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Promise

is a quarterly publication of the
Communications Department
St. Jude Children's Research Hospital
262 Danny Thomas Place
Memphis, Tennessee 38105-3678

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A publication of St. Jude Children's Research Hospital Autumn 2013



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Public Information:
1-866-2STJUDE (278-5833),
ext. 3306

Donations: 1-800-822-6344
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The Treasure Seekers

BY CAROLE WEAVER

St. Jude scientists unearth genes driving the most common childhood tumor of the brain and spinal cord.

A café sits at the heart of St. Jude Children's Research Hospital. Every day, its tables and candy-colored chairs host familiar scenes: a parent hugging a tired child, a nurse sipping a needed cup of coffee. But one day this spring, café patrons witnessed a more unusual spectacle—exultant scientists, laughing and celebrating.

"We were jumping up and down," recalls Jinghui Zhang, PhD, of Computational Biology. Her collaborator, David Ellison, MD, PhD, Pathology chair, had just revealed a key piece of data. It clinched what the researchers already suspected: They had struck genetic gold.

What they had discovered was a tiny change in the DNA of the cells in low-grade glioma, the most common childhood tumor of the brain and spinal cord. The alteration was so small they had almost missed it. Yet, as Ellison's data proved, this tiny change was enough to turn a normal brain cell into something deadly.

Tackling hard-to-treat tumors

Low-grade gliomas are slow growing but can be devastating. Although some types of low-grade glioma can be surgically removed with excellent results, others are challenging to treat. One example is a subtype called diffuse glioma, which infiltrates the healthy brain in ways that make surgery impossible.

"These tumors continue to grow and cause a lot of problems for children over the years," Ellison says. "Cognitive and physical abilities can slowly decline. And ultimately, even though the tumors are less aggressive than other types of brain tumor, they cause premature death."

For difficult-to-treat cases, chemotherapy and radiation are standard therapies.

Two-year-old Juliauna Blackledge looks strong enough to stand up to the chemotherapy she is receiving at St. Jude for a tumor on her optic nerve. She plays with determined focus and lets loose a deep, delighted laugh when something pleases her.

However, Juliauna's chemotherapy regimen exacts a stiff price.

Jinghui Zhang, PhD (at left), of Computational Biology, and David Ellison, MD, PhD, Pathology chair, recently discovered tiny changes that can transform a normal brain cell into a cancerous cell.

“She vomits everything she puts in her mouth,” says Elnora, her mom. “And she sleeps a lot afterwards.”

By discovering the genetic changes causing low-grade gliomas, Ellison hopes one day to help children like Juliauna through new, targeted therapies. In fact, the recent findings from St. Jude suggest that many childhood low-grade gliomas may prove sensitive to drugs

already in the pipeline.

“The pharmaceutical companies likely don’t have pediatric low-grade glioma in mind when they’re developing these drugs for much more common adult cancers,” Ellison says. “But we benefit from all that development work, because if we can show the relevance of new drugs to a kid’s disease, it gives us a new angle on how to treat the child.”

Remarkable achievement

Finding tiny changes in the vast landscape of a tumor’s genetic makeup is a monumental project. When the hunt first began for changes underlying hard-to-treat, diffuse low-grade gliomas, scientists were basically digging without a map.

“Virtually nothing was known about this particular subtype of low-grade glioma in children, and we had very few clues about where to look,” Ellison says.

But if you can dig everywhere at once, you don’t need a map.

So that’s what they did. As part of the St. Jude Children’s Research Hospital—Washington University Pediatric Cancer Genome Project, Zhang, Ellison and their colleagues used heavy-duty technology and know-how to scrutinize every bit of DNA in the tumor genomes of dozens of low-grade glioma patients.

“Jinghui and her team sorted through this huge amount of genetic code and said, ‘How does the DNA of

this cancer cell differ from the patient’s normal DNA?’” Ellison says. “That’s a remarkable achievement.”

The intense effort yielded significant rewards. When the dust settled, the researchers had discovered a slew of previously unknown genetic abnormalities driving low-grade gliomas. The genetic basis for more than 90 percent of these tumors is now understood.

A major win was the discovery of two small changes responsible for more than half of hard-to-treat diffuse low-grade glioma cases. One of these mutations was so tricky to detect, the proof of its ability to cause cancer triggered the café-side victory celebration.

The lively collaboration between research teams was central to the project’s success, Zhang says. “Whenever we found something cool, sometimes even before the experiment was complete, I’d tell Dr. Ellison and he’d test it out. That’s the exciting and scary part—when you hold your breath and wait to see what happens in the lab.

“I’m very, very proud of what we accomplished,” she continues. “We work long hours, but it’s like hunting treasures to try to find these things. And you have people to share the joy with you.” ●

The Pediatric Cancer Genome Project is yielding discoveries that may one day help patients with low-grade gliomas—children such as 2-year-old Juliauna Blackledge.

Low-Grade Glioma

A slow-growing tumor of the central nervous system

- #1** the most common childhood tumor of the brain and spinal cord
- 700+** number of children diagnosed with low-grade glioma in the U.S. each year
- 1/3** can be cured by surgery alone. Other options are irradiation (for older children) and chemotherapy.
- 94%** the 5-year survival rate for children with low-grade glioma
- 50%** proportion of surviving patients with new tumor-related problems in the 15 years after diagnosis

A Cancer Survivor's Lesson:

10 Things I've Learned in 10 Years

BY EMILY LAND

Some of her fellow St. Jude patients help osteosarcoma survivor Emily Miller Land illustrate 10 concepts she has embraced during the past decade.



Javon Bass, Lisa Redmond, Jakayla Bass

Cancer, as unimaginably hard as it is, can do more good than harm. It can strengthen, bond, heal and focus your life and those around you.

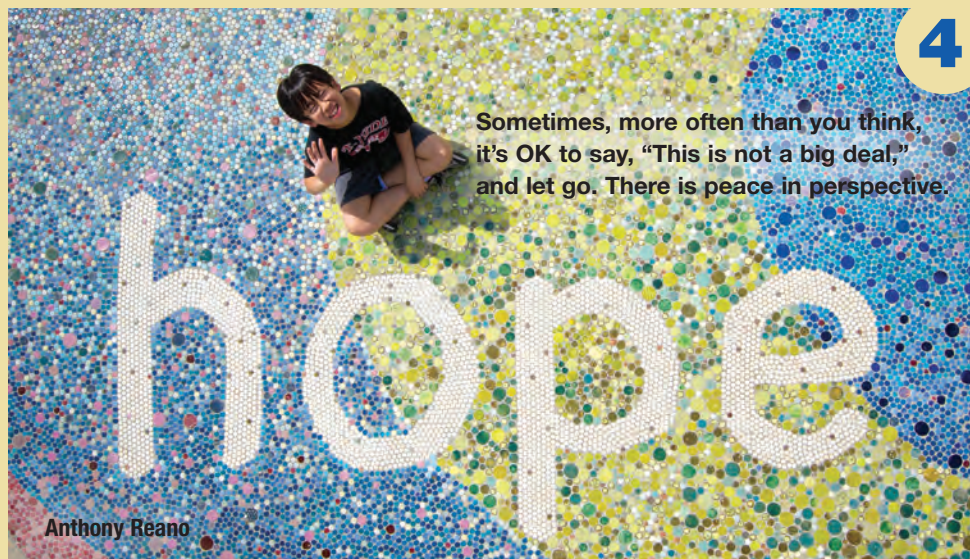


Ciera Blackburn



Karizma Burks

Christina Aguilera's song "Fighter" is probably about a boy for most people. For me, it is powerful in ways beyond the lyrics. Every survivor should listen to it and really hear it.



