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Development of the Embryonic Left-Right Organizer: Identifying regulators of proliferation during development of the embryonic left-right organizer

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Identifying regulators of proliferation during development of the embryonic left-right organizer

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On the outside, our bodies have established left-right symmetry along our anatomical plane. However, the inside of our bodies is not so symmetrical. This is known as bilateral asymmetry. For instance, the heart and stomach are on the left side, and the liver is positioned on the right side of the body. The internal organs of the body are organized in a complex way, but it is essential to the function of life. Without the heart being positioned between the lungs, the exchange of blood and oxygen would not be able to be optimized most efficiently. There are cases where errors in establishing the left-right (LR) axis during embryonic development can lead to serious birth defects, including life-threatening heart malformations. In 1 in 10,000 births, a complete randomization of internal organ organization occurs, known as heterotaxy syndrome. This occurs due to a malfunction in the left-right organizer (LRO) of the human body. The LRO is an embryonic structure that is a key player in the process of establishing the LR axis. However, little is known about LRO development and how it impacts organ laterality. It is important to understand the mechanisms that control the determination of the LR axis to conceptualize preventative measures for developmental anomalies. My lab used the zebrafish embryo to investigate the development of the LRO and its role in the LR asymmetry of internal organs. The LRO found in zebrafish is known as Kupffer's Vesicle (KV). KV starts as a collection of undifferentiated stem cells known as Dorsal Forerunner Cells (DFCs). The pathways that regulate how these DFCs multiply are unclear. In our experiment, we used a pharmacological approach to determine the pathways that are involved in DFC proliferation. By understanding these mechanisms, we can understand the role DFCs play in defects such as heterotaxy and pave the way for preventive measures in clinical cases of congenital abnormalities. The proliferation of DFCs is one of the foundational steps that give rise to the development of KV, and a fuller understanding of its actions towards internal organ asymmetry allows for a more targeted approach to treating/detecting fetal organ complexities.

This abstract summarizes the project displayed on the website, which can be accessed by scanning the QR code.

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