# TMCPULSE

THE OFFICIAL NEWS OF THE TEXAS MEDICAL CENTER - VOL. 1 / NO. 7 - NOVEMBER 2014

## Protecting Our Players

Getting ahead of sports-related concussions

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#### Meena Has Momentum

Meena Outlaw, a former TIRR Memorial Hermann patient who successfully carried and gave birth to her son after a spinal cord injury, uses her story to educate and inspire.



#### Spotlight: Thomas Ksiazek, DVM, Ph.D.

The director of high containment laboratory operations for the Galveston National Laboratory discusses his recent trip to Sierra Leone, and how the Vietnam War helped shape his career.



#### **Protecting Our Players**

As awareness of sports-related head injuries continues to grow, so do the efforts to take care of athletes through education and treatment.



#### Anatomy of a Concussion

What happens to the brain when football helmets collide, or a soccer player head-butts the ball? The Houston Methodist Concussion Center offers helpful information for parents and athletes.



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The former Army major general reflects on his time as an aide for Ronald Reagan, and how his faith carried him from the battlefield to the halls of St. Thomas University.

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BAYLOR COLLEGE OF MEDICINE'S DAVID EAGLEMAN, PH.D., IS DRIVEN TO ADDRESS SOME OF LIFE'S BIGGEST QUESTIONS AND ACHIEVE A GREATER UNDERSTANDING OF THE HUMAN BRAIN. HE TACKLES TOPICS AS ABSTRACT AS TIME PERCEPTION AND AS BROAD AS THE INFLUENCE OF MODERN SCIENCE ON THE CRIMINAL JUSTICE SYSTEM—ALL FROM A NEUROSCIENTIST'S POINT OF VIEW.

#### PRESIDENT'S PERSPECTIVE



ROBERT C. ROBBINS, M.D. President and Chief Executive Officer. Texas Medical Center

We're so fortunate to have the medical center here in Houston, with all of the great work that goes on here. Many people take it for granted, and that is easy to do, but it truly is an amazing set of institutions, any one of which you put in any other city and it would be like they won the lotto. We are blessed with an abundance of resources and expertise, all committed to the common goal of improving human health.

As we celebrate Veterans Day and Thanksgiving, it is only fitting that we take time to appreciate the men and women who have helped protect this country and all of the opportunities we are afforded. The Texas Medical Center campus is home to the DeBakey VA Hospital, which is actively involved in helping provide the resources and support our city's veterans need.

This community is uniquely positioned to serve not only our city, but also the rest of the country through research, education and personalized care. And this is a truly great time to be in science and medicine. I often think of the progress made in genomics and regenerative medicine in the last decade as an indicator of the limitless potential for the future.

Genomic testing started out as a 10-year-long, multibillion-dollar effort, and it now takes 48 hours and costs \$1,000 to have your genome sequenced. Amazing progress! Eventually, it will be a one-hour blood test that costs \$50, and everyone's health will be guided by his or her genomic readout. Ten years ago, IPS cells weren't even known. They were developed in the last five or six years, and the researcher who invented the process, Shinya Yamanaka, won a Nobel Prize for his work. Things are changing rapidly, and progress is important if we are going to improve the health of humanity.

We are grateful for progress, but recognize that there is still so much more work to do. So as the holidays near, take time to pause and give thanks for where we are, and all that we still have to look forward to.



#### TMC PULSE

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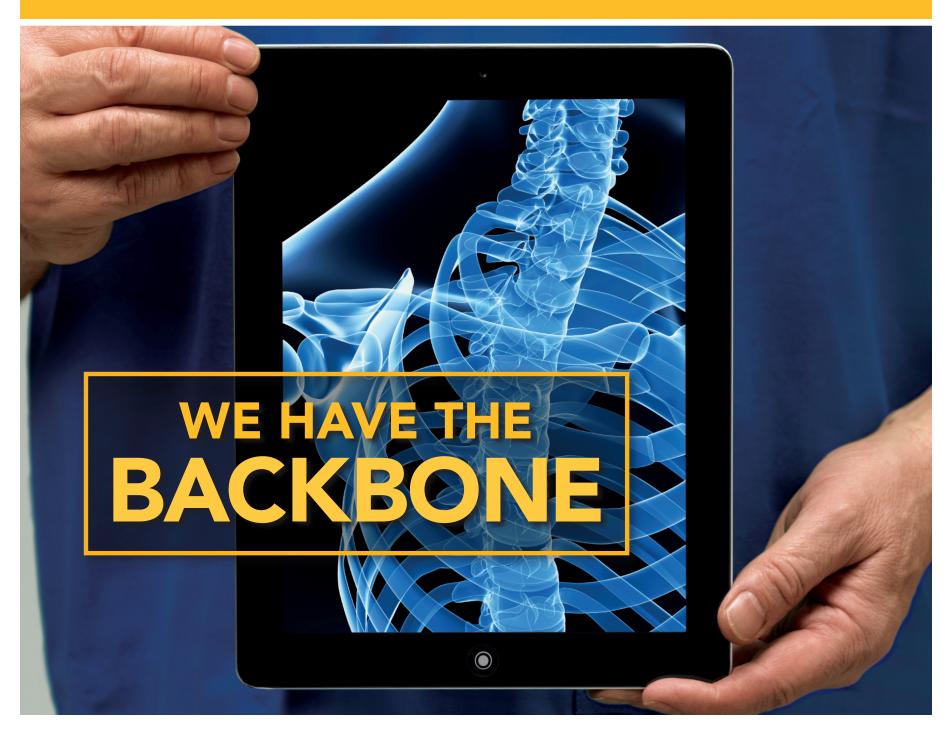


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ADVANCING HEALTH

#### Meena Has Momentum

Even after a spinal cord injury left her paralyzed from the waist down, Meena Outlaw has not allowed her disability to place limits on her life as a wife, mother and professional

By Alex Orlando



For an expectant mother, the turbulence of pregnancy and the looming responsibilities of parenthood can be daunting. Navigating the razor-thin tightrope of taking care of yourself while preparing for an onslaught of diaper changes, midnight feedings and sleepless nights is no easy feat—now imagine doing all of that sitting down.

"When I became pregnant with my son Jamie after my injury, it was quite a shock for my husband and I—it was also a little bit frightening," admitted Meena Dhanjal Outlaw, who sustained a spinal cord injury that left her paralyzed from the waist down. "It was hard to wrap my head around the fact that I was pregnant after all of that. My regular general practitioner had told me that there was a possibility that I might not be able

to have this baby. I was being congratulated, but I was also being told that having a child might not be a possibility. There was kind of a numbness in me at that point."

Outlaw recalls, with vivid clarity, the incident that would alter the course of her life—it happened on January 23, 2000, only three weeks after giving birth to her son, Miles. Stepping onto the balcony of her newly built home, she realized that she had been locked out of her house. Following several minutes of fruitlessly trying to communicate to her three-year-old daughter, Jasmine, how to unlock the door, Outlaw's concern for the safety of her children took hold.

"All of a sudden, Jasmine looked back at me and there was fear in her eyes—she realized that something was wrong and mom can't get in," she recalled. "It was just this moment of reaction. I knew I had to get to my kids. Nothing else seemed to matter. After I had climbed down from the balcony, I realized that one of the posts was too thick to get across, and my body was three-weeks postpartum, so I was just weak and couldn't pull myself back up. There was nowhere else to go and nothing else to do. I let go."

Unbeknownst to her at the time, Outlaw's fall shattered two vertebrae, T12 and L1. "I instantly had this surge of pain and I thought I had broken my legs, because I obviously couldn't move them, but that wasn't going to stop me-my mission was to get into the house, because I had two small children in there," she said. "The paramedics were screaming at me to lay down and not move, because of the risk of the injury moving up, but at the time I didn't know what they were talking about or why they were yelling at me." After Life Flight airlifted Outlaw to Memorial Hermann's Texas Trauma Institute, where she stayed for a weeklong acute-care hospitalization, she was transferred to TIRR Memorial Hermann (The Institute for Rehabilitation and Research), where William Donovan, M.D., became her attending physician.

"My first day there was very frightening, because I understood for the first time that I was headed down a different path," said Outlaw. "I thought they transferred me to TIRR Memorial Hermann so that I could learn to walk again, but instead they were teaching me how to be functional in a wheelchair. I knew it was the start of a journey of learning the 'new me,' so I gritted my teeth and moved forward. My son was only three weeks old when the accident occurred, so my kids were my motivation to get better and get home."



Throughout her pregnancy, Outlaw cultivated a close relationship with Hunter Hammill, M.D., obstetrician and gynecologist at TIRR Memorial Hermann Outpatient Medical Clinic. She has stayed connected to TIRR Memorial Hermann since her injury in 2000.

My most rewarding patients are always the spinal cord injury patients [...] Usually, these patients have survived a terrible, traumatic event in their life that left them with their injury and they've had to overcome a lot of struggles just to be alive and breathing. Being pregnant is a struggle for them at times, but it's a struggle that they enter with a lot of optimism and hope.

— HUNTER HAMMILL, M.D.

Obstetrician and Gynecologist at
TIRR Memorial Hermann Outpatient Medical Clinic

When she re-married in 2006, the prospect of pregnancy was not on Outlaw's radar. Following the unexpected realization that she was expecting, she saw an obstetrician who referred her to a high-risk maternalfetal medicine specialist. "I went into the exam room thinking that being pregnant was a good thing, but left thinking as if it was a bad thing," said Outlaw, who was 41 at the time. "Of course, my husband David was just in constant shock, because when we married he didn't expect to have children with me, so he was just as content raising Miles and Jasmine as his own."

Margaret Rogers, nurse coordinator in the department of urology at TIRR Memorial Hermann, referred Outlaw to obstetrician and gynecologist Hunter Hammill, M.D., at TIRR Memorial Hermann Outpatient Medical Clinic. "When we first met, it was like night and day," reflected Outlaw. "The first thing he asked me was, 'What have you heard about pregnancy and spinal cord injury?' I went down my list of mostly cons—I was high risk, I couldn't have a baby normally and would have to have a C-section. There was also mention of me not being able to have this baby at all. Then he told me to rid myself of all those thoughts and start thinking about having a baby. I left calm and relaxed, with the conviction that I could do it."

"My most rewarding patients are always the spinal cord injury patients," added Hammill. "They're some of the ones that have the strongest bond with their children because it's such an intense experience. Usually, these patients have survived a terrible, traumatic event in their life that left them with their injury and they've had to overcome a lot of struggles just to be alive and breathing. Being pregnant is a struggle for them at times, but it's a struggle that they enter with a lot of optimism and hope."

That sense of optimism and conviction in defying conventional wisdom

paid off in spades—a natural birth, James (Jamie) Om Prakash Outlaw was born on June 29, 2011. After becoming a mother once more, Outlaw had to navigate an entirely different obstacle course, from the sheer lack of available resources to the seemingly simple task of buying a new crib. After being rebuffed at the store, where all of the cribs were too high to be accessible by a wheelchair, and finding nothing available online, Outlaw had to improvise. "I eventually got a cheap pine crib and had my next door neighbor adapt the crib based on my design," she said. "We added hinges so that it would open up like a door. That's the crib that Jamie still sleeps in, but that's how far I had to go."

Embracing her new path, Outlaw refused to allow her disability to place limits on her as a mother. "The joy of watching Jamie grow up is watching him adapt to me, and it's just amazing," she said. "He never learned to walk with a regular walker—he actually learned to walk pushing my wheelchair, because the wheelchair fascinated him. The joy is watching him progress, and it hasn't affected him, or his siblings, in any way. They've just adapted. By the time Miles was four years old, he was able to break down my entire wheelchair and put it in the trunk of my car. It's a very cool thing, it really is. I'm just 'mom' to them. There's no difference."

Realizing how her vast amount of independent research, innovative thinking and continuous connection to the support structure of TIRR Memorial Hermann had allowed her to carry, give birth, and continue to raise a child with ease (despite the occasional hiccup), Outlaw felt compelled to share her experiences with others. "I've definitely made a conscious effort to bring it all together," she said. "I try to put myself out there on a very personal level, but I don't think that there's any other way to do it in this situation. I've been working on compiling a directory of

It has to be about mind over matter. One of my therapists at TIRR said, 'It's all about focusing on the positive,' and I knew that I was supposed to let go of everything that was going to hold me back, and hang onto the good things so that I could continue to grow.

- MEENA DHANJAL OUTLAW

everything that's out there for someone with a disability, especially for people who want children—whether it's through adoption or a natural birth. It's about ensuring that they know what's around them and where they can go for further assistance."

This past year, Outlaw competed for Ms. Wheelchair Texas 2014, becoming the first runner up and promoting a platform that reflects her experiences: "Inclusive Parenting." She continues to ensure that all the resources that were available to her are easily accessible to other disabled persons wishing to have families of their own, working to dissolve the perception that spinal cord injury and pregnancy are somehow incompatible.

"This is one of those instances where, after decades of spinal cord injury patients resigning themselves that nothing's available to help them have children, we've sort of accepted that," said Hammill. "With each individual pregnancy, we try and do individual interventions and hopefully there will become a coalition of providers—physical therapists and adaptive technology manufacturers—who will come together. I'm lobbying to develop adaptive technology for mothers with spinal cord injuries that helps them change diapers and take care of their child. These are all things that you can overcome."

Outlaw is now a published author, spurred by that same sense of obligation to help others to benefit from her journey. Her first book, "A Moment in Time," was published in 2005 and chronicles her experience following her spinal cord injury. Frustrated by the lack of relatable children's books to read to her two young children after her paralysis, Outlaw decided to write one of her own. "Mattie Has Wheels," her burgeoning children's series, provides a window of insight into the life of Mattie, a young girl who uses a wheelchair without letting it inhibit her from being a normal kid. "When I would go outside and saw parents and their kids react to my wheelchair. I wished they would just ask me questions," she said. "I wanted to make them understand that this is not anything but a device that helps me get around. I decided that the best way to speak to people, even adults, was through children's books. Mattie is my way of saying to everybody, 'Here I am! If you've ever wondered what it's like to be in a wheelchair, I'm going to tell you." In May 2012, Outlaw was awarded a college diploma in writing for children and teenagers from The Institute of Children's Literature, and is working on the continuation of the Mattie series. Her newest release, "Mattie Has Wheels: Traveling on a Plane," will be out later this year.