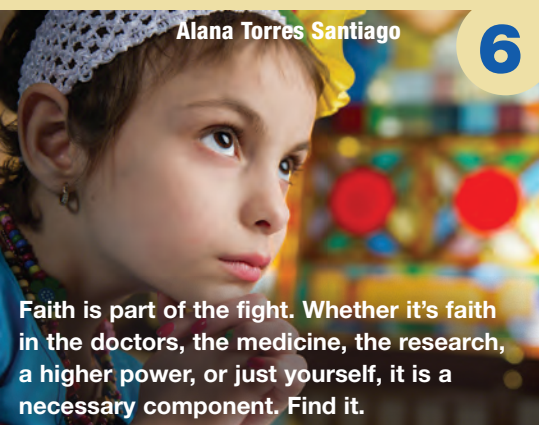
Anthony Reano

Sometimes, more often than you think, it's OK to say, "This is not a big deal," and let go. There is peace in perspective.



Slade Anderson

Cancer exposes you at your weakest, even if you're the only one who sees it. But once it's out there, the foundation for who you are becomes the strongest you've ever been.



Alana Torres Santiago

6

Faith is part of the fight. Whether it's faith in the doctors, the medicine, the research, a higher power, or just yourself, it is a necessary component. Find it.



Carly Wright

8

Something still feels right and refreshing about shampooing and conditioning a bald head when everything else in your world feels wrong and out of place.



Tyler West

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PHOTOS 1, 4, 6, 10 BY PETER BARTA
PHOTOS 3, 5, 8, 9 BY SETH DIXON
PHOTOS 2, 7 BY ANN-MARGARET HEDGES

Coffee smells beyond horrible without nose hairs, and cayenne pepper isn't the least bit spicy without freshly regenerated taste buds. Oh, and yes, your eyebrows are actually functional—an often overlooked oddity of the human body until you don't have any.

People are often in awe of survivors, and it is a badge that we carry with immense pride, but being undetectable as a survivor for the first time in a sea of normality is oftentimes our proudest moment. We are not our cancer, but we are what it made us. Please see us for who we are, not who we were.



Hayley Arceneaux

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When it comes to life and the essence of the human cycle, you only get to go around once. But, if you do it right, once is enough. Don't just exist. Live.

Emily Land and her children

10

Knowledge is Power

By understanding their risks, childhood cancer survivors learn to be proactive about their health.

BY ELIZABETH JANE WALKER

WHEN BECKY DIACHUN discovered she was pregnant 20 years ago, she immediately called her husband with the happy news. Her second phone call went to the doctor who had coordinated her cancer treatment years before at St. Jude Children's Research Hospital.

"As a survivor of Hodgkin lymphoma, I wanted to see if there was anything I should know," explains Diachun, who went on to have four healthy children.

Today, she continues to rely on St. Jude for crucial information about her specific health risks. She obtains much of that information through her participation in St. Jude LIFE. This study brings adults who were treated as children at St. Jude back to the hospital to gauge the impact of cancer treatment on their health as they age.

During a recent visit to St. Jude, Diachun underwent an extensive battery of tests tailored especially for her, based on the regimen used to cure her cancer 25 years ago.

"St. Jude saved my life twice—once as a kid and once as an adult. I believe I would have died of a massive heart attack on my bike somewhere if it hadn't been for St. Jude."



Kirsten Ness, PhD, of St. Jude Epidemiology and Cancer Control assesses the grip strength of survivor Evan Hamilton.

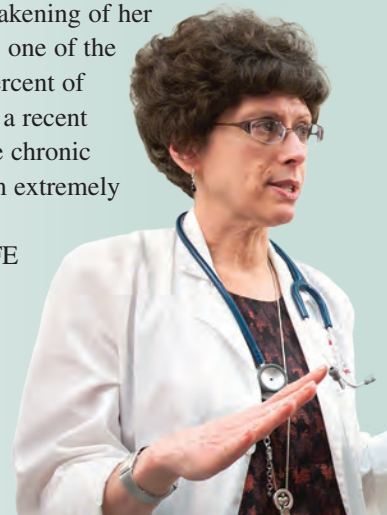
Results from this comprehensive exam will help her make healthy lifestyle choices and communicate more effectively with her hometown medical provider.

The data from St. Jude LIFE will help scientists identify which survivors have the highest risk of health problems and which screening tests are most helpful in revealing those threats. The information will also guide physicians when treating future patient generations.

After the cure

The chemotherapy and radiation used to cure Diachun's cancer in 1988 caused a slight decrease in her lung capacity and a minor weakening of her heart muscles. But Diachun is one of the fortunate few. Ninety-eight percent of childhood cancer survivors in a recent St. Jude study had at least one chronic health condition, ranging from extremely mild to severe.

Of the 1,713 St. Jude LIFE participants in the study, 80 percent had encountered a life-threatening or disabling condition by age 45.



Published in the *Journal of the American Medical Association*, these findings underscore the importance of survivors understanding their risks, pursuing healthy lifestyles and obtaining appropriate medical screenings.

For years, researchers have known that adults who received cancer treatment during childhood have an increased risk for health problems. But until this report, no one knew the prevalence of those risks. Most past studies had relied on health surveys. Often, survivors filling out the surveys were unaware of their health conditions, because they had not yet begun to experience symptoms.

“This study was unique, in that we were able to bring in an extremely large population of survivors and comprehensively evaluate them,” says Melissa Hudson, MD, director of the St. Jude Division of Cancer Survivorship.

Appearances may be deceiving

After identifying a survivor’s health risks, St. Jude staff members show that individual how to use the information.

Survivors are encouraged to make appointments specifically to discuss their complex medical histories with their hometown medical providers. Even though an individual may appear healthy, that survivor may have an elevated risk of heart disease or a second cancer. St. Jude LIFE gives survivors the information they need to communicate crucial information about their health issues.

