Evaluation of the bioNexia® Rota/Adeno RAPID TEST

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22 - 23 - 24 juin 2016

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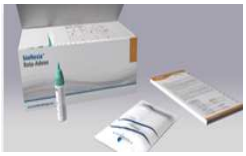
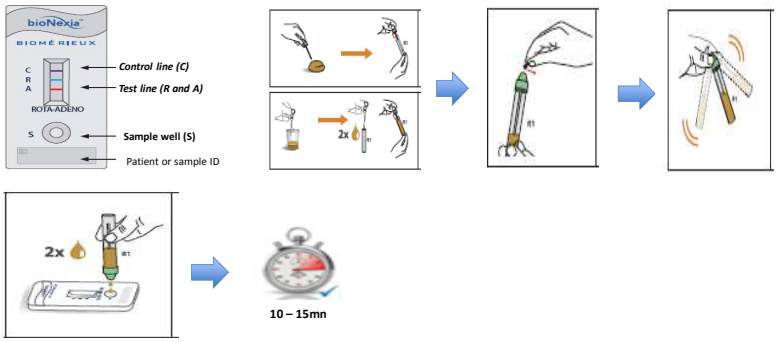
INTRODUCTION

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 Rotavius 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.





The aim of this study was to evaluate the performance of this qualitative Rapid Test

MATERIAL AND METHODS

❑ Comparative study between bioNexia® Rota/Adeno and Rotavirus RT-PCR :

The performance of bioNexia® Rota/Adeno for the detection of rotaviruses 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 dilution was made for each standard, the last dilution giving a positive result was considered as the limit of detection. The NucliSENS® Easy MAG™ platform (bioMérieux) was used for the nucleic acid extraction. The viral load of each rotavirus standard dilution was assessed with an in-house quantitative RT-PCR. The viral load of each adenovirus standard dilution was assessed with Adenovirus R-gene™ commercial kit (Argene, reference 69-010B).

❑ Cross-reactivity

The cross-reactivity was evaluated on 18 gastrointestinal pathogens (17 bacteria and 1 virus isolate). Twenty five stool samples coming from patient infected with gastrointestinal pathogens 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 spiked with each substance at a pre-established concentration: *Hemoglobin Lipids, Mucin Amoxicillin, Bismuth Salicylate, Calcium Carbonate, Ceftriaxone, Benzalkonium, Chloride, Ciprofloxacin, Erythromycin, Ethanol, Gentamicin, Mineral oil, Hydrocortisone, Aluminium 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

		Rotavirus RT-PCR	
		Positive	**Negative**
bioNexia® Rota/Adeno	**Positive**	**26**	4
	Negative	5	**286**

Negative percent agreement/ RT-PCR: ***98.6%*** *[96.5% – 99.6%]*
Positive percent agreement/ RT-PCR : ***83.9%*** *[66.3% – 94.5%]*

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

ROTAVIRUS and ADENOVIRUS combined – 10 minutes				
Sample level	**Total number of observations**	**Observed positive result**	**Observed negative result**	**Agreement observed/ expected**
Negative	300	6	294	**98.0 % [95.7 – 99.3]%**
All positives	180	169	11	**93.8 % [89.4 – 96.6]%**
Low positive	60	56	4	**93.3 % [84.1 – 97.4]%**
Moderate positive	60	56	4	**93.3 % [84.1 – 97.4]%**
High positive	60	57	3	**95.0 % [86.1 – 99.0]%**
Overall agreement at 10 minutes	480	463 (=169+294)		**96.5 % [94.4 – 97.9]%**

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

3. Analytical sensitivity

	Rotavirus Standard (Rotavius culture supernatant)	**Adenovirus Standard (Adenovirus culture supernatant)**
	Analytical senstivity *Rotavirus Quantitative Real-time RT-PCR (CNR home test)*	Analytical sensitivity *Adenovirus Quantitative Real-time PCR (Adenovirus R-gene™ test)*
bioNexia Rota/Adeno	**$4{,}60.10^6$ copies**	**$6{,}79.10^5$ copies**
VIKIA Rota/Adeno	**$4{,}60.10^6$ copies**	**$6{,}79.10^5$ copies**

The analytical sensitivity of bioNexia® Rota/Adeno is similar to VIKIA Rota/Adeno

4. Cross reactivity

Microorganisms/Viruses	Concentration	Results
Staphylococcus aureus methicillin S,Staphylococcus aureus methicillin R, Staphylococcus methicillin S, Enterobacter agglomerans A, Campylobacter jejuni, Campylobacter fetus, Candida albicans, Klebsiella pneumoniae, Vibrio cholerae, Vibrio parahaemolyticus, Escherichia coli, Shigella sonneii, Alcaligenes faecalis, Yersinia enterocolitica, Pseudomonas aeruginosa,Salmonella enteritidis, Streptococcus group D	6×10^8 CFU/mL*	No cross-reactivity
Virus Aichi	10^4 to 10^6 TCID50/mL**	No cross-reactivity

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

25 stool samples containing the following viruses: Enterovirus, Hepatitis A virus, Astrovirus, Coronavirus, Norovirus GI, Norovirus GII were tested: no cross reactivity was observed

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.