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Polymer "Band-Aid" for Heart

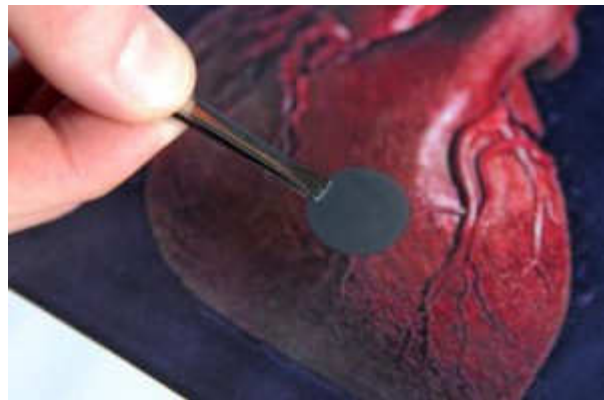
May 27, 2011 By [Rajendrani Mukhopadhyay](#) [Leave a Comment](#)

When you skin your knee, you can treat the injured area with a Band-Aid. Researchers have now come up with a special [polymer-based "Band-Aid"](#) for injured parts of the heart. The new medical device could provide cardiac surgeons a new way to treat heart attacks in the future.

The novel polymer-based medical device could potentially help millions of people in the future. According to the [American Heart Association](#), in 2009, about 785,000 Americans suffered a second heart attack linked to weakness caused by the scarred cardiac muscle from a previous heart attack. One-third of women and one-fifth of men who have had a heart attack will have a second one within six years.

Nerve cells in the heart's wall and a special class of cells, called cardiomyocytes, keep the heart beating by creating spontaneous expansions and contractions in perfect. But in a heart attack, parts of those cells die, which surgeons can't repair.

To figure out how to resuscitate the dead heart tissues, three researchers at [Brown University](#) and [India Institute of Technology Kanpur](#) exploited [nanotechnology](#). [Thomas Webster](#), [David Stout](#), and [Bikramjit Basu](#) created a patch made of nanoscale carbon fibers and a government-approved polymer.



Nanopatch for the heart restores damaged areas.

Tests showed the nanopatch regenerated the cardiomyocytes and neurons.

Physical sciences writer [Richard Lewis](#) explained on his blog:

What is unique about the experiments at Brown and at the India Institute of Technology Kanpur is the engineers employed carbon nanofibers, helical-shaped tubes with diameters between 60 and 200 nanometers. The carbon nanofibers work well because they are excellent conductors of electrons, performing the kind of electrical connections the heart relies upon for keeping a steady beat. The researchers stitched the nanofibers together using a poly lactic-co-glycolic acid polymer to form a mesh about 22 millimeters long and 15 microns thick and resembling 'a black Band Aid,' Stout said. They laid the mesh on a glass substrate to test whether cardiomyocytes would colonize the surface and grow more cells.

The nanopatch works because it is elastic and durable, thanks to the polymer. These properties allow it to expand and contract like heart tissue.

Next, the researchers will focus on perfecting the nanopatch so it mimics the electrical current of the heart more closely. They also want to make test-tube models to see how the material reacts to changes in heart's voltage and beats. The researchers also want to confirm that the cardiomyocytes that grow on the nanopatch have the same characteristics as other heart cells.

Source: "[Researchers create nanopatch for the heart](#)," Brown University, 05/19/11

Source: "[Poly\(lactic-co-glycolic acid\): Carbon nanofiber composites for myocardial tissue engineering applications](#)," *Acta Biomaterialia*, 05/03/11

Image courtesy of Frank Mullin, Brown University.

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