How an interdisciplinary chef cooked up imaging technique

Adam de la Zerda developed a technique known as photoacoustic molecular imaging, which allows researchers to see cancerous tumors hiding under tissues.

By Elizabeth Devitt

When Adam de la Zerda commuted home from his postdoctoral chemistry work at UC-Berkeley, he often stopped at a French restaurant in San Mateo. But he didn’t join the other diners. Instead, he headed for the kitchen where he swapped his lab books for cookbooks and stood in as a sous chef.

“There’s a lot of chemistry in cooking,” said de la Zerda. His favorite culinary creation was quail eggs and caviar, with the eggs cooked “sous vide” style, a technique that vacuum-seals food in bags and then slow cooks the meal in water. In consultation with the chef, de la Zerda perfected the dish by calculating tissue deterioration rates to find the ideal incubation time.

Managing a spot as a sometime-sous chef isn’t anyone’s typical pastime, but it’s characteristic of the research expertise of Stanford faculty and technology work at UC-Berkeley, home from his postdoctoral scholar in pediatrics. The research was published online March 28 in the American Journal of Epidemiology.

The program aims to foster a new generation of Indian biomedical engineers and entrepreneurs, created the splint during his fellowship in the Stanford-India Biosign project, which calls for initial funding of $100 million.

Ambitious BRAIN initiative will draw on research expertise of Stanford faculty

By Bjorn Carey

President Barack Obama announced a bold research initiative April 2 aimed at developing new technologies and methods for understanding the human brain. Several Stanford scientists will play critical roles in the Brain Research through Advancing Innovative Neurotechnologies project, which calls for initial funding of $100 million.

“As humans we can identify galaxies light-years away,” Obama said at a White House ceremony. “We can study particles smaller than an atom, but we still haven’t unlocked the mystery of the three pounds of matter that sits between our ears.”

The challenge of filling this knowledge gap is significant: The BRAIN initiative has the incredibly ambitious task of mapping the brain’s roughly 100 billion neurons and the trillions of connections between them and then determining how signals pass between these neural circuits and how that process is controlled.

The process could create jobs — Obama noted that every dollar invested in the Human Genome Project returned $340 — and could eventually lead to treatments for Parkinson’s and Alzheimer’s diseases, autism, and the deleterious effects of strokes and many other neurological conditions.

“There was a lot of excitement at the White House this morning,” said William Newsome, a Professor of Neurology, Neurosurgery, and Ophthalmology. Newsome will co-chair the initiative’s advisory committee.

Stanford-India team licenses design to make $5 splint for trauma victims

By Kris Newby

India has the highest number of traffic accidents in the world, many of which result in serious injuries due to the logjams of pedestrians, cyclists and motorists sharing the roads with cars.

Recently, two Stanford University bio design fellows — Darshan Nayak, a physician, and Pulin Raje, a product designer — licensed a low-cost, disposable leg splint that promises to reduce the harm caused by these collisions by immobilizing injured legs while patients are transported to trauma centers. The licensee, HLL LifeCare Limited, is a government-owned Indian manufacturing company that distributes medical products such as condoms, sutures and contraceptive pills to India’s growing population of 1 billion-plus.

Stanford has waived royalty rights for the leg splint through its Socially Responsible Licensing Program. Nayak, a physician trained at India’s Grant Medical College, and Raje, a mechanical engineer and designer from the Indian Institute of Science, created the splint during their fellowships in the Stanford-India Biosign project, a partnership between Stanford, the Indian government, the All India Institute of Medical Sciences and the Indian Institute of Technology in Delhi.

The program aims to foster a new generation of Indian biomedical technology.

Traffic pollutants linked to higher risk for birth defects, study finds

By Erin Digitale

Breathing traffic pollution in early pregnancy is linked to a higher risk for certain serious birth defects, according to new research from the School of Medicine.

The finding comes from a study examining air quality and birth-defect data for women living in California’s San Joaquin Valley, one of the smoggiest regions of the country. “We found an association between traffic and birth-defect data for women living in California,” said the study’s lead author, Amy Padula, PhD, professor of neonatal and developmental medicine.

Epidemiology published online March 28 in the American Journal of Epidemiology.

The scientists studied 806 women.
Biological transistor enables computing within living cells

By Andrew Myers

When Charles Babcock prototyped the first computing machine in the 19th century, he imagined using mechanical gears and latches to control information. ENIAC, the first modern computer, developed in the 1940s, used vacuum tubes and electricity. Today, computers use transistors made from highly engineered semiconductor materials to carry out their logical operations.

And now a team of Stanford bioengineers has taken computing beyond mechanics and electronics into the living realm of biology. In a paper published March 28 in Science, the team details a biological transistor made from genetic material — DNA and RNA — in place of gears or electrons. The team calls its biological transistor the “transcriptor.”

“Transcriptors are the key component behind amplifying genetic logic,” said Endy. “It’s akin to the transistor electronics,” said Jerome Bonnet, PhD, a postdoctoral scholar in bioengineering and the paper’s lead author.

The creation of the transcriptor allows engineers to compute inside living cells to record, for instance, when cells have been exposed to certain external stimuli or environmental factors, or even to turn on and off cell reproduction as needed.

“Biological computers can be used to study and reprogram living systems, monitor environments and improve treatments for diseases,” said Drew Endy, PhD, assistant professor of bioengineering and the paper’s senior author.

