

Using nanomaterials for tissue regeneration: Where academia meets commerce

October 18 2012, by Angela Herring

Thomas Webster, the new chair of the Department of Chemical Engineering, keeps a titanium hip implant on his desk. "If you look at bone or any natural tissue in the body, it's composed of nanomaterials," he said. "But if you look at what we're implanting today"—he pointed to the titanium hip—"it's not nano."

The synthetic materials used as replacement tissues today are typically composed of millimeter or micron sized particles. While [human cells](#) are on the micron scale, the materials they consist of, proteins included, are much smaller.

Webster's team has created implants for bone, vascular and neural settings using nanoparticles instead. "No matter what [tissue](#) we've looked at so far, we're able to increase [tissue growth](#) and make that implant last longer in the body than what the field is currently using," he said.

The explanation for their success is simple: they're creating an environment that is similar to what the cells are used to. "Cells recognize these nanomaterials as more friendly," Webster explained. "More like the tissues that they themselves created."

For one project, Webster's team is using highly conductive carbon nanotubes combined with an injectable, bio-compatible polymer to repair cardiac tissue after heart attacks. "Cardiomyocytes"—or [heart cells](#)—"will 'crawl' onto this heart patch faster," he said. "They will grow and they will beat faster than when other materials are used in this way."

The research team has also used nanomaterials to improve neural regeneration in [stroke patients](#), combining carbon nanotubes with [stem cells](#). Surprisingly, the nanotubes alone work better than stem cells alone, but the combination of the two works best of all.

Having taken his work to several start-up companies, Webster is a keen proponent of industry partnerships. As a chair, he hopes to explore collaborations between faculty and industry to a greater extent.

"We have this great experiential learning program here at Northeastern," he said. "We need to extend that into the research area."

Webster has already invited representatives of several commercial organizations to listen to faculty presentations of their research, and then brainstorm ways of improving collaboration through centers or spin-offs.

While the age-old standard has been to draw a line between academia and commerce, that model is rapidly changing. "I think we've got to make that line blurry because there's a lot that can be learned both ways," Webster said. "We need to help industry and industry needs to help us."

Provided by Northeastern University

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