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St. Jude Children's Research Hospital
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On the cover:
Zahaan Tambawala
Photo by Seth Dixon

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PHOTOS Y SETH DIXON

6 More Reasons to Love St. Jude

By Elizabeth Jane Walker

Patients and families often praise St. Jude clinical care and research. Now they have even more reasons to love the hospital.

Camila Vargas Ruiz, age 6

Having a child with a life-threatening disease is stressful. Handling day-to-day issues during treatment shouldn't be.

When patients and families arrive at St. Jude Children's Research Hospital, they're enfolded in a warm blanket of care and concern. Breathing a sigh of relief, they learn they'll never receive a bill for housing, food or treatment. Then they discover their St. Jude family will walk beside them every step of the journey, help alleviate their stress and assuage their worries.

"Our experience at St. Jude has been amazing," says Josh Bush, whose daughter, Bella, has undergone treatment for the brain tumor astrocytoma. "It's almost too good to be true. The care, the compassion, the relief of financial burden—everything is done with excellence."

This dedication to patients and families is woven into the fabric of St. Jude.

"The patient and family experience has always been everybody's job," says Janice English, RN, director of the hospital's Patient and Family Experience Office, "and we want to continue to improve."

The hospital's strategic plan includes a blueprint for doing that. The plan has already begun to unfold, with many new amenities, including construction of state-of-the-art inpatient units, dramatic housing renovations and the addition of apartments designed to accommodate larger families.

St. Jude is exploring 87 additional ideas and projects suggested by patients, families and staff members. On the following pages, you'll learn about a few of the most recent projects and activities to elicit smiles from St. Jude patients and families.

At your service

When a child is sick, parents may not have the time or energy to run errands, mail packages, shop for personal items or take their cars in for oil changes. The hospital's new concierge service offers assistance with those kinds of non-medical tasks. The service is free to families, who pay only for outside goods or services purchased.

While 4-year-old Hannah Boyer whirls around Target House like a tiny tornado, her mom greets concierge staff member Erin Clemens, who delivers groceries for the family. Because Hannah recently underwent a bone marrow transplant, the little girl must avoid public spaces where germs and viruses lurk. As a result, her mom has enthusiastically embraced the hospital's concierge service.

"I can't take Hannah to places like the grocery store," Chandra Boyer explains. "But now I can order my groceries online and have the concierge bring them to me. That's really cool."

(From left) Hannah and Chandra Boyer with Erin Clemens

Nature's balm

As clinicians and researchers hurry down a hospital corridor, they glance over at 9-year-old Miller Calhoun, who is blissfully unaware of their presence. Miller is searching for butterflies and hummingbirds in a tranquil pocket garden tucked between buildings on the St. Jude campus. A giant glass wall protects the boy from bee stings, dust mites and inclement weather while allowing him to savor a visual feast of color and movement. As he contemplates the lush blossoms and the water cascading from a lotus-flower fountain, Miller can take a mental break from his treatment for acute lymphoblastic leukemia.

This tiny garden is only one of many campus features to provide patients and families with a welcome distraction from the challenges of treatment.

Miller Calhoun

Time for self-care

Sometimes caregivers need a little TLC—a brief break to check emails, wash clothes, run errands or make personal phone calls. That's why St. Jude offers short-term babysitting services. If a child is inpatient, a parent or grandparent can call on the hospital's Helping Hands program to provide free respite care. Recently, the hospital also added a babysitting service at Target House. Fully licensed and certified sitters are available to play with children for group sessions once a week.

"I've used the sitter service three times," says Tom Campbell, grandfather to 9-year-old David. "Except for when David's in school, he never leaves my side. The sitter services give me a couple of hours occasionally where I know he's safe and I can have an adult conversation or get a little break."

David Campbell with sitter Cheryl Fields

James R. Downing, MD, and Luke Blank

Crucial conversations

Five-year-old Luke Blank has a direct line to the top, and he's not afraid to use it. During his first week at St. Jude, Luke and his mom, Wendi, attended Coffee with the CEO, a monthly event in which patients and families offer advice and input to James R. Downing, MD, the hospital's president and chief executive officer.

Weeks later, Downing was waiting for an elevator when he glanced down to find the little boy gazing up at him.

"Can I see where you keep all the security cameras?" asked Luke, who wants to be in the FBI when he grows up.

"Sure," Downing responded. "Tell your mom to email me, and I'll make it happen."

"I thought it was amazing that with so many children and families here that Dr. Downing remembered us," Wendi says. "Everyone at the hospital has been wonderful from the moment we arrived."

Josh, Jennifer and Bella Bush

Freedom to roam

Sometimes families need a change of scenery. Wouldn't it be nice to run errands, visit the zoo or attend a sporting event? Zipcars® at the hospital provide families with the freedom to roam. The hospital covers the cost of registration and other fees; families pay only for the number of hours they use the vehicle.

When Josh and Jennifer Bush brought their daughter Bella for a checkup recently, they took advantage of the new service.

"A lot of families may not be able to afford a rental car, but they could take the Zipcar for a few hours to get things done or to get the kids off campus for a while," Josh says. "Those are the kinds of things that add to the excellence of what St. Jude accomplishes in treating the whole family. They seem to think about things that other hospitals don't think about."

Janice English, RN (left), and Sonia Black

Partners in planning

When St. Jude designs new construction projects, they turn to the undisputed experts—patients and families—to suggest improvements and innovations for future St. Jude patients.

Recently, dozens of parents and grandparents gathered for an evening of brainstorming. During the session, Sonia Black and other caregivers offered opinions and suggestions to Janice English, RN, director of Patient and Family Experience. The group's suggestions will be considered for a new housing facility to be located adjacent to campus.

In addition to providing a way for families to give back to St. Jude, events such as this one provide a sense of empowerment, enhance communication and cement the partnership between patients and staff. ■

Keeping FLU at Bay

WHEN BIRDS ALIGHT AT DELAWARE BAY FOR A CRAB FEAST, INFLUENZA RESEARCHERS GATHER DATA THAT MAY SAVE LIVES WORLDWIDE.

PHOTOS BY JERE PAROBEK

Influenza research pioneer Robert Webster, PhD, strolls the beach at Delaware Bay during a trip to gather influenza samples from gulls and shorebirds.

BY CHRIS PENNINGTON

Each spring, a team from the St. Jude Children's Research Hospital Department of Infectious Diseases travels to Delaware Bay in New Jersey. They go to collect samples from shorebirds and gulls. Many of these birds use the area as a stopover during an 8,000-mile migration.

This stopover is a unique location for influenza research. What researchers find out from the birds at Delaware Bay helps scientists create vaccines for humans and animals and possibly prevent pandemics.

Internal travel clock

Timing is critical.

After the first full moon in May, horseshoe crabs arrive at the shore to lay their eggs. Birds called red knots migrate from Tierra del Fuego on the southern tip of South America to the Arctic, where they will breed.

Robert Webster, PhD, St. Jude emeritus faculty member, first visited the site in 1985.

"Delaware Bay is absolutely unique," he says. "The red knots build fat reserves while in South America to make the

trip. During migration, red knots are joined by others called ruddy turnstones. These birds are known to be the main carriers of influenza A viruses at Delaware Bay, and they depend upon the horseshoe crab eggs to provide fuel for the next part of the journey. During their stopover they bring in influenza."

Infected birds

For flu research, Delaware Bay is an anomaly. More shorebirds there have influenza viruses than anywhere else in the world—so much so that the scientific community questioned Webster's findings until other researchers confirmed it.

