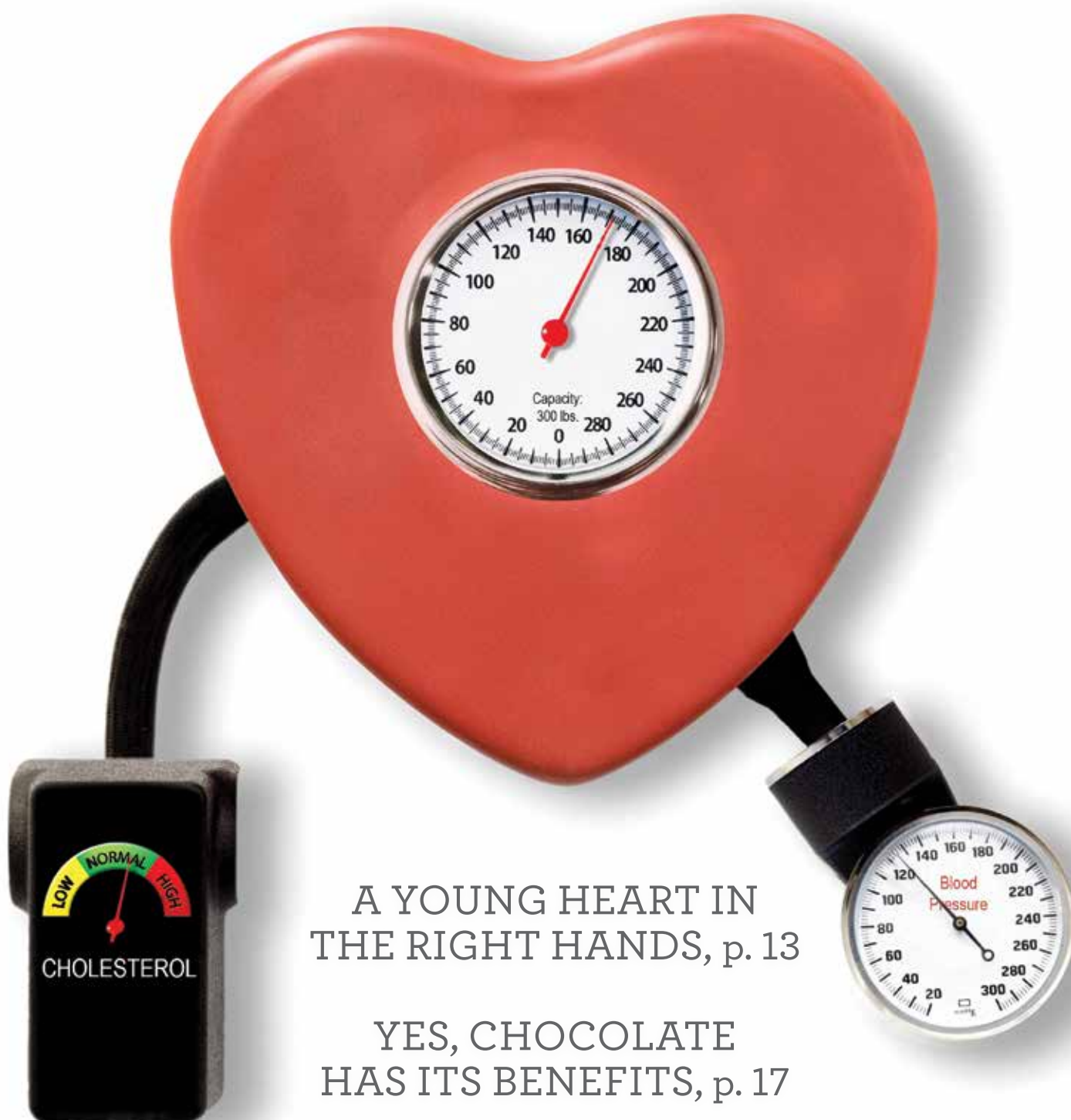


TMC | PULSE

NEWS OF THE TEXAS MEDICAL CENTER — VOL. 5 / NO. 1 — FEBRUARY 2018

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WILLIAM F. McKEON

President and Chief Executive Officer, Texas Medical Center

On this page, I often tout the qualities that make Houston unique. But here's a new distinction I'm not happy to report: Houston is the largest city in the U.S. that Amazon is unwilling to consider as the future home of its second headquarters.

After Amazon announced the list of its 20 finalist cities, with Houston absent, leaders here reacted with shock, outrage, indignation and sadness—not unlike the stages of grief. The sting was even worse since our friendly rivals, Austin and Dallas, made the cut. Amazon didn't pass on Texas. It just took a pass on Houston.

Despite the frustration, some business and civic leaders quietly shared the emerging consensus that maybe our city really is lacking some of the key ingredients needed to attract the world's top companies. We should encourage that type of introspection.

Houston has a lot going for it, including its diversity, the energy industry, NASA, the Port of Houston and, of course, the Texas Medical Center—the largest medical city in the world. But the Amazon decision is a signal that those assets are no longer enough. Instead of touting the same qualities we've always relied on in our pitch, we must honestly address our shortcomings and create new sources of value to attract emerging Fortune 100 companies and millennial talent. If we don't, Amazon won't be the only company that refuses to consider Houston.

My pledge is that the Texas Medical Center will do its part in that effort. We recognize we must do more than simply represent a collection of individual institutions that happen to share proximity. We must completely change the way we operate.

Our institutions are aligning in new ways, leveraging our collective expertise. We're competing to attract industry as well as the brightest clinicians and researchers in the world. It might be a cliché, but it's true: together, we can be greater than the sum of our parts.

Specifically, our bold plan is to create an iconic, translational research campus we call TMC³ that proudly shows we're the Third Coast for life sciences in the United States. This will serve as a beacon to the world that Houston is diversifying its value proposition, and we intend to compete globally in the innovation of health care.

Houstonians are resilient, and every time they've been tested, they do whatever is necessary to thrive. I'm optimistic that Houstonians will rise to this occasion as well, and they'll find new ways to invest in and advance our city.

A handwritten signature in black ink that reads "William F. McKeon". The signature is fluid and cursive, with a long, sweeping underline.

TMC | PULSE

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ON THIS PAGE: Seun Adigun, a University of Houston alumna, is leading the Nigerian bobsled team to the Winter Olympics. (Credit: Obi Grant)

ON THE COVER: A conceptual rendering depicts metrics associated with heart health: cholesterol, weight and blood pressure. (Credit: Cody Duty)

Is the Flu Bugging You?

Congestion, fever and chills are ubiquitous this season

BY MAGGIE GALEHOUSE

WELCOME TO THE WORST FLU SEASON IN RECENT MEMORY. Influenza, a contagious illness of the respiratory system, is widespread and active in 49 states, according to the Centers for Disease Control and Prevention (CDC), with close to 87,000 confirmed cases as of the end of January.

For most, it's a temporary misery. But the flu can be fatal. So far this season, nearly 40 children have died of flu-related complications.

To demystify this annual outbreak, Janak Patel, M.D., an infectious disease expert, pediatrician and clinician at The University of Texas Medical Branch - Galveston, answered questions about the flu and its treatment.

PULSE | Why is the flu so bad this season?

JP | That's a million-dollar question. It is not about the vaccine; it's not that fewer people are getting shots. We seem to have three times as much flu as last year during the same period—at least at UTMB. I think Houston is not too different.

We have looked at our own patients. Typically, of those sick enough to be in the hospital, about 85 percent have no vaccination. Right now we have to collect our strains and send them to the CDC in Atlanta to see if they match the vaccine. Severity is not measured easily because flu-related deaths are not always reported as flu deaths. Death is one measurement. Another is how often people are admitted into the hospital with the flu.

PULSE | What's the difference between a common cold and the flu?

JP | With a common cold, the only problem you have is a stuffy nose and nasal discharge. A mild flu will present as a common cold. For the general public, though, the flu means symptoms beyond the nasal passages. The classic flu has nasal congestion along with fever, body aches and chills.

PULSE | How long does a mild case of the flu last?

JP | Typically it's a five-day illness. Fever, headache—they peak within about two to three days of onset. A low-level cough could persist for two to three weeks, due to damage to the lining of the breathing passages. But the virus is already gone.

PULSE | When is peak flu season?

JP | It can vary, but typically flu season starts in December and ends in March or April. And it comes

in two, even three waves. We can have up to three types of flu viruses circulating every season, and they can all come at the same time. The "A" type is more severe, the one that leads to a lot of complications. "A" comes early and is typically gone by January. "B" comes around February and may not peak until March.

But some years we are fooled. This year the flu started quite early. At UTMB, we've been diagnosing cases since October.

PULSE | The H3N2 strain of influenza A, typically responsible for more hospitalizations and deaths, is this season's dominant strain. How effective are antiviral medications like Tamiflu against it?

JP | Tamiflu could reduce your sickness by one or two days. As is always the case for disease, I would say if you're mildly ill, don't get any medication. If you're moderately ill, talk to your doctor and see if you need the medication. For Tamiflu to have its best effect, it must be started within the first two days of the flu.

The CDC every year looks at resistance of circulation strains against medications. For the past several years, it has not been a problem, but there's always the fear that if something is used widely it can lead to resistance. Tamiflu has been resistant in years past. If it becomes resistant again, we'll have a big problem. We'd have to use older drugs with more side effects.

PULSE | Health officials always advise people to get their flu shots. Is it ever too late to get a flu shot?

JP | Never too late. Even in good years, we recommend getting a flu vaccine until the end of April. Flu shots can help you stay away from the worst presentation of flu, which is pneumonia and even death. Even under the best circumstances,

the vaccine to prevent the flu completely is nowhere close to 90 percent—like the vaccines for measles, polio and chicken pox. So it may have more efficacy against the severe presentation.

PULSE | Each year, scientists create an updated vaccine from the top three or four strains of the flu virus. The best flu vaccine of the past ten years, given over the 2010-2011 season, had a 60 percent effectiveness rate, according to the CDC. The worst, given during the 2014-2015 season, had a 19 percent effectiveness rate. Why is a more effective vaccine so elusive?

JP | Flu is very unique. It's the only virus that keeps changing by itself and it causes mass outbreaks. The World Health Organization goes through circulation strains in many parts of the world. Australia is in the southern hemisphere so we have opposite flu seasons. Last summer, we paid attention to their winter's strain. We have to figure out which strain is coming this year and make a vaccine for that strain. You need a very specific response for a particular strain of the virus, and there is no significant cross-protection from one strain to another.

PULSE | Are we any closer to a universal vaccine, which wouldn't need to be modified each year and would be effective against multiple strains of the flu?

JP | It's pie in the sky. I've been hearing about efforts to develop a universal vaccine for the last 20 years ... but I have seen no product that is going through large-scale clinical trials. So we're not going to see anything on the market in the next five years. Now, if we could find a part of the virus that doesn't change, and if we could get a vaccine for that part of the virus, we would have protection from all the strains over many years. That is the holy grail. ■

This interview has been edited for clarity and length.



Janak Patel, M.D.



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The Intersection of ARTS and MEDICINE

By Britni N. Riley

To better understand his surroundings and the human condition, Houston-based artist Joseph Cohen has spent several years embedded in top research labs with scientists, immersing himself in their work.

"I am working with labs in different research institutions and trying to distill the information in a way that will allow me to expand on the capability of science through the lens of art," Cohen said.

Cohen's latest exhibit, *Looking at a flower*, is on display at the BioScience Research Collaborative (BRC) at Rice University, in conjunction with Rice Public Art.

Because of the exhibit's name, one might expect to find paintings of peonies or fields of lavender. Instead, Cohen dives deep into the microscopic intricacies of science, engineering and medicine. The three-piece exhibit in the lobby of the BRC uses molecules as a springboard for mixed-media works. Each piece has two parts that complement one another while remaining distinct.

To create the first set in the exhibit, entitled *Where do I stand?*, Cohen worked with the Tour Group at Rice University using lasers, computer imaging and other raw materials. These works incorporate graphene, a form of carbon consisting of a single layer of carbon atoms arranged in a hexagonal lattice, like a honeycomb.

"I worked with laser-induced graphene," Cohen said. "In a sense, it's kind of burning it, but not quite because it is doing it in such a way that it's not just making carbon, it is making a very particular structure of carbon."

The second set in the show, *If he/she could see my love*, is a result of time spent in the labs of R. Bruce Weisman, Ph.D., professor of chemistry, materials science

and nanoengineering at Rice University, and Daniel Heller, Ph.D., head of the Daniel Heller Lab at Memorial Sloan Kettering Cancer Center and Weill Cornell Medical College.

Heller's team is harnessing the luminescent properties of carbon nanoparticles to help detect cancer

at earlier stages and target treatment therapies for metastatic cancer tumors. Cohen's work with carbon nanotubes—forms of carbon with a cylindrical nanostructure—follows a similar search and find mission. Under light, carbon nanotubes are naturally fluorescent; the colors they release depend upon the structure of the tubes themselves. Cohen uses them to expose light that would otherwise not be visible to the human eye.

"The material allows me to create artwork that directly addresses the near-infrared spectrum," Cohen said.

A song for my father is the final piece in the exhibit. To develop the vocal painting on canvas, Cohen worked with Ennio Tasciotti,

Ph.D., director of the Center for Musculoskeletal Regeneration at Houston Methodist, to analyze the molecular structure of various pigment samples and create "color chords." Cohen used these color chords as the basis for a musical composition and then produced a painting based on the song, in essence allowing viewers to hear how a painting sounds and see how a song looks. Visitors to the exhibition who have headphones can listen to the song on an iPad mini. ■

Looking at a flower, on display through April 8, is located in the lobby of the BioScience Research Collaborative at Rice University, 6500 S. Main St., on the corner of University Blvd. Information: brc.rice.edu



Artist Joseph Cohen stands with one of his works, *If he/she could see my love*, currently on display at the BioScience Research Collaborative.



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On the Fast Track with Seun Adigun

The UH alumna is leading the Nigerian bobsled team to the Winter Olympics

BY SHANLEY CHIEN

SEUN ADIGUN is headed to the 2018 Winter Olympics, one of the three Nigerian-American women making history as Africa's first-ever bobsled team. A University of Houston alumna, Adigun, 31, has already built an athletic career as a track and field star, even representing Nigeria as a hurdler in the 2012 Summer Olympics in London. She also served as an assistant coach for the UH women's track and field team and recently completed her doctor of chiropractic degree from Texas Chiropractic College.

PULSE | *You and your Houston-based teammates are track and field athletes. How did that background help you transition to bobsledding, which sends you hurtling down an icy track at more than 80 miles per hour?*

SA | It was actually a pretty smooth transition. Track and field athletes make really good bobsled push athletes because of the transfer of speed, the transfer of power and the transfer of the mechanics of actually running.

The biggest difference is that you have to get significantly bigger and stronger as a bobsled athlete than you are as a track athlete. You need the weight in order to equate and produce the forces that are necessary for just the basic physics of the sport. If you don't have the weight on your body, then you have to put it in your sled. You're already under-sized, and you're pushing a heavier sled. You're at a complete disadvantage on the push part, but you try and make up for it with the driving and the weight on the actual ice. We each had to gain probably 15 to 20 pounds just to be on the same playing field as everyone else.

