KU researcher developing synthetic patch to improve tracheal surgery

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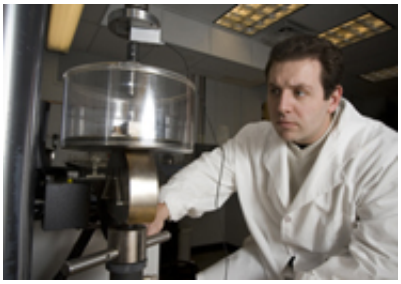

Michael Detamore

(Medical Xpress) -- Each year, thousands of newborns develop tracheal stenosis, a narrowing of the trachea that can make it difficult for them to breathe. While surgeons can fix this condition, the procedure requires reshaping the trachea and patching it with a piece of rib cartilage taken from the patient's torso, which adds a level of complexity to the process.

But a University of Kansas researcher is developing a synthetic patch that could replace rib cartilage in this procedure, resulting in easier, safer surgeries.

Michael Detamore, an associate professor of chemical and petroleum engineering and of bioengineering, has developed a patch made of polycaprolactone (PCL) – a biodegradable material used in various biomedical applications – that is proving to be a viable substitute for rib

cartilage in preliminary studies. In addition to eliminating the need to cut into a patient's rib cage, Detamore's synthetic patch is more flexible and easier to mold than cartilage, making it an all-around superior alternative.

"You always want to make surgeries easier and safer," Detamore said, "especially when dealing with newborns and infants. That's exactly what we're trying to do with this synthetic patch. It's an exciting technology."

Detamore isn't the only one excited by his new technology. In fact, his tracheal patch is one of only 31 breakthrough technologies to earn a coveted presentation slot at the University Research & Entrepreneurship Symposium, a showcase of the nation's most promising new university-based technologies for industry leaders, venture capitalists and entrepreneurs, April 18 in Cambridge, Mass. The symposium is designed to develop financial or industrial partnerships to advance new technologies into the marketplace.

To the casual observer, Detamore's tracheal patch seems similar to a patch you'd stich onto a shirt. It's thin and has a fibrous, clothlike feel to it. It comes in sheets that can be cut and folded to fit any sized incision on any sized trachea.

But here's where the science kicks in. Detamore's patch is made of PCL, a biodegradable polyester used in dissolvable stiches, root canal fillings and various drug delivery devices. The patch is airtight, resorbable and suturable, and its fibers are oriented in the same direction as the natural collagen fibers of the trachea. This means surgeons can simply cut the exact size and shape they need and suture it to the trachea. Then, in the weeks and months after surgery, the patch slowly resorbs as natural tracheal tissue expands to cover the incision.

"It's plug and play," Detamore said. "You cut the patch to fit the size and

shape of the patient's windpipe, you stitch it in place, and you're done. The key innovation here is that the patch has the mechanical integrity to keep the airway open while also being suturable and absorbable."

Detamore first began researching tracheal patches in 2006, when he was approached by Dr. Robert Weatherly, a surgeon and pediatric otolaryngologist at Children's Mercy Hospital in Kansas City, who was interested in developing a synthetic patch for his stenosis patients. Weatherly and Detamore quickly hit it off and began collaborating.

"This is a great example of a practicing surgeon identifying a real-world need for a specific technology and then seeking out KU expertise to help develop it," said Detamore, who heads the Biomaterials and Tissue Engineering Lab within the KU School of Engineering. "It's rewarding when you see a partnership like this that produces life-changing technologies, especially technologies that can help infants."

Next steps for Detamore include running larger trials, gathering data for Food and Drug Administration submissions and recruiting additional clinical collaborators. In terms of bringing his patch to market, he said a likely strategy would be to initially target the approximately 2,000 domestic pediatric stenosis patients who are candidates for surgery each year. Production of the patch could mean an annual market opportunity of nearly $40 million, according to some estimates.

In addition, the simplest version of his patch has no growth factors or biologics, resulting in a more straightforward regulatory approval process – which is enticing to investors, insurance companies and entrepreneurs who might be interested in his product.

"That's why it's so exciting and important for me to have been invited to present this technology at next month's University Research & Entrepreneurship Symposium," said Detamore, an emerging leader in his

field whose accolades include a National Science Foundation CAREER Award, a Faculty Fulbright Award and a Coulter Award for Translational Research. “The symposium will be a great forum for investors and industry leaders to evaluate this technology and determine how we can get it to patients as quickly as possible. That’s what this research is all about – improving our ability to help patients.”

Provided by University of Kansas