U. researcher is trying to regenerate dead heart muscle

By [Daphne Chen](http://www.deseretnews.com/author/23169/Daphne-Chen.html), Deseret News Published: Saturday, Sept. 19 2015 3:35 p.m. MDT

SALT LAKE CITY — In Amit Patel's lab, science resembles science fiction.

For decades, Patel and other researchers have tried to figure out how to regenerate dead heart muscle in patients who have had massive heart attacks.

"The doctors say, ‘We'll give you the beta blocker and the aspirin and the Lipitor and we can just hope to maintain you,’" Patel said. "But short of them getting worse or getting a heart transplant, there's not too many options."

Now he's leading trials on an experimental technology that might be able to repair scarred heart tissue and freeze — or even reverse — heart failure.

The procedure, in Phase 1 FDA clinical trial, goes as follows:

1. Mix the "extracellular matrix" powder — a mixture of proteins and molecules isolated from heart muscle — with saline or water.
2. Inject the mixture into the patient’s dead heart muscle via catheter.
3. Wait three to six months to see if the patient’s heart muscle regenerates.

If it sounds like a long shot, there’s a reason why Patel's clinic is nicknamed the Optimus Clinic.

"Heart disease is the most common cause of death in the world, and the most prominent problem is heart failure," said Tim Henry, the director of cardiology at the Cedars-Sinai Heart Institute. "Effectively, it's basically one of the biggest problems in the U.S."

But though it may sound like something out of "Frankenstein," Henry said the technology — inspired by stem cell research — is “within our reach."

"(Patel) is clearly one of the most experienced stem cell people in the country," Henry said.

Researchers have been bearing down on other avenues of research, like stem cell therapy and gene therapy, in a quest to stop the degeneration of heart function that happens after a massive heart attack.

Those are promising in many ways, but haven’t been much good at reviving completely dead scar tissue, said Patel.

He said endocardial matrix therapy would likely also be cheaper than either stem cells or gene therapy because it's an off-the-shelf product that can be widely produced and delivered in an easy clinical procedure.

But what exactly is "extracellular matrix" if it's not stem cells?

Every organ has its own unique matrix, Patel explained. It's everything but the cells — the elixir of nutritious proteins, minerals and other molecules that physically provide a scaffold for the cells, nerves and vessels to attach.

"A heart without scaffolding is just a bag of cells," said Patel.

The matrix also contains important molecules that signal cells to grow and develop.

Just like in the movies, the matrix is the entire environment within which the cells live and grow.

But, Patel said, “This matrix came first.”

The powder form of this matrix was developed by researchers at the University of California, San Diego. They [found a way](http://www.sandiegouniontribune.com/news/2012/feb/22/ucsd-creates-gel-repair-heart-tissue/) to remove heart muscle from pigs, wash away all of the cells and turn the resulting proteins into a powder. Patel and his team have also developed a version made from human heart muscle.

Hydrogels like VentriGel are flexible like natural tissue and are used in tissue engineering to mimic the molecular environment that cells are used to.

VentriGel has already been shown to successfully reduce scar tissue in rats and pigs. The next step is for the technology to pass human trials — and that’s where Patel’s lab comes in.