Mom’s voice lights up children’s brains

By Erin Digitale

Children’s brains are far more engaged by their mother’s voice than by voices of women they do not know, a new study from the School of Medicine has found.

Brain regions that respond more strongly to the mother’s voice extend beyond auditory areas to include those involved in emotion and reward processing, social functions, detection of what is personally relevant and face recognition.

The study, which is the first to evaluate brain scans of children listening to their mothers’ voices, was published May 16 in the Proceedings of the National Academy of Sciences. The strength of connections between the brain regions activated by the voice of a child’s own mother predicted that child’s social communication abilities, the study also found.

“Many of our social, language and emotional processes are learned by listening to our mom’s voice,” said lead author Daniel Abrams, PhD, instructor in psychiatry and behavioral sciences. “But surprisingly little is known about how the brain organizes itself around this very important sound source. We didn’t realize that a mother’s voice would have such quick access to so many different brain systems.”

Preference for mom’s voice

Decades of research have shown that children prefer their mother’s voices: In one classic study, 1-day-old babies sucked harder on a pacifier when they heard the sound of their mother’s voice, as opposed to the voices of other women. However, the mechanism behind this preference has never been defined.

“Nobody had really looked at the brain circuits that might be engaged,” senior author Vinod Menon, PhD, professor of psychiatry and behavioral sciences, said. “We wanted to know: Is it just auditory and voice-selective areas that respond differently, or is it more broad in terms of engagement, emotional reactivity and detection of salient stimuli?”

The study examined 24 children ages 7 to 12. All had IQs of at least 80, none had any developmental disorders, and all were being raised by their biological mothers. Parents answered a standard questionnaire about their child’s ability to interact and relate with others. And before the brain scans, each child’s mother was recorded saying three nonsense words.

“The majority of children with IQs higher than 70, who are being raised by their biological mothers, can do this task,” Menon said. “We found that children who had a preference for their mother’s voice had more strongly connected brain regions.”

Folate fortification appears not to have slowed some birth defect rates

By Erin Digitale

Fortifying the U.S. food supply with folic acid was not associated with a decline in certain birth defects that researchers expected to see in California, according to a new study from the School of Medicine.

The study of more than 1.3 million California births and pregnancies spanning two decades was published online May 18 in Birth Defects.

How nanotechnology could detect and treat cancer

By Krista Conger

The crew of the Proteus has one desperate chance to save a man’s life. Shrunk to the size of a large bacterium, the submarine contains a team of scientists and physicians racing to destroy a blood clot in the brain of a Soviet defector. The group journeys through the body, evading giant white blood cells and tiny antibodies while traveling through the heart, the inner ear and the brain to reach and destroy the blockade.

Although events in the film Fantastic Voyage were far-fetched when it was released in 1966, they’re now being realized every day in labs around the world, particularly in cancer treatment. A growing field called nanotechnology is allowing researchers to manipulate molecules and structures much smaller than a single cell to enhance our ability to see, monitor and destroy cancer cells in the body.

Tens of thousands of patients have already received chemotherapy drugs delivered by nanoparticles called liposomes, and dozens of other approaches are currently in clinical trials. Within the next five to 10 years, our bodies’ biggest defenders may be tinier than we could have ever imagined.

“Exquisite sensitivity and precision”

“Nanotechnology offers an exquisite sensitivity and precision that is difficult to match with any other technology,” says Sam Gambhir, MD, PhD, professor and chair of radiology at the School of Medicine. “Within the next decade, nanomedicine will change the path of cancer diagnosis and treatment in this country.”

The field has some big backers: The National Cancer Institute now spends about $150 million each year on nanomedicine research and training to combat the disease; other institutes and centers at the National Institutes of Health spend an additional $300 million on nanotechnology research for cancer and other disorders. And a national alliance created by the NCI in 2004 to bring together researchers from biology to computer science to chemistry to engineering is now bearing fruit — in the form of dozens of clinical trials — at campuses and companies across the country, including Stanford.

