

ANALYSIS OF OSMOTICALLY STIMULATED CELL SWELLING BY QUANTITATIVE DIGITAL HOLOGRAPHIC PHASE CONTRAST

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ABSTRACT

The quantitative analysis of osmotically stimulated cell swelling is important for the understanding of the cell membrane permeability and cell mechanics. Digital holographic microscopy (DHM) provides minimally invasive label-free quantitative phase contrast for dynamic monitoring of living cells with low demands on sample preparation [1-4]. Thus, it was investigated if DHM can be applied to quantify cell swelling due to osmotic stimulation. Primary rat kidney inner medullary collecting duct cells (IMCD cells) were cultured in a perfusion

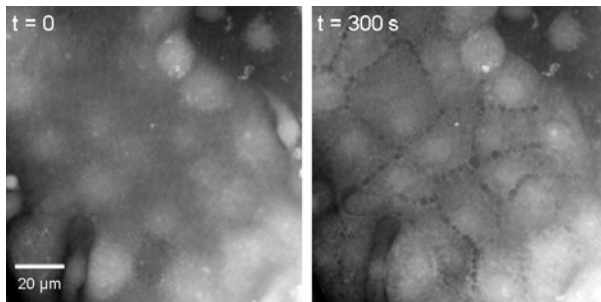


Figure 1: Quantitative DHM phase contrast images of rat IMCD cells (coded to 256 gray levels). Left: before osmotic stimulation (600 mOsmol/kg), right: after decrease of the osmolarity to 200 mOsmol/kg.

chamber and exposed to a hypoosmolar shock. The response of the cells to the osmolarity change was measured by time-laps DHM investigations. In further DHM measurements the volume and the integral refractive index of suspended IMCD cells were determined. The obtained results demonstrate that DHM is a suitable method to characterize the regulation of water permeability of living cells.

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