



HIV Antigen/Antibody Testing In a Low Incidence Population

T. Dubravac, T. Gahan, and M. Pentella. State Hygienic Laboratory at the University of Iowa, Coralville, IA.

Abstract

Objective: In 2010, Iowa reported 3.6 HIV diagnoses per 100,000 compared to the national average of 16.1. While incidence is low, the need to quickly identify and treat infected individuals is as great or greater because of the lack of public awareness. Detectable levels of antibody can take from two to eight weeks to develop, while HIV p24 antigen can be detected as early as one week after infection. This study was conducted to evaluate the performance of an HIV antigen/antibody combo (4th generation) assay compared to an EIA 3rd generation assay, for routine screening in a low HIV incidence population.

Methods: Over a 4 month period, 2,037 specimens submitted for HIV screening were tested by BioRad HIV-1/2 Plus O EIA and the Abbott Architect HIV antigen/antibody combo assay. The performance characteristics of sensitivity, specificity, positive predictive value and negative predictive value were determined.

Results: Of the 2,037 specimens tested, there were 13 true positives detected. None of the positive test results were from patients who had not yet produced antibodies to HIV. The antigen/antibody assay had a sensitivity, specificity, positive-predictive value and negative predictive value of 100%, 99.85%, 81.25%, and 100% respectively. Three false positives were detected by the antigen/antibody assay and tested negative by EIA, western blot and HIV NAAT testing. For the three false positive tests by the antigen/antibody assay, the signal to cut off ratio was low at 1.86, 2.03 and 1.59 respectively. The EIA had a sensitivity, specificity, positive-predictive value and negative predictive value of 100%, 99.80%, 76.47% and 100%, respectively. The EIA had four false positive results which tested negative by the antigen/antibody assay and western blot.

Conclusion: In a low-incidence state where early infections are less commonly encountered, both the EIA assay and the antigen/antibody assay perform with near equivalency in detecting HIV infection. The antigen/antibody assay had one less false positive result. While no patients were detected in that early stage of infection, the use of the antigen/antibody assay presents the opportunity to detect an infected patient sooner.

Detection of HIV by Diagnostic Tests

With the FDA approval of the 4th generation HIV antigen/antibody combination assay in 2010, Iowa's State Hygienic Laboratory reviewed its testing program to determine the appropriate test to offer for the population served in the state. While most testing comes from clinics and correction facilities in the state, the number of positives detected is low compared to other parts of the U.S. Regardless of the number of positives, the need to detect positives early in the disease process and link infected individuals to treatment programs is still a critical prevention effort. It is recognized that the 1989 HIV diagnostics algorithm which detects only HIV antibody using a screening immunoassay followed by the Western Blot (WB) is no longer adequate since the introduction of more sensitive assays that detect the presence of antibodies earlier in the course of the disease. Current 3rd generation (antigen-sandwich) immunoassays are now routinely employed for HIV screening, and 4th generation (antigen/antibody combination) immunoassays have recently been approved by the FDA. These newer assays detect HIV infection earlier than the WB or immunofluorescence assay (IFA), resulting in increased numbers of indeterminate or negative supplemental test results. CDC and APHL have collected data that support alternative testing algorithms.



Abbott Architect Performance Characteristics

| N = 2037 | HIV Ag/Ab Positive | HIV Ag/Ab Negative |
|-----------------------|--------------------|--------------------|
| Positive by Architect | 13 | 3 |
| Negative by Architect | 0 | 2021 |

