Improving CD4 T-cell Trending in HIV Patients with a Moving Average Lymphocyte Count

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The time from infection with HIV to development of AIDS correlates with progressive immune deficiency which has been traditionally characterized by loss of circulating CD4 T-lymphocytes. Trends in CD4 counts are considered important for initiating HIV therapy and switching therapy regimens when patients become drug resistant. However, trending CD4 count is made difficult by three variable factors that are not related to HIV; diurnal variation, inherent within-day random variation, and inherent day to day random variation. Physiologic changes in lymphocyte count are the root cause for these variations in CD4 count.

In our study of both normal and HIV-infected subjects, absolute CD4 counts rose on the average by 31% during a normal clinic day whereas CD4% (CD4 lymphocyte count normalized to total lymphocyte count) rose only by 6%. The within-day coefficient of variation of CD4 count was 15% compared to 5% for CD4%. The day to day coefficient of variation of CD4 count was 12% when phlebotomy was controlled to within an approximate two hour band, whereas it was 5% for CD4%. These results indicate that CD4 counts are subject to within- and between-day random variability that is less apparent for CD4%. Despite the robustness of CD4%, clinical guidelines for using CD4% are not available; primarily because flow cytometry for CD4% has not been widely deployed. In recognition of this shortcoming, we have developed a method to enhance the trending value of absolute CD4 counts by incorporating a moving average of lymphocytes obtained from three past lymphocyte counts. This reduced the variability of the CD4 count to the same, low level as that for CD4%. This compensation technique improves confidence in absolute CD4 readings and will allow current clinical standards for CD4 count to be used more effectively.