

Medical Bulletin

UNIVERSITY OF MINNESOTA MEDICAL SCHOOL

SPRING 2020

PAGE 2

On the front lines

Medical School alters the course of COVID-19

ALSO INSIDE

8 New brain health institute aims to put kids on course for life

14 Microbiota transplant patient becomes an inspired researcher

19 Leading the quest for stem cell innovations

24 Story slam fosters connection and catharsis





PAGE 8

Starting strong

U institute homes in on the two most sensitive periods of brain development in a person's life: the first 1,000 days and adolescence

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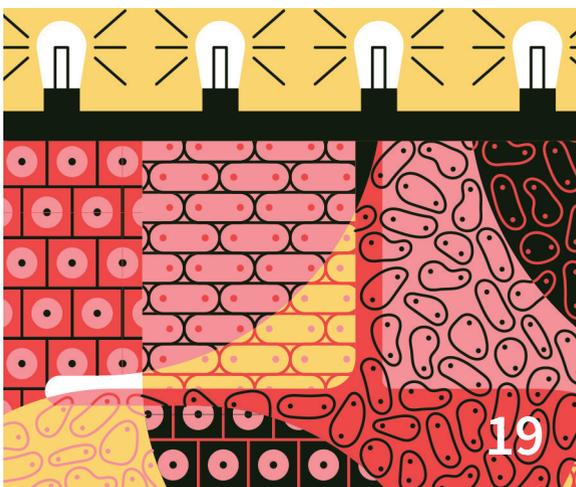
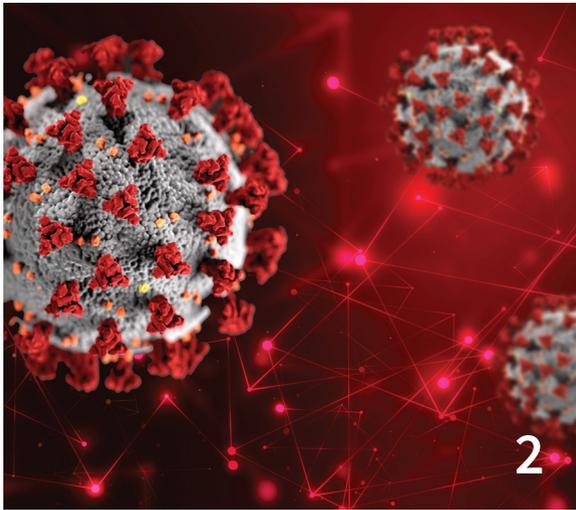
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ON THE COVER A researcher put on protective gloves at the U of M's Microbiology Research Facility, which has been transformed into a testing facility for SARS-CoV-2.

PHOTO: CRAIG LASSIG, REUTERS

SPECIAL REPORT

2 **COVID-19: The Medical School mobilizes**

A rapid response prepares our state and region to confront this crisis

8 **Starting strong**

U's new Masonic Institute for the Developing Brain aims to put kids on course for life

14 **Gut feeling**

Patient-turned-researcher teams up with her doctor to advance the U of M's pioneering microbiota transplant program

19 **Stem cell ingenuity**

For two decades, the U's trailblazing institute has led the quest to unlock the potential of the cells that keep on giving

24 **Healing words**

This story slam fosters connection and catharsis among the storytellers – residents, fellows, and practicing physicians

ALSO IN THIS ISSUE

28 **Alumni Connections**

28 **Alumni Spotlight** Family medicine ambassadors

30 **Scholarship Winner** Self-starter finds opportunity

34 **In Memoriam**

36 **A Look Back** Program in Human Sexuality turns 50

MORE ONLINE

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Email us at giving@umn.edu to receive the *Medical Bulletin* by email instead of as a paper copy.

TICK FIX

Due to a printing error, the fall 2019 *Medical Bulletin* inadvertently excluded the last section of the feature article "Targeting ticks." The full article is available at z.umn.edu/targetingticks, or readers may request a complete printed copy from Nicole Endres at nendres@umn.edu.



PHOTO: PATRICK O'LEARY

Transformational

IF ANYONE HAD TOLD US in October, the last time we published the *Medical Bulletin*, what the medical and social landscape would look like now, I'm not sure we would have believed them. Equally unbelievable is the scale of good that has come out of the COVID-19 crisis. Since March 13, when the national emergency was declared, the University and its Medical School have not just changed, but transformed. A few examples:

- In a matter of weeks, our educational efforts shifted from hands-on training to online learning and use of virtual models.
- Telemedicine went from something “we need to do” to “done,” with hundreds of virtual visits to our clinics weekly.
- Clinical trials—made possible by the Herculean efforts of our clinical, regulatory, and research staff—were launched within days to answer some of the most pressing questions around treatment of the virus, especially to provide critical data on the efficacy of the medications losartan, remdesivir, and hydroxychloroquine. We also are investigating ways to use the human body's own natural killer cells to target the virus.
- Anesthesiologists and biomedical engineers developed, tested, and received approval for a now-in-production low-cost ventilator, the plans of which have been freely shared worldwide.
- Work from the College of Veterinary Medicine that defined the molecular structure of the virus was handed off to immunologists in the Medical School's Department of Biochemistry, Molecular Biology, and Biophysics. Within three weeks, antibody testing for COVID-19, designed completely in-house and using reagents that we produced ourselves, was validated and operational.

The Center for Immunology's Marc Jenkins, Ph.D., who was just elected to the National Academy of Sciences, was integral to creating the antibody test (see page 32).

- Thanks to the M Health Fairview partnership, we were able to quickly equip and staff Bethesda Hospital to exclusively handle patients diagnosed with COVID-19.
- Collaborations with the College of Design produced new mask designs to help protect caregivers.
- The Medical School collected and redeployed equipment from labs across campus to build a COVID-19 testing lab and develop a fully validated coronavirus test in five days.

Since mid-March, the University of Minnesota and the Medical School have responded to the COVID-19 pandemic with truly extraordinary flexibility, collaboration, and inventiveness. The changes we are seeing are not just temporary measures, but will truly revolutionize the way we educate our students, perform research, and treat our patients.

Our thoughts are with you and yours in this difficult time. Stay safe. Be well.

Jakub Tolar, M.D., Ph.D.

Dean of the Medical School and Vice President for Clinical Affairs

HOW TO SUPPORT OUR EFFORTS

The **Vice President's Emergency Support Fund** provides lifesaving patient care equipment like ventilators and protective gear, as well as funding for clinical trials and grants to support U researchers' most innovative research ideas. More than 260 donors have generously supported the fund so far.

The **U of M Caregiver Emergency Fund** will ensure that frontline caregivers in clinics and hospitals, both here on campus and around the state, have the resources and equipment to serve patients safely as needs grow.

The U of M's systemwide **Student Emergency Fund** supports students most significantly affected by COVID-19, helping them gain access to housing, food, tuition, mental health services, and transportation. [MIB](#)

Make a gift to any of these funds at give.umn.edu/covid-19.

Developing tests—and a plan

U joins forces with Mayo and the state to reopen Minnesota safely

Marc Jenkins, Ph.D., and his team at the University of Minnesota Center for Immunology acted quickly to develop and validate a test to detect the antibodies to COVID-19. After about three weeks, the test was in clinical use at M Health Fairview Bethesda Hospital, the state's first hospital dedicated to treating severely ill COVID-19 patients. It was one of the first such tests developed in Minnesota.

And now, the U has partnered with the Mayo Clinic and Minnesota Department of Health to establish testing capacity for 15,000 antibody tests and 20,000 molecular diagnostic tests per day. The effort, funded in part by \$36 million from the state's COVID-19 Minnesota Fund, is expected to help control the spread of the virus and lead the way to the safe reopening of society.

"When Minnesota faces a challenge, we rise up—together," Gov. Tim Walz said in an April 22 news release. "I'm proud to partner with Minnesota's innovative health care systems and leading research institutions to pioneer how states can begin to move forward amid COVID-19."

The three entities together are creating the means to accommodate the expanded testing and a virtual command center to monitor the daily testing needs of health care systems and coordinate rapid responses to outbreaks. Three buildings on the U's Twin Cities campus now function as on-site testing facilities for SARS-CoV-2.

I'm proud to partner with Minnesota's innovative health care systems and leading research institutions to pioneer how states can begin to move forward amid COVID-19.

— Gov. Tim Walz

The U-developed antibody test has been seen as an important part of Minnesota's response to the pandemic because it can help to determine who has already been infected by the virus and may have immunity to it. Such testing can provide information on who is and isn't at risk of acquiring or spreading the infection—particularly useful information for health care workers—and inform how and when to lift social-distancing restrictions.

Knowledge about COVID-19 antibodies also lends critical insight into how to produce an effective vaccine.

"What makes this test different is that it was developed here in Minnesota, meaning we aren't relying on an outside supply chain for kit parts from another part of the world," says Tim Schacker, M.D., the Medical School's vice dean for research. "And the test has had good results with people who are 10 days out from their symptoms giving positive immune response results." ^[MIB]

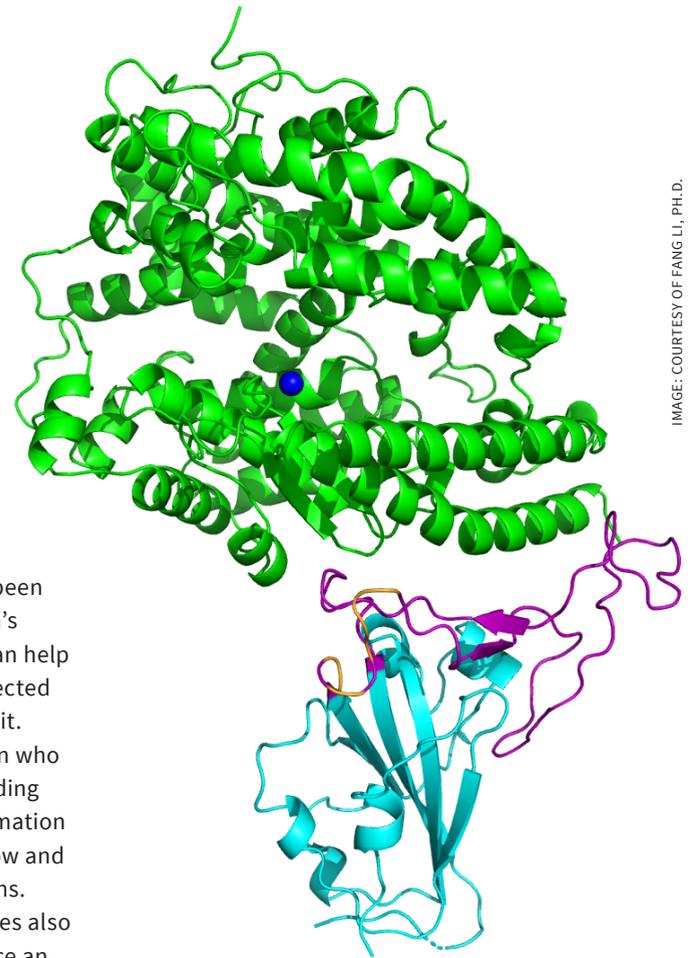


IMAGE: COURTESY OF FANG LI, PH.D.

University of Minnesota researchers led by Fang Li, Ph.D., were among the first to describe how the SARS-CoV-2 protein attaches so securely to human cells, infects them, and spreads quickly—laying the groundwork for interrupting this process and advancing the development of antibody testing.

RESOURCES

- Campus Public Health Officer rapid response updates: covid-19.umn.edu
- Center for Infectious Disease Research and Policy COVID-19 Resource Center: cidrap.umn.edu/covid-19
- M Health Fairview COVID-19 Resource Hub: mhealthfairview.org/covid19

GRANTEES INCLUDE:

Attacking the virus

Alon Herschhorn, Ph.D.

Medical School

Herschhorn, an expert on infectious disease and AIDS, is now using his knowledge of viruses to identify ways to attack the vulnerabilities of emerging coronaviruses.

Developing a vaccine

Yuying Liang, M.S., Ph.D.

College of Veterinary Medicine

Using technology developed in her laboratory, Liang is creating a sensitive test for COVID-19 that could diagnose infection in people whether or not they have symptoms. She is also developing COVID-19 vaccines.

Predicting outcomes

David Odde, Ph.D.

College of Science and Engineering

Odde creates disease simulators to predict the progression of cancer and neurodegenerative disorders. He extended his research in these areas to work on a simulator to help predict clinical trial outcomes for new COVID-19 therapies.

Creating rapid field test

Mark Osborn, Ph.D.