Compelled to use her struggles and successes as a platform to educate others, Outlaw serves as a lead co-coordinator for a Spinal Cord Peer Group, an outreach program of the National Spinal Cord Injury Association of Houston that strives to bridge the interpersonal gulf that can arise in the



Besides being a busy mom, Outlaw is a published author—her children's series, "Mattie Has Wheels," shows that anyone can achieve independence. Her newest release, "Mattie Has Wheels: Traveling on a Plane," will be out later this year. (Credit: TIRR Memorial Hermann)

wake of a traumatic injury. "We already have over 100 mentors alone on our list for anyone with a spinal cord injury, but we're also expanding to other areas like muscular dystrophy or multiple sclerosis," explained Outlaw. "That way, you always have someone—I didn't want anybody to feel alone, because I felt really alone after my injury. I lost my husband, his family and my friends. Nobody wanted to know me. I was no longer Meena, and I had to fight my way through to make people realize that you can't shut me away just because I had this injury. Now, it's become this amazing, beautiful chain reaction that keeps everyone connected." Outlaw continues to foster those connections—as an ambassador

for Ms. Wheelchair Texas, she recently hosted Houston Fashion Week's Couture Fashion Show at the JW Marriott Houston in the Galleria.

"I may be in this chair, but I will always look good in this chair," said Outlaw. "When people look at me, I can see that they're thinking, 'Wow! She looks really good, and she happens to be in a chair.' It has to be about mind over matter. One of my therapists at TIRR said, 'It's all about focusing on the positive,' and I knew that I was supposed to let go of everything that was going to hold me back, and hang onto the good things so that I could continue to grow."

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#### TMC SPOTLIGHT

EVEN BEFORE THE FIRST PATIENT IN THE UNITED STATES WAS DIAGNOSED WITH THE VIRUS, TEAMS OF HEALTH
CARE PROFESSIONALS AND RESEARCHERS WERE WORKING WITH OFFICIALS FROM THE WEST AFRICAN COUNTRIES
HIT HARDEST BY THE EBOLA OUTBREAK. THOMAS KSIAZEK, DVM, PH.D., DIRECTOR OF HIGH CONTAINMENT
LABORATORY OPERATIONS FOR THE GALVESTON NATIONAL LABORATORY AT THE UNIVERSITY OF TEXAS
MEDICAL BRANCH AT GALVESTON, DISCUSSES HIS LIFE'S WORK WITH SPECIAL PATHOGENS, AND THE CENTERS
FOR DISEASE CONTROL AND PREVENTION REQUEST THAT TOOK HIM TO SIERRA LEONE DURING THE
LARGEST EBOLA EPIDEMIC IN HISTORY.



### Q | Can you tell us about your formative years?

A I graduated from veterinary school in 1970, during the later stages of the Vietnam War, which had the highest troop concentrations. At this time, there was a draft and most of the guys in my class voluntarily enlisted because you might end up going involuntarily. I opted to enter the Air Force under a program called the Early Commissioning Program, which offered some pretty reasonable educational opportunities. They sent me back to university to get a master's degree. I then worked in a

couple of Navy labs in Southeast Asia in the mid 1970s, after which they sent me back to school to get a doctoral degree in epidemiology. This path ultimately formed my career.

What likely had an even more profound effect on my career was that they did away with the Air Force Veterinary Corps while I was in graduate school, so I transferred to the Army's Veterinary Corps. I ended up in Fort Detrick, Maryland, at the Army's Infectious Disease Biodefense Institute. It was during my time at Fort Detrick that I got involved with hemorrhagic fevers.

I was already working with arthropod-borne viruses but tilted more towards hemorrhagic fevers, like Ebola.

One significant event that happened in the later part of my tenure there was the Ebola episode in the Washington, D.C., suburb of Reston, Virginia. This was the incident that led to the book, "The Hot Zone." A bunch of monkeys were imported into a facility in Reston. These monkeys were infected with a previously unknown species of Ebola virus that is called now the Ebola Reston virus. I was directly involved in this situation, as I was the

head of rapid diagnostics at the United States Medical Research Institute of Infectious Diseases. Dr. C.J. Peters. who later also came to UTMB, walked into my office late one afternoon and said, 'Do we have a diagnostic test yet for Ebola?' and I said, 'No.' The virus was sort of partitioned out and only certain individuals worked on it, but I commented that we could put a test together pretty quickly. So, in a matter of a few days we put together an assay for diagnosing Ebola infection by looking for the antigen of the virus. That assay turned out to be quite useful for a number of things, including human diagnostics for Ebola. For a number of years, it was the standard rapid diagnostic test that was used.

So that's basically the pathway that led me to where I am now. By 1991, I had spent the past 20 years in the armed forces. At this point, Dr. Peters and I went to into public health service work with the CDC. I then spent about 18 years working with them, and eventually succeeded Dr. Peters as the chief of the Special Pathogens Branch.

## Q It sounds like the work you did during your time with the CDC is still relevant today. Has much changed in terms of the concerns the CDC faced then versus those they face now?

A | Well, first of all, the CDC branch that Dr. Peters became the chief of and that I worked with for 18 years was created to deal with special pathogens like the Ebola and Marburg viruses. It was put there as part of the global concern for these types of viruses and the potential for them to play a role in our own nation's health. The United States Medical Research Institute of Infectious Diseases was doing some of the same work, sort of from a biodefense angle, whereas the CDC's chief mission is public health. So, the importation concern was not necessarily because someone was disposed to do harm

to the United States, but rather the potential for natural circumstances of outbreaks occurring, like what's just happened in Dallas. You may recall that the Peace Corps was created in the 1970s. This was just one of the circumstances that led to imported cases of these sorts of diseases. People living in epidemic areas and then traveling back...if you think about global transport, the revolution of jet air travel transformed how rapidly one can move around the world. In the 1950s, we were still more or less bound by shipborne transport. There certainly were airplanes, but it wasn't that common to take an international trip. So, for instance, people who were assigned to overseas laboratories—as I was—would travel there. But, essentially, if you wanted to correspond with somebody, you did it by putting a stamp on a letter and sending it. The only time, for instance, that I called home when I was stationed in Indonesia was when my daughter was born. The remainder of the time I merely wrote letters, maybe once a week, to my family and other people that I knew. Nowadays, things

The jet age increased the ability of these viruses to be imported—things like Lassa fever, which is one of the diseases that the Special Pathogens Branch focused on in the 1970s. Later, there was the advent of some of the newer viruses like Ebola in 1976. The CDC designated all of these viruses as BSL-4 agents that must be handled in specially outfitted BSL-4 laboratories where these pathogens could be safely handled, just about the time that I arrived. In the United States, these types of laboratories were really only built and maintained in a couple of places during that era. One such place was Fort Detrick, where the military had a biodefense establishment. The other was a civilian public health establishment in the CDC in Atlanta. In 1989,

they opened a brand new laboratory, which was just beginning to be used when Dr. Peters and I came on the scene in 1991.

#### Q What brought you to UTMB?

**A** I retired from the civil service when I reached my 62<sup>nd</sup> birthday, per the current civil service retirement system. You become fully vested at 62 and can retire without any penalties, so it was an opportunity to take advantage of the new laboratory that had been built here at UTMB.

There was a cadre of people here with similar backgrounds and very high-level reputations. That was attractive. I was also given the opportunity to work with UTMB's World Reference Center of Emerging and Arthropodborne Diseases. This is a rare and expansive source of the types of viruses that many pathogen researchers, including myself, had worked on. That reference center itself is perhaps one of a number of reasons as to why people were drawn here at that time.

At the time that I joined UTMB, the Galveston National Lab had just been built. You may recall that Ike hit in September of 2008. I actually signed my contract to come here the day Ike hit. To give UTMB credit, they offered me the chance to back out of the contract. This lab was not affected by the storm and there was no doubt in my mind it would offer a lot of opportunities for me, so I decided to come. The difficultly was that much of the logistical support for the remainder of campus was damaged so it did complicate getting this lab going.

### Q | So you work in the BSL-4. What do you do specifically?

A I do a few things. First, I have administrative responsibilities for maintaining operations. Second, I am responsible for maintaining, making available and obtaining new strains of interest for the World Reference Collection for use by interested investigators.

## Q You recently returned from Sierra Leone. Can you tell me a little bit about that trip and what led you to go?

A | I'd say the plain and simple truth of it was I retired from the CDC special pathogens branch, the group that was normally responsible for responding to these operations. The outbreak began this March and the people within the branch had already spent a couple of tours in Guinea responding to that so they were beginning to be somewhat overly in demand. They were looking for other individuals as the CDC decided to expand their efforts into the other two countries of Sierra Leone and Liberia. They had been involved in Guinea for some time and the commitment was to get something like 50 to 75 people out into the field in the affected countries. In order to do that they reached out to me. Dr. Nichol, who succeeded me as branch chief, called me and asked if I would be willing to spend 30 days in Sierra Leone as a CDC team lead. I really had missed being out in the field. It's harder in a university setting to obtain funding to undertake this sort of response. Since the CDC is the nation's public health agency, they do that as a matter of course.

UTMB is going to play a big role in not only the current Ebola response, outbreak and possible treatments and vaccines, but in future infectious disease outbreaks and discoveries, and I'm very proud to be a part of the work we're doing here. 66 My role [in Sierra Leone] was to act as a team lead, which is more political than administrative. It was good that I had experience doing this before to provide some gravitas to the response. I spent the majority of my time dealing with national and public health entities and working with the emergency health operations center [...] >>







Thomas Ksiazek, DVM, Ph.D., pictured bottom right, recently returned from a month in Sierra Leone, where he served as a team lead in the efforts to curb the country's the Ebola outbreak. Ksiazek's trip came at the request of the Centers for Disease Control and Prevention, the agency he spent 18 years with prior to taking his current position at The University of Texas Medical Branch at Galveston. (Credit: UTMB)

#### Q So what was your purpose there?

A | My role was to act as a team lead, which is more political than administrative. It was good that I had experience doing this before to provide some gravitas to the response. I spent the majority of my time dealing with national and public health entities and working with the emergency health operations center, a national governing body made up of a fairly large number of international groups like Doctors Without Borders, WHO, World Food Program and a couple of other alphabet-type agencies that generally assist in the developing world in dealing with health, food security and other issues like that. When there are disasters they also respond to those as part of the international community that tries to help affected countries.

#### Q For the communities that you visited, what was it that they needed help with the most?

A | Well, there was a variety of things. One of the chief needs is treatment facilities that can help isolate affected individuals. There is sort of an Ebola playbook to find the cases. This is not terribly difficult if you have a small beginning outbreak, then you isolate affected individuals in a facility where they are taken care of by people who are protected from becoming infected themselves. This breaks the chain of transmission. Then you identify those individuals' contacts so that at the first sign of illness they can be removed from the community. The whole idea behind this is to break the chain of transmission. If you can do that in a thorough manner, particularly if you're there early, you can stop these outbreaks when they are small. It's been essentially the means of controlling these outbreaks since the 1995 Kikwit outbreak.

#### I have heard you mention there are some cultural factors that helped this disease progress as it has. Can you tell us a bit about those factors?

A | There are always issues when you go into an area where literacy rates are low. People may not fully ascribe to the germ theory. When you understand that this is an infectious agent, what I just described in terms of control is

fairly easy to comprehend if you get the idea that it's a germ that is transmitted from one person to another. They may think of it in other terms. One of the big risk factors is that when people die they are still infectious. In funeral practices in some of these areas, it's common to wash the bodies and fondle them and kiss them. That is a dangerous thing with this particular virus because the virus in patients who become extremely sick and die is essentially uncontrolled. It contaminates the corpse as well as the live patient. So those practices such as ritual washing and handling of the body can carry a great deal of risk. A couple of reports showed these kinds of practices seemed to lead to a large number of people being exposed. Dozens of people can become infected from participating in those funerals. Thus our goals included not only isolating patients but trying to make sure burials are being carried out in a safe manner. In addition, people may die without their community ever realizing they had Ebola. So, you have to somehow introduce the idea that burial practices can be very risky and try somehow to modify community behavior in regard to burials.

#### | I would imagine it really takes collaboration with local leaders in Africa to help educate the community about how this virus is spread.

A It depends on using community leaders or religious leaders, essentially priests or monks, to convey the message. There also are sometimes black magic or subcultural practices that are not totally visible. Secret societies also can play a role. Traditional healers often work in clinics that practice a sort of standard Western medicine. Sometimes clinics use practices like scarification, cutting with razor blades, that can be quite dangerous in terms of contaminating the individual who is doing it but also when the same instrument is used from one individual to another. Usually if somebody is sick, they go to the healer and he uses an implement. You get a non-sick individual who follows that and the virus is transferred through that process. Those are all things in past outbreaks, including this one, that have played at least some role.

You want to try to keep these things above the surface of society and make people as aware as possible that they are endangering themselves by practicing some of these things.

#### Q You have mentioned that you walked the streets of Sierra Leone during your most recent visit, confident in your understanding of how this virus is transmitted.

A I have done this many times and I'm convinced that this is not an airborne disease. It's not being transmitted in the way that influenza and other infectious disease are transmitted in an airborne route throughout the community. It really does take close contact with a patient or a deceased individual who had the disease to be at risk. We've sent people out to respond to these outbreaks, and in times past we had people who worked with patients. CDC doesn't work in a clinical fashion with patients any longer, but we do send people into the communities where people are affected. The catch phrase I use is that we've always brought back the same number of people that we've sent out. This outbreak has been a little different in that generally when CDC people have gone into clinical facilities, infection of health care workers in the supervised environments has stopped. This one is different in that the agencies that usually provide health care in situations like this—Doctors Without Borders for example—have been unable to create enough of their own health care facilities to respond to the scope of the outbreak.

#### Q Unlike many of the hardest-hit communities in West Africa, it seems the United States has the resources that are necessary to safely handle and treat Ebola patients. Based on your experiences in Sierra Leone, do you think it really comes down to training and protocol?

