

Review of: "Pitx controls amphioxus asymmetric morphogenesis by promoting left-side development and repressing right-side formation"

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The establishment of Left-Right (LR) asymmetry is a fascinating process during embryo development. All the molecular fuss that operates in the LR asymmetry morphogenesis leads to the best arrangement of most visceral organs in terms of size, shape, position, and proper function. Laterality defects are frequently associated with congenital heart disease, one of the most common birth defects, affecting almost 1% of births worldwide.

In this study published in BMC Biology, Xing and colleagues demonstrated through a series of successful design experiments that Nodal-Pitx pathway is required for LR morphogenesis in the chordate amphioxus. They show that, in amphioxus embryos, there are two isoforms, Pitxa/b and Pitxc, displaying different expression patterns. Detailed analysis of Pitx animals carrying different mutations revealed that the different organs show different sensibility to Pitx activity. This evidences that LR organ development is more dependent on Pitx in amphioxus than in vertebrates. Interestingly, there are asymmetric morphogenic events that are independent of this protein, although Nodal signaling-dependent. This suggests that despite some differences, the development of LR asymmetry in amphioxus and vertebrates is much the same, relying on Dand5-Nodal-Lefty-Pitx core. Even though there is room for new players. Factor X suggested by the authors could be an example of a new molecule involved in LR organogenesis, or simply, a new role or level of a well-known player. We can assume that the mechanism, or mechanisms, for establishing the LR axis is well far from being thoroughly explored.