“If a 35-year-old woman comes into a doctor’s office and doesn’t mention that she had chest radiation as a child, the physician wouldn’t order a mammogram or a breast MRI,” says Kirsten Ness, PhD, of St. Jude Epidemiology and Cancer Control. “But, in fact, women who are treated for childhood cancer and who received chest radiation need to start having mammograms at age 25, or eight years after their radiation, whichever comes later.”

Childhood cancer survivors must be vigilant about preserving their health.

“One thing survivors can control is their lifestyle,” Ness

Survive and Thrive

395,000 childhood cancer survivors live in the U.S.

2,600 survivors are currently enrolled in St. Jude LIFE study

St. Jude researchers encourage all childhood cancer survivors to:

- 1. Know their unique health risks.**
- 2. Pursue healthy lifestyles.**
- 3. Obtain regular medical checkups.**

says. “For instance, if they’re at risk for high blood pressure because of treatments they received, they can make sure that they follow a heart-healthy diet, that they don’t smoke and that they exercise.”

Hidden risks

Through St. Jude LIFE, physicians have identified hundreds of previously undetected health problems in St. Jude survivors, including heart and lung abnormalities, memory problems and new cancers.

Nick Dustman is one such survivor. This 45-year-old has consciously pursued a healthy lifestyle since undergoing treatment for Hodgkin lymphoma at St. Jude 29 years ago.

“I don’t drink or use tobacco products. I’m extremely active, and I’m cautious about what I put into my body,” says Dustman, who rides his bicycle more than 100 miles per week.

When he began having problems breathing a few years ago, local physicians concluded he had asthma. Then Dustman returned to Memphis to participate in St. Jude LIFE. Tests revealed six cardiac blockages. The problems were likely caused by the radiation that had helped cure his cancer decades ago.

“Little did I know that I was having major heart issues,” he says.

“St. Jude saved my life twice—once as a kid and once as an adult,” he adds. “I believe I would have died of a massive heart attack on my bike somewhere if it hadn’t been for St. Jude.” ●

Melissa Hudson, MD, director of the St. Jude Division of Cancer Survivorship, confers with Hodgkin lymphoma survivor Becky Diachun during a St. Jude LIFE examination.





The Voices of HIV

Teens and young adults ages 13 to 24 account for approximately one in four new HIV infections in the US. With an estimated 1,000 children infected with HIV each day, at least 3.4 million children worldwide live with HIV.

The St. Jude Voices project enables patients with HIV to share their feelings with fellow patients, educate their clinicians and give back to the hospital.

BY CARRIE L. STREHLAU

For a teenager or young adult diagnosed with human immunodeficiency virus (HIV), the experience can be overwhelming, confusing, life changing. The words “HIV positive” can profoundly affect relationships with friends and family. At St. Jude Children’s Research Hospital, a new program enables patients to share their deepest, most profound feelings in a venue that protects their identity.

According to Aditya Gaur, MD, of St. Jude Infectious Diseases, teenagers and young adults ages 13 to 24 account for approximately one in four new HIV

infections in the United States. With an estimated 1,000 children infected with HIV each day, at least 3.4 million children worldwide live with HIV.

Shortly after St. Jude founder Danny Thomas’ 1987 proclamation that HIV/AIDS should be part of the St. Jude mission, the hospital established a pediatric HIV/AIDS clinical program. Today, more than 250 patients are part of that program.

Because of new therapies, HIV is now a chronic disease, requiring lifelong medication and vigilance. Even after three decades of clinical progress, there is

still a lingering stigma about HIV.

In fall 2012, staff in St. Jude Child Life, Social Work and Infectious Diseases departments started the Voices project—an opportunity for HIV-infected patients to share their experiences, fears, hopes and advice through private audio recordings.

“The words the patients choose and the context in which they share their experience makes it so much more powerful than any one of us saying the same message,” Gaur says.

The Voices project provides a therapeutic coping experience for patients. Participants obtain greater control of their illness experience by conceptualizing it.

“HIV patients aren’t often provided with that control—that outlet to construct their illness experience—because they want so deeply to remain anonymous and hidden for the fear of stigma and judgment,” says Kathryn Cantrell, who spearheaded the project as part of the St. Jude Child Life program.

More than a dozen St. Jude patients have shared their stories so far. Referred by their health care team, patients ages 18 and older meet with Voices staff members who explain the project. The format of the recording session is guided by the patient, who can choose to record alone or with someone in the room.

“During the experience, they may relive the day that they were diagnosed and how they came through it, evaluate where they are at this point and discuss where they want to go,” says Sylvia Sutton of St. Jude Social Work.

St. Jude patients say Voices enables them to give back to St. Jude. They can offer advice to other patients and to clinicians while retaining their privacy.

“Think of this as anonymous altruism,” Cantrell says. “They want to give back. They want to contribute to health care. They want to contribute to those practitioners who have aided in their illness experience.”

Narratives are coded, transcribed, digitally archived and used by members of the HIV health care team for patient and staff education. The project provides vital information to clinicians: How does it feel to be diagnosed with HIV? How does it affect each day? How does it change relationships?

By listening to the recordings, clinicians can assess how they communicate with patients, how patients communicate with them and how that promotes patient health. The recordings provide the St. Jude HIV team a powerful tool to educate students and other health care providers about HIV and humanize the impact of the disease.

For patients struggling with coping or medication adherence, the recordings provide an opportunity to listen to the voices of others who went through similar challenges and to hear how they overcame them.

The narratives have uncovered several common themes: dealing with initial diagnosis, adjustment, relationships, disclosure, coping, medication and hopefulness.

Patients who have participated in Voices also say it makes them feel empowered.

“They all say that,” Sutton observes. “They tell me, ‘It means so much to me that I can help somebody else while I’m telling my story and they’re hearing my voice.’” ●

St. Jude Voices participants share their thoughts and feelings

“HIV is not you. It may be something you have, but it’s not the person in you. Yeah, I have HIV, but I’m not going to let it stop me from achieving my goals or stop me from having my wants or desires, or stop me from wanting to go travel or stop me from wanting to go far beyond places or anything else like that.”

“The actual diagnosis was confusing and scary... but when I thought about having a relationship with another person with my diagnosis, I think that was the scariest and the most complicated. Disclosing that to someone that you care about and that you are afraid to lose is one of the hardest things that I have had to do after being diagnosed.”

“Yeah, for a while I didn’t want to take my medicine; yes, for a while I didn’t even want to claim the diagnosis. But after hearing other people’s stories telling me about their type of HIV, and how they dealt with it, it made me want to come out and tell my own story, to let the others know that it’s not a killer disease, it’s not “your life is over.”...What I love about being here at St. Jude is that they made me feel like I was OK—no matter what, I’m OK.”

St. Jude *Thanks and Giving:* 10 Years Young

A decade after Marlo, Terre and Tony Thomas created the St. Jude *Thanks and Giving*[®] campaign, more individuals and companies than ever are embracing the hospital's mission.

