

# Induced pluripotent stem cells repair heart, study shows

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In a proof-of-concept study, Mayo Clinic investigators have demonstrated that induced pluripotent stem (iPS) cells can be used to treat heart disease. iPS cells are stem cells converted from adult cells. In this study, the researchers reprogrammed ordinary fibroblasts, cells that contribute to scars such as those resulting from a heart attack, converting them into stem cells that fix heart damage caused by infarction. The findings appear in the current online issue of the journal *Circulation*.

"This study establishes the real potential for using iPS cells in cardiac treatment," says Timothy Nelson, M.D., Ph.D., first author on the Mayo Clinic study. "Bioengineered fibroblasts acquired the capacity to repair and regenerate infarcted hearts."

This is the first application of iPS-based technology for heart disease therapy. Previously iPS cells have been used on only three other disease models: Parkinson's disease, sickle [cell anemia](#) and hemophilia A. The ultimate goal is to use iPS cells derived from patients to repair injury. Using a person's own cells in the process eliminates the risk of rejection and the need for anti-rejection drugs. One day this regenerative medicine strategy may alleviate the demand for [organ transplantation](#) limited by donor shortage, the researchers say.

"This iPS innovation lays the groundwork for translational applications," comments Andre Terzic, M.D., Ph.D., Mayo Clinic physician-scientist and senior author. "Through advances in nuclear reprogramming, we should be able to reverse the fate of adult cells and customize 'on demand' cardiovascular regenerative medicine."

## From Damage to Repair

The Mayo Clinic team genetically reprogrammed fibroblasts via a "stemness-related" human gene set to dedifferentiate into an iPS cell capable of

then redifferentiating into new heart muscle. When transplanted into damaged mouse hearts, iPS cells engrafted after two weeks, and after four weeks significantly contributed to improved structure and function of the damaged heart, in contrast to ineffective ordinary fibroblasts.

Compared to non-engineered fibroblasts, the iPS cells:

- Restored [heart muscle](#) performance lost after the heart attack
- Stopped progression of structural damage in the damaged heart
- Regenerated tissue at the site of heart damage

Source: Mayo Clinic ([news](#) : [web](#))

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