

Scientists in Japan design first optical pacemaker for laboratory research

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The world's first optical pacemaker is described in an article published today in *Optics Express*, the Optical Society's open-access journal. A team of scientists at Osaka University in Japan show that powerful, but very short, laser pulses can help control the beating of heart muscle cells.

"If you put a large amount of laser power through these cells over a very short time period, you get a huge response," says Nicholas Smith, who led the research. The laser pulses cause the release of calcium ions within the cells, Smith explains, and this action forces the cells to contract.

This technique provides a tool for controlling heart muscle cells in the laboratory, a breakthrough that may help scientists better understand the mechanism of heart muscle contraction.

One potential application of this technology is in studying uncoordinated contractions in heart muscle. Normally, heart muscle contracts in a highly coordinated fashion, and this is what allows the heart to pump blood through the vasculature. But in some people, this coordinated beating breaks down, and the heart twitches irregularly—a condition known as fibrillation.

The new laser technique may allow scientists to create a form of fibrillation in the test tube. The lasers can destabilize the beating of the cells in laboratory experiments by introducing a beat frequency in one target cell distinct from the surrounding cells. This would allow scientists

to study irregular heart beats on a cellular level and screen anti-fibrillation drugs.

Outside the laboratory, exposing heart muscle cells to powerful laser pulses can have its drawbacks. Although the laser pulses last for less than a trillionth of a second, damaging effects can build up over time and this currently limits the possibility of clinical applications.

Source: Optical Society of America

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