PULSE | *As the driver of the two-woman bobsled, you use a rope and pulley system to steer. Your teammates, Ngozi Onwumere and Akuoma Omeoga, are brakemen—during a race, one of them will help push the bobsled at the starting line, jump in,*



Above: Seun Adigun, center, is flanked by Akuoma Omeoga, left, and Ngozi Onwumere at practice in Lake Placid, New York. Top right: On the bobsled track. Lower right: Adigun takes a break.

(Credit: Under Armour)

and then pull the brakes after the end of the race. How difficult was it for the three of you to learn the intricacies of bobsledding?

SA | This sport has the biggest learning curve that I probably have ever experienced in my life. Take a driver who just freshly got their license—16 years old. They know what to do behind the wheel. They have an idea. But then go throw them in Daytona. It might be a little bit different type of driving. That's how I feel. It's just straight survival mode the entire time.

And, my brakemen, it just seemed so elementary, where you think, 'Ah, you just push a sled, run and jump in, and get out.' No, that's not just how it is. There's actually a whole technique and an entire concept behind hitting the sled, and hitting the sled at the same time as your driver, and then generating max velocity within the first five seconds.

PULSE | *Tell me about your first bobsled race. I understand it was a bit of a bumpy ride.*

SA | My first race ever, we crashed. It was the first time I had driven the two-man that week, and I'd only gotten three days worth of driving in—maybe two and a half. It was my brakeman's first time on ice, so this was her first ride, first time seeing a bobsled, first time seeing the ice track, first time knowing what to do. We're all out there and it's like, "Okay, here we go."

I get in, I navigate the track until corner 12. ... I only had two more turns before the finish line, but I had so much momentum that it catapulted us up and through the finish line—so the race counted. My very first crash was the very first race, and all I'm thinking in my head: 'Oh my God. This is just not the start I was looking for.'

But it all worked out. We celebrated as if we'd won something when we realized that we'd crossed the finish line and it counted.

PULSE | *As the founding member of the bobsled team, you literally built a bobsled from scratch.*

SA | On dry land, here in Houston, we use a wooden bobsled that I've named The Maeflower. I built that when I was on the U.S. Team [training as a rookie brakeman]. I was coming back and forth [from Canada] very frequently, and I didn't want to get left behind in the development like with the other rookies. My brain just told me to go to a hardware store and get up a bunch of wood, some screws, some wheels, a couple door handles and pot holders, and put them together to make this little push cart thing. That actually served as the primary tool for Bobsled 101 and building the Bobsled & Skeleton Federation of Nigeria.

(continued)



PULSE | How did you come up with the name “The Maeflower”?

SA | It’s named in honor and in the memory of my late sister whom we called Mae-Mae. Her name was Amezee. I called her Miss Amazing because she was born with sickle cell anemia, so when she would go through crises and come out, I would call her Miss Amazing. She ended up passing away in 2009 from a car accident.

When that happened, I basically decided that anything that I was going to be passionate about in life, I was going to dedicate to her memory. And so, I went ahead and started crocheting “Miss Amazing” on everything, which I could never be cool enough to call myself.

PULSE | You competed in the 2012 Summer Olympics in London as a 100-meter hurdler representing Nigeria. Then you took up bobsledding—following in the footsteps of other U.S. track and field stars like Lolo Jones, Lauryn Williams, and Aja Evans—and put together Nigeria’s

first Olympic bobsled team. It sounds like you really have a hunger for the Olympic Games.

SA | I really stunk it up at the Summer Games. Not because I wasn’t in the best shape of my life or I wasn’t mentally in the best place I’ve ever been, but more so because I had a stress fracture in my left tibia. As a hurdler, obviously, the biggest concern that I had basically from March of 2012 all the way through the Olympic Games in August was trying not to snap my leg in half.

At the time [I started bobsledding], I thought I’d join the U.S. team, fight for a spot on there and give myself some



Above: On the track in Lake Placid.
Below: Omeoga, Adigun and Onumwere pose with the Nigerian flag.

(Credit: Under Armour)

type of Olympic redemption. But then it became much larger than that.

PULSE | Thirty years ago, at the 1988 Winter Olympic Games in Calgary, Jamaica became the first tropical nation with a bobsled team and inspired the movie, Cool Runnings. This year, you and your teammates—Nigerian-Americans with dual citizenship—

are Africa’s first-ever Olympic bobsled team and the first Nigerian team to qualify for the Winter Olympic Games. How does that feel?

SA | It’s crazy. I’m still trying to wrap my mind around what’s happening. ... But fortunately, there was that level of support, resilience and dedication that came from the Nigerian Olympic Committee’s first vice president, Solomon Ogba, who’s now the president of our federation.

PULSE | You recently earned your doctorate of chiropractic degree from Texas Chiropractic College (TCC) and master’s degree in exercise and health sciences from UH-Clear Lake. How have you balanced academic and clinical responsibilities with intense Olympic training?

SA | I honestly only have the one answer: God. I do not know how I made it through the last three years, other than a lot of prayer, very little sleep and just a lot of support from all the people that have been involved from TCC and UH-Clear Lake. ... My family, my teammates and everyone around me really rooted me on into getting everything done, especially when it was really hard.



“On dry land, here in Houston, we use a wooden bobsled that I’ve named The Maeflower. ... My brain just told me to go to a hardware store and get up a bunch of wood, some screws, some wheels, a couple door handles and pot holders, and put them together to make this little push cart thing. That actually served as the primary tool for Bobsled 101 ... ”

— SEUN ADIGUN

Nigerian Olympic bobsled team member

PULSE | You’re also in the process of building a business plan for a chiropractic clinic. Why did you choose chiropractic medicine?

SA | When I was injured, I really started to hone in on my mechanics and getting back to the fundamentals of neuromusculoskeletal issues. That really brought me into the light of what chiropractic was because I had a chiropractor who primarily treated me going into the Summer Games.

I also did an internship at a chiropractic office where I learned that there was a lot more to chiropractic than what basically the general public assumed or understood—way more than I actually understood. It just fit and flowed right into line of bare bones, fundamental anatomy type stuff to drive what actual bodies can do.

I don’t believe that one body and another operate the same, particularly in sports. You can’t just give two different people the same workout and expect their bodies to respond the exact same way. They may respond similarly, but there are going to be things that will differentiate between their outcomes. If you can understand the fundamentals of why their bodies respond differently, then you could also be able to contribute to those specific differences, to make that individual athlete better. That was what I saw in chiropractic: The ability to see what the bones do, what the muscles do, what everything does to be able to isolate why some person constantly blows a knee when they’re doing the same workout as another person who’s never been injured.

PULSE | As an athlete and chiropractor, you’ve experienced both sides of sports medicine and undergone multiple types of treatments for injuries.

SA | I really respect the direction sports medicine is going and how integrated practices are becoming so much more common. ... I think that it’s just so beautiful to know that the evolution of sports medicine is really now keying in on the development and the success of the actual athletes and the patients.

The way we get the best output from patient outcomes and patient health care is by giving the multidisciplinary approach. There’s been that Batman versus Superman type of appeal: One saves the world in a little bit of a different way than the other one, but they are both saving the world, and if they work together versus against each other, they actually are more powerful.

PULSE | You’re making history and having fun with it in the process.

What’s the secret to your success?

SA | First and foremost, it’s selflessness. The ability to be selfless is what drives your ability to actually see clearly.

The next thing I would say is fearlessness. In being selfless, you’re able to see a lot more sometimes than you really want to. Sometimes you just have to be able to tackle that fear, particularly that of the unknown. It’s always easier to just turn away and walk away from it, but if you just open up to it, you’ll really be able to see exactly what your purpose is.

And most importantly, faith. When you ride on faith, you’re able to live in that element of selflessness. You’re able to live in that moment of fearlessness. I don’t attribute any type of individual success to myself, but more so to God’s will to put me in places to allow things to flourish or opportunities to present themselves. ■

This interview has been edited for clarity and length.

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An anatomical illustration of a heart, likely a human heart, shown in a frontal view. The heart is centrally located and surrounded by a network of branching blood vessels. Various parts of the heart and vessels are labeled with letters: 'g' at the top, 'h' and 'i' to the right, 'f' on the right side, 'm' on the right ventricle, 'c' on the left ventricle, 'n' on the left side, 'r' on the right side, 's' and 'a' on the lower right, 'b' on the lower left, and 'p' at the bottom. Arrows indicate the direction of blood flow: one arrow points down into the top vessel labeled 'g', another points up from the bottom vessel labeled 'p', and a third points up towards the left ventricle labeled 'c'. The illustration is rendered in a detailed, engraved style with fine lines and shading to show the texture of the heart muscle and the branching pattern of the vessels.

THE Heart ISSUE

A Young Heart in the Right Hands

Three Texas Medical Center doctors traveled to Colombia to save a young woman's life

BY SHANLEY CHIEN

Gabriel Mena, M.D., was busy in the operating room last May when a message popped up on his cell phone. The text came from a fellow doctor and friend in Houston who had heard about a young woman from Colombia, Mena's home country, who had a rare heart condition and needed Mena's help.

For months, Laura Caicedo, 23, suffered from a mysterious case of persistent chest pain and constant hypertension. Caicedo, who stands at 5'2" and weighs 101 lbs., maintained a healthy lifestyle, exercised regularly and didn't smoke. She had no history of health problems, such as diabetes or high cholesterol. By all accounts and appearances, Caicedo was healthy. But her blood pressure had skyrocketed to a dangerously high level, called a "hypertensive crisis." Normal blood pressure ranges between 90/60 and 120/80, but a hypertensive crisis occurs when blood pressure spikes to 180/120 or higher. Caicedo's blood pressure had reached an alarming 200/120.

Her heart was a ticking time bomb.

Doctors in Colombia were confounded by Caicedo's medical condition for quite awhile. In March 2017, they finally diagnosed her perplexing problem: Caicedo had a tumor, called a cardiac paraganglioma, growing around her heart.

"I was really surprised and frightened at the same time," Caicedo said through an interpreter.

Paragangliomas are rare tumors that grow in the nerve cells along the brain and spinal cord. Some types cause the body to produce excess noradrenaline and adrenaline, which affects various bodily functions, including heart rate, blood pressure and breathing. Left untreated, paragangliomas lead to heart attack, stroke and death.

Cardiac paragangliomas are extremely rare. To date, no more than 50 cases have been reported.

Given the location of the tumor and the high risk of surgical death associated with it, Caicedo's doctors determined that it was inoperable and that they would continue treating her condition with medication. However, without surgically removing the tumor, they would just be delaying the inevitable: The growing mass would eventually engulf her heart and kill her.

Nonetheless, Caicedo and her family remained optimistic. Through a series of introductions, Caicedo learned about a foundation in Houston that might be able to help her and sent an email to a Houston acquaintance to act as a liaison. She and

her family weren't sure what to expect, but they hoped for a miracle.

They found one in Mena.

Joining forces

As an anesthesiologist in the department of anesthesiology and perioperative medicine at The University of Texas MD Anderson Cancer Center, Mena has experienced the highs and lows of treating cancer patients and building relationships with their families. He accompanies patients along their continuum of care at the hospital and helps facilitate recovery after surgery. It never fails to be a deeply gratifying experience, but several years ago, Mena could no longer ignore the restlessness stirring within him: He knew there was a population of patients who couldn't afford to travel to Houston for care, let alone be treated at MD Anderson.

"Unfortunately, we in the medical center and many places, including MD Anderson, don't have the possibility of taking care of [out-of-state] Medicaid children. It's so hard for a mother or a father to have to tell their children that they have to perish because they don't have any access to life-saving therapy," Mena said. "It's really heartbreaking. We are making great leaps in cancer care, but at the same time one of our missions is to eradicate cancer from the face of the Earth.

That includes treating the rest of the world."

Galvanized by his desire to help underserved and underprivileged children suffering from cancer, Mena in 2011 launched the United2Cure Children Foundation, a non-profit social impact organization that combines the surgical, oncological and pediatric expertise from institutions across the Texas Medical Center to deliver lifesaving therapies to cancer-stricken children. In addition, the foundation provides financial and psychological support for patients' families.

(continued)

“I was very nervous and anxious, but I put everything in God's hand. At the moment I went to Houston and had the appointment with Dr. Mena and Dr. Reardon, I immediately calmed down because I knew I was going to be in the best hands.”

— LAURA CAICEDO
Heart patient



Laura Caicedo's fiancé, Julian Cortes, kisses her hand after her heart surgery.

Credit: Gabriel Mena, M.D.

“We are making great leaps in cancer care, but at the same time one of our missions is to eradicate cancer from the face of the Earth. That includes treating the rest of the world.”

— GABRIEL MENA, M.D.

Associate professor in the department of anesthesiology and perioperative medicine at MD Anderson Cancer Center

In the best hands

When Mena learned about Caicedo's condition, he was determined to help her and immediately forwarded her case to a team of thoracic surgeons at MD Anderson for review.

After studying her file, David Rice, M.D., professor of thoracic and cardiovascular surgery at MD Anderson, decided that the best course of action was to perform a heart autotransplantation, a procedure that would disconnect the heart from Caicedo's chest, remove the tumor, reconstruct the heart, and then place it back inside her chest. The problem: Only a handful of surgeons in the entire world had the expertise to perform such a highly complex surgery. Luckily, the top expert in heart autotransplantation for cancerous heart tumors—cardiac surgeon Michael Reardon, M.D.—was a stone's throw from MD Anderson at Houston Methodist Hospital and agreed to lead the surgery.

On Aug. 15, 2017, Mena and his foundation flew Caicedo and her family to Houston to meet with Reardon and his team and introduce Caicedo to the first cardiac paraganglioma patient Reardon had saved many years ago. Reardon outlined the risks and benefits of the surgery. Yes, it was going to be invasive. Yes, it was high risk. And yes, cardiac paraganglioma patients had died on the operating table.

At this point, Reardon had only performed the surgery 15 times in his 40-year career. Caicedo would be his 16th patient for this procedure. Given the rate the tumor was growing and where it was located, Reardon said, Caicedo wouldn't survive another year or two without the surgery.

“I was very nervous and anxious, but I put everything in God's hand,” Caicedo said. “At the moment I went to Houston and had the appointment with Dr. Mena and Dr. Reardon, I immediately calmed down because I knew I was going to be in the best hands.”

Although Caicedo was initially apprehensive about the surgery, she had the rest of her life to look forward to. She was completing her degree in business administration from the Universidad de La Sabana and helping her father run the family's interior design business. On top of that, Caicedo's boyfriend of three years, Julian Cortes, had proposed to her. He stood devotedly at her bedside during her hospitalization from March to June 2017, holding her hand as doctors wracked their brains over her condition. When Caicedo was released from the hospital, Cortes promptly took her out for a romantic dinner and popped the question.

Her heart might have actually skipped a beat that night, but this time, it wasn't because of the tumor.

