

Stem cells use GPS to generate proper nerve cells

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An unknown function that regulates how stem cells produce different types of cells in different parts of the nervous system has been discovered by Stefan Thor, professor of Developmental Biology, and graduate students Daniel Karlsson and Magnus Baumgardt, at Linköping University in Sweden. The results improve our understanding of how stem cells work, which is crucial for our ability to use stem cells to treat and repair organs. The findings are publishing next week in the online, open-access journal *PLoS Biology*.

Stem cells are responsible for the creation of all cells in an organism during development. Previous research has shown that [stem cells](#) give rise to different types of cells in different parts of the nervous system. This process is partly regulated by the so-called [Hox genes](#), which are active in various parts of the body and work to give each piece its unique regional identity - a kind of GPS system of the body. But how does a stem cell know that it is in a certain region? How does it read the body's "GPS" signals? And how is this information used to control the creation of specific nerve cells?

In order to address these issues, the LiU researchers studied a specific stem cell in the nervous system of the fruit fly. It is present in all segments of the nervous system, but it is only in the thorax, or chest region, that it produces a certain type of nerve cell. To investigate why this cell type is not created in the stomach or head region they manipulated the Hox genes' activity in the fly embryo.

It turned out that the Hox genes in the stomach region stop stem cells from splitting before the specific cells are produced. In contrast, the specific nerve cells are actually produced in the head region, but the Hox genes turn them into another, unknown, type of cell. Hox genes can thus exert their influence both on the genes that control stem cell division behaviour and on the genes that control the type of [nerve cells](#) that are created.

"We constantly find new regulating mechanisms, and it is probably more difficult than previously thought to routinely use stem cells in treating diseases and repairing organs, especially in the nervous system", says Thor.

More information: Karlsson D, Baumgardt M, Thor S (2010) Segment-Specific Neuronal Subtype Specification by the Integration of Anteroposterior and Temporal Cues. PLoS Biol 8(5): e1000368. [doi:10.1371/journal.pbio.1000368](https://doi.org/10.1371/journal.pbio.1000368)

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