“We can now detect just a few cancer-related molecules or circulating tumor cells in the body in just a few milliliters of blood or saliva, or map the boundaries of a brain tumor within millimeters to assess its response to therapy or to plan...”
Nancy Lonhart, ‘expert negotiator’ and ‘quiet achiever,’ wins Amy J. Blue Award

By Kathleen Sullivan

When Nancy Lonhart arrives at her office in Encina Commons, she is ready to hit the ground running while maintaining a patient and understanding demeanor with everyone — faculty, researchers, fellows, students, staff, visiting VIPs, the janitor and the UPS delivery person.

She is the calm at the center of the storm for the 70 people working at the Center for Health Policy and division manager of the Center for Primary Care & Outcomes Research. She provides administrative and financial leadership, guidance and oversight to the centers, including strategic planning and development, finance and research administration, human resources and student affairs.

“My goal is to make everyone’s life, work and research run as smoothly and as efficiently as possible,” said Lonhart, who joined the organization in 2007.

Lonhart is one of this year’s winners of the Amy J. Blue Award, which honors university staff members who are exceptionally dedicated, supportive of colleagues and passionate about their work.

The other two winners are Lynn Diamond, director of systems specialist in Faculty Affairs, which is part of the Office of the Provost; and Jörg Grawert, a faculty data systems specialist in the department of Microbiology and Immunology, which is known as Stanford Health Services.

Working in the office on the main campus, particularly in the Student Health Center, which is part of Residential & Dining Enterprises.

“Nancy is the heart, soul and engine of our centers.”

Praise from colleagues

Colleagues said Lonhart has an “unwavering can-do attitude” and inspires the best in everyone who works at the center. In addition, colleagues said Lonhart is always looking for ways to enhance the skills and further the careers of her staff.

Kathryn McDonald, executive director and senior scholar at the Center for Primary Care & Outcomes Research, said Lonhart works many hours — tirelessly — because she cares so deeply about the work and the people.

“When Nancy asks, ‘How are you?’ her earnestness elicits how I am really doing,” McDonald said. “It opens up exchanges that we need to have — and work problems get solved. She does this with everyone. She is grounded, and ever so capable in knowing just what is needed to work in a customized fashion with each and every person she works with. Nancy has the heart, soul and engine of our centers. Many people look to our centers and wonder how it is possible to have such a great work environment with such incredible faculty productivity. Nancy. She makes it all possible, in an incredibly humble way.”

David Studdert, LLB, ScD, MPH, professor of medicine and of law, said Lonhart has been instrumental in helping Stanford Health Policy to grow over the last decade into “one of the best, most vibrant places in the world” to do health policy research and teaching. He said Lonhart has played an important role in creating the atmosphere of collaboration and intellectual excitement that characterizes the Center for Health Policy.

“Nancy is calm, unfailingly positive and amazingly good at what she does,” he said. “She is a patient teacher who contributed immeasurably to the mission of our centers, to the success of our faculty and to building a truly extraordinary staff. She is richly deserving of the Amy J. Blue Award.”

Stem cell agency awards nearly $4 million to researchers

Albert Wong, MD, professor of neurosurgery at the School of Medicine, was awarded $2.9 million on May 19 by the California Institute for Regenerative Medicine to study the use of a vaccine to treat glioblastoma, a common and often-deadly brain tumor.

The vaccine is meant to stimulate patient’s immune system to recognize and attack cancer cells. The award was made through the state stem cell agency’s Partnering Opportunity for Translational Research Projects program.

In addition, four School of Medicine researchers received Inception Awards of about $240,000 each through the agency’s Partnering Opportunity for Discovery Stage Research Projects program. These awards provide seed funding to support the exploration of transformative ideas that hold the potential to greatly impact the field of human stem cell research.

Recipients include Bertha Chen, MD, professor of obstetrics and gynecology, to investigate ways to treat radiation-induced bladder injury; Jeffrey Goldberg, MD, PhD, professor of ophthalmology, to explore the use of embryonic stem cells to treat corneal endothelial degeneration; Phillip Yang, MD, associate professor of medicine, to study how to activate patient-specific congenital myocardial repair; and Philip Beachy, PhD, professor of developmental biology, to learn whether bladder cancer can be treated by replacing the corrupted urothelial lining.

In total, 19 Discovery Stage Research awards and one Translational Research award were granted for a total of $7 million. With these awards, Stanford has received roughly $307 million from iCIRM.