Medical School

An expert in genome engineering for pediatric genetic diseases, Osborn is applying his skills to create a rapid field test for COVID-19. Still at the experimental stage, these inexpensive test strips could allow testing and results without special lab equipment.

Increasing testing

Sophia Yohe, M.D.

Medical School

Yohe led the effort to repurpose equipment from labs across campus to create a new COVID-19 testing lab and develop a fully validated coronavirus test in five days.

Rapid response grants fuel pandemic-specific projects

WHEN HE WAS a U of M medical student, Stephen Richardson, now an M.D., received an ominous warning.

It came from Michael Osterholm, Ph.D., M.P.H., a world-renowned infectious disease expert and director of the U's Center for Infectious Disease Research and Policy, who explained during a lecture that whenever the next pandemic occurred, there wouldn't be enough ventilators in the United States to meet the need.

"That message was always in mind," says Richardson, who graduated from the Medical School in 2015 and now is an anesthesiology fellow at M Health Fairview University of Minnesota Medical Center.

So when the COVID-19 pandemic spread to the U.S. earlier this year—inflicting tens of thousands of Americans and proving Osterholm's ventilator shortage prediction true—Richardson wasn't surprised. And he had an idea of how he could help.

As the first cases emerged across the country, he teamed up with colleagues in the U's Earl E. Bakken Medical Devices Center to create a low-cost mechanical ventilator, now known as the Coventor. The first prototype included an Ambu-bag, a simple motor, and spare parts from other devices.

Over the course of about two weeks, the team fine-tuned the initial device from an assortment of available machinery components to a custom slider-crank mechanism, which allows health care providers to control how oxygen is delivered to patients.

The Coventor was approved by the U.S. Food and Drug Administration on April 15,



WEB EXTRA

See how the Coventor works at med.umn.edu/covid19ventilator.



PHOTO: COURTESY OF UNIVERSITY RELATIONS

Working with an interdisciplinary team, cardiac anesthesia fellow Stephen Richardson, M.D., and fellow inventor Aaron Tucker, a lab supervisor at the Earl E. Bakken Medical Devices Center, made the first Coventor prototype from an Ambu-bag, a simple motor, and spare parts from other devices.

becoming the first device of its kind authorized under the FDA's Emergency Use Authorization for the COVID-19 pandemic. Its open-source design is available online for manufacturers across the globe. Locally, the Medical Devices Center has partnered with Boston Scientific to produce the ventilators.

The idea was supported by a rapid response grant, one of 40+ such grants made available by the U's Office of Academic Clinical Affairs to faculty who are pursuing small-scale research projects that address the COVID-19 virus and its impact. The Coventor project also received financial and in-kind support from Digi-Key, MGC Diagnostics, Protolabs, Teknic Inc., and philanthropy.

"[The Coventor] allows patients who wouldn't otherwise have the opportunity to survive, to survive," Richardson says. "[It] gives people a chance, and that is what this is all about. Making the ventilator as fast as possible, pushing it to people everywhere."

See sidebar at left to read about more grant-funded projects.

U clinical trials assess potential COVID-19 treatments

LOSARTAN

Two Medical School clinical studies are evaluating the high blood pressure drug losartan as a potential treatment for those recently diagnosed with COVID-19. The first is a national multisite study evaluating whether losartan can prevent lung injury in those hospitalized with pneumonia stemming from COVID-19, while the second assesses whether the drug can prevent hospitalizations in the first place.

We're trying to prevent the lung injury caused by the virus that makes it so deadly. We're trying to turn COVID-19 into an everyday coronavirus – the common cold.

– Michael Puskarich, M.D.

an emergency physician at Hennepin Healthcare, who coleads the study with Christopher Tignanelli, M.D., assistant professor of critical care and acute care surgery in the Department of Surgery. “We’re trying to turn COVID-19 into an everyday coronavirus – the common cold.”

The inpatient trial is funded in part by the Bill and Melinda Gates Accelerator Funds, while the outpatient arm of the trial is funded by the Minnesota Partnership.

Previous research suggests that losartan may be able to block an enzyme that the COVID-19 virus uses to attack cells.

“We’re trying to prevent the lung injury caused by the virus that makes it so deadly,” says Michael Puskarich, M.D., associate professor in the Department of Emergency Medicine and

HYDROXYCHLOROQUINE

The U is also examining the effectiveness of hydroxychloroquine, an FDA-approved antimalaria drug, in preventing or reversing symptoms of COVID-19. Prior laboratory research has shown that hydroxychloroquine can impede progression of the virus but it carries risks.

REMEDSIVIR

U researchers are also participating in a multicenter National Institutes of Health trial to test the drug remdesivir, originally developed to treat Ebola. The study has had early success in reducing severity for hospitalized COVID-19 patients and is moving into a next phase with a combined antiviral medication therapy.

CELL THERAPIES

Several other studies exploring potential COVID-19 treatments are at various stages of regulatory approval, including a trial looking at the safety and efficacy of **natural killer (NK) cell therapy**. The clinical trial is designed to replenish patients’ NK cells with off-the-shelf engineered NK cells, restoring patients’ functional immune systems while equipping the cells to directly target the virus. Another trial is exploring whether an infusion of healthy **regulatory T cells** can prevent inflammation related to acute respiratory distress in severe COVID-19 cases. On another front, U scientists are examining whether **mesenchymal stromal cell transplantation** could be deployed to treat pneumonia in patients with severe COVID-19, many of whom are in critical care and on a ventilator. MIB

PREPARING FOR A SURGE

Following a 72-hour, around-the-clock transformation effort in March, M Health Fairview Bethesda Hospital became Minnesota’s first hospital dedicated to the care of severely ill COVID-19 patients. The facility accepted its first patient around 4:30 p.m. on March 26, with more arriving later that day.

Three weeks later, M Health Fairview set plans to open up COVID-19 cohort units at its St. Joseph’s Hospital and then its Southdale Hospital if needed. MIB



PHOTO: COURTESY OF M HEALTH FAIRVIEW

Revamped ICU rotations

WHILE THEIR REGULAR in-person clinical rotations had been paused until further notice, U of M Medical School students craved an opportunity to lend a hand this spring during the COVID-19 crisis.

So Department of Medicine faculty Karyn Baum, M.D., M.S.Ed., M.H.A., and Brian Hilliard, M.D., with help from fourth-year medicine-pediatrics resident Jessica Hane, M.D., found a way to continue to educate these students and use their skills to mitigate the burden facing frontline health care providers.

The group quickly put together a new curriculum for third- and fourth-year medical students—as part of their Medical Intensive Care Unit rotation—designed to remotely equip them to help clinical staff at M Health Fairview hospitals throughout the COVID-19 patient surge.

Baum, medical lead for the system operations center, has students remotely helping with patient placement, transfers, and patient flow. Students also are reviewing charts and crafting detailed summaries for providers to review and approve, significantly reducing the amount

of time caregivers are spending on paperwork.

“This unique opportunity allows us to use our medical knowledge to help triage patients to appropriate medical facilities, at a time when emergency departments can become overwhelmed,” says third-year

It is rewarding to know our training is helping to make a real impact in the community, even when our regular clinical rotations are on hold.

– Ryan Duff, medical student



LEFT TO RIGHT Medicine-pediatrics resident Kevin Sullivan, M.D., with medical students Kelsey Simmons, Zineb Alfath, and Michael Berryman

medical student Ryan Duff. “It is rewarding to know our training is helping to make a real impact in the community, even when our regular clinical rotations are on hold.”

“It’s a completely different experience compared to being in the ICU right now, but it’s so inspiring to see how quickly people all across our health care system have moved into new roles to make patient care as safe and efficient as possible,” adds third-year medical student Zineb Alfath.

The curriculum also offers a series of self-paced activities and reading materials about COVID-19—how the infection behaves, whom providers will test and why, and the ethics involved in establishing protocols for managing limited medical resources. ^[MIB]



CovidSitters board member Tom Schmidt, M.D., with his daughter Nora

HELP FOR THE HELPERS

When the COVID-19 crisis began, medical students at the University of Minnesota and around the country were faced with canceled rotations and online classes. Health care workers were faced with keeping up their households during a time of school closings and an onslaught of work that cannot be done from home.

Recognizing the need, second-year medical students Sruthi Shankar and Sara Lederman founded Mn CovidSitters, a group of students who volunteer to help health care workers of all stripes with tasks like child and pet care, grocery shopping, and errands. The group began with medical students only but soon

expanded to include students from the other health professional schools at the U of M and then other area colleges as well.

Virtually overnight, the group recruited volunteers, created an app to automatically match volunteers with families, and launched a website with the motto “Caring for your family while you care for ours.”

By late April, they had matched 290 students with 180 families.

“This organization is a potent reminder that each of us has so much care and nurturance to offer,” says volunteer Marvin So, “even without our fancy technology or medical degrees.” ^[MIB]

Inspiration in a crisis



I've loved seeing the random acts of kindness that people have been doing to spread joy, such as grocery stores handing out free flowers, people sending hand-painted letters, or people offering to grocery shop for high-risk groups so they don't have to risk exposure by going into public settings. Despite the social distancing, people are still finding ways to show their support for one another.

– Kate Geschwind, MS3

It is inspiring to be part of an institution that actively participates in finding solutions during times we need it the most. Minnesota should be immensely proud of that.

– Carlos Perez, sixth-year M.D./Ph.D. student



Hearing stories about how our health care providers are confronting this challenge reminds me every day why I chose to pursue medicine as a career.

– Jake Krogstad, MS2



Seeing my med school peers create Covid-Sitters [and] watching the efforts of several professors ... is all incredibly inspiring. This has inspired me personally to help in any way possible, whether it's by donating blood or volunteering my time to one of the many ongoing efforts.

– Edith Hernandez, first-year M.D./Ph.D. student

It is wonderful to experience such amazing teamwork, solidarity, and devotion to our patients, whether it be through direct medical care or through protecting them by staying home.

– Marketa Dimitrov, M.D., second-year pediatrics resident



We are blessed and lucky to live in the state of Minnesota at this time. At all levels of leadership, we have seen swift and decisive actions that are helping 'flatten the curve' and mitigate untold consequences of this disease.

– Sean McSweeney, MS2

UNIVERSITY OF MINNESOTA MEDICAL SCHOOL

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Starting strong

U's new Masonic Institute for the Developing Brain aims to put kids on course for life

BY NICOLE ENDRES

“I can crack an egg with one hand,” boasts 13-year-old Hadley Lucca (pictured at right) with a smile as wide as her face. For most of her life, Hadley has done a lot of things with just one hand. She suffered a stroke when she was a baby that significantly weakened the right side of her body. □ Since her mother enrolled her in a research study with University of Minnesota rehabilitation neuroscientist Bernadette Gillick, Ph.D., M.S.P.T., P.T., six years ago, Hadley has started using her right hand more frequently. That makes it a lot easier to ride her favorite horse, hone her hockey skills, and be less self-conscious about participating in all kinds of activities.

In a first-of-its-kind study designed to enhance motor skills in children who, like Hadley, have stroke-induced cerebral palsy (CP), Gillick and her team applied noninvasive brain stimulation and temporarily restrained the use of each child's dominant hand to encourage use of the hand more affected by CP.

The stimulation, known as transcranial direct current stimulation, or tDCS, is painless—"It's kind of like a buzz, like an electric toothbrush," Hadley says—and is meant to activate the brain cells around the area of the stroke that are still alive.

Gillick's group found that the treatment combination significantly improved hand function and had few, if any, side effects. The team recently has extended the study to infants who have suffered a stroke.

"I like to think that we are all very neuroplastic, that we all have the potential for recovery, no matter what age we are," says Gillick, a McKnight Land Grant Professor in the Medical School's Department of Rehabilitation Medicine. "The children with whom I work have shown me that. They have the potential to make significant changes. It's pretty powerful to see what can happen, especially with the motivation and energies of a child."

Today the University is doubling down on the immense potential of brain adaptability, bringing together a team of clinicians and researchers to form its new Masonic Institute for the Developing Brain. It's designed to capitalize on the most sensitive periods of brain development in a person's life: the first 1,000 days and adolescence.

The Masonic Institute for the Developing Brain—named in recognition of a \$35 million gift from Minnesota Masonic Charities, the University's largest donor—will be located at the former Shriners Healthcare for Children site on East River Parkway in Minneapolis, near the U's Twin Cities campus.

Its mission: unite a deep and broad group of experts—from the Medical School, College of Education and Human Development, and beyond—to learn more about typical brain development and then tackle complex brain conditions that can result when that process goes off track.

The following examples describe the kind of work the institute will perform to keep kids' brains at their best.



