APPLICATION NOTE

IVD

Evaluation of the EchoLUTION™ Viral RNA/DNA Kit for Nucleic Acid Extraction of Respiratory and Enteropathogenic Viruses

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Rapid and accurate clinical diagnostic tests are essential for the detection of viral infections and proper medical care. Real-time polymerase chain reaction (qPCR) is used to diagnose respiratory and enteropathogenic viruses, among other pathogens, in cutting-edge clinical practice. The detection sensitivity of this approach is mostly determined by the reliability and efficiency of both the nucleic acid extraction procedure and the qPCR. The EchoLUTION technology is an innovative method that allows nucleic acid extraction with a single centrifugation step. In this study, we evaluate the performance of the LyseNtact Buffer New Formula, which is included in the EchoLUTION Viral RNA/DNA Kit, for the nucleic acids extraction from SARS-CoV-2 and enteropathogenic virus (adenovirus and rotavirus). This new buffer has been developed to enhance the sustainability standards of the kit. The data confirm that the LyseNtact Buffer New Formula is suitable for the extraction of nucleic acids from respiratory and enteropathogenic viruses, displaying comparable results in all investigated assays. In addition, LyseNtact Buffer New Formula performs as well as or better than the LyseNtact Buffer included in the EchoLUTION Viral RNA/DNA Swab Kit Plus, which was previously available in the European Union.

Introduction

The pandemic caused by the severe acute respiratory syndrome coronavirus type 2 (SARS-CoV-2) demonstrated the importance of preventing the spread of viruses and treating symptoms early. These issues are also important for responding to enteropathogenic virus epidemics in which children are more severely affected than adults by gastrointestinal complications. As infectious viral diseases proliferate, quick and accurate clinical diagnostic tests are crucial for determining the disease progression and, ultimately, for creating the best possible patient care. qPCR is commonly used for the molecular biological detection of nucleic acids from viral pathogens. This detection technique guarantees high throughput and excellent sensitivity. However, in contrast to the rapid development of qPCR, the extraction methods used for these detection techniques have not

improved much in the past decades. More than 90 % of the kits on the market use a silica-based purification principle, which involves high-salt solutions and buffers containing organic solvents that can compromise or inhibit downstream applications. Commonly used extraction methods are time-consuming, as they comprise several washing steps. As a faster alternative, BioEcho Life Sciences provides the EchoLUTION Viral RNA/DNA Kit based on the patented EchoLUTION technology for fast lysis followed by single-step nucleic acid isolation. In contrast to conventional methods, nucleic acids flow freely through the EchoLUTION purification matrix rather than being attached to a membrane or magnetic beads, while unwanted lysate components, including inhibitors, are held back in the matrix. The EchoLUTION technology reduces the use of hazardous reagents to a minimum and omits all binding and washing steps, which not only leads to drastic time saving, but also reduces plastic consumption by up to 70 %. To better improve the sustainability of the product, we have developed a new lysis buffer for the EchoLUTION Viral RNA/DNA Kit, LyseNtact Buffer New Formula, which is more environmentally friendly than the previous buffer (LyseNtact Buffer, formerly included in the EchoLUTION Viral RNA/DNA Swab Kit Plus). Other than the lysis buffers, the other components of both kits are the same.

In this application note, we evaluate the performance of the LyseNtact Buffer New Formula in comparison with the previous formulation (LyseNtact Buffer) for the nucleic acid extraction of a respiratory virus (SARS-CoV-2) and enteropathogenic viruses (adenovirus, and rotavirus). For this purpose, we collected 20 positive SARS-CoV-2 samples and 36 clinical patient samples positive for enteropathogens and processed each sample with both buffers. We analyzed performance, precision, sensitivity, and compatibility with different sample types as well as with different swab preparation and transport media. The data demonstrate that, in all assays, the LyseNtact Buffer New Formula performs similarly to the LyseNtact Buffer. Our results confirm that the EchoLUTION Viral RNA/DNA Kit provides a robust method and is suitable for the extraction of nucleic acids and their subsequent use for detection of respiratory and enteropathogenic viruses.

Materials and Methods

Lysis buffer and protocol adaptations

For all experiments, the newly developed EchoLUTION Viral RNA/DNA Kit (BioEcho Life Sciences, Germany), which includes the more sustainable LyseNtact Buffer New Formula, was compared to the EchoLUTION Viral RNA/DNA Swab Kit Plus (BioEcho Life Sciences), previously available in the EU, which contains the LyseNtact Buffer. To simplify readability, we refer to the lysis buffer names rather than the kit names throughout this application note.

