Quality Control of Nucleic Acid from FFPE and Liquid Biopsy Samples Using Cartridge-based Capillary Gel Electrophoresis

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Principle of capillary gel electrophoresis
Compared to traditional slab gel electrophoresis, capillary gel electrophoresis provides higher sensitivity and higher resolution for nucleic acid analysis, as well as automatic digital output for secondary analysis. Here, we present the cartridge-based QIAxcel® Connect System, for fully automated analysis of up to 96 samples per run.

To begin separation and analysis of nucleic acid with the QIAxcel® Connect System, a gel-filled capillary is inserted into a sample well. An electric field creates a positive charge. This makes the negatively charged nucleic acid fragments migrate through the gel in the capillaries, with the smaller fragments travelling faster than the larger ones.

Within the capillary, a dye intercalates into the nucleic acid. As the fragments pass a detector, it measures the signals emitted by the dye. System software converts these signals to digital data which are visualized in real time as electropherograms or gel images. By comparing the run times and areas under the peak to a known marker, size and concentration are determined.

Key sample parameters provided
Sample requirements for nucleic acids vary depending on the intended downstream applications. RT-PCR, RT-qPCR, sequencing or NGS. Small deviations in key sample properties parameters can have a significant impact on results. For example, gaps in NGS readings due to sample degradation.

QIAxcel ScreenGel® Software provides tools for distribution analysis, ratio calculation and setting of pass criteria to be displayed in sample reports.

Degradation analysis for FFPE samples
Nucleic acid extracted from intact FFPE sample usually shows heavy fragmentation, and analysis methods often fail to distinguish between intact and degraded DNA. Quality Control of Nucleic Acid from FFPE and Liquid Biopsy.

For cDNA extracted from liquid biopsy samples, there are different sample parameters of interest, including identification of size, and relative concentration. QIAxcel Connect facilitates identifying mono-, di-, and trinucleosome peaks, as well as sizing of peaks.

Comprehensive NGS library assessment
In addition to the quality control of stirring media, capillary electrophoresis is a standard practice for NGS library construction. Inaccurate and inconsistent parameters of high throughput. These parameters include measuring the library size (A) and presence of gDNA or non-adenine bases as primer-dimers, with stringent acceptance criteria (B).

QIAxcel Connect workflow
QIAxcel Connector up to 96 samples with a minimal setup time. Once buffers and reagents are loaded, the ready-to-use gel cartridge is inserted. A 24-hour step is to the QIAxcel® Connect analysis. QIAxcel provides high-resolution analysis, also allowing small RNA. RIS correlates with similar integrity metrics from other commercially available solutions such as Agilent TapeStation® (RINe).

Objective assessment of RNA integrity
QIAxcel RNA integrity number (RIN) provides information on the quality of RNA before it is used in downstream applications. Quality is indicated by a score ranging from 1 (degraded RNA) to 10 (intact RNA). QIAxcel provides high-resolution analysis, also allowing small RNA. RIS correlates with similar integrity metrics from other commercially available solutions such as Agilent TapeStation® (RINe).

Conclusion
Cartridge-based capillary gel electrophoresis with QIAxcel Connect provides considerable advantages for the assessment of nucleic acid quality parameters including:
• No tedious gel or consumable preparation
• Less manual setup time required
• Analyses of up to 96 samples in one run
• High levels of automation reducing handling errors
• High-resolution and high-sensitivity insights into sample quality parameters
• Digital output and powerful secondary analysis features, including customized parameter setting

References:

For up-to-date licensing information and product-specific distributors, see the respective QIAGEN® product instructions for use or user-manual instructions. QIAGEN instructions for use and user manuals are available at www.qiagen.com or can be requested from QIAGEN Technical Services (for your local distributor).