BY LEIGH ANN ROMAN

During the first St. Jude *Thanks and Giving*[®] campaign 10 years ago, millions of Americans watched Brian Quinlan, age 4, sit on the floor of the Medicine Room and explain to Marlo Thomas why he was at St. Jude Children's Research Hospital.

"My body got sick. The circles inside it were not working," the curly-haired boy said in one of the first segments featured on NBC's *TODAY* show. The segment was promoting a unique campaign, which to date has raised more than \$387 million for the children of St. Jude.

Created by Marlo, Terre and Tony Thomas, the children of St. Jude founder Danny Thomas, St. Jude *Thanks and Giving* unites more than 60 brands nationwide that encourage customers to give to St. Jude through add-ons at the register or by purchasing specialty merchandise during the holiday season.

Marking a milestone

Brian was early in treatment when *TODAY* show viewers met him. Diagnosed with acute lymphoblastic leukemia in September 2004, he appeared on the program that November.

Fast forward 10 years, and Brian is healthy and active. Last year, he was recognized as the most valuable player on his school's flag football team. He also enjoys Boy Scouts, skim-boarding and basketball.

More importantly, Brian has passed a milestone for childhood cancer survivors—being cancer-free five years after completing treatment.

"That was the big moment in our lives," says Nancy Quinlan of the checkup her son had at the end of 2012.

"We had never used the 'cured' word. We were so happy."

Delivering hope

Thanks to the research and treatment at St. Jude, families worldwide have fought childhood cancer and have found cures.

Families like the Quinlans never receive a bill from St. Jude for treatment, travel, housing or food because most of the hospital's funding comes from generous supporters like those who donate through campaigns like St. Jude *Thanks and Giving*.

That kind of support meant a lot to the Quinlans, who moved with sons Brian and Brendan to St. Jude for treatment for several months and then traveled between Memphis and Florida for three years to complete Brian's chemotherapy.

"I am so grateful to the wonderful partners who have come together during these last 10 years for our St. Jude *Thanks and Giving* campaign," says St. Jude National Outreach Director Marlo Thomas. "Their support helps ensure that St. Jude can continue the lifesaving research and care that brings hope to families like Brian's. It is so inspiring to see him and other St. Jude patients happy and healthy after treatment, bringing us closer to the day when my father's dream—that no child shall die in the dawn of life—becomes a reality."

Partners in the journey

Corporate partners for St. Jude *Thanks and Giving* include Kmart, CVS/Pharmacy, ANN INC., DICK's Sporting Goods, Kay Jewelers, Target, GNC, Williams-Sonoma, Domino's Pizza and many more. Top fundraising partner Kmart raised an all-time record of more than \$7.6 million in the 2012 campaign. To date,





Brian Quinlan participated in St. Jude *Thanks and Giving* at age 4. Today, he is a healthy and active teenager.

new partners this year include Best Buy, Justice, Haggar, Tommy Hilfiger and Christopher & Banks.

Beginning in November, shoppers will see the St. Jude logo identifying these and other retailers who are joining forces to save children fighting cancer and other life-threatening diseases. These companies will help raise donations to support the hospital.

Each year, TV spots for the campaign feature patients with Marlo Thomas and celebrity friends. This year, those spots will include Jennifer Aniston, Robin Williams, Shaun White, Sofia Vergara, Michael Strahan and Latin GRAMMY® winner Luis Fonsi.

In addition, the celebrities are featured in a movie trailer that shares the St. Jude story nationwide in theaters, including Regal Entertainment Group, Cinemark USA, Carmike Cinemas and many others.

The fundraising efforts are reinforced with a national media blitz that includes TV appearances by Marlo and St. Jude patients. For the tenth straight year,

in what has become a holiday tradition, Marlo will appear on NBC's *TODAY* show for five consecutive days during Thanksgiving week to share heartwarming stories about St. Jude patients and the hospital's work.

Stories like Brian's.

For the Florida teenager, passing the five-year, cancer-free milestone means he can focus all his energies on the activities he loves free of worry.

How to get involved

The Quinlans continue to support St. Jude at fundraising events, and Nancy is chair of the St. Jude *Give thanks. Walk™* this year in Palm Beach County, Florida.

On November 23, 75 communities nationwide will participate in this noncompetitive 5K to raise funds for St. Jude. Since the event began in 2010, it has raised \$11 million and has become the official kick-off for the St. Jude *Thanks and Giving* campaign. Registration is open at givethankswalk.org.

It's easy to get involved with St. Jude *Thanks and Giving*. Shop wherever you see the St. Jude logo. Visit stjude.org to make a donation or send e-cards in honor or memory of loved ones, and join the campaign on Facebook and Twitter. ●

Marlo Thomas and St. Jude patients encourage you to get involved:

SHOP wherever you see the St. Jude logo.

VISIT stjude.org to make a donation or send e-cards.

JOIN the campaign on Facebook and Twitter.

The *Teen Scene*

One-third of St. Jude patients are teenagers. Hospital staff members use a variety of methods to help teens embrace and enhance their unique talents while undergoing treatment.

Dustyn Ates

Fifteen-year-old Dustyn Ates has always had an artistic flair, but when he traveled to St. Jude for leukemia treatment, he devised a novel way to while away the hours between appointments. Dustyn began creating duct-tape wallets, purses and other items. He meticulously measures and cuts each strip of tape before applying it to his project *du jour*. “I’ve probably made more than 100 wallets,”

Dustyn admits. “When we learned about Dustyn’s interest, we started keeping duct tape supplies on hand,” says Jaime Moran, his Child Life specialist.

“We want him to keep up with his passion and to be able to share it with others.”



PHOTOS BY PETER BARTA

BY ELIZABETH JANE WALKER

One moment, the teen is invincible—plugged into music and social media, friends and sports, dreams and aspirations.

With three words, that world implodes.

“You have cancer.”

Swept into a whirlwind of back-to-back appointments, a teen can be overwhelmed. Fear and

uncertainty creep in like a thief, stealing self-assurance along with hair; severing relationships with peers back home.

At St. Jude Children’s Research Hospital, a team of experts are dedicated to helping teens and young adults cope with that maelstrom of emotions, while increasing their coping skills and decreasing anxiety and stress.



Max Burdette

For the past year, Child Life Specialist Jessika Boles has been receiving guitar instruction from the only St. Jude patient who knows the entire musical score to *The Legend of Zelda™* video games. "Because I come here often and my days are sometimes long, I spend a lot of time with Jessika," says pianist and bass player Max Burdette, who is undergoing treatment for fibrolamellar hepatocellular carcinoma, a rare form of liver cancer. "We talk or draw or make things, or we go to the auditorium and I play piano." The 16-year-old also creates and shares humorous lapel pins that celebrate his oncologist, Wayne Furman, MD.



