The surprising link between a baby's proprioception and the genetics of motor control

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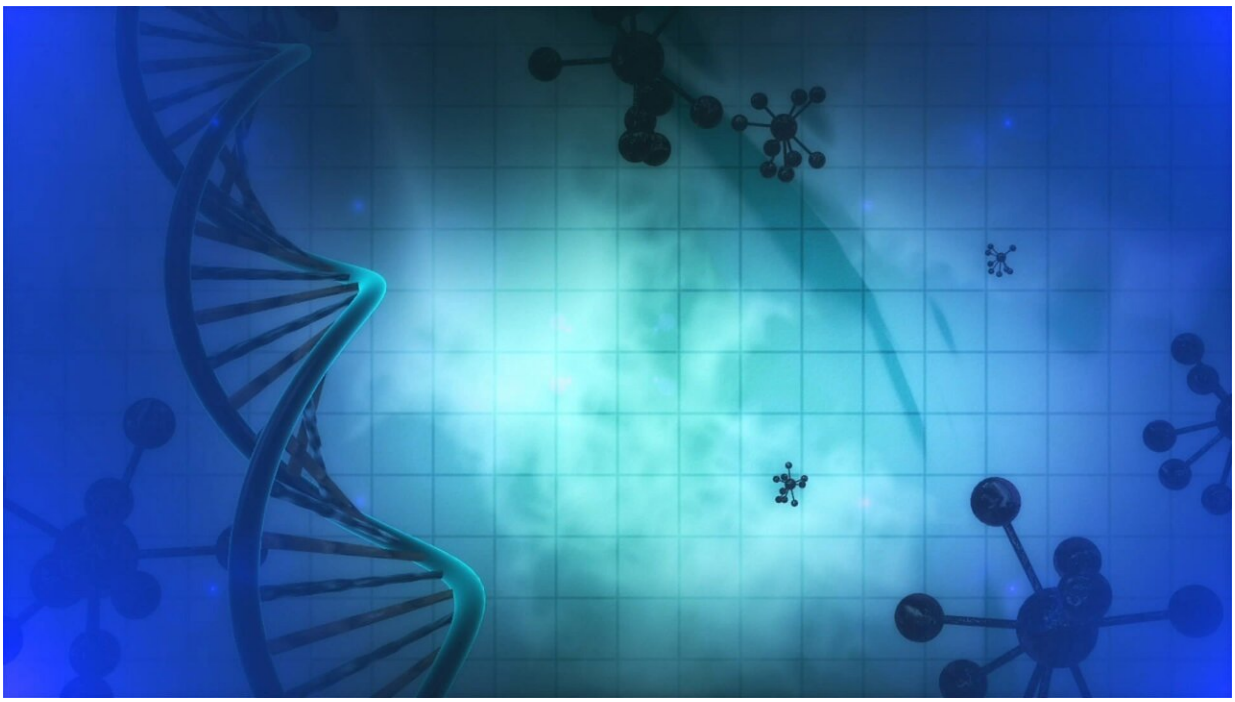

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Neuroscientists at the University of Sussex have revealed that complex movements, such as those for maintaining posture, can be controlled by a simple genetic system, providing a framework to better understanding the molecular basis of diseases that affect motor control, like

Huntington's and Parkinson's.

Claudio Alonso, professor of developmental neurobiology at the University of Sussex, and colleagues studied a motor sequence in fruit flies called 'self-righting," involving a a change in posture via the rotation of the body so as to maintain a constant position in respect to the ground.

Such movements are also seen in humans; rolling in babies represents a marker to monitor motor development during infancy, and can form part of the repertoire of core motor sequences that control "body posture" providing the basis to all movements such as lifting an arm.

In Professor Alonso's new research paper, published in the journal *Current Biology*, he shows that, in fruit flies, these movements are controlled by a simple genetic system where one gene, called miR-iab4, represses another, a Hox gene, to enable "self-righting" behavior. Similarly, in mammals, a parallel gene to miR-iab4, is also able to repress Hox gene expression, demonstrating the common genetic circuitry present in flies and mammals.

Until now, scientists thought that the Hox genes were just developmental, involved in the formation of body structures and the brain, but Professor Alonso and colleagues at the Champalimaud Institute in Lisbon, now show that these genes are also able to control neural physiology and behavior.

The findings could help to provide a framework to better understand the molecular basis of motor diseases like Huntington's and Parkinson's.

Professor Alonso, Subject Chair for Neuroscience at the School of Life Sciences and a member of the internationally-leading research center of Sussex Neuroscience, said: "Although our work is focused on deducing

fundamental biological principles—what you may call "basic science"—there are several possible biomedical projections of this study.

"For example, aging, as well as various forms of neural disease including motor neurone disease, Parkinson's and Huntingdon's disease, can degrade posture and motor control, leading to a deterioration of health and quality of life.

"In order to understand more about these conditions and to be able to map the anomalies caused by disease or advanced age, we need a deeper understanding of the genetic and physiological factors that underlie normal posture control and movement.

"While we knew that deregulation of the Hox genes can cause several types of disease and disorders, including cancer, as far as we know our results are the first to report Hox-dependent roles in neurophysiological and behavioral control in the fully formed organism (once development has concluded)."

More information: A. Raouf Issa et al. A Single MicroRNA-Hox Gene Module Controls Equivalent Movements in Biomechanically Distinct Forms of Drosophila, *Current Biology* (2019). DOI: 10.1016/j.cub.2019.06.082

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