Delaware Bay offers a perfect environment for many aquatic animals, especially horseshoe crabs. During the time when the horseshoe crabs are laying eggs, the shore and the crabs are protected by conservation measures. Wildlife biologists run tests on the birds and tag them for research.

Scientists obtain samples from the birds for flu research. The samples return to St. Jude, where investigators isolate the viruses and provide information to the World Health Organization (WHO) about potential viruses for vaccine strains.

Flu pioneers

Young children are at high risk for serious complications from influenza. The disease is especially dangerous for children with cancer and other life-threatening disorders. That's why Webster has dedicated his life to influenza research.

Before visiting Delaware Bay in 1985, he had been studying flu for nearly 15 years, including research at the Great Barrier Reef in Australia and at St. Jude. He also tested waterfowl in West Memphis, Arkansas, and at waterfowl nesting grounds in Alberta, Canada.

St. Jude has been at the forefront of influenza research for decades.

Led by Webster, the hospital was designated a WHO Collaborating Center in 1975 for the study of influenza at the human-animal interface. The hospital is one of five Centers of Excellence for Influenza Research and Surveillance (CEIRS) of the National Institute of Allergy and Infectious Diseases.

"Robert Webster initiated the influenza research at Delaware Bay," says Scott Krauss, manager of laboratory operations for WHO/CEIRS Global Surveillance at St. Jude. "We're just following what he established. He was the first in, and he did it with support from St. Jude."

Webster's work with avian flu, originally funded

A cannon net is used to gather the birds while they feed on horseshoe crab eggs.

Jon Seiler (left), Pamela McKenzie and Robert Webster, PhD, collect the birds' fecal samples for influenza surveillance.

This year, the team gathered more than 600 samples, which were placed in vials and transported to St. Jude, where researchers run tests in the lab.

Young children are at high risk for serious complications from influenza. The disease is especially dangerous for children with cancer and other life-threatening disorders.

Karlie Woodard, a research technologist in St. Jude Infectious Diseases, prepares eggs in order to isolate viruses from the samples. The scientists will then determine whether the samples are flu-positive for surveillance purposes.

under a grant titled "Pandemic Preparedness in Asia," was later converted to a National Institute of Allergy and Infectious Diseases (NIAID) contract.

"The impact of Dr. Webster's work and its significance in public health led to an NIAID initiative to build capacity so that others in the scientific community could study influenza," says Pamela McKenzie, director of St. Jude CEIRS Global Surveillance.

Tracking flu to save lives

Delaware Bay is the longest, most well-established site for influenza A virus surveillance in shorebirds. It's an important component for pandemic preparedness, prevention and planning.

Ironically, the birds with flu appear completely healthy. Unlike in humans, these birds and the flu have formed an equilibrium. The flu thrives in the birds' guts and doesn't harm them.

Research like this also helps St. Jude Infectious Diseases' scientists understand how the flu is evolving. Webster says it's a difficult target.

Before he became an emeritus faculty member, Webster routinely represented St. Jude at the semi-annual WHO vaccine selection conferences. He joined scientists from the other WHO Collaborating Centers to designate which influenza strains should go into the vaccine for the coming year.

Today, Richard Webby, PhD, director of the St. Jude CEIRS program, attends that meeting and carries on Webster's work. The samples collected at Delaware Bay each year contribute information that helps scientists prepare for future pandemics or dangerous outbreaks in animals.

Flu forecasters

Predicting the next flu strain in humans is somewhat like predicting the weather, Webster says.

"We're pretty successful for the most part, but you cannot predict when there is going to be a pandemic," he says. "In 2009, we were preparing for a bird flu pandemic, and what did Mother Nature do? She gave us a virus out of pigs.

"If the virus goes from Delaware Bay to the chicken farms, things change," Webster continues. "That flu content in the gut of a ruddy turnstone can get nasty. It can become a killer." ■

An Unwavering PARTNER IN PAIN CARE

Kaylin McGuire shows two of her handcrafted bracelets to Doralina Anghelescu, MD, medical director of the St. Jude Pain Management Service. Kaylin says creating jewelry is one of many tactics she uses to provide a distraction from pain.

JUSTIN VENEMAN

The St. Jude Pain Management Service is dedicated to easing the hurt of illness and treatments.

By Maureen Salamon

Kaylin McGuire has a favorite saying: *"Excuses are the nails in the house of failure."*

The credo perfectly captures the special brand of grit the 21-year-old embodies. Diagnosed with bone cancer in her jaw and palate seven years ago, Kaylin leans on this trait constantly to cope with chronic, insistent pain from numerous facial reconstruction surgeries, some of which have required taking bone and tissue from her legs.

But she also relies heavily on her unwavering partner in pain care: St. Jude Children's Research Hospital. At every step of Kaylin's journey—from chemotherapy and radiation in the early months to ongoing procedures today—clinicians from the St. Jude Pain Management Service have alleviated her suffering by drawing from a robust toolbox of treatments. These range from oral and IV medications to nerve blocks and pain patches to non-drug approaches such as physical therapy, deep breathing and distraction.

To divert her focus from her hurting body, Kaylin busies herself with creating beautiful beaded bracelets by the hundreds, which she sells or gives as gifts.

"I still have pain, but I don't think about it as much," says the aspiring nurse. "I don't know what I would do without the pain team. They make sure I have everything I need and that I'm comfortable."

Standout program nationwide

Pain is an unwelcome—but never unchallenged—companion to many illnesses and treatments tackled at St. Jude.

Cancerous tumors can painfully press against nerves, bones and organs, while conditions such as sickle cell disease can prompt agonizing pain episodes, when crescent-shaped blood cells clog normal circulation. Meanwhile, treatments such as radiation can burn skin and mucus membranes, while chemotherapy side effects can include searing nerve pain. The pain can be short-lived when linked to surgery or other procedures, or lasting when triggered by illnesses or treatments.

But no matter how it arrives, pain is taxing to both body and soul.

"Cancer survivors report that the most distressing experience they encountered during their treatment was their exposure to painful procedures," explains Doralina Anghelescu, MD, medical director of the St. Jude Pain Management Service. "If pain isn't well-controlled, your heart has to beat faster, you consume more oxygen and your body produces more stress hormones, so there are physiologic consequences as well."

Launched formally in 2000, the service stands out as one of only a handful of similar programs at children's hospitals across the United States. St. Jude clinicians refer their patients to the program, which encompasses anesthesiologists, pharmacists, nurses, physical therapists and psychologists. These experts work together to treat complex pain issues or track major surgical cases that have a high likelihood of acute pain after surgery.

Stepped approach to pain relief

The multidisciplinary team decides on pain relief options by first categorizing each case as either nerve- or tissue-based pain. From there, they take a stepped approach, first using over-the-counter analgesics and moving on to morphine and other opioids when necessary.

When indicated, local or regional pain blocks are used at the same time as systemic drugs. Clinicians also complement medications whenever possible with physical therapy and psychological interventions such as teaching relaxation techniques.

"We're constantly pushing the limits because we still encounter situations where we're scratching our heads wondering what else we can try," Anghelescu says. "We don't feel we have everything we need yet. Clearly there's a place for drug development, and eventually I think gene therapy will play a role in pain management. There's a lot of space for innovation."

At every step of Kaylin's journey, clinicians from the St. Jude Pain Management Service have alleviated her suffering by drawing from a robust toolbox of treatments. These range from oral and IV medications to nerve blocks and pain patches to non-drug approaches such as physical therapy, deep breathing and distraction.

