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ДОСТИЖЕНИЯ В ИММУНОТЕРАПИИ: РЕВОЛЮЦИЯ В ЛЕЧЕНИЕ РАКА ЗА ПРЕДЕЛАМИ ТАРГЕТНОЙ ТЕРАПИИ

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В данной статье рассматривается иммунотерапия как способ лечения рака, целью исследования является изучение механизмов различных видов иммунотерапии, созданных для специфических форм онкологических заболеваний, результатом исследования является подтверждение актуальности выбранной темы и эффективности иммунотерапии в борьбе с онкологией.

Ключевые слова: иммунотерапия, онкология, лечение рака

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ADVANCEMENTS IN IMMUNOTHERAPY: REVOLUTIONIZING CANCER TREATMENT AND BEYOND WITH TARGETED THERAPIES

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This article discusses immunotherapy as a way to treat cancer, the purpose of the article is to study the mechanisms of various types of immunotherapy created for specific forms of cancer, the result of the study is to confirm the relevance of the chosen topic and the effectiveness of immunotherapy in the fight against cancer..

Key words: Immunotherapy, oncology, cancer treatment

Nowadays immunotherapy is one of the most relevant and innovative way to fight cancer. Researches on this topic allows us to find new effective mechanisms of cancer treatment. The entity of this form of disease control is using the own human immune system to find, recognize and destroy cancer cells. Immunotherapy has certainly gained success in the scientific field, but despite this, not all patients feel the benefits of such treatment and only a small percentage of them are on the way to recovery. However, this topic is very important for future improvements in cancer treatment, that is why we have analyzed several types of immunotherapy for each specific form of cancer.

Checkpoint inhibitors.

Inhibitors targeting immune checkpoints are a natural feature of the immune system, serving to regulate immune responses and prevent excessive damage to healthy cells within the body. These inhibitors come into play when specific proteins on the surface of T cells in the immune system identify and attach to complementary proteins on different cells, including certain tumor cells. These proteins act as immune checkpoint proteins, and their interaction triggers a signal that inhibits T cell activity. This mechanism can effectively hinder the immune system from attacking cancer cells [3].

Cancer vaccines

Extensive research has been conducted on cancer vaccines using animal models and human subjects. Initial investigations primarily focused on first-generation vaccines utilizing whole cell preparations or tumor lysates from autologous or allogeneic tumors. Clinical trials involving these early vaccine candidates demonstrated the feasibility of immunizing cancer patients against their own

tumors, resulting in significant clinical benefits, including improvements in long-term survival rates and reduced recurrence rates. In recent years, there has been a shift towards developing cancer vaccines that target well-defined tumor-associated antigens, specifically expressed by cancer cells and not normal cells. Trials with these second-generation vaccines have shown promising results, indicating their safety and their ability to trigger both humoral and cellular responses against tumorspecific antigens without causing adverse autoimmune reactions. Progress in understanding tumor biology and immunity has provided insights into how tumors evade host immune responses, informing the design of future cancer vaccines that are likely to target multiple tumor-associated antigens through various antigen presentation methods, in combination with synthetic adjuvants and immunostimulatory cytokines [5].

Oncolytic viruses

Historical records spanning a century highlight the effectiveness and safety of adenovirus and other oncolytic viruses in treating various conditions. This historical data is supported by recent patient series and numerous clinical trials. While certain oncolytic viruses have received approval from regulatory bodies, there is still room for enhancement.

Given the observed safety and tolerability, the oncolytic virus field is now focusing on improving efficacy through diverse strategies. One such approach involves incorporating different immunomodulatory transgenes into viruses, aiming to produce immunostimulatory molecules within the tumor while minimizing systemic side effects. Preclinical studies suggest potential additive or synergistic effects when combining oncolytic viruses with traditional treatments like radiotherapy and chemotherapy. Moreover, the integration of checkpoint inhibitors and other immunomodulatory drugs with oncolytic viruses shows promise, particularly in rendering immunologically unresponsive tumors recognizable to the immune system. Current trials are investigating the combination of oncolytic viruses with checkpoint inhibitors. Another avenue of interest involves using oncolytic viruses to modulate the tumor microenvironment, thereby enabling T cell therapies to effectively target solid tumors.

Oncolytic viruses have the potential to usher in a new era in cancer immunotherapy, offering a promising avenue for future advancements in the field [4].

Adaptive cell therapy

Weakened tumor-targeting immune cells (effector T cells) are associated with cancer progression and poor patient outcomes. Adoptive cell therapy (ACT) has emerged as a promising approach to address this by harnessing the power of the immune system. ACT acts as a form of "immunoediting" that relies on T cells. It involves stimulating and expanding tumor-infiltrating lymphocytes (TILs) – immune cells naturally present within tumors – or genetically engineering T cells to express receptors (CARs/TCRs) that recognize specific tumor markers. These enhanced T cells are then reintroduced

into the patient after lymphodepletion, a process that reduces the number of existing immune cells. ACT relies on the ability of these primed T cells to mount a potent and durable attack against cancer cells. By gaining a deeper understanding of how these "living drugs" function, we can refine current ACT strategies and develop even more effective T cell-based immunotherapies for the future [2].

One powerful strategy in combating cancer is combination therapy, which utilizes immunotherapy alongside other established treatments. This approach allows for a multifaceted attack on cancer cells.

Additionally, the field of cancer research has seen significant progress in identifying biomarkers. These biological signatures can predict an individual patient's response to immunotherapy, enabling the creation of personalized treatment plans. Biomarkers hold immense potential for minimizing side effects as they guide therapy selection towards options with the highest chance of success for a specific patient.

Oncology is the second most popular cause of death in Russia. In 2021, 3.23 million patients were identified, which is almost 3% of the total population of the country [1]. That is why researches on the topic of immunotherapy are important and in demand. Fortunately, the development in this direction helps to improve the treatment of cancer in the early stages and reduces mortality.

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