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Communicating Nerve Cells – New Insights

The human brain consists of more than 100 billion nerve cells, and each of them is able to communicate with thousands of its neighbors. Nerve signals let us move, act and think. Scientists of the Max Planck Institute (MPI) of Biochemistry in Martinsried near Munich have now succeeded in obtaining detailed 3D images of synapses, the connections where communication between nerve cells takes place. "With the help of cryoelectron tomography, we could detect and analyze structures in synapses that no one else could see before," says Rubén Fernández-Busnadiego, scientist at the MPI of Biochemistry. The work has now been published as the cover story in the *Journal of Cell Biology*.

When nerve cells, also known as neurons, communicate with each other, the emitter cell releases transmitter molecules into the recipient cell. The result is an electric impulse within the recipient neuron and, thus, the transmission of information from one cell to the other. During their work, Max Planck scientists of the Research Department of Molecular Structural Biology, headed by Wolfgang Baumeister, focused on the tiny vesicles which transport and release the neurotransmitter molecules.

According to the scientists, there are delicate filaments which connect these vesicles with each other. They also connect them with the active zone of the synapse, the part of the cellular membrane from where neurotransmitter molecules are released. "These filamentous structures act as barriers that block the free movement of the vesicles, keeping them in their place until the electric impulse arrives, as well as determining the likelihood with which they fuse with the membrane," explains the Spanish physicist Rubén Fernández-Busnadiego.

Original Publication:

R. Fernández-Busnadiego, B. Zuber, U. E. Maurer, M. Cyrklaff, W. Baumeister, and V. Lučić : Quantitative analysis of the native presynaptic cytomatrix by cryoelectron tomography. Journal of Cell Biology, January 11, 2010.

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