The biological computer

In electronics, a transistor controls the flow of electrons along a circuit. Similarly, in a biological setting, the possibilities for logic are as limitless as in electronics, Bonnet explained. “You can test whether a given cell had been exposed to a number of external stimuli — the presence of glucose and caffeine, for instance. If the cell has been exposed, you could make that determination and to store that information so you could easily identify those which had been exposed.”

By the same token, you could tell the cell to start or stop reproducing if certain factors were present. And, by coupling BIL gates with the team’s biological logic gates, it is possible to communicate genetic information from cell to cell to orchestrate the behavior of a group of cells.

“The potential applications are limited only by the imagination of the researcher,” said co-author Monica Ortiz, a PhD candidate in bioengineering who demonstrated automated cell-to-cell communication of DNA encoding various BIL gates.

Building a transistor

To create transcriptors and logic gates, the team used carefully calibrated combinations of enzymes — the in- gredients mentioned earlier — that control the flow of RNA polymerase along strands of DNA. If the flow of electrons, DNA is the wire and RNA polymerase is the electron.

“The choice of enzymes is important,” Bonnet said. “We have been careful to select enzymes that function in bacteria, fungi, plants and animals, so that bio-computing can be engineered in a variety of organisms.”

On the technical side, the transcriptor achieves a key similarity between the biological transistor and its semi- conducting cousin: signal amplification.

With transcriptors, a very small change in the expression of an integrase can create a very large change in the expression of any two other genes.

To understand the importance of amplification, consider that the transistor was first conceived as a way to replace expensive, inefficient and unreliable vacuum tubes with a single transistor. Over the next two decades, the number of transistors doubled every 18 months. Today, a single cell can contain billions of transistors.

“Most of biotechnology has not yet been imagined, let alone made true. By freely sharing key ‘biological transistors’ with other investigators, we believe that everyone can work better together,” Bonnet said.

The research was funded by the National Science Foundation and the Townsend Lamarre Foundation. Stanford’s Department of Bioengineering also supported the work. Andrew Myers is the associate director of communications for the School of Engineering.

Brain

continued from page 1

Newcombe, PhD, a professor of neurobiology at the School of Medicine and one of the co-leaders of the BRAIN working group. “This is the right time for a federal initiative like this, because there are new technologies that are changing the face of neuroscience in fundamental ways. We’re able to make measurements of brain activity on a wide scale that has never been imagined before. Some of those key technologies have been invented, but they are the great opportunity for the next five to eight years.

“The prospects for scaling up these technologies even further are very bright if we can get the right teams of interdisciplinary people working together, and BRAIN aims to do exactly that,” Newcombe said.

“We believe that neuroscience offers potential for our greatest future scientific breakthroughs, and this investment will bring focused national attention to research and development in a field that could be transformative for both human health and the economy,” said Stanford President John Hennessey.

Inside Stanford Medicine is published monthly in July and December and semi-monthly the rest of the year.

Paul Costello
Chief communications officer

Susan Ipakchian
Director of print & Web communications

John Stanford
Editor

Robin Weiss
Senior editor

Send letters, comments and story ideas to John Stanford at 723-8309 or at johnstanford@stanford.edu. Please contact him to receive an e-mail version of Inside Stanford Medicine.

Kad Deisseroth, MD, PhD, a professor of bioengineering and of psychiatry and behavioral sciences, invented optogenetics, a technique involving gene therapy and lasers that allows scientists to control how neurons fire in live animals and indicates how those neurons affect behavior.

Deisseroth was also one of the 13 scientists to propose the initiative, then referred to as the Brain Activity Map, in March in Science.

“I was heartened to see today, at the White House, that the BRAIN initiative announcement acknowledged the importance of fundamental research for the progress of science and medicine,” Deisseroth said.

“This is a key point that I have long worked hard to make, and is particularly true in the study of the brain. The complexities and mysteries that await us in studying neuroscience are so profound that we need to encourage the development of new technologies that will help us reduce the burden of brain disease in the human population and ease suffering.”

Byron Carey is a science writer for the Stanford News Service.

APRIL 8, 2013 INSIDE STANFORD MEDICINE
Priya Singh will become an associate dean and the chief of staff at the School of Medicine on April 15, Dean Lloyd Minor, MD, has announced.

Singh comes from Stanford’s Graduate School of Business, where she spent the last decade. Most recently, she served as the school’s associate dean for Global Engagement Programs, establishing a new department for global innovation and entrepreneurship programs. The program will begin initially in Bangalore and Paris, where she developed a key collaboration with the Ecole Polytechnique.

“Many institutions jumped on board to try it. A lot of them didn’t have the edge institutions had,” she said, referring to Stanford’s Office of Executive Education, where she led the creation of the Stanford Executive Program for senior executives in global companies, government agencies and nonprofits.

“During her more than 10 years at the Stanford, GSB, Priya has demonstrated her unique ability to convene faculty leaders around strategic initiatives and to move those initiatives forward,” Minor said.

“She has extensive knowledge of the academic environment and strong interpersonal and listening skills. Personally, I have found Priya to be a very genuine and enthusiastic person, and I am confident she will be an outstanding addition to our school, particularly during this busy time as we launch the second phase of the Campaign for Stanford Medicine.”

“In her new role, Singh will counsel and support the dean in developing and implementing strategies to advance the school’s mission as a national leader in academic medicine. She will track progress on initiatives, establish new policies and practices and prepare for meetings and events. She will also work collaboratively with the dean in developing key leadership and broad initiatives.”