Inside Stanford Medicine is produced by the Office of Communication & Public Affairs.

Send letters, comments and story ideas to John Sanford at 723-8399 or at janford@stanford.edu. Please also contact him to receive an e-mail version of Inside Stanford Medicine.

Nancy Lonhart is associate director of the Center for Health Policy and division manager of the Center for Primary Care & Outcomes Research.
Winners of Spirit, Leadership awards announced

By Ruth Schechter

The School of Medicine has announced the winners of the annual Anne G. Crowe Spirit Award and Inspiring Change Leadership Award. Spirit award winners are selected for their outstanding dedication, initiative, motivation, positive attitude and customer service. This year’s recipients are Tacy Framhein, fellowship coordinator in the Department of Genetics, and Charlene Rotandi, fellowship coordinator in the Department of Pediatrics.

Tacy Framhein

Framhein really does need to be in two places at once. Balancing a position split between two programs means that she has to juggle two job descriptions in different locations while serving as point person for faculty, students and staff. She tends to the needs of 16 master’s degree students in the Human Genetics and Genomic Medicine program from freshman to senior year, and the Fellowship in Medical Genetics program. She manages taxes, vacation requests, and the fellowship program coordinator for two programs.

“Tacy is incredibly organized,” said Allison Guettin, director of education programs in the Department of Pediatrics. “She is a tireless supporter of graduate medical education both locally and nationally,” said Allison Guettin, director of education programs in the Department of Pediatrics. “She is a constant resource of knowledge and does everything she can to improve our programs to better support our faculty, staff and trainees. She is the glue that holds everything together.”

“Tacy has made some major contributions,” said Kelly Ormond, MS, professor of genetics and director of the annual Anne G. Crowe Spirit Award. “Her day-to-day demands range from clarifying policies to ensuring attendance at educational conferences and smoothing the way for visiting professors. She has to manage the Fellowship Program, schedule educational conferences, ensure the faculty and trainees are well informed and remain in touch with alumni and community leaders.”

She spearheaded a number of initiatives focusing on military-affiliated students and veterans, including Honoring the Ghosts, which featured campus-wide events focusing on war and health, and she brought the Telling Project to Stanford, which featured workshops and talk shows for veterans and their families.

“One aspect of Tacy’s work that really stands out is her ability to see the big picture and look for opportunities to improve upon them. It’s like a big puzzle: You have to see the big picture but also take care of the minute pieces. And that’s easier when all the parts are in place.”

Teresa Burk

It started last spring with a series of classes about how to identify problems and measure change. An administrative associate in the Department of Radiology, Burk was asked to help improve the high turnover rate and low morale among her fellow support staff members. A survey distributed to the department’s 40 support staff showed an average satisfaction rate of only 5 on a scale of 1 to 10.

“People felt that there was no access to resources and that they didn’t know what was going on in the department,” said Burk, who worked at an environmental engineering company and taught sculpture and sustainable engineering before moving to higher education. “Part of my role is to make sure they take adequate time for themselves and maintain a healthy work-life balance. It’s an important part of helping these physicians.”

Her day-to-day demands range from clarifying policies to ensuring attendance at educational conferences and smoothing the way for visiting professors. She also monitors their emotional health. “She is a tireless advocate for the impact of the arts and humanities on our understanding of medicine,” said Audrey Shafer, MD, professor of anesthesiology, perioperative and pain medicine at the medical school and at the Palo Alto VA Health Care System. “She is a powerful agent for change, an inspiration to those around her and a leader in new, impactful initiatives.”

Each year, the School of Medicine recognizes employees who have reached their five, 10, 15, 20, 25, 30, 35, 40 and 45 years of service. University employees celebrating 30 years or more of service at Stanford will be honored May 26 at the Multicultural Spring Festival.

Tacy Framhein

Charlene Rotandi

Teresa Burk

Jacqueline Genovese

Honor roll: Longtime staff members mark work anniversaries

By Ruth Schechter

Each year, the School of Medicine recognizes employees who have reached their five, 10, 15, 20, 25, 30, 35, 40 and 45 years of service. University employees celebrating 30 years or more of service at Stanford will be honored May 26 at the Multicultural Spring Festival.

