Using in-vitro stimulation of blood sample as a measure of HIV incidence in a cross sectional population study – cost effective and informative.

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Background: Estimating HIV-1 incidence (rate of new HIV-1 infections) in various populations is important to understand the current status of transmission dynamics, identify high-risk populations, monitor prevention efforts and target resources on programs that are most effective in reducing transmissions. Several different laboratory methods have been developed to measure recent infections in the post-seroconversion phase, yet they have several limitation.
Methods: Blood samples, unlinked, which were sent to the immunology laboratory in Kenyata Hospital in Kenya for HIV testing, had 1ml of blood cultured for 5 days (using SMARTube™ culture tubes), for stimulation of HIV specific antibody production. Antibody level was measured, in both the plasma and the culture supernatant, using the same diagnostic kits.
Results: Of 413 adult donors, 32 (7.7%) were seropositive, and there were an additional 14 (3.4%) positives in the culture supernatant after the pre-incubation step. Among 280 high-school donors, 10 (3.6%) were seropositive, and additional 8 (2.8%) were positive after incubation. When the signal/cut-off ratios for the ELISA readings in the seropositive individuals were compared (supernatant versus plasma), it was found that more samples showed increase in antibody levels after stimulation in the younger cohort than the adult one.
Conclusions: Using a pre-testing stimulation step, in addition to the plasma testing for HIV antibodies, has a two fold benefit when doing a cross sectional study of a high risk population. First, it enables the detection of those in the earliest stages of the infection, before seroconversion, giving a good indication of the most early infections (which are otherwise missed). Second, as can be seen from the difference between the younger population, with more recent infections, versus the adult, it offers an indicator for sorting the recent seroconversions from the older ones, based on the stimulation index between supernatant and plasma HIV antibody levels. Thus a compounded, two phase, calculations of the incidence rate (very early, and recent seroconversions) can be achieved by using a simple, cost effective, pre-testing culture step and comparing the plasma and the supernatant ELISA reading.