"I don't know what I would do without the pain team. They make sure I have everything I need and that I'm comfortable."
– Kaylin McGuire

New Pain Board bridges gap

The newest enhancement to the Pain Management Service is the recent creation of a Pain Board designed to bridge the gap among clinicians treating various forms of pain and to help educate caregivers on the best strategies for treating complex pain patients.

"The intention is to be a board similar to the concept of a Tumor Board, where clinicians in various disciplines sit around a table and review patients' imaging and clinical status to look at all the options for pain management and come up with a plan," Anghelescu says.

During her seven years of treatments, Kaylin has absorbed as much about the St. Jude ethos as she has about methods to control and calm her pain. She's laser-focused on someday becoming a nurse practitioner at St. Jude, partly to right the wrongs she experienced at another hospital where nurses didn't believe her descriptions of how bad her pain really was.

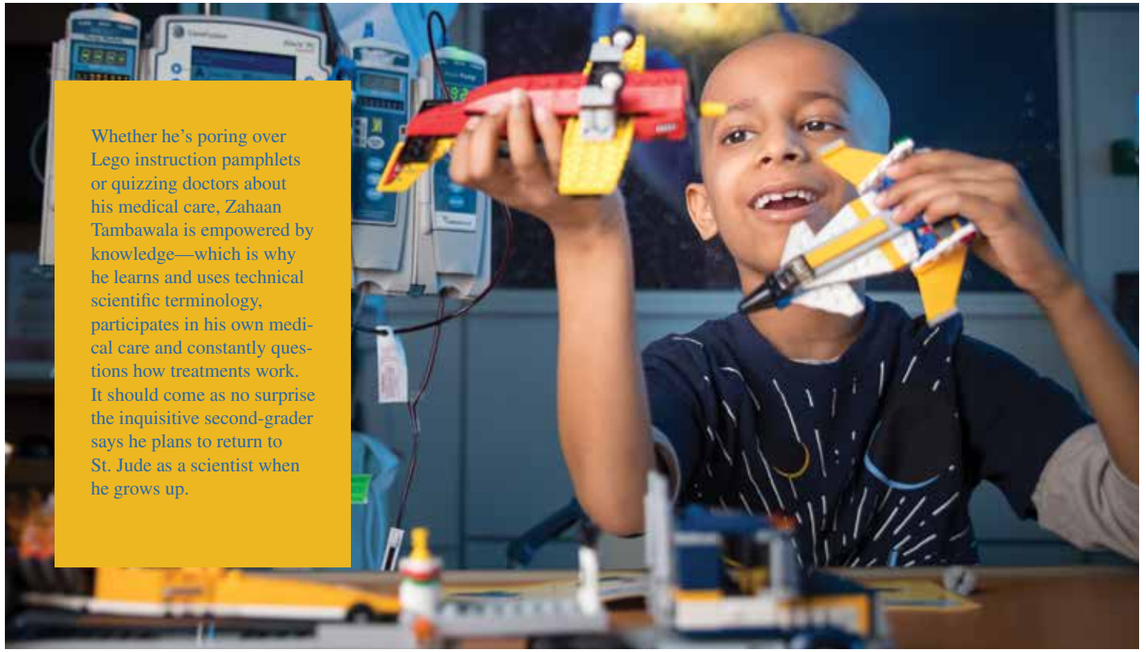
"We need nurses who understand how we feel and who understand how to work with patients and get them out of pain," she says. "At St. Jude, I feel like they really listen to me." ■

The Pieces Snap Together

SETH DIXON

Building on prior research, St. Jude scientists discover two genes suspected to cause brain tumors in children. This discovery lays the foundation to expand targeted treatments.

By Maureen Salamon



PETER BARTA

Whether he's poring over Lego instruction pamphlets or quizzing doctors about his medical care, Zahaan Tambawala is empowered by knowledge—which is why he learns and uses technical scientific terminology, participates in his own medical care and constantly questions how treatments work. It should come as no surprise the inquisitive second-grader says he plans to return to St. Jude as a scientist when he grows up.

In the most comprehensive analysis yet of medulloblastoma, an international group of scientists led by St. Jude identified genomic changes responsible for more than 75 percent of the tumors.

The day before Zahaan Tambawala was diagnosed with the brain tumor medulloblastoma, he insisted on buying food for kids at a local orphanage with money from his own piggy bank.

The 7-year-old's random act of kindness was actually one of a series of big-hearted deeds leading up to his diagnosis, including volunteering to help a new classmate adjust to school and asking to donate his hair to children with medical needs. Although Zahaan had always been outgoing and precocious, his parents were proud but a bit puzzled by their son's actions.

But the couple was certain about one thing. For the finest follow-up care after surgery, they wanted to take their son to St. Jude Children's Research Hospital.

"I was told St. Jude is one of the best places in the world, and that's when our journey here began," says Zahaan's father, Murtuza.

Designing targeted therapies

After receiving a doctor's referral, the Tambawala family traveled to St. Jude from their home in Singapore. Zahaan has undergone chemotherapy and highly precise proton radiation therapy. That cutting-edge treatment coincides with recent advances revealing the genomic landscape of the malignant brain tumor.

In the most comprehensive analysis yet of medulloblastoma, an international group of scientists led by St. Jude identified genomic changes responsible for more than 75 percent of the tumors. The researchers also discovered two new suspected cancer genes found exclusively in the least-understood disease subgroups.

Published in the journal *Nature*, the findings will aid efforts to develop desperately needed precision medicines combating medulloblastoma.

Current therapies are only partially tailored to which of the four disease subgroups affect a patient, but typically combine surgery, chemotherapy and radiation. A child's prognosis depends greatly on the disease subgroup. These subgroups are named WNT, sonic hedgehog, Group 3 and Group 4.

About 95 percent of children in the WNT subgroup enjoy long-term survival, compared to about 50 percent of patients in Group 3. Overall, about 70 percent of patients survive beyond five years.

But both survival rates and treatment side effects need to improve drastically—an ambition fueling research all over the globe, says St. Jude cancer biologist and medulloblastoma expert Paul Northcott, PhD, co-first author of the new study.

"Standard therapies fall short because if you expose a child's developing central nervous system to radiation, it can induce damage," he says, explaining that thinking,

PETER BARTA

Paul Northcott, PhD (left), is co-first author of a study that discovered two new suspected cancer genes found exclusively in the least-understood medulloblastoma subgroups.

memory and other cognitive skills can be affected.

"Likewise, chemotherapies target dividing cells, but a growing child may have many normal cells actively dividing," he continues. "The movement is to develop more specific therapies that only target tumor cells, an oncogene that is over-expressed, or a signaling pathway that is activated in cells it shouldn't be."

Data stacked upon data

This once-lofty goal is now within reach. Northcott and his colleagues built off some of their own prior research that uncovered "low-hanging fruit"—genes that mutate at a high frequency in medulloblastoma. In the latest study, the scientists discovered two new suspected cancer-fueling oncogenes altered only in Group 3 and Group 4 medulloblastoma, which account for 65 to 70 percent of all cases of the malignant brain tumor.

The pair of genes, *KBTBD4* and *PRDM6*, had not previously been linked with any type of cancer. And previously, less than one-third of mutations driving Group 3 and Group 4 medulloblastoma had been identified.

"It's a big discovery," Northcott says. "You don't expect to find new cancer genes in 2017. If you talked to the godfathers of cancer genomics, they would've basically said all of the important cancer genes had already been found."

International collaboration was crucial to generate the large numbers of patients required to produce these insights. Teaming with the German Cancer Research Center and The Hospital for Sick Children in Toronto, among others, St. Jude investigators performed whole-genome or whole-exome sequencing on tumor and normal tissue collected from 491 medulloblastoma patients. The genome is the complete set of genetic information carried inside nearly all cells.