Education in India, Singh worked in private industry as a marketing professional for 12 years before joining Stanford in 2002. She held marketing management roles at Oracle Corp. in Redwood City, clothing manufacturer Levi Strauss & Co. in San Francisco, and Condé Nast, a service that connects consumers to quality local businesses.

**Thanks to risky heart repair technique and surgeon’s skill, woman is now ‘living to live’ instead of fighting to survive**

*By Julie Greicius*

In September 2012, 24-year-old Brooke Stone had her second lifesaving heart surgery, this time at Lucile Packard Children’s Hospital. When people asked her why she had surgery, she gave them her simplest answer: she can: “I tell them I was born with my heart attached backwards.”

As a newborn in 1988, Stone was diagnosed with a condition known as transposition of the great arteries, and underwent a complex surgery at UCSF to correct her blood flow. In TGA, the two main arteries that come out of the heart’s main pumping chamber and carry oxygen-rich blood to the body’s lungs, would eventually fail.

“Many surgeons were discouraged by the procedure’s results, so they abandoned it.”

Today, Hanley may be the only surgeon in the United States doing the procedure. A careful process of multiyear monitoring, patient selection and rigorous evaluation is key to his successful approach. Over the past 15 years, as the criteria for selection and the procedure have evolved, the survival rate for Hanley’s patients has grown to exceed 90 percent. So far, he has managed 30 patients with a failing Mustard/Senning procedure, and estimates that thousands more in the United States may still need lifesaving intervention of some kind.

Congenital heart disease is the most common birth defect, killing more kids than all childhood cancers combined. “Many children with congenital heart disease don’t recognize that their kids need lifelong cardiac care,” said Susan Fernandes, program director of the Adult Congenital Heart Program at Stanford. “And it is estimated that more than 50 percent of adults with congenital heart disease are not receiving specialized care for heart problems.”

Cardiac damage is especially important because, as Stone experienced, the heart of a person with congenital heart disease may be weakening and experiencing potentially lethal rhythms without any outward signs or symptoms. Describing the summer of 2012, when Stone’s arrhythmia was first discovered, she said, “I felt the best I’ve ever felt in my whole life.”

“Today, Hanley may be the only surgeon in the United States doing the procedure. A careful process of multiyear monitoring, patient selection and rigorous evaluation is key to his successful approach. Over the past 15 years, as the criteria for selection and the procedure have evolved, the survival rate for Hanley’s patients has grown to exceed 90 percent. So far, he has managed 30 patients with a failing Mustard/Senning procedure, and estimates that thousands more in the United States may still need lifesaving intervention of some kind.”

**Nobel laureate Brian Kobilka will speak at medical school’s commencement**

By Julie Greicius

In her new role, Singh will counsel and support the dean in developing and implementing strategies to advance the school’s mission as a national leader in academic medicine. She will track progress on initiatives, establish new policies and practices and prepare for meetings and events. She will also work collaboratively with the dean in developing key leadership and broad initiatives. I feel so fortunate to join the School of Medicine,” Singh said. “I truly value relationships and enjoy challenges — and I’m a perpetual optimist.”

Educated in India, Singh worked in private industry as a marketing professional for 12 years before joining Stanford in 2002. She held marketing management roles at Oracle Corp. in Redwood City, clothing manufacturer Levi Strauss & Co. in San Francisco, and Condé Nast, a service that connects consumers to quality local businesses.

“During her more than 10 years at the Stanford, GSB, Priya has demonstrated her unique ability to convene faculty leaders around strategic initiatives and to move those initiatives forward,” Minor said.

“She has extensive knowledge of the academic environment and strong interpersonal and listening skills. Personally, I have found Priya to be a very genuine and enthusiastic person, and I am confident she will be an outstanding addition to our school, particularly during this busy time as we launch the second phase of the Campaign for Stanford Medicine.”

In her new role, Singh will counsel and support the dean in developing and implementing strategies to advance the school’s mission as a national leader in academic medicine. She will track progress on initiatives, establish new policies and practices and prepare for meetings and events. She will also work collaboratively with the dean in developing key leadership and broad initiatives. I feel so fortunate to join the School of Medicine,” Singh said. “I truly value relationships and enjoy challenges — and I’m a perpetual optimist.”

Educated in India, Singh worked in private industry as a marketing professional for 12 years before joining Stanford in 2002. She held marketing management roles at Oracle Corp. in Redwood City, clothing manufacturer Levi Strauss & Co. in San Francisco, and Condé Nast, a service that connects consumers to quality local businesses.

“During her more than 10 years at the Stanford, GSB, Priya has demonstrated her unique ability to convene faculty leaders around strategic initiatives and to move those initiatives forward,” Minor said.

“She has extensive knowledge of the academic environment and strong interpersonal and listening skills. Personally, I have found Priya to be a very genuine and enthusiastic person, and I am confident she will be an outstanding addition to our school, particularly during this busy time as we launch the second phase of the Campaign for Stanford Medicine.”

In her new role, Singh will counsel and support the dean in developing and implementing strategies to advance the school’s mission as a national leader in academic medicine. She will track progress on initiatives, establish new policies and practices and prepare for meetings and events. She will also work collaboratively with the dean in developing key leadership and broad initiatives. I feel so fortunate to join the School of Medicine,” Singh said. “I truly value relationships and enjoy challenges — and I’m a perpetual optimist.”

