Visualizing calcium “death waves” in heart cells

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Video Byte

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Abstract

Cell death is a hallmark of various abnormalities of the heart, including heart failure, heart attack, and ischemia. While the long-term effects of cell death in the heart have been described, the cellular processes that occur immediately after cell death remain poorly understood. Now, by tracking the movement of calcium ions, researchers are gaining a better idea of what happens right after individual heart cells die. Calcium ions regulate vital cell functions in mammals and therefore serve as a valuable signal of cellular activity and intercell connections. When zapping and killing a single heart muscle cell with a laser, researchers found that different types of surrounding cells responded differently. Nearby myocytes showed a slow and sustained uptick in calcium “sparks,” while distant myocytes were weakly or not affected. This activity was accompanied by mechanical damage in myocytes. Fibroblasts, however, showed rapid shock waves of calcium ion activity. Understanding the mechanisms that control these varying behaviors could help explain the immediate effects of cell death in the heart and help researchers find ways of counteracting these harmful effects.