A There are a couple of ways health care workers are probably infected. They get their gloved hands contaminated. Then perhaps they begin to have problems with their goggles. Next, they adjust the eye protection with their gloved hands and introduce the infection to the face. If the health care worker



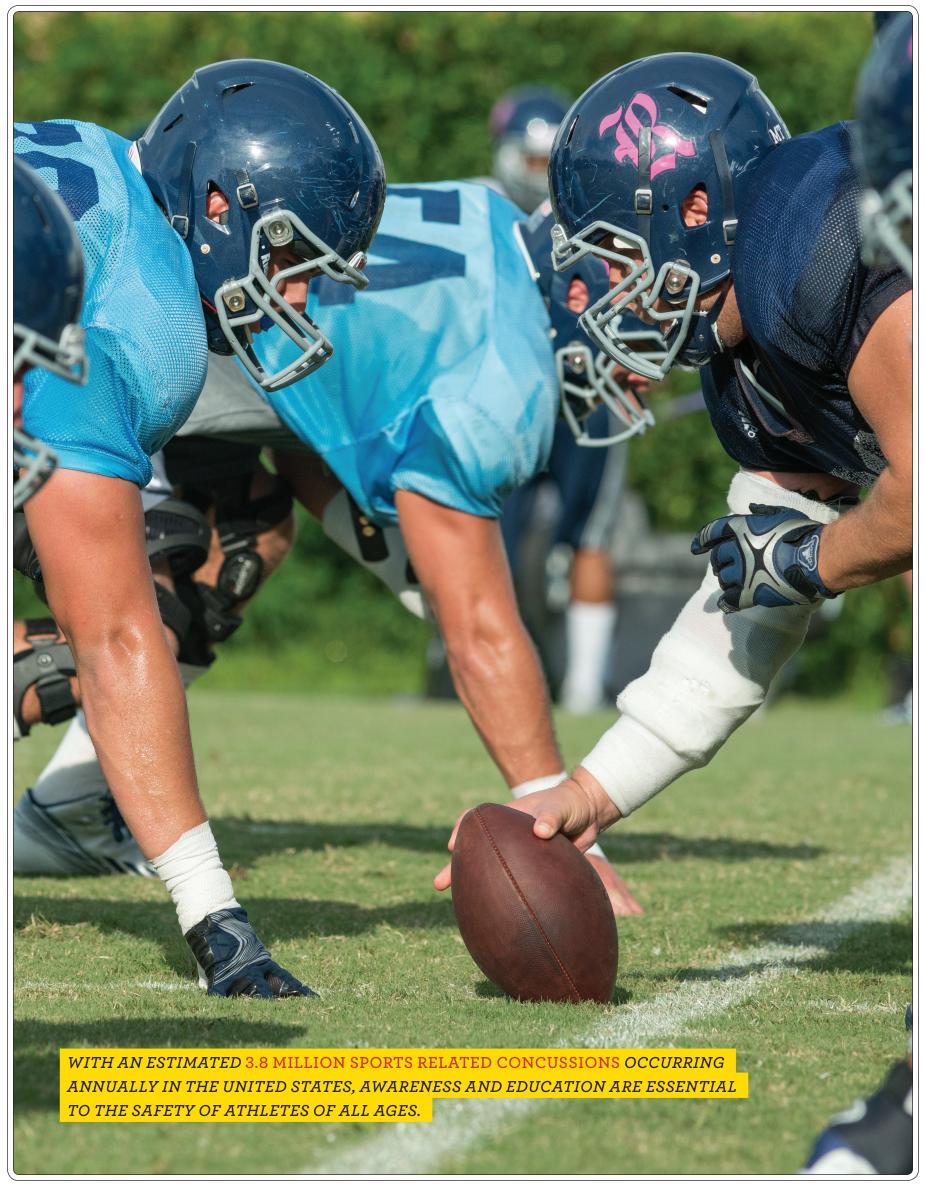
Ksiazek was recently named to the Texas Task Force on Infectious Disease Preparedness and Response by Gov. Rick Perry. (Credit: UTMB)

is sweating, the infection runs down the skin. That's not so much of a breach of a protocol other than health care workers should keep their hands from their faces. In circumstances where you are near equatorial countries that are quite warm and rainy, if you're wearing PPE that's essentially impervious to fluids, it gets very hot and you perspire heavily. In fact there's a great risk of heat stress or heat stroke if you work for periods of time that are excessive. So in general, agencies like Doctors Without Borders insist that they work no longer than two hours, I think. If you go beyond that you're putting yourself at risk for serious health consequences, not necessarily from Ebola but from heat stress. In a situation where you are sweating profusely and you are wearing eye protection of some sort, it may fog your goggles and then you can't see. Or you're sweating and somehow you have to adjust your goggles. Or the beads of sweat that are coming down around your goggles are creating an issue and you inadvertently contaminate your forehead or some part of your body where that sweat carries the virus. Another very common thing is that when people come out of the facility they somehow contaminate their hands with fluids that have gotten on their garments. And maybe they haven't cleansed their hands, which touched their garments, and at this point they rub their eyes, nose and mouth. One way to avoid that is to decontaminate

the person by spraying them with a fairly strong hypochlorite solution to kill the virus before they take off their garments. This diminishes the possibility of getting it from gloved hands to other parts of the body that can spread around and contaminate mucus membranes.

#### Q Any closing thoughts?

A | Myself and Dr. Jim LeDuc, director of the Galveston National Lab. were appointed to the Texas Task Force on Infectious Disease Preparedness and Response on October 6 and, although I cannot speak to the specifics of this task force, in general the idea was to get a group of people together with various kinds of expertise to advise the government of Texas on ways of improving the response to Ebola and what may become the pandemic of a new virus and to be better able to handle this one under present and near future circumstances. UTMB is going to play a big role in not only the current Ebola response, outbreak and possible treatments and vaccines, but in future infectious disease outbreaks and discoveries, and I'm very proud to be a part of the work we're doing here.



## Protecting Our Players

By Alex Orlando

As football players crisscross down the turf, ducking and weaving to avoid their opponents, shoulder pads mesh together and helmets collide. Propelling themselves across the soccer field and competing over the ball at high velocity, elbows come into contact with faces and players' heads strike the ground. In hockey, athletes glide across the ice before abruptly plowing into the boards, courtesy of a check from an opposing player.

For many competitive sports, at every level from elementary school to professional leagues, the inherent danger of collision and, subsequently, concussion, is always present. Driven by an exponential increase in concussion awareness, education and prevention, many physicians, athletic trainers, coaches and players are banding together to battle the looming threat of sports related head injuries.

"There was a fumble, and I was chasing the tackler, and I just got blindsided and my head hit back on the turf," recalled Andrew Reue, an offensive lineman for the Rice Owls men's football team who sustained a concussion during game time. "I blacked out for probably five seconds or so, and I got up when they scored the next play."

It was not obvious at first that Reue had sustained a concussion, but when he began to show signs of confusion, a teammate immediately alerted Rice University's athletic trainer. They attribute the training team's quick response, and his teammate's concern, to ongoing educational efforts surrounding concussion awareness. Unlike other injuries sustained on the football field, signs of a concussion can be subtle, and symptoms easy to miss.

"I actually went in for another series before we realized I had a concussion—I don't remember any of that series, and still don't to this day," he added. "I looked up at the scoreboard and asked how the other team had scored...I didn't even know where I was. Our center told the coach and they got the athletic trainer over, who started the concussion protocol. I was pretty much done for the season."

A concussion is the term used to describe mild traumatic brain injury—it is characterized as any type of blow to the head or body that causes the disruption of brain functioning. "Really, a concussion is a physiological dysfunction that occurs in the brain," explained Kenneth Podell, Ph.D., FACPN, neuropsychologist and co-director of the Houston Methodist Concussion Center. "If two players are

running at full speed and they collide, both their helmets and the skull stop, but their brain will continue to move. It's the same as if you were in the car and slammed on the brakes, where you would lurch forward as the car stops. In a car, you have a seatbelt, but unfortunately, we haven't designed that for the brain yet."

"The brain is the softest tissue in the body, pretty much like cold Jell-O," he added. "Imagine the brain were to hit something, it would compress like a spring and then bounce back and hit the other side of the skull—that causes the shape of the brain to change. When that happens, you're changing the shape of the cell membranes, and the normal balance of chemicals inside and outside the brain is disrupted. That imbalance that develops inside the cells of the brain causes this whole chain reaction, which manifests as the initial signs and symptoms of a concussion."

Backed by a multispecialty team that incorporates a wealth of disciplines from neurosurgery to athletic training, experts from the Houston Methodist Concussion Center serve as team consultants for an equally broad range of professional athletes, including the Houston Texans, Houston Astros, Houston Dynamo and Houston Rodeo, as well as Rice University, collegiate, high school and youth teams. Embracing education and community outreach, Houston Methodist Sports Medicine's athletic trainers work in conjunction with the Houston Methodist Concussion Center to provide an arsenal of weaponry in efforts to combat concussions.

Changed over the years, especially at the collegiate level
[...] It's a lot different now—it used to not be a respectable injury, but now that people are understanding the severity of it, it's much more understandable. People are appropriately worried about the symptoms.

Offensive Lineman, Rice Owls

## THE BRAIN IS THE SOFTEST TISSUE IN THE BODY.



(Credit: Carl Henry/Rice Athletics Communications)

Visiting over 300 schools in the greater Houston area, they provide information about the concussion center, administer ImPACT baseline testing, which serves as a neurocognitive assessment tool, and deliver presentations on concussion education. The latter, reflects Podell, is essential in addressing sports injuries to the brain.

"There are a good number of myths about concussions," noted Podell. "The important thing to understand is the distinction between what is myth and what we simply don't understand yet, because the data just hasn't been collected. More and more data is coming out, and at some point, enough correlational data is the same as causation. As of right now it still hasn't been definitely proven that the development of degenerative brain diseases, like chronic traumatic encephalopathy, is due to repeated trauma to the head. We still need more information." According to Podell, the average college football player sustains up to 3,000 hits a season.

"What we do know is that if a player is acutely concussed, meaning that they're showing symptoms, cognitive deficits, impaired balance, or a combination of those three, that the brain is considered much more vulnerable to being re-concussed," he added. "In those instances, the effect is potentially exponential—that second concussion could be much more severe and much more detrimental to the individual, long term."

While the cumulative impact of repeated concussive blows to the head is still being studied, the necessity of preventing additional concussions prior to a player's symptoms resolving, especially at the high school level when their brain is still developing, is paramount.

"When the brain has already been concussed, it's in a state of stress," explained M. Cullen Gibbs, Ph.D., clinical neuropsychologist at TIRR Memorial Hermann (The Institute for Rehabilitation and Research). "There are a variety of things that occur in terms of metabolic changes happening in the



The culture has changed, and we've arrived at a point where people are acknowledging that this is a real injury.

That mentality of playing through pain and injuries is gone—the fact that we're treating players differently than we were 10 years ago will make a big difference for their long-term health.

- KENNETH PODELL, PH.D., FACPN
Co-Director of the Houston Methodist Concussion Center

brain, from changes in the amount of blood flow to the ability to metabolize glucose. If another concussion occurs in that state of heightened vulnerability, there can often be longer lasting symptoms and the level of severity of those symptoms may increase. A person in a previously damaged state is being put at increased risk for further loss of function."

Fortunately, in cases of acute concussions where symptoms are recognized and treated appropriately, players are able to return to their sport and their lives without issue. "What we tend to do, initially, is reduce physical and cognitive activity," said Podell. "We might say, 'Hey, you might not want to go to school for a couple of days and we're going to monitor your symptoms throughout that process.' Once those symptoms start to drop, and it doesn't have to be zero, but once they're low enough, we will start some low level physical activity."

"Once the symptoms have cleared up sufficiently, then we start phasing them in gradually, over a period of a few days or more," added Houston Methodist physician David Braunreiter, M.D., team physician for the Houston Dynamo and physician member for the Major League Soccer Concussion Committee. "It's never wise to return an athlete to the sport with this injury without testing gradually up the ladder of intensity in game-like circumstances before getting them back in the actual game."

Unlike visible orthopedic injuries that come with the territory of competitive sports, concussions have a greater potential to go unnoticed. Vigilance from athletic trainers, coaches and fellow teammates in recognizing observable signs (appearing dazed, problems with memory, or personality changes) and transparency from the athletes themselves in discussing their symptoms (headache, nausea and problems with memory, among others) are both crucial.

"In our education process, we emphasize to our athletes to watch out for each other," said Scott McGonagle, MS, ATC, LAT, head athletic trainer for Rice University. "These things happen throughout the course of a football game where nobody sees the impact and the kid continues play until, all of a sudden, somebody realizes that he's not acting quite right. If a player keeps jumping on the snap count, or goes left instead of right, his teammates might catch on. They check on each other during the huddle—it's really amazing, and our coaches tend to know when something's wrong with one of their players."

As concussion awareness continues to evolve, the efforts to protect our athletes are manifesting in everything from research to equipment. David M. Eagleman, Ph.D., neuroscientist and director of Baylor College of Medicine's Laboratory for Perception and Action, recently launched a new company, BrainCheck, which uses mobile tablets to assess concussions on the sidelines. "In six minutes we can harvest 12 measures of brain function that have the sensitivity and specificity for detecting

FACING LEFT: (Credit: Houston Methodist Hospital) LOWER RIGHT: (Credit: USA TODAY Sports Images) concussion," he said. "With this technology, we can provide coaches and clinicians with the critical information they need to optimize return-to-play decisions."

Supported by a grant from General Electric and the National Football League, the Houston Methodist Concussion Center is working to develop biomarkers for concussion that can be identified through magnetic resonance imaging (MRI). While sensors that can be attached to helmets currently exist, they only measure pure force without acknowledging the influence of rotation on concussive blows. If they're adapted with the capacity to measure rotation, physicians and athletic trainers will have to consider the ramifications of pulling athletes from play based on strictly mechanical data. As it stands, furthering education and fostering a climate of awareness are the two strongest assets that we have.

"I think that the attitude towards concussions has changed over the years, especially at the collegiate level," said Reue. "In high school, unless you were unconscious or had some serious memory loss, the attitude was that you just got your bell rung and kind of shook it off. It's a lot different now—it used to not be a respectable injury, but now that people are understanding the severity of it, it's much more understandable. People are appropriately worried about the symptoms."

"At the end of the day, being aware of concussions and getting to the point where the athletes are volunteering to take themselves out if they think they might have sustained a concussion is just remarkable," concluded Podell. "The culture has changed, and we've arrived at a point where people are acknowledging that this is a real injury. That mentality of playing through pain and injuries is gone—the fact that we're treating players differently than we were 10 years ago will make a big difference for their long-term health."

THE BRAIN USES ABOUT

20 PERCENT OF THE TOTAL

OXYGEN AND BLOOD

IN THE BODY.



# Anatomy of a

#### What Is a Concussion?

A concussion is a mild traumatic brain injury. When an athlete hits an object or is hit, the brain moves around inside the skull, stretching and twisting the cells and fibers and changing the way that the brain normally works. Less than 10 percent of concussions result in any loss of consciousness.

#### What Happens During a Concussion?

During a concussion, the shape of the brain's cell membranes are distorted, causing a chemical imbalance. This sets off a cascade of effects leading to a disruption in blood flow and the brain's ability to get oxygen and glucose that are necessary for recovery. This mismatch between decreased supply and increased demand leads to an "energy crisis" in the brain and results in concussion symptoms. If severe enough, permanent damage can occur.

