

# Scientists develop 'cyborg engineering' for coronary bypass grafting

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A team of London scientists have taken a major step in making the use of artificial veins and arteries in coronary bypass grafts a reality. In a study published in the June 2008 print issue of *The FASEB Journal*, researchers describe how they developed this artificial graft tissue by combining man-made materials with human cells to make it elastic and durable and so it can attach to host tissue.

"Obviously this advance could be a medical breakthrough that saves millions of lives around the world," said Gerald Weissmann, M.D., Editor-in-Chief of *The FASEB Journal*, "but even more tantalizing is the successful fusing of living cells to nonliving substances that actually—heal—by forming a stronger bond to each other and to host tissue once put in use. This might even be called a start toward 'cyborg engineering.'"

In the research report, scientists describe how they took an elastic scaffold (the material that gives the artificial graft its shape) of compliant poly(carbonate-urea)urethane and incorporated human vascular smooth muscle cells and epithelial cells from umbilical cords. Then they took the artificial grafts and simulated blood flow in the laboratory to test their durability. They found that as the pulsing fluid flow slowly increased, the artificial graft's performance actually improved. The researchers hypothesize that this improvement is because the movement of fluid through the graft stimulates the smooth muscle and epithelial cells to release proteins that strengthen their ability to attachment to the elastic scaffold and other tissues.

"The notion that any body part could be engineered in a lab, attach to existing tissue 'naturally,' and grow stronger as it is being used is something thought completely impossible just 20 years ago," Weissmann added. "It is only a matter of time before human tissues can be engineered to be at least as good as the originals, and this study moves us toward that reality."

According to the National Institutes of Health, coronary artery bypass grafting is the most common open heart surgery in the United States, with 500,000 procedures performed each year. It is one of only a few surgical options to treat coronary artery disease, which is the leading cause of death in the United States. During this surgery, a healthy vein or artery from another part of the body is connected to the blocked coronary artery to route blood flow around a blocked passage.

Current procedures are limited, however, by the availability of healthy veins or arteries as well as the patient's ability to survive both aspects of the procedure. Furthermore, many patients experience significant pain in the area where the vein or artery was removed. Using artificial veins or arteries instead would reduce recovery time, reduce pain, and save lives by making this type of surgery more available to people who need it.

Source: Federation of American Societies for Experimental Biology

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