Carrie-Lynn Grazette

"She's just a girl, and she's on fire," croons Carrie-Lynn Grazette, in a private performance of a hit song by artist Alicia Keys. "She's living in a world, and it's on fire/Filled with catastrophe..." Since arriving at St. Jude in 2012, this teen from Barbados has endured her own challenges, undergoing two bone marrow transplants for acute myeloid leukemia. With the support of Brandon Triplett, MD, and the rest of her clinical team, Carrie-Lynn has been cancer free for nearly a year. The 2011 winner of a national calypso-singing contest, she plans to attend medical school and pursue a career of helping others.

I am not my illness

"When teens arrive at St. Jude, there are so many things they're grieving," says Jaime Moran, a St. Jude Child Life specialist who works exclusively with teenagers and young adults. "They're not just mourning the loss of their health, but they're leaving behind their friends, their schools, their homes."

In order to build rapport, Moran and her colleagues offer St. Jude teens the opportunity to express their feelings and cultivate relationships.

"It's important for them to realize that we're interested in who they are, and not just their illness," says Jessika Boles of Child Life. "These kids are not just sick; they are experiencing a complete life disruption. That has repercussions for how they think about the world, their faith, who they are, their relationships with other people and what they want out of life. We help them realize that life isn't over, but life has changed, and we help them adjust to those changes."



Hailey Kennedy

With a voice as smooth as butter, Hailey Kennedy provides an *a capella* concert for some of her biggest fans. Hailey credits St. Jude staff and volunteers with helping her to keep pace with her classmates at the performing arts school she attends in Florida. “The people at St. Jude helped me cope by being amazingly generous and kind,” says Hailey, who is receiving treatment for acute myeloid leukemia. “I’ve developed great relationships with all my nurses and doctors.” The talented 13-year-old has also expanded her aspirations: “After going through treatment at St. Jude,” she says, “I now have an interest in becoming a doctor.”

Markell Gregoire

Lights, camera...action. For the past three years, Markell Gregoire has been writing, directing and starring in a documentary while undergoing treatment for bone cancer. The 14-year-old with the trademark sunglasses and dazzling smile received assistance on the project from numerous employees, including Michelle DiBoyan-Zitta, a videographer/editor in St. Jude Biomedical Communications. Titled “My Struggle,” the hour-long biopic offers a glimpse into Markell’s cancer journey. He has shared the finished product with his clinical team and family members. “It has happy moments, serious moments, funny moments and everything in between,” the young filmmaker says.



“If we can help them hold onto what they love and what they think is fun, it makes the medical and physical aspects more manageable.”

Existential questions

In the St. Jude Teen Room, patients and siblings ages 13 and older participate in video game tournaments, crafts activities and discussion groups. To encourage socializing, the staff hosts events ranging from fondue parties and karaoke contests to fiestas and cooking classes.

Teens and young adults can also participate in bimonthly photography classes or attend positive-image groups. And patients who join the Teen Advisory Council gain a sense of empowerment by offering input into

“These kids are not just sick; they are experiencing a complete life disruption. That has repercussions for how they think about the world, their faith, who they are, their relationships with other people and what they want out of life.”

projects that affect the entire hospital.

Twice a month, Child Life and Chaplain Services sponsor “Real Talk” for teenaged patients and siblings to discuss weighty issues, unhindered by the presence of parents, teachers, advisers or medical staff.

“Being at the hospital causes teens and young adults to question many of the things they thought or believed,” Boles says. “Sometimes we’ve talked about how hard it is to feel like an individual when your parents are with you constantly during treatment. We’ve talked about the question of suffering. We’ve discussed how it feels to have a friend who has died. It’s a chance for them to talk honestly about things that really matter to them.”

Express yourself

By supporting teens and encouraging their unique interests, hospital staff members infuse a sense of normalcy and provide a welcome distraction from treatment.

“We want to help them keep up with their passions or their interests,” Moran says. “If we can help them hold onto what they love and what they think is fun, it makes the medical and physical aspects more manageable.” ●

Andrew Hurd

Budding filmmaker, fiction writer, screenwriter and artist Andrew Hurd has not allowed a diagnosis of acute lymphoblastic leukemia to impede his academic progress or dampen his artistic abilities. In fact, his progress has accelerated. With the assistance of St. Jude school teacher Justin Gardner, the 17-year-old completed his final two years of high school in one year. “I had a lot of extra time, so I basically just power-housed through it,” Andrew says. The imaginative young writer often bounces ideas off his social worker, Ken Mitten (pictured with Andrew). When they aren’t laughing, talking or joking, the two collaborators evaluate one another’s writing.



REHAB

TO THE RESCUE

The four disciplines of St. Jude Rehabilitation Services collaborate to set patients on the right track.



ANN-MARGARET HEDGES

Thanks to the therapists in St. Jude Rehabilitation Services, Colin can now walk, swim, draw and fully participate in school.



BY MIKE O'KELLY

Most moms get a little irked when their children slip off to a secret hiding place. Six-year-old Colin Hayward Toland doesn't have one of those moms. Colin's clandestine adventures are met with an approving smile from his mother, Tamiko Toland, because four years ago she wondered if he would ever walk again.

As a toddler, Colin underwent two surgeries to remove a rare brain tumor called ependymoma. The tumor, deep in Colin's brain, damaged structures essential for producing normal movement, and the operations left him unable to walk or speak. He had

facial palsies, experienced difficulty moving, could not hold onto things and lost hearing in his right ear.

Colin arrived at St. Jude Children's Research Hospital in August 2009, where surgeons removed his remaining tumor. Immediately afterward, Colin met with staff members from all four areas of St. Jude Rehabilitation Services: Audiology, Speech-Language Pathology, Occupational Therapy and Physical Therapy. These specialists worked with Colin to overcome deficits caused by the tumor and surgery.

A month later, he was sitting on his own, playing, moving his mouth and trying to form words.

**Stephanie White, AuD,
(foreground) and Johnnie Bass,
AuD, conduct a hearing test
with Angel Collins.**



**Speech-language
pathologist Kelly Strachota
works with Carson Chandler
in his hospital room.**



Lending an ear

An important part of learning to speak is being able to hear speech sounds, and Audiology staff contributed significantly to Colin's improvement. Brain surgeries and certain chemotherapy drugs can cause hearing loss in children, sometimes resulting in hearing equivalent to that of a 70- or 80-year-old, says St. Jude audiologist Johnnie Bass, AuD.

"This isn't your typical deficit that most kids with hearing loss experience," Bass says. "We've tailored our clinic to meet the needs of patients with high-frequency hearing loss because that's 90 percent of what our kids have."

This type of hearing loss can be sneaky, Bass says, because children can still hear and respond, but they often miss crucial sounds like "s," "th" and "f," which are important in developing speech and language skills.

