Evaluation of the bioNexia® Rota/Adeno RAPID TEST

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INTRODUCTION

Acute gastroenteritis (AGE) is one of the most common diseases in humans and continues to be a cause of high morbidity and mortality in children worldwide. A rapid detection can help to put in place the infection control procedures to stop the spread of the disease and limit the damage.

bioMérieux has recently launched bioNexia® Rota/Adeno for rapid and simultaneous detection of Rotavirus and Adenovirus in human stool samples. The test is intended to be used by healthcare professionals in laboratories as well as for Near-Patient Testing.

MATERIAL AND METHODS

- **Comparative study between bioNexia® Rota/Adeno and Rotavirus RT-PCR:**
  The performance of bioNexia® Rota/Adeno for the detection of rotavirus was evaluated by comparison to a Rotavirus real-time Reverse Transcription Polymerase Chain Reaction (RT-PCR) in the National Reference Center (NRC) in Dijon (France) on 321 stool samples coming from patients presenting gastroenteritis symptoms. The NucliSENS® Easy MAG™ platform (bioMérieux) was used for the nucleic acid extraction.

- **Evaluation of bioNexia® Rota/Adeno on Near-Patient-Testing (NPT):**
  The NPT study was conducted at BIOFORTIS (Saint Herblain, France): 7 physicians and 8 nurses were represented in this clinical trial. The operators were informed on the product use without any training. A panel composed of 16 randomized samples (including negative, low and high positive samples) was provided to each operator. A total of 15 panels were tested corresponding to a total of 240 samples and resulting in 480 results since 2 results (adenovirus and rotavirus) were obtained per sample.

- **Analytical sensitivity:**
  The analytical sensitivity study was carried out in NRC in Dijon. Internal standard for rotavirus and adenovirus were used. A range of adenovirus standard dilution was assessed with an in-house quantitative RT-PCR. The viral load of each adenovirus standard dilution was measured by non-laboratory healthcare professionals.

- **Cross-reactivity**
  The cross-reactivity was evaluated on 18 gastrointestinal pathogens (17 bacteria and 1 virus isolate). Twenty five stool samples coming from patient presenting gastroenteritis other than rotavirus and adenovirus were also tested.

- **Interfering substances**
  The interference of certain endogenous substances and some drugs that may be present in stool was evaluated. Positive and negative stool samples were treated with each substance at a pre-established concentration: Loperamide, Mesalazine, Metronidazole, Naproxen, Phenylephrine, Sennosides, Benzalkonium, Chloride, Ciprofloxacin, Erythromycin, Ethanol, Gentamicin, Mineral oil, Hydrocortisone, Aluminum Hydroxide, Magnesium Hydroxide, Lidocaine, Loperamide, Mesalazine, Metronidazole, Naproxen, Phenylephrine, Sennosides, Tetracycline.

- **Transport Media**
  Thirty stool samples (20 negative and 10 positive) collected in modified (semi-solid) Cary-Blair transport medium COPAN have been tested with bioNexia® Rota/Adeno test.

RESULTS

1. **Comparative study between bioNexia® Rota/Adeno and Rotavirus RT-PCR**

<table>
<thead>
<tr>
<th>Rotavirus RT-PCR</th>
<th>bioNexia® Rota/Adeno</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive</td>
<td>26</td>
</tr>
<tr>
<td>Negative</td>
<td>5</td>
</tr>
<tr>
<td>Negative</td>
<td>286</td>
</tr>
</tbody>
</table>

   - **Negative percent agreement/ RT-PCR:** 96.5% – 98.6%
   - **Positive percent agreement/ RT-PCR:** 96.5% – 98.6%

2. **Evaluation of bioNexia® Rota/Adeno on Near-Patient-Testing (NPT):**

<table>
<thead>
<tr>
<th>Sample level</th>
<th>Total number of observations</th>
<th>Observed positive result</th>
<th>Observed negative result</th>
<th>Agreement observed/ expected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negative</td>
<td>300</td>
<td>6</td>
<td>294</td>
<td>98.6%</td>
</tr>
<tr>
<td>All positives</td>
<td>180</td>
<td>169</td>
<td>11</td>
<td>93.8%</td>
</tr>
<tr>
<td>Low positive</td>
<td>60</td>
<td>56</td>
<td>4</td>
<td>93.3%</td>
</tr>
<tr>
<td>Moderate positive</td>
<td>60</td>
<td>56</td>
<td>4</td>
<td>93.3%</td>
</tr>
<tr>
<td>High positive</td>
<td>60</td>
<td>57</td>
<td>3</td>
<td>95.0%</td>
</tr>
</tbody>
</table>

   Overall agreement at 10 minutes: 96.5% – 97.9%

   - **bioNexia® Rota/Adeno** presents very satisfactory agreement between the results of the untrained operators and the expected results.

3. **Analytical sensitivity**

   - **Rotavirus Standard (Rotavirus culture suspension)**
     - **Analytical sensitivity**
       - Rotavirus QuantiFast Real-Time RT-PCR (CFU/mL)
       - Adenovirus QuantiFast Real-Time PCR (Adenovirus R-gene™ test)

   - **bioNexia® Rota/Adeno** shows excellent performance in terms of positive agreement and negative agreement versus Rotavirus RT-PCR. The analytical sensitivity is similar to the VIKIA Rota/Adeno.

   - **VIRUS ACHI**
     - 10^9 to 10^10 TCID50/ mL
     - No cross-reactivity

4. **Cross-reactivity**

   - **Microorganisms/Viruses**
     - Concentration
     - Results

   - For each strain, the number of colonies per mL suspension (CFU/mL) was determined with the Mac Farland method using a densitometer (bioMérieux Densimat). **Tissue Culture Infectious Dose**

5. **Interfering substance**

   - The substances that may be present in human stool were evaluated. They do not interfere with bioNexia® Rota/Adeno.

6. **Transport media**

   - The (semi-solid) Cary-Blair transport medium doesn’t interfere nor with the negative or positive results. Hence, this transport media is validated for bioNexia® Rota/Adeno test.

CONCLUSIONS

- **bioNexia® Rota/Adeno** shows excellent performance in terms of positive agreement and negative agreement versus Rotavirus RT-PCR. The analytical sensitivity is similar to the VIKIA Rota/Adeno. No interference was detected with pathogens or substances potentially present in stool.

- The stool can be collected in modified Cary-Blair transport medium. Furthermore, this easy-to-use rapid test is appropriate for Near-Patient Testing by non-laboratory healthcare professionals.