Research Journal of Cardiology

OPEN ACCESS

News & Comments

Scientists Regenerate Heart Muscle Cells in Mice

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If the heart does not pump enough blood or oxygen throughout the body, then it is considered to be heart failure. US death certificates for 2018 showed 379,800 deaths or about 13.4% of all deaths. The most common cause of heart failure is the loss of cardiomyocytes, which occurs due to ageing, heart attacks, high blood pressure, and coronary artery disease. The heart can be irreparably damaged by these conditions. Despite being the standard treatment option for heart failure, heart transplants are not widely used due to limited donor hearts and rejection risk. In the meantime, long-term results have also not been achieved with lab-grown cardiomyocytes derived from pluripotent stem cells.

Following a heart attack, researchers have developed a new technique to repair and regenerate cardiomyocytes. "To restore the function of the heart, we have developed a pair of synthesized modified messenger RNAs (mRNA) that code for proteins that will restart the process of cell replication, thereby replacing dead heart cells with new, healthy ones," explained Robert Schwartz, one of the study's authors.

New heart cells are created by Serum Response Factor (SRF), a transcription factor protein. Cardiac-specific gene activity is determined by how it interacts with other cofactors. Cardiomyocyte proliferation and growth are also affected by YAP-5SA, a modified version of transcription factor YAP1. The researchers hypothesized that disrupting SRF-cofactor interactions could lead to cardiomyocyte dedifferentiation. According to these authors, this might complement YAP-5SA and allow cells to become cardiomyocytes from stem cells.

A mouse heart attack model was also treated with the experimental treatment in a separate study. They observed an increase in cardiomyocyte nuclei in the left ventricles of infarcted adult mice within a day of injection. Human heart disease may be treated with mRNA encoding Stemin and YAP-5SA combined, concluded the authors. Whether the approach will work in humans remains to be seen - and years of research will be required - but the research team is optimistic.

KEYWORDS

Cardiac regeneration, synthetic mRNA, heart delivery, serum response factor, SRF153(A3), hippo pathway, YAP, serum response factor, STEMIN, YAP5SA, heart disease, surgery, cardiovascular, Cardiology, parent cell, heart disease, stroke prevention