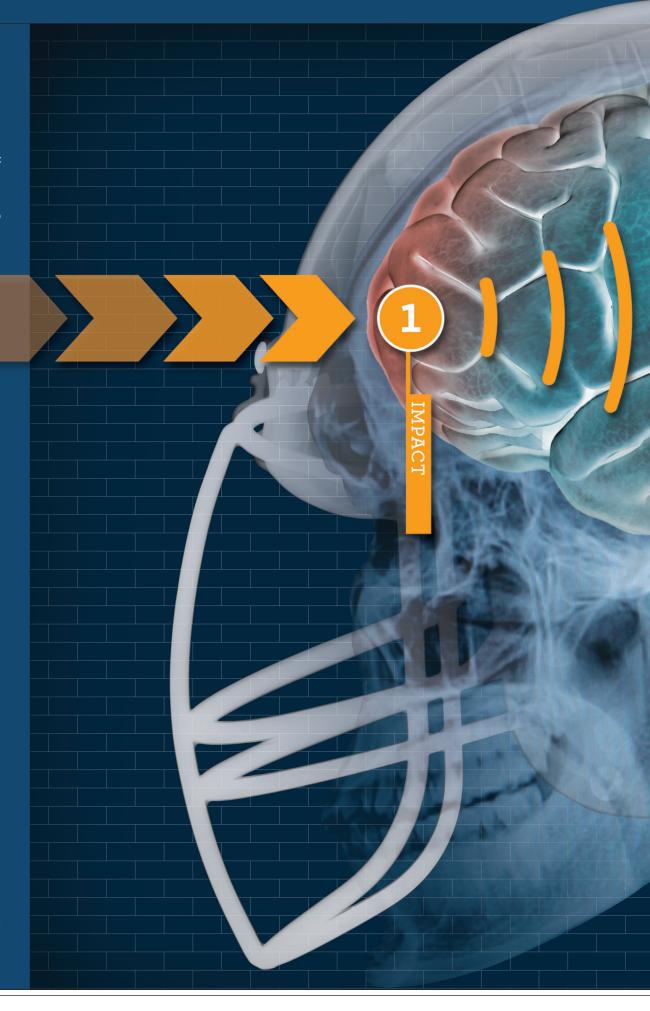
#### **Epidemiology of Sports Concussion**

While several factors determine the rate of concussions in a given sport, football has the highest rate in males and soccer in females, with other sports like ice hockey, soccer, lacrosse, basketball and field hockey not far behind. Gender and age are also key factors, with younger athletes being more vulnerable and taking longer to recover. Women are more prone to suffer concussions compared to men.

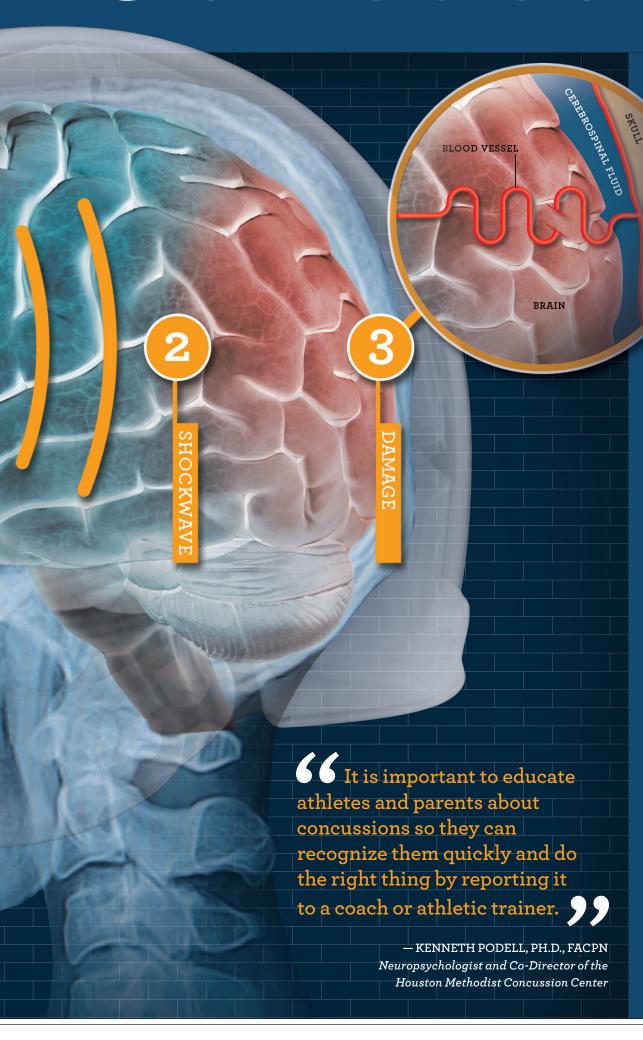
Also, concussions are much more common in competition than in practice. Concussion frequency has increased over the past decade (most likely due to better detection and awareness), and the Centers for Disease Control and Prevention estimates upwards of 3.8 million concussions annually in the United States. However, many go unreported, so the exact number is unclear.

#### When Is an Athlete Ready to Return?

A gradual, incremental approach is essential. An athlete must be symptom-free, cognitively intact and demonstrate good balance before a return to play exercise protocol can begin. This is when an athlete is slowly reintroduced to competitive athletics with gradually increasing physical activity, followed by non-contact practice, contact practice, and finally game play. All 50 states have laws regarding concussion education and care.



# Concussion



#### Signs and Symptoms

Observable Signs

- Appears dazed or stunned
- · Confused about assignment or position
- Forgets an instruction
- Unsure of game, score, opponent
- Balance problems or clumsy movements
- Answers questions slowly
- Loses consciousness (even briefly)
- · Can't recall events before or after impact
- · Loses balance or is unsteady walking
- Shows mood, behavior and personality changes
- Vomiting

Symptoms Reported by Athlete

- Headache or "pressure" in head
- Nausea
- Dizziness
- Double or blurry vision
- Sensitivity to light or sound
- Feeling sluggish, hazy, foggy or groggy
- Concentration or memory problems
- Confusion
- Just not "feeling right" or "feeling down"

#### **Danger Signs**

It's essential to be alert for symptoms that worsen over time. The student/athlete should be seen in the emergency department right away if he or she has:

- One pupil (the black part in the middle of the eye) that is larger than the other or loss of vision
- Drowsiness or cannot be awakened
- A headache that gets worse and does not go away
- Weakness, numbness, or decreased coordination
- Repeated vomiting
- Slurred speech
- Convulsions or seizures
- Difficulty recognizing people or places
- Increasing confusion, restlessness, or agitation
- Loss of consciousness (even a brief loss of consciousness should be taken seriously)
- Moderate or severe neck pain or rigidity

Content contributed by the Houston Methodist Concussion Center

## A Playground of Possibility

One neuroscientist is exploring all avenues in his quest to unearth the mysteries of the human brain

By Alex Orlando



(Photo provided by Baylor College of Medicine)

For me, my lab is all about understanding how brains construct reality. We try to figure out how people perceive the world, why and how they hold certain types of beliefs, and how reality can be different for different people—we try and understand all of that from the point of view of biology.

— DAVID EAGLEMAN, PH.D.

Director of the Laboratory for Perception and Action at

Baylor College of Medicine

Malking through the doors of the Laboratory for Perception and Action, located on the ground floor of Baylor College of Medicine, it becomes clear that, at least in the realm of laboratory space, one is not in Kansas, anymore. A manic fusion of creative energy and the boundless nature of scientific discovery, the workplace of neuroscientist David M. Eagleman, Ph.D., radiates a vibrant sense of controlled chaos. The dry-erase walls, a surface for scientific free play that run from floor to ceiling, are augmented with everything from equations and graphs to summarizations of complex principles and sketches of brain activity. Students and postdoctoral researchers chat animatedly, working to understand the neurobiological basis behind questions that most people ruminate on while gazing up at the stars or sitting in a philosophy class. Who are we? What is the nature of reality and perception? Why do we think and behave the way that we do? For Eagleman, those are the questions worth answering.

"At some point, I came to realize that if we want to understand the big questions, all of those philosophical musings boil down to a single, three-pound organ that I could devote my career to studying," said Eagleman, who directs the Laboratory for Perception and Action at Baylor, where he also directs the Initiative on Neuroscience and Law. "My lab is all about understanding how brains construct reality. Our subject is the human brain, and we try to answer our questions using the full armamentarium of modern neuroscience. We try to figure out how people perceive the world, why and how they hold certain types of beliefs, and how reality can be different for different people."

Propelled by that desire for understanding, Eagleman's lab has several research thrusts, centered on unraveling the mechanisms behind the various ways our brains construct perception. Time perception, a topic that has fascinated Eagleman since childhood, is woven into the fabric of many of his professional pursuits.

"Early in my research career, I realized that even though we think of time as flowing like a river, subjective time can be easily manipulated. In the laboratory, we can make you think something lasts shorter or longer than it actually does, or that one thing came before something else, even though it was the other way around," he said. "Your perception of time is a construction of your brain. The brain is locked in silence and darkness inside the skull, so all you ever experience is what it thinks is going on."

While investigating the underlying physical characteristics of time perception and how they manifest neurobiologically, Eagleman's unusual scientific path led him to a hypothesis that he never would have discovered otherwise—one with a potential multibillion-dollar impact on the life science community. "I think that schizophrenia might fundamentally be a disorder of time perception," he said. "If you're not getting the perception of time correct, you're going to have a fragmented cognition. And this could be the explanation for many of the features of schizophrenia, such as credit misattribution and auditory hallucinations. We've begun testing time perception issues with schizophrenic patients, and everything we've found so far is consistent with that hypothesis."

While Eagleman and his colleagues are still taking their first steps down a long research road, if that idea turns out to be a correct interpretation of the basis of schizophrenia, it suggests entirely new rehabilitative strategies. "Instead of doing a shotgun approach with pharmaceutical drugs, we could have someone play a video game to

train up their sense of timing," he noted. "This approach is hypothetical at the moment, but it's a game changer if it's accurate. Schizophrenia might be an example of what happens when these very complex mechanisms that we have for constructing time go wrong."

That malleability in going against the grain of conventional knowledge has served Eagleman well in another of his pursuits: sensory substitution. A non-invasive technique for circumventing the loss of one sense by feeding its information through another channel, sensory substitution is based on the idea that the brain doesn't differentiate which conduit it receives information through. "I'm interested in the flexibility of the brain, in terms of the data that it can take in," said Eagleman. "We're very used to our eyes, ears, fingertips and nose and so on because these are the sensors that we've inherited through evolution. So we tend to think of them as being fundamental. But the brain is so flexible that you can feed in new kinds of senses."

Following that line of thinking, Eagleman and one his graduate students, Scott Novich, developed a non-invasive, low-cost solution: a vest with several small vibratory motors that can be worn under the clothing. With the help of a cell phone, sound is converted into patterns of vibration on the torso. And that allows those with deafness to perceive auditory information through their skin.

"Through these patterns, they can come to understand the sounds out there," explained Eagleman. "We're still at the foot of the mountain with this line of research—this week we're finishing testing our third deaf participant—but it looks like the idea is going to work. And because this technology is one hundred times less expensive than the alternative of cochlear implants, that means it can have real global impact, especially in developing countries. People don't have to feel that it's unaffordable for them if they want to hear."

The relationship between our senses forms another of Eagleman's research thrusts. Synesthesia is a condition that afflicts at least three percent of the population, occurring when there is a blending of the senses. "A synesthete might look at the letters of the alphabet, which triggers a color experience for them, or hear music, which puts a taste in their mouth, or have other cross-sensory experiences," explained Eagleman. "These aren't just memorized associations, but instead genuine perceptual experiences—it's as though they were actually experiencing that color or taste. It represents the

cross-talk between different parts of the brain that are normally kept separate."

Eagleman has used synesthesia as a vehicle to examine how the content of consciousness differs between individuals, from the level of genetics to neuroimaging. "We've all thought about the possibility that what you see as red and what I see as red might be a different experience inside our heads," he said. "We can now take this sort of philosophical conundrum and elevate it to a real scientific problem, because synesthesia gives us a measureable example in which one person's sensory reality is different from another's." The Laboratory for Perception and Action developed a standardized battery for testing and quantifying the phenomenon—tens of thousands of people have taken the test, with over 20,000 now verified as synesthetes.

A testament to his vision for incorporating scientific discoveries into our social framework, Eagleman is also the director of Baylor's Initiative on Neuroscience and Law. Studying how new discoveries in neuroscience should influence the ways that we make laws, punish criminals and develop rehabilitation, the project brings together a unique collaboration of neurobiologists, legal scholars and policymakers.

"Much of my research shows that

reality can be quite different inside different people's heads, and the next important question is what that means for us as a society," said Eagleman. "The Initiative on Neuroscience and Law seeks to bring together the understandings of modern neuroscience with the way we run our legal system and practice social justice.

"A fundamental piece of that is recognizing that brains are very different from one another, and that means that iail is not the 'one size fits all' solution that we pretend it is in our courtrooms," he added. "Instead, different people may have all committed the same crime, but for different reasons. They may all have different paths—neurally speaking—by which they've arrived in front of the judge's bench, and that allows us to move towards a tailored system of rehabilitation and punishment."

As one practical application of those goals, Eagleman and his graduate student Ricky Savjani are using a cutting-edge neuroimaging technique to help individuals with cocaine addiction strengthen their own impulse control in a participatory manner, using realtime feedback from their own brains. Eagleman regularly speaks to audiences of judges and lawyers, educating them about critical issues in neuroscience. He's also establishing formal collaborations with probation centers and prisons to study issues relating to re-offense.

Given his emphasis on dissolving barriers to understanding, it's no surprise that Eagleman views his research efforts as intertwined. "Everything we do here is networked." he admitted. "It took me a lot of thinking to even figure out how to divide up my descriptions into separate projects. Everything is related in one way or another, and that opens an opportunity for a lot of cross-fertilization of ideas. All my research projects are at the intersection of what I consider to be the most interesting questions and where I might be able to make a meaningful impact."



David M. Eagleman, Ph.D., works closely with colleagues to take neuroscience to the next level. (Credit: Agapito Sanchez/ Baylor College of Medicine)

#### INDUSTRY SPOTLIGHT



ROBERT IVANY, PH.D., PRESIDENT OF
THE UNIVERSITY OF ST. THOMAS
AND A RETIRED ARMY MAJOR
GENERAL, SAT DOWN WITH TEXAS
MEDICAL CENTER EXECUTIVE VICE
PRESIDENT AND CHIEF STRATEGY
AND OPERATING OFFICER WILLIAM
McKEON TO DISCUSS HOW HIS
MILITARY BACKGROUND HAS
TRANSLATED TO HIS WORK
WITH ST. THOMAS, AND THE
WISDOM HE HOPES TO IMPART
ON HIS STUDENTS.