A recent collaboration between Bass and Ibrahim Qaddoumi, MD, of Oncology, found that children treated with the chemotherapy drug carboplatin were likely to

experience hearing loss and that the hearing loss was greatest in patients who were less than 6 months old when they received the drug.

"We believe we found a higher incidence of hearing loss in part because we were more diligent about following up and screening our patients," Qaddoumi says. Such evaluations identify children who can benefit from Audiology services.

Research collaborations, such as those between Audiology and Oncology are a priority for all disciplines in Rehabilitation Services, says Steve Morris, PhD, St. Jude Rehabilitation Services director.

"These collaborations help us to identify deficits these children may have and to seek new and better ways to help them overcome these deficits," he says.

Finding the right words

After surgery, Colin had difficulty communicating verbally. Speech therapists helped him bring his

**Isabelle Hanson paints
a picture during an
Occupational Therapy session
with Jessica Sparrow.**



communication skills up to par with those of his classmates back home.

“If a child isn’t able to communicate at an age-appropriate level, it usually shows up first in school,” says Kelly Strachota, a speech-language pathologist at St. Jude.

The hospital’s speech therapists use communication boards and other techniques to help children who have difficulty talking after surgery. Periodic language testing and informal daily checks are used to ensure that patients are improving. In Colin’s case, therapists first helped him improve strength and control of his mouth and tongue, and then progress to producing specific speech sounds.

St. Jude speech therapists work with professionals in the child’s hometown to ensure continued improvement after the patient leaves the hospital.

A lesser-known function of speech therapists is to help children who experience difficulty swallowing after brain surgery. These problems can make it difficult for a child to receive adequate nourishment. By using video X-ray to observe patients eating and drinking, speech therapists can detect complications of the mouth and throat. Results help the therapists treat patients and recommend particular foods and feeding techniques.

Meaningful occupations

Colin is one of many patients who work with the hospital’s occupational therapists to develop skills needed for age-appropriate, meaningful undertakings, such as playing, getting dressed, writing and participating in other school activities. Each occupational therapy session is tailored to the goals of the patient and family.

Colin participated in numerous tasks designed to move him toward his goals, such as stacking objects, cutting items with scissors, crawling up inclines, assembling puzzles and drawing—which remains one of

his favorite pastimes.

“We talk with the family about what’s important to them, and that drives our activities,” says occupational therapist Jessica Sparrow.

St. Jude occupational therapists help patients overcome challenges in areas ranging from hand-eye coordination to fine-motor and cognitive skills. Depending on patients’ needs, therapists can use customized medical technologies and activities to help them move better, read more easily, and strengthen and stretch their bodies. Occupational Therapy also conducts research to help develop new interventions for patients.

For instance, one such study is exploring whether an intervention originally developed to treat children with cerebral palsy can help brain tumor patients who experience difficulty using one side of their body. Therapists hope the project will help these children recover lost function.

Physical benefits

Located in the rear of the Rehabilitation Services area is a colorful, welcoming gym complete with bright blue elevated mats, slides, stairs, an exercise room and a quiet room designed to reduce the distractions infants and toddlers can experience during therapy. A regulation-height basketball goal stands outside the back door.

Many patients recovering from surgery for brain tumors experience problems with strength, conditioning, balance, movement and walking. The Physical Therapy group uses this equipment as well as hands-on techniques to make these children better able to play safely.

Earning little victories along the way is the goal for patients—progressing from standing and holding themselves up, to walking from the therapist to a parent, to using a walker to scoot across the shiny gym floors that are decorated with tiny footprints.



PHOTOS BY PETER BARTIA

Physical therapist Angela Corr helps Josiah Hackett improve his walking skills.

Rehab: A Wide Reach

During the past year, more than

14,152

patient visits have been made to St. Jude Rehabilitation Services:

Audiology: 1,664

Speech: 2,227

Occupational Therapy: 3,020

Physical Therapy: 7,241

**The total number represents visits, not total patients, as some patients are seen by multiple disciplines.*

One of these patients, an energetic 5-year-old girl, spent her time in physical therapy riding a bike and enjoying time on the scooter.

The therapy was hidden in the fun.

“Kids learn by playing, and to most of them, that is what we’re doing,” says physical therapist Kristin Scobey. “But we know that we’re providing a

therapeutic intervention to improve their function, get them stronger and get them back home to their activities and their friends and family so they can be doing what they enjoyed before.”

Rather than waiting for treatment-associated problems to arise, several members of the Physical Therapy team are collaborating with other St. Jude researchers to test interventions that might limit these problems in the first place. For example, therapists are assessing whether exercise may reduce the adverse effects of cranial irradiation. In another study, therapists are exercising children with bone cancer in hopes of speeding their post-surgical recovery. Physical Therapy also has an obesity clinic to teach overweight survivors how to manage their weight.

Walking again

Initially, Colin had difficulties simply holding up his head. With physical therapy at the hospital and at home, he is now walking independently, keeping his parents busy with a variety of activities: swimming, drawing and playing with his army action figures. The walker from Rehabilitation Services was gathering dust in a closet when Colin’s family decided what to do with it.

“We brought it back to St. Jude so another family could use it,” Tamiko says. “That family will be told that this walker is available to them because the child who used it last doesn’t need it anymore—because he’s walking again.” ●

Research Highlights

PETER BARTA



Endowment supports Evans' work, honors past director

ALSAC and the St. Jude Boards of Directors and Governors have earmarked \$5.5 million for creation of the Donald Pinkel Endowed Chair of Pediatric Cancer Treatment. The endowment, among the largest of its kind in the country, honors the hospital's first director and will be held by the sitting St. Jude CEO. Dr. William E. Evans, the present St. Jude director and CEO, is its first designee. The endowment provides support for the CEO's research and academic programs.

"I am deeply honored to be named the first Donald Pinkel Endowed Chair," Evans said. "When I first came to St. Jude in 1972 as a student, Dr. Pinkel was the director, and he was a person whom everyone looked up to, largely because he did not expect more out of others than he expected from himself. He led by example. I respected him because of what he had already accomplished, and because he was interested in hearing everyone's ideas, even those of a student like me."

Kill the cancer, spare the heart

Cancer cells are notoriously good at evading death by blocking cell suicide pathways, which normally eliminate damaged, dangerous or unneeded cells. To resist death, cancer cells may produce high levels of suicide-inhibiting proteins, such as one called MCL1.

So, why not create drugs that prevent MCL1 from working, and let the cancer cells kill themselves? St. Jude scientists have found it may not be so simple, because MCL1 is also essential for normal cardiac function. The researchers, reporting in *Genes and Development*, observed rapid and devastating consequences when MCL1 was eliminated in heart muscle.

