

Difference Between Cytokines and Interleukins

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Key Difference - Cytokines vs Interleukins

An inflammatory response is an [immunological response](#) which takes place as a result of an [infection](#). In order to initiate an immune response, certain chemicals are secreted by the immune cells. The presence of these inflammatory chemicals acts as a biomarker for many clinical conditions. Cytokines are small proteins secreted by cells in response to inflammation following an infection and includes many types such as chemokines, interleukins, and interferons. Interleukins are proteins secreted from [leukocytes](#) which act on another type of a leukocyte. The **key difference** between cytokines and interleukins is that **cytokines belong to a broader group of chemical molecules that act on inflammation, whereas interleukins are a subset of that large group which specifically act on leukocytes.**

What are Cytokines?

Cytokines are cell signaling molecules that aid cell to cell communication in immune responses and stimulate the movement of cells towards the sites of inflammation, [infection](#), and trauma. Cytokines are small proteins which have a specific function. Cytokines act as [hormones](#) in signaling cells to activate its immune mechanisms. Cytokines interact between cells and are mediated by receptors which identify the signal of the specific cytokine. Cytokines are a broad group of signaling molecules which includes chemokines, lymphokines, adipokines, interferons, and interleukins.

Similar to hormones, cytokines have several methods in which they act;

- Autocrine - acts on the same cell in which it is been secreted
- Paracrine - acts on a close-by cell to which it is secreted
- Endocrine- acts on a distant cell to which it is secreted

Its secretion by the cells is termed to be Pleiotropic. Pleiotropy is the condition in which different cell types are capable of secreting a single cytokine or vice versa where one cytokine is capable of acting on different cell types.

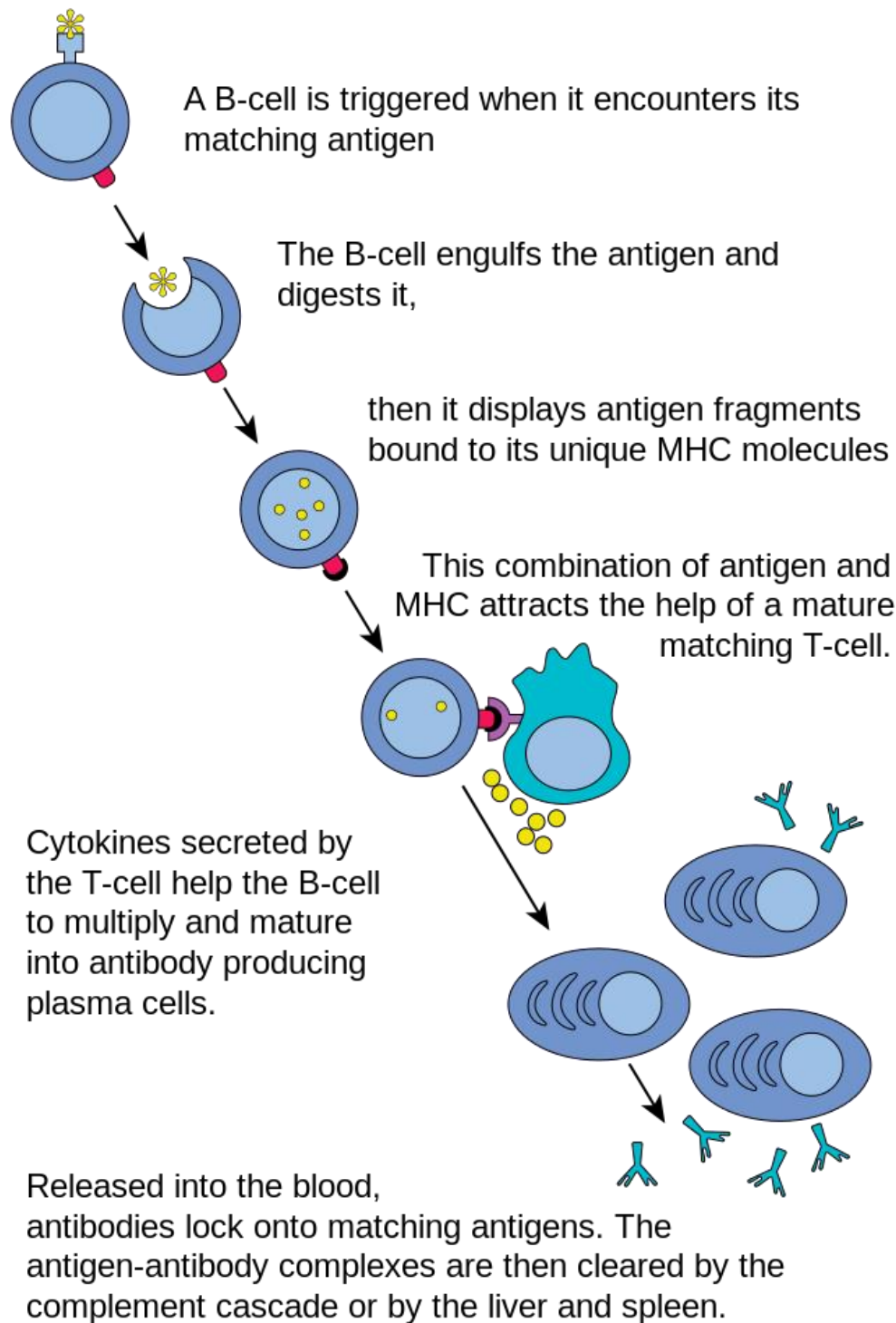


Figure 01: B cell activation by Cytokines

Production of cytokines takes place via a cascade of reactions. Cytokines are mainly produced by [T Helper cells](#) and [Macrophages](#). The produced cytokines then identify its

specific receptor and bind to it. The cytokine – receptor association at the target cell then initiates a cascade of reactions which result in the alteration of gene expression to trigger an immune response. Cytokines can act synergistically or antagonistically according to its reaction process. This takes place since more than one cytokines are involved in triggering inflammation.

