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Autophagy: Scientists discover novel role for self-recycling process in the brain

Proteins classically associated with autophagy regulate the speed of intracellular transport / Publication in ,Nature Communications’

Scientists from the laboratory of Dr. Natalia Kononenko at the CECAD Center of Excellence in Aging Research at the University of Cologne have found out that autophagy – the process of cellular self-recycling, or waste clearance – is dispensable for the survival of the neurons in mice. The new findings suggest that autophagy in fact also fulfils a different important function: The proteins classically associated with waste clearance in cells regulate the speed of intracellular transport. This transport is achieved by microscopic hollow tubes, so-called microtubules. The article ‘Autophagy lipidation machinery regulates axonal microtubule dynamics but is dispensable for survival of mammalian neurons’ appeared in the current issue of *Nature Communications*.

Autophagy cleans the cells by breaking down and removing the damaged proteins and organelles, cell areas with a specific function. It is hardly surprising that this process is particularly important for long-lived cells such as neurons, since neurons are no longer capable of cell division (‘post-mitotic’) and are therefore particularly vulnerable to accumulating unfavorable proteins and damaged organelles. In their new study, the scientists show that neurons in the mouse brain do not need autophagy to survive. Instead, these specialized cells use autophagy proteins to regulate the microtubule-dependent transport of molecules crucial for learning and memory.

The fact that autophagy is crucial for the well-being of the brain is supported by scientific discoveries made over the last decade. Many studies have identified defective autophagy as one of the pathological causes of neurodegenerative diseases, including Alzheimer’s (AD), Parkinson’s and Huntington’s disease. In this context, the novel function of autophagy the scientists discovered suggests that the therapeutic modulations of autophagy activity in patients might not only promote the

waste clearance in the brain, but also alter the cognitive abilities by changing the efficiency of the intracellular transportation system.

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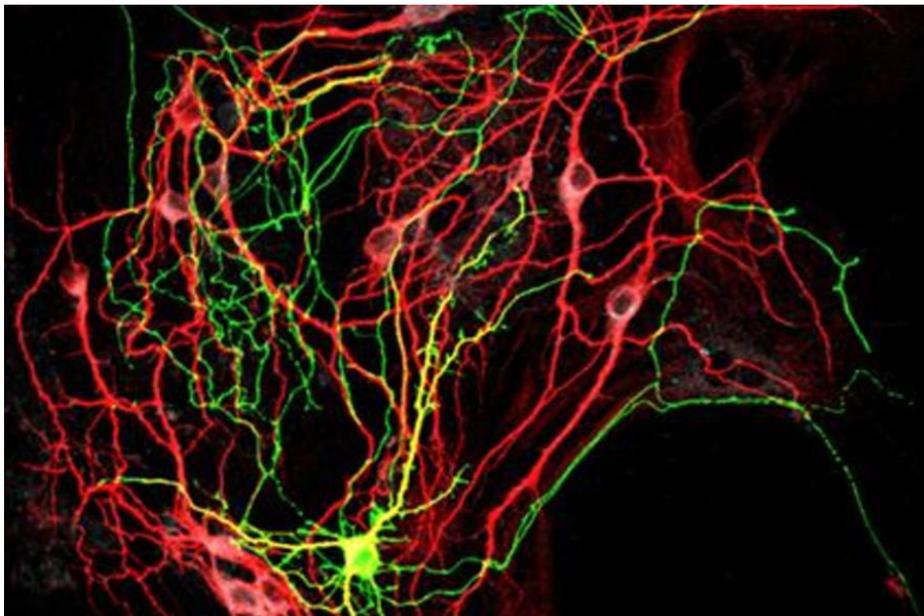
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GFP-labelled axons of wildtype cortical neurons in-vitro; (c) Natalia Kononenko