Data from the application note ***Diagnosis of Enteropathogenic Viruses from Clinical Stool Samples using EchoLUTION Nucleic Acid Extraction Technology***[1] demonstrated that the mean ΔCt value for rotaviruses was significantly higher with the EchoLUTION method than with a magnetic bead-based method (ΔCt = 10.60 ± 0.81). We discussed that the reason for this phenomenon is most likely due to virus lysis efficiency. Rotaviruses have a triple capsid structure that presents a challenge for lysis, resulting in the release of less nucleic acid under the same lysis conditions than observed for other viruses. To improve the lysis efficiency for stool samples, the protocol of the new EchoLUTION Viral RNA/DNA Kit was modified by adding a 10-minute heating step during the lysis of the stool samples. This modification eliminated the difference in Ct values from the EchoLUTION and the magnetic bead-based methods.

The EchoLUTION Viral RNA/DNA Kit was evaluated for a respiratory virus (SARS-CoV-2) and enteropathogenic virus detection.

1. Respiratory virus: SARS-CoV-2

Sample preparation and nucleic acid extraction for performance assay

We used respiratory swabs to collect a total of 20 positive SARS-CoV-2 samples (lyophilized infected cell culture supernatant) which were stored in compatible non-chaotropic transport media (LMS-Swab Amies, Heinz Herenz, Germany). We extracted the RNA with both the LyseNtact Buffer New Formula and the LyseNtact Buffer according to the manufacturer's protocols.

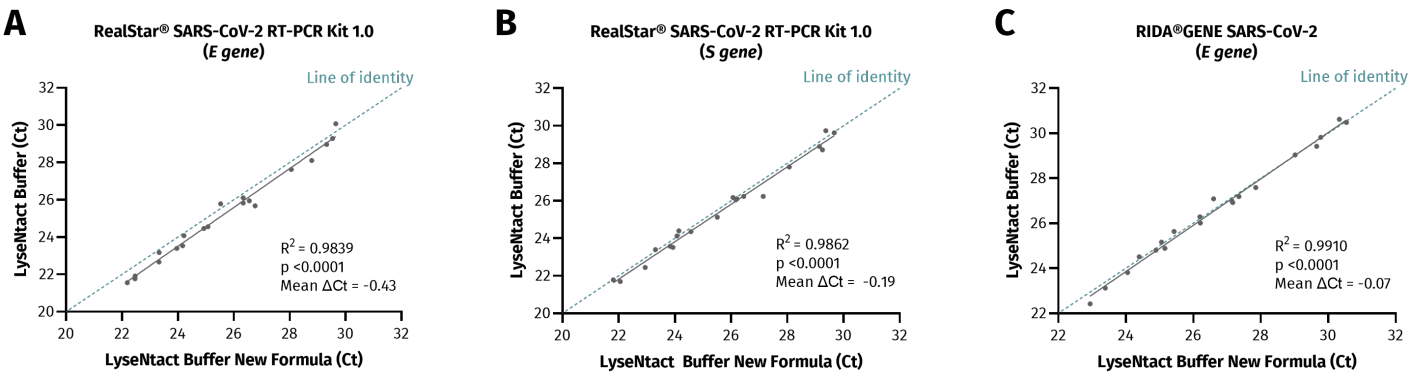

Figure 1. LyseNtact Buffer New Formula and LyseNtact Buffer exhibit identical performance with clinical SARS-CoV-2 samples. A. *RealStar SARS-CoV-2 RT-PCR Kit 1.0 was used to amplify the E gene (FAM channel).* ***B.*** *RealStar SARS-CoV-2 RT-PCR Kit 1.0 was used to amplify the S gene (Cy5 channel).* ***C.*** *RIDA GENE SARS-CoV-2 was used to amplify the E gene (FAM channel). Mean ΔC_t = mean (Ct LyseNtact Buffer - mean C_t LyseNtact Buffer New Formula). Grey line: trend line; turquoise dotted line: line of identity.*

Serial dilution for extraction efficiency analyses

The extraction efficiency and the intra-run precision were evaluated using heat-inactivated SARS-CoV-2 virus particles. A stock solution with a concentration of 2×10^7 copies/mL was used to create a 1:1 dilution series using phosphate-buffered saline (PBS) for five viral titers (1.25×10^6 to 2×10^7 copies/mL). Since 80 individual swabs were necessary for the whole assay, we prepared several stock solutions and combined them in one 15 mL tube. We performed eight technical replicates for each dilution. PBS was used as a negative extraction control. Viral RNA was then extracted with both buffers according to manufacturer's instructions and analyzed with qPCR.