“I was very happy and very excited,” Caicedo said. “I said, ‘Obviously!’ We're still deciding on a date for the wedding, but we hope it will be between this year or the next.”

The surgery had to work.

Ideally, Reardon would have performed the procedure at Houston Methodist, but it would have been too expensive for the family and it would have cost the hospital an estimated \$250,000 in operational and institutional fees not covered by insurance. Instead, Mena was convinced he could do it for a fraction of the cost.

Thanks to the philanthropic support of three donors (the Burk, Provenzano and Selber families), Mena and his foundation raised \$30,000, part of which was used to fly Reardon and the anesthesia team to the Fundación Cardioinfantil in Bogotá, Colombia, to perform the surgery.

Open-heart surgery

On the morning of Nov. 3, 2017, the day of the surgery, Mena, Reardon and Jessica Brown, M.D., a cardiothoracic anesthesiologist at Houston Methodist, landed in Bogotá. The trio met with Juan Pablo Umaña, M.D., lead cardiovascular surgeon and medical director of the Fundación Cardioinfantil, and members of the hospital's medical-surgical team to review every detail of Caicedo's surgery.



Mena stands by a statue of the Virgin Mary in Bogotá, Colombia. Heart patients and their families hang rosaries around the statue's neck.

(Credit: Courtesy photo)



Above: Michael Reardon, M.D., cardiac surgeon at Houston Methodist Hospital (left), and Juan Pablo Umaña, M.D., lead cardiovascular surgeon and medical director of the Fundación Cardioinfantil (right), operate on Caicedo to remove the paraganglioma tumor. Below: Michael Reardon, M.D.

The operation was not only going to be life-changing for Caicedo, but for the doctors, as well. The surgery would be the first of its kind ever to be performed in Latin America, the doctors said. The team was about to make medical history.

By 8 a.m., Caicedo was prepped for surgery and wheeled into the operating room. After they put her to sleep, the surgeons were ready to begin. Reardon and Umaña made the initial incision down the length of her sternum and pulled back the layers of tissue to expose her heart. The two surgeons then placed Caicedo on the heart-lung machine for cardiopulmonary bypass, which maintained the flow of blood and oxygen during surgery and allowed Reardon to begin the cardiac autotransplantation. They clipped Caicedo's superior vena cava (the main vein that carries blood from the upper body to the heart), aorta and the pulmonary artery, effectively disconnecting the heart from the vessels leading up to the head. The only vein to which the heart remained tethered was the inferior vena cava, a large vein that carries blood from the lower and middle body, making the procedure a partial autotransplantation.

After partially removing Caicedo's heart from her chest, Reardon and Umaña were able to expose the tumor, which measured 5 by 7 centimeters, about the size of a baseball. Unfortunately, the tumor had swelled to the point where it was pressing up against Caicedo's aorta and pulmonary artery, compromising the left main coronary artery, which feeds blood to the heart.

Umaña looked across the operating table at Reardon.

"What are we going to do?" Umaña asked Reardon.

"We're going to cut the left main [artery] in half," he responded.

"Cut the left main in half?" Umaña repeated.

"That's what you've got to do for this," Reardon said.

Thankfully, the two surgeons had prepared vein grafts from Caicedo's leg to bypass the split artery

while they successfully removed the tumor. Using veins from the leg for coronary bypass is a rare technique that had only been performed on paraganglioma patients twice before, Reardon said.

"Sometimes the enemy of good is better, and this went very well. Somewhere in the next 10 to 15 years, she'll probably need another operation just to redo her coronaries," Reardon said. "But it's a surgery that will carry with it a very low risk. It will carry a risk of less than 1 percent."

Ten hours after the surgery began, shortly before 6 p.m., Reardon and Umaña completed sewing all the vessels back together, placed the heart inside Caicedo, restarted it to beat on its own and closed her chest. The team then carted Caicedo off to the intensive care unit for recovery.

"On the first day, I woke up with the happiness of being able to

open my eyes again," Caicedo said.

By 10 p.m., the team had removed her breathing tube and let her rest overnight. The next morning, Caicedo was sitting up, talking with her family and eating on her own.

Mena spared no time getting Caicedo back on her feet. As an expert in enhanced recovery after surgery (ERAS) protocols, a perioperative program designed to speed up the recovery process for surgical patients, Mena urged Caicedo to get up, walk around and eat. Unlike the conventional care protocol that encourages bed rest, a mounting body of evidence shows that patients who are mobilized shortly after surgery have better clinical outcomes, experience shorter hospitalization time and heal faster.

"The more you're in the hospital, the higher the risk of complications, infections and pneumonia," Mena said. "You're in the bed and you're not moving, so by accelerating her recovery, we allowed her to regain her strength, her muscles and her mental sharpness to allow her to go back to her loved ones safely."

Mena kept a watchful eye over Caicedo's post-operative recovery.

"He said that I am a very strong woman, that I was capable of everything, that little by little I had to walk and make an effort. He had words of motivation, of love, all the time," Caicedo said. "For me, he has been an angel. I learned that the limits are only in the head."

Mena's encouragement, coupled with Caicedo's self-determination, paid off. By the second day, Caicedo was out of bed and walking around. A week later, she was discharged from the hospital.

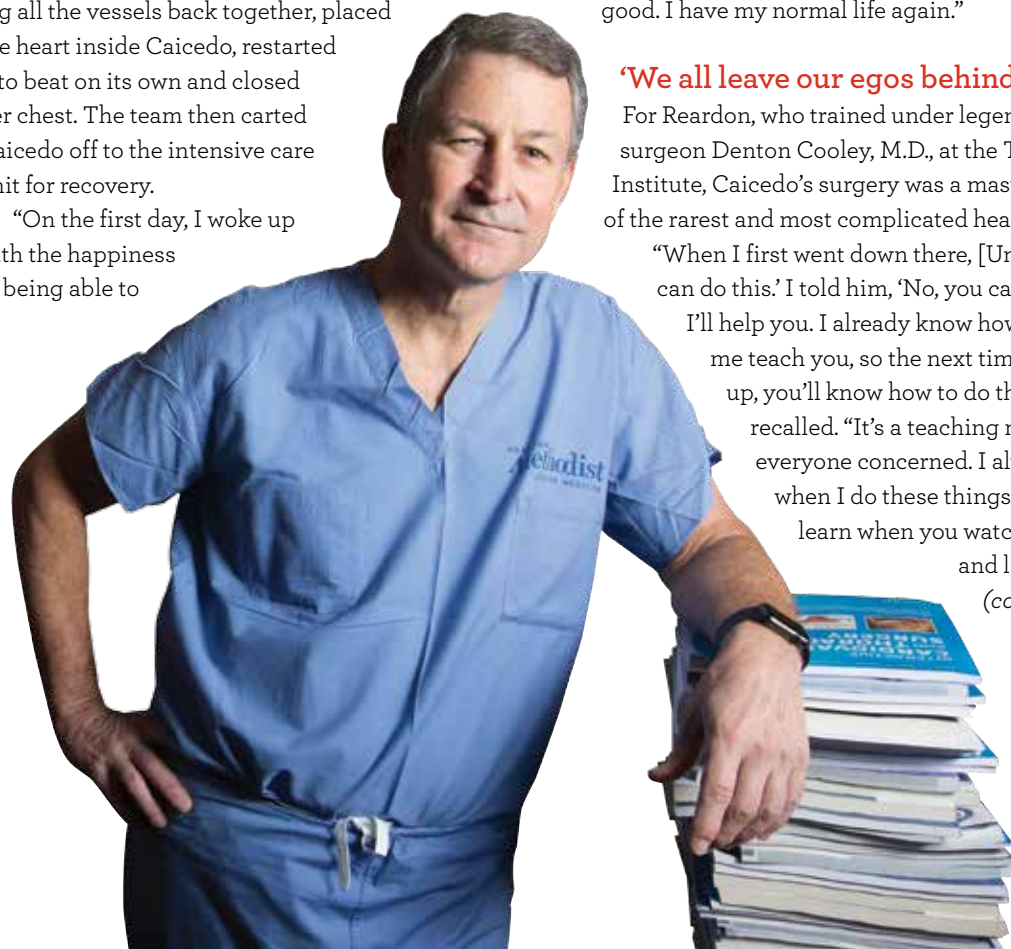
"Now, I feel perfect," Caicedo said, months after her surgery. "My recovery has been spectacular. I feel very good. I have my normal life again."

'We all leave our egos behind'

For Reardon, who trained under legendary heart surgeon Denton Cooley, M.D., at the Texas Heart Institute, Caicedo's surgery was a master class in one of the rarest and most complicated heart surgeries.

"When I first went down there, [Umaña] said, 'You can do this.' I told him, 'No, you can do this, and I'll help you. I already know how to do this. Let me teach you, so the next time this comes up, you'll know how to do this,'" Reardon recalled. "It's a teaching moment for everyone concerned. I always learn when I do these things. You always learn when you watch other people and listen to them."

(continued)





Mena, left, with members of Caicedo's surgery team.

Reardon has performed close to 300 cardiac tumor and 116 primary cardiac sarcoma surgeries, and continues to run several clinical trials and research initiatives. But he isn't interested in his own statistics.

"When I finish my career, nobody is going to care how many papers I wrote. They're not going to care about how many research trials I ran. They're not—and I'm probably not—going to remember," Reardon said.

"What I'm going to remember, though, are the people I met, the friends I made, the places I went. When I get to go do something, like go down to Bogotá and operate with an excellent team like that, with my friends from MD Anderson, the memories that this creates are something that's going to be around forever."

The Texas Medical Center has long been lauded as the nexus of world-class patient care, medical

innovation and research, boasting nearly 60 member institutions. For Mena, the heart of clinical success and medical advancement is collaboration, not competition.

"It's not about MD Anderson. It's not about Houston Methodist. It's about Laura [Caicedo], a girl who had cancer," Mena said. "We all leave our egos behind. We all come together to collaborate, give the very best scientifically and our expertise to deliver this world-class care. We don't care about anything else, and I think we need to help foster that culture in our Texas Medical Center. This is the mecca of medicine in the world, but we still have some distances to go."

With United2Cure Children, Mena hopes to harness the best and brightest minds in the Texas Medical Center, like Reardon, to help patients who otherwise couldn't afford cancer treatment. Since its inception, the foundation has sent experts from the Texas Medical Center to help approximately 20 patients across the country and South America.

But Mena has his eyes fixed on a bigger goal. Instead of flying experts to other locations, he plans to treat more patients by bringing them to the medical center through his foundation.

He admits it's an ambitious plan, but he's up to the challenge.

"It's a big philanthropic effort, but we can do this," Mena said. "We are here. We have a mission. We have to take care of people who need our help." ■

(Credit: Courtesy photo)



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Yes, Chocolate has its Benefits

Medical experts spill the beans about dark chocolate

BY BRITNI N. RILEY



When cocoa beans—the main ingredient in chocolate—were first cultivated in the Americas many centuries ago, both the Mayans and Aztecs believed they had healing, even magical, properties.

Although the way we consume chocolate has changed, health professionals say that purer forms of chocolate can contribute to a healthy heart. That's one less reason to feel guilty about indulging on Valentine's Day.

"There is observational data telling us that chocolate—the cocoa bean itself—can have favorable effects on heart and vessel health if consumed appropriately," said William Zoghbi, M.D., chair of the department of cardiology at Houston Methodist DeBakey Heart & Vascular Center.

The tiny beans pack a big punch. Just like blueberries, goji berries and acai berries, cocoa beans are filled with antioxidants.

"Chocolate is rich with flavonoids and polyphenols, and research has indicated that those two forms of antioxidants have a positive effect on your heart," said Daphne Hernandez, Ph.D., assistant professor in the department of health and human performance at the University of Houston.

Antioxidants work to prevent damage caused by free radicals, unstable molecules in the body that are produced by natural biological processes or introduced via tobacco smoke or other pollutants. Free radicals can inhibit the ability of cells to function normally and lead to heart disease—the number one cause of death for men and women.

The flavonoids in chocolate are known to have a beneficial effect on the vasculature of the heart, Zoghbi said, increasing the body's production of nitrous oxide, which helps expand blood vessels and improve blood flow.

Although chocolate is available in many forms and flavors, not all chocolate is created equal.

"Dark chocolate is better for you in many ways," Zoghbi said. "It has more concentration of cocoa itself, it has less milk and other sugars and it highlights more of the positive effects of chocolate."

But the darker and healthier the chocolate is, the less appetizing it may be for consumers.

"If you eat a piece of chocolate with a really, really high percentage of cocoa, it is actually bitter," Hernandez said. "Chocolates with higher concentrations of cocoa are also more expensive

than other chocolates, which is often the case with healthier foods in general."

Many popular and more affordable forms of chocolate are filled with caramel, marshmallows, nuts, milk and sugar, which can wreak havoc on health.

"When you are wanting to reap the health benefits of chocolate, you will want to go straight for dark chocolate—at least 60 percent or higher cocoa concentration," said Diana Guevara, student dietetic intern at The University of Texas Health Science Center at Houston (UTHealth) School of Public Health. "When you are looking at white chocolate, that is just cocoa butter, so that is not going to have any of the health benefits."

While there are numerous benefits to cocoa beans and chocolate, experts warn to keep consumption to a minimum.

"You have to balance the positive effects of chocolate with the total caloric intake, as well as the fat and sugar intake that is in a chocolate bar," Zoghbi said. "My advice usually is, if you like chocolate, aim for an ounce or two ounces of dark chocolate per week; don't over-indulge."

Keeping your chocolate intake to a minimum might be easier than you expect, Hernandez said.

"Most chocolate bars today are designed with these tiny squares," Hernandez said. "If you get a bar of dark chocolate with a high percentage of cocoa, just break yourself off a square—not more than an ounce or so."

While Zoghbi does not prescribe chocolate, he does not frown on patients rewarding themselves with a little chocolate every once in awhile.

"Chocolate is not a medication and it is not prescribed as a health supplement," he said. "But I wouldn't discourage them from having a proportionate, good amount of chocolate and, if the brain feels good from the satisfaction of the chocolate, you feel good, too, so it is good for the overall health." ■



William Zoghbi, M.D., is chair of the department of cardiology at Houston Methodist DeBakey Heart & Vascular Center.

STEPHANIE COULTER, M.D., directs the Center for Women's Heart and Vascular Health at Texas Heart Institute. The high-energy Louisiana native—who didn't always want to be a cardiologist—is committed to understanding how cardiac disease affects women and developing the best treatments and care for female patients.

Q *You've dedicated your career to the often overlooked and surprising gender differences in cardiovascular disease. Heart disease remains the No. 1 cause of death in both men and women in the country, but there's a limited understanding as to why it affects men and women differently. What has your research shown?*

A | We've known for a long time that women suffer at a greater risk of death from any cardiac impairment. I mean, double. When I started at the women's center, we were really interested in what was the ideology of that disparity. We went and looked at the database here at Texas Heart [Institute], and we looked at all the people that had established vascular disease. We looked at what was the difference among women. Is there a racial disparity? Some of the risk factors are different in different groups.

We looked at our database and we found that basically all women had a similar outcome independent of what their race was. But by gender, compared to men, they had lower outcomes.

