

New Method for Generation of Human Pacemaker Cardiomyocytes

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BACKGROUND

The heart consists of a multitude of diverse cardiomyocyte cell types, including atrial, ventricular and pacemaker cells, which cooperate to ensure proper cardiac function and circulation throughout the body. The rhythm of the heart beat is regulated by the sinoatrial node (SAN), functionally known as the cardiac pacemaker. Loss or dysfunction of these pacemaker cardiomyocytes leads to severe cardiac arrhythmias, syncope and/or even death. Although artificial pacemakers exist to help overcome these issues, several serious limitations and problems have emerged with this approach over the past several decades including **electrode** fracture or damage to **insulation**, **infection**, re-operations for **battery** exchange, and **venous thrombosis**. Moreover, size mismatch and the fact that pacemaker leads do not grow with children are a concerning problem. Thus, replacing artificial pacemakers with biological pacemakers potentially overcomes these artificial pacemaker issues including the expense and complications associated with device replacement, device or lead failure, and infection. To achieve these goals, understanding how pacemaker cardiomyocytes are generated is necessary to develop a human biological pacemaker for cardiac cellular therapies.

TECHNOLOGY DESCRIPTION

Researchers at UC San Diego have developed a new method for creating human cardiac pacemaker cells from human pluripotent stem cells (hPSC). This new methodology results in the generation of hPSC-pacemaker cardiomyocytes, which exhibit the ability to successfully pace human cardiac tissues, thus offering an exciting potential source of pacing human cardiomyocytes for biological pacemaker therapy.

APPLICATIONS

This method allows for the generation of human pacemaker cardiomyocytes and provides a potential supply of specialized pacing cardiomyocytes for future regenerative pacemaker therapy as well as cardiac disease modeling.

ADVANTAGES

Current methods employ BMP signaling molecules to generate human pluripotent stem cell (hPSC) pacemaker cardiomyocytes but this signaling is non-specific and can generate other hPSC cell types.

STATE OF DEVELOPMENT

Based on developmental principles that we uncovered from animal models, we have identified unique signaling molecules that when applied to human pluripotent stem cell derived cardiac precursors generates pacemaker cardiomyocytes. We have a working prototype and experimental data to support our claims.

INTELLECTUAL PROPERTY INFO

This technology is patent pending and available for licensing and/or research sponsorship.

PATENT STATUS

Patent Pending

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OTHER INFORMATION

KEYWORDS

human cardiac stem cells, human
pacemaker cardiomyocytes,
therapeutics, human pluripotent stem
cells (hPSC)

CATEGORIZED AS

- **Medical**
 - Disease: Cardiovascular and Circulatory System
 - Rehabilitation
 - Stem Cell

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