

THE ROLE OF NON-CODING GENOME IN THE REGULATION OF CARDIAC DISEASES AND DEVELOPMENT

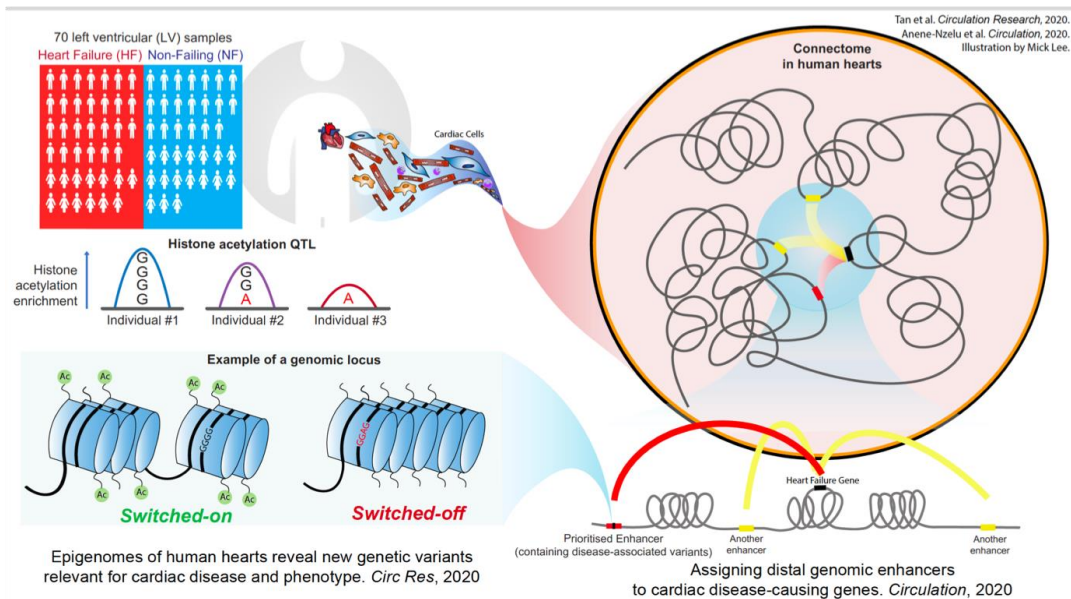


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Have you ever wondered why different cells from different organs in your body can carry out different functions even though they have the same DNA blueprint? That is largely because of the stretches of regulatory elements in the DNA, some of which are called “genomic enhancers”.

Genomic enhancers regulate genes, and can keep them turned on or off in different cell types and under different conditions, and therefore control the function of the cell through their gene expression signature. Enhancers cooperate with other proteins such as transcription factors to regulate gene expression. Some enhancers are active in all cells, while most are cell-type specific.

Like adroit maestros in orchestras who coordinate the performance and tempo of each instrument, enhancers are important for cellular and organismal function in response to external stimuli. DNA variations and mutations in enhancers can therefore make a critical difference to how enhancers control gene expression and cell function. Unsurprisingly, enhancers have also recently been used as a new approach for therapy.

In this review, we summarise benchmark studies that have mapped and elaborated the role of heart enhancers in disease and development. We highlight how enhancer-localised genetic variants offer a missing link to heart disease.

Moving forward, we are inspired to establish functional means of annotating genomic enhancers, and also to consider the next phase of devising enhancer-based gene therapy for cardiovascular disease.

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“Our paper reviews key published insights into how genomic enhancers play a role in heart development and disease. A deeper understanding of enhancers may offer new drugs for treating heart disease.”



Prof Roger Foo, Senior Group Leader,
Laboratory of Molecular Epigenomics & Chromatin Organisation,
GIS



“In this era of precision medicine, understanding the enhancer landscape will help us target specific pathways in different cells for disease treatment. Knowledge of cell-type specific enhancers will open new avenues for gene therapy.”

Prof Patrick Tan, Executive Director, GIS