NANOHOUR

Wednesday, February 27, 2013 at 3:00 pm
Beckman Institute - Room 3269

An Integrated CD4+ and CD8+ T Lymphocyte Counter for Point-of-Care HIV/AIDS Diagnostics

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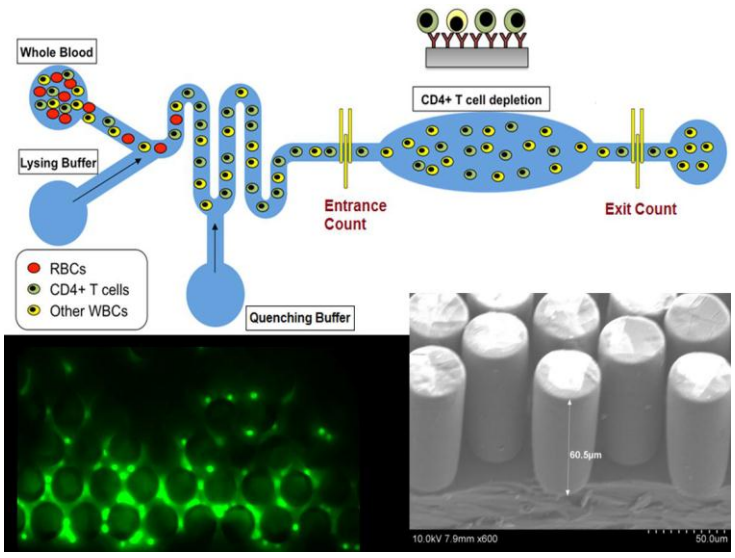
Diagnosing all of the HIV infected people around the globe is one of the biggest challenges the world faces today. Globally 34 million people are infected with HIV/AIDS, and 1.8 million people die of AIDS each year. Almost 70% of them are living in sub-Saharan Africa. The lack of availability of medical infrastructure and expertise required to perform the current standardized test i.e. Flow cytometer, especially in resource limited settings indicates an imminent need to make a portable, low cost diagnostics device.

When a person contracts HIV, the HIV virus starts killing the CD4+ T-lymphocytes which constitutes the main defense of the body. Without the treatment like Antiretroviral therapy (ART) the CD4+ T cells continue to decrease till it reaches 200 cells/uL (a clinical definition of AIDS) below which an infectious disease like TB can easily kill the patient. One way to diagnose the HIV is to count the number of CD4+ and CD8+ T cells per microliter in human blood.

We present a differential CD4+/CD8+ T cell lymphocyte counter. The 10uL of blood is infused in the device along with the lysing buffer to lyse the red blood cells. Quenching buffer is then infused to maintain the pH of the solution. The remaining white blood cells pass through the 15 micron counting channel where a set of micro-electrodes generate a pulse for each passage of a cell, thus giving the entrance counts. The cells then passed through a capture chamber to which CD4 Antibody is initially immobilized by adsorption surface chemistry. With optimized shear stress for maximum capture efficiency, the cells flow through the capture chamber and CD4 cells get captured. The remaining cells pass through another counting channel and give the exit count. By taking the difference between the counts, the number of captured CD4 cells is calculated. Similar procedure is used to find the CD8+ T cell count. A high co-relation exists in between the CD4+ and CD8+ T cell counts from our device and the control results from the Carle hospital using blood from the healthy people and infected donors. The high correlation with the "golden standard" of flow cytometry suggest that this electrical differential counting method with on-chip sample preparation is a viable technology to provide portable and rapid CD4+ and CD8+ T cell counts for patients in resource-poor regions.



Coffee and cookies will be served
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