Tissue Cytometry Vs. Flow Cytometry: What's the Difference?

Cytometric methods are used by researchers looking for insights into cell size, count, cycle, and morphology. They are also used to measure key cellular constituents (i.e. DNA content). The broad goal of cytometry is to obtain extremely specific data from individual cells. This is predominantly achieved using flow cytometry, the cytometric workhorse of life sciences. However, despite its widespread implementation in research applications, flow cytometry is not the only tool available for detailed cellular analysis.

Tissue cytometry is a novel approach to cellular imaging that allows researchers to measure and analyse cells in the context of their tissue microenvironment. Flow cytometers use complex fluidics systems to measure cells in solution one-by-one, as they pass through the laser intercept in single file. By contrast, tissue cytometers are based on high-resolution light microscopy and use a solid tissue section rather than single cell suspensions.

How Flow Cytometers Work

Flow cytometers comprise three primary components:

1. Fluidics: The fluidics system forces labelled cells in a single-cell suspension into a core stream which passes through the instrument for analysis.
2. Optics: The optical system includes an array of excitation light sources and filters, foremost of which is the laser intercept comprising a perpendicular beam of monochromatic light which is either scattered or absorbed.
3. Electronics: Forward scattered light, side scattered light, and fluorescence emission signals are acquired by photodetectors and digitized for subsequent analysis.

How Tissue Cytometers Work

Tissue cytometry applies the basic imaging principles of flow cytometry to the tissue sections on slides. The **TissueFAXS platform** – currently the best-in-class tissue cytometer available – is based on high-end imaging hardware comprising a microscope, scanning stage, fluorescence excitation devices, cameras for detection, software enabling scanning automation, and quantification software.

Varied sample types can be used, including cell culture monolayers on various substrates, cryo-cut sections, paraffin-embedded tissue, and so on. Standard staining protocols apply to each, using several markers to achieve the same phenotypic characterization typical of flow cytometry but within the native tissue environment. The benefits of this are multifaceted.

So, what do these differences mean in practice and when might you consider deploying tissue cytometry instead of conventional flow cytometry?

Benefits of Tissue Cytometry

Tissue sections comprise a great variety of cells including epithelial cells, muscle cells,

nerve cells, blood vessels, tissue infiltrating leukocytes and sometimes tumor cells at various differentiation stages. In a single cell suspension, much of this morphological detail and diversity is lost. Tissue cytometry provides a better indication of critical cellular and spatial interactions in their normal context. Tissue cytometers are not only assessing basic properties such as cell diameter or shape and are instead quantifying multiple molecular marker expressions across a whole slide. This way they can also provide a much greater depth of insight into the functional characterization of single cells and their interactions with other morphological substructures.

Interested in Tissue Cytometry?
TissueGnostics is the industry-leading manufacturer of tissue cytometry solutions for histology and precision medicine applications. We offer a range of **TissueFAXS tissue cytometers** for whole slide and high-resolution confocal imaging with a choice of configurations and built-in automation systems to support easy onboarding in any setting. Our image analysis software, **StrataQuest**, can help to streamline your image analysis workflow with automatic detection and analysis modules, suitable for any type of marker or tissue.

Want to learn more? **Contact a member of the TissueGnostics team today**.