Q *Why is that?*

A | In fact, women's overall risk is the same as men. But it's delayed because women, before they hit menopause, are relatively protected from the burden of coronary disease, which is really the main killer of men and women in our society still.

Then, after age 50, or 52 to 53, when women go through menopause, their risks really catch up with them. Their risk factors go up two to four times. After that, women and men had similar outcomes. Women outlive men, but they catch up and end up with a slightly higher risk of dying of heart disease

just because they live longer. Burden of heart disease accumulates over time.

Q *Why is it important for the future of cardiovascular health to study these nuanced differences?*

A | Because the dirt is always in the details. If you want to make a major advance in preventing, treating and stopping disease mortality, you've got to get to people younger in life. You can't wait until they show up in your ER with a heart attack or a stroke because, by then, it's too late. ... That has been a major focus for the American Heart Association and the American College of Cardiology for the last 20 years, really since Laura Bush's Red Dress Project, which really made a big impact on cardiovascular mortality. In fact, if you address the big problems, which are smoking, high blood pressure, diabetes, high cholesterol ... If you attack those risk factors early enough, and control them, you completely prevent disease.

Q *When did you know you wanted to pursue a career in medicine?*

A | I knew from when I was a youngster ... that I didn't want to stay at home. I grew up in Louisiana because my dad worked for Exxon, and all the mothers were your typical Southern women who stayed home with their children. I remember, by the time I was 11 or so,

I didn't see a lot of homology between them and me.

I developed this unique sense of, 'It's okay to be different.' I internalized that at a young age and told myself, 'It's okay that I don't really want the same things that another person wants.' I just got used to being a little bit different. That's the heart of it. People who have to stake out and do something unique have to be okay with that. Otherwise, they're not going to do a great job.

I graduated from high school in 1983. I was coming of age in a period when women were getting more opportunities, but there was a serious glass ceiling back then. I liked the structure that medicine provided. It was very much a meritocracy. I chose well, but I learned to trust that I was different and I learned to trust my internal compass, big time. When something doesn't feel right to me, I know it. I learned not to follow the hooves.

I didn't know a single doctor. I'd never spent any time in any medical facility before I became one. I just knew that it was filled with science, and I liked figuring things out. It had the structure to it where you couldn't be boxed out. I was willing to work.

Once you're in the medical system, it's a meritocracy. You have to make the right grades. Can you do that? That's up to you. You take a test, you study. It's up to you. I liked that.

“ I liked the structure that medicine provided. It was very much a meritocracy. ... I learned to trust my internal compass, big time. When something doesn't feel right to me, I know it. I learned not to follow the hooves. ”

Q *Once you were in medicine, how long did it take you to determine that you wanted to be a cardiologist?*

A | I always took the trail that had the most forks because I never knew what I was going to like and I always liked everything. If I got to the end of a road and there was a fork, I always took the next fork that had the most options. And I didn't always follow the grain.

Along these forks in the road, you have to decide what fits for you. What fits for you may not fit for the next guy. And sometimes I would try those hats on, and then I would go, 'No, that hat didn't fit for me.'

Even when I was a young doctor, I didn't want to be a cardiologist. In fact, I traded away a cardiology elective when I was a third-year medical student because I was like, 'No, those guys are cowboys. I'm not like that.' I never chose the thing that everybody said you should do.

I became an internal medicine resident, and then [cardiology] didn't look so scary. It was more cerebral. I knew enough to think about it in a different way. It wasn't just guys dying and people rushing them to surgery or to the [catheter] lab. There was a lot more intricacy to the physiology. That was very entertaining to me.

Q *What is the best part of cardiology?*

A | You get to take care of patients, and you make them better. We really have transformed [cardiovascular] disease in 20 years, 30 years. I've been like a voyeur of that. Since I started my training [as] a cardiology fellow in 1994, the world has changed. We make a huge difference.

I want to be in a field where we have optimism. I'm optimistic, and I think that you can be optimistic in many fields, but if all your patients are dying it's going to be tough to stay optimistic.

It's really gratifying when you take somebody from the brink and you can transform them.

(continued)



“There are things that are important in life, and they’re worth pursuing. Remember, life is long. You don’t have to have everything at one time, especially as a woman. Life has seasons.”

Q | Many specialties in medicine are still male-dominated. According to a recent study by the American Association of Medical Colleges, nearly 87 percent of active physicians specializing in cardiovascular disease are men.

A | Part of the problem is that we need to encourage women to pursue longer training programs. Sub-specialists require a longer training program, and the training of those sub-specialties interferes in the child-bearing years.

You graduate from college when you’re 22. You graduate from medical school when you’re 26. Sub-specialty training starts at age 29 to 30, so you’re going to train between 30 and 33 or 30 and 35. People have other goals in life.

Q | Yet you managed to do both. You have an impressive career as a cardiologist, as well as a husband and two college-age daughters.

A | You need help and need to be able to afford [childcare]. And you have to be a little bit fearless.

I was frantic about something once, and my mom told me, ‘You can’t have it all at one time, but it doesn’t mean you can’t have it all.’ It was a really good piece of advice because it just depends on how long your time horizon is. I feel like I really just got good enough and wise enough to juggle many things.

But in order to juggle many things, you have to have really, really good people around you.

[Some young girls] are very worried about finding the right husband, or

finding the right match. I’m in full agreement with that because, who you marry, if you’re going to be a working and contributing woman, then, the very best way to sack yourself at the beginning is to marry the wrong guy. You need a guy who’s going to contribute, help out, understand and not be threatened by whatever you’re doing.

Q | What is your advice for young girls pursuing STEM careers?

A | One, pursue the things that you’re good at. If you’re good at something, it’s going to be easier for you to excel at it. Two, find a mentor. I think, in society, we need to provide better mentoring to girls and women who are good at math or science.

You just can’t give up. There are things that are important in life, and they’re worth pursuing. Remember, life is long. You don’t have to have everything at one time, especially as a woman. Life has seasons. You can’t have it all at one time, but that doesn’t mean can’t have it all. You just have to space it out.

Q | What are some simple things people can do to incorporate more physical activity and better eating habits into their daily life?

A | If you cannot exercise during the day because you have no time, and I believe that’s true, take the stairs. Park far away from your office. Get up and walk around as much as you can. Then, it becomes about what you put in your body. If you can’t exercise your body regularly, then you need to be very cognizant of what you put in, which means count your calories, eat non-processed foods, healthy foods, fruits and grains. I’m a big fan of the Mediterranean diet. It’s a big deal because the people who went on the Mediterranean diet reduced their risk of dying of a heart attack or a stroke by 20 percent.

Q | You lead several research initiatives at Texas Heart Institute and advocate for more public education about heart health. What is your main goal for 2018 in this realm of cardiovascular health care and research?

A | I want to involve my young fellows more in research and investigative processes in the hospital for clinical research. The more they get involved in research, the more we move the field forward, the more they learn. They take that information with them when they leave. Because remember, we’re training the next generation of cardiovascular specialists here. We have a big-time responsibility. I heed that responsibility really carefully. ■

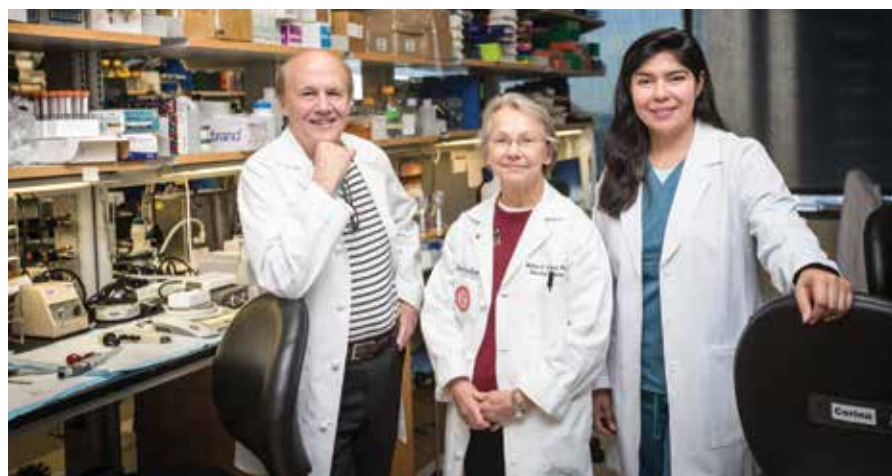
Stephanie Coulter, M.D., was interviewed by Pulse reporter Shanley Chien. This interview has been edited for clarity and length.



Cholesterol Takes a Shortcut

Houston Methodist Research Institute scientists help shed light on cardiovascular disease

BY SHANLEY CHIEN



Henry Pownall, Ph.D., professor of bioenergetics at Houston Methodist Research Institute, in the lab with assistant research professors Baiba Gillard, Ph.D., and Corina Rosales, Ph.D.

Houston Methodist Research Institute scientists recently made a surprise discovery that could potentially change the way cholesterol is treated.

The accidental breakthrough began as an innocuous task.

Bingqing Xu, a third-year medical student from China, joined a research program led by Henry Pownall, Ph.D., professor of bioenergetics at the Houston Methodist Research Institute. One of the program's goals was to assist Xu in publishing a paper. Since no one had fully validated the current model of cholesterol transport from the arteries to the liver, Pownall decided that it would be an appropriate topic for Xu to explore. Little did they know that her research would lead them to new evidence that challenges a decades-long assumption of how the body processes and eliminates cholesterol.

"It was a very benign proposal. It was going to be easy, nothing controversial," Pownall said, "but it turned out that the hypothesis was not valid. She found something totally opposite."

For four decades, the medical community has believed that cholesterol travels from the arteries, becomes absorbed by a particle and remains in the blood for three to five days before being excreted from the body by the

liver. However, Pownall and his team showed that a nascent form of cholesterol known as free cholesterol—an early form of high-density lipoprotein (HDL) cholesterol, often referred to as "good" cholesterol—bypasses this process and instead travels directly from the particle to the liver within two to three minutes, a thousand times faster than scientists had previously believed.

"We're not erasing 40 years of history, but we're definitely updating and bringing to light mechanisms that other people had not previously researched because they just took for granted that there was only one pathway," said Corina Rosales, Ph.D., an assistant research professor of bioenergetics at Houston Methodist Research Institute. "We're trying to find those correct pathways and not just follow everybody else. It'd then be like the blind leading the blind, in a sense."

Many clinical trials use drugs to inhibit the transfer of cholesteryl ester, a mature form of cholesterol found in the body. The drugs are designed to reduce the risk of atherosclerosis, a precursor for heart attack and stroke caused by the buildup of cholesterol in the arteries. However, a number of the drugs failed to yield any meaningful clinical improvement or led to death, despite increasing "good" cholesterol levels.

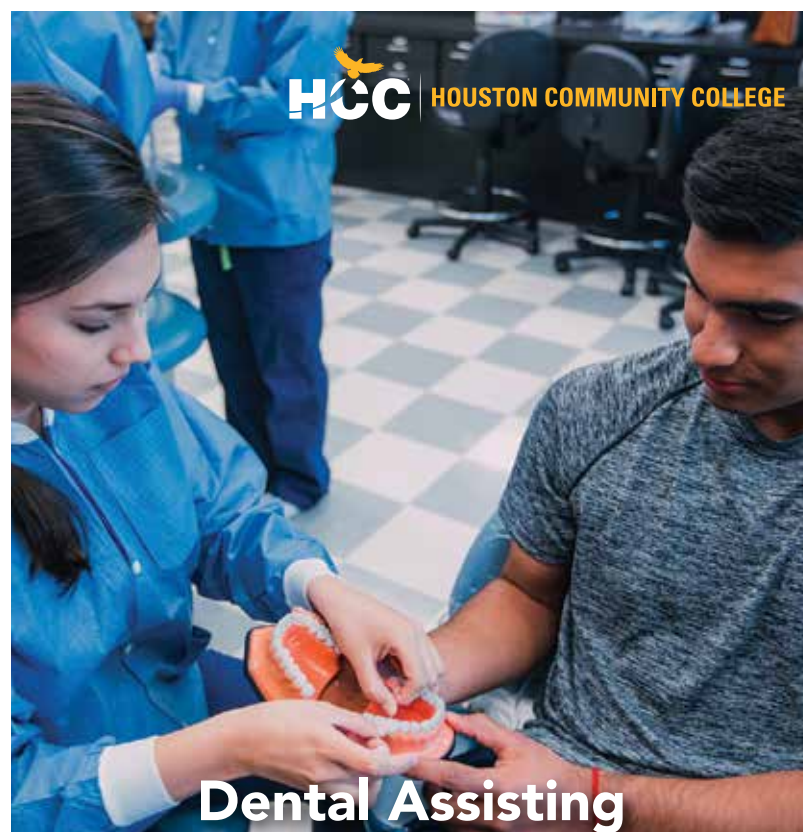
"There were at least three different forms of inhibitors that have been duds because they were focused on the wrong aspect of HDL biology," said Baiba Gillard, Ph.D., an assistant research professor of bioenergetics at the Houston Methodist Research Institute. "We're hoping our refocus will be more productive."

Equipped with the new understanding that free cholesterol is eliminated from the body by the liver much faster than cholesteryl ester, the team said they believe their findings will encourage scientists to take a closer look at how HDL cholesterol contributes to cardiovascular disease and how to increase HDL cholesterol levels in ways that are beneficial to the heart, thus opening the

door to more effective therapies.

"The most important thing is that we really need to elucidate all the proper mechanisms and pathways for cholesterol and other lipids in order to develop good therapeutics," Rosales said. "If you don't know the pathways or if you don't know how they're metabolized, then you can't really develop a good therapeutic agent to treat ... lipid disorders, atherosclerosis or conditions like that."

The team plans to continue their research in partnership with the Houston Methodist cardiology department to test patients' plasma and determine how "good" cholesterol has affected their heart health. ■



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Tiny Valves for Tiny Bodies

PolyVascular aims to manufacture valves for children who need heart valve replacement

BY CHRISTINE HALL

Congenital heart disease, the most common birth defect, can affect the heart's walls, valves and arteries.

The biggest problems associated with treating congenital heart disease are the limited availability and poor durability of replacement heart valves, said Henri Justino, M.D., director of the Charles E. Mullins Cardiac Catheterization Laboratories at Texas Children's Hospital.

Very few options exist for young children with congenital heart disease, he said. Currently, doctors replace valves using homograft valves from human baby cadavers.

"This means another baby has to die and donate their valve," said Justino, an associate director of pediatric cardiology at Baylor College of Medicine. "There are not a lot of babies who die and donate their tissue."

And that baby would have had to die without a major disease, infection or trauma.

This reality prompted Justino and two other researchers to start developing synthetic valves that could fit tiny hearts of varying sizes. Justino teamed up with Daniel Harrington, Ph.D., assistant professor at The University of Texas Health Science Center at Houston, and Kwon Soo Chun, Ph.D., a pediatric cardiology instructor at Baylor, to form a company called PolyVascular.

The medical device startup creates valves that can be scaled to a range of diameters. Valves for newborns and young children need to be as tiny as 8, 10 or 11 millimeters.

