

Neuroscientists find out how vertebrates terminate locomotion

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Neuroscientists of the universities of Cologne and Montreal have discovered neural mechanisms that control the termination of locomotion. In a study, which was published in the journal *Cell Reports*, they have identified 'stop cells' in brainstem neurons and characterized their cellular features and specific activity patterns. The study is the result of a long-term international collaboration between the working groups of Professors Ansgar Büschges and Réjean Dubuc, who both research neural activity.

In the case of vertebrates - including humans - the [neurons](#) in the midbrain control body activity, especially those required for locomotion. Command neurons are produced in this region of the brain and transferred directly to the brainstem. From there, they go through the medulla to the local networks that control the activity of the body's musculature. While much has been known about the initiation and maintenance mechanisms of activity for some time now, with regard to the stopping of activity there was only the assumption that the result of the termination of activity was from brainstem neurons. It only recently became known that specific [neural mechanisms](#) existed for this. Researchers from the Karolinska Institutet in Stockholm discovered a cell population in the brainstems of mice, which causes the end of a movement sequence. The individual activities of such neurons could not, however, be described or analysed.

In their study, Dr. Laurent Juvin and Swantje Grätsch in collaboration with Prof. Réjean Dubuc, Prof. Ansgar Büschges and other colleagues were able to characterize similar brainstem neurons ("stop cells") using a lamprey. For this, they used MRI imaging, electrophysiological and kinematic methods to measure the cell activity of "stop cells" which were then compared with body activity. It could be demonstrated that "stop cells" could be activated quickly and strongly just before the end of movement. These activity patterns for brainstem

neurons were unknown up until now. Interestingly, the targeted activation of these cells results in the quick termination of movement while experimental inactivation significantly impairs this process.

These research findings deliver new insight into the neuronal control of movement termination in vertebrates: "Stop cells" are brainstem neurons that affect neural networks in the medulla as command neurons and quickly end body activity.

Provided by University of Cologne

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