## Q | Where were you born? Tell us about your early days and how that led you to West Point.

A I was born in Austria. My parents were Hungarian refugees who fled from Hungary to Austria during World War II. They were displaced persons, DPs as they were called. We were in a refugee camp for a while as they tried to figure out what to do—go to Germany or go back to Hungary? My mom and dad finally decided to come to America. They spoke no English, they left everything behind. The three of us got on a troop ship, sailed to Boston and then took a train to Cleveland, Ohio, where I grew up. I am very thankful that they had the courage to come to this wonderful country.

#### **Q** Why Cleveland, Ohio?

A | They had a distant relative who came to Cleveland back in the 1920s and they agreed to sponsor us, so that is where we ended up. I was born in '47 and we came to America in '49.

## Q Did you feel like a DP when you were growing up, or were you so young that it just felt natural?

**A** | Cleveland has wonderful ethnic communities, so where I grew up on the east side, the church had a mass in Hungarian, the stores had Hungarian signs,

and everyone, it seemed, spoke Hungarian. It was a relatively easy transition for my parents and me. We lived there for a couple years and then we moved out to the west side, which was rapidly expanding. My father was an engineer and thought that we would all benefit from living in the suburbs, and then assimilation became much stronger.

When I went to school, I started to play football and got the opportunity to attend St. Ignatius High School, which is an outstanding Jesuit school in Cleveland. I graduated, and from there I went on to West Point. My father, who passed away 12 years ago, always emphasized to me how fortunate we were that America took us in. I think it was that spirit of gratitude and respect for America that first got me thinking about a military career. We had no connections to the military otherwise. I just felt a calling to go to West Point and so I went there. I did well and even played for some great football teams. Then I started my Army career. I served in different places.

I had a tour in Vietnam. I was an armor officer, serving on tanks. I was wounded while I was in Vietnam. I was able to stay on there after a couple weeks in the hospital, finished my tour, and came back. I really didn't know if I should stay in the Army. It was a tough

66 During the two years I was in the White House, I got a chance to see the president in a lot of public and private moments, and I was very fortunate to have Ronald Reagan as the president. He had this innate respect for the military. My job was made easier and, personally, much more rewarding because he allowed us the opportunity to watch him and learn from him.

decision, but I felt that even though there was a lot of anti-military sentiment after the Vietnam War, I wanted to serve our country. I found my dear wife who agreed to marry me and follow the nomadic life of an Army officer.

#### Q Where were you at the time?

A I had just come back from Vietnam, and our parents set us up. My mother played tennis with Marianne's mother, and when I came home, my mother announced that we'd be going to dinner at the O'Donnells'. I'd just been back for a week or so-I said, 'O'Donnells? Who are they?' Reluctantly, I went to dinner. But it turned out much better than I thought it would. We were married about a year later. God bless Marianne, because I could not have served the 34 years I served without her and the children being willing to put up with the challenges of a military career. I moved the family 24 times. I ended my career as a major general presiding over the U.S. Army War College in Carlisle, Pennsylvania.

#### Q How has your family responded to the 24 trips?

A Each of our children went to eight different schools between kindergarten and 12th grade. When I ask them how they adjusted, they say, 'Dad, we wouldn't change it for the world.' They lived all over the world. They learned to cope with different types of people, nationalities, backgrounds, and I think it's made them much more open, resilient and focused. The oldest right now is an Army psychiatrist. He's working in the Office of the Surgeon General on treating PTSD and eliminating suicides in the Army as a lieutenant colonel. Second son is a priest in Washington, D.C. He is a pastor in an inner-city parish there. Our daughter had a tour in Iraq as a civilian. She's an anthropologist who helped advise the Army on different cultures, religions and tribes. The youngest is back here. He graduated from West Point, served his five years—two tours in Iraq—and earned his MBA. Now he's here in the energy business, so we finally have one close to us. But I think that our lifestyle gave them a sense of confidence. I think it was great for them.

Q If you look at your career in the military, what are some of the highlights that when you look back you think, 'I can't believe when I started the first day at West Point that I had the opportunity to do this?

A I was lucky to serve 34 years. Seventeen of those years were in a command position, and the best thing about being in the Army is being with soldiers. You've got to love soldiers. Training them, even disciplining them, caring for them and feeding them. And if you enjoy being with soldiers, quite frankly, it was easy to make the transition to loving students. It's basically the same thing. People always say, 'Wasn't it a big change from the military to academia?' Sure, it's a different environment. But the central point, the focus in academia, is the student. If you focus on studentshow are they going to mature and get better-it's much like the Army.

To answer your question directly, other than being with soldiers, what I enjoyed the most: First, being the aide to Ronald Reagan. I had served three years in Germany. After I came back, I went to the Command and General Staff College—it was a yearlong school in Ft. Leavenworth, Kansas. I got assigned to the Pentagon, so I was in the Pentagon for a year, and then in 1984, I was selected to be the Army aide to the president.

#### Q Can you tell us what that means?

A The president has an aide from each of the services, and they have basically three jobs. The first is to act as a typical aide, so, for example, if there's a military-related event then you are responsible for setting it up, working with the White House staff. The second is to coordinate all the military support to the office of the president: Air Force One, Marine One, the helicopter, and a whole team of military personnel in communications and transportation. And the third and most well-known duty was carrying the so-called 'football,' which was a briefcase that had to be near the president all the time. As a result, during the two years I was in the White House, I got a chance to see the president in a lot of public and private moments, and I was very fortunate to have Ronald Reagan as the president. He had this innate respect for the military. My job was made easier and, personally, much more rewarding because he allowed us the opportunity to watch him and learn from him.

#### I read about the number of awards that you've received. Which one was most special to you?

A Probably the Purple Heart. It makes you realize how lucky you are. Those situations, it's a difference of seconds, it's a difference of feet whether you're

wounded or killed or you're not. You get a different appreciation of things when you've been in combat and you realize just how fragile life is. I think that's something that stays with you forever.

#### Q Does that help you in times of stress—whether it be leading a great university or an important function of our military service—to prioritize or not sweat the small things?

A | I've been very fortunate, my parents brought me up to believe in God and my Catholic faith has always been an important component of who I am. As a result, a lot of times I pray for the good Lord to help me. This print behind me is one of my favorites given to me by the George Washington Chapter of the Sons of the Revolution. It's an unusual print because you don't normally see George Washington kneeling in prayer, but when you read his memoirs you realize how much he really did do that. He prayed, especially in the days of Valley Forge, when things were pretty bleak and he hung in there. You try to do the best you can and I think it's essential to have a belief in God to get you through those tough times.

#### What brought you to St. Thomas?

A When I left the Army, I had no idea what to do. I'd been focused on doing my job, I was lucky enough to go to different parts of the world and serve our country in many different ways. Then, all of a sudden, I have to do something different. My dear wife convinced me that I should take a year to really figure that out. The military had always been a calling. I looked upon it as a vocation. It was a wonderful career. I thought about the next step for a long time and decided to go into higher education. I had my Ph.D., and I thought, 'Well, you know, it's kind of the same thing, it's a calling.' The good Lord works in strange ways. The Basilian priest who was the president here, Fr. Michael Miller, suddenly got elevated to archbishop and sent to Rome on very short notice. I interviewed and went through the process. I'm always very grateful to the board of directors. They took a gamble probably wondering, 'Is this military guy going to fit into Houston and in a Catholic university?' So far, so good. I am going on my 11th year, and we love it here.

## You get a different appreciation of things when you've been in combat and you realize just how fragile life is. I think that's something that stays with you forever.



## Q | Can you tell us a little bit about St. Thomas' relationship with the Texas Medical Center and how that's starting to come together?

A Our mission at St. Thomas is to educate leaders of faith and character. The only way we can accomplish our mission is for the University to be a strong presence in Houston. If you look at the major cities of America, I think you'll see there's a Catholic university—at least one—in each of those cities. Georgetown, Fordham and Loyola. And they've contributed in their own unique way to their city. The University of St. Thomas has the opportunity to do the same here. We are in a great location and we have a great reputation as a faith-based institution with outstanding academic programs. Our graduates think critically, communicate effectively and succeed professionally, and that's where I think the University of St. Thomas can play an indispensable role in Houston. To partner, to cooperate and to collaborate is an essential part of contributing to this great city. We are always looking for partnership opportunities.

We have great relationships with the University of Houston College of Engineering, and the Glassell School of Art, the South Texas School of Law and others.

The institution with the greatest potential partnerships for us is the Texas Medical Center. Not just because of our proximity, but because some of our strongest academic fields are pre-med, biology and chemistry. The best example is, of course, our Odis and Carol Peavy School of Nursing, which graduated its first class of 27 students this past May. St. Thomas reopened its School of Nursing in 2012. We had a

nursing school at St. Thomas for a short time, from '72 to '85, but it closed due to poor economic times. Now, we have five endowed chairs. With those chairs we were able to attract outstanding faculty. This year the national accreditation organization, Commission on Collegiate Nursing Education, came to see us in March, and they were impressed. We are looking forward to this national accreditation. Now we are looking closely at making the next jump to advanced nursing practice. We're talking to the hospitals in the Texas Medical Center, asking about the future of nursing. We want to complement the Texas Medical Center and the city of Houston.

The other partnership we've been very fortunate to forge is with the Houston Methodist Research Institute. We just had the celebration to announce our new partnership to launch a new master's in clinical translation management degree.

#### Q | Tell us a little more about that program. How many people will be in it? How does it work in the relationship with Methodist research?

A | The Master of Clinical Translation Management degree is a 36-credit-hour program. The first cohort begins in spring 2015. We're aiming for 12 students, and we're talking to lots of potential students from diverse backgrounds. Some applicants are researchers, who need to learn about financial backing—how do I

raise millions of dollars? Others are great entrepreneurs; they know the funding part, but they need to know how to navigate the FDA process. We have many wonderful discoveries here in Houston, but when it comes to financing, our researchers go to Boston or to Los Angeles because there are no venture capitalists or entrepreneurs to finance their discoveries. If we can work to pull this together, there is a niche that I think will be very productive and rewarding for everyone.

## Q | St. Thomas students will have access now to the Innovation Institute. Students apply to the program with new products, new devices, and new therapies.

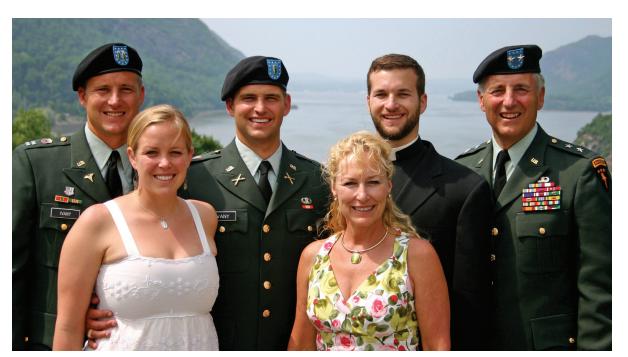
A The Innovation Institute is one of the most encouraging initiatives that we've seen. You are doing a great job promoting collaboration. The only way to be successful for a hospital, a university or for a city is to work together.

#### Q Any closing thoughts?

When I talk with our students, I urge them to try to put everything in perspective. 'When you're 85 years old,' I tell them, 'and sitting in a rocking chair on your front porch, and you look back upon your career, what are you going to remember?' I think you're going to remember the times that you made a significant impact on people. Yes, it's wonderful to be recognized for achievements, for wealth or whatever you have. But what you will really treasure are people that you have mentored, guided or assisted.

All of us at St. Thomas are fortunate to be around students whom we can inspire.

I am very confident in our young men and women. They will meet the challenges of the future. Our responsibility is to provide them with an education that prepares them to face those challenges with faith in God, themselves and their institutions.



(Credit: Robert Ivany)



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## Standing Together

Houston's 14th annual Stand Down offers the city's homeless veterans the services and support to get back on their feet

By Shea Connelly



The neighborhoods surrounding the Latino
Learning Center were packed with cars Oct. 3—
a bumper-to-bumper show of support for the city's
annual Stand Down for Homeless Veterans. A torrential downpour drenched the area overnight, but skies
were blue and the morning had turned crisp and clear
by the opening ceremony.

During times of war, a "stand down" offers soldiers a break from battle and an opportunity to recuperate. Since the very first Stand Down for Homeless Veterans was held in San Diego, California, in 1988, these events have performed a similar function for veterans struggling to transition back into civilian life, giving them access to medical screening and care, housing and career assistance, and more, all in one location.

This year's Stand Down marked the 14th held in Houston and was named Camp Hatcher after the late Earl Hatcher, a longtime advocate for the homeless and a former executive director of the Housing Corporation of Greater Houston. Hatcher was described in the dedication as "relentless in his efforts to help the homeless restore their lives."

66 The Stand Down for me helped me stand up, and that's what I'm hoping it does for everybody else here.

— YUSHANA ROETTENBACHER Army Veteran

The backdrop for this year's event was a bit different than in years past. Thanks to renovations at its usual location, Emancipation Park, the Stand Down itself was briefly homeless until the Latino Learning Center stepped up to host. And so the day began with an opening ceremony on the center's front steps, as a color guard composed of veterans presented flags from each military branch. Loud cheers from the audience announced how many Army, Navy, Air Force, Marine and Coast Guard veterans were present, a reminder of the work that needed to be done.

"This is an opportunity for veterans to access a wide variety of services at one convenient location, and to create a plan to get back on their feet," said Adam Walmus, director of the Michael E. DeBakey Veterans Affairs Medical Center Houston. "I think we can all agree that the word 'homeless' and the word 'veteran' should never be together in the same sentence. When even one of our nation's heroes spends a night on the streets without hope, permanent housing or food, we know we have work to do."

And work they did. Outside, veterans were given free flu shots and medical screenings. Inside, the center was packed from wall to wall with volunteers and booths. A computer lab in one corner held a workshop for retooling resumes. A room full of clothing helped job-seeking veterans find the perfect ensemble to impress potential employers.

The common theme throughout the room was veterans helping veterans. A significant number of volunteers and service providers were veterans themselves, like David Leamon, managing attorney of the military and veterans unit at Lonestar Legal Aid.

"They're definitely an underserved legal community, and all of us being veterans certainly have

## When even one of our nation's heroes spends a night on the streets without hope, permanent housing or food, we know we have work to do.

- ADAM WALMUS

Director of the Michael E. DeBakey Veterans Affairs Medical Center Houston

personal affinities with the veteran community," said Leamon. "A lot of the veterans face legal issues, particularly when it comes to VA benefits, that are niche legal areas...We're trying to provide those services."

Career transition manager Pat Snow recently retired after 30 years in the Air Force. He manned a booth for the Lonestar Veterans Association, which assists post-9/11 veterans in making a successful switch from soldier to civilian.

