Cancer Immunotherapy and Immunonutrition

Abstract

Recently, immunotherapy has become a clinically validated treatment for cancer patients. Immunotherapeutic strategies include cytokines, cancer vaccines, adoptive cellular therapy, immune checkpoint blockade, Immunostimulatory antibodies and treatment methods used to restore or enhance the cancer cell antigen numbers. Studies also show that immunonutrition, newly developed formulas containing arginine and/or glutamine, omega-3 fatty acids, and ribonucleic acids could modulate inflammatory and immune response in cancer patients. This review outline some of the main strategies in cancer immunotherapy and the role of immunonutrition. The authors believe that the combination therapies with the support of immunonutrition may provide new hopes to end cancer.

Keywords: Cancer; Immunotherapy; Immunonutrition

Introduction

Cancer is a disease where cells fail to die, and continue to multiply until it overwhelm the healthy cells and later the body. The oldest description of cancer was found in an ancient Egyptian text that dated back to 3000 B.C. The paper was called the Edwin Smith Papyrus and it was part of a textbook about trauma surgery, and states about cancer “There is no treatment” [1]. Centuries later, the treatment of cancer becomes more advanced, and survival rates has steadily increased. Currently, we are on the path trying to find a more suitable treatment that does not involve the destruction of healthy non-cancerous cells.

The human immune system protects us against pathogens including cancer cells with innate and adaptive immunity. Innate immune system includes physical barriers, mononuclear phagocytes, macrophages, natural killer cells, and cytokines and so on. Adaptive immunity consists of B cells and T cells. Cancer immunology realizes that there are three different phases of cancer cells progression, the first is immune surveillance, in which the immune system efficiently eliminates the cancer cells. The second phase is immune equilibrium, in which the cancer cells clings to survival and when the immune cells fight back. Immune escape is the third phase, in which the immune system is defeated, and the tumor begins to grow, invade, and metastasize [2]. Immunotherapy is a reasonable treatment option that uses the body’s very own immune system to help fight cancer cells. There are many different possible methods for immunotherapy with different levels of success and results [3].

Discussion

The different approaches against already existing cancers include surgery, radiation therapy and chemotherapy, and immunotherapy to eliminate neoplastic cells. Regular immune system can suppress cancer cells, however but cancer cells are known to be efficient at suppressing or resisting the body’s immune response, including local immune evasion, and systemic disruption of T cell signals. The immune system’s immune editing, immune recognition of malignant cells are also suppressed. Over the years, people discovered different components of the immune systems that play a critical role in killing cancer. That includes various approaches such as the stimulation of effector mechanism to counteract inhibitory and suppressive mechanisms [4].

Cytokines are a form of immunotherapy, in which IL-2 and IFN-alpha stimulate the host’s immune system, but both have low response rates. IL-2 has a significant risk of serious systemic inflammation, and IFN-alpha has a high dose of toxicity [5].

Treatments to activate effector immune cells involve vaccination with tumor antigens or augmentation of antigen presentation which can increase the ability of the patient’s immune system and bolster immune response against neoplastic cells. While having only a small amount of toxicity and is able to be administered outpatient, the lack of universal antigens and ideal immunization protocols lead to poor efficacy and response [6].

Another cell-based therapy besides vaccines is adoptive cellular therapy (ACT), which exploits the antitumor properties of lymphocytes to erase metastatic and primary tumors. The lymphocytes are isolated from patient’s blood, tumor-draining lymph nodes or tumor tissues, expanded ex vivo, and are reinfused back into the patient. ACT would hopefully circumvent the tolerance to tumor antigens and produces high avidity in effector T-cells, but is only currently restricted to melanoma, and has

Abbreviations: ACT: Adoptive Cellular Therapy; CAR: Chimeric Antigen Receptors; CMP: Cancer Precision Medicine; CTLA-4: Cytotoxic T-Lymphocyte Associated Protein 4; DCs: Dendritic Cells; PD1: Programmed Cell Death Protein 1; PD-L1: Programmed Cell Death Protein-Ligand 1; TCR: T Cell Receptor

Keywords: Cancer; Immunotherapy; Immunonutrition
Cancer Immunotherapy and Immunonutrition

Cancer immunotherapy is now emerging as an important addition to conventional therapies by bolstering the patient’s immune system to fight cancer. Cancer is a complex condition, in which the cancer cells with different characteristics come from the normal cells. Figuring out the key therapeutic targets and supporting the patient’s own immune system are the critical issues in cancer treatment. Immunonutrition has been demonstrated to improve outcome in surgical or radical treatment in cancer patients. The best formulation and protocols which may aid in improving patient outcomes with immunotherapy needs to be further investigated. However, we believe that optimal combinations of regimes would be the final way to end of cancer.

Acknowledgement

This work was supported primarily by grants to Fen Wang from the National Natural Science Foundation of China (81573798 and 81001586).

References


