The Analytical Sensitivity of the 3M™ Rapid Detection Flu A+B Assay

Infectious Diseases Society of America
October 2007

Authors:
Suzanne E. Dale, PhD., Christine Mayer, BS., Marie C. Mayer BS., and Marilyn Menegus PhD.
Clinical Microbiology Laboratories, University of Rochester Medical Center, Rochester, New York 14642
The Analytical Sensitivity of the 3M™ Rapid Detection Flu A+B Assay

Suzanne E. Dale, PhD., Christine Mayer, BS., Marie C. Mayer BS., and Marilyn Menegus PhD.
Clinical Microbiology Laboratories, University of Rochester Medical Center, Rochester, New York 14642

Introduction and Purpose
Currently available tests for the rapid diagnosis of influenza lack sensitivity compared to viral culture, generally require subjective interpretation and lack automation. The investigational 3M™ Rapid Detection Flu A+B Test is a lateral flow immunochromatographic assay that detects and differentiates influenza A/B from nasal and nasopharyngeal swabs and aspirates. The results generated in this assay are read and interpreted by the automated 3M™ Rapid Detection Reader.

The purpose of this study was to compare the analytical sensitivity of the 3M Rapid Detection Flu A+B Test with three other commercially available rapid influenza antigen detection assays. The assays used as comparators included the BD Directigen™ EZ Flu A+B, Inverness BinaxNOW® Influenza A&B and the Quidel QuickVue® Influenza A+B tests.

The 3M Rapid Detection Flu A+B Test detects and differentiates between influenza A/B. It’s an objective lateral flow immunochromatographic (IC) assay able to detect nucleoprotein antigen using nasal washes, NP swabs and aspirates. An automated Reader allows connectivity to laboratory information systems.

Study Design
Five different influenza A (2 H1N1 and 3 H3N2) and five different influenza B viruses were prepared in primary rhesus monkey kidney cells. The TCID50 of each virus was calculated using the Reed-Muench method. The virus titers ranged from 32,768 to 121,072 TCID50 for the Influenza A strains and 44,728 to 98,304 TCID50 for the Influenza B strains.

Each virus was diluted in serial two-fold dilutions into normal saline. For kit testing, the lowest starting dilution was 1/32 and the highest ending dilution was 1/2048. For all experiments, this proved to be a suitable range to achieve positive and negative results with the majority of the assays tested. Each dilution was tested in duplicate for each assay according to the manufacturer’s instructions. The following tests were used: Directigen™ EZ Flu A+B, Inverness BinaxNOW® Influenza A&B, Quidel QuickVue® Influenza A+B and 3M Rapid Detection Flu A+B Test. Results reported are the highest dilution for which any replicate of the assay was positive.

Results
The analytical sensitivity of each rapid influenza assay with each virus tested. Values in the table indicate the last dilution for which the test was deemed positive.

<table>
<thead>
<tr>
<th>Influenza</th>
<th>Titer</th>
<th>3M™ Best</th>
<th>BD™ EZ</th>
<th>Quidel®</th>
<th>BinaxNOW®</th>
</tr>
</thead>
<tbody>
<tr>
<td>A/Korea/770/2002 (H3N2)</td>
<td>32,762</td>
<td>2,048</td>
<td>1,024</td>
<td>2,048</td>
<td>512</td>
</tr>
<tr>
<td>A/Philippines/4/1968 (H3N2)</td>
<td>131,072</td>
<td>1,024</td>
<td>1,024</td>
<td>1,024</td>
<td>128</td>
</tr>
<tr>
<td>A/Panama/2007/99 (H3N2)</td>
<td>49,152</td>
<td>2,048</td>
<td>512</td>
<td>1,024</td>
<td>256</td>
</tr>
<tr>
<td>A/H1N1/Taiwan/87 (H1N1)</td>
<td>49,152</td>
<td>512</td>
<td>256</td>
<td>1,024</td>
<td>256</td>
</tr>
<tr>
<td>A/H3N2/Phillipines/86 (H3N2)</td>
<td>32,768</td>
<td>1,024</td>
<td>256</td>
<td>1,024</td>
<td>512</td>
</tr>
<tr>
<td>B/Shizuoka/15/2001</td>
<td>98,304</td>
<td>2,048</td>
<td>256</td>
<td>1,024</td>
<td>512</td>
</tr>
<tr>
<td>B/Shenzhen/379/99</td>
<td>98,304</td>
<td>2,048</td>
<td>256</td>
<td>1,024</td>
<td>512</td>
</tr>
<tr>
<td>B/NewEngland/123/99</td>
<td>98,304</td>
<td>1,024</td>
<td>256</td>
<td>1,024</td>
<td>512</td>
</tr>
<tr>
<td>B/Shanghai/361/2002</td>
<td>44,728</td>
<td>2,048</td>
<td>256</td>
<td>1,024</td>
<td>512</td>
</tr>
<tr>
<td>B/USSR/86</td>
<td>49,152</td>
<td>2,048</td>
<td>256</td>
<td>1,024</td>
<td>512</td>
</tr>
</tbody>
</table>

Summary comparison of the analytical sensitivity for each assay.

Influenza A Sensitivity

- **QuickVue®**: 1 min extraction step, 2 min incubation, generally easy to read
- **Directigen™ EZ**: 1 min extraction step, 2 min incubation, generally easy to read
- **BinaxNOW®**: Investigational product, 3 min incubation, automated results, easy to read
- **3M Rapid Detection Flu A+B Test**: Investigational product, 3 min incubation, automated results, easy to read

Influenza B Sensitivity

- **QuickVue®**: 1 min extraction step, 15 min incubation, generally easy to read
- **Directigen™ EZ**: 1 min incubation, 15 min incubation, easy to read
- **BinaxNOW®**: Investigational product, 3 min incubation, automated results, easy to read
- **3M Rapid Detection Flu A+B Test**: Investigational product, 3 min incubation, automated results, easy to read

Results (cont.)
Archived samples (60) were tested using the 3M™ Rapid Detection Flu A+B Assay:
- 30 were previously positive by culture and antigen detection (QuickVue or Directigen EZ)
- 30 were negative by both culture and antigen

In this population, the 3M™ Rapid Detection Flu A+B Assay showed:
- **100% sensitivity**
- **100% specificity**

Substantiates, at a minimum, equivalence to other available rapid influenza antigen detection assays.

Summary and Conclusions

**Influenza A**
The 3M™ Rapid Detection Flu A+B Assay is analytically:
- More sensitive than the BinaxNOW and Directigen EZ Influenza tests
- Equally sensitive to the QuickVue Influenza test

**Influenza B**
The 3M™ Rapid Detection Flu A+B Assay is analytically:
- More sensitive than the BinaxNOW, Directigen EZ and Quidel Influenza tests

Reference

Suzanne E. Dale can be contacted at the Hamilton Regional Laboratory Medicine Program, McMaster University, Hamilton, ON L8S 4J9
Christine Mayer, Marie Mayer and Marilyn Menegus can be contacted at the University of Rochester.

Acknowledgement
This study was funded by 3M.