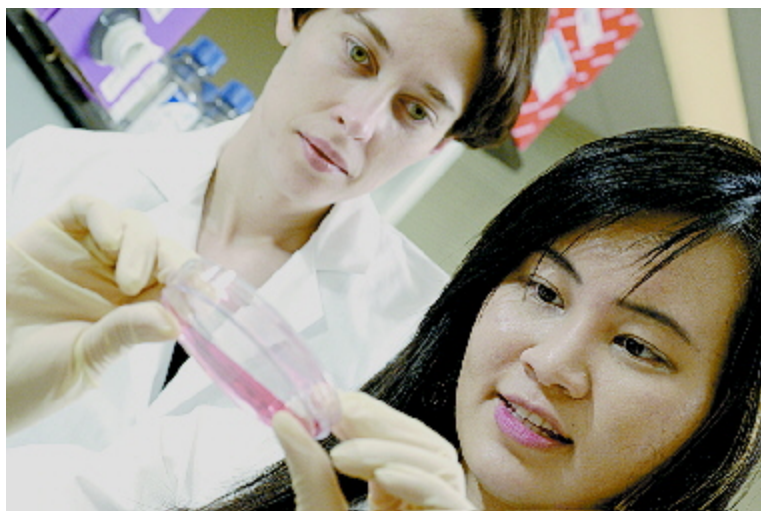


Finding a catalyst for cartilage creation

Using adult and embryonic stem cells from mice, **Thanissara Chansakul** is conducting important experiments in a project aimed at growing new cartilage to repair injured knees and other body parts. Chansakul, a junior [chemical and biomolecular engineering](#) major, is helping a research team led by Jennifer Elisseeff find out whether mixing the two types of stem cells with a particular growth medium will cause the cells to thrive, multiply and turn into the building blocks for cartilage.



Thanissara 'Noon' Chansakul, foreground, is working with Jennifer Elisseeff to find the right cells and proper medium to grow new cartilage to repair injuries.

PHOTO BY HPIS/WILL KIRK

Early test results have been encouraging. "This is a key step that moves our lab a little closer to its goal of growing new cartilage through tissue engineering," says Chansakul, who is known on campus by her nickname, Noon.

Chansakul, with doctoral student H. Janice Lee, presented preliminary findings last fall during a poster session at the annual meeting of the Biomedical Engineering Society. Continuing to work with Lee and supported by a PURA, Chansakul is now seeking to replicate the results for a paper that she and Lee will submit to a peer-reviewed scientific journal.

This is not the first time her strong science skills have put the 21-year-old from Bangkok, Thailand, in the spotlight. As a high school student in 2001, Chansakul received the highest score and a golden medal in the International Biology Olympiad, held in Brussels, Belgium, where she competed against 150 students from 38 nations.

That achievement led to a college scholarship from the government of Thailand. "I applied to a lot of schools," Chansakul says. "I came to visit Johns Hopkins, and I really liked the biomedical engineering program and research opportunities here."

After completing her freshman year at Johns Hopkins, she secured a summer job working alongside other undergraduates, graduate students and postdoctoral fellows in Elisseeff's lab. "I was really interested in tissue engineering," Chansakul says, "and I always wondered what we could do with stem cells. I was interested in their medical applications."

In her Homewood campus lab, Elisseeff, an assistant professor of biomedical engineering, is pioneering a method of repairing cartilage, the material found in knees, noses and other body parts, without major surgery. The idea is to place cells in a hydrogel, inject the liquid into the body and then harden it with ultraviolet light. Ideally, the gel will hold the cells in place while they multiply and replace damaged cartilage.

To attain this goal, Elisseeff's team needs to find the right cells and the proper medium to build new cartilage. One strategy is to coax stem cells to turn themselves into chondrocytes, the cells that make up cartilage. But stem cells do not always cooperate with this plan. Embryonic stem cells, derived from early embryos, have the ability to replicate indefinitely and differentiate into many cell types. Yet they do not always survive in the lab's hydrogels, and when they do survive, the researchers need to find the right biochemical medium to get them to form cartilage. In contrast, mesenchymal stem cells — adult stem cells that are more inclined to turn into cartilage — are not plentiful enough to complete the injury repair project on their own.

To overcome these drawbacks, Elisseeff's lab — believed to be the only one in the country to do so — is testing a mix of adult and embryonic stem cells, in an effort to generate new cartilage. Chansakul is conducting some of these experiments. "We're trying to find the best biological conditions to increase the survival rate of these cells and to get them to turn into the cells that make up cartilage," she says.

Elisseeff cautions that the mice cells in Chansakul's tests do not always behave exactly the way human cells do. Nevertheless, Elisseeff says, the experiments do yield useful information about the way embryonic and adult stem cells influence one another and how well they survive in the hydrogels.

The undergraduate research grants are helpful, Elisseeff says, because they allow students like Chansakul to gain important hands-on lab experience. "They're invaluable," the faculty member says. "My students who have gotten these awards are usually the real academic superstars."

— *Phil Sniderman*