"There are basically no manufactured valves of that size," Justino said.

The current procedure to replace heart valves with other human valves is similar to an organ transplant, in that the patient has to take anti-rejection



Henri Justino, M.D., director of the Charles E. Mullins Cardiac Catheterization Laboratories at Texas Children's Hospital, Daniel Harrington, Ph.D., assistant professor at The University of Texas Health Science Center at Houston, and Kwon Soo Chun, Ph.D., a pediatric cardiology instructor at Baylor College of Medicine, display PolyVascular valves.

medication and the patient's immune system must accept the new tissue. Not only can anti-rejection medication jeopardize a patient's chance for future transplants, but the replacement valves could weaken over time, creating the need for another open-heart surgery.

"Now you are exposed to yet another human valve," Justino said. "A person could end up being so sensitized to tissue that if they needed to have an organ transplant, they may not be eligible."

The standard way to build replacement valves involves hand-sewing

human or animal tissue around a frame. These are mostly crafted for adult heart valves, so surgeons with tiny patients often end up retrofitting the valves to fit individual bodies.

PolyVascular's idea is to change the manufacturing paradigm to make valves in small sizes, without human or animal tissue.

"We can bring an entirely new way of manufacturing that doesn't involve hand-sewing of biologic tissue on a frame," Justino said.

In addition, PolyVascular valves

would be implanted through a minimally-invasive procedure using a catheter, which means the open-heart surgery now required to replace valves would not be necessary.

Road to commercialization

Chester Koh, M.D., has known Justino for close to four years and is familiar with the work he is doing at PolyVascular.

"His company has had a long pathway and a great story about perseverance, and about filling a niche need in the market," said Koh, a pediatric urologist at Texas Children's Hospital and associate professor of urology, pediatrics and OB/GYN at Baylor College of Medicine. "I give him a lot of credit for balancing his priority of taking care of patients while also being a physician scientist who brings innovative things from the lab to the bedside."

The hurdles for pediatric device development are high: Not only is the pediatric field 10 years behind the adult market, but children and parents appear to be less willing to participate in clinical trials, said Koh, who directs the pediatric robotic surgery program at Texas Children's and Baylor and co-directs a pediatric medical device consortium in Southern California and Houston that is supported by the U.S. Food & Drug Administration (FDA).

Often there is an unmet need in the pediatric world for pint-sized devices, but investors don't see enough financial potential for them, so many never come to market. But Koh and Justino are trying to change that.

"We need to think creatively to change the financial process with regard to the development of pediatric devices," Justino said. "If we do our job right, and we can get the investment in a good valve and treat it from the

get-go, the return to society and child could be enormous.”

Justino and his team have reached some milestones along the way to commercialization, including meeting with medical device manufacturers who are eager to work with PolyVascular.

In addition, the team has successfully performed pre-clinical trials of their valve in sheep. In testing, they were able to get their valve to work for 200 million cycles to meet clinical standards.

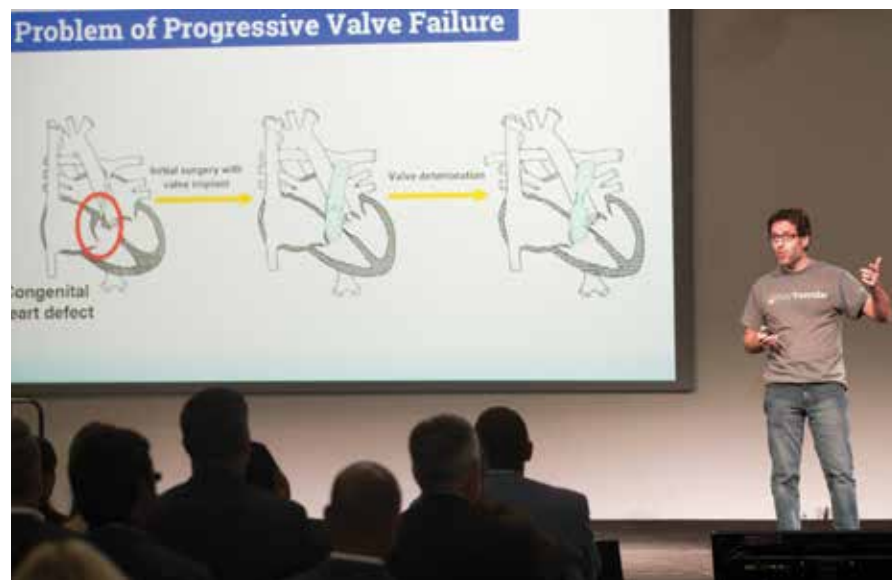
“That translates to five years of durability in the body at a regular heart rate,” Harrington said.

Next, PolyVascular is going for FDA clearance in order to market

their product as a Class III medical device, meaning the device would be implanted in the human body.

Reaching this milestone will take millions of dollars in funding. Justino believes they will need \$5 to \$7 million to get them through the manufacturer’s contract, to perform additional animal studies and then be ready for human clinical trials. It could be two or three years until the device is ready for human trials, and then longer before it would be ready for widespread use.

“We see it getting closer now,” Justino said. “Approval for general use could be in five, six or seven years, but we will get it into patients who need it as part of the clinical trial.” ■



Justino explains heart valve failure at the Texas Medical Center Innovation Institute’s Demo Day.



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Reaching for a Renewable Heart

Researchers at Baylor College of Medicine reverse heart failure in mice

BY ALEXANDRA BECKER



John Leach, a graduate student of molecular physiology and biophysics at Baylor College of Medicine, and James Martin, M.D., Ph.D., professor and Vivian L. Smith Chair in Regenerative Medicine at Baylor and director of the Cardiomyocyte Renewal Laboratory at Texas Heart Institute, in their lab.

Years ago, a young boy named John Leach visited a farm to help pick out a pig to roast at his little league baseball team's annual banquet. His best friend's mom, a nurse, took it upon herself to turn the occasion into a learning experience, showing him each organ and explaining its function. Leach remembers the heart especially—how she pointed to the chambers and ventricles, how she used a water hose to simulate blood flow, how she made it beat.

The image sparked a lifelong interest that Leach, now a graduate student of molecular physiology and biophysics at Baylor College of Medicine, has channeled into potentially groundbreaking research in the field of cardiac development and regenerative medicine. Working with his advisor, James Martin, M.D., Ph.D., professor and Vivian L. Smith Chair in Regenerative Medicine at Baylor, Leach discovered that modifying a widely-studied genetic pathway could

reverse advanced heart failure in mice. Their findings were recently published in the journal *Nature*.

According to the American Heart Association (AHA), close to 6 million Americans suffer from heart failure, meaning their hearts no longer pump blood as efficiently as they should. As a result, heart muscle cells known as cardiomyocytes deteriorate and the heart itself is subject to scarring. Treatment options are limited and the AHA found in 2016 that about half the individuals

who develop heart failure die within five years of diagnosis.

But what if there was a way to replenish those cardiomyocytes by injecting them with a virus? Would that make the heart regenerative?

"We prefer the word 'renewable,'" explained Martin, also the director of the Cardiomyocyte Renewal Laboratory at Texas Heart Institute, "but that is essentially the idea."

By manipulating a cell signaling channel called the Hippo pathway,

Leach and Martin found they could trigger cardiomyocytes to multiply and essentially repair the scarred muscle, thus renewing the heart's pumping function.

"I have clinical training and I took care of people in heart failure, and we were taught in medical school that the heart is a terminally differentiated organ, meaning it cannot renew and regenerate," explained Martin, who stopped practicing to dedicate himself to research full-time. "But what we found was that the Hippo pathway controls size in a developing heart. So when we turned the Hippo pathway off—we took away the stop signal in the heart during its development—what you end up with is a newborn mouse with a two-and-a-half-fold enlarged heart."

The reason? Over-proliferation of the cardiomyocytes. Martin's next question was: what happens when you turn the stop signal off in a fully developed heart? When they found that it induced a similar effect in cardiomyocyte proliferation, he and Leach were excited. Would it actually induce a reparative response in an injured heart?

The answer was yes.

In addition to cardiomyocyte proliferation, Martin and Leach found that the scarred muscle, made up of cells called fibroblasts, was altered as well. Precisely how and why this happens is one of the major focuses of their continued research, but the fact that these cells are also modified is both interesting and encouraging.

"Exactly what's happening downstream—what pathways are active in these fibroblasts to direct them to actually modify this scar tissue—is still an unknown, but one thing that we were able to show is that there are a number of signaling pathways that are active in the heart muscle that are talking to the other cell types in the heart and aiding in the renewal effect," Leach said.

Using mouse models, researchers are able to turn genes like the Hippo pathway on and off through genetic

engineering techniques. But in the future, applying this discovery to treat advanced heart failure in humans would require gene therapy—using naturally occurring viruses as vectors and manipulating them to deliver genetic material that would be beneficial to the human cell, like making a protein, counteracting an abnormal gene, or turning off a stop signal.

"We have these specific viruses that prefer to infect the heart muscle, and we deliver a gene or some type of nucleic acid that alters the pathway," Martin explained. "The pathway is a negative regulatory pathway, like a stop signal, so when we try to remove the stop signal, it unleashes the cardiomyocyte's ability to proliferate and divide."

Altering a signal like this does come with risks, including cancer. Martin explained that there is still more research required before any human trials could be approved. As with all therapies related to DNA manipulation, finding the exact balance is key.

Still, if a genetic therapy that reverses heart disease could be developed from these findings, heart transplants might someday be rendered unnecessary. And a more thorough understanding of the Hippo pathway could lead to other breakthroughs, as well. Martin said they recently discovered that the Hippo has a close connection to genes that are central to Duchenne muscular dystrophy.

"Our findings indicated that we could use this pathway not just for heart failure but for treating muscular dystrophy to try to improve the outcome of kids suffering from this disease," he said. "I suspect that you're going to need to have multiple interventions if we're talking about a cure, but I would say this could be a very important piece." ■



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One Heart, Two Lives

A transplant recipient's life becomes a donor's legacy

BY ALEXANDRA BECKER



Lisa Neely, who received a heart transplant seven years ago, watches her twin granddaughters, Kaleigh and Kinsley, play at her home in Spring.

On a chilly morning in mid-December, Lisa Neely sat in her sewing room and watched as her twin granddaughters whipped up a feast in their plastic play kitchen. A Christmas tree twinkled through the front window where, just four days earlier, millions of tiny snowflakes had settled onto the lawn—a rare and extraordinary sight in Spring, Texas. Kaleigh and Kinsley, who turned four in November, soon grew bored and moved on to a game of dress-up, giggling over their wide-brimmed hats and the oversized sunglasses discovered at the bottom of Neely's purse. They were full of energy and growing anxious for lunch, the promise of Chick-fil-A fresh on their minds.

Every so often, Neely bent down to tell them how much she loved them. She brushed wisps of hair out of their faces and kissed their foreheads.

Not a minute goes by that Neely doesn't feel grateful for their time together. It's all a gift, she often says—the good days and bad days. And it's true. After all, it's been seven years since her own life was saved by a young woman's heart.

Neely's health began to fail in late 1999, when she fell ill with bronchitis. Despite treatment, her condition worsened and she grew so inexplicably weak that one morning she couldn't get out of bed. Convinced that her infection had turned into a bad case of the flu, she went to the emergency room, where physicians told her she was suffering from cardiomyopathy, a severe condition in which the heart muscle becomes enlarged, inhibiting blood flow and often leading to heart failure.

Neely was stunned. She was just 37—with four children ages five to 15.

"My first thought was that my kids were going to be those kids with no mom," she said.

For the next 11 years, Neely took medication and underwent surgical procedures in an attempt to keep her heart functioning as efficiently as possible. It was not an easy road. She forced herself to hold it together for the sake of her children, but would often find herself stopped at a red light with tears streaming down her face. It was like a black cloud followed her everywhere—as if lightening could strike at any time.

And it did. During routine oral surgery, Neely flat-lined on the operating table and was resuscitated with CPR. As her heart continued to fail, she was placed on the transplant list. Eventually, an electrophysiologist implanted a defibrillator to treat her dysrhythmia; the first time it fired, Neely woke up on

“I remember asking my cardiologist the same question so many different ways. I’d say, ‘So a weak heart is not going to last as long as a regular heart?’ But the answer was always the same.”

— LISA NEELY
Heart transplant recipient

the kitchen floor. Driving became too risky, and bit by bit she lost many of the freedoms she used to enjoy.

Still, she was in denial.

“I remember asking my cardiologist the same question so many different ways. I’d say, ‘So a weak heart is not going to last as long as a regular heart?’” Neely recalled. “But the answer was always the same.”

In the months that followed, her defibrillator would go off more and more frequently—a shock that would reset her heartbeat and essentially save her life. But on the day it wouldn’t stop, when it fired again and again and again, the cardiologist told her husband he didn’t have time for an ambulance; he needed to drive his wife straight to the medical center as fast as he could.

Neely had reached end-stage heart failure.

She was admitted to the Texas Heart Institute and underwent a procedure for an intra-aortic balloon pump to temporarily assist with blood flow. Surgery was scheduled for a left ventricular assist device, known as an LVAD, to more permanently supplement her heart’s pumping mechanism.

But then, on a Saturday evening, a nurse came in and told Neely that her orders had been switched to NPO—nothing by mouth—meaning she could no longer eat or drink anything until further notice. Neely was confused. She knew this was a requirement for surgery, but they wouldn’t be inserting the LVAD on Sunday morning, would they?

(continued)



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5,700,000 ADULTS

in the United States suffer from heart failure

~4,000

people are waiting for heart transplants each day in the U.S.



3,244

heart transplants took place in the U.S. in 2017

384
PEOPLE

in Texas are waiting for a heart transplant¹



312
HEART
TRANSPLANTS

took place in Texas in 2017

1

person dies from cardiovascular disease in the U.S. every 40 seconds

1/2

of the people who develop heart failure die within five years of diagnosis

Source: LifeGift, the American Heart Association, and the Organ Procurement and Transplantation Network

¹ This statistic was gathered on January 24, 2018 and includes both adults and children

It took less than a minute before her mind started racing, and she grabbed her cell phone and called her husband.

"Something's up," she told him.

As they spoke, the phone in her hospital room rang, confirming her suspicions. It was the transplant coordinator with news from LifeGift, the designated organ procurement organization for much of the state of Texas.

"She told me: 'We've had an offer on a heart and we'd like to accept it, is that OK with you?'"

Neely's hands shook violently as she said yes. She called her husband back and by midnight, her room was teeming with family and close friends. It was surreal—something that happens on television, she explained, not something that happens to you.

But sitting there in bed, watching her now-grown children smiling and laughing, she couldn't stop thinking that someone had passed away in order for this to happen; that somewhere, there was another family falling apart.

Felecia Dawn Baker was born on Feb. 4, 1984. The youngest of five, she spent her childhood doted upon by her older siblings.

"Everybody loved her," Felecia's mother, Marla Ellsworth, recalled. "They wouldn't leave her alone. She was like their baby doll, so pampered. The sweetest girl in the whole wide world."

