GETTING **RID** OF THE **STENT**

Late one night several years ago in a shared office on the top floor of the Robert H. Lurie Medical Research Center on the Chicago campus, Guillermo Ameer and Melina Kibbe came up with a new idea for their research. Kibbe, associate professor of vascular surgery at the Feinberg School of Medicine, had spread out the different kinds of stents she uses in surgery; Ameer, associate professor of biomedical engineering at McCormick and of surgery at Feinberg, wanted to know why certain aspects of one or another are good or bad, what causes devices to fail, and how biomaterials could be more successful. After a long discussion the two came up with a radical idea: What if you got rid of the stent altogether?

That idea came after years of successful collaboration. Kibbe and Ameer began working together five years ago, when one of Ameer's postdoctoral fellows was searching for a researcher who could provide some much-needed assistance with animal models of vascular grafting and found Kibbe, who was just beginning her research program at Northwestern to improve upon current vascular grafts. "My lab was working on citric acid polymer materials and needed a partner to help test these materials in vivo," says Ameer. "Melina and I share a strong interest in cardiovascular work, so it just made sense to work together."

Their partnership developed quickly, and when Kibbe outgrew her research space downtown, an opportunity to share facilities at the Institute for Bionanotechnology in Medicine (IBNAM) on Northwestern's Chicago campus allowed the collaboration to go to the next level. (This opportunity was provided by Sam Stupp, director of IBNAM and Board of Trustees Professor of Materials Science and Engineering, Chemistry, and Medicine.) Kibbe's entire lab is based in IBNAM, and several members of Ameer's team are now there as well. Ameer and Kibbe share an office, facilitating close collaboration and the easy exchange of ideas.

"It can be challenging to work across two campuses, but it's important to have those connections," Ameer says. "The IBNAM space is great because it creates an ideal working environment for this type of collaborative research."

Working together in that space Ameer and Kibbe developed the unorthodox idea that they are pursuing today. They theorized that a liquid polymer could form to the contours of an artery to provide a custom-made stent. "Why couldn't we inject a polymer into an artery and cast it into the shape of a cylinder, like designer medicine?" Kibbe explains. And if that polymer were loaded with drugs that promoted healing, the stent could disperse them in a targeted area before degrading, leaving behind a healthy artery. After some discussion, the two decided that the idea had merit.

Ameer and Kibbe hope to develop nitric oxide–eluting materials for use in a biodegradable stent. Nitric oxide is naturally produced by the thin layer of endothelial cells that line arteries and provides a host of benefits key to cardiovascular health. For example, it inhibits the proliferation of the white blood cells, vascular smooth muscle cells, and platelets that can hinder the artery as it heals. In addition, nitric oxide promotes the survival and growth of more endothelial cells in the region. These all-important endothelial cells and the nitric oxide they produce are put at risk by the trauma of surgery. "Whenever you insert a balloon into an artery for angioplasty, the act of blowing it up and the trauma from surgery kill off the fragile single layer of endothelial cells," Kibbe says. "When you lose those cells, you lose your normal nitric oxide supply."

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After working on several small projects to make the case for further study, Ameer and Kibbe received a highly competitive challenge grant from the National Institutes of Health. The two-year grant provides them with the resources to develop their idea into a concept that could find its way to clinical trials. "It's my hope that I can eventually use techniques and devices that we've developed in the operating room," says Kibbe.

Ameer and Kibbe's partnership also includes a company they formed in 2008 to commercialize some of the work they were doing with citric acid–based biomaterials (see *McCormick* magazine, spring 2007) and nitric oxide. Since the launch of the company, Vesseltek, Ameer and Kibbe have won a Chicago Biomedical Consortium Business Plan competition and received small-business funding from both the National Science Foundation and the National Institutes of Health.

Even with the benefits of shared space, shared business, and innovative ideas, collaborations are only as strong as the participants. That match is where Ameer and Kibbe thrive. "It can be difficult to find collaborators outside your field who will approach a project with an open mind," Ameer explains. "Some people will shoot down a creative idea because it is so different from current techniques. It's important to develop some of these ideas enough to see the merit in them." —*Kyle Delaney*

Guillermo Ameer and Melina Kibbe share lab space in the Institute for Bionanotechnology in Medicine on Northwestern's Chicago campus. With support from the National Institutes of Health, the two are developing a biodegradable stent that forms inside the body to the contours of an artery. They hope the technology will elute drugs that promote healing during recovery, improving upon current options.