Research studies focus on using body's own cells to repair damaged discs

Dr. Karen Hasty

At some point in their lives, eight out of ten adult Americans will experience low back pain. In approximately one-third of those cases, the pain will be due to degeneration of the intervertebral disc, the tissue that separates the vertebra in the spine.

Surgical solutions can help relieve the pain and other symptoms of disc degeneration. Now Campbell Foundation-supported researchers are looking at solutions from a different angle.

Dr. Karen Hasty leads a research team that is studying ways to repair the disc itself, correcting the defect rather than treating the resulting problems. Dr. Hasty is the George Thomas Wilhelm Professor of Orthopaedics and chief researcher for the UT-Campbell Clinic Department of Orthopaedic Surgery.

The intervertebral disc consists of a central water-filled nucleus surrounded by a tough, fibrous ring of cartilage. Over time, the central nucleus can lose fluid, so the disc is less effective as a cushion between the vertebra.

"We are conducting several research projects in which we are growing intervertebral disc replacement tissue in culture in the lab," Dr. Hasty said. "We are looking at ways to repair the nucleus using collagen, plasma and other components that encourage regeneration."

Dr. Richard Smith, a basic scientist who is an Assistant Professor of Orthopaedic Surgery, is studying what happens when certain growth factors are inserted into a damaged disc. Dr. Hongsik Cho, a biomedical engineer in the Department of Orthopaedic Surgery at UT, has been engineering an intervertebral disc in the laboratory, experimenting with ways to culture the cells in order to make them proliferate and create the water-filled network needed.

> "The biologics approach encourages replacing human parts with natural parts instead of metal or substances." — Dr. Karen Hasty

"There could come a day when, if an MRI reveals degeneration in one of your discs, a surgeon could take some bone marrow from your hip, process that, add collagen, take some of your platelets, put them into the mix, inject that into your disc — and your disc will begin to regenerate itself," Hasty said.

When does Hasty expect that day to come?

"As always, the more resources that go into the research, the faster it will go," Hasty said.

Research Awards

The Alpha Omega Alpha Carolyn L. Kuckein Student Research Fellowship has been awarded to **David Holt,** a UT-Memphis medical student, in collaboration with Hongsik Cho, Ph.D., UT-Campbell Clinic Biomedical Engineer; Ray Gardocki, M.D., Campbell Clinic surgeon; and Karen Hasty, Ph.D, chief researcher for the UT-Campbell Clinic Department of Orthopaedic Surgery.

This prestigious national fellowship will support Holt in working with the Campbell research team to study the effects of platelet-rich plasma on halting the progressive degeneration of a damaged intervertebral disc. Human discs removed following disc herniation surgery will be incubated with platelet growth factors. "We would like to see an increase in collagen synthesis and a decrease in collagenase (enzyme) that breaks down collagen," Dr. Hasty said. The disc research is in line with the growing popularity of regenerative medicine, in which naturally-occurring substances are being used to encourage healing and repair.

Dr. Adam Fosnaugh

Dr. Adam Fosnaugh, Campbell Sports Medicine Fellow, is the 2008 winner of the Aircast Award for Basic Science for his cartilage research, in collaboration with Frederick Azar, M.D., Campbell orthopaedic surgeon, and UT-Campbell Clinic researchers Jinsong Huang, Ph.D.; Hongsik Cho, Ph.D.; Yongxing Liu, Ph.D.; Yunzhi Yang, Ph.D.; and Karen Hasty, Ph.D.

New cartilage for damaged knees was created by growing chondrocytes (the cells that produce and maintain joint cartilage) in culture and then implanting the cell construct mounted on a synthetic bone anchor into a cartilage defect. The engineered new cartilage tissue shows promising results for better stability with this anchor when implanted in cartilage defects in the knee in an experimental pig model.