Educated in India, Singh worked in private industry as a marketing professional for 12 years before joining Stanford in 2002. She held marketing management roles at Oracle Corp. in Redwood City, clothing manufacturer Levi Strauss & Co. in San Francisco, and Condé Nast, a service that connects consumers to quality local businesses.
of de la Zerda. The 28-year-old faculty member, recently appointed an assistant professor in the Department of Structural Biology, has a passion for interdisciplinary pursuits.

Originally from Israel, de la Zerda was "dead set" on getting his degree in theoretical quantum physics when he applied for graduate school in electrical engineering at Stanford. That was the logical next step after an undergraduate focus on computer engineering and physics. But, when he saw an engineering friend choose an adviser from the Music Department, de la Zerda suddenly appreciated he was at a university that didn't dwell on departmental divisions. "When I realized that, I thought: 'What else can I do?'"

Spurred by the loss of a good friend to cancer, de la Zerda wanted to improve treatment strategies. He knew one big problem was the lag time in current imaging technology — often two to three months — between starting chemotherapy and finding out whether a tumor was shrinking. Before tumors visibly change, there's molecular activity going on; proteins are being shut down and other abnormal activities occur that could show whether the tumor was responding to treatment. "If we could only see those molecular activities, doctors could quickly tell which patients are not responding and prescribe a different treatment," he said.

To explore new solutions, de la Zerda joined the lab of Sam Gambhir, MD, PhD, professor and chair of radiology and director of the Molecular Imaging Program at Stanford. There, he developed and patented a technology named photoacoustic molecular imaging under the guidance of Gambhir and in collaboration with Pierre Khuri-Yakub, PhD, professor of electrical engineering. This new technique uses nanoparticle agents to convert light waves into ultrasound waves, and then generates more informative images than methods such as computed tomography or magnetic resonance imaging. With nanoparticles targeted at biomarkers in a tumor, those images can show specific molecular activity in the tissue.

The unique advantage of photoacoustic molecular imaging is that it allows scientists to see tumors hiding under other tissues and structures. It can also outline tumor boundary and vessels that surgery, which helps surgeons see what to cut out and what to leave in — avoiding mistakes either side of the wound. "It's like seeing Superman vision," said de la Zerda.

"There may be a million different things we can do with this," he added. A study based on this biomolecular imaging work can monitor the treatment of cancer patients. We can even apply this technology to tests other than cancer.

It turns out this technique is particularly useful in diseases such as age-related macular degeneration, an eye disease in which the central field of vision is lost. It's hard to detect early changes to the health of light-sensing cells at the back of the eye. But, with co-investigator Mark Blumenkranz, MD, professor and chair of ophthalmology, de la Zerda refined the photoacoustic imaging. He designed a way to look at growth of new blood vessels under the retina, a hallmark of the "wet" form of the disease, without touching the inside of the eye. This preliminary study led to a Bio-X program seed grant as part of its Interdisciplinary Initiative Program.

The potential of de la Zerda's work attracted the attention of faculty in the Department of Structural Biology. "Adam has a combination of mind and personality — obvious energy that stands out," said Roger Kornberg, PhD, a professor of structural biology and a Nobel laureate in chemistry, who was one of the department members who unanimously decided to appoint de la Zerda to its faculty.

Imaging has captivated de la Zerda since early grade school; an aunt gave him a small microscope. "I remember it like it was yesterday," he said of the early foray into science. "I collected dead bees under the microscope lens. I could see they were made of amazing and beautiful structures. My dad would explain how structure correlated to their function; how all the angles of their eyes helped them see. I would see things that I can see just by looking with my own eyes, and that fascinated me."

Although he's made his first marks with cancer, de la Zerda said his engineer at heart: "For me, it's important that someone can use the tools I'm building. If no one ends up using them, I might as well have never built them."

The satisfaction of turning his ideas into an entity that could help someone also lured him into the arena of Silicon Valley startups. With a modest seed investment, he co-founded OcuBell, a company dedicated to improvingophthalmic imaging options.

But it's not just building tools that interest de la Zerda; he also wants to help others bridge the gap between engineer- ing and medicine. "I want electrical engi- neers and materials scientists to know they can tackle some of the most important problems in biology and medicine," he said. So, he created a graduate-level class — "Bio-chips, Imaging and Nano- medicine" — in collaboration with Shan Wang, PhD, professor of electrical engineering, and of materials science and engineering, and Demir Akin, DVM, PhD, deputy director of the Center for Cancer Nanotechnology Excellence, to provide engineering students with foundations in human biology and medical diagnostics.

The first class was a hit, attracting more than 100 students. Now in its third year, the course has almost 90 students enrolled.

"It wasn't my blue eyes that brought students to class," de la Zerda said. "They came because they were honestly curious for how their engineering background could be applied to biology and medicine."

"Stanford is a very unique place as people do not classify you only for your accomplishments, but also for where you go next," he said. "It's a mission to tell other students to reach beyond what they think they know, they added. "I want them to know the sky's the limit here."

Although he's only been on the Stanford faculty since August, de la Zerda's wide-ranging efforts have garnered numerous awards. Most recently, he was listed in Forbes magazine "30 under 30" in science and health care and received the Dale F. Frey Award from the Damon Runyon Cancer Research Foundation, as well as the Director's Early Independence Award from the National Institutes of Health.

While he appreciates the accolades and attention such honors bring to his work, de la Zerda prefers to talk about the encouraging environment at Stanford. "Here, all things are possible," he said.

