Automated Cell-free DNA Extraction Using MultiEX 024L Large Volume Nucleic Acid Extractor

Introduction

Cell-free DNA (cfDNA) has emerged as a crucial biomarker in liquid biopsy applications, offering non-invasive diagnostic and monitoring capabilities for various diseases. This application note demonstrates the efficiency of the MultiEX 024L large volume nucleic acid extractor for automated cfDNA isolation from blood samples.

Background

Cell-free DNA consists of fragmented DNA sequences (approximately 160bp) present in blood and other body fluids. While cfDNA levels are typically low in healthy individuals, they increase significantly in various pathological conditions, including:

- Malignant tumors
- Cardiovascular diseases
- Parasitic diseases

The ability to efficiently extract cfDNA from large volume samples is critical for:

- Early disease diagnosis
- Prognosis evaluation
- Treatment monitoring
- Research applications

Materials and Methods

Sample Preparation

- Source: Anticoagulated whole blood samples
- Processing: Frozen and centrifuged to obtain cell-free samples
- Input volume: 2mL cell-free sample per extraction

Extraction Protocol

Equipment: MultiEX 024L Large Volume Nucleic Acid Extractor

Extraction Reagent: Automated extraction using pre-filled kit

Protocol Parameters

Step	Well	Step	Volume (μL)	Mix speed (1-8)	Mix time (s)	Magnet Lower time (s)	Magnet resting time (s)	Collect cycles	Wait time/Air Dry (s)	Fan (on/off)	Lysis Temp (℃)	Elute Temp (℃)
1	4	4000	60	2500	45	30	30	1	0	0	0	0
2	1	7000	1200	2500	45	30	30	2	0	0	60	0
3	3	4000	120	2000	45	30	30	1	0	0	0	0
4	4	4000	60	2000	45	30	30	1	0	0	0	0
5	5	4000	60	2000	45	30	30	1	120	0	0	0
6	6	60	360	2500	30	20	20	1	0	0	0	0
7	4	4000	30	2500	30	15	15	0	0	0	0	0

Step	Volume (μL)	Mix Time (sec)	Magnet Time (sec)	Cycles	Temperature (°C)
1	4000	2500	30	1	-
2	7000	2500	30	2	60
3	4000	2000	30	1	-
4	4000	2000	30	1	-
5	4000	2000	30	1	-
6	60	2500	20	1	-
7	4000	2500	15	0	-

Results

Performance Comparison

Automated extraction was compared to manual extraction using identical samples and reagents. Quantification was performed using fluorometer with HS dsDNA reagent.

Yield Comparison

Method	Sample	Concentration (ng/μL)	Elution Volume (μL)	Total Yield (ng)
Manual	1	1.03	50	51.5
	2	0.635	50	31.8
Automated (Multi EX 024L)	1	0.91	50	45.5
	2	0.566	50	28.3

Conclusions

1. Extraction Efficiency
    - Automated extraction achieved approximately 88% recovery compared to manual extraction
    - Differences attributed to variations in mixing and heating methods
2. Processing Time
    - Single sample: Automated method requires ~5 minutes additional time
    - Batch processing: Significantly faster than manual extraction
3. Advantages
    - Consistent results
    - Reduced hands-on time
    - Improved throughput for batch processing
    - Standardized workflow

For More Information, please contact:

marketing@4esci.com