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Perspective

Role of Antigen: Presenting Cells in Antigen Presentation Process

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DESCRIPTION

Antigen presentation is the process of a cell displaying antigen bound by major histocompatibility complex proteins on its surface; this is known as antigen presentation. T cells may recognise these complexes through their T cell receptors. APCs process antigens before presenting them to T-cells. Almost all cell types may display antigens in a number of ways. They're present in a lot of different tissues. Professional antigen-presenting cells, such as macrophages, B cells, and dendritic cells, offer external antigens to helper T cells, but virus-infected cells can present cytotoxic T cells with antigens produced inside the cell. Antigen presentation relies on various specialised signalling molecules on the surfaces of both APCs and T lymphocytes in addition to the MHC family of proteins.

Professional and non-professional antigen-presenting cells are the two types of antigen-presenting cells. Professional antigen-presenting cells are those that express MHC class II molecules, as well as co-stimulatory chemicals and pattern recognition receptors. The MHC class I molecules are expressed by non-professional APCs. Before T cells to proliferate and execute their role, they must be activated. This is accomplished by engaging with a professional APC that offers an antigen that their T cell receptor recognises. Dendritic cells are the most common APC implicated in T cell activation. T cells are unable to identify antigens that are "free" or soluble. They can only recognise and react to antigen that has been processed and presented by cells, such as MHC molecules.

Exogenous antigen displayed on MHC class II is recognised by helper T cells, while endogenous antigen presented on MHC class I is recognised by cytotoxic T cells. Most cells in the body can employ MHC class I to deliver antigen to CD8+ cytotoxic T lymphocytes; nevertheless, the term "antigen-presenting cell" is frequently used to refer to professional APCs. MHC class I and MHC class II molecules are expressed on these cells, and they may excite both CD4+ helper T cells and cytotoxic T cells. APCs can also use the CD1 family of proteins, which are physically identical to the MHC class I family, to deliver foreign and self-lipids to T cells and NK cells.

Professional APCs: Professional antigen-presenting cells are experts in presenting antigens to T lymphocytes. They are highly good at phagocytosis (e.g., macrophages) or receptor-mediated endocytosis (e.g., phagocytes), digesting antigens into peptide fragments, and then displaying those peptides on their membrane. The antigen-class II MHC molecule complex on the antigen-presenting cell's membrane is recognised and interacted with by the T cell. The antigen-presenting cell subsequently produces an extra co-stimulatory signal, causing the T cell to become activated. Professional APCs are distinguished by the expression of co-stimulatory molecules and MHC class II. MHC class I molecules are expressed by all professional APCs. Dendritic cells, macrophages, and B cells are the three primary categories of professional antigen-presenting cells.

Non-professional APCs: MHC class II molecules are seldom expressed by non-professional APCs. Antigen presentation to CD4+ cells via MHC class II is not limited to conventionally professional APCs, as has been discovered.

CONCLUSION

Antigen-presenting cells are required for a successful adaptive immune response, as both cytotoxic and helper T cells rely on them for survival. Antigen presentation contributes to immune responses against both intracellular and external infections and allows adaptive immunity to be more selective. It also plays a part in tumour defence. To stimulate the adaptive immune system to target malignant cells, certain cancer treatments require the manufacture of artificial APCs.

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