Growing up in Wyoming, Felecia was a tomboy, a "ball-cap kind of girl" who preferred hiking and camping in the wilderness to playing with makeup and practicing for dance recitals. As she grew older, her interests expanded to include gardening, reading mysteries and romances, and later, being a mother herself.

"One of her favorite things was being a mom to her boys," Ellsworth said. "She loved going on adventures with them, always with the youngest on her hip."

Felecia eventually settled in Marble Falls, Texas, after her parents divorced and her father moved to the area, and found her calling as a certified nursing assistant at a local nursing home. She made it her mission in life to teach her children everything she knew, from pitching a tent to cooking dinner in their small kitchen at home.

On Saturday, Nov. 13, 2010, Felecia died in a car accident at the age of 26.

Her two young boys

were strapped into their car seats in the back. When a State Trooper asked the eldest what had happened, he said that his mom had gotten a flat tire, that she had gotten mad and kicked it, and that when she went to move the car, they'd gotten hit. After that, she didn't wake up.

Hours after learning that a heart was available, Lisa Neely was wheeled into surgery. By the following morning she was sitting up in bed eating ice pops—the transplant had been wildly successful. It was a Monday. She told her surgeons she'd be home by Thanksgiving.

"Nobody's arguing with you," they said.

But late Tuesday, Neely went into cardiac arrest. With no time to spare, her cardiologist turned to a young surgical resident in the room and hastily gave him orders.

"Open her up and massage her heart."

The resident clipped the stitches, cut the sternum wires and separated her breastbone. Then he took her heart—Felecia's heart—in his hands. For more than an hour he manually pumped blood to her brain and fingers and toes until Neely's cardiothoracic surgeon could get there.

Over the course of that week, Neely was in and out of surgery, and in and out of consciousness. After a while, she said her chest was essentially covered in cellophane wrap, the surgical team just waiting for the next issue to arise. But she fought—they all did—and eventually her sternum was shut again for good.

When Felecia was just two years old, her family went on a week-long camping trip. It was unseasonably hot and one day, quite suddenly, Felecia



Felecia Dawn Baker with her youngest son, Elijah.

(Credit: Courtesy photo)

was nowhere to be found. Her family panicked and began frantically searching the woods and trails. Her mother recalls memorizing license plates that were leaving the park—"Just in case"—as she drove into town to call a search and rescue team. Chaos ensued for what seemed like hours, and boats had already begun dragging the lake when someone thought to look inside the sleeping bags. There was Felecia, who had gotten overheated and crawled inside. She looked up drowsily as her siblings all fought to hug her at once.

As a young adult, Felecia went with her stepfather to the DMV to get a new driver's license. Filling out the application, she paused at the part that asked if she wanted to be an organ donor.

"What does that mean?" she asked.

"It means that if you died, you would save other people's lives," he told her.

"Oh, well of course then," Felecia said, checking the box.

Neely's recovery took longer than her doctors anticipated. She grew frail—

even the thought of food made her stomach turn—and she struggled to get out of bed. After conversations about moving her from the hospital into a rehab facility began, she asked her cardiologist if instead she could go home by Christmas. No one seemed optimistic, but one day in late December, the transplant coordinator came into her room and said, "Oh my God, he's sending you home."

Home was exactly the medicine Neely needed. In just one week, she went from wheelchair-bound to walking up a driveway to her longtime boss' annual New Year's Day bash. After that, there was no turning back.

These days, Neely fills her time with activities that bring her joy—a part-time job, swimming in her pool, learning to quilt, and filling her seven-passenger SUV with grandkids for special outings with their "MoMo." She also volunteers with LifeGift in hopes of honoring Felecia's memory and encouraging others to become organ donors. Every day, she thinks about what she would have missed had it not been for Felecia's heart.

"I've had seven years of life I

“We thank God every day for Lisa. When you lose a child, just knowing that she's got a heart that's still beating, knowing that her heart is still alive—it keeps us going.”

— MARLA ELLSWORTH

Mother of heart donor Felecia Dawn Baker

wouldn't have had," Neely said. "I can't tell you how many times I look up and I'll say, 'Thank you, God, for letting me be here for this.'"

Through letters, Facebook, and later, in person, Neely has connected with members of Felecia's family, including her mother and sisters. At the time of the transplant, Neely was given only minimal information—that her heart donor was a 26-year-old female from the Austin area—and told that after a period of time, she could write a letter to the family via LifeGift. To protect the privacy of both parties, all correspondence between transplant recipients and donor families is anonymous to start;

it is up to each person to decide how much he or she would like to share.

Both Ellsworth and Neely are grateful the other was so open.

"We thank God every day for Lisa," Ellsworth said. "When you lose a child, just knowing that she's got a heart that's still beating, knowing that her heart is still alive—it keeps us going."

Sometimes Neely worries that she isn't doing enough to give back. She cites the oft-quoted verse, "To whom much is given, much is required," and says she is constantly striving to make Felecia's family proud.

"I have always said that between my will to live and her strong heart, we survived. And I do think of it as 'we,'" Neely said. "Sometimes, I call it 'our' heart." ■

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Small Device Promises Big Fix

BY CHRISTINE HALL

In the future, abnormal heart rhythms could be controlled by a tiny device inserted directly into the heart, eliminating the wires that are attached to standard pacemakers and defibrillators. The device could also put an end to the invasive surgery needed to implant a traditional pacemaker or defibrillator.

Aydin Babakhani, Ph.D., formerly of Rice University and now associate professor of electrical and computer engineering at the University of California at Los Angeles (UCLA), has been working on this device for a year with Mehdi Razavi, M.D., director of clinical arrhythmia research and innovation at Texas Heart Institute (THI).

“The ideal technology we will have will precisely control the electrical

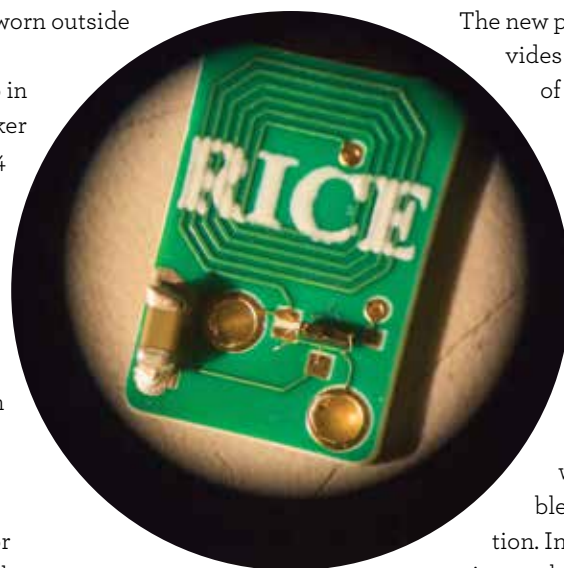
pulse,” said Babakhani, who directs UCLA’s integrated sensors laboratory. “It is surprising that this has not been done in the last 50 years.”

Traditional pacemakers and defibrillators are implanted near the heart. Pacemakers help control heart rhythms through electrical pulses from a wire lead that connects to the heart. Defibrillators also monitor heart rhythms, delivering shocks when they sense an abnormality. The shocks are not only painful, but can be stressful to the patient.

In contrast, the new battery-less pacemaker designed by Babakhani and Razavi—about the size of a dime—harvests energy wirelessly from microwaves transmitted by a battery pack

that can be worn outside the body.

The chip in the pacemaker is less than 4 millimeters wide, and pacing—the rhythm of contraction and relaxation in the heart—can be adjusted by increasing or decreasing the power transmitted to the receiving antenna in the chip.



The new pacemaker provides solutions to many of the complications associated with pacemakers and defibrillators, said Razavi, an associate professor at Baylor College of Medicine.

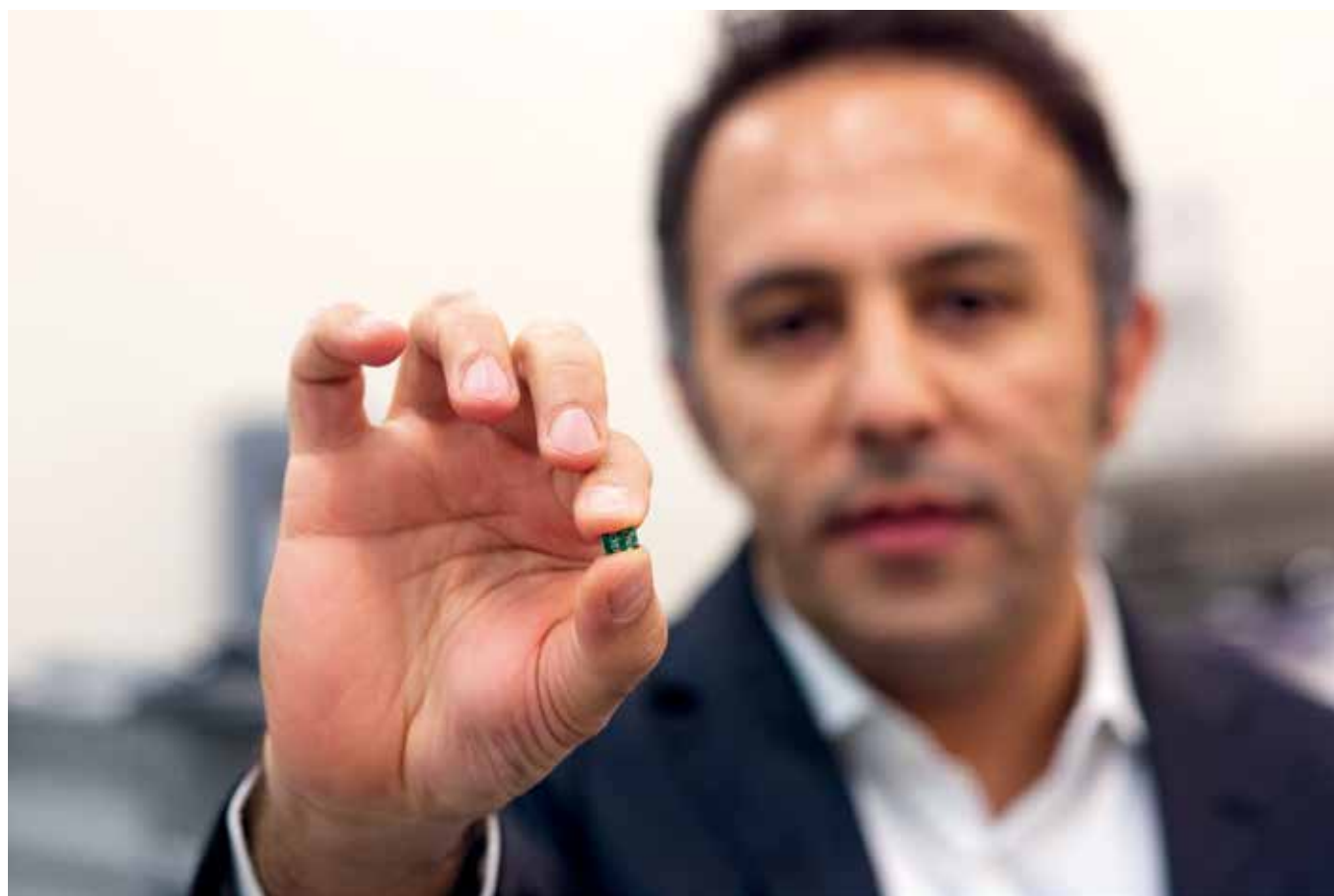
Some side effects of the wire leads include bleeding and infection. In addition, the continuous beating of the heart can cause the wire’s insulation to fail over time. Twenty percent of leads have issues after 20 years, Razavi said.

Other recently introduced lead-less pacemakers also reduce these complications, but they are unable to provide dual-chamber or biventricular pacing, which Babakhani and Razavi aim to do with their device.

In addition, if a patient with the device ends up in the intensive care unit, the external battery pack could be placed up to 20 feet away and transmitted using telemetry.

“It’s similar to the way smartphones can be charged wirelessly,” Razavi said.

The new pacemaker also offers a different sort of shock to the heart. When an ordinary cardiac defibrillator detects an abnormal heart rhythm, it shocks the heart in a painful way that Razavi describes as being hit with a two-by-four. The new technology



Left: Aydin Babakhani, Ph.D., formerly of Rice University and now associate professor of electrical and computer engineering at the University of California at Los Angeles, holds the pacemaker chip. Above: Detail of the chip.



Mehdi Razavi, M.D., director of clinical arrhythmia research and innovation at Texas Heart Institute, holds a heart model.

will stimulate the heart with a lower voltage so the patient doesn't even know it is happening.

"Our hope is to replace actual defibrillators, which can be a traumatic experience for patients," Razavi said. "We have the possibility of achieving treatment of both the most common and most lethal cardiac arrhythmias with external powering, wireless pacing and cardiac defibrillation that is not only painless, but is actually imperceptible to the patient."

Next steps

The team successfully tested the device in a pig, demonstrating that it could tune the animal's heart rate from 100 to 172 beats per minute. Razavi and Babakhani said they will continue with animal studies this year.

Babakhani, Razavi and other colleagues introduced the device at the Institute of Electrical and Electronics Engineers International Microwave

Symposium in Honolulu in June 2017. They also authored a short paper written by Babakhani and Yuxiang Sun, M.D., Ph.D., of Rice; Brian Greet, M.D., David Burkland, M.D., and Razavi of Baylor and THI; and Mathews John of THI.

The team is further developing its technology in collaboration with Behnaam Aazhang, Ph.D., the J.S. Abercrombie Professor of Electrical and Computer Engineering, and Joseph Cavallaro, Ph.D., professor of computer science and electrical and computer engineering, both at Rice.

The next step is to develop better versions of the pacemaker. The team hopes to use the device in patients who recently had surgery or a heart valve replacement.

"Patients who have a defibrillator may live longer, but not better, because of the pain of the shocks they receive," Razavi said. "With this new idea, they are going to live longer *and* better." ■

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A New Type of Medical School

UH College of Medicine will focus on primary care

BY RYAN HOLEYWELL

From his office at the center of the University of Houston campus, Stephen Spann, M.D., offers a thoughtful assessment of the challenges facing modern medicine in the United States, and in Houston in particular.

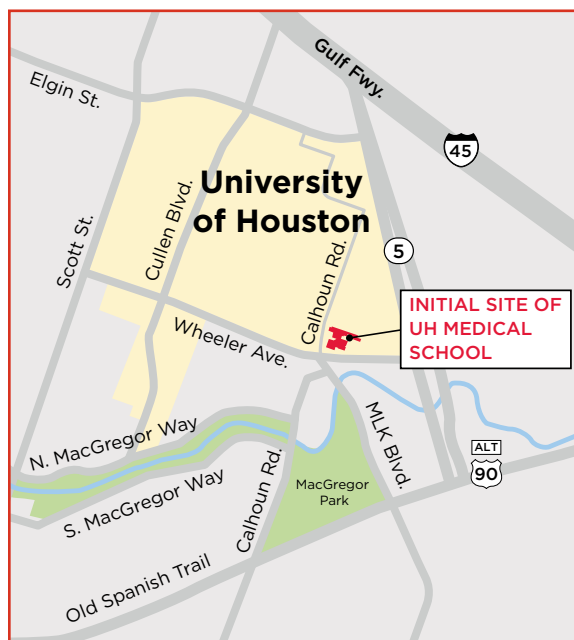
“Your life expectancy here, and in other parts of the country, is dependent, among other things, on your zip code,” Spann said. “There are geographic communities in Greater Houston that have major health disparities, and they need a different approach to health care.”