PHOTO: BRADY WILLETTE

An innovative therapy improved Hadley Lucca's hand function, allowing her to keep her hands in her hockey gloves and stay in the game.

The researchers believe that identifying at-risk children sooner will lead to earlier interventions that may mitigate symptoms of autism long term.



WEB EXTRA

Watch a video about the importance of optimizing child and adolescent brain development at z.umn.edu/startingstrong.

The many layers of autism

The more researchers and clinicians learn about autism, the more its complexity amazes them. As experts piece together what they know about genetic risk, biological factors, brain imaging, and observed behaviors, the picture is slowly coming together, says Suma Jacob, M.D., Ph.D., an associate professor in the Medical School's Department of Psychiatry.

"We are now getting better at connecting many layers," Jacob says. "This integration gives us new clues to which things may be really important, which things may change, and what things we need to target in order to develop interventions."

The U's Infant Brain Imaging Study, which tracks the brain development of very young children via magnetic resonance imaging, is one study that's shedding new light on autism spectrum disorders. So far, brain images obtained through the study have predicted which children will develop autism with 80 percent accuracy. The researchers believe

that identifying at-risk children sooner will lead to earlier interventions that may be able to mitigate symptoms of autism long term.

And the SPARK study, the largest study of autism ever attempted in the United States, is designed to identify genes and genetic risk. (There are more than 25 study sites nationally; Jacob leads the U arm of the study.) SPARK collects and analyzes saliva samples and surveys about medical history from people diagnosed with autism and their family members.

Jacob believes the U's collaborative environment will be key to advancing knowledge about autism and other complex brain conditions affecting children and young adults.

"One of the things that makes the U unique is the community of colleagues who are motivated to work together on autism," she says. "Having a place where you interact with people frequently, where you share resources, is essential to do the work."

Finding light again

Uma Oswald's art has always stood out.

"My mom still has my very first drawing from when I was 3," Oswald says. "I drew a family portrait. She always brags about how good it is."

She kept drawing—and impressing. Then, somewhere along the line, Oswald's drawings of colorful shapes and patterns turned dark. Very dark.

Her family was deeply concerned, though Oswald herself didn't view her art as disturbing or scary. "I would paint from my emotions. That's just how I felt inside," she recalls. "To me, that was normal."

Yet Oswald knew something wasn't right with her brain. She suffered from depression, anxiety, and paranoid thoughts. But not until her freshman year of college, after three visits to the emergency room in a month, was Oswald diagnosed with schizoaffective disorder. A

Suma Jacob, M.D., Ph.D., believes the U's collaborative environment is key to advancing knowledge about autism.



PHOTO: KARL RASCHKE



relative of schizophrenia, it is characterized primarily by hallucinations or delusions, combined with symptoms of a mood disorder such as mania or depression.

The diagnosis was difficult to hear but also a relief: it meant that she would get the right therapy and medications to help her deal with it.

“It’s hard to find the balance of getting people to understand that it’s a serious mental illness,” Oswald says, “but also understand that I can manage it.”

And those feelings can be isolating. Oswald joined a U of M pilot study, led by the Medical School Department of Psychiatry’s Aimee Murray, Psy.D., and Sophia Vinogradov, M.D., that connected people who have schizophrenia and like illnesses through social media platforms and gave them a safe space to talk about what’s going on in their lives.

“I felt less alone,” Oswald says. “There were other people in the same realm of disability. We all had our different backgrounds, but we could still relate to each other.”

Today Oswald, 23, attends the School of the Art Institute of Chicago on scholarship, has an internship, and works a part-time job as a notetaker for students who have disabilities. She’s thinking about going to graduate school and hopes to become an independent video game developer one day. She hasn’t painted for a while.

“Now they’re hard for me to look at,” she says of the dark paintings from her teen years, “not

ABOVE A painting by Uma Oswald represents hope after a dark time.

RIGHT After a scary start to life, Beau Buehner is now a thriving kindergartner.

PHOTOS: COURTESY OF EMILEY BUEHNER



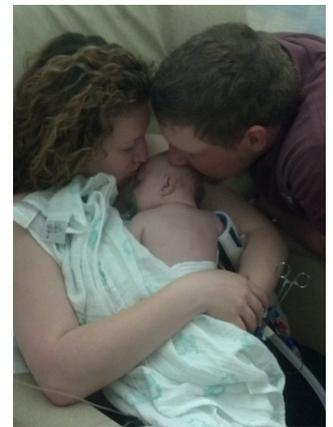
because I recognize them as disturbing, but because I equate them with that time period, when I was having a hard time.”

Stressed from the very start

Beau Buehner entered the world at 10 pounds 13 ounces and full of fluid, the result of a rare condition called congenital chylothorax. Lymphatic fluid was building up between his lungs and chest wall, impeding his ability to breathe.

“He turned purple on us,” says his mom, Emiley Buehner. “We didn’t know what our future was going to hold.”

After seven days on extracorporeal membrane oxygenation in the neonatal intensive care unit (NICU) at M Health Fairview University of Minnesota Masonic Children’s Hospital, and with three chest tubes to drain fluid from each side of his body, Beau weighed in at 7 pounds 2 ounces.



Stress negatively affects physical health, even in very young children. It has detrimental effects on the developing brain and immune system.



WEB EXTRA

See a demo of the *Minnesota Executive Function Scale app* for children at z.umn.edu/startingstrong.

“The first time he was stable enough for me to hold him, he was 13 days old,” Emiley Buehner says. “It was one of the best moments of my life. His blood pressure went down, his heart rate went down—he just relaxed. We both needed that.”

As he got stronger, the NICU staff encouraged Emiley to take part in more “kangaroo care”; the skin-to-skin contact supports babies’ brain development and reduces stress.

Stress negatively affects physical health, even in very young children. It has detrimental effects on the developing brain and immune system, says Maria Kroupina, Ph.D., an expert in early childhood mental health and director of the children’s hospital’s Birth to Three Program, which supports pediatric patients and their families who are at high risk of toxic stress, including those facing long hospitalizations or chronic health issues.

“Stress can be a normal part of life,” Kroupina says. “When we talk about toxic stress for a young child, it’s prolonged and severe. Stress can be tolerable if something is really painful but the parents are still there. But it can be toxic

if the child is going through the experience alone, if parents are not available or if they are so distressed that they cannot provide help.”

Beau spent three months in the NICU, with his mom by his side, before he was able to go home to the family ranch near Killdeer, North Dakota. Chylothorax is no longer a problem for the kindergartner, who recently was diagnosed with an auditory processing disorder but is learning to read and do math alongside his peers.

“He’s such a sweet boy,” Emiley says. “I’m forever grateful to the hospital for keeping Beau with us.”

Getting ready to learn

Educators and child development experts increasingly understand that a child’s executive function skills—such as impulse control, sustained focus, and flexible problem-solving—are better predictors of kindergarten readiness and academic success than IQ is.

“Kids with these foundational skills do better in school,” says Philip Zelazo, Ph.D., Nancy M. and John E. Lindahl Professor in the U’s College of Education and Human Development. “But too many kids are coming to school without them.”

Zelazo and his research partner, Distinguished McKnight University Professor Stephanie Carlson, Ph.D., aim to close the opportunity gap by finding better ways (including a recently patented app) to assess executive function and help at-risk children. They are making progress in understanding the brain circuitry behind it all, too.

Their research shows that it’s possible to improve executive function after 20-minute sessions in which children practice pausing, reflecting on a problem, and talking through it using rules. They found changes in brain function as well: children who had gone through the training also showed a more mature pattern of brain activation.

Philip Zelazo, Ph.D., and Stephanie Carlson, Ph.D., observe a child using their app aimed at assessing executive function.



PHOTO: JAYNE HALBRITTER

Zelazo and Carlson now have developed a classroom curriculum that helps young children practice mindfulness through exercises such as focused breathing.

“This helps children understand the difference between being active and being calm,” says Zelazo, “which can help them learn to relax, control their emotions and behavior, and improve their focus on tasks.”

Fighting the effects of fetal alcohol exposure

Macie Kappauf loves Barbies. *Loves* them. And she has to have them.

“Those fingers are pretty sticky,” Sherry Kappauf says of 7-year-old Macie. “It’s not so much premeditated, but it’s the mentality of ‘I saw it. I like it. It must be mine.’”

Self-regulation is one of the challenges Macie faces, likely due to prenatal alcohol exposure. Sherry and Jeff Kappauf are parents to 13 children, nine of whom they adopted. Six of the couple’s adopted children have been diagnosed with fetal alcohol spectrum disorders (FASD), including Macie.

So when the Kappaufs heard about a U study that aims to help improve memory and executive function (like planning, organizing, and, yes, self-regulating) in children affected by FASD, they were quick to sign on.

“Once upon a time, I wanted to be a scientist, to help find cures for diseases. I wound up being a mom, and they just let me in on that science portion,” Sherry Kappauf says with a laugh.

U researchers believe that supplementing the nutrient choline at a sensitive time during a child’s brain development could confer lifelong benefits.

“What we’re hoping is that, by affecting these attention and memory systems early on, it allows these children then to do everything from that point forward just a little bit better,”

says Jeffrey Wozniak, Ph.D., a Medical School psychiatry professor and coprincipal investigator on the study.

“All of development is additive, meaning that early interventions can be quite powerful in the long run.”

The U team observed small but significant changes, most notably in the 2- to 3-year-old participants: The choline recipients showed higher nonverbal intelligence, better working memory, fewer behavioral symptoms, and better attention than their peers who did not get it. A four-year follow-up study showed more separation between the choline group and the placebo group.

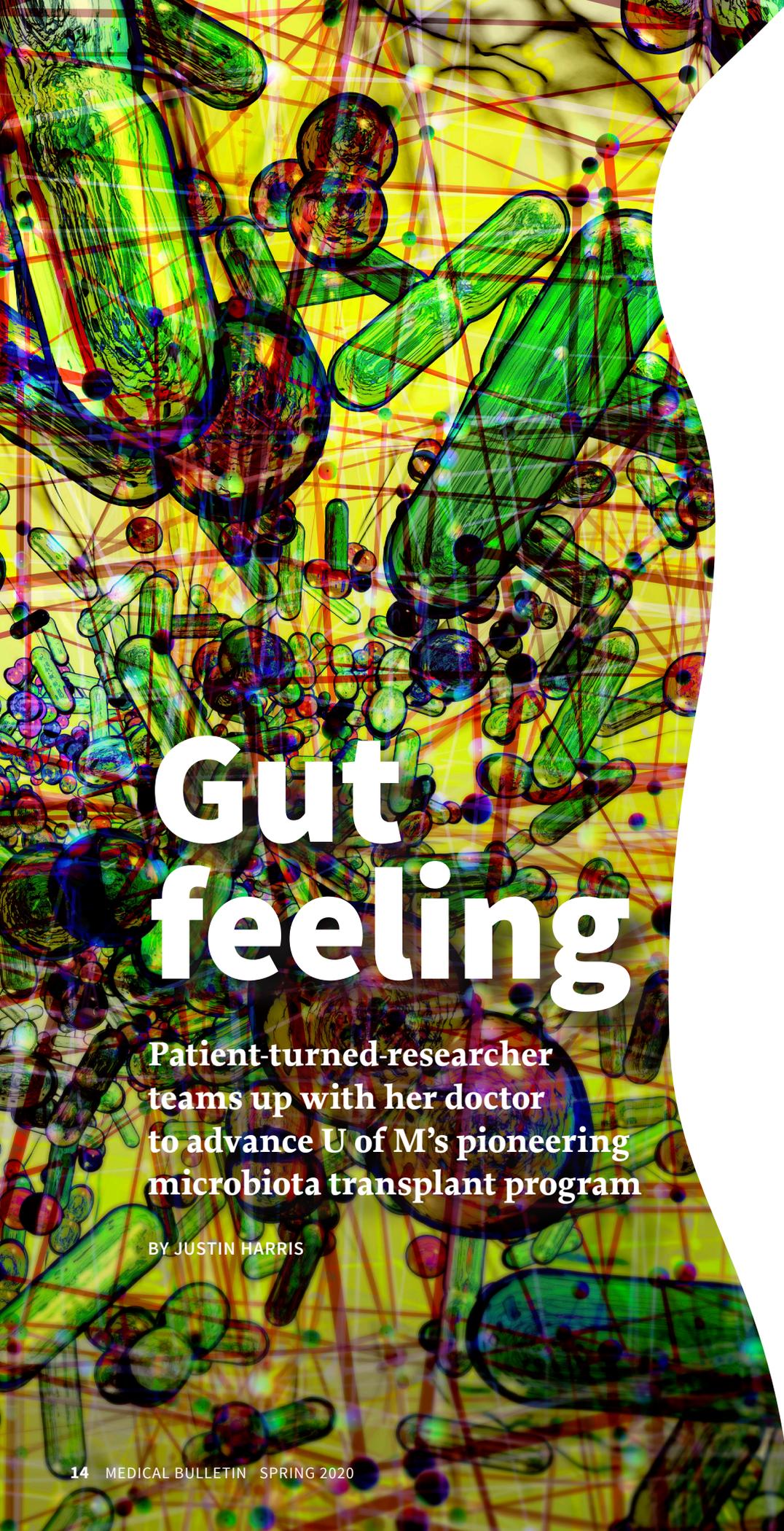
“That’s exactly what we would expect to see with developmental change,” Wozniak says. “It should result in a widening of the gap.” ^{MIB}

Nicole Endres is managing editor of the *Medical Bulletin*. University of Minnesota Foundation writer Maiya Grath contributed to this report.



