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Perspective

Plasmacytoid dendritic cell: its characteristics and response to immune system

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DESCRIPTION

Plasmacytoid Dendritic Cells (pDCs) are a rare type of immune cell known to secrete large amounts of type 1 interferon (IFN) in response to viral infection. They circulate in the blood and are found in the peripheral lymphatic organs. They develop from hematopoietic stem cells in the bone marrow and make up <0.4% of Peripheral Blood Mononuclear Cells (PBMCs). In addition to carrying out antiviral mechanisms, pDCs are thought to be crucial for linking the innate and adaptive immune systems. However, pDCs are also responsible for the involvement and exacerbation of certain autoimmune diseases such as lupus. pDCs undergoing malignant transformation cause a rare hematologic disorder, blastic plasmacytoid dendritic cell neoplasm.

Characteristics

The use of data and information tools in the “science and service dealing with detection, identification, and antimicrobial susceptibility is testing” of clinically important bacteria. It is crucial to clarify that the field of informatics encompasses not only technology but also the individuals who use, implement, and maintain information systems, as well as the workflow procedures that are impacted by this technology (Paxton A, 2012).

In the bone marrow, dendritic cell progenitors expressing Flt3 (CD135) receptors are common, capable of giving rise to pDCs. Flt3 or CD135 signaling induces pDC differentiation and proliferation, although their mechanisms are not fully understood. Phosphoinositide 3-kinase (PI3K)-dependent activation of the mechanistic target of rapamycin (mTOR) is thought to regulate this signaling pathway. The transcription factor E2-2 was also found to play a key role in influencing the lineage commitment of the DC common progenitor on its way to becoming pDC.

Unlike Conventional Dendritic Cells (cDCs), which leave the bone marrow as precursors, pDCs leave the bone marrow after completion of development and target lymphoid organs and peripheral blood. Plasmacytoid dendritic cells are also distinguished from cDCs by their ability to produce significant amounts of type 1 interferon. Maturation of pDCs is initiated when the cell is exposed to virus, leading to upregulation of MHC class I and MHC class II, the costimulatory molecules CD80, CD86, CD83 and c-c Chemokine Receptor 7 (CCR7) and interferon production gradually decreases. Expression of CCR7 prompts mature pDC to migrate to the lymph node, where it will be able to stimulate and interact with T cells.

In humans, pDCs exhibit plasma cell morphology and express CD4, HLA-DR, CD123, Blood Dendritic Cell Antigen-2 (BDCA-2), Toll-like Receptor (TLR) 7, and TLR9 in endosomal compartments. Expression of TLR 7 and TLR 9 allows pDCs to interact with viral and host nucleic acids. TLR 7 and TLR 9 detect ssRNA and unmethylated CpG DNA sequences, respectively. ILT7 and BDCA-4 are also expressed on the surfaces of human pDCs, although their signaling pathways are still unclear. However, there is speculation that the interaction between ILT7 and BST2 may have a negative regulatory effect on interferon production in the cell.

Immunity

Upon stimulation and subsequent activation of TLR7 and TLR9, these cells produce large amounts (up to 1000 times more than other cell types) of type I interferon (mainly IFN-α and IFN-β), which are critical antiviral compounds that mediate a wide range of effects and induce pDC maturation. For example, secretion of type 1 interferon triggers natural killer cells to produce IFNγ while activating B cell differentiation. In addition, they can also produce the cytokines IL-12, IL-6, and TNF-α, thereby helping to recruit additional immune cells to the site of infection.

Because they are able to activate other immune cells, pDCs serve as a bridge between innate and adaptive immunity. The

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ability of pDC to stimulate T cells is enhanced upon maturation. As mentioned earlier, maturation also induces the expression of MHC I and II molecules. class also in pDCs, allowing the cell to optimize its antigen-presenting capabilities. MHC classes I on pDC surfaces are able to activate CD8+ T cells, while MHC class II has been found to activate CD4+ T cells. pDCs are also thought to be able to promote both T cell activation and tolerance.