Immunotherapies Effects on Cancer and Cancer Research

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Cancer is a disease that professionals have long been attempting to figure out. Over time, new technologies have allowed doctors and researchers to help figure out cancer. However, some of these technologies have caused negative side effects for cancer patients. New research has been introduced in treatments called immunotherapies. This type of therapy attempts to use a patient's own immune system to attack the tumor and cancerous cells within the body. T cells are the focus of this research because of their abilities within the immune system. Once activated with an antigen, the immune cells are able to locate the cell with the same antigen and annihilate them. For different types of cancers different methods of treatments are needed. Figuring out an individual treatment plan for patients is key in sending the patients into remission. The use of PD-L1 in cancer cells allows them to avoid the immune system, however, they can be susceptible to T cell targeting. The immune system for every individual is different and adaptive immunity is personalized. Due to this, treatment regimens also need to be personalized for each patient when being treated with immunotherapies. Even with large advancements in immunotherapies, there are still issues that arise and more research needs to be conducted to eventually better this cancer treatment method.

Key Words:
Cancer, Immunotherapies, Checkpoint therapy,

Introduction

Cancer is a deadly and dangerous disease that plagues hundreds of thousands of people around the world. Over the years, new technologies and a better understanding of human biology have allowed for more effective defenses and cures against cancer. Surgery, chemotherapy, and others are known treatments for cancer. However, researchers have done testing to include immunotherapies to this ongoing list. Immunotherapies aim to use the patient's own immune system to attack the tumor and cancer. Due to the complications and complexity of not only the immune system, but also the cancer cells, immunotherapies are only currently used to treat a few types of cancers. Professional's aim to better this technology in order to be able to target more cancer types and incorporate immunotherapy into more treatment regimens. Immunotherapies are important because of their effects on cancers. They have the potential to provide a cure and send patients into complete remission (Sharma & Allison, 2015). Immunotherapies, specifically immune checkpoint therapy, focus not only on the tumor alone, but also on the T cells of the immune system (Sharma, 2015). The goal is to control the molecules that regulate T cells and eventually remove the cancer cell's ability to defend against the host's immune system (Sharma, 2015). Cancer cells use many different techniques in order to avoid the immune system. One of these is PD-L1, or programmed death ligand 1. These are used not just to slow the spread of tumors, but also to change the cancerous cells so they can no longer

hide from and prevent the immune system's attacks. T cells are important because of their ability to target and attack cells that present peptides on MHC, major histocompatibility complex molecules. MHC molecules are responsible for the way immune cells recognize and respond to antigens. The peptides have been derived from tumor cells and can come from a range of different genetic mutations (Sharma, 2015). Gaining more knowledge on how these peptides affect T cells and therefore the way T cells can attack cancer has been crucial in gaining a better understanding to help improve immunotherapies. T cells have the ability to destroy cancerous cells when they are able to find and distinguish them from self-cells. Cancerous cells are host cells that have undergone a mutational change that affected the cells in a negative way. T cell cytotoxicity has been found to be a major part of immunotherapies (Schumacher, 2015). T cells will be able to destroy these mutated cells and tumors if they are able to break through the cancerous cell's defenses.

Recent Progress
It is understood that immunotherapies are complex to research and that for now, these alone will not be able to treat all cancers. Discovering a combination of treatments or immune checkpoint therapy will have better effects on fighting cancer. Treating cancer with immunotherapies is detailed and is personalized to every patient and their immune system (Sharma, 2015). Studies have been focused on a combination of immunotherapy treatments rather than just one for certain cancer types. This combination has had success. For some patients, a combination is the only way to rehabilitate the patient. It was also found through these studies that former treatments such as radiation and chemotherapy are also responsible for a release of activated T cells as the tumors are destroyed (Sharma, 2015). It was found that patients who do have the PD-L1 within their cancer cells and those who do not

have the PD-L1 both have similar responses to combined treatment with immunotherapies (Sharma, 2015).

Also being studied are the different biomarkers and components in the immune system that could affect different types of treatments (Sharma, 2015). These biomarkers could help professionals determine the most effective treatment for the individual. The complexity of the immune system has caused some problems trying to use biomarkers effectively (Sharma, 2015). Even with the success of immunotherapies against the PD-L1 defense in cancer, there may be other defenses that are more advanced that prevent attack from T cells. With this in mind, personalized immunotherapy treatment is also highly tested in research (Sharma, 2015). Being able to analyze a person's immune system and help boost what is naturally in the immune system is helpful when fighting cancer. Depending on the patient's type of cancer, whether they are an immunogenic tumor or not determines a lot. These contrasts in cancer types present differences in treatments for different individuals. For cancers that are immunogenic, patients are eligible for immune checkpoint therapy; but, those who do not have immunogenic tumors would rely on a combination of treatments (Sharma, 2015). It was found that many patients do not share the mutations that cause their cancer, but instead almost all cancers are individual based. This means that treatments will also have to be individualized for every patient (Schumacher, 2015). These recent studies have improved the clinical use of immunotherapies and combination treatments.

Discussion
Immunotherapies are a very complex and rigorous study. Using a patient's immune system to target cancerous cells can be an effective way to destroy tumors. Preventing these inhibitory pathways and defenses of tumors will allow a patient's own immune system to fight off the

tumor's growth instead of relying on methods such as chemotherapies that can have negative effects on patients (Sharma, 2015). Combinations of treatments can be much more useful for cancers that are not immunological. A combination of different types of treatments gives that patient the best chance of remission. A patient who is diagnosed with an immunological tumor will benefit more from immunotherapies. These treatments rely on T cells to recognize antigens or peptides on a tumor cell and attack these cells. Discovering that different methods of treatment also release T cells means that the focus of immunotherapies is correct.

The use of T cells is beneficial and necessary to fight cancer. PD-L1 allows cancer cells to be able to defend against a host immune system. This allows the tumor to grow unchecked by the body. Tumor cells are able to avoid the attack from the immune system, and that is why the cancer is able to form. Preventing tumor cells from being able to avoid the immune system is crucial for using immunotherapies as a treatment. Using PD-L1 recognition helps to give T cells an advantage and allows them to destroy cancer cells even with their preventative measures (Sharma, 2015). When T cells are able to recognize the antigen, they can attack these cells in the body. Seeing that PD-L1 did not have huge changes between those who's cancer cells had it and those who did not means that T cells are able to recognize these tumor cells as foreign and attack them. This discovery is a success for immunotherapies because with treatment, the patient's immune system can attack cancer cells.

There are still unanswered questions and issues with immunotherapies that still need to be addressed. Using biomarkers to determine treatments is more complex than helpful at the moment. Finding a way to correctly identify markers in the cells could greatly affect the way cancer is treated, but also allow patients to get treatment faster. Also, how to improve the T cells in the body to break through the cancer's

defenses against the immune system is a focus of immunotherapy researchers. If researchers can find a way to completely break down cancer's defenses against the immune system, then professionals may be able to prevent patients from dying from cancer.

References

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