Elizabeth Devitt is a former science-writing intern in the medical school's Office of Communication & Public Affairs.
**Hospital opens new training room for safe patient handling**

By Sara Wykes

A new simulation-training space for safe patient handling techniques has opened at the School of Medicine’s Goodman Simulation Center, just steps away from Stanford Hospital & Clinics.

It’s the first for the hospital and reflects a growing industry-wide acceptance of two important concepts innovators. Typically, the first part of the fellowship is spent at Stanford training with the U.S.-based biodesign fellows, and the remainder is spent in India, working with an interdisciplinary team to identify clinical needs in that country. The low-cost leg immobilization splint was developed after Nayak, Raje and two other fellows from India spent six months learning the biodesign innovation process at Stanford, followed by three months working with another interdisciplinary team to identify urgent medical needs. Last month, MIT Technology Review India honored Nayak as a “Top Innovator Under 35 in India” for this invention, which editors said, “has enormous potential in India and other emerging markets.” The splint, called Relligo, is deceptively simple: a cardboard plank threaded with five Velcro straps along its length. When its side wings are folded up, it becomes rigid enough to immobilize a damaged leg over what can be a two-hour ambulance ride on bumpy roads. Best of all, the design offers a five-fold cost reduction over the most commonly used leg splints, which sell for around 1,400 rupees (about $25).

“The $5 price-point of the splint eliminates the biggest problem that we observed in the field: To save money, ambulance companies and clinics often remove and reuse their expensive splints as patients are moved from the roadside to a trauma center,” Raje said. “By making our splint inexpensive, effective and disposable, we increase the likelihood that the limb remains stable during patient transport, preventing secondary damage.” Another advantage to the new design over older metal splints is that it is radiolucent; it doesn’t have to be removed before a patient is examined with imaging equipment. (Metal within cage-like splints can interfere with X-ray imaging and can cause harm to patients within a magnetic resonating imaging device because of its strong magnetic fields.) In addition, the three-sided splint tray leaves most of the limb accessible so that wound dressings can be examined and changed with minimal disruption.

“This is Stanford-India Biodesign’s second licensed product, and it represents a wonderful achievement for the fellows,” said Rajiv Doshi, MD, the U.S. executive director of the Stanford-India Biodesign program and a consulting assistant professor of medicine at Stanford. “This success also validates the importance of using in-country needs assessment to identify unmet medical needs, resulting in solutions that are appropriate for that environment.” Today, the two other fellows who were involved with the splint project, Rahul Ribeiro, PhD, and Ashokan Thondiyath, PhD, are reaching Stanford Biodesign innovation methodologies at leading Indian universities. Since its inception in 2008, the Stanford-India Biodesign program has produced a number of cost-effective medical devices that benefit underserved patients. This includes a low-cost bone drill that helps provide fluids to patients when a traditional IV can’t be used; a bearing screening device for children in rural India; and an inexpensive neonatal resuscitation device that is lifesaving for babies having breathing difficulties immediately after birth.

“India has the potential to become a world hub for low-cost medical device design,” said Paul Yock, MD, director of Stanford Biodesign and a professor of bioengineering. “With the thoughtful, frugal design approach that our Indian innovators take, we believe that their inventions will not only improve health in the developing world, but also collectively help us understand how to develop more cost-effective technologies for the United States.”

During an innovation summit in New Delhi last May, “These innovations cost a fraction of other medical devices that address these same problems, making life-saving health care available to people who may not otherwise be able to afford treatment,” she said.

Kris Newby is the communications manager for Spectrum, the Stanford Center for Clinical and Translational Education and Research.
Grimm images of gun incidents spanning from Newtown, Conn., to Las Vegas have sparked heated discussions about gun violence in general and the safety of our children in particular.

RESEARCH: While the science behind amyloids is still in its infancy, Lawrence Steinman and his team have been working to understand how proteins can become harmful and what steps, if any, can be taken to remove them.

By Krista Conger

A misfolded protein usually can’t carry out its job. Some proteins, however, don’t go quietly, if at all. Instead, they initiate a chain reaction with other proteins, forming long, insoluble strands called fibrils that mat together to form amyloid clumps. These clumps appear in the brains of people with neurodegenerative diseases like Alzheimer’s and multiple sclerosis, but not in the brains of healthy people.

Although these clumps are thought to be detrimental to nerve cells, it’s not yet clear how or why they form. But there is a possibility that the ability of the fibrils to form cylindrical pores that disrupt the cellular machinery is anathema to the orderly flow of ions and molecules used by the cells to communicate, extend neurotransmitter release, and transmit nerve signals. Regardless, it’s not a protective, rather than destructive, force. In other words, amyloids can be considered damaging molecules involved in inflammation and inappropriately immune responses.

The lessons we learn from our study and others are welcome but that if the child doesn’t want to, it’s OK to offer reassurance and support. We must protect children by limiting their exposure to news reports of gun violence and the possibility that any therapeutic maneuver could in- 

The short-term effects include re- versing the symptoms of a multiple-sclerosis-like neurodegenerative disease in laboratory mice. The second study, published April 3 in the Journal of Neuroscience, found that the fibrils bound to and re- paired the mice developed signs of the condi- tion.

5 QUESTIONS

1 What are the potential short-term psychological ef- fects of children hearing or seeing infor- mation about these events?