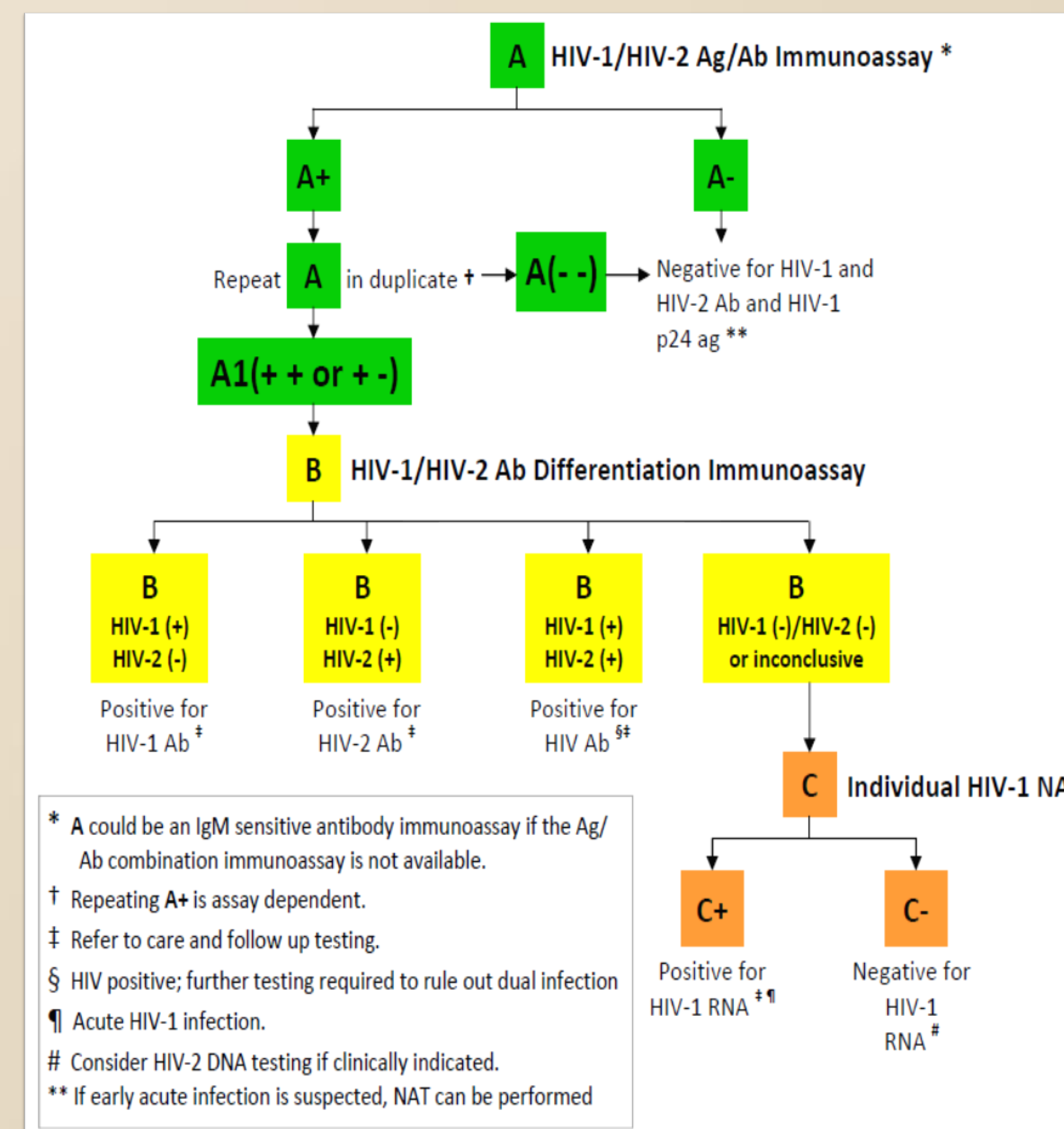
| Abbott Architect | |
|---------------------------|--------|
| Sensitivity | 100% |
| Specificity | 99.85% |
| Predictive Value Positive | 81.25% |
| Predictive Value Negative | 100% |

BioRad HIV-1/2 Plus O EIA Performance Characteristics

| N = 2037 | HIV Ag/Ab Positive | HIV Ag/Ab Negative |
|-------------------------------------|--------------------|--------------------|
| Positive by BioRad HIV – 1/2 Plus O | 13 | 4 |
| Negative by BioRad HIV 1/2 Plus O | 0 | 2020 |

| BioRad HIV1/2 Plus O | |
|---------------------------|--------|
| Sensitivity | 100% |
| Specificity | 99.80% |
| Predictive Value Positive | 76.47% |
| Predictive Value Negative | 100% |

Proposed Algorithm 2010



Algorithm Benefits

- While no additional positives were detected by the Abbott Architect in this small sample study, adopting the algorithm provides for the detection of infected individuals in the highly viremic, acute phase and acts as an effective tool in reducing transmission.
- The Abbott Architect 4th generation assays demonstrated itself to be a highly sensitive and specific HIV serologic assay. In this study of a low incidence population the 3rd & 4th generations performed essentially the same with the exception of one additional false positive for the 3rd generation assay.
- The HIV-1 RNA test resolved the false positives.
- The new algorithm is less labor intensive than the current algorithm and should provide a more rapid turn around time.
- Additionally, the algorithm provides for detection of HIV-2, which can incorrectly be identified as HIV-1 using WB.

Conclusions

- The performance characteristics of the Antigen/Antibody are essentially equal.
- The Abbott Architect detected one less false positive result in this low sample size from a low incidence population.
- The ultimate success is the detection of patients in the acute phase of disease. None, however, were detected in this study
- These results demonstrate the value to Public Health Labs which adopt the new algorithm including screening with an antigen/antibody assay and elimination of routine use of the WB