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Fluorescent Green Stem Cells Regenerate Heart Muscles After Heart Attacks

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Two weeks after having heart attacks, 3 macaque monkeys received injections of a billion heart cells, derived from human embryonic stem cells, to repair their damaged muscle. About 40 percent of the damaged tissue was regenerated in the macaque's hearts using this technique, according to a study [published in the journal Nature](#).

Heart attacks do damage to the cells that make the heart beat, which are called cardiomyocytes. Damage to them makes it harder for the heart to pump blood throughout the body, which is why many people often remain on medication permanently after heart attacks. About [1 million people in the U.S.](#) have heart attacks each year.



English: A Crab-eating Macaque (*Macaca fascicularis*) Monkey eating peanuts. Pictured in Bangalore, India Français : Un Macaque crabier (*Macaca fascicularis*) mangeant des cacahuètes, Bangalore, Inde. (Photo credit: Wikipedia)

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breaks open in an artery, causing a blood clot to form. The clot, if large enough, can totally block blood from flowing through the heart's arteries. The muscle ordinarily fed by the blood flow through that artery begins to die. The dead muscles don't grow back — instead they are replaced by scar tissue, which makes it harder for the heart to pump blood. Heart attacks can lead to other serious conditions, like heart failure, arrhythmias, and death.

The hope of stem cell therapy is replacing the tissue damaged by the heart attack with new cells that could allow the heart to heal back to something like normal function. Today's study suggests that may be possible. The stem-cell derived heart muscle cells matured and began to beat along with the macaque heart cells, and after 3 months, they were fully integrated. The scientists were able to determine this by making sure the human stem cell-derived cells would express a fluorescent green protein, making them easier to spot. Not only were they relatively normal, new blood vessels had grown to feed the heart cells, the first time that's been seen.

There were some hiccups. First, all the monkeys required immunosuppressive therapy to prevent their bodies from rejecting the human cells. And ultrasound studies of the animals' hearts showed that the muscle's ability to pump blood improved in some but not all of the animals. But the most worrisome thing were episodes of irregular heartbeats that happened shortly after the stem cell injections. These disappeared after 2 to 3 weeks following the injection, as the stem cells matured.

But the technique, while used in only a few animals, may one day provide help for heart failure patients, the study authors wrote. Of course, more research needs to be done.