In many parts of the U.S., health and socioeconomic status are closely intertwined. And in cities like Houston, where the disparity between wealthy and poor residents is increasingly pronounced, the best medical care is often reserved for those who can afford it.

As planning dean for the forthcoming UH College of Medicine, which was approved by the school’s Board of Regents in November, Spann hopes to solve this problem by producing a different type of doctor from a different type of medical school. He says most medical schools are “more focused on sick care” than on wellness. Many of their graduates choose to become specialists, a pathway generally considered to be more prestigious and more lucrative than primary care. But Spann sees a shortage of primary care doctors nationwide, and in Texas specifically, which ranks 47th in the ratio of primary care doctors to residents.

So UH will take a different approach, by creating a medical school that doesn’t focus on elite specialties and instead develops physicians focused on primary care who have a particular interest in underserved populations in rural and urban Texas.

It’s a shift that makes sense today, Spann and others say, when health care experts are increasingly



examining the economic and social factors that affect people’s health. Meanwhile, there is a gradual shift in the health care sector from the historic fee-for-service model—in which providers are paid based on the volume of treatment they provide—towards “value-based-care,” in which providers are paid based on health outcomes.

“I’m trying to create the medical school that the people in the know say we need today,” said Spann, who is charged with opening Houston’s first new medical school in more than 40 years.

Spann is a natural fit for a medical school that focuses on primary care. A family physician who attended Baylor College of Medicine, he spent a year early in his career with the U.S. Public Health Service

in rural Arkansas practicing family medicine, and another three years in family medicine in rural North Carolina.

But he has spent most of his career in medical education, in positions at University of Oklahoma College of Medicine, The University of Texas Medical Branch - Galveston, Baylor College of Medicine, and Tawam Hospital, a tertiary care teaching hospital in United Arab Emirates managed by Johns Hopkins Medicine International.

UH’s goal to produce a primary care-focused school comes at a time when just 20 percent of all Texas medical school graduates choose residencies in primary care specialties, according to UH. The school’s ambition is for 50 percent of its graduates to go into primary care. The hard part? UH can’t actually require its students to do that. So the school has a three-pronged approach to steer students in that direction.

First, it will recruit students who are statistically more likely to become primary care doctors, based on well-known predictors. Applicants from rural areas, those with parents who had service-oriented jobs such as teaching or preaching, people choosing medicine as a second career, those who have shown an interest in community health through volunteering, and under-represented minorities are all more likely to go into primary care, Spann said.

Second, UH will create a curriculum that emphasizes primary care. For example, student rotations will be focused on outpatient care, unlike other medical schools rooted in large, academic hospitals. There will also be a required, four-week rural health rotation.

Spann expects students will spend a half day every week as part of a health care team at a primary care clinic. Additionally, students will work with interprofessional teams made up of other UH students—from fields such as nursing, social work, pharmacy and law—who would be assigned to families with complex medical and social problems living in underserved areas. The teams would follow the families over four years to provide support and learn about the social determinants of health.

That program is modeled on a similar effort at Herbert Wertheim College of Medicine at Florida International University (FIU), which opened its doors

“Your life expectancy here, and in other parts of the country, is dependent, among other things, on your zip code. There are geographic communities in Greater Houston that have major health disparities, and they need a different approach to health care.”

—STEPHEN SPANN, M.D.

Planning dean for the forthcoming UH College of Medicine

to students in 2009 and has a similar focus on community-oriented, primary care.

“We want our students immersed in this,” said Pedro Greer, M.D., associate dean for community engagement and professor and chair of the department of humanities, health, and society at FIU medical school. “They need to know how to put these teams together when they start practicing. It’s not the doctor’s responsibility to solve the patient’s housing issue, but they need to know how to put a team together who can.”

Third, UH aims to create a culture that values primary care. That means recruiting faculty members who buy into the mission. “It’s not okay for any of the faculty to say (to a student), ‘You’re too smart to be a primary care doctor,’” Spann said. “Believe me, that happens.”

Eventually, UH wants to be known nationally for producing doctors who have a deep understanding of health disparities, who know how to work in communities to improve health and health care, and who are experts in providing “high value” health care, school officials say.

That’s exactly the right approach, said Molly Cooke, M.D., professor of medicine at the University of California San Francisco School of Medicine. Cooke has written extensively on ways medical schools can modernize, and her work has influenced some of UH’s plans.

UH has a unique opportunity, she said, since it’s difficult for existing schools to adapt their curricula and culture to changing times. “From my perspective, knowing medical education fairly well, you’re seeing more interesting things going on at the new medical schools than the legacy medical schools, by and large,” Cooke said.

UH expects to enroll its first class of 30 medical students in August 2020, and to have a full entering class of 120 students by 2024. But there are many milestones ahead. The school must win approval from the Texas Higher Education Coordinating Board, as well as the Liaison Committee on Medical Education, the national accrediting body for medical schools. UH also has to recruit students and faculty, fundraise, and receive state appropriations.

(continued)



Stephen Spann, M.D., on the University of Houston campus.

The school needs to generate about \$120 million over 10 years in startup costs. The goal is to raise a third of that through philanthropy, a third from state legislative appropriations and a third from revenue the university can generate through its intellectual property. The medical school would start off with space in a building on UH's campus that is nearing completion. But eventually, UH will need to pay for and build a new, \$80 million medical school building.

If it all goes well, UH will be the latest of several new medical schools in Texas. In 2016, The University of Texas at Austin opened the Dell Medical School to its first class of students. That same year, The University of Texas Rio Grande Valley School of Medicine welcomed its first cohort. Texas Christian University and University of North Texas Health Science Center have plans for a joint medical school in Fort Worth scheduled to begin classes in 2019.

The surging number of medical schools in the state concerns some leaders, including state Rep. John Zerwas, M.D., a Houston-area anesthesiologist who chairs the state house appropriations committee. He has warned that the ratio of Texas medical students to residency slots may not be adequate if the surge of medical schools continues.

“I’m trying to create the medical school that the people in the know say we need today.”

— STEPHEN SPANN, M.D.

In other words, if Texas doesn't have enough slots for residents, then its medical school graduates will move elsewhere for residency, undermining the goals of addressing the state doctor shortage by opening more medical schools.

UH is addressing that concern through an arrangement with Hospital Corporation of America (HCA) for the development of eight new residency programs that will include 103 new first-year residency positions by 2020, and 309 total residents by 2024. Spann says he thinks that will go a long way towards satisfying leaders in Austin, but he acknowledged the challenges of building a medical school at a time when so many others across Texas are doing the same.

Still, Zerwas said there's room for another medical school in Houston, and the HCA deal will help address his and other policymakers' concerns. "I think they've targeted a niche out there, a community that hasn't

been served as well," Zerwas said. "The medical center has a tendency to focus on specialty-type care. That's not surprising, considering all they do. To have a medical school that focuses on the underserved primary care community is a good way to go."

Spann doesn't think the surge of new medical schools in Texas is a problem. Only 30 percent of those who apply to Texas medical schools get in, he said, suggesting that even as new schools open, demand is far from being met. "We don't believe that this medical school will in any way threaten other medical schools," Spann said.

Greer, of FIU, said a new UH medical school could be a major asset for Houston. "This is about preparing our students to make our country healthier," said Greer, a Presidential Medal of Freedom recipient and MacArthur "genius" grant winner for his work with the homeless. "Our medical system hasn't really changed in 100 years. That's the advantage in Houston. It's brand new, and they have a clean slate. ... The question is not, 'Does Houston need another medical school?' It's, 'Does it need one like this?' And there's no question. Of course it does." ■



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ON THE SIDE

BY SHANLEY CHIEN



Mentally and physically, Milan Jamrich, Ph.D., has always aimed high.

For the past 20 years, Jamrich has served as a molecular and cell biologist at Baylor College of Medicine, where he studies a rare genetic mutation that causes animals—including humans—to be born without eyes.

“Our claim to fame is that we have identified the key gene in eye formation,” Jamrich said. “This gene is also expressed in a part of the brain called ventromedial hypothalamus—this part of our brain that regulates our body temperature and oxygen level. ... If you don’t have ventromedial hypothalamus, typically, you would die even in utero, but there are some minor mutations in which case the brain is just fine but the eyes are lacking.”

Outside the lab, Jamrich, 67, has pushed himself to his physical limit and found fame as an elite high jumper.

Jamrich began high jumping when he was 14 years old in his home country of Czechoslovakia, now a part of Slovakia. When a friend’s father—a track and field enthusiast—built a high jump pit

NAME: **Milan Jamrich, Ph.D.**

OCCUPATION: **Professor at Baylor College of Medicine**

INTEREST: **Competitive high jumping**

and introduced the boys to the sport, he was hooked.

He later joined the track and field team and trained to be a hurdler, but after his coaches noticed that he leapt too high over the hurdles and lost too much time in the air, he decided to redirect his natural skill and pursue the high jump instead.

“I just followed the talent,” Jamrich said.

Jamrich later immigrated to Germany at the age of 20. While he pursued his Ph.D. at Heidelberg University, he continued to compete in the high jump at the elite level, earning the collegiate champion title and placing first in the International British Track and Field Championships in 1972.

During the apex of his athletic career in Germany, Jamrich competed twice a week for eight years. In 1976, he hit his all-time career best at 2.15 meters (7.05 feet). But when

he turned 28, his coaches told him he was too old to compete any further.

Like many athletes who retire, Jamrich turned to coaching a small group of high jumpers. His biggest success was coaching a British high jumper who competed in the 1984 Summer Olympics in Los Angeles. Although Jamrich was interested in continuing to coach, the time commitment proved too challenging. On top of his career as a science researcher, he was a husband and a father to an autistic son.

When Jamrich moved to the United States, he decided to compete again at age 48. Since then, he has won the USA Masters Indoor Track and Field Championships in his age group 11 times and the World Masters Indoor Track and Field Championships five times, earning first place in 2011.

Over his career, Jamrich

broke several American records in high jumping and still holds the record in the 60–64 age group at 1.67 meters (5.5 feet), which he earned in 2011.

His growing list of championship titles is impressive and, for many, hard to believe.

“They’re a little bit confused when I tell them I’m a high jumper,” he said. “They’re not sure if I’m joking or whether I’m serious, especially when they ask me how old I am.”

Jamrich attributes his success to hard work, dedication, and a rigorous exercise regimen. He spends 30 to 45 minutes every day working out—weight training three times a week, high jumping twice a week and focusing on sprints and plyometric exercises the rest of the time.

“If you really stick to exercises, you don’t feel like you are aging that fast,” he said. “You still feel like you have energy, power and speed. ... People say 60 is the new 40. To a degree, it is.”

Jamrich plans to train for an upcoming high jump championship in Spokane, Washington, this summer. ■

HOW HEALTHY ARE 'HEALTHY' SNACKS?

BY BRITNI N. RILEY

Those who have kept their New Year's resolutions may have stocked their pantries and refrigerators with 'healthy' snacks and drinks.

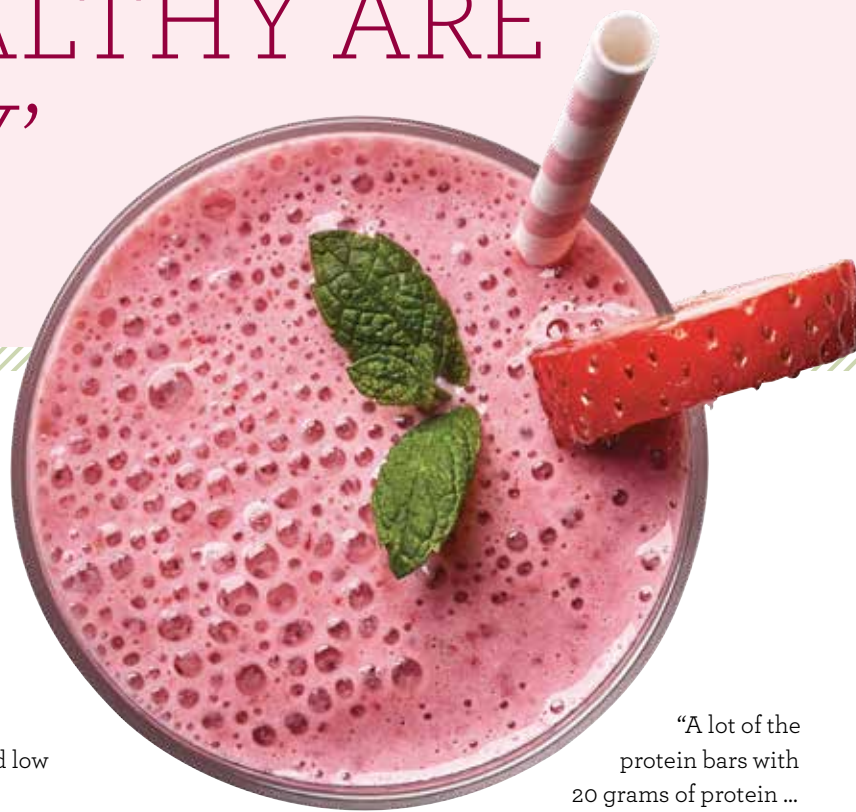
But some foods that profess to be healthy are more processed than consumers might expect, while plenty of high-protein offerings are actually belly bombs in disguise—high in sugar and fat and low in nutrition.

"There are always fads that are emerging, but we know what works for weight loss: calorie restriction and exercise," said Roberta Anding, registered dietitian and assistant professor at Baylor College of Medicine. "But if you are not willing or able to do that, then it becomes an 'I'll try anything' kind of mentality... Maybe it's the gluten, maybe it's the dairy. You can spend a lifetime searching for something."

Gluten—a family of proteins found in grains such as wheat, rye and barley—has gotten a bad name in recent years for adding carbs to our diets. Because of this, costly gluten-free products, such as pasta, bread, and chips, have been popping up in grocery stores.

"For the average person who does not have celiac disease, gluten-free means they had to take something out of a food," said Anding, who is also a sports dietitian for the Houston Astros. "To take something out makes the food more processed."

Gluten has also been blamed for causing stomach irritation in people who do not suffer from celiac disease, but Anding believes another group of substances—sugar alcohols—could be responsible for that.



"A lot of the protein bars with 20 grams of protein ...

that is equal to almost

three ounces of meat. In order to keep the calories low, they may put in a category of sweeteners called sugar alcohols," Anding said. "Sugar alcohols can cause cramping, bloating and diarrhea and, depending on how sensitive you are, that would be something to avoid."

To avoid purchasing bars made with sugar alcohols, Anding says to look for ingredients on nutrition labels ending in the suffix "ol." Sorbitol, erythritol and mannitol are all examples of sugar alcohols.

