

Application Note

Performance Evaluation of the MagPurix[®] 12 N.E.O. in comparison to the MagPurix[®] 24 EVO for Nucleic Acid Extraction

Introduction

Reliable nucleic acid extraction is fundamental for molecular diagnostics, directly impacting downstream assay sensitivity, reproducibility, and quantitative accuracy. The MagPurix[®] 12 N.E.O. was developed as the next-generation automated extraction platform, building upon the proven performance of the MagPurix[®] 12 EVO and MagPurix[®] 24 EVO, while introducing a more compact design and enhanced workflow efficiency.

This evaluation compares the extraction performance of the MagPurix[®] 12 N.E.O. and MagPurix[®] 24 EVO across multiple sample types, including viral DNA, viral RNA, HPV-positive clinical samples, bacterial cultures, and stool specimens. Performance was evaluated using qPCR detection, repeatability studies, linearity assessments, and spectrophotometric quantification.

Materials and Methods

Extraction Platforms

- MagPurix[®] 12 N.E.O.
- MagPurix[®] 24 EVO

Extraction Chemistry

MagPurix[®] Viral/Pathogen Nucleic Acids Extraction Kit B

- Sample input: 200 µL
- Elution volume: 100 µL

Downstream Analysis

- Bio-Rad CFX96 Real-Time PCR System
- SaCycler-96 RT-PCR System
- Thermo Fisher NanoDrop Spectrophotometer

1. Viral DNA and RNA Extraction Performance

HBV DNA Recovery

HBV standards at high (3×10^5 IU/mL) and low (3×10^4 IU/mL) concentrations were extracted and analyzed by an in-house qPCR assay on the Bio-Rad CFX96 instrument.

HBV High Concentration (3×10^5 IU/mL)

Instrument	Mean Ct
MagPurix [®] 24 EVO	25.97
MagPurix [®] 12 N.E.O.	26.03

HBV Low Concentration (3×10^4 IU/mL)

Instrument	Mean Ct
MagPurix [®] 24 EVO	29.74
MagPurix [®] 12 N.E.O.	29.31

The MagPurix[®] 12 N.E.O. generated slightly lower Ct values at the lower HBV concentration, indicating equivalent or marginally improved DNA recovery.

HCV RNA Recovery

HCV-positive samples (5×10^4 IU/mL) were extracted and analyzed by an in-house qPCR assay on the Bio-Rad CFX96 instrument.

Instrument	Mean Ct
MagPurix® 24 EVO	30.15
MagPurix® 12 N.E.O.	30.06

The difference between systems was less than 0.1 Ct, demonstrating highly comparable RNA extraction efficiency.

2. Repeatability and Linearity Assessment

Repeatability Study

HBV samples were tested across two independent runs using an in-house qPCR assay on the Bio-Rad CFX96 instrument.

In-House HBV qPCR

Instrument	Mean Ct
MagPurix® 24 EVO (Day 1)	29.37
MagPurix® 12 N.E.O. (Day 1)	29.08
MagPurix® 24 EVO (Day 2)	29.12
MagPurix® 12 N.E.O. (Day 2)	29.16

Inter-run variation remained below 0.3 Ct for both systems, confirming excellent reproducibility.

Linearity Evaluation

HBV standards ranging from 300 to 300,000 IU/mL were extracted and quantified, using both an in-house qPCR assay on the Bio-Rad CFX96 instrument and a commercial Sacace assay on the SaCycler-96 instrument.

In-House HBV Assay

HBV (IU/mL)	MagPurix® 24 EVO Ct	MagPurix® 12 N.E.O. Ct
300	34.88	34.95
3,000	31.58	31.09
30,000	28.25	28.26
300,000	25.02	24.49

Sacace HBV Quantitative Assay

HBV (IU/mL)	MagPurix® 24 EVO Ct	MagPurix® 12 N.E.O. Ct
300	29.5	29.6
3,000	26.3	26.2
30,000	22.7	22.6
300,000	19.4	19.2

Both platforms demonstrated excellent linear response over three logarithmic dilution ranges, with nearly identical Ct progression.

3. Inter-Instrument Variability Study

HPV16-positive cervical swab specimens, preserved in PreservCyt® solution, were extracted on one MagPurix® 24 EVO and two different MagPurix® 12 N.E.O. instruments. Analysis was carried out with an in-house qPCR assay on the Bio-Rad CFX96 instrument.

Instrument	Mean Ct
MagPurix® 24 EVO	25.40
MagPurix® 12 N.E.O. #1	25.70
MagPurix® 12 N.E.O. #2	25.75

The observed variation between the MagPurix® 12 N.E.O. instruments remained below 0.1 Ct, indicating excellent inter-instrument consistency.

