Gene therapy with implanted LED device automatically corrects heart rhythm disorder

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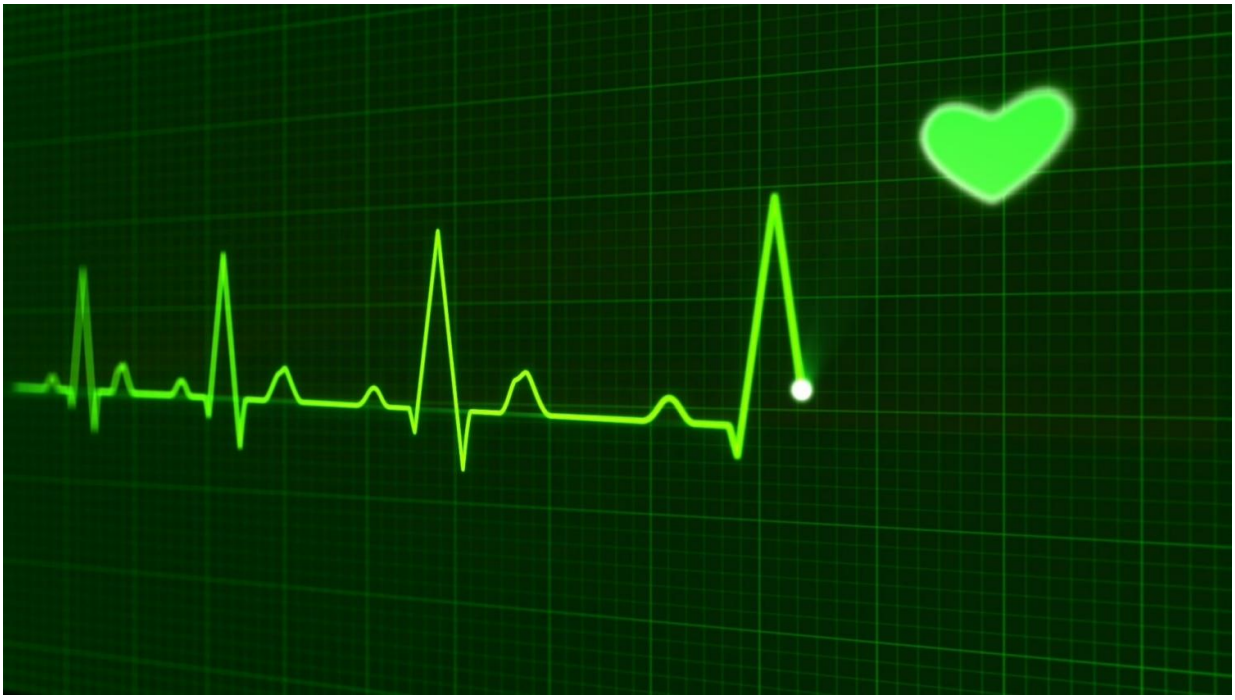

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Researchers at the Leiden University Medical Center (LUMC), in collaboration with Delft University of Technology, have found a way to reset a racing heart immediately and automatically with an implanted LED device. In the scientific journal *Science Translational Medicine*, they describe how their bioelectronic defibrillator works in the laboratory. It could be the first step towards a pain-free treatment for

patients with atrial fibrillation.

The system detects fast arrhythmias in the atrium of a rat's heart and sends a signal to an LED device placed near the heart. "The flash of light from this LED then causes the heart to generate an electric current itself to halt the arrhythmia. This is made possible by using gene therapy to introduce specific light-sensitive proteins into the heart. This restores the heart's normal rhythm immediately and automatically," says principal investigator Daniël Pijnappels of LUMC's Department of Cardiology.

According to the researchers, this could represent a great improvement on the current way of stopping atrial fibrillation. Atrial fibrillation is the most common heart rhythm disorder in clinical practice. The current treatment, known as cardioversion, is based on administering an electric shock to the heart, which has to be done in the hospital under general anaesthesia because of pain. For many patients, this is the only treatment to immediately stop atrial fibrillation, because drugs or an operation are ineffective.

Without electrical shock

Pijnappels says, "The bioelectronic defibrillator can stop atrial fibrillation without an electrical shock. In this way, the heart can be reset in a fully automated manner and at any time. We anticipate that this treatment for atrial fibrillation could improve both the patient's quality of life and their prognosis." The researchers emphasise that considerable research is still needed before a treatment can be arrived at that is suitable for patients. According to the researchers, however, it has now been demonstrated that the possibility exists.

More information: Emile C. A. Nyns et al. An automated hybrid bioelectronic system for autogenous restoration of sinus rhythm in atrial fibrillation, *Science Translational Medicine* (2019). DOI:

10.1126/scitranslmed.aau6447