Membeory T cells in SIV infected rhesus macaques

Human immunodeficiency virus (HIV), a retrovirus, erroneously transcribes viral RNA to DNA before integration into the host genome. The random mutations have diversified HIV, preventing the discovery of a functional vaccine. Cluster of differentiation (CD) markers identify the cell surface molecules of immunological cells, indicating the type of cell as well as memory designation. Without memory, the body cannot form immunity. Memory T cells differ based on memory designation and combination code for entry into tissue. Naïve T cells have not encountered their specific cognate antigen, thus do not express memory designation CD makers. CCR7 molecules destine central memory T cells for lymph nodes, whereas effector memory T cells are able to migrate to other tissue. Flow cytometry can be used to count immunological cells based on CD markers by staining whole blood with CD antibodies bound to fluorescent labels of a specific absorption and wavelength. Lasers pass through antibody-stained cells and detectors read the transmittance of light, indicating the specific CD marker.

The Picker laboratory mainly uses SIVmac239 virus, a version of simian immunodeficiency virus (SIV) that infects non-human primates, including rhesus macaques. SIV in rhesus macaques resembles HIV and allows for the use of non-human model organisms. I helped the lab with a project to find the viral reservoir of SIV. Even after treatment antiretroviral therapy (ART), the HIV/SIV virus persists in an infected individual in an unknown anatomical site. Four out of the 22 monkeys in the project were treated with ART early on in their infection. I learned to preform peripheral blood mononuclear cell (PBMC) isolations on blood samples to detect lymphocyte cells and tested the levels throughout the infection. Plasma was also isolated and viral loads were counted. In an effort to search for the viral reservoir, the early-ART monkeys were biopsied regularly to determine tissue lymphocyte levels as well to search for the virus. The MHC complexes of 22 monkeys were genotyped prior to SIV infection. Monkeys with an A*02 MHC often have the ability to regulate their infection by recognizing SIV peptides. I was able to preform a tetramer assay on the A*02 + monkeys to determine if the T cells would show a response to common SIV peptides. For the assays I preformed, monkeys showed more response than the control.

An older project of the lab explored the relationship between age of rhesus macaques and immune system strength. Interleukin 17 (IL-17) produced by CD4+ T cells functions as a cytokine in inflammatory response. IL-17 levels indicate immune system function. I preformed an IL-17 ELISA plasma from monkeys of various age groups to help the lab better understand the relationship between age and immune system level.

Although these studies are ongoing, the continued investigation of memory T cells is vital to the understanding of the SIV/HIV vaccine mechanism, which is a critical step towards the development of a vaccine.