Gene and cell therapy for cardiac arrhythmias

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Technology description

Summary

Problem or Unmet Need:
Cardiac arrhythmia is one of the leading causes of sudden death in the US. Currently available anti-arrhythmic medications consist of small-molecule based drugs that target and modulate ion channel activity. These treatments suffer from issues related to uniform efficacy, potential to cause life-threatening ventricular arrhythmias (pro-arrhythmias), as well as toxicity. For example, many potassium-channel blockers induce conduction block by increasing the refractory period after an action potential, but also lengthen the action potential as well, predisposing the heart to pro-arrhythmia. In addition, current sodium-channel blockers increase mortality in patients with previous myocardial infarctions. Given these limitations associated with current treatment options, there is a tremendous clinical need for new methods to treat cardiac arrhythmias that focus on increasing cardiac conduction and terminating arrhythmia.
This technology consists of a novel method to treat cardiac arrhythmias by genetic modulation of cardiac electrical conduction. These gene constructs serve to increase cardiac conduction and restore electrophysiology by introducing sodium ion channels from the skeletal muscles to the post-infarcted heart tissue or by increasing coupling of gap junctions. These vectors have a range of therapeutic applications including gene delivery by viral transduction of recombinant ion channel or connexin gene constructs, gene delivery by viral transduction of small interfering RNA (siRNA) that modulate ion channel or connexin function, or delivery of transfected cells expressing ion channel or connexin channel subunits.

Application area

Treatment of cardiac arrhythmias
This technology could be used for direct treatment of various disorders including atrial fibrillation and flutter, long QT syndrome and supraventricular and ventricular tachycardias.
Research platform
These gene constructs could be used to further study arrhythmias and conduction disorders.

Advantages

Superior approach to current treatments as these constructs can increase cardiac conduction without predisposing heart to pro-arrhythmias.
More uniformly effective as they can be used to treat a wide range of disorders.
Returns the heart to a normal state of conduction, thereby minimizing toxicity.

Institution

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