PHOTO COURTESY OF JEFF AND SHERRY KAPPAUF

Macie Kappauf took part in a study to evaluate whether the nutrient choline can improve memory and attention in kids who have fetal alcohol spectrum disorders. Results so far suggest that it can.



Gut feeling

Patient-turned-researcher teams up with her doctor to advance U of M's pioneering microbiota transplant program

BY JUSTIN HARRIS

For more than a year, an unwelcome guest waylaid Amanda Kabage's life. Debilitating gastrointestinal symptoms—abdominal pain, blood in her stool, and trips to the bathroom—occurred so frequently that leaving the house became nearly impossible for the then-32-year-old. The culprit: recurring *Clostridium difficile*, or *C. diff*, a bacterial infection of the gut.

C. diff is a common complication of antibiotic exposure. Ironically, the standard treatment for the infection is also antibiotics. Often the treatment works, but about 20% of the time, it fails. In those cases, each round of treatment makes the *C. diff* infection more difficult to eradicate. Every year in the United States, about 100,000 people become trapped in a cycle of recurrent *C. diff* infections. Kabage was one of them.

She read online about a new treatment that was showing promise for patients like her: an intestinal microbiota transplant. The intervention involves taking gut bacteria from a healthy person and putting it into the intestinal tract of someone who's sick.

At the time, only a few physicians in the U.S. had Food and Drug Administration approval to do microbiota transplants. As luck would have it, one of them—gastroenterologist Alexander Khoruts, M.D.—worked at the same place Kabage did: the University of Minnesota.

Khoruts, the medical director of the U's Microbiota Therapeutics Program and a professor in the Medical School's Division of Gastroenterology, Hepatology, and Nutrition, met with Kabage and agreed a transplant could work. Khoruts scheduled the procedure, and after months of misery, Kabage finally had reason to be hopeful.



Just a few hours after her transplant, Kabage felt an unfamiliar energy bubbling up in her stomach, growls rumbling to a crescendo loud enough that her friend across the room could hear it. Kabage knew right away that the sound was the transplanted gut microbes settling in their new home.

“There’s just this physical and instinctual feeling that something different is happening,” she recalls. “The new microbes are here, and they’re going to work.”

Kabage was right—the transplant worked. Her chronic diarrhea stopped almost immediately, she started eating solid food again, and she returned to working out at the gym, running, and playing racquetball.

“My life had come to a screeching halt,” Kabage says. “And then it all came back, my completely normal life, within just a few weeks.”

Understanding the microbiome

By the time he met Kabage in 2013, Khoruts was nearly five years into his exploration of the microbiome—the collective term for the trillions of bacteria, fungi, and viruses that live within each person, mostly in the large intestine.

Scientists knew that these microscopic creatures help perform important tasks in the body, including food digestion, immune system regulation, and nutrient production. But the mechanics of how they worked remained a mystery.

Khoruts learned that the microbiome functions much like a city, with different, coexisting individuals working together as communities. When these communities are diverse and their interactions are plentiful, the microbes’ human host tends to be healthier. And when they’re not, the person usually suffers.

Khoruts began to focus his research on the gut microbiome in 2008, after performing his first microbiota transplant. As in Kabage’s case, *C. diff* had derailed the 61-year-old patient’s entire life.

Working with Michael Sadowsky, Ph.D., a microbial ecologist at the U, Khoruts found an alarming lack of normal microbes in the woman’s intestine. He asked the patient’s husband for a stool donation, which was used to create a microbiota transplant and administered by way of a colonoscopy.

“She reported feeling better while still in the recovery suite. Soon, we found that her husband’s bacteria had taken over,” Khoruts says. The demonstration of microbial transplant was groundbreaking, proving for the first time that a donor’s microbes could survive and thrive in the recipient’s gut. “It was at that point that I realized this could help a lot of people.”

Soon after, the Microbiota Therapeutics Program was born, and Khoruts got to work refining his transplant capabilities. He created the world’s first microbiota donor program, which recruits healthy individuals to donate stool samples that can be turned into microbiota transplants—the same kind Kabage and more than 700 other *C. diff* patients have received at the U since 2008. The methods published by Khoruts and Sadowsky after the first transplant were adopted by groups around the world and have since helped to treat nearly 100,000 patients suffering with *C. diff*.

Amanda Kabage battled a debilitating *C. diff* infection for more than a year. Today she’s a research coordinator working with the team that cured her.



PHOTOS: SCOTT STREBLE

Alexander Khoruts, M.D., and colleagues can now deliver a microbiota transplant via capsules rather than by way of colonoscopy.

As the Microbiota Therapeutics Program continued to grow, Khoruts realized the donor initiative needed the attention of a full-time research coordinator. He wanted someone who had detailed knowledge of the microbiota transplant process and who had experience navigating the complicated rules and regulations of health-related research.

Kabage—who was working at the U as a research coordinator in pediatric health at the time of her *C. diff* diagnosis—was a serendipitously perfect choice.

“Alex thought, ‘What are the chances that one of my patients is a researcher at the University who’s become very passionate about this therapy?’” Kabage says.

From colonoscopy to capsules

Since taking over about six years ago, Kabage says the donor program has become a “well-oiled machine.”

Interested donors undergo an extensive health history questionnaire and repeated in-person exams that include testing of blood and stool for infections and other measures of health. Common disqualifiers include food allergies, a history of asthma, and use of prescription medications.

“They’re literally the healthiest people we can find,” Kabage says.

Those who make the cut donate stool samples multiple times a week and undergo continued in-person exams once every three months. Kabage and her team carefully study the samples before turning them over to a dedicated group at the U’s Molecular and Cellular Therapeutics facility that turns the samples into material for a transplant.

Kabage’s transplant was administered via colonoscopy. But Khoruts wanted a way to make the treatment more accessible, less intimidating, and significantly less invasive. So he and Sadowsky worked to create a capsule delivery form of intestinal microbes.

Today, most patients simply swallow capsules to receive their new microbiota. “They’re surprised and relieved that that’s all they have to do,” Kabage says.

In addition to running the donor program and overseeing the logistics of the Microbiota Therapeutics Program’s clinical trials, Kabage also makes time to talk with people who might benefit from a transplant—people whose experiences often mirror her own.

Having a gastrointestinal illness like *C. diff* is an isolating experience, she says. People are

embarrassed to talk about what they are experiencing and afraid of what others will think.

“It’s so much more than just, ‘Oh, so you have diarrhea,’” Kabage says. “That minimizes a really debilitating disease. I’m happy to sit with people and say, ‘I’ve been through this; here’s my story.’ They’ll surprise themselves with how easy it is to talk with a stranger about what they’re going through. And then they become interested in our research, too.”

Powerful potential

As scientists learn more about the microbiome and its role in human health, Khoruts expects doctors will use microbiota transplants more frequently to treat a growing group of health concerns.

Already, his team is collaborating with colleagues at the U and across the country who are examining the microbiome’s connection to disparate diseases, including inflammatory bowel disease, cancer, obesity, Parkinson’s

disease, and autism. While the specifics of each study are different, the central question is similar: can restoring or boosting the microbiome to a more optimal state create beneficial effects throughout the body?

To answer that question, Kabage and Khoruts help researchers design their clinical trials and provide them with microbiota transplant capsules created specifically for their studies. They also share the years of data they’ve collected from healthy donors and patients.

Armin Rashidi, M.D., Ph.D., and Shernan Holtan, M.D., of the Medical School’s Division of Hematology, Oncology, and Transplantation, are working with Khoruts and his team to explore whether microbiota transplants could help patients recover from the difficult after-effects of cancer treatment, including graft-versus-host disease, which kills nearly 10 percent of patients who have leukemia and undergo blood and marrow transplants.

Most patients simply swallow capsules to receive their new microbiota.

AMERICA, LAND OF THE DISAPPEARING MICROBIOTA

THE UNITED STATES might be a microbiome’s worst enemy. At least that’s what Dan Knights, Ph.D., and his team at the U’s Immigrant Microbiome Project think.

Knights, a Masonic Cancer Center, University of Minnesota researcher and associate professor in the College of Biological Sciences, was interested in uncovering how individuals’ microbiomes change when they move to the U.S.

His team compared the microbial profiles of Hmong and Karen people still living in Asia with those of first- and second-generation immigrants living in the Twin Cities.

“There was a significant drop in microbiome diversity between the people living in Asia and the people living in the U.S.,” he says. “The disappearing microbiota hypoth-

esis says every generation in an industrialized society has fewer and fewer types of microbes. This was first time we’d ever actually seen evidence of that in a multi-generational group.”

Highly industrialized countries tend to have higher rates of immune and metabolic-related disorders—like obesity, diabetes, asthma, and allergies—and Knights says the lack of microbial diversity could be to blame.

Surprisingly, the microbial changes cannot be easily attributed to an Americanized diet. The researchers tracked what participants were eating in the U.S. and found that their meals looked a lot like what they ate back home. If it’s not a change in diet, what about the U.S. leads to such a rapid change in microbial diversity?

“It could be something in our water, or maybe it’s the additives in our food,” Knights says. “Or perhaps our microbes are kind of like invasive species—like zebra mussels. Maybe if you hang out with us for long enough, you’ll get them, too.”

He isn’t sure that’s the case, but it is one possibility. His team is continuing its work to illuminate how the microbiome functions and changes in a new country, with the goal of using that information to customize individuals’ health care.

“Your health can be determined by just a single mutation in a single gene in a single microbial strain in your gut,” Knights says. “The more we know about the microbiome, the more we can help the people in our community.”

You need a lot of researchers using the same protocols and pooling their data because the microbiome is so complex. There's a great deal to learn. – Alexander Khoruts, M.D.

“We think giving our patients a microbiota transplant prior to their treatment for leukemia could help them recover and avoid graft-versus-host disease,” Holtan says. “Or maybe for folks who have it already, a transplant could give them the ammunition they need to survive.”

To extend future collaborations, Khoruts says, the next step may be to evolve the Microbiota Therapeutics Program into a multidisciplinary center that facilitates all microbiome research at the U. He envisions a centralized hub where interested investigators from any field can collaborate on projects, explore and share data and findings, and continue to shed light on the microbiome’s role in human health.

“This is a whole new era of therapeutics,” he says. “But the nature of this science is such that it only works when it’s big. You need a lot of

researchers using the same protocols and pooling their data because the microbiome is so complex. There’s a great deal to learn.”

Aside from reducing inefficiencies in the research process and streamlining data collection, the center’s ultimate goal would be to develop new microbiome-related breakthroughs. Which, as Kabage knows, can be life changing.

“I’m forever indebted to the work of Dr. Khoruts,” she says. “It changed my life as a patient and has inspired my career as a researcher. To be part of the team that’s helping others who may benefit from this incredible treatment — there’s nowhere else I’d rather be.” ^[MIB]

Justin Harris is an editor/writer with the University of Minnesota Foundation.

OPEN WIDE TO FORECAST YOUR FUTURE HEALTH

RIGHT NOW, there are close to a billion microscopic creatures living in the pockets between your gums and teeth. Grossed out? Don’t be, says Ryan Demmer, Ph.D., an associate professor in the U of M School of Public Health. The microbiome in your mouth might actually be a powerful tool in helping physicians forecast your future health.

Demmer and his team followed 1,000 individuals for two years and tracked which microbes lived in each person’s mouth. Some of these organisms, they found, were strong predictors of glucose changes that are a precursor to diabetes.

“In fact, the presence of certain microbes more strongly predicted glucose changes than either age or obesity,” Demmer says. “And those are the two leading risk factors that doctors look for.”

