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Towards high-throughput morphomics at the nanoscale

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Morphological analysis is fundamental to understanding cell and tissue function. Cells and organelles comprise rich arrays of 3D data that can be mined across the imaging scales of light and electron microscopy to yield precise and bias-free measurements. Recently, we introduced the term morphome for the spatial distribution of matter in a biological object and morphomics for any method that systematically or quantitatively assesses a 3D data set. At the EM level morphomics (e.g. immuno-EM or serial section analysis) can yield petabytes of data and a big question is how to estimate high quality data easily and rapidly. In this, I will discuss the currently available solutions to the "big data" problem and strategies for removing or negotiating technological roadblocks to high-throughput. I will also address issues such as automated recognition, the integration of EM data with readouts from other imaging modes and how the morphome integrates into the omic framework.

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Characterizing kidney structures in health and diseases by eosin-fluorescence of haematoxylin and eosin-stained tissue sections

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For a long time Haematoxylin and Eosin (H&E) staining has been widely used for diagnosis of many diseases by looking at the histopathological changes in tissue sections. Eosin, one of the staining dyes in the H&E stain, is fluorescent in the FITC and TxR fluorescent channels. In this study, we elucidate the use of eosin fluorescence to visualize molecular histopathological changes in the glycerol-induced model of acute kidney injury (AKI) in mice. AKI was induced in BALB/c mice by intra-muscularly injecting 10 mL/Kg b.w. of 50% Glycerol after 24 hours of water deprivation, followed by dissection of kidney after 24 hours. Kidney tissue sections were examined under a fluorescent microscope using double channel filter cube (FITC and TxR) after H/E staining. First we characterized the fluorescence pattern of normal kidney structures as the fluorescence patterns varied between different parts of the kidney. Interestingly, in injured kidney sections, we noticed a striking increase in the red fluorescence in the damaged areas. In the damaged kidney, casts was deposited inside tubules, which showed bright yellow fluorescence whereas fibers showed strong green fluorescence. We also performed in vitro experiments in order to understand possible mechanisms underlying this phenomenon. We concluded that eosin fluorescence can be used to quantify the degree of damage to the tissue which in turn may help in assessing the kidney-protective effect of unknown compounds and plant extracts and to diagnose kidney pathology.

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