"These findings suggest that cancer-related drug development efforts should focus on reducing MCL1 expression in target cells rather than eliminating the protein's function completely," said Joseph Opferman, PhD, of St. Jude Biochemistry.

The new results also suggest that providing higher levels of MCL1 in heart muscle cells might benefit a patient recovering from heart damage.

Cranial irradiation linked to memory issues

Cranial irradiation for treatment of childhood acute lymphoblastic leukemia (ALL) increases the risk for memory problems in adult survivors in their mid-30s, according to a St. Jude study published in *Journal of the National Cancer Institute*.

Several years ago, St. Jude eliminated cranial irradiation from leukemia treatment after demonstrating cure rates were not compromised. But many of the estimated 50,000 pediatric ALL survivors nationwide were treated with brain irradiation. According to Greg Armstrong, MD, of St. Jude Epidemiology and Cancer Control, these survivors may benefit from continued screening for changes in memory and cognitive functioning.

St. Jude researchers are working to find interventions, said Kevin Krull, PhD, of Epidemiology and Cancer Control. In the meantime, keeping mentally, physically and socially active may help delay progression of symptoms, he said.



Lung nodules: Benign, or cancer?

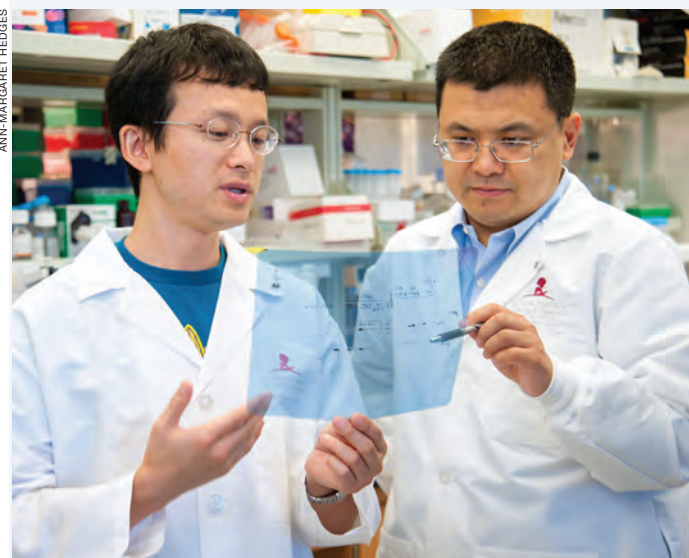
When a child has been diagnosed with one cancer, the last thing a parent wants to hear is, “We see a spot on your child’s lung.” Is it benign? Or has the cancer spread?

Answering this question is critical. Twenty years ago, patients with lung nodules faced invasive diagnostic surgery that could delay cancer treatment for weeks. Since then an alternative approach, combining CT scans, interventional radiology and minimally invasive surgery, has been widely

used to diagnose and remove lung nodules, but there have been few reports about how children fared under this approach.

Now, new findings from St. Jude have demonstrated that the minimally invasive procedure is safe and effective in children. The research was published recently in the *Journal of Pediatric Surgery*. Senior author Bhaskar Rao, MD, of St. Jude Surgery, noted, “This technique helps to reduce the physical and psychological burden on young patients and their families.”

Scientists uncover secrets of T cells



ANN-MARGARET HEDGES

St. Jude researchers have rewritten what scientists previously understood about how key immune cells are regulated. The recent work focused on white blood cells known as regulatory T cells. These cells help to protect healthy tissue from misguided immune attacks or to prevent runaway inflammation.

St. Jude researchers showed that a molecular complex called mTORC1 uses an unconventional process to control the supply and function of regulatory T cells.

“These results challenge the prior view of the mTOR pathway as an inhibitor of these key immune cells and highlight the role of the mTORC1 complex in regulating the T cells that are vital for controlling inflammation,” said Hongbo Chi, PhD (at right), of St. Jude Immunology. Chi, postdoctoral fellow Hu Zeng, PhD (at left), and their colleagues published their findings in the journal *Nature*.

How does leukemia develop?

Genetic mutations are recognized players in the development of acute lymphoblastic leukemia (ALL). But recent research points to another possible culprit underlying ALL: epigenetic changes, which are modifications to DNA that can instruct genes to turn on or off.

The researchers focused on an epigenetic process called cytosine methylation, which modifies a building block of DNA. Each subtype of ALL they examined displayed a unique methylation pattern that correlated with gene expression.

“It is well known that different leukemia subgroups have

distinct patterns of gene expression that are important in the development of leukemia,” said Charles Mullighan, MBBS (Hons), MSc, MD, of St. Jude Pathology.

“We have assumed that the underlying genetic changes are important determinants of those gene expression profiles. We now know that changes in methylation state also have key roles in influencing gene expression,” he added.

The study was reported in the *Journal of Clinical Investigation*.

Highlights

Ridin' high

Like tumbleweeds blowing in the breeze, siblings “headed west” recently to enjoy Sibling Star Day activities. Employees and volunteers lined the red carpet and cheered the young cowboys and cowgirls as they arrived for a special day hosted by the Child Life Program.

This year's event featured Western-themed arts-and-crafts activities and a luncheon to show appreciation for the contributions that siblings make as part of the patient care team.



PETER BARTA

Shedding light on the dark side of mitochondria

Like microscopic power plants, mitochondria produce the energy that fuels cells. However, they also have a dark side: buildup of defective mitochondria inside cells can lead to neurodegenerative disorders such as Parkinson's disease and amyotrophic lateral sclerosis.

Research from St. Jude has now shed light on the molecular underpinnings of this problem. Scientists discovered that disease-causing mutations in a gene called *VCP* lead to accumulation of defective mitochondria inside muscle and nerve

cells. The researchers demonstrated that *VCP* works with two other proteins, also implicated in neurodegenerative disease, in a quality control process that recognizes damaged mitochondria and leads to their disposal.

The findings, published recently in *Neuron*, raise the possibility that disorders associated with *VCP* mutations could be treated with small molecules now under development, observed J. Paul Taylor, MD, PhD, of Developmental Neurobiology. “We have begun screening compounds,” he said.

Unraveling inflammatory disorders

For decades, abnormal changes in a protein called SHP-1 have been known to underlie a variety of inflammatory and autoimmune disorders. But only recently did St. Jude scientists figure out how this happens—and develop leads on how to prevent it.

The researchers, publishing in *Nature*, teased apart the details of a complex web of interactions between SHP-1 and other molecules important for fueling inflammation. Scientists found that an inflammatory disorder caused by abnormal SHP-1 could be completely prevented by blocking a single molecule, IL-1 alpha. They also discovered the experimental drug necrostatin 1 protected against inflammation-driven tissue damage caused by abnormal SHP-1.

The findings hold clues for designing the next generation of anti-inflammatory drugs that work more selectively and do not leave patients at risk for infectious diseases and other problems. “These results are a stepping stone that leads to the clinic,” observed Thirumala-Devi Kanneganti, PhD, of St. Jude Immunology.