Compatibility assay

To ensure compatibility as well as low inhibition with different media and swab preparation, we employed heat-inactivated SARS-CoV-2 virus particles. For this purpose, we used two methods for swabs preparation (dry and fresh) and tested several transport and resuspension media: viral transport medium (VTM, inhouse) and Cobas® PCR Media (Roche®, Switzerland) as chaotropic media, and Amies medium (Heinz Herenz) and PBS as non-chaotropic media.

LMS-Swabs (Heinz Herenz) were soaked into the freshly prepared virus stock solution. One portion of the swabs was then dried in a suitable tube for 12 hours at room temperature (dry swabs). The other swabs were directly immersed into the different transport/resuspension media (VTM, Cobas, Amies and PBS) and incubated for 12 hours at 4 °C (fresh swabs). To ensure that the virus particles were detached from the swabs, tubes were vortexed and then incubated for 15 minutes at room temperature.

We also tested the LyseNtact Buffer New Formula and the LyseNtact Buffer as resuspension media. For these samples, an alternative protocol to achieve higher nucleic acid concentration was applied (see ***User Manual EchoLUTION Viral RNA/DNA Kit***[3]). Instead of mixing 50 µL of swab medium with 50 µL Lysis Buffer, 100 µL of the swab medium (the lysis buffer, in this case) was transferred directly onto the Purification Plate skipping the 1:1 dilution mandatory for the other transport and resuspension media. This leads to a higher viral load within the sample and consequently to a higher RNA concentration.

qPCR assays

Downstream analyses were performed on the extracted respiratory viral RNA using the following qPCR assays: the RealStar® SARS-CoV-2 RT-PCR Kit 1.0 (altona Diagnostics GmbH, Germany) to amplify the E and the S gene and the RIDA®GENE SARS-CoV-2 (R-Biopharm AG, Germany) to amplify the E gene. Positive and negative controls for the respective qPCR assay were included. Samples were analyzed using the CFX Opus Dx Real-Time PCR Detection System for In Vitro Diagnostics (IVD) (Bio-Rad® Laboratories, Germany).

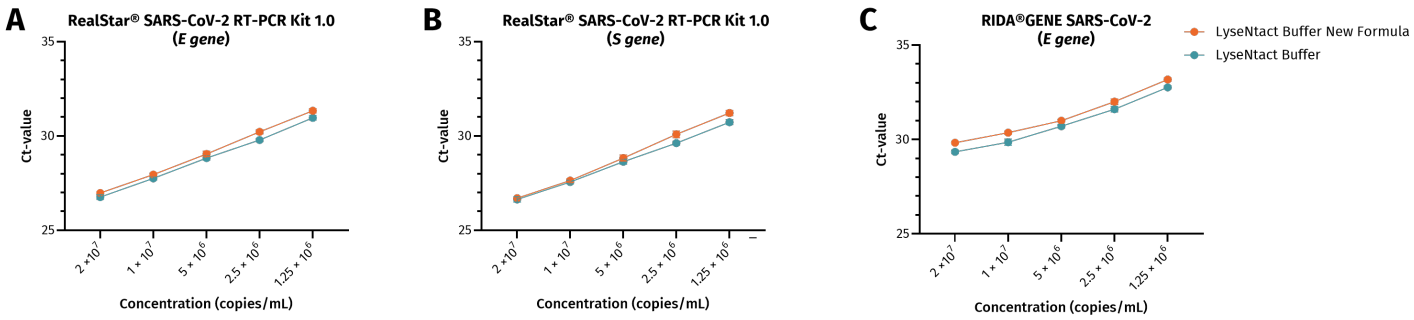

Figure 2. Dilution series (1:1) shows similar extraction efficiency for the LyseNtact Buffer New Formula and LyseNtact Buffer. A. *RealStar SARS-CoV-2 RT-PCR Kit 1.0 was used for E gene amplification.* ***B.*** *RealStar SARS-CoV-2 RT-PCR Kit 1.0 was used to amplify the S gene.* ***C.*** *RIDA GENE SARS-CoV-2 was used to amplify the E gene. N = 8 technical replicates for each dilution. SARS-CoV-2 E gene (FAM channel); SARS-CoV-2 S gene (Cy5 channel). Error bars represent standard deviation (SD).*