4. Bacterial Culture Extraction Performance

E. coli cultures (OD600 = 0.42) were extracted and evaluated by NanoDrop and 16S-rRNA qPCR on the Bio-Rad CFX96 instrument.

qPCR Results

Instrument	Mean Ct
MagPurix® 24 EVO	16.85
MagPurix® 12 N.E.O. #1	16.61
MagPurix® 12 N.E.O. #2	16.59

DNA Yield

Instrument	Mean Yield (ng/μL)
MagPurix® 24 EVO	27.12
MagPurix® 12 N.E.O. #1	30.68
MagPurix® 12 N.E.O. #2	32.03

Purity

Instrument	A260/280
MagPurix® 24 EVO	1.95
MagPurix® 12 N.E.O. #1	1.91
MagPurix® 12 N.E.O. #2	1.93

The MagPurix® 12 N.E.O. consistently produced higher DNA yields while maintaining excellent purity ratios.

5. Stool Sample Extraction Performance

Method A – S.T.A.R. Buffer

Stool specimen is collected in **S.T.A.R. buffer** and homogenize thoroughly.

A required volume of the homogenized sample is transferred into a microcentrifuge tube, then heated at **95°C for 10 minutes**. The sample is centrifuged at **3,000 rpm for 5 minutes**. The supernatant is carefully transferred to a new tube, avoiding disturbance of the pellet. The clarified supernatant is used for subsequent nucleic acid extraction.

qPCR Results

Instrument	Mean Ct
MagPurix® 24 EVO	15.78
MagPurix® 12 N.E.O. #1	15.94
MagPurix® 12 N.E.O. #2	15.32

DNA Yield

Instrument	Mean Yield (ng/μL)
MagPurix® 24 EVO	175.85
MagPurix® 12 N.E.O. #1	213.17
MagPurix® 12 N.E.O. #2	220.70

The MagPurix® 12 N.E.O. demonstrated approximately 20–25% higher nucleic acid recovery compared with the MagPurix® 24 EVO.

Method B – Zinexts Stool Buffer

Stool specimen is collected in **Zinexts Storage Buffer** and homogenized thoroughly. A required volume of the homogenized sample is transferred into a microcentrifuge tube and centrifuged at **13,000 rpm for 5 minutes**. After carefully discarding the supernatant, **InhibitEx** is added to the pellet and mixed thoroughly. The sample is then heated at **95°C for 10 minutes**, followed by centrifugation at **13,000 rpm for 1 minute**. The clarified supernatant is carefully transferred to a new tube, avoiding disturbance of the pellet, and used for subsequent nucleic acid extraction.

qPCR Results

Instrument	Mean Ct
MagPurix® 24 EVO	15.47
MagPurix® 12 N.E.O. #1	15.23
MagPurix® 12 N.E.O. #2	15.37

DNA Yield

Instrument	Mean Yield (ng/μL)
MagPurix® 24 EVO	75.50
MagPurix® 12 N.E.O. #1	104.33
MagPurix® 12 N.E.O. #2	100.15

Using the Zinexts Stool Buffer workflow, the MagPurix® 12 N.E.O. generated approximately 33–38% higher DNA yields while maintaining equivalent qPCR performance.

Discussion

Across all evaluated sample types, the MagPurix® 12 N.E.O. delivered performance equivalent to or exceeding that of the MagPurix® 24 EVO. Viral DNA and RNA extraction efficiencies were highly comparable, with differences generally below 0.5 Ct. Repeatability and linearity studies demonstrated excellent consistency across multiple concentration ranges and assay formats.

Particularly notable improvements were observed in bacterial culture and stool samples, where the MagPurix® 12 N.E.O. consistently generated higher nucleic acid yields without compromising purity or downstream amplification performance.

Conclusion

The MagPurix® 12 N.E.O. provides extraction performance fully comparable to the established MagPurix® 24 EVO platform while offering improved nucleic acid recovery in several challenging sample matrices.

Key findings include:

- Equivalent HBV DNA and HCV RNA recovery.
- Excellent repeatability and linearity across a 1,000-fold concentration range.
- Strong inter-instrument consistency.
- Higher DNA yields from bacterial cultures.
- Significantly improved nucleic acid recovery from stool specimens.
- Consistent purity and qPCR performance across all tested sample types.

These results demonstrate that the MagPurix® 12 N.E.O. is a robust and reliable automated extraction platform suitable for molecular diagnostic laboratories requiring high-quality nucleic acid purification across a broad range of applications.