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Application Note

Standardizing DNA Extraction Across Blood Samples, Prenatal Samples, and Buccal Swabs Using the MagPurix® 12 N.E.O. Automated Extraction System

I. Executive Summary

A Medical Genetics Laboratory at an Italian hospital evaluated the MagPurix® 12 N.E.O. Automated Extraction System as a potential replacement or complementary solution to its existing extraction workflow. The laboratory required a robust and user-friendly platform capable of delivering consistent DNA quality from multiple sample types, including peripheral blood, chorionic villi, amniotic fluid, and buccal swabs.

A total of 72 samples were processed during the evaluation using the MagPurix® Blood DNA Extraction Kit and the MagPurix® Forensic DNA Extraction Kit. Blood samples were compared against the laboratory's routine QIAGEN EZ1® extraction workflow, while prenatal and buccal swab samples were assessed independently.

The study demonstrated that the MagPurix® 12 N.E.O. delivered DNA yields comparable to the EZ1® platform while providing improved purity and excellent reproducibility. Particularly strong results were obtained from prenatal specimens and buccal swabs, where the laboratory reported significantly improved DNA recovery compared with their previous extraction methods.

II. Introduction

Molecular genetics laboratories increasingly require extraction systems capable of processing diverse sample types while maintaining consistent DNA quality for demanding downstream applications such as:

- Multiplex Ligation-dependent Probe Amplification (MLPA)
- Next-Generation Sequencing (NGS)
- Comparative Genomic Hybridization (CGH) Arrays
- Genetic and prenatal testing workflows

The Medical Genetics Laboratory sought a standardized extraction platform capable of supporting multiple workflows while reducing variability and simplifying laboratory operations.

To assess the suitability of the MagPurix® 12 N.E.O. platform, an extensive evaluation was conducted using clinical blood samples, prenatal specimens, and buccal swabs.

III.Materials and Methods

- MagPurix® 12 N.E.O. Automated Nucleic Acid Extraction System
- MagPurix® Blood DNA Extraction Kit 200 N.E.O.
- MagPurix® Forensic DNA Extraction Kit N.E.O.

- Samples evaluated:

Sample Type	Number of Samples
Peripheral Blood	60
Amniotic Fluid	9
Chorionic Villi	7
Buccal Swab	1
Total	**72**

- Extraction conditions:

Parameter	Blood Kit	Forensic Kit
Input Volume	200 µL	200 µL
Elution Volume	50–100 µL	50–100 µL
Run Time	54 min	37 min

IV. Results

a. Blood DNA Extraction Performance

Blood DNA extraction represented the largest portion of the evaluation. Multiple extraction runs were performed and compared directly against the laboratory's EZ1® system.

Average Performance

Metric	EZ1®	MagPurix® 12 N.E.O.
DNA Concentration Range	20 - 82 ng/µL	21 - 117 ng/µL
DNA Yield Range	2.0 - 8.2 µg	2.1 - 11.7 µg
A260/230 Ratio	Variable	Typically 1.8 - 2.0
A260/280 Ratio	Variable	Typically 1.8 - 2.3

Laboratory personnel reported that DNA concentrations obtained with the MagPurix® 12 N.E.O. were generally comparable to those obtained using the EZ1® platform while consistently exhibiting improved A260/230 purity ratios.

Several challenging samples were re-extracted during later runs. These repeated extractions generated improved concentrations and confirmed the robustness of the extraction chemistry.

Prenatal Sample Extraction

The laboratory also evaluated the MagPurix® 12 N.E.O. system using prenatal specimens, including fresh amniotic fluid, cultured amniotic fluid, and chorionic villi.

DNA Recovery from Prenatal Samples

Sample Type	Digestion Method	DNA Concentration (ng/μL)
Fresh Amniotic Fluid	Homemade Buffer	3.1 - 10.9
Cultured Amniotic Fluid	BL2 Kit Buffer	63.0
Cultured Amniotic Fluid	Homemade Buffer	97.8 - 389.2
Chorionic Villi	BL2 Kit Buffer	16.5 - 48.9
Chorionic Villi	Homemade Buffer	Up to 229.1

The highest DNA concentrations were obtained from cultured amniotic fluid and chorionic villi. While successful extraction was achieved using the kit digestion protocol, the laboratory observed even higher yields when employing its optimized in-house digestion procedure.

Re-Extraction of Prenatal Samples

Selected prenatal samples were extracted a second time using a 100 μL elution volume.

Sample Type	DNA Concentration (ng/μL)
Cultured Amniotic Fluid	333.5
Chorionic Villi	57.6
Chorionic Villi	150.0
Chorionic Villi	91.2

These results demonstrated excellent recovery from low-input prenatal specimens and confirmed the suitability of the MagPurix® 12 N.E.O. for genetic testing workflows.

b. Forensic DNA Extraction Performance

Buccal Swab Extraction

A combined buccal swab sample was processed using the MagPurix® Forensic DNA Extraction Kit.

Sample Type	DNA Concentration (ng/μL)	Yield (μg)
Buccal Swab	44.1	4.41

The customer reported that their existing extraction workflow typically produced approximately 10 ng/μL DNA from buccal swabs. The MagPurix® result therefore represented more than a four-fold increase in DNA concentration.

Evaluation of the Forensic Kit on Blood Samples

Additional testing was performed using the MagPurix® Forensic DNA Extraction Kit on blood specimens to evaluate potential emergency-use scenarios.

Sample	DNA Concentration (ng/μL)
1	20.7
2	20.8
3	13.8
4	19.9
5	12.0
6	8.5
7	19.3

Although extraction was successful, results were consistently lower than those obtained with the dedicated MagPurix® Blood DNA Extraction Kit. These findings confirm that the MagPurix® Blood DNA Extraction Kit remains the preferred solution for routine blood testing applications, while the MagPurix® Forensic DNA Extraction Kit may serve as an emergency backup option when necessary.

V. Workflow Benefits

The evaluation highlighted several practical advantages of the MagPurix® 12 N.E.O. system:

- Consistently high DNA quality across multiple sample types
- Comparable or improved Blood DNA extraction performance relative to EZ1®
- Excellent performance with prenatal specimens
- High DNA recovery from buccal swabs
- Short automated run times
- Minimal hands-on intervention
- Flexible workflow suitable for routine and specialized genetic testing laboratories

VI. Conclusion

During this evaluation, the MagPurix® 12 N.E.O. Automated Extraction System successfully processed 72 samples encompassing blood, amniotic fluid, chorionic villi, and buccal swabs.

For blood samples, the MagPurix® Blood DNA Extraction Kit produced DNA yields comparable to or higher than those obtained using the laboratory's EZ1® system while delivering excellent purity metrics. Prenatal specimens and buccal swabs generated particularly impressive results and represented the most convincing aspect of the evaluation for the customer.

The study demonstrates that MagPurix® 12 N.E.O. provides a reliable and versatile extraction solution capable of supporting a broad range of molecular genetics applications, including MLPA, NGS, CGH array analysis, and prenatal genetic testing.