2. Enteropathogenic viruses (stool sample analysis)

Clinical sample preparation and nucleic acid extraction for performance assay

A total of 24 stool samples positive for adenovirus or rotavirus (12 samples each) were analyzed. Stool samples were resuspended in TE buffer and sedimented, and the supernatant was frozen at –20 °C (see "Material and Methods: Clinical sample preparation", in the application note *Diagnosis of Enteropathogenic Viruses from Clinical Stool Samples using EchoLUTION™ Nucleic Acid Extraction Technology*[1]). Nucleic acid extraction was carried out according to the manufacturer's protocol with one adaptation: To be able to compare both buffers, the modified protocol for stool samples was also applied to the previously available EchoLUTION Viral RNA/DNA Swab Kit Plus (which includes the LyseNtact Buffer). We added 50 µL of the stool sample supernatant to either 50 µL of LyseNtact Buffer New Formula or LyseNtact Buffer. As negative control, 50 µL virus-free TE with 50 µL lysis buffer was used. The lysis plate was sealed with Adhesive Foil and incubated in a preheated thermoshaker (Eppendorf ThermoMixer® C and Eppendorf SmartBlock DWP 1000, Eppendorf) for 10 minutes at 95 °C with constant shaking at 800 rpm. The plate was cooled to room temperature for 5 minutes and 90 µL of the lysates were pipetted onto the Purification Plate.

Serial dilution for extraction efficiency analyses

The comparability of the extraction efficiency and the intra-run precision using LyseNtact Buffer New Formula compared to LyseNtact Buffer were evaluated using clinical adenovirus and rotavirus samples. A 1:10 dilution series was prepared in TE buffer from stock samples, and eight technical replicates were performed for each dilution level. In addition, TE buffer was used as a negative extraction control.

qPCR assays

Downstream analyses were performed with the extracted enteropathogenic viral RNA/DNA using the following multiplex qPCR assays: RIDA®GENE Viral Stool Panel III (R-Biopharm) and the ampliCube® Gastrointestinal Viral Panel 1 (Mikrogen Diagnostik, Germany). Positive and negative controls of the corresponding qPCR assay were included. Samples were analyzed with the CFX Opus Dx Real-Time PCR Detection System for In Vitro Diagnostics (Bio-Rad Laboratories).

Results

1. Respiratory virus: SARS-CoV-2

The LyseNtact Buffer New Formula and the LyseNtact Buffer exhibit comparable performance

First, we wanted to verify that the performance of the LyseNtact Buffer New Formula is comparable to the LyseNtact Buffer. For this comparison, positive SARS-CoV-2 samples were used for extraction and analyzed with two different qPCR assays. Results are presented in a correlation plot (Figure 1). R^2 indicates the standard deviation from a trend line (shown in grey) when two numerical series are plotted on a XY diagram. An R^2

		LyseNtact Buffer New Formula			LyseNtact Buffer		
qPCR assay	Concentration (copies/mL)	Mean (C_t)	SD (C_t)	CV (%)	Mean (C_t)	SD (C_t)	CV (%)
RIDA GENE SARS-COV-2, E gene	2×10^7	29.84	0.11	0.37	29.38	0.16	0.54
	1.25×10^6	33.16	0.09	0.27	32.76	0.09	0.27
RealStar SARS-CoV-2 RT-PCR Kit 1.0, E gene	2×10^7	26.99	0.08	0.29	26.78	0.12	0.45
	1.25×10^6	31.33	0.11	0.35	30.93	0.12	0.38
RealStar SARS-CoV-2 RT-PCR Kit 1.0, S gene	2×10^7	26.70	0.07	0.26	26.68	0.14	0.52
	1.25×10^6	31.18	0.14	0.45	30.73	0.13	0.42

Table 1. Intra-run precision *The table summarizes the data acquired from eight replicates of samples with two different viral concentrations in a single run. Results were obtained from the LyseNtact Buffer New Formula and LyseNtact Buffer, respectively, and three different qPCR assays. SD: standard deviation; CV: coefficient of variation.*

value of 1 indicates that all values are exactly on the trend line. The higher the standard deviation, the smaller the R^2. The p value expresses the significance of the correlation of numerical series (in this case Ct values of both buffers). A significant correlation exists from a p value of < 0.05. The highest significance is observed for a p value of < 0.001. The line of identity (shown in turquoise) indicates how similar the results from the two buffers are to each other. If a data point is above the line of identity, the LyseNtact Buffer had a higher Ct value than the LyseNtact Buffer New Formula and if data are below the line, the LyseNtact Buffer exhibited less Ct value than the LyseNtact Buffer New Formula. The mean ΔCt summarizes this observation. A negative value indicates overall lower Ct values for the LyseNtact Buffer and positive values indicate lower Ct values for the LyseNtact Buffer New Formula.

