Regulation of gene expression in B cells and T cells

Scientist at DBT's National Institute of Immunology (NII), New Delhi studied the metabolic differences in B and T cells in order to understand the ground state of these cells as it can determine how they behave upon activation. It was found that there are dramatic differences in the metabolic activity of B and T cells, despite both being dormant cells. For example, T cells uptake more energy (glucose and fatty acids) and exhibit faster movements compared to B cells. On the other hand, B cells exhibit higher uptake of amino acids and carry out protein synthesis. Interestingly, it was found that the synthesis of proteins responsible for the recognition of antigen, its internalization and processing events that are immediately required after activation, and are were up regulated even in naive B cells, suggesting that the naive B cells could be primed for activation. The research work was published in Journal *Immunology*.

While B cells generate antibodies, a subset of T cells called CD4+ T cells help regulate the action of other immune cells. These are called helper T cells. A fraction of CD4+ T cells called regulatory T cells (Tregs) function to downregulate the immune response. The generation of these cells is extremely important as any deficiency in them can cause devastating autoimmune diseases. One of the major differences between Tregs and other T cells is that they do not secrete IL2, a cytokine associated with T cell activation and proliferation. But if IL2 is required for the generation of Tregs was unknown. The problem was addressed with mixed bone marrow chimeras. It was found that when chimeras were created with equal amounts of wild type and IL2 knock out the bone marrow, no defects were observed in the Tregs. On the other hand, when we increased the proportion of IL2 knock out bone marrow, Treg levels were low and their survival was also limited. Thus we uncovered an important autocrine role IL2 plays in the development of Tregs.

The B and T cells have a common ancestor in the bone marrow and their development pathways have parallel steps. Moreover, upon maturation, both of them form quiescent cells (dormant) that have very little metabolic activity; they become active only when they recognize the specific antigen with their antigen receptors. It is important to maintain these cells in the quiescent state as unwanted activation could lead to devastating autoimmune disorders. These cells have very different functions upon activation. B cells make antibodies that neutralize pathogens, while T cells play diverse roles including modulation of the activity of other immune cells including B cells and killing of pathogens.

Source: Chawla AS, Khalsa JK, Dhar A, Gupta S, Umar D, Arimbasseri GA, Bal V, George A, Rath S. (2020) A role for cell-autocrine interleukin-2 in regulatory T cell homeostasis. *Immunology*. doi: 10.1111/imm.13194

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