

Image Cytometry 2020 - From H&E to Expansion-Based Super Resolution

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Key words: Tissue cytometry, image analysis, confocal, super resolution microscopy

Determining the in-situ expression levels of (signalling) molecules in individual cells of diseased organs or quantify coexpression on the single-cell level has mostly been subject to visual estimation, or – at best – to manual counting for decades. Hence, experts usually had the choice between guessing and time-consuming (manual) counting. In tumor immunology, infiltrating inflammatory cells need to be phenotypically characterized on a quantitative basis. To better understand the function of inflammatory cells in tumor development, type and number of inflammatory cells and their proximity to glandular/tumor structures have to be analyzed in-situ and correlated with disease state. For signal transduction cascades different molecular species have to be quantified on the single-cell level and the cellular microenvironment has to be correlated with intracellular events.

Using TissueFAXS™ Cytometry the time-consuming and error-prone human evaluation of stained histological sections can be approached with an observer-independent and reproducible technology platform, offering a high degree of automation, paired with user interaction at relevant points of the analytical workflow. This platform can be applied as a means of tissue cytometry for immunohistochemistry, immunofluorescence, whole-slide confocal imaging, multi-spectral analysis and thus constitutes the microscopic equivalent to flow cytometry (FACS). A combination of Expansion Microscopy with TissueFAXS provides Super Resolution quality in a high-throughput manner (Expansion-Based Super Resolution).

Likewise FACS, TissueFAXS™ can quantify any type of molecular marker in any type of cell – but in tissue context or in adherent cell culture monolayers without the need to solubilise the cells (i.e. TissueFAXS permits analyses in-situ).

The TissueFAXS Cytometry platform can be used in clinical multi-center studies to determine the immune response to certain drugs in-situ, measure proliferation, apoptosis, cytokine expression, signalling molecules, and others. It can do end-point assays as well as live-cell imaging and time-kinetic experiments. But TissueFAXS Cytometry also promotes tissue cytometry to a new level of quality, where complex cellular interactions can be addressed on the single-cell level but still in histological context.