School of Medicine employees with 45 years of service:

• Ethnicity, Darleen, Office of Facilities Planning and Management

Those with 40 years of service:

• Marilyn Masek, Department of Pathology

• Cecelle Quaintance, Department of Pediatrics

• Bach-Hong Tran, Institute for Immunity, Transplantation and Infection

Those with 35 years of service:

• Samuel Brain, Department of Radiation Oncology

• Donn Fullington, Human Resources Group

Those with 30 years of service:

• Karen Denny, Department of Orthopaedics

• Corrine Sanchez, Department of Electrophysiology

• Valerie Scott, Department of Medicine

Those with 25 years of service:

• Nancy Edelman, Department of Surgery

• Maria Fabian, Department of Neuropathology

• Teresa Hinkle, Department of Radiation Oncology

• Nicole Hovak, Department of Medicine

• Donna Jones, Department of Pathology

• John Reuling, Information Resources and Technology

• Judith Roberts, Department of Ophthalmology

• Dawn Robinson, Stanford Cancer Institute

• Evangelina Salazar, Department of Anesthesiology, Perioperative and Pain Medicine

• Carmen Satterstrup, Department of Microbiology and Immunology

• Marilyn Tinsley, Lane Medical Library

• Virginia Tse, Department of Anesthesiology, Perioperative and Pain Medicine

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Inside Stanford Medicine May 23, 2016
By Robert Dicks

From the beginning, Lucile Packard Children’s Hospital Stanford stood out. When it opened on June 10, 1991, it was one of very few children’s hospitals in the nation to incorporate both pediatrics and labor and delivery in one building.

Now, 25 years later, the hospital is the centerpiece of a preeminent pediatric and obstetric health system that has 65 locations in the Bay Area. Since 1991, the hospital and health system have logged more than 3 million clinic visits, 1,600 solid organ transplants, 110,000 births — and found a permanent place on the U.S. News & World Report annual list of America’s best children’s hospitals.

The silver anniversary in June is a perfect time to look back on a remarkable period of extraordinary care, and look ahead to the 2017 premiere of a new main building for the pediatric and obstetric medical campus.

“From the start, our goal has been to fulfill the vision of Lucile Salter Packard, our generous founder and visionary for children’s health,” said Christopher Dawes, president and CEO, who has led the hospital and enterprise since 1997 and was previously chief operating officer. “She planned a very nurturing environment, one that would make possible the futures of our children and the children of our grandchildren and the children of our great grandchildren.”

**Major achievements**

“I remember opening day just like it was yesterday,” recalled neonatologist David Stevenson, MD, professor of pediatrics at the School of Medicine. Stevenson helped plan and open the hospital, where he’s still treating and saving premature infants. “It was really exciting to see the whole community come out to celebrate. Their support has played a huge role in our tremendous impact.”

Lucile Packard, long an advocate for the health of children and expectant mothers, died before the hospital’s debut. She and husband David Packard founded the hospital with a $40 million donation in 1986. “Her magnificent spirit still guides everything we do,” said Dawes. “She would have loved this place and all we’ve achieved.”

Those achievements include a series of notable breakthroughs in academic and clinical excellence. Some highlights:

- Launch of the first mobile clinic program in America specifically targeting underserved adolescents.
- Development of a nonsteroidal, immune-suppressing drug regimen for organ transplant recipients.
- Open-heart surgery on the youngest and smallest infant ever to undergo such an operation.
- Groundbreaking improvements in pregnancy and newborn care.
- Leadership in preterm birth research.
- Pioneering food allergy research.
- Studies focused on eradicating disease for children around the world.
- Recognition as being No. 1 in the United States in solid organ transplant volume.

Becoming one of the nation’s elite children’s hospitals has long been a collaborative effort with the School of Medicine, Stanford University and the top minds in Silicon Valley, all tremendously driven by our innovation and achievements,” Dawes said.

**Saluting donors**

Dawes also saluted the unwavering generosity of donors through the Lucile Packard Foundation for Children’s Health, and the support of the David and Lucile Packard Foundation. “They’ve helped propel every element of our success,” he said. And through aggressive outreach and advocacy, the hospital and health system have become leaders in community service, providing care regardless of a family’s ability to pay.

