# Poster #565: Estimated time from HIV infection to earliest detection for 4 FDA-approved point-of-care tests

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## Background

Currently available estimates of time from infection to first detection with FDA-approved rapid HIV tests are based on testing of plasma seroconversion panels.

Most rapid HIV tests are designed to be used at the point-of-care (POC). In these settings the tests are performed on unprocessed specimens: whole blood, fingerstick blood, or oral fluid.

## Objective

We designed a study, Project DETECT, to assess seroconversion sensitivity for tests when using these unprocessed specimens.

## Methods

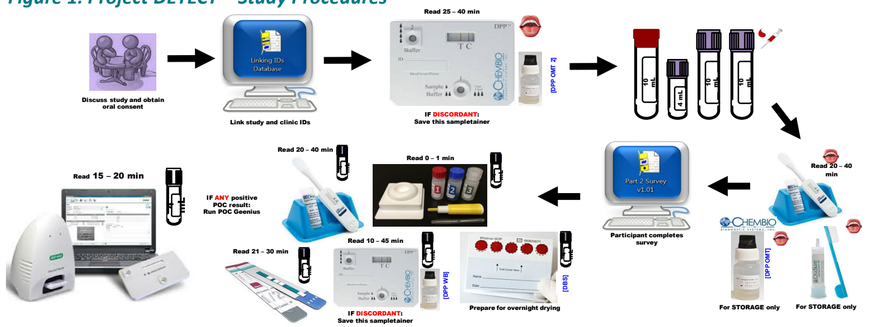
Project DETECT is a research contract awarded to the University of Washington by the CDC. Participants were at high risk for HIV infection and seeking testing at the public STD clinic in Seattle Washington, or were referred to the study after diagnosis with early infection.

Study procedures are outlined in Figure 1. All participants completed a behavioral questionnaire designed to identify recent exposures that could have led to HIV infection, and collect data on symptoms of acute HIV infection experienced in the preceding 3 months, including: Fever, sore throat, nausea, vomiting, diarrhea, fatigue, joint stiffness, and body rash.

We limited this analysis to 12 participants with discordant results at the enrollment visit who were enrolled in serial follow-up with planned visits at 3, 7, 10, 14, 21, 28, 42, 56, 70, 90, 120, 180, 270 and 360 days past enrollment.

## Methods - Continued

***Figure 1: Project DETECT – Study Procedures***




Estimated dates of infection were based on an average of the 3 items in Table 1. Figure 2 provides an example: interpolation from observed viral load values suggested a date of infection of approximately 29 days prior to enrollment, symptoms began 22 days before enrollment, and the most recent reported exposure was reported 29 days prior to enrollment. Estimated date of infection for this participant was 30 days prior to enrollment. Table 1 shows the estimated date of infection for all 12 participants with a range of 21 to 60 days before enrollment.

***Figure 2: Illustration of data available to estimate time of infection for participants enrolled in serial follow-up***

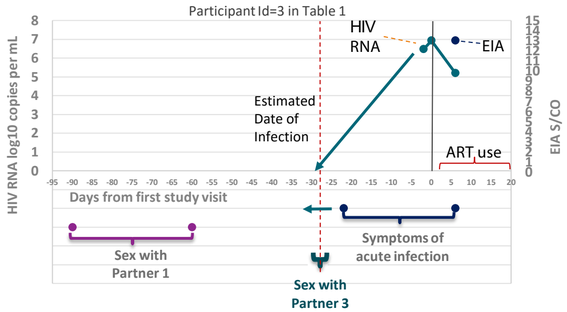



***Table 1: Estimated days between infection and first study visit for 12 seroconverters***

| ID | Linear interpolation from viral load | Symptom onset -10 days | Possible Exposure | Average |
|---|---|---|---|---|
| | Estimated days before first study visit | | | |
| 1 | -27 | -32 | -26 | -28.33 |
| 2 | -37.5 | | | -37.5 |
| 3 | -29 | -32 | -29 | -30 |
| 4 | -21 | | -45 | -33 |
| 5 | -12 | | -30 | -21 |
| 6 | -55 | -55 | -15 | -41.67 |
| 7 | -42 | -35 | -45 | -40.67 |
| 8 | -30 | -30 | -40 | -33.33 |
| 9 | -20 | -35 | -45 | -33.33 |
| 10 | -25 | -27 | -45 | -32.33 |
| 11 | -37 | -98 | -45 | -60 |
| 12 | -27 | -15 | -45 | -29 |