"We provide peer-to-peer mentoring, where veterans that have been there before help those who are coming back," said Snow. "It's important that we take care of our veterans. They've taken care of us, they've protected our freedoms so it's time that we help our veterans out."

Often that help must start on the inside, by addressing mental health issues, said Laura Marsh, M.D., director of the Mental Health Care Line at the Veterans Affairs Medical Center Houston. "We must recognize that mental health is something we value and need, and support those people—especially veterans—who struggle with those issues," she said. "In order to address mental health issues, a person most often needs treatment; treatment works, but the person has to engage in that treatment."

Nearly 25 percent of the United States' homeless population are veterans, Marsh said. Many of them face significant obstacles as they try to reintegrate to civilian life, including post-traumatic stress disorder, depression, anxiety, substance abuse issues and traumatic brain injuries, all of which have an impact on a person's ability to adjust to daily life outside the military.

For some, even reaching out for help can be a struggle. "Our system often sends the homeless person shuffling from place to place, from here to there," said Marsh. "If they have to be someplace at 3:00 to have a place to sleep, but they can't get that appointment for a job until 2:45, they are in a quandary and ask, 'OK, what am I going to do?' They're really living moment to moment." The ability to fulfill multiple needs at once is exactly what makes the Stand Down so valuable for Houston's veterans, she added.

At the beginning of 2014, the U.S. Department of Housing and Urban Development estimated around 49,933 veterans are homeless in the United States. That number represents a decline of nearly 33 percent since 2010. Bringing an end to homelessness in veterans has been a goal in the city of Houston for years. The Housing Houston's Heroes program successfully housed 101 veterans in 100 days in 2012 and has since helped many more get back on their feet. Just this past spring, the Obama administration launched the "Mayor's Challenge to End Veteran Homelessness," in which Houston Mayor Annise Parker has been heavily involved.

The battle against veteran homelessness is far from over, but initiatives like the Stand Down are valuable tools in the fight. One of the highlights of this year's event came from a beneficiary of the 2013 Stand Down. Yushana Roettenbacher, an Army veteran, spoke of how her life has changed over the past year. The struggles she faced after leaving the Army are likely familiar to many veterans.

"When the time came around for me to get out

[of the military]," said Roettenbacher, "I found myself at the airport with no place to go." She drove from state to state looking for housing and searching for a job. She lived in her car, traveling all the way from Florida to Oregon until finally arriving in Houston last year. Once here, she was advised to attend the 2013 Stand Down.

"When I went to the Stand Down, my only thought was, 'Are there going to be free bathrooms?" she joked. But when Roettenbacher followed up with some of the connections she made at the event, her life started falling into place.

"I went to Career and Recovery Center, and the next day, I had a job," said Roettenbacher. "That is the God's honest truth, it was so weird. I really wasn't expecting that." She went on to become certified as a dog groomer and now has her own grooming business.

"The Stand Down works," said Roettenbacher. "The Stand Down for me helped me stand up, and that's what I'm hoping it does for everybody else here."

Roettenbacher's success story is just one of many, according to Quindola Crowley, chief of social work at the VA Medical Center. "The Stand Downs are working and the work that we do throughout the year is helping veterans," she said, noting she believed this year's Stand Down had fewer veteran attendees than the last. "When we reach that goal of having more vendors than veterans, we've reached our goal of serving homeless veterans."





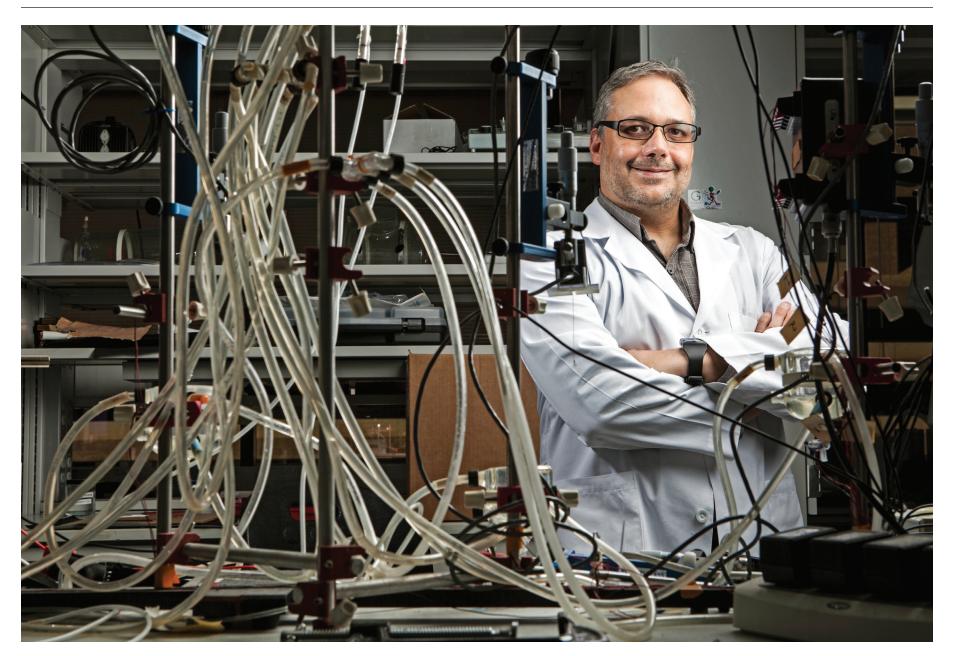


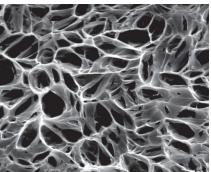
At the 14th annual Stand Down, homeless veterans from every branch of the military had access to a variety of services, including flu shots and help selecting new clothing for job interviews.

## Helping Tiny Hearts Beat

A new patch infused with carbon nanotubes has the potential to change the way congenital heart defects are repaired

By Shea Connelly





You could diagnose a heart defect in a fetus, grow heart tissue and have the tissue ready to repair the defect when the baby's born.

— JEFFREY JACOT, PH.D.

Assistant Professor of Bioengineering at Rice University and Director of the Pediatric Cardiac Bioengineering Lab in the Division of Congenital Heart Surgery at Texas Children's Hospital

 $TOP: Jeffrey\ Jacot,\ Ph.D.,\ in\ the\ Pediatric\ Cardiac\ Bioengineering\ Lab\ at\ Texas\ Children's\ Hospital's\ Feigin\ Center.\ (Credit:\ Jacot\ Lab/Rice\ University)\ LEFT:\ A\ scanning\ electron\ microscope\ image\ of\ a\ pediatric\ heart\ patch.$ 

ach year, close to 40,000 babies in the United States are born with a congenital heart defect. It is the most common birth defect in the country and, tragically, thousands of those infants will not reach their first birthday. In the Texas Medical Center, bioengineer Jeffrey Jacot, Ph.D., is working to improve outcomes for congenital heart defect patients by developing new ways to repair those tiny hearts and keep them beating through long, healthy lives.

Jacot is an assistant professor of bioengineering at Rice University and the director of the Pediatric Cardiac Bioengineering Lab in the Division of Congenital Heart Surgery at Texas Children's Hospital. His spacious lab, located in the Feigin Center at Texas Children's, is devoted to using biomaterials and stem cells to cure congenital heart defects.

Speaking in his sunny office, located just feet away from the activity of the lab, Jacot shows a deep enthusiasm for the work he's currently doing to patch up broken hearts and for the impressive goals he's set for the future. Among a number of exciting projects taking place in the lab, one of the most promising involves using single-walled carbon nanotubes to help electrical signals pass freely through patches used to repair pediatric heart defects.

"We're concerned with finding a piece of tissue or some sort of material that we can sew in that surgeons can use to reconstruct a heart with a structural abnormality," said Jacot. The patches currently in use, made of materials such as Dacron or Teflon, eventually end up as pieces of scar tissue in the heart, often impeding the heart's electrical impulses.

"They lead to several complications, but one of the most common is arrhythmias," or irregular heartbeats, said Jacot. "We wanted to find something

we could put in that doesn't end up as a big piece of scar tissue, but can blend in with the rest of the heart and also doesn't disrupt the electrical signals."

A couple of years ago, Jacot's team created a patch that could be implanted into the heart and would allow cells to invade. That first patch did not solve the problem of electrical signal disruption, which is why they turned to nanotubes. Jacot collaborated with Matteo Pasquali, Ph.D., a professor of chemical and biomolecular engineering and chemistry at Rice, whose lab makes highly conductive carbon nanotubesminuscule cylinders made of carbon.

"I had the hypothesis that if we put these into a patch, when we loaded it with cells, these could help the cell-tocell electrical communication," Jacot said. The patches are made of collagen, chitosan—a processed form of crustacean shells—and the nanotubes. The chitosan helps keep the nanotubes spread out and prevents clumping. Pores in the patches allow cells to invade and form their own networks, and the conductive nanotubes facilitate the electrical signals between the cells. Meanwhile, the patch slowly degrades and is replaced by natural tissue.

"About two months allows the cells time to build up enough of a matrix around them that they can take over the force from the rest of the patch," said Jacot. "Then the artificial materials we've put in there just disappear and the rest of it blends in with the heart. We feel if that happens it should grow along with the child and along with the heart."

The results thus far are promising, but there is still much to learn before the patches can be put to use in human subjects. Most importantly, the team must examine the carbon nanotubes for toxicity. The rest of the patch materials have been deemed safe for use in other devices, but the nanotubes have yet to

be stringently tested. Future research will also determine the exact fate of the conductive nanotubes as the patch degrades.

"People are still investigating the toxicity of certain types of carbon nanostructures. Some of them have been shown to be toxic, some aren't," said Jacot. "Our initial test with heart cells, specifically, seemed to show that we can't see any toxicity as long as we keep a fairly low, under 100 parts per million or so, concentration of these nanotubes."

In addition to the experiments with nanotubes, Jacot's lab is working toward using amniotic fluid stem cells to make heart cells. Those heart cells would then be used to invade the patches, creating a custom patch for each infant. Heart defects are often diagnosed in fetuses at around 20 weeks gestation, which offers time to prepare the patch to fix the defect immediately after birth.

"You could diagnose a heart defect in a fetus, grow heart tissue and have the tissue ready to repair the defect when the baby's born," said Jacot. "When the baby's born you have this infant you're going to need to operate on anyway, but then you can implant something made with that infant's own cells." The benefit of using cells genetically matched to the infant is lessening the risk of rejection and the need to suppress the child's immune system post-surgery.

Jacot's ultimate goal in the field of cardiac bioengineering is to build living tissue that can be implanted into hearts to repair much larger defects than the patches are able to handle. The patches are limited in terms of size by how far cells are able to invade. With living tissue, "you can build up large portions or restructure large portions of the heart," said Jacot.

"I think you can look at cures of

some very severe heart defects like a single ventricle defect, where a baby can be born with one ventricle instead of two ventricles," Jacot continued. "It requires a large series of operations to correct that over the course of many years, and you still don't end up with a heart that works as well as a typical heart. A lot of these children keep having problems later in life."

Naturally, the grand vision that goes hand-in-hand with building living tissue is engineering a whole heart from scratch. "That's the many-years-off thing," said Jacot. "If you could do that then you could imagine off-the-shelf hearts. When somebody needs a heart transplant they don't need to wait for a donor. They order, they figure out the size and get an off-the-shelf heart that is implanted."

As Jacot envisions a bright future for cardiac bioengineering, his passion for the field is palpable. "It's really exciting, a lot of technologies are coming together right about now," he said, adding that working with two different institutions at the Texas Medical Center provides a unique and comprehensive environment for research.

"Rice is one of the very top bioengineering departments in the world and it's well known for biomaterials and tissue engineering. Texas Children's is one of the top children's hospitals and especially well known for pediatric cardiology and cardiac surgery," said Jacot. "Being associated with that cardiac surgery team and with Rice bioengineering allows me access to all of those resources and allows me to meet day-to-day with congenital heart surgeons and collaborate with people who are really on the cutting edge of materials research. It's a good time to be working on this."

## Preparing for a Public Health Crisis

Texas Governor Rick Perry announced the formation of an infectious disease task force, directed by Texas A&M Health Science Center CEO Brett P. Giroir

By Shea Connelly

n Oct. 6, one week after a patient was diagnosed with the Ebola virus at Texas Health Presbyterian Hospital in Dallas, Gov. Rick Perry issued an executive order to form of the Texas Task Force on Infectious Disease Preparedness and Response. Though the announcement came on the heels of growing concerns about Ebola in the United States, the task force will focus on assessing the state's capabilities to prepare for and respond to any emerging infectious disease, not limited to Ebola.

"Over the past several days we have learned a lot about the unique challenges of situations like this, and it's important that we continue to adapt our response to these realities," Perry said at a press conference. "This task force will develop a comprehensive, longterm plan to ensure Texas deals effectively with any potential outbreak, building on our existing State Emergency Plan, and will cover all phases of preparedness and response."

The task force is made up of public health experts, epidemiologists and leaders of state agencies. A number of Texas Medical Center physicians and experts are among its members, including the director, Brett P. Giroir, M.D., chief executive officer of Texas A&M Health Science Center.

"Infectious disease outbreaks are real, and they are inevitable given our interconnected world where an outbreak anywhere is a risk everywhere. We must be fully prepared as a state to address this challenge," said Giroir. "Governor Perry is mobilizing the tremendous wealth of expertise within the state to assure that we are as prepared as possible for any further Ebola

66 Infectious disease outbreaks are real, and they are inevitable given our interconnected world where an outbreak anywhere is a risk everywhere. We must be fully prepared as a state to address this challenge. 🤊 🤊

- BRETT GIROIR, M.D.

Chief Executive Officer of Texas A&M Health Science Center and Director of Texas Task Force on Infectious Disease Preparedness and Response

case—both in the near and long term—as well as for other public health threats that will inevitably occur."

The task force has already met several times and has identified a number of priorities. The initial areas of focus include hospital preparedness and the potential role of improved rapid diagnostics; command and control issues; organization and implementation of epidemiologic investigations and monitoring; decontamination and waste disposal; patient care issues; care of patients being monitored; and handling of domestic animals in contact with patients.

In order to ensure health care providers are prepared to handle infectious diseases, the task force will also study the procedures surrounding the Ebola patient treated in Dallas, where nurses giving treatment contracted the disease. "We will certainly look into the situation that led to a transmission of Ebola to health care workers to ensure lessons are learned and appropriate actions are taken to prevent such a scenario from occurring again," said Giroir.