“I know my mother would be extraordinarily proud of everything Lucile Packard Children’s Hospital stands for,” said Susan Packard Orr, vice chair of the hospital’s board of directors. “The breakthrough discoveries, the community service, the family-centered approach and such great care are exactly what she wanted this hospital to be.”

**Expanding access to meet demand**

“Major advances in patient care mean that more children today are living into adulthood with serious and chronic diseases that would have been fatal 25 to 35 years ago,” said Chrissy Sandborg, MD, pediatric rheumatologist and professor of pediatrics at the School of Medicine. “There’s an increasing demand for more space to care for these kids and families.”

That’s why the hospital plans to debut a new first among the pediatric and obstetric medical campus — a $1.1 billion expansion, adding 521,000 square feet of building space and 149 patient beds — in the summer of 2017. The project will create the nation’s most technologically advanced, family-friendly and environmentally sustainable hospital for children and their parents, Dawes said.

“The hospital’s expansion signals its continued dedication to the sickest patients, and illustrates the essential role children’s hospitals play in our health-care system,” said Mark Wietecha, president and CEO of the Children’s Hospital Association in Washington, D.C.

The hospital’s influence expanded further in 2012, and in a way few could have predicted back in 1991. “We launched a new, integrated network called Stanford Children’s Health,” said Dawes. The network, with the hospital as its centerpiece, now has 65 locations in Northern California and 100 locations in the western United States. “It was our response to a changing health-care environment and consumers’ increased demand for high-quality services, like those at Stanford Medicine, to be available closer to their homes.”

That model, providing everything from routine checkups to advanced treatment, has been a runaway success. Together with the hospital’s comprehensive health system receives more than 500,000 clinic visits a year.

The next 25

As the pediatric and obstetric teaching hospital of the School of Medicine, Lucile Packard Children’s Hospital Stanford will continue to have access to the top minds in science, research and innovation.

“For the past 25 years, Lucile Packard Children’s Hospital Stanford has helped to lead the world in advancing pediatric research, care and training for the benefit of countless children,” said Lloyd Minor, MD, dean of the School of Medicine. “As an integral part of Stanford Medicine, the hospital will remain indispensable to our overarching vision for precision health, through which we hope to win the race against childhood and adult disease before it even begins — preventing it from striking before they strike and curing them decisively if they do.”

Those cures are poignantly illustrated in stories of lives saved. For instance, 6-month-old Liam Luna of San Jose, California, recently became the first baby in the world successfully treated with prenatal maternal hyper-oxygenation for his rare heart defect. His parents were thrilled to take him home with a great prognosis.

And the family of Elliot Loh, age 7, is so happy that he was successfully treated for a brain tumor at Packard Children’s that they return to the United States every year from China for a reunion with their care team.

“In the end, it’s stories like these that best represent how our staff is fulfilling the vision of our beloved founders,” Dawes said. “Lucile Packard inspires our past, present and future, and we think she’d be very proud of everything we’ve done.”
Ron Davis, PhD, has built a career solving biochemical puzzles — and now his son is desperately ill due to a biochemical puzzle of his own. So Davis, a professor of biochemistry and of genetics at Stanford, has taken on a new scientific challenge: sussing out the molecular cause of chronic fatigue syndrome, the disease afflicting his son.

The story of this quest appears in the spring issue of Stanford Medicine magazine as part of a special report, “Relationships: Ties that heal.”

As the article explains, for Davis, “Each day has become a race to unravel the mystery of chronic fatigue syndrome, the disease afflicting his son.

The story of this quest appears in the spring issue of Stanford Medicine magazine as part of a special report, “Relationships: Ties that heal.”

The magazine also includes a Q&A with actress Glenn Close and her sister Jessie about their family’s experience with mental illness and their fight to end stigma against the mentally ill. The online version of the magazine includes audio of the interviews.

Additional highlights of the special report include:
• An article about the benefits of supportive relationships for physical health.
• A piece about urinary incontinence and how the condition interferes with relationships and can change your relationship with yourself.
• A feature about the beneficial bond that can form between at-risk teens and their doctors.
• An essay about the unexpected joy of raising a child with cerebral palsy.

