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APPLICATION NOTE

The Naveni® Technology

A trusted neuroscience tool

The world of neuroscience is intricate and requires cutting-edge tools for the discovery of synaptic interactions and protein dynamics holding the key to the secrets of neurodegenerative diseases, cognitive functions, and even behavioral disorders. The Naveni® Technology, based on proximity ligation, is designed to explore protein-protein interactions with unparalleled precision and has been instrumental in several neuroscience publications.

Use case 1.
In a study by Vitet et al., the Naveni® Proximity Ligation method demonstrated the interaction between HTT and KIF1A, a protein interaction previously unconfirmed. Researchers found that neurons expressing constitutive phospho-HTT exhibited a significantly higher number of HTT/KIF1A interactions compared to wild type (WT). This discovery unveiled a critical pathway regulating synaptic transmission and motor skill learning. See figure 1.

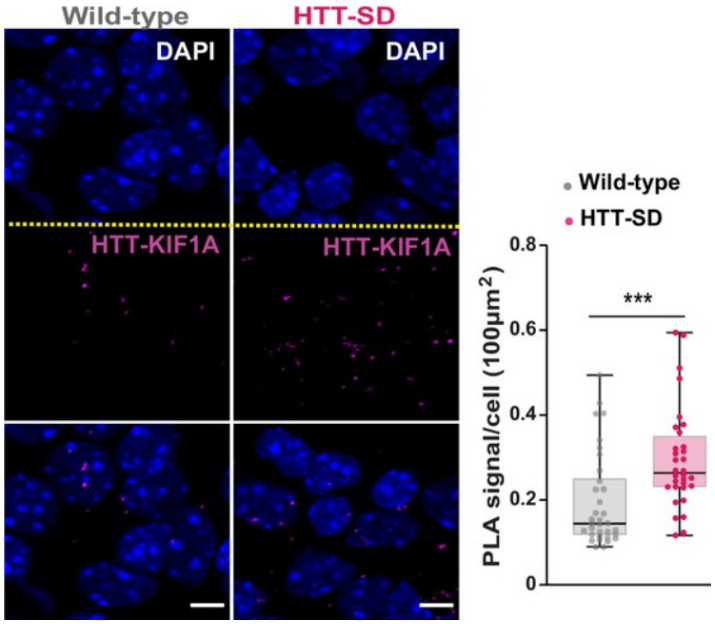


Figure 1. Naveni® Proximity Ligation Assay was used to confirm the cellulo interaction between HTT and KIF1A. From Vitet et al (2023), eLife 12:e81011.

Use case 2.
In another study led by Ross et al., the Naveni® Proximity Ligation Technology was used to investigate the dynamic interaction between AMPA receptors and the synaptic scaffolding protein Shank3. Shank3 is a master regulator of synaptic architecture, intricately involved in regulating synaptic receptor density and, consequently, synaptic strength. Genetic associations extend its relevance to autism spectrum disorders.

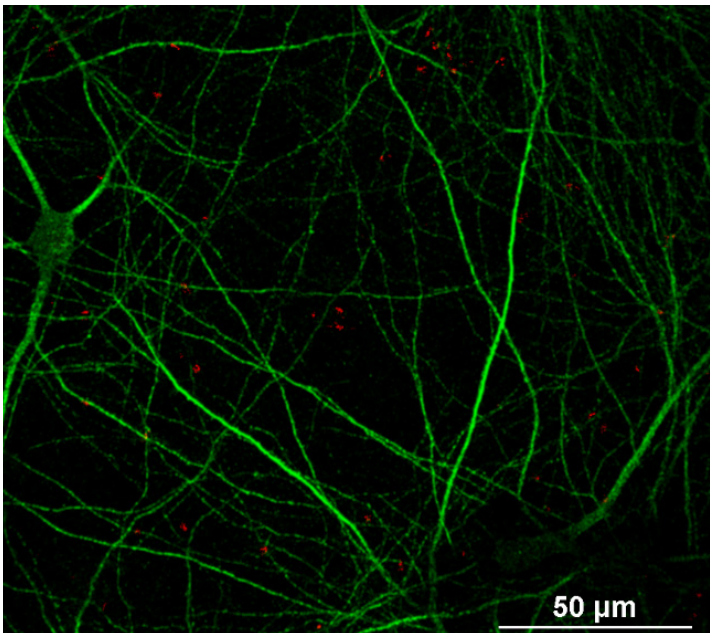


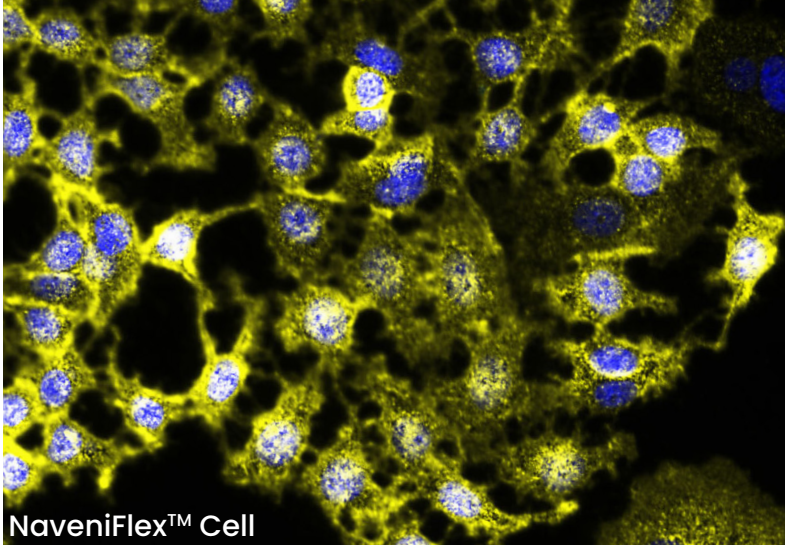
Figure 2. Representative image of Naveni® Proximity Ligation Assay between GluA1 and Shank3 under control conditions. Neuronal morphology is shown with Map2 immunofluorescence (green), and interactions in red. For more images see Ross et al. (2023) Neuroscience Letters, 137305.

