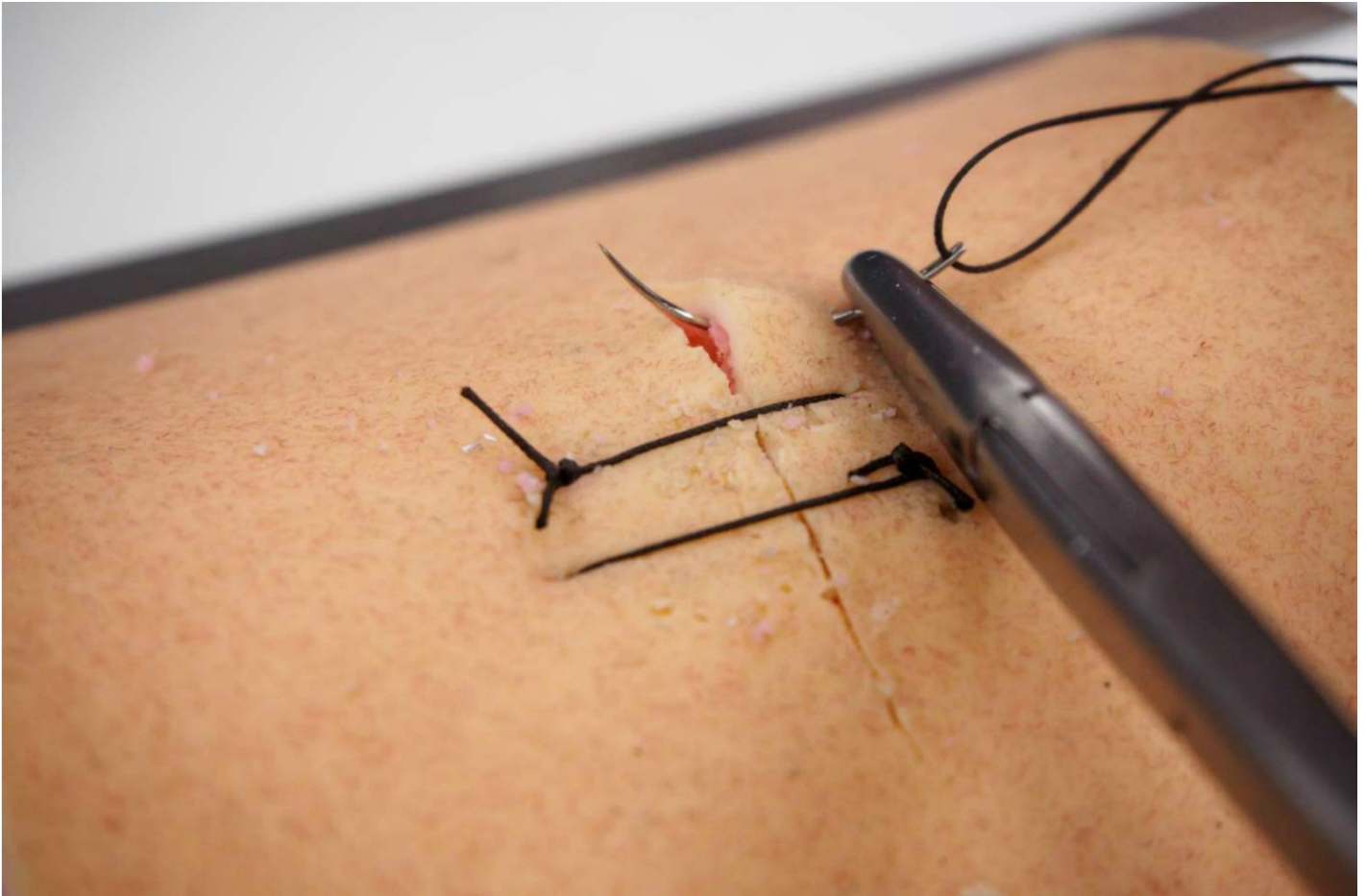


# Veterinary Surgeons Make Suture Training More Like The Real Thing

CSU Ventures Inc



The way doctors in training learn to stitch — or suture — a wound is one of the many contradictions of modern medicine: At many veterinary and medical schools, students still practice suturing techniques on orange peels, pig feet or fabric.

To improve that educational experience, surgeons at the [College of Veterinary Medicine and Biomedical Science at Colorado State University](#) (CSU) developed a multilayer silicone suture pad that mimics live tissue — and founded a company called [SurgiReal](#) to sell the product to medical training programs and their students.

“I think we’re making a difference in turning people out who are better at what they do and giving patients better care,” says inventor Dean Hendrickson, DVM, professor of surgery at CSU. “That makes it all worthwhile.”

## **Suturing 101**

Learning to make an incision and then sewing it up with a needle and suture material are fundamental skills taught to

doctors and various healthcare professionals during their training. Students are required to master various suturing techniques including symmetry in the depth and width of each stitch, knot-tying and deep-wound closure.

“As SurgiReal began looking for customers outside of veterinary schools, they learned that nurse practitioner and physician assistant students are trained to close superficial wound closures, a task that could be mastered using a three-layer suture pad.”

After nearly 15 years training veterinary students, Hendrickson was frustrated by the lack of materials available for students to practice suturing.

“Surgical labs didn’t have what I wanted to teach with,” he says. “We had been working with orange and banana peels and carpet pads, but I wanted something that handled more like a live animal and less like a peel.”

A quick review of the marketplace produced nothing that impressed Hendrickson.

“I couldn’t believe there wasn’t something out there,” he says. “Even med schools are using products that don’t mimic tissues well.”