The data show that the LyseNtact Buffer New Formula and LyseNtact Buffer have nearly identical Ct values within a broad range of Ct values, suggesting equivalent lysis activity as well as protection from RNases in the medium for both buffers. This observation is supported by a high coefficient of determination: $R^2 > 0.95$ and a highly significant Ct value correlation ($p < 0.001$) between the two buffers. Furthermore, no difference in the coefficient of determination or the significance can be observed in the two different PCR assays. The trend line is almost identical with the line of identity, indicating a highly comparable performance of both buffers. Only for the RealStar E gene assay, a slight trend towards lower Ct values of the LyseNtact Buffer was detected.

The LyseNtact Buffer New Formula and the LyseNtact Buffer display same extraction efficiency

Next, we wanted to study the extraction efficiency of the method and compare the results obtained from the LyseNtact Buffer New Formula and the LyseNtact Buffer. We prepared five 1:1 dilutions of the SARS-CoV-2 initial concentration ranging from 1.25×10^6 to 2×10^7 copies/mL and extracted samples of each dilution with both buffers. Downstream analyses were performed on extracted SARS-CoV-2 RNA using qPCR. The data indicate a similar extraction efficiency was obtained for the LyseNtact Buffer New Formula and the LyseNtact Buffer (Figure 2).

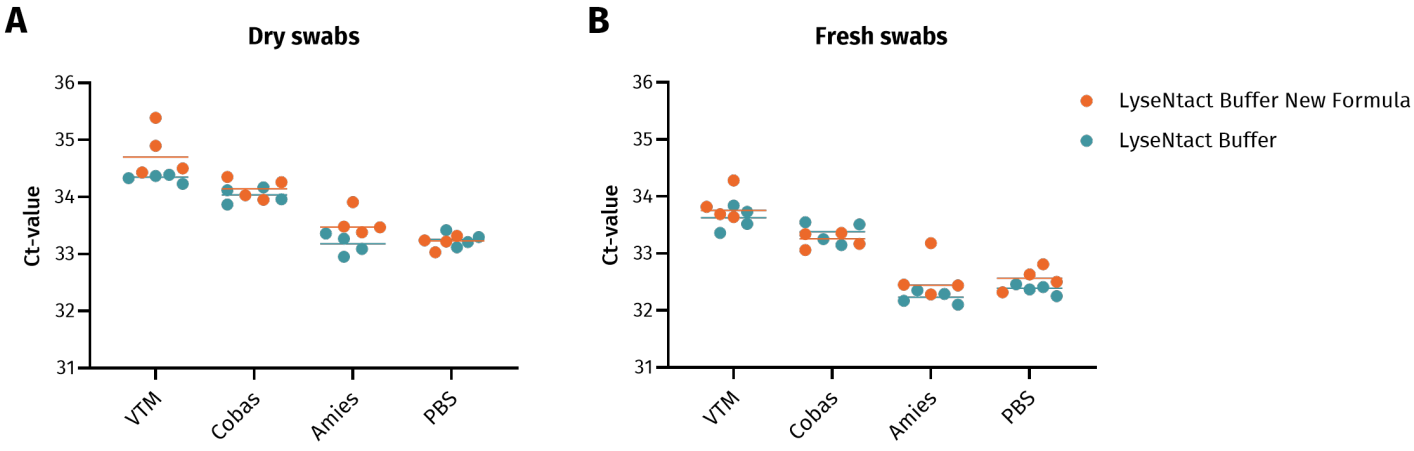

Figure 3. qPCR assay demonstrates compatibility of the EchoLUTION Viral RNA/DNA Kit with different transport and resuspension media and swab types. *Chaotropic and non-chaotropic media were tested in combination with the LyseNtact Buffer New Formula and the LyseNtact Buffer according to the manufacturer's instructions. We performed the PCR assay with the RealStar SARS-CoV-2 RT-PCR Kit 1.0. All media were tested with dry swabs* ***(A)*** *and fresh swabs* ***(B)****. An eluate volume of 2 µL was used as input volume in all assays. N = 4 for each medium and lysis buffer.*

LyseNtact Buffer New Formula demonstrates high intra-run precision for SARS-CoV-2 detection.

