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Engineers Take Grant to Heart

■ Local Company to Develop Life-Saving Device for Infants

By Matt Dozier - *Staff Writer*

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LaunchPoint Technologies, a Goleta-based engineering firm, recently received a \$4.4 million grant to create the world's first internal heart-assist pump for infants.

LaunchPoint will share the five-year grant with a consortium made up of researchers, engineers and doctors from the University of Pittsburgh, Carnegie Mellon University, Children's Hospital of Pittsburgh and MedQuest Products, Inc. The grant was one of five awarded by the National Institutes of Health in an effort to spur the development of a heart pump that can meet the needs of children less than one year old.

"We applied for this over a year ago," LaunchPoint Chief Financial Officer Diana Hadjes said. "These grants are not given away easily, so we are very stoked to have gotten it."

LaunchPoint, which was created by Brad Paden, a professor of mechanical engineering at UCSB, his brother Dave Paden and their father, Alvin, was originally based in the garages of each of their houses. In 2001, the company opened a laboratory and machine shop in office space behind The Habit restaurant on Hollister Avenue.

Hadjes said LaunchPoint will be working on the technical side of the project, doing computer modeling of fluid flows within the pump and making physical prototypes of the device. The other members of the consortium will be contributing in areas ranging from maximizing the device's efficiency to testing it and perfecting it through clinical trials.

"Everyone has their piece of the project to focus on," Hadjes said.

Congenital heart disease strikes approximately 30,000 infants each year, Hadjes said, 5,000 to 6,000 of whom will die from the disease. Currently, the only treatment available for the disease is a device called an Extracorporeal Membrane Oxygenation system, which pulls blood out of the patient's heart and re-oxygenates it, warms it, then feeds it back into the body.

"They have one option right now, and it's terrible," Hadjes said. "The survival rate is extremely low, and it only works for a few weeks at most."



Paul Pan / Daily Nexus

The engineers of LaunchPoint Technologies, Inc., from left to right, Brad Paden, Jing Chun Wu, Dave Paden and Chen Chen, display their innovative heart pumps for infants (left) and adults. The Goleta company, founded by Brad, Dave and Alvin Paden, received a grant to continue research on an internal heart-assist pump for infants, the first to be developed.

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Hadjes said the oxygenation system is unreliable for infants, especially over long periods of time. She said the bulky external device must be hooked to an immobilized infant at all times during treatment, and is only really valuable as a temporary solution until a heart transplant can be performed. She said the National Institutes of Health decided that a more reliable, internal heart pump could dramatically increase the chances of survival for thousands of infants.

"There's just nothing out there," Hadjes said. "Until now, no one has really tried to develop a device like this."

Brad Paden said the company began designing heart pumps in 2001 when it set out to create a unit that incorporates principles of magnetic levitation into an adult-size pump.

He said the pump's impeller - the rotor-like section that physically pushes the blood through the unit, helping the patient's heart circulate blood throughout the body - is suspended by magnets, minimizing its contact with other surfaces within the pump.

He said this dramatically reduces wear and tear on the pump and makes its operating time an estimated five to 10 years, instead of the one-year life span of conventional heart pumps.

"I think that's one reason why we won the grant," Brad Paden said. "We're the leading group in the world in this application of the magnetic levitation technology."

An initial prototype of the infant heart pump has already been developed. Brad Paden said the design condenses the machinery of LaunchPoint's palm-sized adult heart pump into a unit roughly the diameter of a quarter.

He said the biggest problem facing the design team modifying the pump design to fit infants has been keeping the unit powerful enough to pump blood with such scaled-down components. On the other hand, he said, the blood of infants is much more sensitive than that of adults, and blood cell damage can occur if the pump is too forceful.

"Motors become a lot less efficient as we shrink them down," Brad Paden said. "There is also a large variety of defects that are associated with congenital heart disease, so we are trying to take that into account."

Although LaunchPoint's adult heart pump has already had considerable success in clinical trials, Hadjes said the new set of challenges means the development team will be back to square one once the infant unit enters the testing phase.

"Physiologically, babies are very different from adults," Hadjes said, "so they are starting from scratch on these tests."

Brad Paden said much work remains to be done before the infant heart pump will be ready for clinical testing, and it will be years before it goes on the market.

"An aggressive schedule would be to offer a device within 10 years," he said.

However, Brad Paden said the thought of the finished heart pump helping thousands of children makes all of the hard work seem worthwhile.

"It's easy to get motivated," he said. "It feels great to work on something that you know will make a difference. We're looking forward to the day we can meet the parents of the children this device helps and see the look on their faces."



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Brad E. Paden (left), co-founder of LaunchPoint Technologies, Inc., and his colleague Jing Chun Wu, senior mechanical engineer, explain the history of development and the mechanics of their heart-assist pumps.

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