This data was then layered with epigenetic data—chemical modifications to DNA that regulate genes—from 1,256 patients and gene expression data from 392 tumors.

"We covered all of the main attributes of the cancer at the molecular level," Northcott explains. "Each on its own is powerful and gives a snapshot of what could be contributing to the cancer. But what I and many others realized is the utility of bringing these different data types together to make even further insights. Each of the individual components themselves couldn't come to that conclusion."

Under construction: Precision-based treatments

With the disease's genetic and molecular underpinnings far better defined, the next logical step is to reclassify Group 3 and Group 4 medulloblastoma into a series of discrete subtypes. Northcott says he is excited to help design a new clinical trial testing various treatments in each of these subtypes.

"This will change the way we're going to approach patients," he says. "It's really going to push us toward a precision-based approach. It's another level of resolution we didn't have before."

Being at St. Jude has offered the Tambawalas a different sort of resolution, spurring personal growth and gratitude. The Lego-loving second-grader has become even more sympathetic to other children in need.

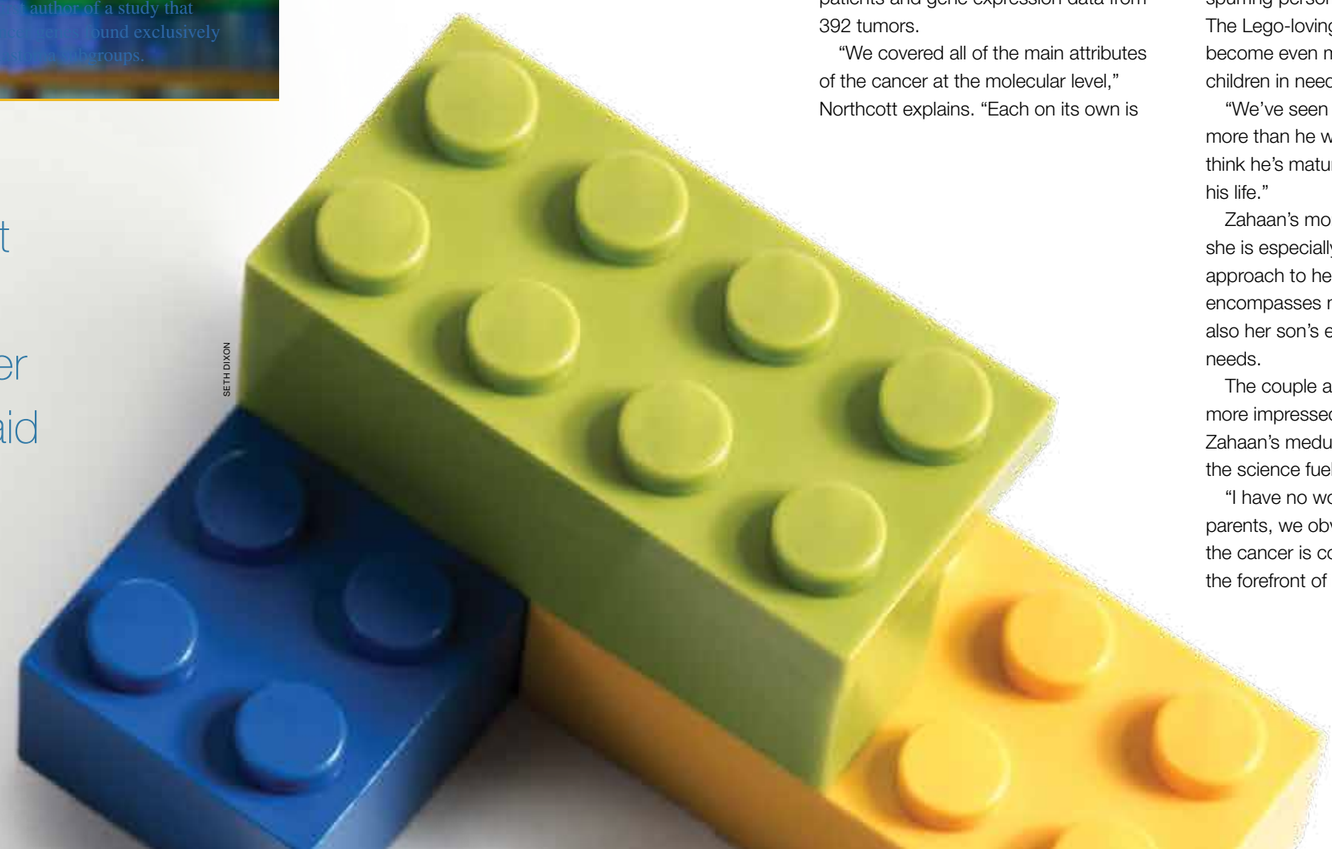
"We've seen him being compassionate, more than he was before," Murtuza says. "I think he's maturing through this episode in his life."

Zahaan's mom, Karishma, adds that she is especially thankful for the holistic approach to healing at St. Jude, which encompasses not only medical issues but also her son's emotional and psychological needs.

The couple agree they couldn't be more impressed and hopeful—both with Zahaan's medulloblastoma treatment and the science fueling it.

"I have no words," Murtuza says. "As parents, we obviously want to know where the cancer is coming from. St. Jude is at the forefront of it all." ■

> "It's a big discovery. You don't expect to find new cancer genes in 2017. If you talked to the godfathers of cancer genomics, they would've basically said all of the important cancer genes had already been found."
>
> *– Paul Northcott, PhD*



SETH DIXON

TAMING THE

"C" MONSTER

By Elizabeth Jane Walker

SETH DIXON

Catherine Lam, MD, talks with 7-year-old Lily Fielding during the Collaborative Rare Endocrine Tumor Referral Clinic.

Every child knows monsters can lurk behind doors, under dark beds or beneath murky seas. But sometimes parents also lie in bed and stare into the void created by a beast in the shadows. They may know the monster's name, but not how to vanquish it.

For Peter and Eileen Fielding, the foe is a rare endocrine cancer called an adrenocortical tumor. Chicago surgeons recently removed this abnormal growth from their 7-year-old daughter, Lily. The cancer affects glands that produce the body's hormones. It is diagnosed in just 20 to 25 children annually in the U.S.

"We have the original monster out of her," Peter says. "But we can't ensure we have every last cancer cell out of her body. We don't know whether there's some piece of that monster still in her, trying to regain footing and start anew. If so, where is it? Will it come back? If so, when? How aggressively? In what organs? Can we go after it again? We don't know. So we're in a really insecure place right now."

Seeking answers to those questions, the Fieldings recently traveled to Memphis, Tennessee. There, they attended the Collaborative Rare Endocrine Tumor Referral Clinic at St. Jude Children's Research Hospital.

Organized and led by St. Jude oncologist Catherine Lam, MD, the two-day clinic brings patients and families who are treated elsewhere to St. Jude for medical exams, an educational seminar, an in-depth consultation with a panel of experts, and the chance to meet other families with endocrine tumors.

Hosting such a focused clinic allows clinicians to expand their knowledge of these childhood cancers and to assist more children and their physicians.

"It's a unique opportunity to bring together many different disciplines with expertise and interest in these rare tumors and to offer these special patients a consensus team approach," Lam says. "Patients and families who may not otherwise have that opportunity can ask questions and hopefully get some answers."

Exams, advice, support

The Fieldings and three other families traveled to Memphis from as far away as New York and Oklahoma for the June 2017 clinic. This free service is offered to patients who are referred by their physicians. St. Jude provides travel, housing and meals for attendees.