To express precision of SARS-CoV-2 detection with both buffers, we determined the coefficient of variation (CV) from the intra-run assay (eight technical replicates for same extraction procedure and qPCR) of the lowest and highest viral concentrations. Data indicate a high precision for both concentrations (1.25×10^6 and 2×10^7 copies/mL) demonstrated by a low CV under 1 % (Table 1). Moreover, the LyseNtact Buffer New Formula exhibited a better precision (CV 0.07 — 0.14) than the LyseNtact Buffer (CV 0.27 — 0.54) for the different qPCR assays.

LyseNtact Buffer New Formula is compatible with different swab preparation and media types

We investigated the compatibility of both lysis buffers with fresh and dry swabs and different transport/ resuspension media in the extraction of SARS-CoV-2 RNA (as chaotropic: VTM and Cobas PCR media, and as non-chaotropic: Amies medium and PBS).

We observed similar results when using the RealStar SARS-CoV-2 RT-PCR Kit 1.0 to detect the E gene (Figure 3), with no significant differences between the newly developed LyseNtact Buffer New Formula and the LyseNtact Buffer. Small deviations from samples might be due to variations in virus concentration as a separate swab was prepared for each measurement.

Further, we assessed if the LyseNtact Buffer New Formula itself could be used as resuspension medium. Figure 4 shows that the Ct values for LyseNtact Buffer New Formula were lower than those obtained with the other media assessed. This result is because the 1:1 dilution of the resuspension medium with the Lysis Buffer was omitted and 90 µL of sample was transferred directly onto the Purification Plate.

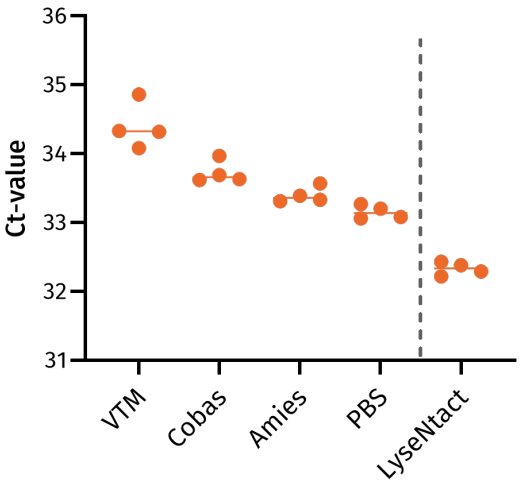

Figure 4. Using LyseNtact Buffer New Formula as resuspension media resulted in the lowest Ct values. *We performed the PCR assay with the RealStar SARS-CoV-2 RT-PCR Kit 1.0 with dry swabs and an eluate volume of 2 µL as input volume. Different resuspension media were used, including LyseNtact Buffer New Formula (for simplicity, LyseNtact in the graph). N = 4 for each media (transport or resuspension).*

