

Mechanisms underlying abnormal epicardium formation in the developing heart

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The heart wall consists of three distinct layers; the epicardium (outer), the myocardium (middle), and the endocardium (inner). Although relatively quiescent in the adult (merely providing an outer protective layer to the heart), the embryonic epicardium is essential for normal heart development, contributing to structures such as cardiac valves and coronary vessels. Studies in our laboratory have shown that when a heartbeat is present but irregular, an abnormal epicardium can form. An abnormal epicardium, in turn, could lead to abnormal valves and coronary vessels. Interestingly, previous studies have shown that altering the blood flow within the developing heart leads to a range of structural defects (e.g septation and cardiac valves abnormalities). However, the mechanisms by which altered blood flow causes structural defects within the heart is unknown. Therefore, an abnormal blood flow could underlie many congenital heart defects which currently have an unknown etiology. This study aims to provide insights into understanding how the embryonic heart, and specifically the epicardium, responds to altered altered blood flow. A range of cellular and molecular techniques will be used to understand the effect altering blood flow has phenotypically and functionally on the developing epicardium. In this way, a greater understanding of how abnormal blood flow can lead to congenital heart defects will be provided.