2 What about the potential long-term impacts?

3 What are some of the early warning signs of child- hood trauma for parents to look out for?

4 Are children who are under a certain age more vul- nerable to psychological impact than a teenager would be?

5 How do you recommend that parents talk to their kids about disturbing events and images?

A study led by Lawrence Steinman, MD, professor of neurology and neurological sciences also sup- ported the findings of the previous study. 5

In the first study, published in August, showed that an amyloid-forming protein called beta amyloid, which is strongly linked to Alzheimer’s disease, could reverse the symptoms of a multiple-sclerosis-like neurodegenerative disease in laboratory mice. The second study, published April 3 in the Journal of Neuroscience, found that the fibrils bound to and re-paired the mice developed signs of the condition.

Lawrence Steinman investigates brain diseases.

By Krista Conger

“What’s the potential — is this a small number or is this the beginning of something greater?” Steinman said.

Lawrence Steinman investigates brain diseases.

The short-term effects include reversing the symptoms of a multiple-sclerosis-like neurodegenerative disease in laboratory mice. The second study, published April 3 in the Journal of Neuroscience, found that the fibrils bound to and repaired the mice developed signs of the condition.

Lawrence Steinman investigates brain diseases.

The short-term effects include reversing the symptoms of a multiple-sclerosis-like neurodegenerative disease in laboratory mice. The second study, published April 3 in the Journal of Neuroscience, found that the fibrils bound to and repaired the mice developed signs of the condition.

Lawrence Steinman investigates brain diseases.

The short-term effects include reversing the symptoms of a multiple-sclerosis-like neurodegenerative disease in laboratory mice. The second study, published April 3 in the Journal of Neuroscience, found that the fibrils bound to and repaired the mice developed signs of the condition.

Lawrence Steinman investigates brain diseases.

The lessons we learn from our study and others are welcome but that if the child doesn’t want to, it’s OK to offer reassurance and support. We must protect children by limiting their exposure to news reports of gun violence and the possibility that any therapeutic maneuver could in-

Lawrence Steinman investigates brain diseases.

By Krista Conger

Lawrence Steinman investigates brain diseases.

Lawrence Steinman investigates brain diseases.

The short-term effects include reversing the symptoms of a multiple-sclerosis-like neurodegenerative disease in laboratory mice. The second study, published April 3 in the Journal of Neuroscience, found that the fibrils bound to and repaired the mice developed signs of the condition.

Lawrence Steinman investigates brain diseases.

The lessons we learn from our study and others are welcome but that if the child doesn’t want to, it’s OK to offer reassurance and support. We must protect children by limiting their exposure to news reports of gun violence and the possibility that any therapeutic maneuver could in-

Lawrence Steinman investigates brain diseases.

By Krista Conger

Lawrence Steinman investigates brain diseases.

The lessons we learn from our study and others are welcome but that if the child doesn’t want to, it’s OK to offer reassurance and support. We must protect children by limiting their exposure to news reports of gun violence and the possibility that any therapeutic maneuver could in-

Lawrence Steinman investigates brain diseases.

By Krista Conger

Lawrence Steinman investigates brain diseases.

The lessons we learn from our study and others are welcome but that if the child doesn’t want to, it’s OK to offer reassurance and support. We must protect children by limiting their exposure to news reports of gun violence and the possibility that any therapeutic maneuver could in-

Lawrence Steinman investigates brain diseases.

By Krista Conger

Lawrence Steinman investigates brain diseases.

The lessons we learn from our study and others are welcome but that if the child doesn’t want to, it’s OK to offer reassurance and support. We must protect children by limiting their exposure to news reports of gun violence and the possibility that any therapeutic maneuver could in-

Lawrence Steinman investigates brain diseases.

By Krista Conger

Lawrence Steinman investigates brain diseases.

The lessons we learn from our study and others are welcome but that if the child doesn’t want to, it’s OK to offer reassurance and support. We must protect children by limiting their exposure to news reports of gun violence and the possibility that any therapeutic maneuver could in-

Lawrence Steinman investigates brain diseases.

By Krista Conger

Lawrence Steinman investigates brain diseases.

The lessons we learn from our study and others are welcome but that if the child doesn’t want to, it’s OK to offer reassurance and support. We must protect children by limiting their exposure to news reports of gun violence and the possibility that any therapeutic maneuver could in-

Lawrence Steinman investigates brain diseases.

By Krista Conger

Lawrence Steinman investigates brain diseases.

The lessons we learn from our study and others are welcome but that if the child doesn’t want to, it’s OK to offer reassurance and support. We must protect children by limiting their exposure to news reports of gun violence and the possibility that any therapeutic maneuver could in-

Lawrence Steinman investigates brain diseases.

By Krista Conger

Lawrence Steinman investigates brain diseases.

The lessons we learn from our study and others are welcome but that if the child doesn’t want to, it’s OK to offer reassurance and support. We must protect children by limiting their exposure to news reports of gun violence and the possibility that any therapeutic maneuver could in-

Lawrence Steinman investigates brain diseases.

By Krista Conger

Lawrence Steinman investigates brain diseases.

The lessons we learn from our study and others are welcome but that if the child doesn’t want to, it’s OK to offer reassurance and support. We must protect children by limiting their exposure to news reports of gun violence and the possibility that any therapeutic maneuver could in-

Lawrence Steinman investigates brain diseases.

By Krista Conger

Lawrence Steinman investigates brain diseases.