Genes linked to attention problems

Chemotherapy has saved the lives of many children with acute lymphoblastic leukemia (ALL), but it can increase their risk for later neurocognitive problems. New St. Jude research published in the *Journal of Clinical Oncology* points to specific genetic variations that influence this risk.

About 40 percent of survivors in the study had problems with attention or processing information. Problems were more likely to occur in survivors with particular variations in any of four genes.

St. Jude researchers are working on interventions to protect neurocognitive skills in young cancer survivors. In addition, said Kevin Krull, PhD, of St. Jude Epidemiology and Cancer Control, families can help enhance their children's neurocognitive development by encouraging children to stay physically and cognitively active and to eat a healthy diet.

Moms on a Mission

BY KERRY HEALY

Their journey through childhood cancer brought them together; their mission to defeat it binds them still.

Denni Ferrara and Chris Meyer are moms on a mission to find a cure for leukemia. Together, the best friends founded The Leukemia Research Foundation of Delaware (LRFDE), an organization that helps raise awareness and funds to combat the most common form of childhood cancer.

Approximately 19 years ago, the expectant moms met at a Lamaze class.

"I struck up a conversation with Chris," Denni explains. "We started talking to each other regularly, and our families started hanging out and vacationing together."

Soon the women's newfound friendship was tested in ways they could never have imagined.

First, Chris' son, 6-month-old Bradley, was diagnosed with stage IV neuroblastoma, the most common solid tumor in infants younger than 1 year of age.

"I'll never forget that feeling when Chris told me," Denni says. "When you hear that, as a parent, it really sounds like a death sentence."

Chris was extremely grateful for the support Denni's family gave during Bradley's treatment. Little did she realize that she would soon be returning the favor. A year later, Denni's 3-year-old daughter, Natalia, was diagnosed with high-risk acute lymphoblastic leukemia.

Both children, who were treated at a local children's hospital, are doing well now. Sharing a bond few children their age can understand, Natalia, 19, and Bradley, 17, are close. Bradley even escorted Natalia to her senior prom this year.

Chris and Denni—deeply grateful that both children's lives were spared—wanted to give back. In September 2007, Denni founded LRFDE with Chris' help, and assumed the role of president. This 100-percent volunteer organization's goal is to support research that will find cures and help advance treatments with fewer side effects. LRFDE raises funds through yearly events, including a golf outing, an annual mud run and a gala, and makes grants to several research facilities, including St. Jude Children's Research Hospital.

The foundation recently completed a generous grant to the leukemia research laboratory of Ching-Hon Pui, MD, St. Jude Oncology chair, and Scott Howard, MD, of International Outreach and Oncology. "We're very proud to be funding the work of Dr. Pui and Dr. Howard," Denni says.

"After doing a lot of research and visiting St. Jude, we were overwhelmed," Chris says. "We had no idea that this



Best friends Chris Meyer (at left) and Denni Ferrara have created a foundation to support research that will help find cures for leukemia and advance treatments with fewer side effects.

type of facility was out there. No other hospital can touch what St. Jude is doing right now for children."

Denni adds, "Their work really seems to have the most promise for advancing cures for leukemia."

When asked if they foresee a time when they can say "mission accomplished," Denni says, "I don't know if, in our lifetime, we'll see a cure."

Chris said she believes a cure is inevitable.

"It's just a matter of when," she says. "It is already so much better than when our kids had it, because of all the things St. Jude is doing." ●

Perspective

BY JOHN RICH

A Tidal Wave of Support

Who's on your email list? If we all reach out to our friends on behalf of St. Jude, we could make a worldwide impact.



John Rich visits with St. Jude patient T'ara Johnson during a recent trip to the hospital.

In 1995, I was a young bass player and songwriter in a band called Lonestar. As a 22-year-old bachelor running with a wild country band, the last thing on my mind was kids fighting cancer.

Then we visited St. Jude Children's Research Hospital, going into rooms, singing songs, having our pictures taken with the kids. Once you've done that, you're never the same again. It will always stay with you.

Through St. Jude, I became friends with Randy Owen of ALABAMA. Randy is the guy who started the relationship between country music fans and St. Jude. His passion for St. Jude inspired me to try to do bigger things. As the years passed, I was able to introduce more and more people to the hospital. I'm really following in Randy's footsteps as I bring what I have to the table on behalf of St. Jude.

Now, as the father of two sons, I realized that when I give to St. Jude, I could be helping somebody in my family who

may need it at some point down the road. Or my neighbor. Or a kid in my community. But I'm also helping kids on the other side of the planet.

Several things make St. Jude unique, but one thing really clinches the deal for me. When St. Jude discovers a new treatment or has some kind of breakthrough, they don't keep it to themselves. They share that information so that every hospital on Earth can access what they've learned. I like to say that St. Jude shares their marbles—they don't hoard them. They let the whole world see their technology.

To me, that is world impact.

The small things you do can make a huge difference. When you send money to St. Jude, you know for sure that it's going to help kids who are at the hospital and it's going to help research ways to eradicate cancer. But

don't stop with just your own donation. Reach out to your email list and say, "Hey, I give to St. Jude; you should too." Then you can share links to articles that describe some of the incredible things St. Jude is doing.

I challenge you to reach out and start your own tidal wave of support through your connections. Everybody's got connections ... and 20 or 50 or 100 bucks a month adds up when you start multiplying it times millions of people. It becomes a viral thing.

And that, too, is world impact.

Country music artist, songwriter and producer John Rich is a loyal and vocal supporter of St. Jude. Among his many activities, Rich raised more than \$1.2 million for the hospital through his appearances on The Celebrity Apprentice. His annual St. Jude Presents John Rich and Friends concert raises funds and awareness through a star-studded evening of songs, stories and hope. ●

Give. To help me live.



Ian, 6
St. Jude Patient

When Ian began to stumble, his mom chalked it up to play. How could she know he had a brain tumor? After the devastating diagnosis, the family arrived at St. Jude, which has the world's best survival rates for the most aggressive childhood cancers—and where they'll never receive a bill for housing, treatment or food. Not now. Not ever. Because all they should worry about is helping Ian live. Please help us find cures and save children.

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True Champion

St. Jude patient Hillary Husband is greeted with cheers as she completes 26.2 miles of walking the corridors of the hospital's Bone Marrow Transplant Unit.

Hillary, who is battling her third cancer, accomplished the feat less than three weeks after undergoing a transplant. She walked at least one mile each day to build strength, endurance and prevent fluid build-up in her lungs. Hillary became the first St. Jude patient to cover the distance of a marathon while receiving inpatient care.

The first part of Hillary's journey was featured in the summer 2009 issue of *Promise*.



Finding cures. Saving children.