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The Plasma Cell

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Abstract

Plasma cells are a type of lymphocyte that produce specific antibody to antigens that they have been programed against. Plasma cells have a wide concentration range and vary in life span. They do not have reproductive capability. They are a terminal cell whose only function is antibody secretion.

Introduction

Plasma cells are a type of blood cell that originate in lymph tissue and will eventually morph into antibody producing cells. Plasma cells will depending on their location in the body have a short or a long life-span. They are a terminal cell, and once fully mature have one function.

Structure

Plasma cells are essentially lymphocytes with a large amount of basophilic cytoplasm. The cytoplasm contains a large amount of Golgi apparatus and rough endoplasmic reticulum. This is in keeping with the primary function of secretions of protein, namely antibody. The nucleus is comprised of hemochromatin. Plasma cells also have a defined plasma membrane and mitochondria [1].

Since plasma cells are a terminal cell type, they have few surface antigens [1]. They have the ubiquitous IL-6 receptor, and CD27++, CD138 and the CD319 receptors which are found on normal plasma cells but also on malignant plasma cells in cases of multiple myeloma [2].

Development

As mentioned, plasma cells in the form of B cells originate in the bone marrow. Among various functions the B cell will perform the duties of an antigen presenting cell (APC) which bind via receptor mediated processes to an opsonize pathogens. The antigen is processed and some of the processed protein is transferred to the MHCII molecules on the B cell surface. There they are presented to T helper cells (CD4+ T lymphocytes). B cells are activated once the T cell binds to the MHCII complex.

All of this activity occurs in the germinal centers of the secondary lymphoid tissue such as lymph nodes and the spleen. Swelling of these centers upon physical examination is the overt sign that activation is occurring. These B cells may evolve into either memory cells or immature plasma cells, which will eventually become mature plasma cells [3]. Cells may stay in this immature state for some period of days and either die or become mature plasma cells [4].

Function

Plasma cells are by definition when fully mature and differentiated, may only produce a single antibody class against a specific antigenic stimulation. There is no switching at this stage. This is because the MHCII is no longer displayed and they no longer function as antigen presenting cells. These cells have the capability to produce thousands of copies of the same antibody per second [5]. This antibody is specific for a given antigen and is the major constituent of the humoral immune response.

Plasma cells may have a long- or short-lived lifespan. Short lived plasma cells tend to circulate and once stimulation is no longer present (the antigen is cleared) they will die off. Long lived plasma cells may exist in bone marrow for long period of time, perhaps for longer than 10 years in some cases. They do not require re-stimulation to produce antibody and can be identified by the CD19 CD 38 CD138 marker [6,7]. The cells are able to survive as they have a specialized "survival area" or niche in the bone marrow. Experimental removal of these cells from this niche results in death of the cell [6]. These longer-lived cells can also be found in gut associated lymphoid tissue. In all cases survival is dependent on a variety of cytokines such as IL-5, TNF, and the ever-present IL-6. These are the cells that produce the continual low amount of circulating IgG, and thus lead to the anamnestic immune response.

Conclusion

Plasma cells are discussed more rarely in the literature than other cells types because they are a terminal cell and known only to produce specific antibody. Nevertheless, they are important not only in their normal function but also related to some of the disease syndromes they are involved with such as primary amyloidosis which is an excess of light immunoglobulin chains that are abnormally secreted from plasma cells, and the involvement with multiple myeloma. These syndromes are difficult to treat and thus have a high mortality rate. Research and disease treatments will continue as a result of the involvement of plasma cells in both the healthy immune response and disease syndromes.

References

1. Bona C (1996) Textbook of Immunology (2 Ed). CRC Press, page 102.

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2. Frigyesi I, Adolfsson J, Ali M, Christophersen MK, Johnsson E (2014) Robust Isolation of malignant plasma cells in multiple myeloma. *Blood* 123: 1336-40. [Crossref]

3. Glader B (2018) Wintrobe's Clinical Hematology, Lippincot, Williams and Wilkens, Page 347.

4. Walport M (2008) Janeway's Immunobiology. Garland Science, Page 387.

5. Kierszenbaum A (2002) Histology and cell biology: an introduction to pathology. Mosby, Page 275.

6. Halliley J, Tipton C, Liesveld J, Rosenberg AF, Darce J, et al. (2015) Long-lived plasma cells are contained within the CD19-CD38-CD138(+) subset in human bone marrow. *Immunity* 43: 132-145. [Crossref]

7. Manz R, Radbruch A (2002) Plasma cells for a lifetime? *J Immunol* 32: 923-927. [Crossref]