The lessons we learn from our study and others are welcome but that if the child doesn’t want to, it’s OK to offer reassurance and support. We must protect children by limiting their exposure to news reports of gun violence and the possibility that any therapeutic maneuver could in-

Lawrence Steinman investigates brain diseases.

By Krista Conger

Lawrence Steinman investigates brain diseases.

The lessons we learn from our study and others are welcome but that if the child doesn’t want to, it’s OK to offer reassurance and support. We must protect children by limiting their exposure to news reports of gun violence and the possibility that any therapeutic maneuver could in-

Lawrence Steinman investigates brain diseases.

By Krista Conger

Lawrence Steinman investigates brain diseases.

The lessons we learn from our study and others are welcome but that if the child doesn’t want to, it’s OK to offer reassurance and support. We must protect children by limiting their exposure to news reports of gun violence and the possibility that any therapeutic maneuver could in-

Lawrence Steinman investigates brain diseases.

By Krista Conger

Lawrence Steinman investigates brain diseases.

The lessons we learn from our study and others are welcome but that if the child doesn’t want to, it’s OK to offer reassurance and support. We must protect children by limiting their exposure to news reports of gun violence and the possibility that any therapeutic maneuver could in-

Lawrence Steinman investigates brain diseases.
Packard Children’s leads nation in kidney transplantation

By Erin Digitale

As dramatic transformations go, it’s hard to match the aftermath of a sick child suddenly gaining the energy and ability to breathe transplant, said Grimm, who is also a professor of pediatric nephrology at the School of Medicine.

One bright spot to transplantography — the small size of the youngest patients — was doubly troubling for the Graham family of Houston. Twins Adri- and Max Graham, now age 2, were born in 2010 with a severe kidney disease called congenital glomerulopathy. Before transplant, they endured 14 to 20 hours of dialysis per day. Their parents, Al and Stephanie, worried they wouldn’t survive to reach the 33-pound size often considered the lower threshold for kidney transplant. Then the Grahams learned that Packard Children’s can transplant kidneys as small as 22 pounds, thanks to the team’s special surgical expertise.

“Al was delighted to find Packard Children’s,” said Stephanie, who donated one of her kidneys to Addie in May 2012. Al gave a kidney to Max in December.

The hospital’s combined emphasis on excellent medical care and family-focus was especially important for the Grahams, since the twins have traveled thousands of miles for transplants that involved all four members of their family. Transplant coordinator Gerri James, RN, ensures that patients’ families are connected to all the resources they need, from local housing to answers to their many questions.

“It’s super-important for families to know that there’s somebody there who is on their side,” James said.

Addie and Max also benefited from several improvements in care that the Packard Children’s team has instituted to help small patients. Before transplant, the twins received optimal nutrition to help them grow as strong as possible in preparation for their surgeries, and had dialysis treatments from nurses who specialize in giving dialysis to infants and small children. After transplant, caregivers carefully monitored their fluid levels and blood pressures to make sure that the adult-sized kidneys they received from their parents would function correctly.

“One thing that makes our smallest patients do so well is that we try to get the biggest, healthiest kidney possible into their little bodies,” Grimm said.

Based on decades of pioneering research at Packard Children’s and the School of Medicine, Addie and Max are also receiving a regimen of immune-suppressing drugs that avoids steroids, which were once considered essential but stunt children’s growth. Steroid-free immune suppression is now standard for all of Packard Children’s kidney recip- ients.

In addition to helping first-time kid- ney recipients, such as Addie and Max, the hospital’s team has special expertise in performing second transplants for children whose bodies have rejected the first one. “These children are often con- sidered untransplantable by their local transplant centers because their immune systems are so hyperactive, and they can languish on dialysis,” Grimm said. Unlike many other transplant programs, Packard Children’s can offer medica- tion to lower the body’s sensitivity to transplanted tissue, he added. “Our de-sensitization program can allow us to transplant them and help them return to more normal lives.”

For the transplant team, the best part of their jobs is watching patients develop after they receive new kidneys.

“They thrive,” James said. “They be-come like every other kid at the play- ground. You really make a difference in their lives. Nothing else can come even close to that feeling.”

Grant will allow researchers to study cancer that strikes young transplant recipients

By Erin Digitale

Prediction and early detection of a high-risk form of childhood cancer are the goals of an ambitious new study led by Packard Children’s and the University of Texas-Southwestern, with a $24 million, five-year grant from the National Institutes of Health. Target: a deadly form of cancer that strikes children who have received solid organ transplants. Because they take immunosuppressing medications to keep their transplanted organs safe, these children are vulnerable to a cancer caused by an inappropriate immune-system response to a common virus.

The cancer, called post-transplant lymphoproliferative disorder, is a confounding problem for doctors, because the treatment is often too aggressive or too gentle. Even when it is treated, the cancer can return. As of 2015, it is the fourth leading cause of death in children who receive kidney transplants now receiving a regimen of immune-suppressing drugs that avoids steroids, which were once considered essential but stunt children’s growth. Steroid-free immune suppression is now standard for all of Packard Children’s kidney recipients. Nationwide, about half the kids who receive kidney transplants now receive steroid-free medication for immune suppression.

In addition to helping first-time kid- ney recipients, such as Addie and Max, the hospital’s team has special expertise in performing second transplants for children whose bodies have rejected the first one. “These children are often con-sidered untransplantable by their local transplant centers because their immune systems are so hyperactive, and they can languish on dialysis,” Grimm said. Unlike many other transplant programs, Packard Children’s can offer medica-tion to lower the body’s sensitivity to transplanted tissue, he added. “Our de-sensitization program can allow us to transplant them and help them return to more normal lives.”

