IMAGE AND PROBE THE EXTRACELLULAR SPACE OF LIVE BRAINS WITH CARBON NANOTUBES IN PARKINSON'S DISEASE MOUSE MODEL

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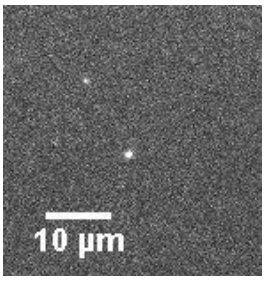
The extracellular space (ECS) is a complex network of biomolecules that constitutes a key microenvironment for cellular communication, homeostasis, and clearance. In the brain, signalling molecules, neuromodulators, and nutrients transit *via* the ECS, therefore mediating the non-synaptic communication between cells [1]. Under pathological conditions, the ECS volume is a key component in the spreading and/or clearance of disease-related molecules. For example, it has been postulated that in Parkinson's disease (PD), secreted pathological α-synuclein species can propagate their pathogenic trait to other neurons via the ECS network [2]. Researchers are currently focused on finding new strategies to unveil the ECS features in pathological live brains. Single wall carbon nanotubes (SWCNTs) are particularly attractive because of their spectral imaging range and their unusual diffusion properties. Recently, we demonstrated that SWCNTs can be used to image and probe live brains, providing high-resolution maps of the ECS and quantitative information on the local viscosity [3].



Widefield imaging of SWCNTs emitting at 985 nm in a brain tissue of a PD mouse at 20 µm depth.

Here, we extend this work by showing near infrared (NIR) imaging of SWCNTs in live brain tissues of PD mouse model. SWCNTs were injected in the lateral cerebroventricles and acute brain slices were prepared 1 hour after surgery. To correctly identify areas of SWCNT activity, we are implementing a structured illumination technique (named HiLo microscopy [4]) to work in parallel to SWCNT NIR imaging. This technique is based on speckle illumination, and relies on the acquisition of one structured and one uniform illumination image to obtain pictures with good optical sectioning. These novel tools will help us to unveil the fundamental characteristics of ECS modification in PD and open up new opportunities for future pharmacological studies.

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