Peter Fielding says he and his wife jumped at the opportunity to attend the clinic.

"St. Jude is the one charity I've supported for many years," he says. "My nephew also received treatment for a brain tumor there. It's sadly ironic that now we're turning to St. Jude for guidance."

The clinic provides a second opinion on topics ranging from diagnosis and therapy to genetics and follow-up care. St. Jude may be able to enroll a child in a clinical trial if one is available and the patient is eligible. Patients in the clinic may also donate tissue samples to the hospital's Biorepository for use in future research.

The referral clinic is an important part of the hospital's strategic plan, which calls for the creation of national referral clinics for several rare cancers.

"Advancing cures for these cancers requires a collaborative effort," explains James R. Downing, MD, St. Jude president and chief executive officer. "Because of their rarity, no institution will see

PETER BARTA

Clinic participants undergo a full day of testing and consultations, before meeting with a panel of specialists to discuss their cases.

many cases of these tumors. By hosting clinics like this one, we can make headway on pediatric cancers in which progress has not been made."

In search of answers

The hospital has a long history of endocrine cancer research. Nearly 30 years ago, St. Jude developed the International Pediatric Adrenocortical Tumor Registry to provide a central repository for data and tumor samples.

"When we began studying this disease, oncology textbooks included about one paragraph on it," recalls Raul Ribeiro, MD, Oncology. "Nobody else was interested in developing protocols because of the rarity of this tumor."

Today, the registry includes samples and data from nearly 400 patients. Scientists and clinicians use this resource to better understand adrenocortical tumors, about which little is known.

Two of the clinic's leaders—Alberto Pappo, MD, director of the Solid Tumor Division; and Carlos Rodriguez-Galindo, MD, executive vice president and chair of Global Pediatric Medicine—have headed the Rare Tumors Committee for the Children's Oncology Group, a National Cancer Institute–supported clinical trials group. In addition to treating children at the hospital in Memphis, St. Jude experts regularly consult on endocrine cases throughout the U.S. and around the world.

"Our oncology team in Chicago has seen very few cases of this particular type of cancer," Peter Fielding says. "Learning about this 'on the job' is not an option for us….We need a team with demonstrable first-hand knowledge and expertise of this beast."

"St. Jude has some of the most knowledgeable people in the world on this cancer," he continues. "The answers to some of our questions don't even exist right now. But the clinic provided us with more clarity and a better understanding of what we should do next."

One problem, many perspectives

Clinic participants undergo a full day of testing and consultations, followed by an educational seminar. The following day, each family meets with a panel of specialists to discuss their child's case.

Ten-year-old Hailey Coniber traveled from New York to attend the clinic. Her mom says the panel discussion was especially helpful. The family obtained insights from a group that included specialists in oncology, endocrinology, pathology, radiology and nuclear medicine, surgery, nursing, pharmacy, and cancer predisposition experts. Every person in the room focused exclusively on Hailey and her challenges.

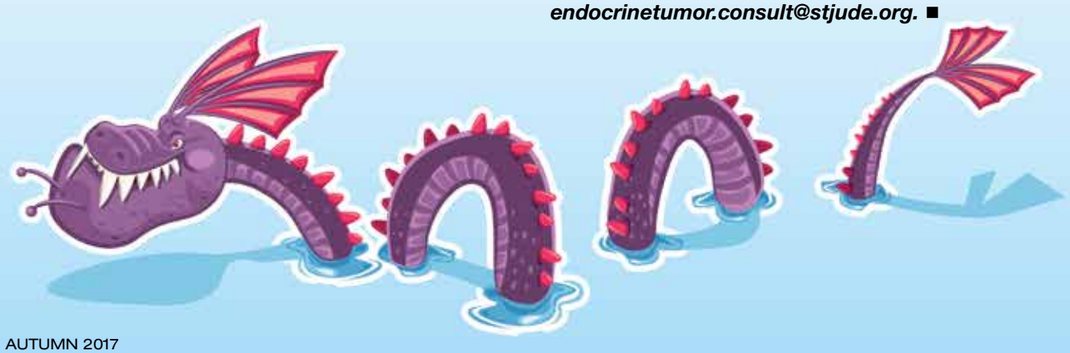
"We weren't quite sure what to expect when we arrived at St. Jude," Melissa Coniber says. "But the fact that we got to meet with researchers who were working on this particular cancer was a good benefit for us. Our meeting with the entire team—having everybody together at the same time—was the biggest asset."

Support for the journey ahead

The Fielding family returned to Chicago armed with information and buoyed by new relationships with patient families and medical experts. The couple say they are comforted to know the St. Jude team is poised to assist and offer counsel if new medical questions arise.

"It felt good to be at an organization that was so knowledgeable about a disease for which there's very little knowledge available," Eileen says. "I was nervous going in, but I was overwhelmed by the goodness of every single person we met. When you're in dire straits, in need of information and so upset, it's comforting to meet people who treat you with kindness and understand what you're going through. I really appreciated that."

For information about future Rare Endocrine Tumor Referral Clinics, call (901) 595-6110 or email *endocrinetumor.consult@stjude.org.* ■



Investing *in the Kids*

STOCKS MAY RISE AND FALL, BUT A LONG-TERM INVESTMENT IN THE LIVES OF CHILDREN ALWAYS PAYS DIVIDENDS.

By Rachel Schwartzberg

Richard and Sally Knuth set themselves an ambitious philanthropic goal a number of years ago: to donate $2 million in stock to support the mission of St. Jude Children's Research Hospital. They are proud to have accomplished that remarkable achievement this year.

The couple's generosity has roots in the mid-1980s, when Richard's mother moved to Iowa to live with them after his father died.

"My parents had saved railroad retirement money, so I said to my mother, 'Let's invest,'" Richard says. "We bought a few thousand dollars in Exxon stock. It split two or three times. Sally and I paid taxes on the dividends. Meanwhile, it just went up and up."

They invested in other publicly traded stock that also performed well.

"Somehow, we never took a loss," Richard notes.

By the time his mother passed away in the early 1990s, the couple inherited a valuable portfolio. They moved from Iowa to Florida, seeking a more temperate climate, before relocating to Nevada in their retirement.

Richard's mother was a big fan of the late entertainer Danny Thomas, who founded St. Jude. Once the couple learned more about the hospital, they decided there wasn't a more deserving cause to support.

"St. Jude is doing good research and saving the lives of little children," Richard says. "There's no place else to compare it with."

For more information about donating stock to St. Jude or other ways you can support the hospital's lifesaving mission, call 1-800-910-3188 or email giftplanning@stjude.org. ■

"St. Jude is doing good research and saving the lives of little children. There's no place else to compare it with."