Other seemingly healthy treats that are often over-processed and unhealthy? Veggie chips.

"We are all looking for the permission to eat a salty or savory snack and we feel better if it says veggie chips," Anding said. "There is really not enough vegetable in it for it to be worth the caloric investment."

Because so much of the packaging for veggie chips depicts beautiful, fresh vegetables, consumers may not realize that many are made with potato starch, potato flour, corn starch, spinach powder and other vegetable substitutes.

“This is a dietitian saying this: You would be better off eating a potato chip than a veggie chip because it is a real potato, where some of these manufactured veggie chips are really designed to make you think they are a better option, and they aren't.”

— ROBERTA ANDING

Registered dietitian and assistant professor at Baylor College of Medicine

"This is a dietitian saying this: You would be better off eating a potato chip than a veggie chip because it is a real potato, where some of these manufactured veggie chips are really designed to make you think they are a better option, and they aren't," Anding said.

In addition to swapping out veggie chips for a bag of baby carrots or raw broccoli for a little crunch, Kristi King, a registered dietitian with Baylor College of Medicine and Texas Children's Hospital, suggests another alternative.

"If you go to the health section of most grocery stores, you can buy actual dried vegetable chips," King said. "They are very different from vegetable-blended potato chips that they market as 'veggie chips.'"

Fruit juice and store-bought smoothies can also be confusing to consumers trying to eat healthy.

"Most folks grab a packaged juice with a picture of a pineapple and a peach on the front and it looks like it has fruit in it," Anding said. "But it really only has 10 percent fruit juice so that means the rest of it is no different than a soda."

Pre-made and store-bought smoothies can be just as bad.

"Smoothies and protein shakes can start with good intentions, but can quickly go wrong," King said. "It all depends on what they are made with. If you make your smoothie at home, you tend to be able to control the calories and the nutritional content better than if you were at a free-standing place, where smoothies are often made with high-fat yogurt or milk. Making it at home is a much better option than buying it out."

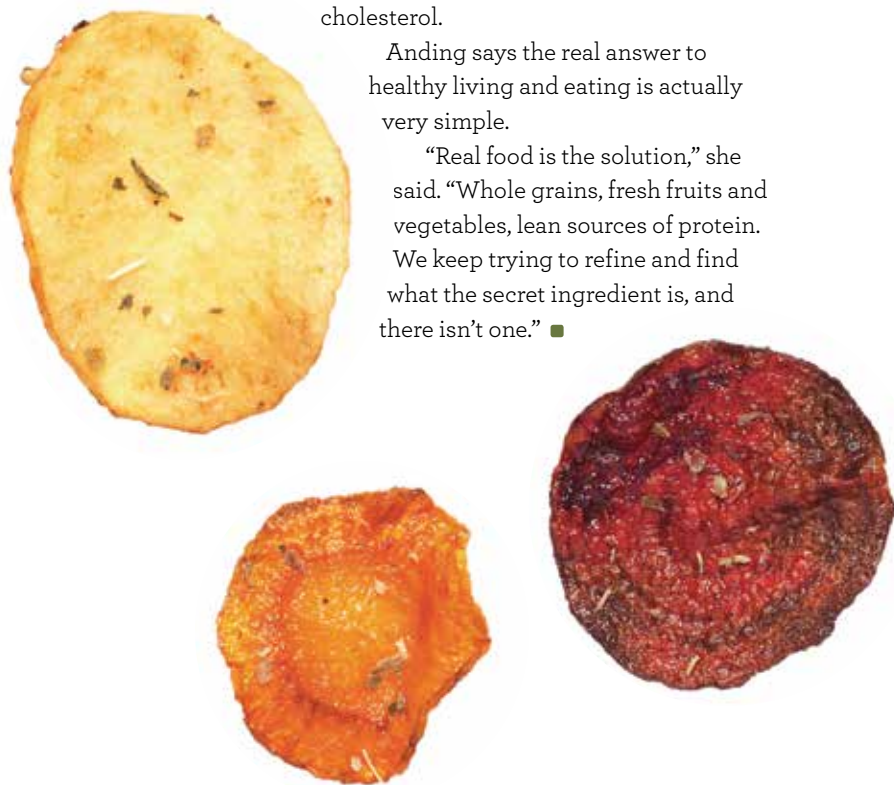
Anding also reminds consumers to have a more discerning eye when it comes to cooking oils.

"The top of the list for me—of foods that people think are healthy that aren't—is coconut oil," she said. "People cook with coconut oil and it really is one of the most saturated fats in the American food supply."

Misled by the fact that coconut oil is plant-based food and might seem to be a better option than beef-fat, consumers need to know that it can still raise your cholesterol.

Anding says the real answer to healthy living and eating is actually very simple.

"Real food is the solution," she said. "Whole grains, fresh fruits and vegetables, lean sources of protein. We keep trying to refine and find what the secret ingredient is, and there isn't one." ■



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[1] **SWATHI ARUR, PH.D.**, associate professor of genetics at The University of Texas MD Anderson Cancer Center, was selected as a member of the second annual class of Andrew Sabin Family Fellows.



1

[2] **MALCOLM BRENNER, M.D., PH.D.**, distinguished service professor and founding director of the Center for Cell and Gene Therapy at Baylor College of Medicine, Texas Children's Hospital and Houston Methodist Hospital, received the European Society of Gene and Cell Therapy Outstanding Achievement Award.



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[3] **WILLIAM F. McKEON**, president and CEO of the Texas Medical Center, presents the 2017 State of the Texas Medical Center at an annual luncheon hosted by the Greater Houston Partnership.



4

[4] **LUKE SCHULTZ**, field operations manager at AECOM Hunt, operates one of the massive flood-gates in the Texas Medical Center, which helped keep institutions operational during the flooding associated with Hurricane Harvey.

[5] **WILLIAM C. SHRADER**, vice president and director of the John P. McGovern Foundation, and **BARBARA J. STOLL, M.D.**, dean of McGovern Medical School and the H. Wayne Hightower Distinguished Professor in the Medical Sciences at The University of Texas Health Science Center at Houston (UTHealth), stand before a new tribute wall at McGovern Medical School that honors John P. McGovern, M.D., and Kathrine G. McGovern, recognizing the \$75 million gift from the McGovern Foundation to the school.



5

[6] **NEST360°**, an international team of engineers, doctors and global health experts, won \$15 million through the MacArthur Foundation's inaugural 100&Change competition for its efforts to end preventable newborn deaths in Africa. **REBECCA RICHARDS-KORTUM, PH.D.**, a Rice University bioengineering professor, was one of the team representatives at NEST360°'s final presentation at the MacArthur Foundation's 100&Change competition in Chicago. NEST360° is a collaboration of Rice University, the University of Malawi, Northwestern University, the London School of Hygiene & Tropical Medicine and 3rd Stone Design of San Rafael, California.



6

[7] Snow came to Houston and the **TEXAS MEDICAL CENTER** in early December 2017, staying long enough to accumulate on vehicles.



7

Credit: Nos. 1, 2, 6, 8, 9, 11, 13, 14, 16 courtesy photos; No. 5, Dwight C. Andrews; No. 12, Nick de la Torre



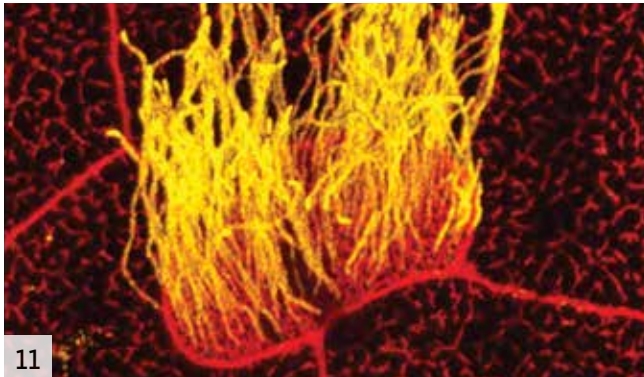
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[8] **JOHN COVERDALE, M.D., M.ED.**, professor in the Menninger Department of Psychiatry and Behavioral Sciences at Baylor College of Medicine, received the Alpha Omega Alpha Robert J. Glaser Distinguished Teacher Award at the Association of American Medical Colleges annual meeting.

[9] **SHELA E. ECOBIZA, BSN, RN-BC**, nurse for the Cardiac Intermediate Unit at Ben Taub Hospital, was named one of the 20 Outstanding Nurses in Houston for 2017 by the Texas Nurses Association, District 9.

[10] **ARTHUR "TIM" GARSON JR., M.D., MPH**, who leads the TMC's Health Policy Institute, hosted "True or False? A discussion challenging everything you *think* you know about health care."

[11] Researchers **VANJA KRNETA-STANKIC, PH.D.**, and **RACHEL MILLER, PH.D.**, of McGovern Medical School at UTHealth and MD Anderson Cancer Center, were among the winners of the annual Federation of American Societies for Experimental Biology's BioArt Competition, which shares the beauty of biological research by celebrating the art of science. Their winning image shows skin cells from a frog embryo that has motile cilia (yellow threads). Krneta-Stankic and Miller are using this frog model to study the role of ciliogenesis in kidney development.

[12] Thousands of people from the Houston area participated in the 2017 **HOUSTON HEART WALK**, which raises money for the American Heart Association.

[13] **CATHERINE L. TROISI, PH.D.**, associate professor of management, policy and community health, and epidemiology at UTHealth School of Public Health, has been elected to the American Public Health Association executive board.

[14] **BIN S. TEH, M.D.**, professor and vice chair of the department of radiation oncology at Houston Methodist Hospital and Weill Cornell Medical College, has been named Fellow of The American Society for Radiation Oncology.

[15] **ELIZABETH L. TRAVIS, PH.D.**, associate vice president, Women and Minority Faculty Inclusion at MD Anderson Cancer Center, has been named to the board of directors for the Association of American Medical Colleges.

[16] **LOURIE MOORE, MSN, RN, NEA-BC**, director of nursing knowledge management for Harris Health System, was named one of the 20 Outstanding Nurses in Houston for 2017 by the Texas Nurses Association, District 9.

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February 2018

2/9

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Houston Methodist Research Institute

John F. Bookout Auditorium

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2/10

Improving Health Care: Cognitive Bias & the Science of Decision Making Conference

Saturday, 9 a.m. – 4 p.m.

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\$550; register online

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2/12

Enhanced Recovery After Surgery Symposium*Implementing Change and New Standard of Care in Surgery*

Monday – Tuesday, 7 a.m. – 4:45 p.m.

MD Anderson Cancer Center

Dan L. Duncan Building (CPB),

Floor 8, Rooms 1-8, 1155 Pressler St.

Tickets start at \$50; registration encouraged

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2/15

Can Listening to Music Support Neurologic Recovery?*Reports from a Recent Music/Brain**Connectivity Study, presented by**J. Todd Frazier and Christof Karmonik, Ph.D.*

Thursday, 5:30 – 7 p.m.

The Health Museum

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2/16

Nantz National Alzheimer Center Symposium*Prion-like Propagation of Misfolded Proteins in Neurodegenerative Diseases*

Friday, 8 a.m. – 4:30 p.m.

Houston Methodist Research Institute

John F. Bookout Auditorium

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Tickets start at \$10; registration encouraged

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2/23

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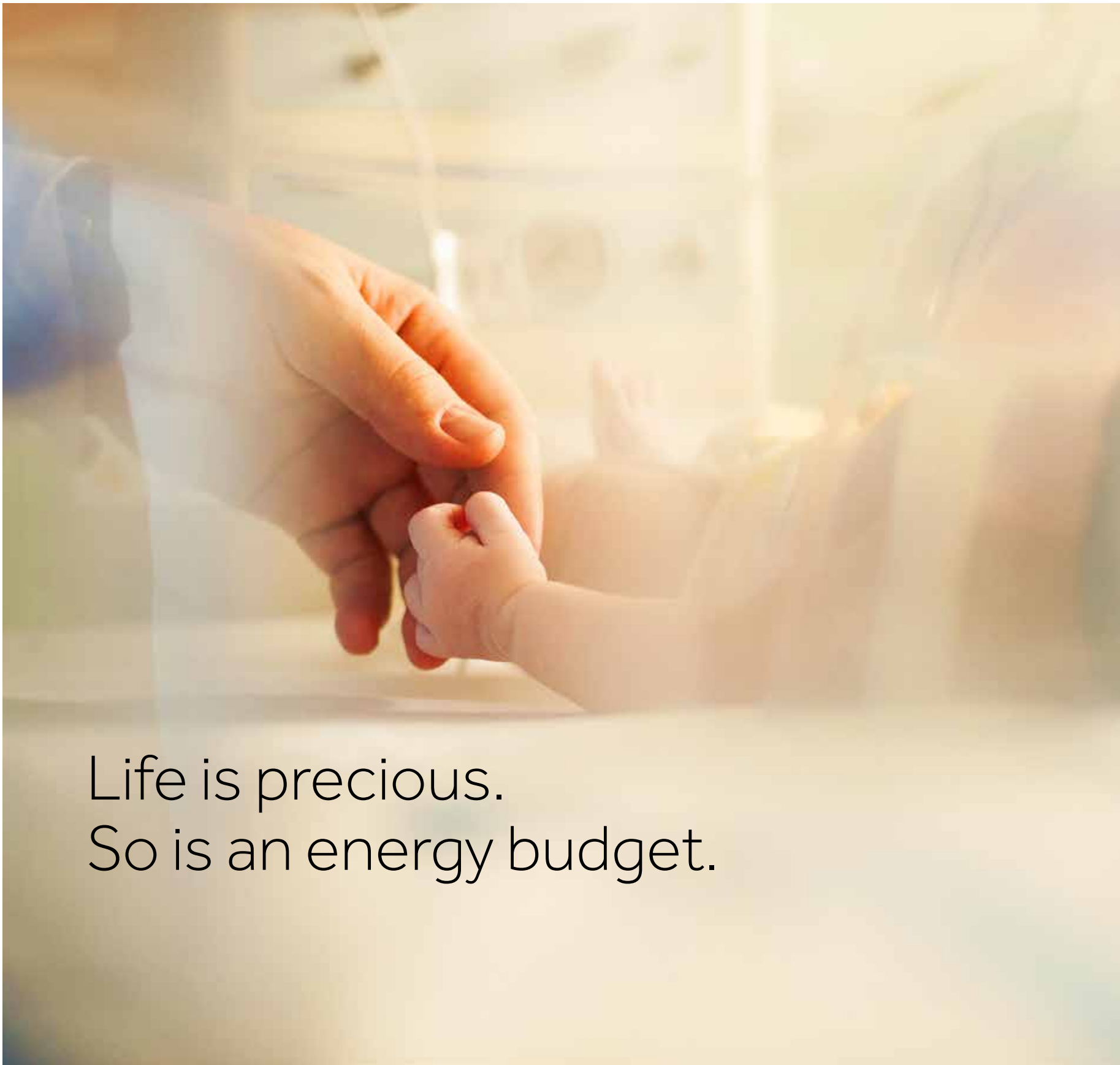
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