A New Tissue Stabilisation Technology for High-Quality Tissue-Based Molecular Studies


Institute of Pathology, Medical University of Graz, Austria, PreAnalytiX GmbH, Hombrechtikon, Switzerland, Institute of Pathology, Technical University of Munich, Germany, Department of Pathology, Erasmus MC, Rotterdam, The Netherlands, Dako Denmark A/S, Glostrup, Denmark, QIAGEN GmbH, Hilden, Germany, AROS Applied Biotechnology A/S, Aarhus, Denmark

Background

Molecular characterization of human disease relies on the analysis of multiple parameters, from morphological features to a broad spectrum of biomolecules. Histopathological diagnosis is routinely based on formaldehyde-fixed and paraffin-embedded (FFPE) tissues but it is known that formalin fixation impairs molecular analyses which typically require frozen tissue samples. Within the European FP7 project SPIDIA (www.spidia.eu) we developed and tested a new technology for combined histological and molecular analyses from paraffin-embedded tissue samples (PAXgene Tissue) and evaluated the impact of several pre-analytical variables on the quality of tissue-based molecular studies.

Methods

Matched samples from different human (non-)malignant tissues were fixed in buffered formaldehyde, non-crosslinking fixatives including the PAXgene Tissue System and paraffin-embedded (PFPE), and snap-frozen tissue samples served as reference. In a comparative study the quality of morphology, antigenicity and different biomolecules was investigated, in particular of nucleic acids.

Results

Preservation of morphology and antigenicity

RNA preservation and gene expression

DNA integrity and performance in multiplex PCR

Conclusions

New tissue stabilisation technology PAXgene Tissue provides

Preservation of morphology and antigenicity resembling FFPE samples.

Excellent RNA quality and strong correlation of multiple mRNA profiles with snap frozen samples in qPCR and microarray analysis.

High molecular mass DNA, well-suited for long-range and multiplex PCR, and different sequencing techniques.

Comparable preservation of (phospho-)proteins with snap-frozen samples.

Improvement of critical pre-analytical variables and reliability of tissue-based molecular studies.

New opportunities for combined morphological and molecular analyses in different application scenarios.

- Clinical trials and biomedical research.
- Multimodal biomarker studies in a routine clinical setting.
- Molecular analyses of lesions where a collection of snap-frozen material is impossible for medical, ethical or logistic reasons.