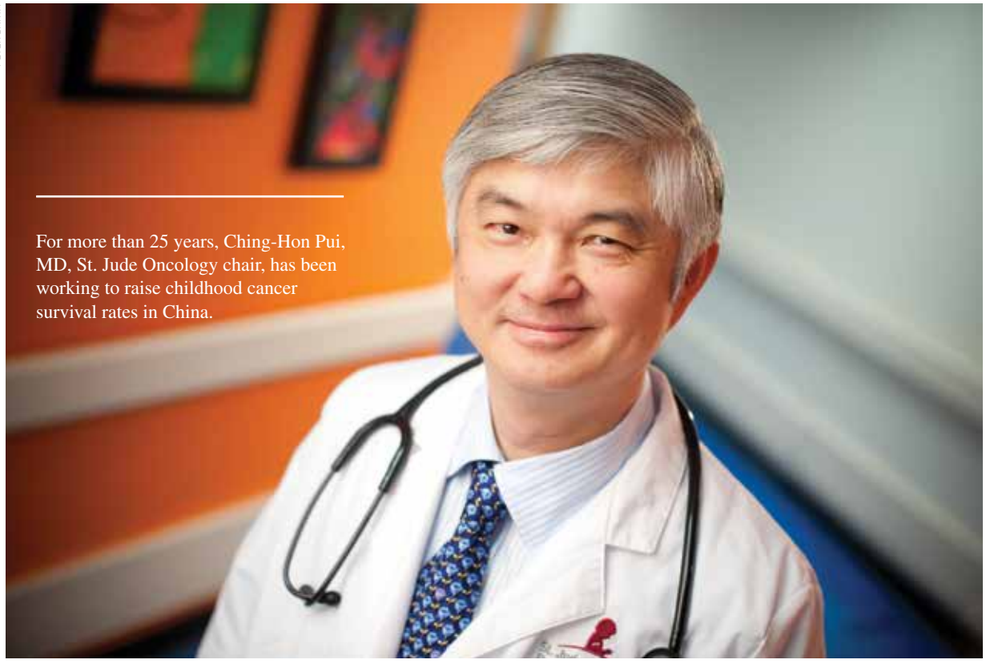
– Richard Knuth

ST. JUDE IN China

By Chris Pennington

Thanks to St. Jude, the number of children receiving cancer treatment in China is soaring with more exciting improvements to come.

PETER BARTA



For more than 25 years, Ching-Hon Pui, MD, St. Jude Oncology chair, has been working to raise childhood cancer survival rates in China.

In China, cancer is a major cause of childhood death.

Each year, about 40,000 children are diagnosed with the disease, about 10,000 of whom have acute lymphoblastic leukemia (ALL). Before the year 2000, fewer than 10 percent of children with cancer received treatment, with individual families required to shoulder the financial burden of therapy.

But thanks to St. Jude Children's Research Hospital, the number of children receiving cancer treatment in China has skyrocketed.

After a 2011 Chinese medical insurance policy provided many children with access to treatment, Ching-Hon Pui, MD, St. Jude Oncology chair, proposed that Shanghai Children's Medical Center form a study group to provide high-quality treatment for children with ALL. With his input, the Chinese Children's Cancer Group ALL clinical trial was developed. Since 2015, that trial has enrolled 1,250 patients annually in 20 major hospitals across China.

With the Chinese government's approval, Shanghai Children's Medical Center and St. Jude developed a National Childhood Cancer Center and established a collaborative framework for cancer treatment and research.

"We need to go where the patients are," says Carlos Rodriguez-Galindo, MD, St. Jude Global Pediatric Medicine chair and executive vice president. "Our mission is to advance care for all children with cancer in the world."

> **"I said, 'Let's make a deal with Beijing and Shanghai, and let's start to save lives.'"**
> *–Ching-Hon Pui, MD*

Don't let them go home to die

In 1991, Pui began working with Beijing Children's Hospital and Shanghai Children's Medical Center, teaching and training their physicians and nurses.

Twelve years later, he had a dramatic experience during a visit to one of the hospitals.

"I saw a mother screaming for help to save her child with leukemia," he says. "And then I realized that after all these years, I might not have saved a single child with leukemia in China."

He had assumed the government had been subsidizing cancer care, but that wasn't the case. Pui then received assistance from St. Jude to treat a group of children. That project proved to Chinese officials that childhood ALL was curable and the treatment was affordable.

With the support of the Hope Foundation established by a St. Jude Board member, Pui collaborated with physicians at Shanghai Children's Medical Center and Beijing Children's Hospital to develop a clinical trial that treated 149 patients, 86 percent of whom remain in continuous complete remission. After results of the trial were published in *Pediatric Blood and Cancer* and the project was introduced to Chen Zhu, MD, China's minister of health, the official selected childhood ALL as the first disease to be covered by his new national medical insurance.

Soon, more than 70 percent of children with ALL were being treated nationwide.

In 2012, Pui suggested to Zhu that China needed to develop a center like St. Jude for education, training, teaching and research.

"He agreed," Pui says.

Today, the National Childhood Cancer Center is under construction in Shanghai.

"We now have an embryo of a network that could change the landscape of childhood cancer in China."
–Carlos Rodriguez-Galindo, MD

A new model

Rodriguez-Galindo stresses the importance of sharing worldwide the techniques and processes central to the historic success of St. Jude clinical trials.

"At St. Jude, our practice, our values and our models have been evolving for more than 50 years, leaving a culture—a corporate memory—that's invaluable," Rodriguez-Galindo says. "We've constantly improved our systems, and our current results and quality of care reflect the many years of striving to achieve perfection."

Physicians and researchers from China recently traveled to St. Jude to learn the principles behind building clinical trials, collecting data and identifying challenges.

"We reviewed principles of clinical research and analytics, and quality improvement methodology," Rodriguez-Galindo says. "But we also discussed the importance of developing comprehensive clinical care models as well as integrating clinical research into practice."

"It's not just helping them; we think the project is going to have an impact for everyone involved in pediatric leukemia research."
–Jinghui Zhang, PhD

Genomic research

In 2015, through the leadership of James R. Downing, MD, St. Jude president and chief executive officer, St. Jude expanded its work in China and launched a collaborative research project that included whole genome sequencing of patients.

Coordinating a collaborative research project between scientists in Memphis and China means in addition to the science requirements, there are also patient protection measures, government and quality concerns, and financial and legal issues.

"As a researcher, I never thought I'd spend so much time on those things," says Jinghui Zhang, PhD, St. Jude Computational Biology chair. "But it was a worthwhile experience.

"Our lab staff were invaluable to the successful launch of this project, and it's taught our collaborators how to operate first-class genomic research."

At the suggestion of Jun J. Yang, PhD, of St. Jude Pharmaceutical Sciences, the project focused on relapsed patients with ALL. Scientists and physicians at St. Jude and the National Cancer Center in Shanghai worked together to collect, process and analyze patient samples.

Their efforts are paying off.

Jinghui Zhang, PhD; Carlos Rodriguez-Galindo, MD; and Ching-Hon Pui, MD, participate in a meeting during a recent trip to China.

"The preliminary data revealed specific genetic changes in patients who relapsed," Yang says. "That provides important insight into why treatment initially failed.

"Being able to monitor the emergence of these mutations means leukemia relapse can be identified earlier and therapies can be implemented sooner," Yang adds.

"Together, we accelerate the science and advance the cure."
–Ching-Hon Pui, MD

A global collaboration

The new St. Jude Global Alliance–China is a testament to the partnerships formed over decades. The alliance incorporates the sharing of information and technology. That effort also encompasses education as well as clinical and translational research. St. Jude shares its experience and technology, while Chinese partners share data and outcomes. With China as a blueprint, St. Jude plans to create similar partnerships with other countries in Asia.

"Our goal is to treat at least 5,000 patients in the next few years on the current ALL clinical trial in China," Rodriguez-Galindo says. "It's the largest trial of its kind, so we're making sure this is done well and that it benefits these children and cancer treatment in the future."

At its core, it's about doing research together and helping more children.

"It's been a lot of work, but it has been rewarding," Pui says of his work in China. "There's still a lot of work to do and a lot of children to help, but we now have an army of people participating." ■

PHOTOS BY ANN-MARGARET HEDGES

Ricky Bunting

Opening Doors *to the Future*

Inspired by the children of St. Jude, a Brooks Brothers doorman raises funds and awareness for the hospital.