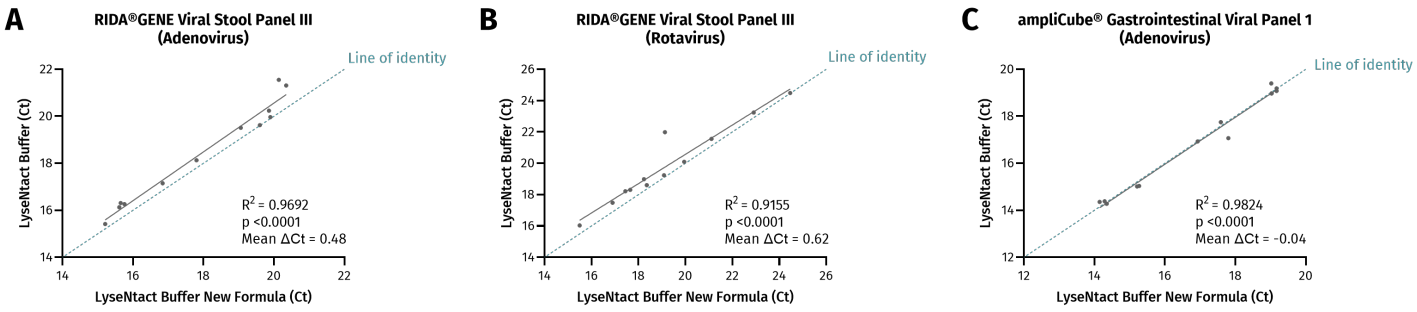

Figure 5. The lysis buffer LyseNtact Buffer New Formula and LyseNtact Buffer exhibit almost identical performance with clinical gastrointestinal samples over a broad Ct value range for two PCR assays. A. *WRIDA GENE Viral Stool Panel III for adenovirus detection (Cy5 channel).* ***B.*** *RIDA GENE Viral Stool Panel III for rotavirus detection (ROX channel).* ***C.*** *ampliCube Gastrointestinal Viral Panel 1 for adenovirus (ATTO Rho12 channel). Twelve samples were used for each assay. Grey line: trend line; turquoise dotted line: line of identity.*

2. Enteropathogenic viruses (stool sample analysis)

The LyseNtact Buffer New Formula and the LyseNtact Buffer display similar performance

For the enteropathogenic viruses, we first tested whether the performance of LyseNtact Buffer New Formula was comparable to LyseNtact Buffer in the detection of adenovirus and rotavirus. We extracted RNA or DNA from 24 samples positive for adenovirus or rotavirus in TE buffer using both buffers. The extracted samples were evaluated in a qPCR assay using the RIDA GENE Viral Stool Panel III (R-Biopharm) or the ampliCube Gastrointestinal Viral Panel 1 (Mikrogen Diagnostik). The results are represented in a correlation plot (Figure 5).

The results depicted in Figure 5 demonstrate that the Ct values from LyseNtact Buffer New Formula and LyseNtact Buffer were nearly identical, indicating equal performance. This conclusion is supported by a high coefficient of determination ($R^2 > 0.95$) and a highly significant Ct-value correlation ($p < 0.001$) between the two buffers. Furthermore, no difference in the significance can be observed in the qPCR assays, indicating that both assays are compatible with the two lysis buffers. Highly similar performance from both buffers was validated by the closeness of the line of identity and the trend line.

Enteropathogen nucleic acid extraction displays similar extraction efficiency with both buffers

Next, we wanted to examine the extraction efficiency of the method to detect enteropathogenic viruses and compare the results obtained from both buffers. We prepared five 1:10 dilutions of the initial samples

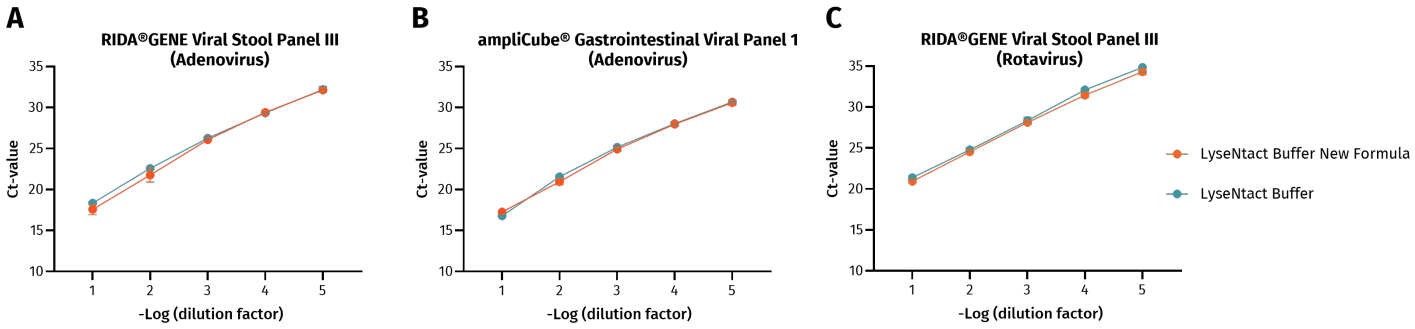

Figure 6. Detection with a dilution series (1:10) indicates similar sensitivity with LyseNtact Buffer New Formula and LyseNtact Buffer. *Adenovirus detection with the* ***A.*** *RIDA GENE Viral Stool Panel III (C; Cy5 channel) and the* ***B.*** *ampliCube Gastrointestinal Viral Panel 1 (D; ATTO Rho12 channel).* ***C.*** *Rotavirus detection with the RIDA GENE Viral Stool Panel III (ROX channel). N = 8 technical replicates for each dilution. Error bars represent standard deviation (SD).*

and extracted the viral RNA or DNA with both buffers. Downstream analyses were performed on the extracted nucleic acids using the selected qPCR assays. The data show similar performance for the LyseNtact Buffer New Formula and the LyseNtact Buffer (Figure 6).

