Antigen-presenting cells role in immune system and cancer immunotherapy.

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Abstract

This article provides an overview of Antigen-Presenting Cells (APCs) and their crucial role in the immune system. APCs, including dendritic cells, macrophages, and B cells, play a critical role in presenting foreign particles or antigens to immune cells, triggering an immune response against harmful pathogens. The article explains how APCs present antigens to T cells through the major histocompatibility complex (MHC) class I or class II molecules and how this process determines the type of immune response that is generated. The article also highlights how APCs induce immune tolerance, preventing autoimmunity, and how they can be used in cancer immunotherapy

Keywords: Antigen-presenting cells, APCs, Immune system, Dendritic cells, Macrophages, B cells, MHC molecules.

Introduction

Antigen-presenting cells (APCs) are an essential component of the immune system. They play a crucial role in identifying and presenting foreign particles or antigens to immune cells, such as T and B cells, triggering an immune response against harmful pathogens. This article will provide an overview of APCs and their role in the immune system. APCs are a diverse group of cells that can present antigens to immune cells. They include dendritic cells, macrophages, and B cells. Each of these cells has unique characteristics that allow them to present antigens in different ways [1].

Dendritic cells are considered the most efficient APCs and are found in many tissues, including the skin, mucosa, and lymph nodes. They have long, branching projections that can capture antigens from the environment, such as bacteria or viruses, and transport them to lymph nodes, where they can present them to T cells. Dendritic cells can also activate naive T cells, which are T cells that have not previously encountered an antigen, and initiate an adaptive immune response. Macrophages, on the other hand, are found in tissues throughout the body and are responsible for phagocytosis, the process of engulfing and digesting pathogens. Once a macrophage has engulfed a pathogen, it can present the pathogen's antigens to T cells, triggering an immune response [2].

B cells are a type of white blood cell that can produce antibodies, which are proteins that bind to specific antigens. B cells can also present antigens to T cells, triggering an immune response. APCs present antigens to T cells in two ways: through the major histocompatibility complex (MHC) class I or class II molecules. MHC class I molecules present antigens derived from intracellular pathogens, such as viruses or intracellular bacteria. MHC class II molecules present antigens derived from extracellular pathogens, such as bacteria or fungi. The presentation of antigens through MHC class I or II molecules determines the type of immune response that is generated [3].

When a T cell encounters an antigen-presenting cell, it becomes activated and begins to divide, producing more T cells that can recognize the same antigen. This process, known as clonal expansion, allows the immune system to mount a response against the pathogen. Zxewe3rwr6tyu6Antigen-presenting cells play a crucial role in the immune system by presenting antigens to T cells, triggering an immune response against pathogens. Understanding how APCs work can help researchers develop new vaccines and therapies to treat infectious diseases and autoimmune disorders [4].

Antigen-presenting cells are not only responsible for activating the adaptive immune response against pathogens, but they also play a critical role in maintaining immune tolerance. Immune tolerance refers to the immune system's ability to recognize and ignore the body's own tissues to prevent autoimmunity. APCs can induce immune tolerance by presenting self-antigens to T cells during their development in the thymus gland. T cells that recognize self-antigens are eliminated, preventing them from attacking the body's own tissues. Additionally, APCs can induce immune tolerance in the periphery by presenting self-antigens to T cells in a way that does not trigger an immune response. This process is known as peripheral tolerance.

One example of peripheral tolerance is the function of regulatory T cells (Tregs), which are a subset of T cells that suppress the immune response. APCs can present self-antigens to Tregs, which can then suppress the activation of

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other T cells, preventing autoimmunity. Moreover, APCs play a crucial role in cancer immunotherapy. Immune checkpoint inhibitors, a type of cancer treatment, work by blocking proteins on the surface of T cells that inhibit the immune response. APCs can help enhance the efficacy of checkpoint inhibitors by presenting tumor antigens to T cells, promoting the activation and expansion of tumor-specific T cells. Antigen-presenting cells are essential for the proper functioning of the immune system, playing a critical role in both initiating immune responses against pathogens and maintaining immune tolerance. Researchers are actively exploring the use of APCs in cancer immunotherapy and developing new ways to enhance their function to treat a variety of diseases [5].

Conclusion

Antigen-Presenting Cells (APCs) are a critical component of the immune system, responsible for identifying and presenting foreign particles or antigens to immune cells, triggering an immune response against harmful pathogens. Dendritic cells, macrophages, and B cells are examples of APCs, each with unique characteristics that allow them to present antigens in different ways. APCs induce immune tolerance, preventing autoimmunity, and play a crucial role in cancer immunotherapy. Understanding the function of APCs can aid in the development of new vaccines, therapies, and cancer treatments to combat infectious diseases and autoimmune disorders.

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