CATEGORY: Spotlight

Proving a concept & leaping the 'valley of death'

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New UC grants will help move research out of the lab and to market.

An instrument to quickly detect traumatic brain injury, a vaccine to save unborn calves from a deadly bacteria and a technology to clean up grimy water are among research projects getting a boost from a new UC program. New grants will help move critical research out of the lab and into the market.

UC Riverside neurosurgeon and neuroscientist Devin Binder is a winner of a UC Proof of Concept grant.

A gap — some say a chasm — lies between many a research discovery and its application in the real world.

Scientists compete for federal research grants to treat disease, solve energy needs and boost agriculture production. Those grants may fund early-stage investigations, but research sometimes stalls or ends before an innovation is ripe for development by industry. A promising technology or treatment often gets stuck in the funding gap known in academia and industry as the "valley of death."

A new program aimed at bridging the gap has just been launched by the UC Office of the President. Called "Proof of Concept" grants, the funding supports researchers ready to take that big leap and demonstrate the potential value of a product for thousands, or even millions, of people. The new program aims to carry emerging technology and treatments over the valley to private industry's doorstep. It could be a classic win-win for researchers, the university, the public and the state's economy.

"Our UC faculty and researchers are leaders in invention, and it's central to the mission of our public university system to help ensure their innovations make a difference to society and the economy," said Steven Beckwith, UC vice president for research and graduate studies. "Helping bridge the gap from the lab to real life is a critical investment we can make not only on behalf of our leading innovators and UC, but for the benefit of California."

Thirteen projects were selected to receive from $100,000 to $250,000 each in the first round of the Proof of Concept (POC) funding. They range from innovations to clean polluted agricultural water to medical interventions for traumatic brain injuries. (For more information, see: list of grant winners, grant release)

Detecting brain damage soon after trauma

Devin K. Binder, a neurosurgeon and neuroscientist at UC Riverside, leads a team that has devised a new way for emergency brain trauma teams to quickly determine if an injury has caused brain swelling — a precursor to life-threatening complications that must be treated early to avoid serious brain damage.

The new strategy uses a number of instruments already approved for clinical treatment, but repurposed for this urgent task. His team has shown in mice that the combination of instruments can detect swelling about 20-30 minutes sooner than current instruments — a period that may translate into hours in human brains. With the POC grant, he plans to integrate the instruments into a single life-saving device.

Brain trauma can cause fluids to build up in the skull, resulting in increased pressure that squeezes blood from

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the brain. If a patient's brain is to swell, the threat will peak within the first 24 to 48 hours after the injury, says Binder, assistant professor and clinical professor of neurosurgery.

"It's in this period while the patient is in the ICU that complications can arise," he says. "The swelling can trigger a stroke or cause death. The longer it continues, the more risky are the procedures needed to save the patient."

If swelling is detected early, certain kinds of intravenous solutions can be injected to suck water out of the brain, but this triage strategy works for only a few hours and runs the risk of causing fluid and electrolyte disturbances in the blood and altering blood flow to other critical organs.

Removing part of the skull — as was done for Arizona congresswoman Gabrielle Giffords — is a last resort, Binder says. The procedure can be effective at reducing intracranial pressure but risks further swelling of the brain out of the opening in the skull, which can lead to further damage and strokes.

Binder's technique uses fiber optics placed near the surface of the brain, a procedure already perfected for other treatments. Light in the near-infrared part of the spectrum is beamed onto the surface of the brain, and the amount of light reflected back is measured in real time. Swollen tissue is more transparent to near-infrared light, and so reflects less light. This provides a safe way to measure the degree of swelling.

Binder expects the POC research support will allow him to complete work on a single device practical for use in the emergency room and/or ICU.

"We are really thrilled that the POC funds will enable the team to work on this full time to get this into clinical use," Binder says.

Saving calves

The new POC-funded projects range not only from the laboratory to the clinic, but the farms, too. A grant to a scientist at the UC Davis School of Veterinary Medicine offers the first realistic chance to prevent the annual loss of tens of thousands of calves in California's foothill ranches. The calves are victims of a pernicious tick-borne bacterial disease that infects pregnant cows. Though they show no initial signs of disease, the heifers abort their calves six to nine months into their pregnancy.

Known as epizootic bovine abortion, the disease has taken a toll on foothill cattle for more than 50 years, and it's an often-devastating loss to independent ranchers. Current costs to western U.S. cattle producers are estimated in the millions of dollars.

Six years ago Jeffrey Stott, a UC Davis professor of pathology, microbiology and immunology, and his colleagues discovered the bacterium that causes the disease. The microbe had been nearly impossible to identify because, like most bacteria, it can't be grown in the lab. Stott's team used DNA comparisons to distinguish the bacterium from bovine genes in diseased fetuses, and then devised a way to experimentally transmit the disease to immunodeficient mice. In a painstaking effort, the scientists then built up enough of the infectious agent to prove that it was this bacterium alone that caused the cattle to abort their fetuses.

The scientists have developed a vaccine designed to trigger an immune response to the bacterium that can make the cow resistant to infection and protect her developing fetus. The POC grant supports a project to establish the effectiveness of the candidate vaccine.

Stott expects that a successful demonstration will stir commercial interest in vaccine production. Development would otherwise likely stall, since drug makers are reluctant to carry out such drug discovery research themselves when the market for the potential drug is fairly small.

The POC grant comes at the perfect time, Stott says. "If we can establish that the vaccine will work as it has in our preliminary studies, we should be able to protect 100 percent of the heifers. That should get us over the hurdle of convincing drug companies of its potential."

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