## Results

Table 2 shows estimates of median time to first detection as well as the percent of participants with reactive results at 30, 45, 60 and 90 days post infection.

***Table 2: Estimated time from infection to first detection for 4 FDA-approved rapid HIV tests when performed on unprocessed specimens from 12 seroconverters***

| Test | Specimen type | Median days from infection to detection (Range) | %‡ Detected by 30 days post infection | 45 days post infection | 60 days post infection | 90 days post infection |
|---|---|---|---|---|---|---|
| Determine HIV-1/HIV-2 | Venous whole blood | 33 (27–68) | 33% | 75% | 100% | |
| AG/AB Combo | Fingerstick blood | 38 (30–68) | 11% | 89% | 100% | |
| Insti HIV-1/HIV-2 | Venous whole blood | 35 (28–68) | 33% | 83% | 100% | |
| | Fingerstick blood | 42 (30–68+) | 11% | 67% | 89% | 100% |
| Oraquick HIV-1/HIV-2 Advance | Venous whole blood | 38 (30–70+) | 17% | 75% | 92% | 100% |
| | Fingerstick blood | 42 (33–70+) | 0% | 67% | 89% | 100% |
| | Oral fluid | 42 (32–90+) | 0% | 75% | 75% | 83% |
| DPP HIV-1/HIV-2 | Venous whole blood | 38 (30–68) | 17% | 75% | 100% | |
| | Fingerstick blood | 42 (33–68) | 0% | 67% | 100% | |
| | Oral fluid | 43 (32–90+) | 0% | 75% | 75% | 75% |

‡12 seroconverting participants were tested with whole blood and oral fluid samples. 9 with discordant results at the enrollment visit were also tested using EDTA whole blood, fingerstick blood, and oral fluid at 3, 7, 10, 14, 21, 28, 42, 56, 70, 90, 120, 180, 270 and 360 days past enrollment. Participants were followed until they tested positive on all HIV tests and specimen types. For this analysis follow-up was censored at 90 days, the current recommended retesting window for POC rapid tests.
+3 participants remained negative on at least one test performed on oral fluid through 90 days of follow-up. All 3 had initiated antiretroviral therapy at or near study enrollment but were reactive on the blood and/or fingerstick version of the same test <70 days after estimated date of infection. 1 of these 3 exhibited seroreversion using the Insti test, testing positive at the first visit then negative for 4 study visits before again becoming positive for the remainder of follow-up.

## Summary of Results and Discussion

Median time to first detection ranged between 33 and 43 days.

- Most tests were reactive in all participants by 90 days after infection.
- For 3 individuals time of first detection was delayed 1 study visit (3 to 7 days) for the same test performed on fingerstick compared to whole blood.
- For the 2 tests performed on oral fluid there was a median delay of 2 and 4 days as compared to whole blood.

All 12 participants initiated antiretroviral therapy a median of 2 days after study enrollment (range: -10 to 37 days).

- 3 participants who initiated treatment prior to reaching peak viremia remained negative on ≥1 oral fluid test through 90 days of follow-up.

Compared to estimates of median time to first detection for the same tests derived from plasma seroconversion panels, these tests showed an additional delay in time to detection of 1 to 3 weeks when performed on unprocessed specimens.

POC tests are important for HIV screening, and access to prevention and treatment. Therefore, further improvements in seroconversion sensitivity and evaluations of new POC tests on unprocessed specimens are warranted.

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