LyseNtact Buffer New Formula demonstrates high precision for detection of enteropathogenic viruses

To investigate the precision of enteropathogenic virus detection with each of the two buffers, we determined the coefficient of variation (CV) from the intra-run assay (eight technical replicates of the first dilution). Data indicate a high precision for all viruses with a CV ≤ 1 % (Table 4). The difference in the adenovirus precision is attributed to handling variability.

Discussion

One of the keys to preventing the transmission of viral infections is a prompt and accurate diagnosis of the disease. In this study, we evaluated the effectiveness of using the EchoLUTION Viral RNA/DNA Kit for nucleic acid isolation in a workflow for the qPCR assay for viral nucleic acids. We compared the performance of the LyseNtact Buffer New Formula with the LyseNtact Buffer (a component of the EchoLUTION Viral RNA/DNA Swab Kit Plus, previously available in the EU). The overall results demonstrate that the EchoLUTION Viral RNA/DNA Kit, containing the LyseNtact Buffer New Formula, offers a reliable and efficient method to extract nucleic acids from respiratory and enteropathogenic viruses. The kit exhibits high extraction efficiency, enabling accurate detection and quantification of viral pathogens in clinical samples. Furthermore, the LyseNtact Buffer New Formula demonstrates robust performance across a range of viral targets and high compatibility with different swab preparation and transport and resuspension media. Most importantly, the results with the LyseNtact Buffer New Formula are comparable to the ones obtained with the LyseNtact Buffer, demonstrating that the use of these buffers should lead to the same outcome in clinical and diagnostic settings.

Moreover, the LyseNtact Buffer New Formula meets the sustainability standards of BioEcho with a composition that is less harmful for the handler and for the environment. Furthermore, the EchoLUTION Viral RNA/DNA Kit including the LyseNtact Buffer New Formula is CE-marked in accordance with Regulation (EU) 2017/746 (IVDR) and is also FDA-registered.

The simplicity and speed of the extraction process (extraction of 2 × 96 samples is completed within 20 minutes for respiratory viruses) makes the EchoLUTION Viral RNA/DNA Kit a valuable tool for routine diagnostic laboratories, particularly in settings in which timely and accurate identification of viral infections is critical or resources are limited. Overall, this kit presents a promising solution for improving the diagnosis and surveillance of viral infections, ultimately contributing to effective management and control of these pathogens in healthcare settings and public health domains.

		LyseNtact Buffer New Formula			LyseNtact Buffer		
qPCR assay	**Virus**	**Mean (C_t)**	**SD (C_t)**	**CV (%)**	**Mean (C_t)**	**SD (C_t)**	**CV (%)**
RIDA GENE Viral Stool Panel III	Adenovirus	17.31	0.62	3.5	18.35	0.15	0.81
	Rotavirus	20.95	0.14	0.67	21.41	0.22	1.03
ampliCube Gastrointestinal Viral Panel 1	Adenovirus	12.27	0.18	1.4	16.82	0.12	0.71

Table 4. Intra-run precision. *The table summarizes the data from eight replicates of each sample containing adenovirus or rotavirus. Results were obtained for both the LyseNtact Buffer New Formula and the LyseNtact Buffer. SD: standard deviation; CV: coefficient of variation.*

Further Information

[1] Maika Schiwy, Christoph Schönfels, Maximilian Weiter, and Laura Torres Benito. Diagnosis of Enteropathogenic Viruses from Clinical Stool Samples using EchoLUTION Nucleic Acid Extraction Technology. 2023. Published as an application note by BioEcho Life Sciences GmbH.

[2] Vera Kloten, Maximilian Weiter, Tobias Schughart, and Laura Torres Benito. Validation of the EchoLUTION Viral RNA/DNA Swab Kit Plus for fast and reliable SARS-CoV-2 extraction. 2023. Published as an application note by BioEcho Life Sciences GmbH.

[3] User Manual EchoLUTION Viral RNA/DNA Kit. BioEcho Life Sciences GmbH.

Ordering Information

Product	Reactions	Product No.
EchoLUTION Viral RNA/DNA Kit	2 × 48 8 × 48 16 × 48	012-051-002-Dx 012-051-008-Dx 012-051-016-Dx
	2 × 96 8 × 96 16 × 96	012-102-002-Dx 012-102-008-Dx 012-102-016-Dx

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