Cytokines are further divided as pro-inflammatory cytokines and anti-inflammatory cytokines. They act as specific biomarkers in diseases conditions involving inflammation (that includes infections) and non - communicable diseases such as diabetes.

What are Interleukins?

Interleukins (IL) are small proteins which are expressed in leukocytes. They are secreted mainly by the leukocytes, and they act upon another leukocyte. There are different types of interleukins. Hence its functionality is diverse. Interleukin's mechanism of action is paracrine. Interleukins affect near-by cells and alter gene expression of a protein by either activating or inhibiting transcription. Interleukins initiate a cascade of reactions by binding to a class of receptors known as [tyrosine](#) receptor [kinase](#) (TRK). This will activate G protein-coupled receptors thereby, leading to the covalent modification of secondary proteins which will affect the transcription process of [mRNA](#) and alter the gene expression.

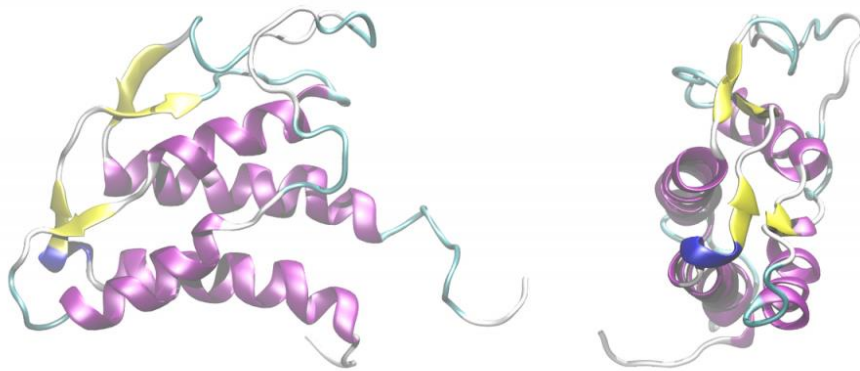


Figure 02: Interleukin

Interleukins are of different types and have a variety of functions. Primarily interleukins can act as pro-inflammatory molecules or anti-inflammatory molecules. Pro-inflammatory ILs include IL-1 β and IL-6. IL-1 β is secreted by monocytes and macrophages as well as by nonimmune cells, such as [fibroblasts](#) and [endothelial cells](#). These are secreted during cell injury, infection, invasion, and inflammation. IL-6 is mainly secreted by the neuronal cells and is involved in regulating proteins in neuronal function.

Anti-inflammatory interleukins include interleukin (IL)-1 receptor antagonist, IL-4, IL-10, IL-11, and IL-13. Among these, IL-10 is a major anti-inflammatory interleukin. IL-10 has the ability to repress the expression of the pro-inflammatory cytokines including IL-1 β and IL-6. It is also involved in upregulating the anti-inflammatory receptors and simultaneously down-regulating the pro-inflammatory receptors. Thus it acts as a counter-regulatory mechanism.

What are the Similarities Between Cytokines and Interleukins?

- Both are protein molecules.
- Both initiate inflammatory responses.
- Both can be either anti-inflammatory or pro-inflammatory.
- Both can act as markers of inflammation in specific clinical scenarios.
- Both bind to specific receptors and initiate a cascade of reactions.
- Both result in the alteration of gene expression at the level of transcription.

What is the Difference Between Cytokines and Interleukins?

| Cytokines vs Interleukins | |
|---|--|
| Cytokines are small proteins secreted by cells in response to inflammation following an infection and include many types such as chemokines, interleukins, and interferons. | Interleukins are small proteins secreted from leukocytes which act on another type of a leukocyte. |
| Effect | |
| Cytokine effect can be autocrine, paracrine or endocrine. | Interleukin effect is mostly paracrine. |
| Secretion | |
| Cytokine secretion is initiated by T Helper cells. | Interleukin secretion is initiated by hematopoietic cells. |

Summary - Cytokines vs Interleukins

Cytokines and interleukins are proteins secreted upon inflammation which can either induce or inhibit inflammation that can be identified as a strong immune response. Cytokines are a broad group of protein molecules whereas Interleukins are a specific group of protein molecules which are secreted from leukocytes. This can be described as the difference between Cytokines and Interleukins. At present, many types of research are involved in this field as they are termed as biomarkers of inflammation. Thus the presence

of these biomarkers in blood acts as an early diagnosis of many diseases and clinical manifestations.

Reference:

1. "Interleukin." Interleukin - an overview | ScienceDirect Topics. [Available here](#)
2. Zhang, Jun-Ming, and Jianxiong An. "Cytokines, Inflammation and Pain." International anesthesiology clinics, U.S. National Library of Medicine, 2007. [Available here](#)

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