“Students learn to suture with rudimentary, crude models,” concurs Steve Foster, director of licensing and business development at [CSU Ventures](#). “Then they go straight to a live animal. There’s no stepping stone.”

### **Simulating Real Skin**

To give students a better alternative, Hendrickson and another well-known animal surgeon at CSU, Fausto Bellezzo, DVM, researched materials and began experimenting with different silicone formulations, pouring the liquid rubber by layers into an 8 ½-by-11-inch mold.

“We ordered different silicones and just worked until we finally got one that felt like skin,” says Hendrickson.

Their first prototype, completed after about six months of trial and error, consisted of five layers of silicone — some embedded with fibers and fabrics — simulating the various layers of tissue in animal and human bodies: the outer epidermis, subcutaneous tissue, external fascia (fibrous connective tissue), muscle and internal fascia. To mimic animal fur or hair, they added a flocked texture to the outer layer.

According to Hendrickson, the suture pad is a better material because it more closely resembles and feels like animal and human tissue.

“Surgical training is muscle memory,” he says. “With the traditional training method, you’re learning and practicing a technique that’s unlike the real thing, which can lead to mistakes and trauma to the skin. Our technique is pretty close to live tissue.”

### **Like the Real Thing**

To make the silicone suture pad even more realistic, Bellezzo and Hendrickson embedded a closed circuit of vessels within the pad that could be connected to an IV bag of artificial blood to simulate the bleeding that occurs when live tissue is cut.

“We had students at CSU give it a try and their eyes got really big when they cut through a vessel and the pad started to bleed,” says Hendrickson. “They don’t have to pretend, it really is bleeding and they have to pay attention to it.”

With the help of Foster and CSU Ventures, two patent applications on the pads were filed in 2010.

“We didn’t know enough to go to the TTO, he had to find us,” says Hendrickson. “We had the classic academician mentality — you research, write it up, give it all away at a conference and move on to the next thing!”

When the surgeons did present their invention at an academic conference, other universities began asking for the suture pads — alerting Foster to a possible commercial opportunity.

“We started sending the pads out under single-use licenses,” he says. “We thought if there are universities out there that want to use them, there must be a market.”

With the help of Foster and an MBA class at CSU, which created a business plan and financials for the startup, Hendrickson and Bellezzo founded SurgiReal in 2011 and licensed the suture pad technology. In late 2012, they set up shop in 2,000 square feet of space in Fort Collins.

“I wish every inventor was as great to work with as they were,” says Foster. “Dean and Fausto were very responsive.”

In early 2013, Mitchel C. Willett was hired as the company’s chief operating officer, joining a full-time production manager and Bellezzo, who works part-time doing research and development.

“As a startup, SurgiReal was great because the product was defined, the IP [intellectual property] was under way and the doctors were available to help,” says Willett.

### **Stepped Approach to Learning**

SurgiReal’s line of suture pads follow a stepped-learning approach, beginning with a translucent suture pad that allows students to evaluate the quality of their stitches.

“I remember practicing suturing on pieces of fabric and then working on live tissue,” says Bellezzo of his own medical training. “It was a very different experience. I wish I would have had a step-by-step process for learning on real tissue versus an artificial process.”

Willett says the company’s suture pads offer several advantages over traditional practice materials, such as pig feet — the use of which is a messy process that requires gown and gloves and lab space.

“The beauty of our product is you can get up to 1,500 practice sutures on one pad versus a pig’s foot, which can only take about 30 stitches total,” says Willett. “The economics are compelling.”

To expand the company’s product line, which currently includes 40 different items, SurgiReal has taken advantage of customer feedback.

### **Customer Input**

“Customers started asking us, ‘Do you sell instruments? How about suture materials?’” says Willett.

Knowing that instructors don’t want students tethered to a laboratory, the company began marketing a portable kit complete with everything a student needs to practice suturing.

“The kit can be taken anywhere, from home to the kitchen table to the library,” adds Foster. “It can be thrown into a backpack and go anywhere for practice time.”

As SurgiReal began looking for customers outside of veterinary schools, they learned that nurse practitioner and physician assistant students are trained to close superficial wound closures, a task that could be mastered using a three-layer suture pad.

“That opened up the three-layer market,” says Willett.

SurgiReal’s offerings also include light and dark skin suture pads, as well as a pad with a mole to allow students to practice punch biopsy techniques — one of the company’s best-selling products.

“Thirty to 40 percent of the time a customer is introduced to our product either at a trade show or by getting a sample, they become a customer,” says Willett.

### **Increased Revenues**

As a result, SurgiReal’s sales of \$140,000 in 2013 doubled in 2014 — and in the last six months of 2014 the company was profitable. Royalty fees paid by SurgiReal to CSU have also steadily risen over the past two years, but Foster says the university always knew SurgiReal would be selling to a niche market.

“Our intention was that this could make a difference in training and teaching students to be better at what they do and alleviate the use of animals in teaching surgery, not revenue,” says Foster.

Although the technology transfer process was challenging, Hendrickson and Bellezzo recognize that the company offers the opportunity to help improve educational outcomes and ultimately, patient care.

“I wouldn’t hesitate to do it all again,” says Hendrickson. “Every now and again I go back into the mentality of giving it all away. But then I realize that are 87 programs using our suture pads that wouldn’t have found out about them at an academic meeting. Commercialization is a way to impact more people.”

Adds Bellezzo, “When I came into this I thought we were just going to do something to help students learn. I think that initial focus and the purity of that thought is what has driven us to where we are today. SurgiReal is slowly finding its place in the educational space.”

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