Influencing our health

Not only do relationships help determine what research is conducted, they influence our physical well-being. Connections with others affect the production of hormones, the actions of immune cells and the pattern of our sleep cycles. Researchers are finding that relationships are a crucial, though difficult-to-measure, ingredient for health.

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Trauma nurse coordinator Jo Ann Schumaker-Watt and trauma service director David Gregg led the trauma service from 1986 to 2001. The site's other authors are Wei Yang, MS, data analyst in pediatrics; and Susan Carmichael, PhD, professor of pediatrics, surgery and cardiology, and members of Stanford's Child Health Research Institute.

The research was funded by the U.S. Centers for Disease Control and Prevention, Stanford's Department of Pediatrics also supported the work.

For 30 years, Trauma Service has treated the most gravely injured community education on injury prevention to rehabilitation to research that advances trauma care. "We pride ourselves on trying to figure out better ways to take care of our patients," said David Gregg, MD, and Ned Speiker Professor and professor of surgery, who has been director of the trauma service since 2001. He has guided many improvements, including new technologies for imaging and information sharing, ways for SHC to be a resource for trauma patients throughout the state and novel approaches to care based on outcomes analysis.

Asiana Airlines crash

"We are constantly reviewing data about our performance," Spain said, "and we've been recruiting people who are committed to doing trauma care.

The team aimed to treat as many people as possible within the "golden hour," said Parties Callagy, director of emergency nurse services. She has been at SHC for nearly 25 years and well knows that starting treatment within the first hour after injury boosts the odds of survival.

"We also know that if you are treated at a Level 1 trauma center, you have a 25 percent greater chance of survival," Callagy said.

The team's research on care improvement continues, said trauma surgeon Thomas Weser, MD, assistant professor of surgery. "We have to be prepared for what happens not just today, but five or 10 years from now."
Nanotech

So what’s so special about nanotechnology? As you might guess, it’s a matter of scale. A nanometer is one-billionth of a meter. A human hair is about 100,000 nanometers in diameter. An average cell, about 10,000 nanometers in diameter, is about 1,000 nanometers long, and the antibiotics that attacked its passengers were about 10 nanometers in size. Thepoint is, nanometers can define, as molecules or structures no larger than about 100 nanometers — comparable in size to the tens of thousands of molecules in the body that slip in and out of intact cells and wiggle harmlessly through blood vessel walls and into tissues. Like the Proteus and its crew, they can seek out and interact with individual cells and their contents. BUT the rules of engagement have changed, as has the possible magnitude of the visitors’ effect. Molecules on the nanometer scale operate in a dusky neighborhood where the laws of physics wobble at the edge of a quantum galaxy. Electrons behave strangely and interact with individual cells and their contents. As a result, the nanoparticles’ experience on such a tiny stage. As a result, the nanoparticles’ experience...Tuning’ nanoparticles

The concept of miniature medical missions requires a payload of new technology. Richard Feynman, PhD, discussed the possibility of “swallowing the doctor” in a talk at the California Institute of Technology, and British researchers first realized the potential of this technology back in 1959 to deliver a payload of a nanometer in size. These spheres can be engineered to contain water-soluble drugs in their interior, while also squirting away hydrophobic, or oil-based, medicines to a tumor’s outer membrane. Careful engineering can result in liposome-based structures that deliver multiple drugs in precise ratios and at high levels without the toxicities that can occur when delivering the medicines without these structures. They accumulate naturally in tumor tissue, or can be targeted to specific cell types by the addition of antibodies or other molecules to their surface.

The technique was first approved by the U.S. Food and Drug Administration in 1995 to deliver the chemotherapy drug doxorubicin to patients with AIDS-related Kaposi’s sarcoma. There are now more than a dozen liposomally packaged drugs on the marketplace, including doxorubicin and paclitaxel. Researchers have begun to explore ways to use other types of nanoparticles to deliver not just drugs, but also small RNA molecules to block the expression of specific genes in a particular cell or tissue.

From a practical perspective, nano-based tech- niques aren’t the wave of the future. This is the now,” said Heather Wakeman, MD, an associate professor of medicine at Stanford who focuses on the treatment of lung cancer patients. “And it’s changing how we treat patients in the clinic.”