The earlier doctors can identify people at risk for developing diabetes, the faster they can intervene and potentially prevent the disease from developing, Demmer says. His team is now preparing a longer-term study that assesses the link between diabetes, other cardiovascular diseases, and the mouth’s microbiome.

In 2000, when the University of Minnesota launched its Stem Cell Institute, a small group of researchers came together to plot the map in a new realm of science.

Twenty years later, the U's Stem Cell Institute—the first interdisciplinary, academic institute in the United States—has grown greatly in size and impact. Today, 53 researchers from 22 departments across the University continue that trend, making discoveries that bring hope to patients facing some of the world's most common but complex diseases.

“You know, 20 years is not that long, and it's staggering to see the scientific advancements that have occurred in such a short time span,” says the institute's director, Brenda Ogle, Ph.D. “What really gets me excited is to see the realization of a promise, and that promise is coming in the way of therapeutics. But it's also coming in the way of understanding human health and disease in a way that we couldn't have without stem cells.”

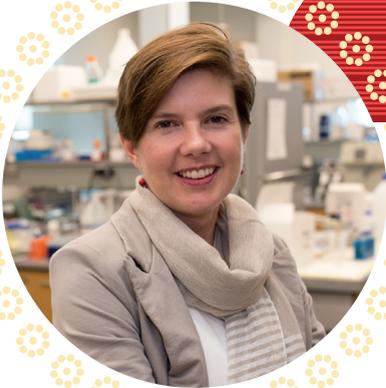
The U of M Medical School established itself as a leader in stem cell research more than five decades ago. In 1968, Medical School immunologist Robert A. Good,

M.D., completed the world's first successful bone marrow stem cell transplant between two people who were not identical twins. The procedure saved a young boy with a severe immune system deficiency from certain death.

By the 1980s, Medical School hematologist Philip McGlave, M.D., had achieved a new milestone, transplanting stem cells from unrelated donors' bone marrow to treat cancer. It put hematopoietic stem cell transplantation on an international stage, catching the eye of Belgian clinician Catherine M. Verfaillie, M.D., who later traveled to the Medical School to study under McGlave. She eventually became the Stem Cell Institute's first director.

Year after year, researchers at the U and around the world continue to gain new knowledge that further reveals the promise of stem cells. Today, scientists can grow human cells and tissue outside the body, forging new pathways to study normal function, disease processes, and therapeutic potential for regenerative medicine. Here are a few of the ways the U's stem cell experts are working to turn that potential into reality.

REPLACING DAMAGED HEART MUSCLE



BRENDA OGLE, Ph.D.
Director, Stem Cell Institute

As we age, our hearts naturally grow weaker, but cardiovascular diseases and conditions accelerate that process. Everything from coronary artery disease to high blood pressure takes a toll on our tickers.

“When cardiac muscle cells die, they aren't replaced by the body,” says Ogle. “What you end up getting instead of new muscle is a scar, and it cannot actually contract like a muscle cell. It's more like a structural Band-Aid.”

Ogle's lab uses stem cells to grow new heart tissue in a petri dish to replace lost cardiac muscle. Her team uniquely organizes the cells, ensuring the new tissue patch beats in rhythm with the rest of the heart.

Currently, Ogle's heart patches are being 3D-printed and tested at the University of Alabama-Birmingham. In preclinical studies, the patches are both recovering function of the heart and avoiding arrhythmia, she says.

Ogle also applies her “heart in a dish” concept to create first-of-their-kind human heart models that scientists can use to test drugs and medical devices.

“A lot of therapy testing has to be done in animals. That's problematic, not only because we're utilizing the animals themselves, but also because it's never a human system,” Ogle says. “By using this framework, we now have a model system where we can test therapies prior to testing on humans.”



HEALING SKIN WOUNDS

Considering how much pain can come from the tiniest paper cut or burn, imagine how devastating large skin injuries can be.

In 2007, Tolar began working with patients who have a severe skin blistering disorder—recessive dystrophic epidermolysis bullosa (RDEB)—that results in chronic and life-altering wounds. The first line of therapy Tolar tried was the prototypical stem cell therapy, bone marrow transplantation. While some patients saw improvement, chronic wounds persisted.

By 2016, Tolar had joined forces with Michael McAlpine, Ph.D., holder of the Kuhmeyer Family Chair in Mechanical Engineering, to develop a skin-replacement therapy for any severe skin wound. They are now collaborating on an ambitious project to create custom skin

grafts using 3D-printing technology. The skin cells used in the printing process are made from induced pluripotent stem cells, which can be cultured from patient cells collected via a small skin punch.

“Most of us take our skin for granted,” Tolar says, “but it forms the external boundary of who we are. Being able to produce the complex layers of the skin without causing the damage of harvesting a graft would allow us to speed healing and protect patients from infection, dehydration, pain, and other dangerous complications of skin injury and loss.”

In addition to helping people who have RDEB, these 3D-printed skin grafts could greatly improve outcomes for those who have injuries and conditions requiring reconstructive surgery, chronic skin ulcers (like those from diabetes), and severe burns.

JAKUB TOLAR, M.D., Ph.D.
Dean, Medical School; vice president for clinical affairs, University of Minnesota; former director, Stem Cell Institute (2013–19)

TARGETING MACULAR DEGENERATION

Imagine the center of your vision getting worse and worse until you can no longer read, drive, or recognize faces.

That is the frightening progression of age-related macular degeneration (AMD), the leading cause of vision loss among people ages 55 and older in the developed world.

There is no effective treatment or cure for dry AMD, the most common form of AMD in the United States. Animal models of the disease, in lab mice, for example, cannot replicate the peculiarities of the human eye, making drug testing difficult, says Ferrington, holder of the Elaine and Robert Larson Endowed Vision Research Chair.

But Ferrington and James Dutton, Ph.D., the director of the Stem Cell Core at the Stem Cell Institute, are working to uncover new ways to treat dry AMD. Their team collects cells from

the conjunctiva—the cells covering the white of the eye—in routine biopsies from AMD patients. The scientists grow these cells and reprogram them into induced pluripotent stem cells that are then directed to become retinal pigment epithelium cells—the very cells that die in dry AMD.

“It allows us to test drugs in the specific cell that we want to deliver those drugs to,” Ferrington says.

The drugs they are testing are approved by the U.S. Food and Drug Administration for other conditions, she adds, so any effective drugs they identify may be fast-tracked for patient use.

“This could actually be transformative for medicine and for the treatment of patients with AMD,” Ferrington says. “We are still at the proof-of-principle stage right now. But this is an important first step.”



DEBORAH FERRINGTON, Ph.D.
Distinguished McKnight University Professor, Department of Ophthalmology and Visual Neurosciences

GENERATING CELLS IN A DISH TO TREAT MD



RITA PERLINGEIRO, Ph.D.
Professor, Department
of Medicine

Can stem cells generated in a petri dish treat muscular dystrophy? Fast-moving research by Perlingeiro suggests the answer is yes.

Her lab has successfully transferred stem cells from a healthy donor into mice that model the genetic neurodegenerative disease—and her team has shown that these stem cells develop into functioning muscle cells that resemble normal muscle cells.

There's more: The healthy stem cells also may outcompete the genetically defective cells, potentially replacing them in the long run. This might be possible because transplanted stem cells can seed specific regions of the muscle tissue, where they remain quiescent until they are activated to produce working muscle cells.

The research is now evolving quickly, says Perlingeiro, who holds the Lillehei Professorship in Stem Cell and Regenerative Cardiovascular Medicine. Her lab will begin work on manufacturing clinical-grade stem cells later this year. Next up is a Phase I safety trial in people who have muscular dystrophy.

Although she has focused most of her attention on Duchenne and limb-girdle muscular dystrophy, the most common forms of this genetic group of diseases, Perlingeiro says cell-replacement therapies like this one hold great promise for treating any kind of muscular dystrophy, regardless of the underlying genetic defects.

“If this approach proves successful,” she says, “this may mean new effective treatments for patients suffering from these devastating diseases.”

HEALING SPINAL CORD INJURIES

Spinal cord injuries often leave patients paralyzed and numb in their extremities. They also cause problems with blood pressure, leg spasticity, bowel and bladder control, erectile function, and fertility.

“These patients have so many issues,” says Parr, director of spinal neurosurgery, with a lab in the Stem Cell Institute. Unfortunately, she says, there are no good therapies for many spinal cord injuries.

Parr hopes to change that by engrafting stem cells to damaged spinal cords to restore lost neural circuitry.

With Dutton, Parr developed a protocol to program stem cells to become spinal neurons in a swift five days. Says Parr, “I don't think anybody makes these cells as well as we do.”

Then Parr teamed up with McAlpine, the mechanical engineering professor, to create scaffolds of silicon and live spinal cord precursor cells. Parr inserts these tiny scaffolds into lab rats that have severed spinal cords. The 3D-printed cells develop quickly, form neural networks, and even extend axons to the brain. The regenerating cells communicate among themselves and with native neurons.

Next, Parr will find out whether the rats can actually regain function. She hopes that one day her lab can help humans with spinal cord injuries do the same.

Restoring one's ability to walk would be a “home run,” she says, but mere base hits such as helping patients regain control of their bowels or move their arms would be huge. Says Parr, “Even small gains can be meaningful.”



ANN PARR, M.D., Ph.D.
Associate professor,
Department of Neurosurgery

KILLING CANCER STEM CELLS



Many scientists nurture and coddle stem cells as though they were cultivating orchids. Not Yamamoto.

“We are trying to kill them!” he says.

The cells that most interest Yamamoto are cancer stem cells, which serve as the seeds of cells that form problematic tumors. Yamamoto calls them “cancer-initiating cells,” as they cause cancer to recur and spread after surgery.

In his lab, Yamamoto, a member of the Masonic Cancer Center who holds the Eugene C. and Gail V. Sit Chair in Pancreatic and Gastrointestinal Cancer Research, isolates cancer stem cells from tumor samples. Then, from a diverse sample of more than a billion adenoviruses, he selects a virus with the ability to invade the cancer stem cells, proliferate, and kill the cancer cells.

Today, people facing colon cancer, even after undergoing surgery, frequently see the cancer recur and spread to the liver. In Yamamoto’s mouse studies, treatment with select viruses inhibited the recurrence of tumors—the basis, perhaps, for a medical therapy that would prevent the recurrence of cancer in humans after surgery, too.

“That makes the patient happy,” Yamamoto says, “and that makes the surgeon happy.” ^{MB}

Angel Mendez is internal communications manager at the University of Minnesota Medical School. Greg Breining is a journalist and author based in St. Paul, Minnesota. Nancy Morgan, a writer in the Medical School, contributed to this report.

MASATO YAMAMOTO, M.D., Ph.D.
Professor, departments of
Medicine and Surgery



WEB EXTRA

See milestones from and watch a video about the Stem Cell Institute’s first 20 years at med.umn.edu/sci20.

TODAY, SCIENTISTS CAN GROW HUMAN CELLS AND TISSUE OUTSIDE THE BODY, FORGING NEW PATHWAYS TO STUDY NORMAL FUNCTION, DISEASE PROCESSES, AND THERAPEUTIC POTENTIAL FOR REGENERATIVE MEDICINE.

H

ealing

words

This story slam fosters connection and catharsis among the storytellers—residents, fellows, and practicing physicians

BY SUSAN MAAS

PHOTO: HEATHER WOESTE



Nasreen Quadri, M.D.,
medicine-pediatrics resident

RULES OF A STORY SLAM

Typically, a story slam is a storytelling contest. Participants get five minutes each to tell their stories, which are often organized around a common theme. Many such events are open mic, and disallow notes.

Because the Metro-wide Resident and Fellow Story Slam was more about sharing and camaraderie than competition, it wasn't a contest, wasn't timed, had a preset list of storytellers, and permitted the use of notes.

FAMILY MEDICINE RESIDENT Jenny Zhang, M.D., had never considered herself a writer. She certainly wouldn't have envisioned herself sharing her deeply personal writing with a packed roomful of people. But last fall, Zhang brought hundreds of her colleagues and faculty to tears with her wrenching story of caring for a cherished patient through pregnancy to its tragic, traumatic end.

Helping her patient deliver a stillborn baby rattled Zhang to her core, and she still struggles with grief and self-doubt in the wake of it. "The emotions of shame and guilt and imposter syndrome—I took a huge hit in my self-confidence," she says.

The kindness and reassurance offered by peers and friends helped, but Zhang continues to process the experience. When a colleague suggested that Zhang write about it and submit her story to organizers of the 2019 Metro-wide Resident and Fellow Story Slam, she swallowed her apprehension and gave it a shot.

"Even months later, I continue to relive this scene over and over. It invades my mind when I'm least expecting it. ... My rational mind tells me it's not my fault, but I think my heart will always feel that it is."

