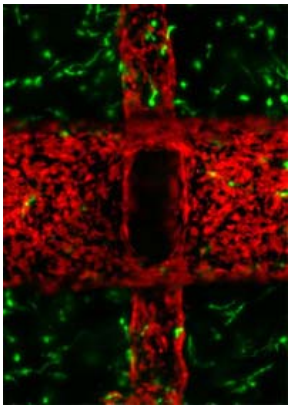
Science NOW UP TO THE MINUTE NEWS FROM SCIENCE

A Sweet Way to Grow Blood Vessels

by Tim Wogan on 1 July 2012, 1:20 PM | 1 Comment

Imagine a world where if your heart or kidneys failed, you wouldn't have to endure an agonizing, possibly futile wait for a donor whose organ your body might reject. Instead, a doctor would simply take cells from your own body and use them to "grow" you a new organ. One of the main obstacles to such tissue engineering has been producing the network of tiny blood vessels that keep newly growing natural tissue alive. But now a new technique, based on material used by the candy industry, may have brought a solution closer.

ENLARGE IMAGE



Special delivery. A microscope image shows engineered blood vessels (red) that keep cells (green) supplied with vital nutrients.

Credit: Jordan S. Millar

The technology of cell culture has advanced drastically in the past few decades to the point where it's now possible to culture skin in a laboratory and transplant it onto a patient. Engineered bladders are also now in clinical trials. But both skin and bladders are thin membranes which, if transplanted into the body, can be supplied with blood from pre-existing vessels. Growing a replacement version of a thick chunk of tissue like a heart or a kidney requires engineering a network of connected channels into the tissue to act as blood vessels. Without them, the cells on the inside would be starved of oxygen and nutrients and would quickly die.

Various research groups have tried to solve this problem. One avenue has involved casting molds of blood vessels, and then culturing tissue around them. The molds must then be dissolved so that the organ can function properly. Getting rid of the molds is hard to do, however, without killing the living tissue. If the mold were made of rubber, for example, a researcher would have to use a toxic solvent to dissolve it.

The new study solves that problem by turning to a material used by the food industry. As they report online today in *Nature Materials*, scientists at the University of Pennsylvania and colleagues have developed a water-soluble carbohydrate glass based on a decoration used on cakes and lollipops. The material can be cast into a variety of shapes, is completely nontoxic, and, when it has done its job, will dissolve naturally in the moist environment of the cells, leaving behind spaces that can carry blood to cells.

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To test the quality of the "blood vessels" produced, the researchers cultured a chunk of tissue made from rat liver cells using their technique. The cells at the center of the tissue stayed alive and functioning after the scaffold had dissolved, showing that the vessels were successfully carrying blood to the cells, says team member and bioengineer Christopher Chen.

The study is "a useful step in this effort to develop fully functional tissues with blood vessels," says chemical engineer Abraham Stroock of Cornell University, who also works on engineering blood vessels in tissue using different techniques.