Theoretical Function of Hassall's Corpuscles in the Thymus

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The fact that Dr. Hammoudi did not know the function of this anatomical feature surprised me and made me eager to figure out the role of the mysterious Hassall’s corpuscle in the thymus. Unfortunately, most resources agree with ambivalence concerning their function. I did find that the corpuscles are composed of Type IV epithelial reticular cells arranged in a brilliantly, unmistakable supernova pattern among the common thymosins and T lymphocytes native to the cortex of the thymus; however not disputing this, one source suggests that they are remnants of dead eosinophils, which may be true if these histamine filled leukocytes recycle to the thymus. No other source stated this origin, but I thought it worth mentioning. Named after discovering British physician: Arthur Hill Hassall in 1846, the corpuscles vary in ages and are grouped as juvenile, immature, mature, and senescent. The lymphocyte rich corpuscles account for around one quarter of the total Hassall’s corpuscles, with noted ages ranging from 7 days to 12 years old. In one experiment, they were removed from young cardiac patients and observed. Though the article does not mention it, the ages of the children they were taken from, as well as their immune condition resulting from their diseases may have been factors effecting both the age of the corpuscles and the amount of lymphocytes in them; though it is interesting that they exist for so long. One source indicated degeneration of the corpuscles between 46 and 55 days due to clefts in the periphery and leukocytotic activity; however, these were thymic cells in the guinea pig (which only live about 46-55 days) which may differ from their role in humans as the life span is longer in the latter.

I did learn quite a bit about the function of the thymus and came across a series of articles by Dr. Yong-Jun Lui M.D., PhD, regarding the function of Hassall’s Corpuscles which, backed by experimentation, made sense and may shed some light on this thymic landmark. The Hassall’s corpuscle is located in the thymic medulla. The functions which take place within the medulla (which the corpuscle is thought to have roles in) are removal of apoptotic thymocytes and T-lymphocytes and maturation of thymocytes and lymphocytes. The corpuscle contains a chemical called thymic stromal lymphopoetin(TSLP) which activates positive dendritic cells*. TSLP appears to be a cytokine which activates the dendritic cells to produce high levels of what are referred to as CD80 and CD86 which then induce production of CD4** (cytotoxic lymphocyte-associated protein 4) among others. CD4 is a glycoprotein present on the surface of macrophages, helper and regulatory T lymphocytes, monocytes, and dendritic cells. With the presentation of this CD4, (as well as CD8- and CD25-, which are produced in the presence of TSLP from the Hassall’s corpuscle) Regulatory T lymphocytes are produced.

The Regulatory T Lymphocytes, which are indirectly produced as a result of the TSLP chemicals within the Hassall’s corpuscles, play an important role in grooming maturing T lymphocytes within the

* The main function of these dendritic cells is to process antigen material from the skin, blood, nose, lungs, stomach, and intestines and present it to the surface of lymphatic cells in order to make the immune system familiar with the potential antigenic agent occupying the environment. Once in contact with antigens, these dendritic cells then carry the antigens to lymphoid tissue to begin ‘training’ the B and T lymphocytes to attack them and create antibodies capable of destroying them. Hence, the dendritic cells play a crucial role in the acquired immune response.

** CD4 is notable as it normally, amplifies signals from antigen presenting cells and recruits enzymes pivotal in the immune response; however, CD4 is the primary receptor used by HIV to gain entry into T lymphocytes.
thymus. We’ve established that dendritic cells are the antigen presenting cells, now these dendritic cells will bring toxins, bacteria, viruses, invaders, and debris into the thymus and program their chemical signatures into the maturing T lymphocytes. Many of these T lymphocytes are unstable and incapable of carrying out the arduous task of immunity. These cells are dangerous to the body and tagged by the dendritic cells for destruction within the thymus. Occasionally, these self reactive cells escape and can wreak havoc on the body, attacking healthy tissues.

At this time, TSLP from the Hassall’s corpuscle plays a role in seeking out the rogue auto reactive T cell and phagocytizing it. Functional regulatory T cells seek out the autoreactive T cells and suppress their effects on the immune system. The article mentioned that TSLP, in some instances, could transform the unstable T cell into a functional Regulatory T cell with chemical signals. Perhaps these findings will enable more precise treatment or even a cure for autoimmune diseases and cancer.
Works Cited

1.) Lui, Yong-Jun, M.D. PhD, "Old Mystery Solved Revealing Origin f Regulatory T cells that ‘Police’ the Body" University of Texas Anderson Cancer Center. Updated Oct. 11, 2005 http://www.eurekalert.org/pub_releases/2005-10


Normal Hassal’s Corpuscles B&C-from thymic medulla of dog (canine), A&D mature or sentient human

Enlarged prenatal Down’s Syndrome Hassall’s Corpuscles symbolized by Marked depletion of T Lymphocytes. Most likely presenting Down’s Syndrome.