APPLICATION NOTE

N-STORM Super Resolution Microscope / C2+ Confocal Microscope

Visualization of microglia-neuron junctions with super-resolution and confocal microscopy

Microglia are the main immune cells in the brain, and play roles in brain homeostasis and neurological diseases. However, the fundamental mechanisms underlying microglia-neuron communication remain unclear. Dr. Csaba Cserép, Dr. Balázs Pósfai and colleagues, (Laboratory of Neuroimmunology led by Dr. Ádám Dénes, Institute of Experimental Medicine) identified an interaction site between neuronal cell bodies and microglial processes in the mouse brain and studied the function of microglia (C. Cserép and B. Pósfai et al., Science 10.1126/science.aax6752 (2020)). In this Application Note, we introduce how the structure of neuron-microglia junctions was revealed on a nano scale resolution using the confocal and super-resolution microscopes.

Seamless switching between super-resolution and confocal microscopy

Sections of the somatosensory cortex of adult, healthy mice were immunolabeled with fluorophores and observed by confocal and super-resolution microscopy. The imaging revealed microglial processes contacting the neuronal cell bodies. Figure 1 shows microglia-neuron junction images taken by a combined system of N-STORM (which is a super-resolution microscope based on the Ti2-E inverted microscope), and the confocal microscope C2+. The morphological features were observed with the confocal microscope and localization information of molecules was obtained by switching to the super-resolution microscope. The images show that microglial P2Y12R expressed in the microglia processes and clusters of neuronal Kv2.1 (voltage-dependent potassium channel) localized to the neuronal somatic membranes are overlapping.

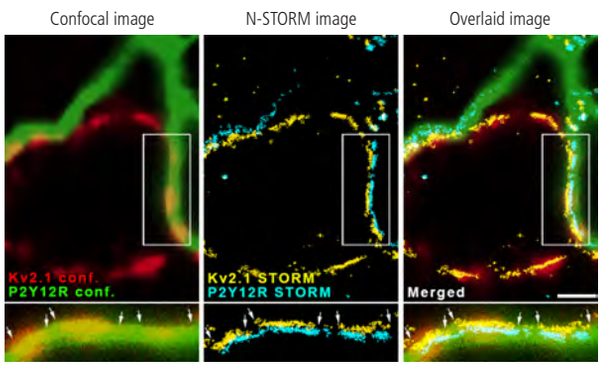

Figure 1. Combination imaging of N-STORM and the confocal microscope
Brain of an adult mouse. The images show localization of microglial P2Y12R (green for confocal, cyan for STORM) and neuronal Kv2.1 (red for confocal, yellow for STORM). Images courtesy of: Barbara Orsolits, Laboratory of Neuroimmunology, Institute of Experimental Medicine

The advantages of combined use of super-resolution and confocal microscopy

Taking the image of the area containing the target first using the confocal microscope allows users to observe the morphology of the target more accurately than when using the fluorescence microscope, thanks to the sectioning effects of the confocal microscope. After identifying the target, users can observe the structure in detail with the molecular level localization by switching to the N-STORM observation mode. The modes are easily switched on the control panel of the NIS-Elements software, realizing a smooth experimental workflow.

Product information

N-STORM Super Resolution Microscope

The N-STORM utilizes a localization technique called STochastic Optical Reconstruction Microscopy (STORM) to achieve a resolution of ten times that of conventional light microscopes. It allows imaging of the structure of cell organelles on a molecular level.

- Lateral resolution: Approx. 20 nm
- Axial resolution: Approx. 50 nm

C2+ Confocal microscope

A compact confocal microscope with simple operability. It employs optically superior circular pinholes to produce high-quality confocal images.

- Image size: 2048×2048 pixels
- High-speed scanning of 8 fps (512×512 pixels) and 100 fps (512×32 pixels)