Writing, rewriting, and sharing her story wasn't easy. But as Zhang hoped, it has fostered her healing. Her story, that of a truly compassionate physician whose humanity compounds the challenges of her job, resonated with every listener in the room, and their shared emotion helped ease Zhang's pain.

"Confidence has been a struggle for me throughout my residency, and I've worked hard to build it up ... It provides me with some comfort that she trusts me enough to continue seeing me, but I'll have to learn to trust myself again, too."

The November story slam, sponsored by the Metro Minnesota Council on Graduate Medical Education, was the second annual event of its kind—and by all accounts, even more successful than the first. The inaugural story slam, held at Minneapolis' Surly Brewing in 2018, attracted 17 storytellers and 185 listeners; the 2019 event, at BlackStack Brewing, included 15 storytellers and about 350 audience members. Attendees came from numerous specialties and institutions. Organizers hope the event, aimed at helping promote well-being among residents and fellows, will become a fixture in graduate medical education. A date for the 2020 story slam is forthcoming.



CLOCKWISE FROM ABOVE
 Brian Berglund, M.D.,
 internal medicine resident
 Jenny Zhang, M.D.,
 family medicine resident
 Trisha Paul, M.D.,
 pediatrics resident

Making connections

The Medical School's Maren Olson, M.D., M.P.H., and Ben Trappey, M.D., are working on measuring the event's impact, on both storytellers and audience members.

"Burnout is a huge problem in medicine, and residents are no exception to that," says Olson, an associate program director for the Medical School's Pediatric Residency Program, associate director of medical education at Children's Minnesota, and the event committee's chair. "We know there is some good research showing that if people have a sense of connection and community, that is protective against burnout. We also know that when people feel their work is meaningful, that is protective against burnout as well.

"Data speaks loudly in medicine, and we've been gathering some to understand the impact of this [event]," explains Olson, a 2003 Medical School graduate. After collecting uniformly positive but rather general reactions following the first year's event, she and Trappey, an assistant professor in internal medicine and pediatrics, sought more in-depth feedback from audience members and storytellers after this year's slam.

Organizers distributed a questionnaire, completed by 129 attendees. They also completed in-depth follow-ups with 30 of those individuals. All were audience members, and a few were storytellers as well.

"I've been really pleased to see that both audience members and storyteller-audience members talk about a sense of connection and community," Olson says. One survey question asked whether attendees would recommend the event to colleagues. The average response was 4.8 out of 5.

"I feel connected to my fellow residents, more than I have in a long time," wrote one participant. "I got to hear from people as humans, not doctors, for a second, and it was awesome."

When asked whether the story slam helped remind them of a sense of purpose and meaning, audience members responded emphatically.

"Listening to everyone's stories reminded me again why medicine is such a special field," one said. "Tonight gives me hope not only for the future of medicine, but for the future of our society as well."

Another wrote, "Made me laugh and cry, renewed my faith in medicine, gave me the will to continue on."

And from a faculty audience member: "This event restores my soul after a very tough week on service at the hospital. Thank you to all the learners whom I am supposed to be teaching, for teaching me to return to myself."

Intentional structure

Every aspect of the story slam—the food and beer, the social time built in at the beginning, the small-group table seating, the absence of reporters or video cameras—was intended to foster conviviality, safety, and intimacy. Still, Trappey says, organizers don't take its resonance for granted. "I think we're both somewhat astounded by its success so quickly," he says.

Organizers and storytellers took pains to protect the privacy of patients in the stories. "We were fortunate that all of our storytellers were mindful of that; these were very much their stories," Trappey says. "I think in the physician writing genre, in general, the pieces that are the

most affecting and least [exploitative] are the ones where it's the provider's journey that's being driven by patient encounters."

Trappey—who, like Olson, has long enjoyed writing—knows firsthand the power of storytelling to help the teller grapple with difficult experiences and appreciate meaningful ones. Since he was a resident seven years ago, he has co-led a physician writing group in Minneapolis.

"There are a number of benefits of reflective writing; there's a pretty robust set of data showing that it has immunologic and overall health benefits," he says. Personally, he knows that writing about a traumatic event—particularly, writing and revising multiple times—helps the storyteller make sense of what happened.

"For people who are inclined to be storytellers, giving them an outlet to do so and to become better writers is what I'm most interested in—and sharing ways to make it less intimidating," he continues.

Pediatric hospital medicine fellow Anisha Rimal, M.D., participates in the Minneapolis writing group and was among the storytellers at the 2019 story slam. "It really impressed on me what an amazing community we have," Rimal says. "Such a rich, diverse array of perspectives. I don't think everyone [who shared a story] would consider themselves a writer, but we all have things to share as part of this unique, weird world."

'Out of my comfort zone'

As a newcomer to storytelling, Zhang concurs: From start to finish, her story slam participation was tough but profoundly worthwhile, much like medicine itself.

"Writing it was hard, because you're reliving it as you're writing it," Zhang says. "But it was also really therapeutic in a lot of ways because it helped me process it and think about how it was affecting me.

"It's hard to bring yourself to do that because with really sad experiences, your instinct is to push it away," Zhang continues. "I was definitely out of my comfort zone. But it's so important, for yourself and [for others], not to do that."

Sharing her writing with 300-some peers may have been even tougher, but worthwhile, she believes—both for the support she received and for the chance to remind other physicians that they're not alone.

The fact that more-established physicians encounter many of the same stressors and occasional crises of confidence that affect residents and fellows—and the response from faculty who attended the November event—suggests there's a hunger for such gatherings across the provider community.

As one faculty physician wrote after this year's story slam, "Sharing tempers the sorrow and expands the joy." ^[MIB]

Susan Maas is a freelance writer and editor in Minneapolis and a frequent contributor to the *Medical Bulletin*.



WEB EXTRA

See more photos from the 2019 Metro-wide Resident and Fellow Story Slam at z.umn.edu/healingwords.

Family medicine ambassadors

Colleagues team up to host Ugandan exchange students

MEDICAL SCHOOL ALUMNAE Julie Mayers Benson, M.D., and Christine Albrecht, M.D., have a lot in common, starting with their commitment to providing comprehensive care to their rural patients, from birth to end of life.

The duo, who work at Lakewood Health System in Staples, Minnesota, pursued similar paths to rural family medicine. Albrecht ('03) and Benson ('94) got their start at the University of Minnesota Medical School, Duluth Campus, where they flourished in small, close-knit classes. As participants in the Rural Physician Associate Program, they lived with and shadowed primary care physicians intermittently during medical school, with Benson in Staples and Albrecht in Mora, Minnesota.



Last summer, they shared a new experience when they teamed up to host two medical exchange students from Makerere University in Uganda. Fifth-year medical students Jonathan Nkalubo and Titus Tumusiime spent nearly a month in central Minnesota immersing themselves in family medicine—a specialty not available in their country—with Albrecht and Benson as their guides.

“It was an awesome opportunity to show how unique our specialty is and promote it around the world as the best way to care for the majority of patients,” Albrecht says. “You get to know the entire family and the interworking of those relationships that you don’t get in any other specialty. You know the social determinants of health in that family, and you can help work on those things.”

Albrecht already had close connections to East Africa, having spent time in Kenya as an undergraduate exchange student, medical student, and resident. When she started working at Lakewood, she convinced its leaders to start a sister hospital program in Tabaka, Kenya. Since 2012, she has traveled there many times for weeks-long rotations with other physicians, including Benson last year. Welcoming Nkalubo and Tumusiime was a natural extension of those activities, Albrecht says.

IMMERSED IN RURAL LIFE AND MEDICINE

During their time in Minnesota, Tumusiime and Nkalubo lived, worked, and recreated with the physicians and their families, soaking up rural life.

“I had an awesome experience,” Nkalubo says. “I enjoyed every bit of the program, ranging from studying to social life.” The students engaged in numerous rural Minnesota experiences, including visiting small-town festivals, going on boat rides, swimming, shopping, and learning how to golf.

I hope to become a better physician who values quality patient care and the involvement of patients in their care. I hope to become an advocate for better health for all people in my country.

— Jonathan Nkalubo, medical exchange student

Benson, who was named Family Physician of the Year by the Minnesota Academy of Family Physicians in 2017, says she sought to show the pair how she builds and maintains relationships with patients, collaborates with them on their care, and approaches difficult decisions.

“I really like slow medicine, where you take the time to talk and listen, help educate, and coach,” says Benson, who serves as medical director of Lakewood’s hospice and palliative care program. “I’m advocating for doing more serious conversations about end of life and being blunt and open to wherever people are at.”

For her part, Albrecht focused on American medical education, explaining, for example, senior physicians’ role as teachers who treat students with respect. “When Jonathan left, he told us, ‘I’m going to go home and show them how they need to teach,’” Albrecht says.

NEW, BROADER PERSPECTIVES

Now back in Uganda, Nkalubo says what he learned in Staples will help shape the way he practices medicine. “I hope to become a better physician who values quality patient care and the involvement of patients in their care. I hope to become an advocate for better health for all people in my country.” His current plans include completing a family medicine residency and then specializing in obstetrics and gynecology.

Albrecht, M.D.

Tumusiime, who dreams of opening the first hospital in his hometown of Kamwenge, found the exchange to be life altering as well. “It was an amazing experience that has completely changed my life and thinking process,” he says. “I learned to conduct a good consultation and have time with patients to let them understand their condition and manage their disease.”

Getting to know people from another part of the world and seeing their own work and country through others’ eyes was equally valuable for the hosts, agree Benson and Albrecht.

“It’s a pretty amazing opportunity to spend time with people from a very different culture. But we figured out in the end that we have more similarities than differences,” Benson says. “You actually get to have a greater appreciation for what you do have and feel a little lucky.” ^[MIB]

By Suzy Frisch, a freelance writer in the Twin Cities



PHOTOS: COURTESY OF JULIE MAYERS BENSON, M.D.



ABOVE Ugandan medical students Titus Tumusiime (far left) and Jonathan Nkalubo (far right) learned about family medicine and rural life from central Minnesota family physicians Julie Mayers Benson, M.D., and Christine Albrecht, M.D.

T WEB EXTRA

Find out what Jennifer Thomalla and Claire Baumgartner, second-year students at the Medical School, Duluth Campus, found most eye-opening during their month-long experience in Uganda last summer at z.umn.edu/ugandaexchange.

Self-starter

Motivation meets opportunity

MEDICAL SCHOOL IS GRUELING for everyone. But imagine being the first person you know who has taken on this daunting training and doing it with three young children while living thousands of miles away from family and friends.

Such has been the daily reality of Tina Cifuentes, who graduated from the University of Minnesota Medical School this spring, and is headed for a pediatric residency at Loma Linda University Medical Center in California.

Cifuentes, the daughter of Guatemalan immigrants, grew up in Arizona and Southern California among people just trying to get by. The idea of attending college, much less medical school, was not on their radar.

Yet Cifuentes, the second-youngest of seven siblings who spent their early U.S. years in a one-bedroom apartment in Torrance, California, had always done well in school and loved math.

AN EARLY VOW

And she had a powerful family story driving her on, pushing her to become a doctor. Before Cifuentes was born, her family lived in the countryside outside Escuintla, Guatemala, near the El Salvador border. One day her sister, then 6 months old, developed a fever that wouldn't go away. Desperate, her mother wrapped up the baby and set off on foot to the nearest clinic—more than an hour away.

I want to be a doctor to Latinx kids, but I also hope to serve as a role model. I was usually the only Hispanic person interviewing at medical schools and for residencies. I want to show them, 'I was like you once.'

— Tina Cifuentes

By the time she got there, the baby had died. When Cifuentes heard this story as a child of 6 years, she thought, “This shouldn't happen anywhere. When I grow up, I am going to start a clinic in this village, so no one else has to die.”

And she quietly nurtured that vow (ultimately envisioning a mobile clinic) through multiple moves and school changes, after her mother's death in a car accident when Cifuentes was 11, and despite very little encouragement from teachers or guidance counselors. “I loved learning and made good grades, but the adults at school didn't really help me,” she says. “All my drive was internal.”

When she reached high school, the Google search engine became her savior, Cifuentes says. “I Googled everything: about SATs and pre-SATs, how to register, how to apply for a fee waiver, and later how to apply to colleges and for financial aid. I discovered all this on my own. I learned to rely on myself.”

Later, while she powered through two years of community college and three more years as a math and applied science major at UCLA, she also relied on her husband, Rudy, who worked as a carpenter and cared for the couple's three children.

