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The mystery of symmetry is revealed

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(PhysOrg.com) -- Some of our organs, such as the liver and the heart, are lateralised. As our bodies develop they mostly display bilateral symmetry across the vertebral column.

A new molecular pathway, which plays a role in this symmetry in vertebrates, has recently been discovered by a Franco-American team led by Olivier Pourquié at the Stowers Institute for Medical research, who moved a short while ago to the Institute of Genetics and Molecular and Cellular Biology (CNRS/University of Strasbourg). This work was published on Thursday in *Nature*.

Vertebral symmetry appears early in the course of embryonic development, at the time when somites are formed. Somites are cubic shaped structures from which the vertebrae and the muscles, in particular, are derived. Under the influence of an internal clock, pairs of somites develop, in a periodic manner, starting from the internal cellular layers of the embryo. Retinoic acid, a derivative of vitamin A, appears to play a significant role in controlling the symmetry of the somites. Moreover, it is known that semitogenesis becomes desynchronised in mice which are deficient in retinoic acid.

In a study performed on mouse embryos, the researchers investigated the Rere protein, also known as atrophin 2. They showed that this molecule participates in the activation of the signalling pathway for retinoic acid by forming a complex with two other proteins, Nr2f2 and p300, and a retinoic acid receptor. Mice mutated for the Rere gene show the same retarded somite formation as mice which are deficient in retinoic acid.

Their work also showed that the proteins, Nr2f2 and Rere, control the asymmetry of the signalling pathway for retinoic acid. This asymmetry is required to correct interference with the signals which determine the lateralisation of organs. Hence, this study improves our understanding of how the general symmetry of the body can be reconciled with the lateralisation of some organs.

In man, the anomalies in symmetric development of the somites could be responsible for vertebral symmetry disorders such as scoliosis. A defect in the regulation of functions performed by RERE or Nr2f2 on the retinoic acid signalling pathway may be implicated in the occurrence of these frequent, and sometimes acute, diseases.

More information: "Rere controls retinoic acid signalling and somite bilateral symmetry", *Nature*, February 2010. www.nature.com/nature/journal/ … ull/nature08763.html

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