Nanosensing technology

Researchers are working on technology for use out side the body that can track and characterize tumor cells at present at minuscule levels in all manner of bodily fluids — tracking the course of a known disease or even pinpointing its inception long before symptoms arise. Wakeme has worked with center co-director Wang to design a kind of “magnetic sifter” that quickly sorts cancer cells from normal blood, based on magnetic nanotags engineered to coat the cancer cells’ surface. A key component of the technique is the ability to swiftly release the bound, living cells for further study. Another approach, also launched in Wang’s lab, involves a magneto-nanotester — a silicon-chip sized magnet that can detect and quantify magnetic nanotags on cancer cells or cancer-associated DNA or protein molecules based on changes in the chip’s external magnetic field. This approach is being tested in clinical trials by MagArray, a company based in Maryland, for its ability to detect multiple lung and prostate cancer biomarkers in patients’ blood. Like other nanotechnol- ogy, it is exquisitely sensitive.

Toward a simple blood draw

These technologies may allow researchers to not just count the circulating tumor cells in a patient, but also to sequence cell’s genomes or assess the levels of expression of cancer-associated proteins on their surfaces. Wakeme is also working to develop techniques to capture and sequence tumor DNA that circulates freely in the blood of cancer patients. We’re looking for specific gene mutations that could change therapy,” she said. “In this way, we’re moving away from invasive biopsies for our patients and toward a simple blood draw to learn more about an individual’s specific cancer.”

Wakeme is working to design gold and silica nanoparticles for use inside the body to detect colon cancer. The particles, which would be swallowed as pills, coat pockets of tumor cells that would normally be invisible during a colonoscopy, and can be visual- ized with a special endoscope designed by the team. The technique is under review by the FDA.

“Cancer is a very difficult disease to treat, and it’s also difficult to diagnose early,” said Pierrot Grodzinski, PhD, a professor and director of the Magnetic Nanotechnology Laboratory. “The alliance was created to bring together engineers and materials scientists, for example, with biologists and clinicians to understand, first, how nanoparticles interact with biological systems and, second, how they interact with cancer cells and what they can do to the tumor.”

Stanford, in the heart of Silicon Valley, is a unique place for this kind of technology to develop,” said Gambhir. “The collaborative atmosphere brings together people to solve specific problems in cancer diagnosis and detection.”

The crew on the Proteus managed to band together to save the detector — in the nick of time, of course. After escaping through a tear duct after destroying the blood clot in its brain just before ballooning back to normal size. Nanomedicine for future systems will likely be less fraught with urgency, but the outcome will be more im- portant. After all, the patient could be you.  

A longer version of this article first appeared in the winter 2016 issue of Stanford Medicine magazine.

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Desiree LaBeaud on the risks of the Zika virus

The warm weather of summer is an invitation to mosquitoes, which may carry the risk of disease, such as Zika virus. Desiree LaBeaud, MD, is an associate professor of pediatric infectious disease who has focused her efforts on understanding the risk factors and long-term health consequences of arboviral infections, including Zika.

She recently shared her thoughts about the local risks of contracting the virus, what precautions residents can take, as well as what travelers outside the United States should do to avoid infection with the virus.

1 What kind of risks could Zika pose this summer to Bay Area residents?

LaBeaud: While there is currently a minimal risk of Zika virus spreading to the Bay Area, there are a number of factors that could contribute to a local outbreak. The vector that transmits Zika virus and many other viruses are Aedes mosquitoes. Aedes mosquitoes have been found in many areas of California, including Menlo Park, Atherton, San Mateo and Hayward. Without exposure to the virus, these mosquitoes cannot transmit Zika virus.

People returning from summer vacations in areas of South and Central America or the Caribbean may be infected with Zika virus without experiencing any symptoms of Zika disease. There is a very low risk of a recent traveler starting a local outbreak in the Bay Area. The traveler would have to have an active infection, which occurs within about 7-10 days after infection. The Aedes mosquito density is much lower in the Bay Area than it is in South and Central America and other tropical regions of the world. Also, we spend more time indoors here, decreasing outbreak risk.