By Richard J. Alley

It's a long way from the farmlands of North Carolina to New York's Madison Avenue. But for Ricky Bunting, doorman for St. Jude Children's Research Hospital's partner Brooks Brothers, the idea of giving back is what connects the two.

"I was born in the South, so I learned to help others when they couldn't help themselves," he says. "I pitch in anywhere I can to try and help someone."

Bunting has been meeting and greeting customers at the front door of the 200-year-old clothier since 2004, and he takes the privilege of raising money for St. Jude to heart. With little more than a friendly smile and charismatic nature, Bunting has raised $12,000 for St. Jude since 2008 through the generosity of Brooks Brothers' guests.

"The unwavering support and commitment of people like Ricky and Brooks Brothers to the St. Jude mission are extraordinary and essential to helping our doctors and scientists continue their groundbreaking research that leads to lifesaving treatments," says Marlo Thomas, St. Jude national outreach director. "Their actions, and those of the millions of supporters around the world, embody the spirit of the St. Jude *Thanks and Giving*® campaign and help ensure that families never receive a bill from St. Jude for anything—not for treatment, travel, housing or food—because all a family should worry about is helping their child live."

Inspired by family

Bunting has three children and two grandchildren, and it's with thoughts of his family that the 59-year-old makes the trek from his home in Brooklyn to the flagship store in Manhattan every day to greet customers. During June, November and December—through the St. Jude Father's Day and *Thanks and Giving* campaigns—he raises money for the hospital.

> "No family should have to go through this, and I'm very proud of working for a company like this that gives back to kids who can't help themselves."

When St. Jude opened the $20 million Brooks Brothers Computational Biology Center in the Kay Research and Care Center in 2015, company representatives traveled to Memphis for the ceremony. A special surprise awaited Bunting.

"As the doors open, I look to the right and there's my picture on the wall," he recalls. "I had tears in my eyes, I was so shocked."

Generosity in the genes

Through the enthusiasm and dedication of its employees—and the generosity of its guests—Brooks Brothers has raised $16.5 million since 2005.

"Our partnership with St. Jude has evolved into a family affair here at Brooks Brothers. It is truly a part of our corporate DNA, and our associates are thoroughly engaged as ambassadors for the children," says Emilie Antonetti, vice president, social purpose, and managing director of the Golden Fleece Foundation.

"Ricky has made it his mission to tell one and all who visit Brooks Brothers about St. Jude," Antonetti continues. "He is not shy about engaging customers, telling them Danny Thomas' story and asking for a donation … always with a smile and his special charm."

Marlo Thomas, St. Jude national outreach director, prepares for this year's St. Jude *Thanks and Giving* with (from left) Gabrielle Dedman, Aamir Banks and Trinity Cunningham.

Extended family of supporters

Along with Brooks Brothers, more than 70 major brands are part of St. Jude *Thanks and Giving*, such as Best Buy, Kmart, Domino's, Kay Jewelers® , HomeGoods, ANN INC., Chili's, New York & Company, AutoZone, Williams-Sonoma Inc., Christopher & Banks, Dollar General, Marshall's, Mazda, DXL, Claire's, GNC and many more.

In addition to generous corporate partners, St. Jude *Thanks and Giving* features celebrity supporters who donate their time to support St. Jude. This year, Jennifer Aniston, Sofia Vergara, Michael Strahan, Jimmy Kimmel, Luis Fonsi and Marlo Thomas will appear alongside St. Jude patients in the ads. A movie trailer featuring these stars will also appear on theater screens nationwide at Regal Entertainment Group, AMC, Marcus Theaters and many others.

Making memories

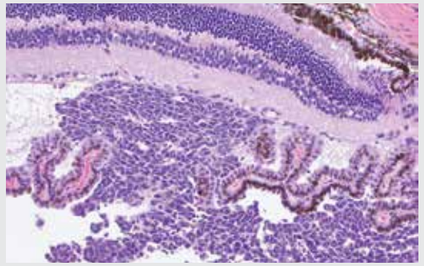
As exciting as it was for Bunting to step off the elevator at St. Jude and see his photo, it was meeting with patients that left him with his most indelible memory.

"I was a little nervous at first because I'm very emotional with kids," he says. "I met these two young ladies—two sisters—and one asked what we were doing there. I told her, 'We work for Brooks Brothers, and we try to raise more money each year for St. Jude.' And she said, 'I want to thank you, because the hospital saved my life twice.'

"That's something I'll never forget." ■

research highlights

St. Jude offers free resources to accelerate solid-tumor research



A sample of the eye tumor retinoblastoma

What's the best way to find cures for some of the deadliest childhood cancers?

St. Jude scientists believe the answer may lie in sharing information.

That's why St. Jude created the world's largest collection of resources for studying childhood solid tumors. These resources are available at no cost to scientists worldwide.

Through the Childhood Solid Tumor Network at St. Jude, scientists can obtain tumor samples, plus details about drug sensitivity and related data. The resources were generated at St. Jude with the help of patients and families.

Michael Dyer, PhD, St. Jude Developmental Neurobiology chair and a Howard Hughes Medical Institute investigator, says more than 800 tumor samples and related data have been sent to more than 130 scientists. The recipients work at 66 research centers in the U.S. and 10 other countries.

A report on the Childhood Solid Tumor Network recently appeared in the journal *Nature*.

Discovery points to drugs to 'short-circuit' deadly leukemia

Yu Fukuda, PhD (left), and John Schuetz, PhD

St. Jude researchers have discovered that survival of an aggressive form of acute myeloid leukemia (AML) depends on production of a small molecule called heme. The finding points the way to new targeted drug therapies that block heme synthesis and kill leukemic cells.

Heme is best known as part of oxygen-carrying hemoglobin in red blood cells. But heme also plays an essential role in transporting electrons. Among these roles is the machinery for cell respiration.

"Absolutely nothing was known about this role for heme biosynthesis before our work," said John Schuetz, PhD, of St. Jude Pharmaceutical Sciences.

The findings suggest two drug strategies to treat AML. Schuetz said certain other cancers—particularly one subtype of the brain cancer medulloblastoma—might also be vulnerable to such a treatment strategy.

A report on the research appeared in the journal *JCI Insight*.

St. Jude signs RSV vaccine agreement

St. Jude and Serum Institute of India have signed a licensing agreement to complete development and commercialization of a St. Jude vaccine against the respiratory syncytial virus (RSV).

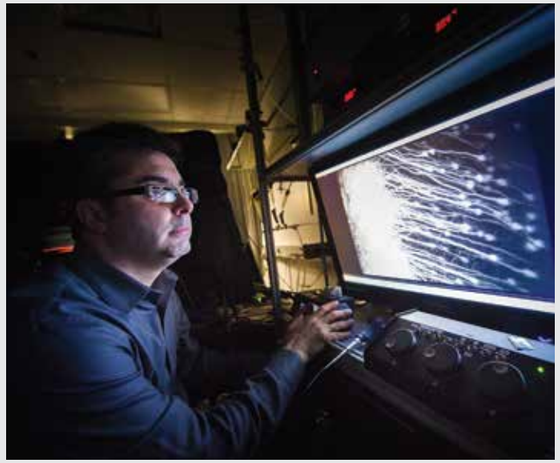
RSV can cause serious lower respiratory infections. Infants are at high risk for the infection, and there are currently no approved vaccines.

Researchers estimate that worldwide, in a single year, as many as 34 million children younger than 5 years old may experience acute infections caused by RSV. About 10 percent of those children may require hospitalization.