For the transplant team, the best part of their jobs is watching patients develop after they receive new kidneys.

“They thrive,” James said. “They be-come like every other kid at the play-ground. You really make a difference in their lives. Nothing else can come even close to that feeling.”

No foolin’: Woodside man makes 600th blood donation

On April 1, Woodside resident Alden Tagg made his 600th donation at Stanford Blood Center at its new donation center in Menlo Park.

Tagg donated through a special-ized two-hour process known as apheresis that allows the center to collect specific blood components, such as platelets.

The apheresis process enables don-ors to give blood up to 24 times a year, whereas whole-blood donors are limited to a maximum of about six donations per year.

Tagg began donating in the com-munity about 40 years ago, inspired by an article in a local paper about children suffering from leukemia. The realization that these children were the same age as his kids at the time, along with the understand-ing that he could help by donating blood, motivated him to become a blood donor.

When the Stanford Blood Cen-ter opened its doors in 1978, he was one of its first donors. Since then, he often donated every other week, and said that simply became a habit.

Only one other donor has reached the 600-donation mark at Stanford. Tagg’s donations have helped countless cancer and leukemia pa-tients, who often depend upon plate-let transfusions to help their blood to clot properly. For example, a leukae-mia patient might have a danger-ously low platelet count, caused by the disease itself or by its treatment, which can damage bone marrow and result in hemorrhage. Platelet trans-fusions can help keep these patients alive while allowing enough time for their therapy to work.

The blood center currently has a need for all blood types, but there is a particular need for Rh-negative blood. Donors should be in good health with no cold or flu symp-toms. They must eat well prior to donation, drink fluids and present photo identification at the time of donation. The process takes about an hour.

For more information or to schedule an appointment online, please call (888) 723-7831 or visit bloodcenter.stanford.edu.
People

A lifetime in hospitals, first as patient now as caregiver

Caring teams from Packard Children’s helped Misty Blue Foster overcome physical, personal adversity in early years of her life

By Robert Dicks

When you hear the story of Misty Blue Foster, a 27-year-old licensed vocational nurse at the Veterans Affairs Palo Alto Health Care System, you start to wonder how she became so successful in her career and life. She was born to a drug-addicted single mom, who died when Foster was just 5. She entered life with spina bifida, from which the spinal column doesn’t form properly, and cloacal exotrophy, a defect of the abdominal wall. She has been homeless and has grown up in foster care throughout her 14 years in foster care. She has endured more than 20 major surgeries. But through all these personal and medical obstacles, Foster found comfort and family at Lucile Packard Children’s Hospital, where care teams throughout the hospital inspire her, guided her and provided the passion for her care as a nurse.

“Packard Children’s has been so important to help me become who I am,” said Foster, whose rough home life included being forced to use a peanut butter jar to catch fluid from a urinary catheter while also being punished for incontinence. “It really has been like a second home for me.”

Now-retired Pete Cote, CNA, remembers caring for Foster as a baby and throughout childhood. “She was quite a challenge back then, a very tough little girl who was not in a loving environment,” recalled Cote, who, along with her husband, gave Foster away at her 2006 wedding. “Our staff worked hard to not just take care of her medical issues, but to let her know we cared about her and that she was important to us.”

The seemingly endless operations to treat Foster’s birth defects included abdominal surgeries; orthopaedic, urologic and reconstructive surgeries; and many other procedures. Her most recent surgery — an abdominal/urological reconstruction and repair led by William Kennedy, MD, an associate professor of urology at the School of Medicine — was done last summer. In 2001, she had a double spinal fusion led by orthopaedic surgeons Lawrence Rinsky, MD, clinical professor of orthopaedics, and James Gamble, MD, associate professor of orthopaedics.

“It has been very gratifying to help Foster pursue her dream of being a nurse without her medical condition getting in the way,” Kennedy said.

“Dr. Kennedy and all the medical specialty teams have been awesome, and they’ve been supportive of everything I’ve tried to do in my life,” said Foster, who also saluted the care of many other faculty and staff members at the hospital. Sheila Brunner, a recreation therapy and child-life specialist, is not surprised that Foster has found a way to live independently, has a career, got married and even become a caregiver like her heroes. “We helped provide so many of the things she could not get at home,” said Brunner, who said Foster was never known as a complainer. “Now, Misty is there for people in their time of need the way we were for her.”

Foster doesn’t shy away from a demanding schedule of both school and work, and the 49ers fan is now studying for a bachelor’s degree in nursing while still working as an LVN at the VA. She also has traveled to Australia, England, Iceland and Spain to inspire other young people through her story of hope.

In the history of Packard Children’s, Foster will be remembered as a brave little girl who touched everyone with her courageous battle to overcome a desperate start in life. As Foster says on her website, “You can’t always control what you are given in life, but you can control what you do with it.”

Now, as a nurse assisting our nation’s veterans, Foster is paying forward the inspirational care she received at Packard Children’s. Her is a life and career that brings great pride to the entire staff. Retired nurse Sandy Tenny-Collins, RN, summed these feelings up: “Misty has overcome so many difficulties. She has always been a fighter and is remarkable beyond words. The fact that all of us at the hospital were able to be a family to her, and to touch her and guide her in life, makes us very thrilled.”

Robert Dicks is the senior media relations director for Lucile Packard Children’s Hospital.