Use of Agilent 4200 TapeStation system for external quality assurance of genomic DNA and cell-free DNA

Background
EQAs are mandatory for quality assurance of the wide variety of DNA extraction methods. DNA quality assurance by integrity and molecular size estimation can be achieved using conventional gel or automated microfluidic electrophoresis systems (e.g. Agilent 2100 Bioanalyzer system).

Here we evaluated the Agilent 4200 TapeStation system, in the context of the ISBER-endorsed “Proficiency Testing (PT)” program organised by IBBL, for:
• Genomic DNA (gDNA) extraction methods from:
  1. Whole blood (BD PAXgene Blood DNA tubes);
  2. Snap frozen tissue;
  3. Formalin-Fixed Paraffin-Embedded (FFPE) cell pellet.
• Cell-free DNA (cfDNA) extraction methods from plasma isolated from whole blood collected in PAXgene cDNA tubes, spiked-in with double stranded DNA ultramers of 200 bp covering several standard cancer mutations.

4200 TapeStation System
• Automated microfluidic electrophoresis system:
  • 96 well plate or 2x6 well strip sample loading format;
  • Individual ScreenTape devices consisting of 16 lanes, i.e. 15 samples and 1 ladder;
  • Multi-lane ScreenTape devices loading for maximum 96 samples run in wells away from lanes.
• 1 µl sample volume needed per run in concentration of 10–100 ng/µl for genomic DNA and 10–1000 pg/µl for High Sensitivity DNA.
• 4200 TapeStation System is more informative than the 2100 Bioanalyzer system, and is well suited for the purpose of quality control of DNA samples extracted from clinical material; it is high throughput and user-friendly and introduces DIN values, a quality label for DNA samples. Particularly in the case of cfDNA, the 4200 TapeStation system allows simultaneous assessment of the size of the extracted cfDNA and of any potential contamination by white blood cell DNA.

Methods
For gDNA:
• We evaluated the extracted DNA quality from each participant, by determining a DIN (DNA Integrity Number score for each DNA sample).
• We measured DIN scores, ranging from 1 (DNA completely degraded) to 10 (DNA completely intact).

For cfDNA:
• We evaluated the extracted DNA quality from each participant based on the % integrated area around the 200 bp peak, corresponding to the size of the spiked-in DNA ultramers.

Results
For gDNA:
• We ran gDNA with the 4200 TapeStation High Sensitivity D1000 and High Sensitivity D5000 kit as well as the 2100 Bioanalyzer DNA 1000 kit.
• Samples run with the Genomic DNA ScreenTape assay.
• Sample run with the Genomic DNA ScreenTape assay.

For cfDNA:
• We evaluated the extracted DNA quality from each participant, by determining a DIN (DNA Integrity Number score for each DNA sample).
• We measured DIN scores, ranging from 1 (DNA completely degraded) to 10 (DNA completely intact).

Conclusions
The 4200 TapeStation system is more informative than the 2100 Bioanalyzer system, and is well suited for the purpose of quality control of DNA samples extracted from clinical material, it is high throughput and user-friendly and introduces DIN values, a quality label for DNA samples. Particularly in the case of cfDNA, the 4200 TapeStation system allows simultaneous assessment of the size of the extracted cfDNA and of any potential contamination by white blood cell DNA.