The agreement gives Serum Institute of India the right to design and conduct clinical trials of the patented St. Jude vaccine, known as SeVRSV.

"RSV remains a serious threat to infants worldwide during their first year of life and to anyone, including pediatric cancer patients, whose immune response has been weakened by illness or age," said James R. Downing, MD, St. Jude president and chief executive officer. "We are pleased that Serum's staff and leadership have recognized the life-saving potential of this vaccine. We look forward to working closely with them to make this vaccine accessible around the globe."

Too old to learn a new language? Maybe not, hints new research



Stanislav Zakharenko, MD, PhD

Imagine being able to learn a new language as easily as an infant or toddler can. How about learning a musical instrument? St. Jude scientists have discovered how one day that may be possible.

The approach involves limiting the activity of a chemical messenger in a key part of the brain. That messenger is adenosine. When researchers reduced or limited adenosine's activity in a certain brain region, mice could learn from sound much later in life.

"The findings offer a promising strategy to extend the same window for auditory learning in humans," said Stanislav Zakharenko, MD, PhD, of St. Jude Developmental Neurobiology. That strategy might involve developing drugs to block adenosine's activity.

The research appeared in the journal *Science*.

Learning the rules of a serious game

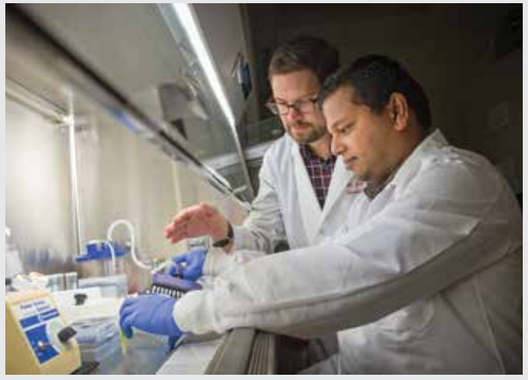
The immune system depends on molecules on the surface of white blood cells to "see" the outside world. The system relies on those molecules, called T cell receptors, to recognize and rally the immune system to respond to viruses, bacteria, cancer cells or other threats.

The immune system does its best to be ready. Scientists estimate that at any given time every person has the ability to make about 100 million different T cell receptors. Each receptor can identify a particular threat.

Until now, scientists have not understood the rules of this complex game and how to harness the immune system to protect us. Scientists at St. Jude and Fred Hutchinson Cancer Center in Seattle have developed a tool that helps decode the process.

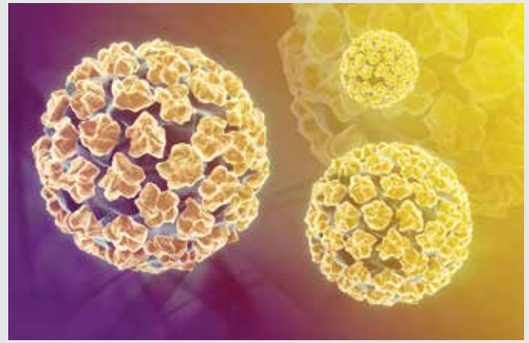
"This lays the groundwork for designing T cell receptors that recognize cancer or new viruses, which should help us use the immune system more effectively," said Paul Thomas, PhD, of the St. Jude Department of Immunology.

The research appeared in the journal *Nature*.



Paul Thomas, PhD (left), and Pradyot Dash, DVM, PhD

HPV vaccinations crucial for childhood cancer survivors



Human papillomavirus

The human papillomavirus, also known as HPV, is a virus that can cause cancers and other diseases in both men and women. Childhood cancer survivors are at a high risk for cancers associated with HPV.

Prevention of HPV infections is simple: get vaccinated.

And yet, the first comprehensive national survey shows that HPV vaccination rates for childhood cancer survivors lag well behind the national average.

Recommendations from health care providers were the most powerful predictor of whether survivors were vaccinated. Even so, health care providers often fail to recommend the vaccine.

"The findings underscore the key role of health care providers to help increase HPV vaccination rates in this high-risk population," said James Klosky, PhD, of St. Jude Psychology.

Researchers concluded that better communication among survivors, parents and health care providers may help remove some barriers to vaccination. Scientists plan to design strategies to ensure health care providers recommend the vaccine to eligible patients and their parents.

A report on this study appeared in the *Journal of Clinical Oncology*.

Donors and Volunteers: ***The Lifeblood of St. Jude***

THOUSANDS OF PEOPLE NATIONWIDE WORK TOGETHER TO HELP FIND CURES AND SAVE CHILDREN.

By Richard C. Shadyac

In my role as president and CEO of ALSAC, I am privileged to travel the country and meet many amazing people who love and support St. Jude Children's Research Hospital.

I am humbled by how many of our donors and volunteers freely give of their time, talents and hard-earned dollars to support the lifesaving work done at St. Jude. And, more often than I can count, these caring individuals tell me they are grateful to be given the opportunity to help our patients and families in need. What an inspiring perspective.

This summer, we hosted some of our volunteers during special awards ceremonies in Memphis. It was powerful to see and hear the commitment and dedication of these St. Jude champions.

There was Lisa Ballard, a St. Jude Math-A-Thon coordinator and a school teacher who travels to St. Jude every summer to create craft activities for patient families. Sue Henderson, a St. Jude Hero who began raising funds for St. Jude while running half marathons in 2011, tearfully pledged to help as long as she could. And Jeff Newton, builder of our Charlotte, North Carolina, St. Jude Dream Home, recalled his own daughter's medical issues and his personal resolve to support St. Jude.

Just two weeks after that ceremony, a caravan of volunteers and supporters descended on the hospital's campus for the annual Memphis to Peoria Run. For 36 years, these staunch supporters—many of whom use their vacation time to help with this event—run the 465 miles day and night from Memphis to Peoria, Illinois, to raise funds and awareness for St. Jude.

It's a bonding experience unlike any other, struggling to sleep in cramped RV quarters and pushing through aching muscles to complete the miles. Yet, no one complains. Instead, they draw upon the inspiration of the researchers tirelessly seeking cures; the doctors, nurses and staff who do whatever it takes to help a child heal; and the stories of the patients and families who bravely battle cancer with strength and hope.

It is because of volunteers like these, and generous donors from all walks of life, that St. Jude can continue breaking new ground in the research and treatment of childhood cancer and other life-threatening diseases. And that we can keep the promise of St. Jude founder Danny Thomas that no family will ever receive a bill from St. Jude for treatment, travel, housing or food—because all a family should worry about is helping their child live.

Our supporters and volunteers are the lifeblood of St. Jude, and we cannot thank them enough for all they do for the children of St. Jude.

Richard C. Shadyac is president and CEO of ALSAC, the fundraising and awareness organization for St. Jude. ■

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New beginnings

When former St. Jude patient Kate Bauer agreed to take part in St. Jude LIFE, a longterm follow-up study for cancer survivors, she never dreamed she would soon be saying "yes" to another request.

As a teenager, Bauer had spent two years undergoing treatment for non-Hodgkin lymphoma. Now she wanted her boyfriend, Nate LaFleur, MD, to see the hospital that had played such a crucial role in her life.

Before their visit, LaFleur secretly arranged for Bauer's care team and a photographer to be present during his marriage proposal. He popped the question in a waiting area where Bauer and her mom had spent hours gazing at the aquariums and devising creative stories about the secret lives of each fish.

After their wedding in November of 2017, Bauer plans to continue participating in the survivorship study.

"It's such a great program, and I feel like I owe my life to St. Jude," she said. "Anything I can do to help is very important to me."

PETER BARTA

Finding cures. Saving children.