system to detect and destroy cancer cells. This approach can be divided into several main categories, including immune checkpoint inhibitors, adoptive cell transfer, cancer vaccines and cytokine therapies.

Immune checkpoint inhibitors

One of the most significant advances in immunotherapy has been the development of immune checkpoint inhibitors. Checkpoints are molecules on certain immune cells that need to be activated (or inactivated) to start an immune response. Cancer cells often exploit these checkpoints to avoid being attacked by the immune system.

Checkpoint inhibitors, such as pembrolizumab (Keytruda) and nivolumab (Opdivo), block these molecules, thereby allowing the immune system to recognize and attack cancer cells. These drugs have shown remarkable success in treating various cancers, including melanoma, non-small cell lung cancer and renal cell carcinoma.

Adoptive cell transfer

Adoptive Cell Transfer (ACT) involves collecting and using patients' own immune cells to treat their cancer. The most well-known form of ACT is CAR T-cell therapy, which involves modifying T cells to express Chimeric Antigen Receptors (CARs) that can specifically target cancer cells. These engineered T cells are then expanded in the laboratory and infused back into the patient.

CAR T-cell therapy has shown significant assurance, particularly in treating certain blood cancers such as Acute Lymphoblastic Leukemia (ALL) and Diffuse Large B Cell Lymphoma (DLBCL). The therapy can lead to long-lasting remissions in patients who have exhausted other treatment options.

Cancer vaccines

Unlike traditional vaccines that prevent infectious diseases, cancer vaccines are designed to treat existing cancer by strengthening the body's natural defenses. These vaccines work by stimulating the immune system to attack cancer cells. One of the first FDA-approved cancer vaccines is sipuleucel-T (Provenge), used to treat prostate cancer. This vaccine is made by isolating a patient's immune cells, exposing them to a protein found on prostate cancer cells and then reinfusing them into the patient to elicit an immune response.

Cytokine therapies

Cytokines are proteins that play a crucial role in cell signaling within the immune system. Certain cytokines can enhance the immune system's ability to fight cancer. Interleukin-2 (IL-2) and interferon-alpha are examples of cytokines that have been used in cancer immunotherapy. These therapies can stimulate the growth and activity of immune cells, helping the body to combat cancer more effectively.

Correspondence to: Gyri Christine, Department of Immunology, University of Cambodian Mekong, Phnom Penh, Cambodia, Email: christine_gyri@cedu.com

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Challenges and future directions

While immunotherapy has brought significant advancements in cancer treatment, it is not without challenges. Not all patients respond to immunotherapy and some may experience severe side effects. Additionally, the cost of these treatments can be prohibitively high, limiting accessibility for many patients.

studies are ongoing to improve the efficacy and safety of immunotherapy. Combining different types of immunotherapies or integrating them with traditional treatments such as chemotherapy and radiation may enhance their effectiveness. Furthermore, identifying biomarkers that predict which patients are most likely to respond to immunotherapy can help personalize treatment approaches.

CONCLUSION

Cancer immunotherapy represents a paradigm shift in oncology, offering avenues for treatment and assurance for patients with previously untreatable cancers. By leveraging the power of the immune system, this innovative approach has the potential to transform cancer care and achieve long-term remissions. Continued studies and clinical trials will be essential in overcoming current challenges and expanding the benefits of immunotherapy to a broader range of patients. As science progresses, immunotherapy may become a knowledge of cancer treatment, heralding a new era in the fight against this devastating disease.