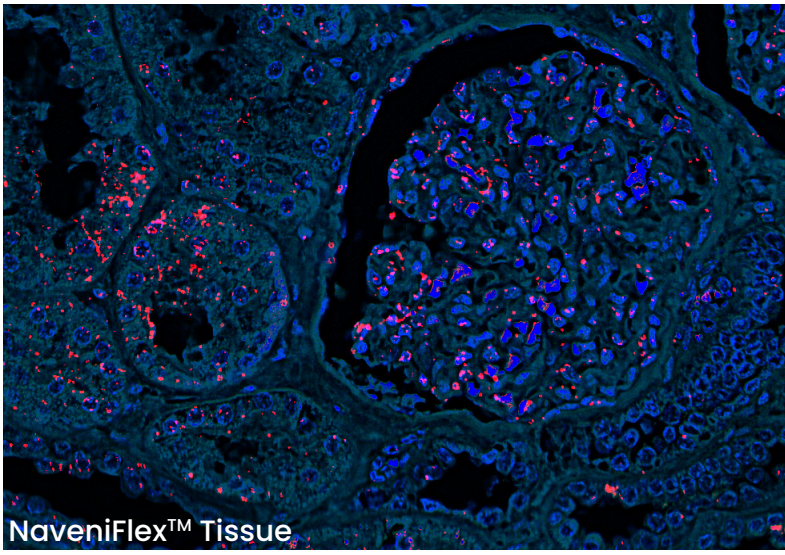
Ross et al. explored the stability of the GluA1-Shank3 interaction under conditions of prolonged neuronal depolarization induced by elevated potassium levels. The results were intriguing: chronic depolarization led to a reduction in GluA1-Shank3 interactions, revealing the modulatory role of neuronal activity on this crucial synaptic interaction.

The benefits of the Naveni® Proximity Ligation Assay for neuroscience

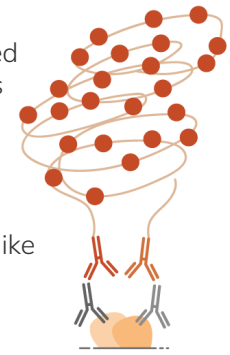
Findings like these highlight the potential of proximity ligation assays in neuroscience research and the power of spatial interactomics. The sensitivity and specificity of the Naveni® Technology enables a deep dive into the molecular intricacies of synaptic connections, uncovering signaling pathways and protein interplay. Visualizing function is pivotal in understanding how proteins orchestrate synaptic plasticity, and how disturbances in the formation of these dynamic protein complexes contribute to neurological disorders.

> “Working with the NaveniFlex reagents was user-friendly and yielded high quality results. I was able to generate high quality images with discrete puncta clearly delineating interactions of my proteins of interest. The clear results of my experiments using NaveniFlex provided a foundation for my project and served as a source of new hypotheses for future work.
>
> - Scientist Madeline (Maddie) Ross, University of Pittsburgh


NaveniFlex™ Cell


NaveniFlex™ Tissue

The NaveniFlex™ Cell and Tissue kits includes two Navenibodies conjugated to proprietary oligo arms (depicted as orange antibodies in the illustration). Only when the Navenibodies are in close proximity will they generate a rolling circle amplification reaction, resulting in a strong and distinct dot-like signal that is easily quantifiable.



Selection of publications

Vitet Hélène, Bruyère Julie, Xu, Hao, Séris Claire, Brocard Jacques, et al. (2023) loHuntingtin recruits KIF1A to transport synaptic vesicle precursors along the mouse axon to support synaptic transmission and motor skill learning. Cambridge: eLife Sciences Publications Ltd. DOI:10.7554/eLife.81011

Madeleine Ross, Elias Aizenman. GluA1-Shank3 interaction decreases in response to chronic neuronal depolarization. Neuroscience Letters, 2023, 137305, ISSN 0304-3940, DOI:10.1016/j.neulet.2023.137305

Estela Díaz-Sánchez, Alexander López-Salas, Marina Mirchandani-Duque, Jose Erik Alvarez-Contino, Jose Andrés Sánchez-Pérez, Kjell Fuxe, Dasiel O. Borroto-Escuela, Natalia García-Casares, Manuel Narváez. Decreased medial prefrontal cortex activity related to impaired novel object preference task performance following GALR2 and Y1R agonists intranasal infusion. Biomedicine & Pharmacotherapy. Volume 161, May 2023, 114433. DOI: 10.1016/j.biopha.2023.114433

Athanasios S. Alexandris, Jiwon Ryu, Labchan Rajbhandari, Robert Harlan, James McKenney, Yiqing Wang, Susan Aja, David Graham, Arun Venkatesan, Vassilis E. Koliatsos. Protective effects of NAMPT or MAPK inhibitors and NaR on Wallerian degeneration of mammalian axons. Neurobiology of Disease, Volume 171, 2022, DOI:10.1016/j.nbd.2022.10580

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