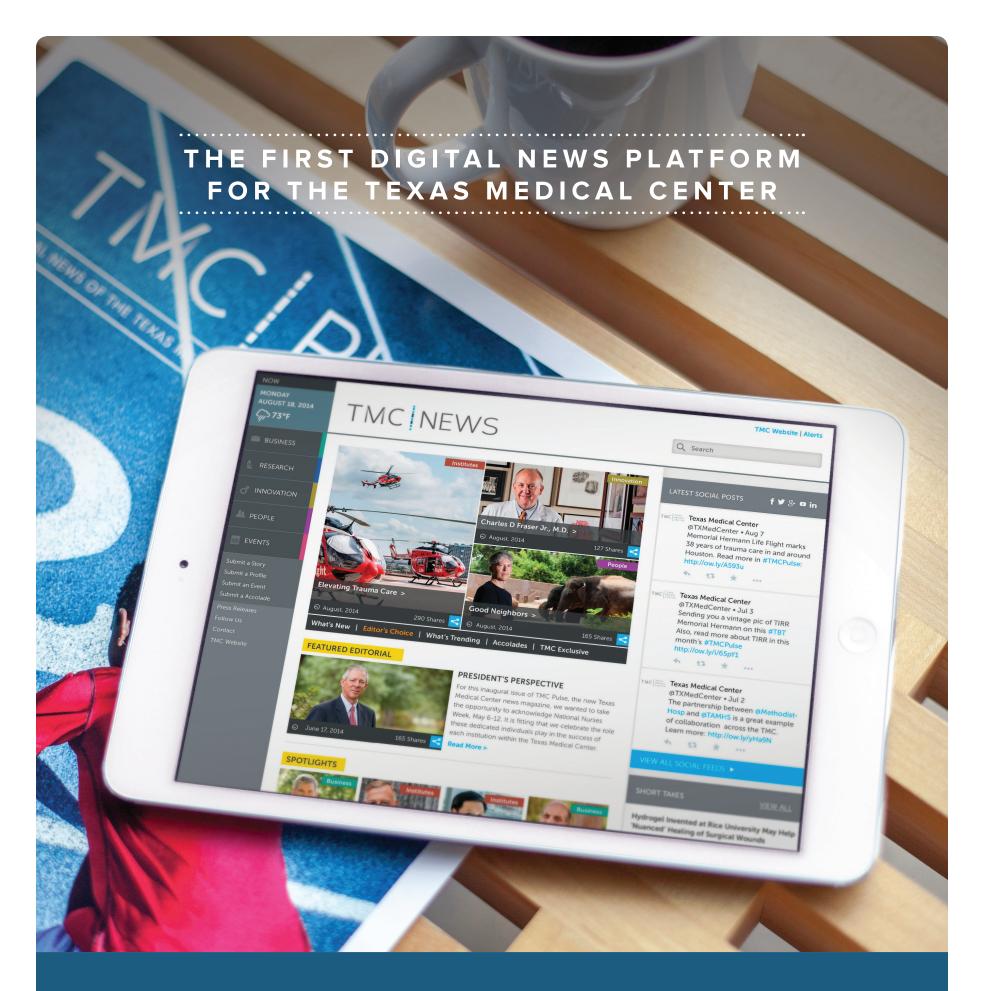
As information spreads about the Ebola virus and its presence in the United States, so has a certain amount of misinformation and fear, particularly in terms of how the disease is transmitted. Giroir spoke to those fears, saying, "It's important to reiterate that Ebola is only transmitted through bodily fluids, and while it's a highly contagious virus with relatively high mortality rates, the general public should realize that unless they have had direct physical contact with a symptomatic Ebola patient, they do not have Ebola."

The task force has already issued its initial recommendations in a letter to Perry. Among the proposals are: establishing specific hospitals designated as official Ebola treatment facilities, with The University of Texas Medical Branch at Galveston offered as a suggestion, the creation of a transportation team to bring infected patients to the treatment facilities, and preventing people from traveling for at least 48 hours if they have been in contact with patients who have Ebola or other infectious diseases. The task force is expected to submit at least two additional reports to Perry and the Texas legislature. Further reports may be issued if the task force deems it necessary.





LEFT: Texas Governor Rick Perry speaks with Thomas Geisbert, Ph.D., about the infectious disease research being done at The University of Texas Medical Branch Galveston National Laboratory, RIGHT: Brett P. Giroir, M.D., chief executive officer of Texas A&M Health Science Center, speaks as the new director of the Texas Task Force on Infectious Disease Preparedness and Response. (Credit: Office of the Governor of Texas)



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## A Gift with Meaning

Young patients at MD Anderson make the world a little more colorful through the Children's Art Project

By Zoe Quezada



One hundred percent of the profits made by the products sold through the Children's Art Project go directly towards the pediatric patient programs at MD Anderson Cancer Center. The bottom line is that this is a project that does a lot of good and if people are shopping during the holidays, this is a great way to make a huge difference in these kids' lives. In 41 years, we have made \$31 million of difference in people's lives.

— SHANNAN MURRAY

Executive Director of the Children's Art Project at
The University of Texas MD Anderson Cancer Center





hat started as a volunteer's suggestion to incorporate the children of The University of Texas MD Anderson Cancer Center's artwork into Christmas cards has grown into a full fledged charitable art program that creates a variety of products throughout the year to raise funds for the patient programs at the children's cancer hospital.

A lot has changed since 1973 when the project first began. In the early days, the children at MD Anderson did not have classrooms or a proper space to have fun and create. During its first year, the Children's Art Project raised \$588 from sales of Christmas cards, and the proceeds went towards simple gifts, such as parties for the children.

Now the Children's Art Project generates close to \$5 million a year to fund important programs for the children, such as a summer camp, called Camp AOK, where patients and their siblings can go do typical summer camp activities, including horseback riding, archery and fishing, all with the comfort and safety of doctors and nurses who accompany them to the camp. Additionally, the project raises funds for the in-hospital, accredited kindergarten through 12th grade school at MD Anderson, as well as college scholarships to help young patients and their families who may have suffered financially due to the stress of cancer treatment.

"In 41 years we have returned more than \$31 million back for programs," said Shannan Murray, executive director of the Children's Art Project.

"The programs are recreational, educational or emotionally based in an effort to help the children go on with their lives. The programs are particularly helpful because they have made a lot of strides in cancer treatment for children and so now the children need to go on to college and go on with their lives and the focus is really on their survivorship."

At the in-hospital school, children at MD Anderson take art classes as part of their curriculum. Teachers, volunteers and staff teach the children drawing, painting and collage making. The children are encouraged to have fun and create whatever they like. Throughout the year the staff collects the children's artwork and submits the work to the Children's Art Project archives.

"As you can imagine, it's very hard to choose designs and we need a lot of help," Murray said. "We have our volunteers help us narrow down the line about 18 months ahead of time.
About 2,000 people help us narrow the choices down to a workable number of designs, and if a child's artwork is not chosen that year, as long as they created it before they turned 19, and while they were a patient at MD Anderson, their artwork can be chosen any time."

As the project has expanded, more artwork by both current and former patients has been able to be featured. Each year more products are added to the catalog and gifts are created for more holidays, including Valentine's Day, Mother's Day and Father's Day. Some products even feature multiple children's artwork in their design.

"Because we are producing more products like kitchenware, ties, scarves, children's books, calendars, jewelry, phone covers, etc., there are more pieces of artwork that can be used. A lot more children are being recognized now than in the early days," said Murray. "In the past, if a piece of artwork couldn't stand on its own as a card, it wouldn't be chosen. Now we need more art to go on children's books, calendars and even the scarves."

It's not uncommon for the Children's Art Project to take advantage of its abundant archives. For example, Murray mentioned that this year a design was chosen that was created by a former patient at MD Anderson who made the artwork when she was a teenager undergoing treatment at the hospital. Now that former patient is grown and has a family of her own, but this year will be her first time being featured as part of the Children's Art Project.

"The thing that is really unique is that the kids are undergoing something where they don't feel that they have a lot of control in their lives," Murray said. "They are undergoing cancer treatment, which is hard for anyone to go through, especially a child. But when their artwork is created and chosen it is a very powerful thing and the child actually sees that they are making a difference in their peer's life when their lives seem very out of control. It's a very empowering thing for the children. They understand that they are making a difference in other people's lives and that's a wonderful thing. It's a good lesson for anyone."

The holiday season marks the busiest time of year for the Children's Art Project. Volunteers and staff pack orders for shipment and showcase products at trunk shows and holiday shows such as the annual Nutcracker Market. In the medical center, there is a taskforce of volunteers who work to spread the word about the Children's Art Project and encourage people to make a meaningful purchase for those on their holiday lists.

"The bottom line is that this is a project that does a lot of good and if people are shopping during the holidays, this a great way to make a huge difference in these kids' lives," said Murray. "In 41 years, we have made \$31 million of difference in people's lives. Everyone out there in the community can be a part of that. It's a great way to make a difference this holiday season."

General Information: Find a retailer or shop online at www.childrensart.org | 800-231-1580

#### **FEATURED ARTISTS**



#### Hannah

Hannah's love of art shines brightly in her MD Anderson art classes. The courageous six-year-old was diagnosed with a brain tumor in 2012, and the ability to create art inspires her to fight and beat cancer. The classes provide the perfect environment for her creativity to bloom. She dives into new projects with enthusiasm and enjoys creating colorful designs. Hannah's sweet giggles show that despite all the strenuous treatments, she can find humor in most situations. She shared many laughs with us this summer at Camp Star Trails, Anderson's overnight camp for young patients. Hannah had a wonderful time making new friends and participating in activities like swimming, horseback riding, and of course, arts and crafts.



#### Hayden

Hayden is a friendly eight-yearold from Spring, Texas. He enjoys creating artwork and playing fetch with his dog Pirate. Many boys his age like to watch superhero movies, but Hayden prefers to fight the bad guys himself in his favorite video game, Skylanders: SWAP Force. While undergoing treatment for a brain tumor, Hayden participated in MD Anderson's Child Life Program. Its recreational activities, like the art classes, really brightened his hospital stay. His stuffed animal Nosy brought him comfort too, its nose worn from countless Eskimo kisses. Hayden is excited that his Christmas-themed truck design was selected for a holiday card and he hopes to have his artwork featured on an ornament one day.

 ${\it Photos\ and\ profiles\ courtesy\ of\ MD\ Anderson}$ 



**DOMINICA ANDERSON,** a nursing assistant at The University of Texas MD Anderson Cancer Center, is the 2014 recipient of the Julie and Ben Rogers Award for Excellence in Patient Care, Anderson was awarded \$15,000 and a framed certificate of merit on September 16, 2014 at a ceremony led by Ethan Dmitrovsky, M.D., provost and executive vice president of MD Anderson. She is a certified nursing assistant on the P4 post-anesthesia care unit and has been with MD Anderson since 2012. In addition to assisting patients, Anderson also serves as a Patient Care Partner Champion, Glucometer Champion and clinical coach for newly hired nursing assistants.



TOM NGUYEN, M.D., assistant professor of cardiothoracic surgery and co-director of the Structural Heart and Valve Program at The University of Texas Health Science Center at Houston (UTHealth) Medical School, has been named to the 2014 Houston Business Journal 40 under 40. Nguyen is an attending physician at Memorial Hermann Heart & Vascular Institute-Texas Medical Center. As a member of the structural heart team, he was the first surgeon in Texas to perform a transcatheter aortic valve replacement under conscious sedation using the Edwards Sapien valve.



WILLIAM JAY BRYAN, M.D., orthopedic surgeon and clinical professor at Houston Methodist Hospital's Orthopedics and Sports Medicine Department, is the recipient of the Arthritis Foundation's Medical Honoree Award. Bryan has been in orthopedic surgery practice for more than 34 years at the Texas Medical Center. He has also been a clinical associate professor at Baylor College of Medicine. Bryan has taught an orthopedics course to physical therapy students at The Texas Woman's University (TWU) Institute of Health Sciences-Houston Center for 33 years. Bryan has been the Astros' baseball physician for two decades and was president of the Major League Baseball Physicians Association.



SELWYN O. ROGERS JR., M.D., MPH, FACS, a surgeon and public health expert with credentials from Harvard, Vanderbilt and Temple schools of medicine, is the new vice president and chief medical officer for the Health System at the University of Texas Medical Branch at Galveston (UTMB). Rogers also will serve as assistant dean for clinical affairs in the School of Medicine. He will assume his duties Dec. 1. 2014. Since 2012, Rogers has served as professor and chairman of surgery at Temple University School of Medicine. Before that, he was an associate professor of surgery at Harvard Medical School.



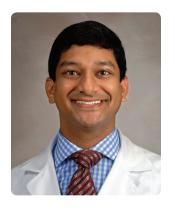
TERESA A. DAVIS, PH.D., professor of pediatrics at the ARS/USDA Children's Nutrition Research Center at Baylor College of Medicine and Texas Children's Hospital, was appointed editor-in-chief of the Journal of Nutrition for 2014 to 2018. The journal, established in 1928, was the first scientific journal created solely for the publication of nutrition research. A top-ranked journal, it publishes peer-reviewed research reports on all aspects of experimental nutrition as well as critical reviews and commentaries. Davis is a past president of the American Society for Nutrition, a nonprofit scientific society of more than 5,000 members whose mission is to advance excellence in nutrition research and practice.



GUSTAVO C. ROMÁN, M.D., neurologist and first director of the Nantz National Alzheimer Center at Houston Methodist Hospital, has been awarded the Doctorado Honoris Causa, the highest academic accolade given by the National University of Colombia. Román is a medical graduate from the National University of Colombia. He will receive the Doctorado Honoris Causa in recognition of his career in clinical neurology and tropical medicine, as well as his contributions to worldwide policies to improve brain health. He is also being recognized for his contribution to the education and training of young Colombian neurologists.



MONICA MENDEZ-GRANT, EDD, has been named the new vice president for Student Life at Texas Woman's University (TWU) following a national search for the position. She has served as the university's interim vice president for Student Life since May. Mendez-Grant has more than 20 years of student affairs leadership experience, most of which has been at TWU. Prior to her service as interim vice president, she served as TWU's associate vice president for Student Life for 13 years and director of the Center for Student Development and Student Orientation for seven years.



MANISH N. SHAH, M.D., pediatric neurosurgeon, is being welcomed to the medical staff at Children's Memorial Hermann Hospital and Memorial Hermann Mischer Neuroscience Institute at the Texas Medical Center, in addition to his appointment as assistant professor of pediatric neurosurgery at The University of Texas Health Science Center at Houston (UTHealth) Medical School. In his new role, Shah also will focus on advancing treatment options in pediatric patients diagnosed with cerebral palsy. Shah's major clinical interests include, among others, pediatric epilepsy surgery, pediatric cranial and spinal trauma and pediatric cranial and spinal vascular malformations.