GIVEN A CHANCE

After college, Cifuentes spent two years at home with the kids—now 11, 9, and 7—and then started applying to medical schools. Her MCAT score was good, but her grades did not reach the stratospheric heights asked of most would-be med students. Every California institute she applied to denied Cifuentes admission.

But when she applied to the University of Minnesota Medical School, not only was she accepted, she was granted in-state tuition and several scholarships, which over the years have included the Future Physicians Scholarship, Dr. William H. Knobloch Scholarship, and Alpha Epsilon Iota Endowed Scholarship.

“I will always be grateful to the University of Minnesota Medical School for taking a chance on me,” she says. “I felt immensely grateful that there was a group of people who thought I was worth helping.”

MAKING SOMETHING HAPPEN

Cifuentes didn't see much of her children during the intense first two years of coursework. But they talked together as a family about what Mom was trying to achieve and why, and “everyone has cooperated really well,” she says.

Now their sacrifices will be rewarded with a return to California for her residency, something the entire family—except for Cifuentes—really wants. “I love the seasons and the snow and Minnesota,” she says. “But it's important for the rest of the family to be back living near our relatives.”

Cifuentes targeted residency opportunities in primary care pediatrics, particularly in clinical settings with large Latinx Medicaid populations such as Loma Linda.

“I want to be a doctor to those kids and develop a relationship over time with them, but I also hope to serve as a role model,” she says. “I was usually the only Hispanic person interviewing at medical schools and for residencies. I want to show them, ‘I was like you once.’”

And she had one more residency requirement: a global health elective that allows residents to work anywhere in the world. For Cifuentes, of course, that will be southern Guatemala, near her family's Escuintla home.

“I plan to establish contacts there and make something happen,” she says. “I will find a way to start that mobile clinic.” ^[MIB]

By Lynette Lamb, a Minneapolis-based writer



Tina Cifuentes

To make a scholarship gift or to learn more, please contact Carrie Albers of the University of Minnesota Foundation at albersc@umn.edu or 612-626-8481.

Student becomes Medical School's first to win Lindsley Prize

M.D./Ph.D. student Brian Sweis was awarded the Donald B. Lindsley Prize in Behavioral Neuroscience by the Society for Neuroscience, becoming the Medical School's first student ever to receive the prestigious honor.

The prize, which is typically awarded to one individual worldwide each year, recognizes Sweis as having an outstanding thesis in behavioral neuroscience.

"It is extremely exciting and humbling to see my Ph.D. thesis recognized on a global level like this," says Sweis, who completed his Ph.D. in the U's renowned Graduate Program in Neuroscience.



Brian Sweis, Ph.D.

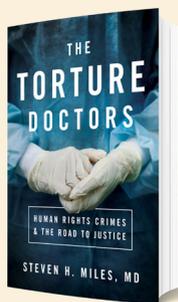
His thesis applied the emerging field of neuroeconomics to psychiatric disorders, including addiction. Combining findings from the laboratories of his coadvisers—David Redish, Ph.D., and Mark Thomas, Ph.D., professors in the Department of Neuroscience—Sweis examined how memories influence the ways the brain makes decisions and how those decisions could go awry.

Specifically, he set out to identify the neural processes that lead to decision-making vulnerabilities, which could pave the way for the development of treatments that target those specific neural mechanisms.

Sweis just finished his eighth and final year of the M.D./Ph.D. program. With support of the University's Clinical and Translational Science Institute, he is applying his research to people who are struggling with addiction. In the future, Sweis plans to continue his medical training in psychiatry while conducting neuroscience research. He says his ultimate goal is to simultaneously run his own research lab, care for patients, and develop new treatments for those struggling with mental illnesses. ^[MB]

New books by alumni authors

THE TORTURE DOCTORS: Human Rights Crimes and the Road to Justice

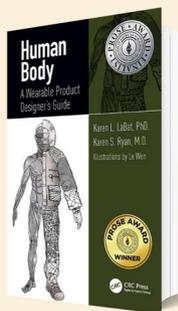


By Steven Miles, M.D.
(Medical School Class of 1976)
Georgetown University Press,
March 2020

“Few are psychopaths. Torture doctors are mostly careerists who collaborate to obtain government positions or simply choose to overlook the tortured people they see in their practice,” Miles says.

“They devise and oversee methods of torture, treating persons undergoing torture to keep them alive for future interrogation. They falsify medical records and death certificates and devise techniques that do not leave scars with the intent of concealing torture.” MIB

HUMAN BODY: A Wearable Product Designer’s Guide



By Karen LaBat, Ph.D.,
and Karen Ryan, M.D., M.S.
(Medical School Class of 1981)
CRC Press, March 2019

“My aged mother had significant osteoporosis-related posture change,” Ryan says. “Necklines in her clothes were tight in the front, and hemlines rode up in the back. As it became more difficult for her

to shop, I tried, with limited success, to help her find clothes that she liked, that fit well, that were comfortable, and that looked good. I was familiar with the medical aspects of osteoporosis from my practice as an M.D. specialist in physical medicine and rehabilitation and recognized that my mother wasn’t the only person with these problems – they were common and were going to increase as Baby Boomers grew older.” MIB

Medical School standouts named to national academies

MARC JENKINS, Ph.D., a Regents and Distinguished McKnight Professor in the Medical School’s Department of Microbiology and Immunology, in April was elected to the National Academy of Sciences. He is the first Medical School faculty member to receive this honor in 50 years.



Marc Jenkins, Ph.D.

One of the world’s most distinguished immunologists, Jenkins investigates how CD4+ T and B cells respond to antigens. His research has led to more effective vaccines and better treatments for autoimmune diseases as well as greater success in transplantation and cancer immunotherapy. He recently

led the development of a COVID-19 antibody test.



Peter Ubel, M.D.

Peter Ubel, M.D., Medical School Class of 1988, was elected to the 2019 National Academy of Medicine for his accomplishments in exploring the mixture of rational and irrational factors involved in health care decision-making. Ubel’s research illuminates how patients and physicians make choices in areas such as informed consent, shared decision-making, and health care cost containment.

After 20 years in clinical practice, Ubel is now a business professor at Duke University. MIB

ALUMNI CELEBRATION OCTOBER 23–24, 2020

Join fellow alumni, faculty, and current students at this year’s Alumni Celebration, which will include Medical School tours and news updates. Reunion events will be held for the classes of 1960, 1965, 1970, 1980, 1985, 1990, 1995, and 2010. Watch for more details in the coming months. MIB

To learn more, visit z.umn.edu/med-alumnicelebration or contact Maureen Long at mlong@umn.edu or 612-626-8045. To update your contact information, visit update.umn.edu.

HOST a medical student

Help our Medical School students as they travel for residency interviews by signing up to HOST. The Help Our Students Travel program connects current medical students with alumni as the students travel for residency and fellowship interviews. Alumni provide lodging for students in their homes and offer advice about the community in which the students are interviewing.

We are currently seeking HOSTs in these high-demand cities where a majority of our students travel for interviews: Chicago, Dallas, Houston, Madison, New Haven, New York City, Rochester (New York), San Diego, and San Francisco.

If you are unable to HOST students in your home, please consider becoming an eHOST. Alumni eHOSTs provide virtual insight and guidance to students and residents on specialties, research topics, area hospitals, and the local community. [MIB](#)

To sign up or find more information, visit z.umn.edu/medHOST.

MEDICAL ALUMNI SOCIETY COUNCIL

The Medical School Alumni Relations team plans to launch a new Medical Alumni Society Council. The council will support the Medical School by providing input to help grow an engaged, connected, and philanthropic alumni community. [MIB](#)

Alumni who have questions, comments, or interest in serving on the council should contact Maureen Long at mlong@umn.edu.



PHOTO: COURTESY OF ST. OLAF MAGAZINE

Community draws them back

Doug Tate, M.D., Ph.D., has a habit, and he's not about to break it.

Since 2006, the U of M Medical School alumna (Class of 1976) and retired Twin Cities pediatrician has led a Peruvian Medical Experience service trip for St. Olaf College students planning careers in health care.

"Medical missions are exciting and challenging," Tate says, "and they're always very humbling."

Tate and a few of his fellow U of M and St. Olaf alumni have taken about a dozen students to remote Andean communities for three weeks each winter. To date, more than 200 students have made the three-week trip.

They spend their first week in Cusco, where they assist doctors and dentists in several children's shelters. Then they travel to Ollantaytambo and Willoq in the Sacred Valley of the Incas. There, doctors primarily prescribe antibiotics and antiparasitic medications, while dentists treat cavities and extract problem teeth. For their third week, students live in the Alto Cayma area of Arequipa, where they visit homes, deliver meals, work in a kitchen, and help in an orphanage.

Tate's group also has formed a nonprofit called Andean Community Partners, designed to improve health and well-being for the people living in Andean Mountain communities. [MIB](#)



Alumni Connections

A virtually perfect Match Day

AS THE MEDICAL SCHOOL Class of 2020 prepared for their Match Day, few would have imagined that a global pandemic would force them to mark this important milestone without their classmates.

But as COVID-19 was spreading throughout the world this spring, our 204 matriculating medical students celebrated their residency matches together via video conferencing.

Unchanged, though, was our new graduates' commitment to primary care. This year, 53.4% of the class matched to primary care residencies – a six-year high for U of M Medical School graduates.



Following suit, the most popular specialties were family medicine (23.5%), internal medicine (16.2%), pediatrics (9.8%), emergency medicine (7.4%), and psychiatry (6.4%).

More than 47% of those who matched will stay in Minnesota residency programs. [MIB](#)



WEB EXTRA

See more of the Match Day emotion on the video conference at z.umn.edu/matchday2020.

In Memoriam

EDITOR'S NOTE: Find links to public obituary notices (when available) in the online *Medical Bulletin* at z.umn.edu/memoriam-spring20.

OSCAR D. ANDERSON, M.D., Class of 1955, North Mankato, Minn., died Nov. 9 at age 96. Dr. Anderson was an ophthalmologist.

BERTON D. BARRINGTON, M.D., Class of 1970, Rochester, Minn., died Jan. 7 at age 75. Dr. Barrington was an ophthalmologist.

ROYDEN A. BELCHER, M.D., Class of 1949, Little Falls, Minn., died Nov. 18 at age 93. Dr. Belcher practiced family medicine.

ROGER D. BERGLUND, M.D., Class of 1969, Mountain Iron, Minn., died Sept. 23 at age 77. Dr. Berglund was an ophthalmologist.

DALE W. BOHLKE, M.D., Class of 1975, New Ulm, Minn., died Oct. 20 at age 68. Dr. Bohlke practiced emergency medicine.

FRANK J. BONELLO, M.D., Class of 1950, Forest Lake, Minn., died Nov. 5 at age 94. Dr. Bonello was a surgeon and family medicine doctor.

ROBERT A. CALLEWART, M.D., Class of 1955, Dallas, Texas, died Jan. 11 at age 92. Dr. Callewart was an orthopaedic surgeon.

KENNETH R. CARTER, M.D., Class of 1968, Granite Falls, Minn., died Jan. 23 at age 77. Dr. Carter practiced family medicine.

ROBERT F. CRAMER, M.D., Class of 1978, Sherman, Ill., died Nov. 7 at age 67. Dr. Cramer practiced internal medicine.

WILLIAM A. DAHL, M.D., Class of 1969, Park Rapids, Minn., died Oct. 24 at age 80. Dr. Dahl practiced family and emergency medicine.

DONALD D. DAHLSTROM, M.D., Class of 1962, Minneapolis, died Dec. 22 at age 85. Dr. Dahlstrom was a radiologist.

ARNDT J. DUVALL III, M.D., Class of 1955, White Bear Lake, Minn., died Oct. 28 at age 88. Dr. Duvall was an otolaryngologist.

RAMON M. FUSARO, M.D., Class of 1953, Plattsmouth, Neb., died Jan. 15 at age 92. Dr. Fusaro was a dermatologist.

WENDELL G. GEARY, M.D., Class of 1960, Maplewood, Minn., died Dec. 12 at age 84. Dr. Geary practiced family medicine.

WILLIAM K. GITAR, M.D., Class of 1978, Duluth, Minn., died Jan 9 at age 69. Dr. Gitar practiced emergency medicine.

MARVIN E. GOLDBERG, M.D., Class of 1952, Minneapolis, died Oct. 7 at age 93. Dr. Goldberg was a radiologist.

WILLIAM L. HEDRICK, M.D., Class of 1954, Bloomington, Minn., died Oct. 2 at age 92. Dr. Hedrick was an oncologist.

JOANNE M. HOFSTRAND, M.D., Class of 1978, Waconia, Minn., died Sept. 24 at age 78. Dr. Hofstrand was a psychiatrist.

