Health & Medicine

Mending Hearts

By
David J. Craig
|
Spring 2008

To understand how the heart works, scientists often conduct experiments on small pieces of heart tissue kept alive in petri dishes. Because these so-called heart patches are flat strips, not muscular chambers that pump fluid, scientists can learn only basic characteristics of heart tissues by studying them, such as how strongly the patches contract when stimulated by electricity.

Columbia researchers say they've invented something much better. Using heart cells from a baby rat, they've created in the lab tiny, three-dimensional hearts, each consisting of a single chamber. These hearts, less than one centimeter in diameter, can pump continuously for up to four weeks in test tubes filled with liquid nutrients. Each heart is connected to a tube through which it sucks liquid in and out of a reservoir; scientists monitor how strongly each heart pumps by adding or subtracting liquid from the reservoir, thereby altering the chamber pressure.

"The big advantage is that now we can examine the relationship between a heart's size and its contractile strength," says lead researcher Kevin Costa, a Columbia associate professor of biomedical engineering. "When a person suffers heart failure, his heart usually enlarges and changes shape. By controlling independently for heart size and strength, and observing how one affects the other, we'll learn a lot about heart function."

This kind of information could help physicians determine whether they should operate on a heart-attack victim to fix the size and geometry of his heart or give him drugs to increase the contractility of the heart cells, says Costa. He developed the miniature heart with Eun-Jung Lee '07SEAS, who earned her PhD in biomedical engineering at Columbia last year.

Costa can induce heart attacks in the miniature organs, too, by touching them with a piece of frozen metal. This damages one section of the heart, mimicking the localized cell death that occurs when a clogged artery blocks nutrients from entering one heart chamber. “Is there anything we can do to help this injured region of the heart heal so that it starts contracting again?” asks Costa. “We don’t know yet, but that would be a real silver bullet.”

Read more from ***David J. Craig***



Guide to school abbreviations

All categories >

Read more from ***David J. Craig***