**Imaging and Response Evaluation** in Clinical Trials

#### Friday, December 5, 2014 9 a.m. – 4:30 p.m.

The University of Texas MD Anderson Cancer Center Cancer Prevention Building (CPB) Floor 8 (Rooms 1-8)



**Directors**: David Hong, MD; Vivek Subbiah MD; Filip Janku, MD, PhD; Eric Rohren, MD, PhD; Chaan Ng, MD; Donald Podoloff, MD

Organizers & Speakers: Robert Benjamin, MD; Haesun Choi, MD; Rivka Colen, MD; Luis Fayad, MD; Bruno Fornage, MD; David Hong, MD; Wen-Jen Hwu, MD, PhD; Filip Janku, MD, PhD; Vinodh (Vince) Kumar, MD; Ravi Murthy, MD; Chaan Ng, MD; David Piwnica-Worms, MD, PhD; Donald Podoloff, MD

#### Workshop will cover:

- Anatomy basics on CT chest, abdomen, pelvis, body PET/CT, and MRI brain imaging and imaging techniques
   Lesion Measurements and RECIST 1.0, RECIST 1.1, CHOI, PERCIST, WHO, CHESON, and RANO criteria
- · Limitations and pitfalls of tumor measurements

#### Who might be interested to attend:

- Physicians and fellows in oncology, radiation oncology, surgery, pediatrics, and radiology
- · Study coordinators and research nurses

This live activity has been approved for *AMA PRA Category 1 Credits*<sup>ad.</sup> Course is FREE of charge Attendees will pay \$12 for all day parking at the Mays Clinic Garage

Please RSVP by Thursday, December 1, 2014 to Sheori Sinegal at <a href="mailto:SASinegal@mdanderson.org">SASinegal@mdanderson.org</a> RSVP is helpful for event planning but is not mandatory

For more information, please contact:

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#### Virtual Patients Come Alive in New Simulation Lab at University of Houston



A UH College of Optometry student practices examining the retina of a virtual patient with an Eyesi ophthalmoscope in the new Optometric Clinical Skills Simulation Lab. (Credit: David Gee)

his fall, University of Houston (UH) optometry students began hands-on training in a first-of-itskind simulation lab that offers them 24/7 access to virtual patients. The Optometric Clinical Skills Simulation Lab, which will better prepare students to administer patient care when they start clinical rotations, is the only one at an optometric program in the country and the largest in the world.

"When students come in this room and see the technology they're blown away," said assistant professor Heather Anderson, who led the initiative to bring the simulation lab to the UH College of Optometry. "The simulators have two components. The patient interface is a smooth black sheet of plastic with a 3-D face, and that face turns into the patient you're examining. The simulators take on the demographics of whatever cases are programmed into the computer, so now we can have the students examine elderly eyes, diseased eyes and eyes from all different ethnicities."

This is done through an augmented headband-mounted light that's used to obtain a view of the retina through a handheld lens in a procedure called indirect ophthalmoscopy. It's the same headband worn by professionals, but instead of having plain oculars to look through, it has LED screens mounted in it to create the images of the lifelike patients. The other component of the simulators is a touchscreen computer

that brings up the different patient cases and faces. All images are based on actual clinical cases, so the images the students see are derived from real patient retinal photographs.

In the traditional academic setting, students use each other as patients during their earliest lessons in optometry. Typically, though, they have healthy retinas, so students aren't getting real-world exposure to diseases until they start with clinical rotations. Additionally, teaching students how to detect disease in the back of the eye requires the patient be dilated. It becomes difficult for a student 'patient' to be dilated frequently when they need to go home and study, since dilation lasts several hours.

With this technology, students gain 24/7 access to dilated patients and can examine the retinas of these virtual patients any time they want. Another benefit is that students traditionally have been taught disease through photographs, textbooks and computer images and not physically examining patients with these diseases until they get to the clinic. This technology enables them to go through the physical examination process to see diseased eyes and better prepare for that detection before they're administering

"When you look through the LED screens, you see a patient that's blinking and moving their eyes and looking back

66 The simulators take on the demographics of whatever cases are programmed into the computer, so now we can have the students examine elderly eyes, diseased eyes and eyes from all different ethnicities. 99

> - HEATHER ANDERSON Assistant Professor at the University of Houston

at you with the ethnicity and age of the patient you're examining," Anderson said. "The simulators are very realistic in that they do get tired. They'll blink and close their eyes if you remain in one position with the light for too long and don't give them breaks. They respond the way a patient would, so if you spend too much time exposing the retina to the light, you'll even see a tear come down the cheek of the virtual patient."

The curriculum built into the software is extensive. Students are quizzed after each exercise and cannot progress to another case until they've mastered the previous level. The simulation equipment maps out the parts of the retina the students have looked at, so now their professors are able to objectively quantify how successful students have been in examining 100 percent of the retina.

This gives faculty an objective way to analyze a student's progress. In current practice, when students are learning these techniques, their professors are looking over their shoulders in a little mirror that reflects what the students see. It can be difficult to quantify how fully the student has examined the retina.

In addition to the simulators now being able to tell faculty how much of the retina students examined, they also reveal how much time it took them. This allows faculty to know if students are doing an efficient exam that would be acceptable to a patient's comfort. Another evaluation tool used in conjunction with these simulators is a series of multiple choice questions about each case as to whether or not students correctly identified the pathology and then identified the correct treatment strategy.

"Many of the diseases we're looking for have dimension to them, so if you

look in a patient's eye that is simulating a retinal detachment, you can see the depth of the retina floating as it's detached," Anderson said. "It's very realistic. Seasoned doctors have gone in to examine the equipment and say it feels so natural. You put the headband on and feel like you're examining an actual patient."

The 10 Eyesi ophthalmoscopes five each of both the direct and indirect models—are designed to train for the examination of the retina and were designed by ophthalmologists and simulation technology experts in Germany at VRMagic, a provider of virtual reality medical training simulators for eye care professionals

Joining Anderson in the effort to bring the Eyesi system to UH were assistant professor David Berntsen and clinical associate professor Amber Gaume-Giannoni. With this new technology, students gain exposure to more than 200 clinical cases of pathology built in to the patient simulators. This mode of education capitalizes on the philosophy of pattern recognition to identify disease presentation and gives all students an equal opportunity to gain exposure to a variety of eye conditions.

To start with, second-year optometry students are using the lab during the fall 2014 semester and then firstyear students will be given access in spring 2015. Ultimately, students will be able to benefit from the simulators through all four years of their time at the optometry college, as well as during their residencies.

-Lisa Merkl, University of Houston Behavioral Hospital of Bellaire offers acute inpatient and outpatient services to adults, adolescents and children who are struggling with mental health or substance abuse issues.

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#### Whole Exome Sequencing Closer to Becoming "New Family History"

A pproximately one-fourth of the 3,386 patients whose DNA was submitted for clinical whole exome testing received a diagnosis related to a known genetic disease, often ending a long search for answers for them and their parents, said researchers from the Baylor College of Medicine departments of molecular and human genetics and pediatrics and the Baylor Human Genome Sequencing Center and the University of Texas Health Science Center at Houston.

In an online report in the Journal of the American Medical Association, the scientists led by Yaping Yang, Ph.D., laboratory director of the Whole Genome Laboratory at Baylor, and Christine Eng, M.D., professor of molecular and human genetics at Baylor and senior director of Baylor's Medical Genetics Laboratories, found a molecular diagnosis (meaning a genetic mutation or variation linked to a disease) in 25 percent of the large

group of cases—confirming in this much larger group of patients the diagnostic yield from their initial report on the first 250 cases that appeared in the New England Journal of Medicine a little more than a year ago.

"The findings in this report, I believe, will forever change the future practice of pediatrics and medicine as a whole," said James R. Lupski, M.D., Ph.D., professor of molecular and human genetics and pediatrics at Baylor and a coauthor of the report. "It is just a matter of time before genomics moves up on the physician's list of things to do and is ordered before formulating a differential diagnosis. It will be the new 'family history' that, better yet, gets you both the important variants inherited from each parent and the new mutations that contribute to disease susceptibility."

In fact, a large percentage of the diagnoses made were patients who inherited a new mutation (in the egg or

sperm) that was not previously seen in their parents.

"The routine application of new genome methods in the clinic is not only benefiting patients but changing the way we think about research," said Richard Gibbs, Ph.D., director of the Baylor College of Medicine Human Genome Sequencing Center and an author of the report.

"It has been wonderful to watch this very large team of colleagues bridging from the patient in clinic to the very most cutting-edge genomic technology to give families answers where previously there were none," said Arthur Beaudet, M.D., professor of molecular and human genetics who was chair of the department when the Whole Gene Laboratory was begun and who began the Baylor College of Medicine Medical Genetics Laboratories.

"The diagnostic rate holds for the entire set of undiagnosed 3,386 patients who underwent whole exome sequencing between June 2012 and August 2014," said Eng, who reported on a detailed analysis of 2,000 consecutive patients.

The procedure involved sequencing the DNA of the patients using new sequencing technologies referred to as next generation sequencing and comparing those results to the normal reference. Any disease-associated mutations were then also compared with the parent's DNA to determine if the child inherited it from one or both parents to better understand the cause of the disease. In this study, the whole exome sequencing also identified ways in which physicians could intervene clinically to ameliorate or eliminate negative symptoms and to give families more information about the possible disease course.

– Glenna Picton, Baylor College of Medicine

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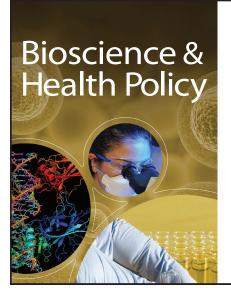
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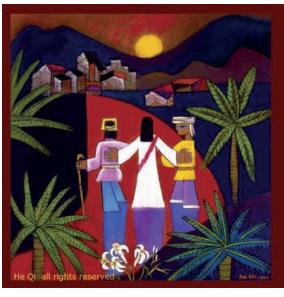


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### Children's Memorial Hermann Hospital Celebrates Patient and Caregiver Reunions at the Houston Zoo

Memorial Hermann Hospital's Level IV Neonatal Intensive Care Unit (NICU), one of the largest in the nation, hosted its 4th Annual NICU Patient and Caregiver Reunion at the Houston Zoo's Mashira Pavillion.

Dressed in Halloween costumes and festive fall attire, patients and their families came excited to reunite with their NICU caregivers and physicians. Families like the Aggours, with quadruplets-Deen, Kareem, Omar and Saif-along with sister Tamara, father Tamir, and mother Marwa, celebrated and enjoyed socializing over snacks, music and activities, including a photo booth, face-painting, pumpkin-painting, a bouncy house, carnival games, and much more. In addition, Children's Memorial Hermann Hospital's official mascot, Topper, greeted and entertained guests throughout the event.

"During the time that babies stay in our NICU, I feel like I become part of their family," said Nicole Francis, director of Children's Memorial Hermann Hospital's Level IV Neonatal Intensive Care Unit. "It's really special having the opportunity to keep up with my extended NICU family over the years."

Children's Memorial Hermann Hospital's NICU provides the full range of care for neonates born prematurely or with congenital birth defects, infection, metabolic problems or other medical or surgical needs. The nursery is equipped to care for premature babies born as early as 23 weeks of gestation and weighing as little as one pound. We provide specialized respiratory care, including high-frequency ventilation, extracorporeal membrane oxygenation (ECMO) and intensive monitoring. The NICU is known for the special attention it provides to the entire family. This includes kangaroo care while the infant is in the unit and overnight care by the family in parent rooms, which offer a secure environment prior to discharge.

6 During the time that babies stay in our NICU, I feel like I become part of their family.

— NICOLE FRANCIS
Director of Children's Memorial
Hermann Hospital's Level IV
Neonatal Intensive Care Unit

After a morning of fun, the party continued with the 2nd Annual Pediatric Epilepsy Reunion also for patients and their families, caregivers and physicians. The event was sponsored by Children's Memorial Hermann Hospital, Memorial Hermann Mischer Neuroscience Institute at the Texas Medical Center, VNS Therapy by Cyberonics, Lundbeck and Upsher-Smith.

Takijah Heard, M.D., UTHealth pediatric neurologist affiliated with Children's Memorial Hermann Hospital and the Memorial Hermann Mischer Neuroscience Institute, caught up with one of her favorite patients, 22-monthold Brynnley O'Leary, and her mom, Courtney O'Leary.

"Pediatric epilepsy patients experience seizures at any time, which can be devastating for these families," said Heard. "It's really important for families and patients like Brynnley to have a forum in which they can interact and provide that necessary support to one another."

Two-thirds of epilepsy cases are caused by an unclear reason and the seizures are treated by



The Aggour family (Credit: Children's Memorial Hermann Hospital)

antiepileptic medications. The expertise of Children's Memorial Hermann Hospital's Level IV comprehensive pediatric epilepsy center, recognized by the National Association of Epilepsy Centers, is applied to treat epilepsy in its multitude of presentations. In collaboration with UTHealth Medical School, the pediatric epileptologists affiliated with Children's Memorial Hermann Hospital and Memorial Hermann Mischer Neuroscience Institute specialize in comprehensive epilepsy care at the Epilepsy Monitoring Unit (EMU). The EMU is a large, family-friendly unit with specialized equipment to help identify the type of seizures and the brain location from which they originate, and to aid in the delivery of an individualized epilepsy treatment plan.

— Kathryn Jungman, Memorial Hermann-Texas Medical Center



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23rd Annual Psychotherapy and Faith
Conference

Friday, 7:15 a.m.- 3:50 p.m. St. Martin's Episcopal Church 717 Sage Road, 77056 jdoctor@ish-tmc.org 713-797-0600

TMC Pharmacy Residency Showcase

Friday, 1:00 p.m.- 4:30 p.m. Rockwell Pavilion, M.D. Anderson Library UH Main Campus ppitman@uh.edu 713-743-1239

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Tuesday, 11:30 a.m.- 1:00 p.m.
UTHealth Behavioral and Biomedical
Sciences Building
margaret.thornsburg@uth.tmc.edu
713-486-2783

13 Nursing Celebration

Thursday, 6:00 p.m.- 9:00 p.m. Hilton Houston Westchase 9999 Westheimer, 77042 tna9@tnadistrict9.com 713-523-3619

Enventure Dialog: David Eagleman, Ph.D.

Thursday, 6:00 p.m.-8:30 p.m.
Bioscience Research Collaborative
Exhibit Hall
6500 Main Street
amy@enventure.org
832-224-6395

14 UTHealth Constellation Gala

Friday, 12:00 p.m.- 3:00 p.m. Hilton Americas 1600 Lamar, 77010 celise.m.munoz@uth.tmc.edu 713-500-3225

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14-16 27th Annual Southern Region Burn Conference

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The Health Museum
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