



**POSTER #7**

**QUANTITATIVE LABEL-FREE INVESTIGATION OF CANCER CELL BEHAVIOR  
USING HOLOGRAPHIC MICROSCOPY**

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Metastatic cancer cells have been known to use a large number of cellular mechanisms, which increase their resistance to chemotherapy. Some of them have been very rare (e. g. entosis), and can be easily left undetected by flow cytometry, which averages properties of large cellular populations.

Time-lapse, live cell imaging has been used to trace those events, as many of these mechanisms have been associated with the changes in the cancer cell morphology and relocation of cellular mass. Phase contrast or DIC microscopies have been commonly used methods for label-free imaging of living cells. However, despite the fact that these techniques provide sufficient visual observation, the automated segmentation of cellular boundaries, which is a prerequisite for analyzing many parameters of individual cells (e.g. trajectory, mass, circularity), is extremely difficult.

Holographic light microscopy or quantitative phase imaging (QPI) allows detailed assessment of cell attributes due to the extremely high sensitivity in detecting even the smallest changes in mass density without any artifacts (Fig. 1). This in turn allows extremely fast and precise automated segmentation of individual cells (Fig. 2.). Once the cells are identified, its properties, such as mass changes, confluency, directionality, growth and many more can be easily calculated. Based on these parameters, rare cells with unique behavior can be gated in large populations (Fig. 3.). Identifications of such patterns can provide answers to origins of chemotherapy resistance.

Here, we used QPI as a method for a label-free quantification of unique proliferative properties of cancer cells and their changes in respect to various treatments. An examples of cell fate monitoring techniques and their use to evaluate rare variations in cancer cells chemotherapy response will be shown.

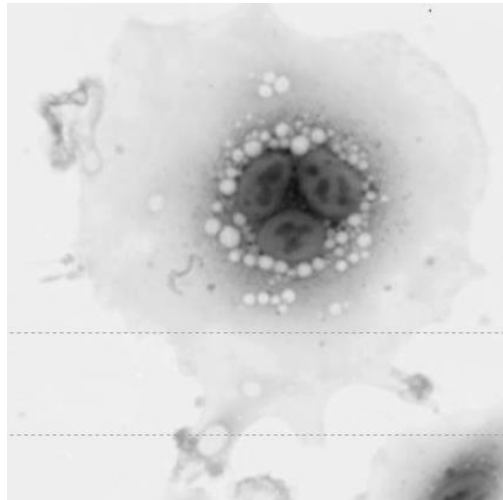


Figure 1. High contrast QPI image of ovarian cancer cell (A2780).

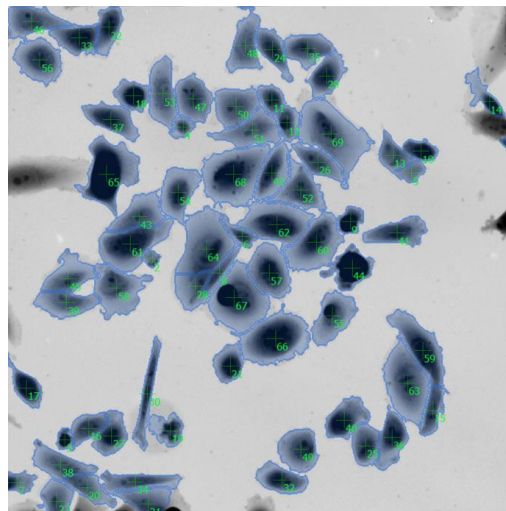


Figure 2. Automatic label-free segmentation of a QPI image for subsequent data analysis

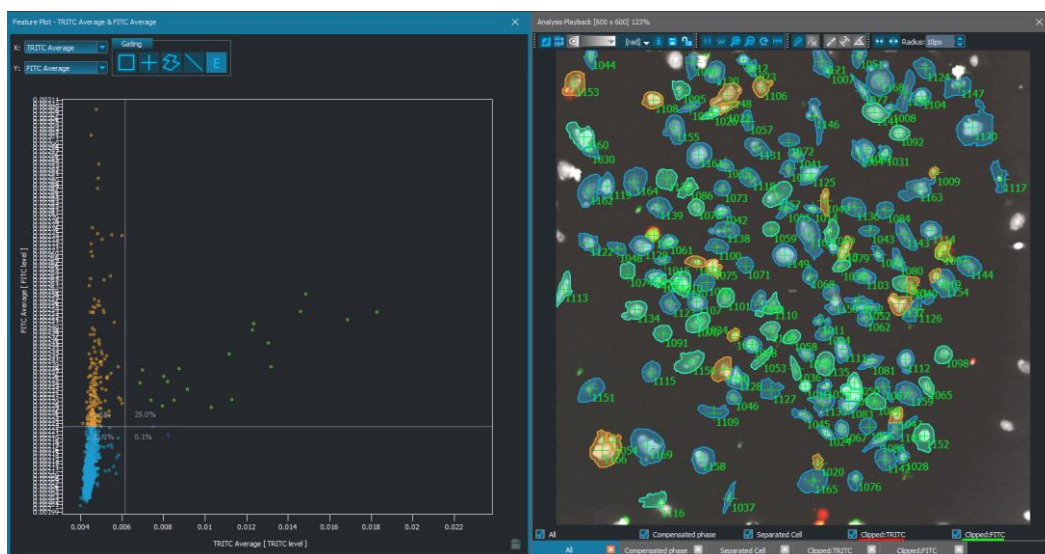


Figure 3. Identification and gating of cellular populations