2 Are there specific precautions people should take to protect themselves from the virus?

LaBeaud: The Centers for Disease Control suggests avoiding travel to areas affected by the current outbreak. For those who are planning on traveling to Latin America or the Caribbean, we highly suggest mosquito repellent. Permethrin clothing that will provide adequate coverage (long sleeves and long pants), treat your clothing with mosquito repellent (like permethrin) before traveling, and apply mosquito repellent (DEET, picaridin) liberally and often. Avoiding the mosquito vector is your best chance of minimizing your risk of infection.

If you are concerned about being exposed at home despite there being a low risk for local exposure, be sure to survey your house and yard for containers that collect water. Standing water in small containers — cups, flowerpots, bird baths, garden fixtures, children’s toys or play structures, for example — is the preferred environment for Aedes mosquito breeding. Dumping out standing water will reduce mosquito breeding around your home.

3 What are the known health risks associated with Zika?

LaBeaud: Typically, Zika virus can cause a broad range of symptoms that have been described as “dengue-like syndrome.” Symptoms may include fever, headache, rash, muscle and arthritic joint pain, conjunctivitis (red eyes), and eye pain. These symptoms are usually mild and only last a few days. About 80 percent of people who have been infected experience no symptoms. Symptoms of infection may be worse in children or people with compromised immune systems.

There are some severe disease presentations that may be linked to Zika virus, including microcephaly in newborns — children born with unusually small brains — and a severe neurologic disorder known as Guillain-Barré syndrome. The CDC is currently performing an extensive investigation to determine whether microcephaly and Guillain-Barré syndrome are linked to Zika virus and what may increase a patient’s likelihood of experiencing these serious problems. During a previous Zika virus outbreak in French Polynesia, the incidence of Guillain-Barré syndrome increased 20 times.

Some researchers believe that people in these regions may have a genetic or physiological susceptibility to a more severe form of Zika disease. Others believe that the strain of virus that is causing the current outbreak has mutated to be particularly virulent. Another thought is that previous exposure or co-infection with another virus — such as dengue virus, that is endemic in currently affected regions — may increase one’s risk for severe Zika disease.

4 Are there Zika-prone areas of the world that travelers should avoid?

LaBeaud: The current outbreak has been reported in 57 countries and territories. Six countries — Argentina, China, France, Italy, and the United States of America — have now reported locally acquired infection through sexual transmission. Vietnam is the country to most recently report mosquito-borne Zika virus transmission.

5 There are certain species of mosquitoes that are vectors for transmitting the virus. What makes these mosquitoes such powerful transmitters of Zika?

LaBeaud: Aedes mosquitoes, specifically Aedes aegypti and Aedes albopictus, are the vectors for Zika virus and many other viruses. The female mosquitoes take blood meals from large mammals in order to stimulate the development of eggs. These mosquitoes are anthropophilic, which means they prefer to feed on people. These mosquitoes specifically bite during the day, making people more susceptible to bites. Aedes mosquitoes breed near the home environment. There are often containers with small amounts of rainwater or other pooled water located near the home, such as tires, containers specifically used for water collection, empty planters and bowls. Breeding near the home makes them more likely to bite humans, as they do not need to travel far for a blood meal. Aedes aegypti is also a “nervous” feeder, so any movement during feeding will make them fly off. This means that it takes on average four or five human feedings for the mosquitoes to become infected with the virus, and the mosquito infects all of them. That means she can transmit viruses very efficiently.

Stanley Falkow at the White House

Stanley Falkow, PhD, professor emeritus of microbiology and immunology and a member of the Stanford Cancer Institute, was presented with the 2015 National Medal of Science by President Barack Obama at the White House on May 19, 2016. Falkow was recognized for his pioneering work in studying how bacteria can cause disease and how antibiotic resistance spreads. He is well-known for his work on extracellular elements called plasmids and their role in antibiotic resistance and pathogenicity in humans and animals. Early in his career, he learned the biochemical and microbiological techniques necessary to deduce how bacteria transmit antibiotic resistance to one another. When Falkow arrived at Stanford in 1981, he set aside his study of plasmids to concentrate on how organisms as diverse as cholera, plague and whooping cough cause disease in humans.