JANET C. HUBBELL, M.D., Class of 1976, St. Paul, Minn., died Aug. 14 at age 69. Dr. Hubbell was a pediatrician.

JOHN R. JALAS, M.D., Ph.D., Class of 2005, Santa Monica, Calif., died Oct. 5 at age 48. Dr. Jalas was a pathologist.

THOMAS M. JULIAN, M.D., Class of 1978, Middleton, Wis., died Feb. 14 at age 70. Dr. Julian practiced obstetrics and gynecology.

MARKLE KARLEN, M.D., Class of 1946, Minneapolis, died Sept. 25 at age 95. Dr. Karlen practiced internal medicine.

DAVID B. KETROSER, M.D., J.D., Class of 1977, Minneapolis, died Nov. 7 at age 67. Dr. Ketroser was a neurologist.

MARVIN C. KORENGOLD, M.D., Class of 1949, Chevy Chase, Md., died Sept. 19 at age 95. Dr. Korengold was a neurologist.

BARBARA A. LUIKENS, M.D., Class of 1984, Long Lake, Minn., died Dec. 2 at age 68. Dr. Luikens was a radiologist.

MERLE S. MARK, M.D., Class of 1957, Minneapolis, died Sept. 27 at age 87. Dr. Mark practiced family medicine.

ANTHONY J. MILTICH, M.D., Class of 1939, Mooresville, N.C., died Nov. 25 at age 104. Dr. Miltich practiced general medicine and surgery.

JOHN C. MUESING, M.D., Class of 1970, Maple Grove, Minn., died Jan. 6 at age 75. Dr. Muesing practiced family medicine.

GERALD T. MULLIN JR., M.D., Class of 1958, Minneapolis, died Dec. 13 at age 86. Dr. Mullin was a rheumatologist.

CHARLES M. NORTH, M.D., Class of 1969, Camarillo, Calif., died Feb. 7 at age 79. Dr. North was a radiologist.

RICHARD E. OLSON, M.D., Class of 1960, Chaska, Minn., died Jan. 19 at age 84. Dr. Olson practiced family medicine.

WAYNE P. PANNING, M.D., Class of 1962, Belle Plaine, Minn., died Feb. 16 at age 83. Dr. Panning was a radiologist.

EDWARD S. PETERKA, M.D., Class of 1961, Galesburg, Ill., died Nov. 26 at age 89. Dr. Peterka was a dermatologist.

GEORGE R. PETERSEN, M.D., Class of 1951, Crosby, Minn., died Dec. 3 at age 95. Dr. Petersen practiced family medicine.

GEORGE M. POPE, M.D., Class of 1970, Silver Bay, Minn., died Sept. 16 at age 73. Dr. Pope practiced family and emergency medicine.

LAWRENCE M. POSTON, M.D., Class of 1963, Bloomington, Minn., died Sept. 3 at age 84. Dr. Poston practiced family medicine.

JOHN J. REGAN JR., M.D., Class of 1970, Homer, Alaska, died Nov. 27 at age 74. Dr. Regan practiced internal medicine.

ROBERT J. ROTENBERG, M.D., Class of 1952, Las Vegas, died Dec. 5 at age 95. Dr. Rotenberg practiced family medicine.

FREDERICK R. SCHLICHTING, M.D., Class of 1956, San Jose, Calif., died Dec. 13 at age 89. Dr. Schlichting practiced obstetrics and gynecology.

LEONARD D. SCHLOFF, M.D., Class of 1958, St. Paul, Minn., died Feb. 2 at age 85. Dr. Schloff was a cardiologist.

HOBERT J. SETZER JR., M.D., Class of 1953, Carmel, Ind., died Jan. 20 at age 92. Dr. Setzer was an internist.

WARREN N. SHELDON, M.D., Class of 1949, Oberlin, Ohio, died Nov. 16 at age 96. Dr. Sheldon was a radiologist.

ARNOLD J. SPANJERS, M.D., Class of 1947, Winter Haven, Fla., died Feb. 17 at age 95. Dr. Spanjers was a radiologist.

MICHAEL T. SPILANE, M.D., Class of 1967, St. Paul, Minn., died May 13, 2019, at age 77. Dr. Spilane practiced internal medicine and geriatrics.

CURTIS N. STOLEE, M.D., Class of 1956, Belle Plaine, Minn., died Jan. 21 at age 89. Dr. Stolee practiced family medicine.

DAVID L. WEBSTER, M.D., Class of 1977, Arden Hills, Minn., died May 18, 2019, at age 68. Dr. Webster was a neurologist.

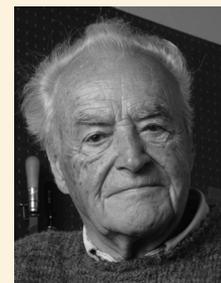
MARTIN G. WEISBERG, M.D., Class of 1960, Minneapolis, died Oct. 7 at age 83. Dr. Weisberg practiced obstetrics and gynecology.

GEORGE J. WERNETTE, M.D., Class of 1949, Reno, Nev., died Feb. 20 at age 94. Dr. Wernette was a general surgeon.

PATRICIA A. WOOD, M.D., Class of 1980, Columbia, S.C., died Oct. 25 at age 66. Dr. Wood was a hematologist and oncologist.

DONALD W. WOODLEY, M.D., Class of 1954, Edina, Minn., died Dec. 12 at age 90. Dr. Woodley practiced internal medicine.

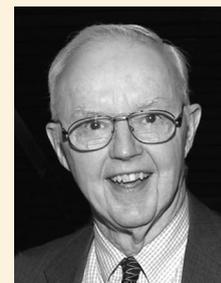
KURT A. AMPLATZ, M.D., Minneapolis, died Nov. 6 at age 95. A professor of radiology at the University of Minnesota Medical School for 40 years, Dr. Amplatz developed the field of coronary angiography and invented the Amplatz catheter to allow examination of coronary arteries through a vessel in the groin. He used pioneering biomedical engineering techniques to solve real-life problems. His inventions, including the Amplatz septal occluder and the Amplatz fascial dilator, continue to save lives today.



GARY L. DAVIS, Ph.D., Duluth, Minn., died Oct. 18 at age 72. For 40 years, Dr. Davis served as a faculty member at the University of Minnesota Medical School, Duluth Campus, including a stint as the regional campus dean from 2007 until 2014. Concurrently throughout his career at the University, Dr. Davis provided clinical psychology care throughout the Duluth community. He also introduced a telemedicine system for mental health, which expanded access to care to patients in rural Minnesota.



JOHN P. DELANEY, M.D., Class of 1955, Minneapolis, died Nov. 20 at age 89. Dr. Delaney was a surgical oncologist who specialized in treating endocrine and breast cancer. He spent more than six decades at the University of Minnesota Medical School—first as a student and then as a faculty member—pursuing advances in clinical care, research, and education. He cherished his relationships with his patients and was a highly regarded educator and mentor to numerous medical students, residents, and early-career surgeons. The Medical School's John P. Delaney Chair in Clinical Surgical Oncology is named in his honor.



A powerhouse at 50

The U's Program in Human Sexuality remains in the vanguard

IN JUNE OF 1970, a group of University of Minnesota physicians, church officials, and sexual health educators from San Francisco gathered at the Towers condominium in downtown Minneapolis. Inside, at the first-ever “Sexual Attitude Reassessment” seminar, participants created an atmosphere charged with anticipation.

The experience left an impression. The SAR, as it came to be known, was carefully designed to help professionals feel more comfortable talking about sex and understand the wide range of human sexual expression. It gave them a place to gain accurate information and reflect on their own attitudes toward sexuality.

From that first SAR grew the now-mighty Program in Human Sexuality (PHS), the University's powerhouse program dedicated to advancing healthy sexuality through research, education, and

clinical care. Repeated thousands of times in many specialized forms, the SAR became the basis for the first human sexuality course for U of M medical students.

“Sexuality is a central part of who we are,” says Eli Coleman, Ph.D., who has been the director of PHS since 1991 and holds the first and only endowed chair in sexual health in the world. “What PHS has always strived to do is tackle challenging and neglected issues dealing with sexuality, and through education,

research, treatment, and advocacy, provide models for education and clinical service.”

Officially established in 1971 as an interdisciplinary program to provide curricula for medical students, PHS added its clinic, the Center for Sexual Health, in 1973. In 1977, the program became a unit of the Department of Family Medicine and Community Health, where it remains today.

FAST FORWARD

From its current home in the West Bank Office Building, PHS conducts research and provides education and clinical services. Clinicians treat both children and adults at the largest such clinic in the country. Specialty areas include relationship and sex therapy, compulsive sexual behavior, and transgender health services. Over its 50-year history, PHS has established world-renowned programs in sexuality and disability, family sexual abuse, chemical dependency and intimacy dysfunction, and sexual offender treatment.

The research program is equally robust. Highlights include groundbreaking HIV/AIDS work starting in the late '80s, as well as significant research in the areas of transgender health, sexual offending, sexual pain in women, and sexuality and aging.

“Our strength has always been our faculty and our leader,” says Bean Robinson, Ph.D., former clinic director, who joined PHS in 1991. “Eli has had the energy, vision, and dedication to make a place like this—a very large program focused on sexuality—exist successfully in the middle of a family medicine department.”

MAINTAINING AND BUILDING

Philanthropy has been critical to that success. After securing funding to endow the chair in sexual health, Coleman rolled up his sleeves to bring a second endowed chair to PHS, this one in sexual health education. Named in honor of former U.S.

PHOTO: JIM BOVIN

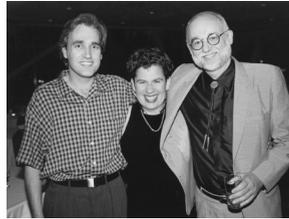


A current-day PHS project focuses on giving gender-creative children a way to accurately express themselves by layering different styles of hair, clothing, and accessories, as well as internal and external sex organs, on two-dimensional dolls.

Milestones



PHS founders Rev. James Siefkes (left) and Richard Chilgren, M.D.



ABOVE (From left) Walter Bocking, Ph.D., Bean Robinson, Ph.D., and Eli Coleman, Ph.D., in 1997

Surgeon General Joycelyn Elders, M.D., who completed her internship in pediatrics at the University in the 1960s, the Joycelyn Elders Chair in Sexual Health Education became a reality in 2014.

Inaugural chair holder Michael Ross, M.D., Ph.D., M.P.H., says the significance of such endowments cannot be overstated. “It’s very rare for any sustained activity in sexual health to be funded beyond an individual’s lifetime. An endowed chair allows us not just to maintain but build on these efforts.”

Through continued outreach – there’s a \$5 million fundraising effort currently underway to endow a third chair in clinical sexual health, create a professorship in sexuality and aging, and establish a National Center for Gender Spectrum Health – Coleman seeks to ensure the ongoing vitality of PHS.

“With our wonderful faculty, we have accomplished so much,” says Coleman, “and with new resources, we are poised to address the myriad of sexual health problems that face us. Rising rates of sexually transmitted infections, continued problems related to sexual assault and violence, sexual dysfunctions, and stigma of marginalized communities will require us to double our efforts to create a sexually healthier world for all.” ^{MB}

By Barbara Knox, a freelance writer and editor and a frequent contributor to the *Medical Bulletin*

1970

Rev. James Siefkes of the American Lutheran Church directs the first Sexual Attitude Reassessment in downtown Minneapolis.

1971

Program in Human Sexuality is formally established in the Medical School with Richard Chilgren, M.D., as director.

1973

Center for Sexual Health clinic opens with James Maddock, M.D., as director.

1976

PHS rolls out a family sexual abuse intervention training program to mental health and public agency welfare workers.

1979

Transgender Services program moves to PHS from Department of Psychiatry.

1987

PHS launches new postdoctoral fellowship training program.

1991

Eli Coleman, Ph.D., takes over as PHS director.

1993–2012

PHS presents Man to Man Sexual Health Seminars, educating more than 5,000 gay men on HIV/AIDS prevention.

2007

PHS establishes the nation’s first endowed chair in sexual health; Coleman is named inaugural chair holder.

2014

U.S. Surgeon General Joycelyn Elders joins forces with PHS to establish the nation’s first endowed chair in Sexual Health Education; Michael Ross, M.D., Ph.D., M.P.H., becomes inaugural chair holder.

2017

TAWANI Foundation donates \$3 million to PHS to support sexual health research, education, and care at a time when federal grants for such programs were at an all-time low.

2018

PHS establishes National Center for Gender Spectrum Health to improve health care and quality of life for transgender and gender-diverse individuals.



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