Last year, Colorado State University launched the State Your Purpose campaign, and the College of Veterinary Medicine and Biomedical Sciences pledged to contribute by raising $250 million in private giving by 2020. Today, we have surpassed 80 percent of our goal. Our remarkable progress is made possible by generous members of our College community. They are our alumni, our clients, our students, our parents, and our faculty and staff. Thanks to their commitment to our College, we can support outstanding students, invest in robust research programs, recruit and retain top faculty, expand our outreach programs, and build state-of-the-art facilities. On the following page, a few of our donors share their stories. They remind us that connection is at the heart of everything we do here – connection between animals and people, between students and faculty, and between the past and the present. I extend my deepest gratitude to these donors, and to every donor and friend of the College who gives with purpose.

– Mark Stetter, D.V.M., Dipl. ACZM
Dean and Professor
State Your Purpose
TO GIVE BACK TO THE DOCTORS AND TECHNICIANS WHO SAVED OUR DOG’S LIFE

Our dog Daisy was just 6 years old when she was diagnosed with a spinal cord condition that required complex surgery to alleviate chronic pain and extend her life. Dr. Rebecca Packer and her dedicated staff performed the surgery with optimal results. Daisy later developed a degenerative spinal cord disease. Once again, Dr. Packer and her team were there for us. I can’t properly explain the sense of comfort, confidence, and trust that we felt in their care. We made a donation to the neurology service to say thank you, and Daisy contributed too. She gave veterinary students the opportunity to learn from her condition. It’s a wonderful partnership and one that our family is honored to be a small part of. Daisy is more than 10 years old today and still wagging her tail with gratitude.

Jenni Tierney, B.F.A., ’83

State Your Purpose
TO HONOR OUR DAUGHTER’S SPIRIT AND TO INSPIRE FUTURE VETERINARIANS

Our daughter, Dr. Sarah Schillereff (D.V.M., ’05), passed away unexpectedly on Dec. 31, 2015, at the age of 40. With the support of our family and friends, we created the Dr. Sarah Lindsay Schillereff Memorial Scholarship to benefit students enrolled in the DVM program so that Sarah’s spirit will inspire future veterinarians to seek their own paths and strive to provide outstanding care.

Dr. Ronald L. Schillereff and Ms. Theresa Von Engeln

State Your Purpose
TO HELP PROMISING STUDENTS SUCCEED IN RESEARCH

As professors, we believe in supporting promising undergraduate and graduate students. We created the Beulah and Doyle Blair Memorial Scholarship in memory of Carol’s parents to support first-generation students who are doing undergraduate research. When department chair Gregg Dean proposed founding the Microbiology Graduate Student Fellowship, we jumped at the chance to be among the first contributors.

Carol D. Blair and Patrick Brennan

FOLLOW YOUR HEART
SUPPORT THOSE WHO AIM FOR THE STARS

col.st/cvmsimpact
Help families break the cycle of poverty
Jennifer Brooks aspires to become a medical doctor and to serve those who are under-resourced.

Heal joint disease in humans and animals
CSU veterinarians and scientists collaborate to bring biologic therapies to the marketplace of medicine.

Investigate the origins of health and disease
Neuroscientists Bob Handa and Stu Tobet explore sex differences, stress, and brain development.

Serve the Navajo Nation
After graduation, Roxanne Benally will return to her home community to be an agent of positive change.

Save lives in a warming climate
Epidemiologist Brooke Anderson uses big data to prepare policymakers for a hot future.

Pioneer new treatments for cancer and infectious diseases
Joshua Daum discovered his passion for translational research as an undergraduate microbiology student.

Knock out drug-resistant tuberculosis
Anne Lenaerts joins a global fight to eradicate the superbug.

Provide veterinary care in disaster zones
Veteran Alex Gomes grew up as a cowboy, served in Iraq, and now aspires to help animals in the developing world.

Educate future generations of doctors and scientists
The Health Education Outreach Center will meet rising demand for world-class medical education in Colorado.

Improve global health through epidemiology
Rebecca Hermann learns to approach health issues with a holistic view in the environmental health program.

Cure brain disease in pets and humans
Dr. Rebecca Packer advances minimally invasive surgery and new therapies for the treatment of brain tumors.

Be a good father, leader, and veterinarian
First-generation student Elton West teaches his kids about the value of higher education.
AMBITION: I grew up in a family stricken with drug addiction and poverty. My future seemed bleak, but I had many people who invested their time and energy in my future. Today, I am happily married with two young children. I work as a bookkeeper and dental assistant, and I love volunteering. My career goal is to become a medical doctor and to serve those who are under-resourced. I was beyond blessed by those who helped me overcome my situation as a child, and I have a heart to give back.

GRATITUDE: I am so grateful for the generosity of scholarship donors. A scholarship is not only a financial gift but also proof that donors believe in my generation. I can focus more on my studies and my family rather than worrying about finances. I aim to graduate without any school loans, so that I can give back to others after medical school.

JENNIFER BROOKS
DR. ALAN TUCKER MEMORIAL SCHOLARSHIP, JOAN C. KING-TOBET MEMORIAL SCHOLARSHIP
CLASS OF 2017

STATE YOUR PURPOSE
TO BECOME A DOCTOR WHO HELPS FAMILIES BREAK THE CYCLE OF POVERTY

INSPIRE STUDENTS WHO ASPIRE TO SERVE OTHERS
GIVE TO THE CVMBS SCHOLARSHIP ENDOWMENT
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John Eisele/CSU Photography
STATE YOUR PURPOSE
TO HEAL JOINT DISEASE IN HUMANS AND ANIMALS

CSU TAKES AIM AT UNCOMMON CURES

NEW PARTNERSHIP HARNESSES THE BUILDING BLOCKS OF LIFE

By Kristen Browning-Blas
When Rio knocked over her first barrel at a race in Craig, Colo., her rider Linda Ghent thought it was a little odd. When Rio bonked into a second barrel, Ghent knew the champion barrel horse was in trouble.

Ghent took her “once-in-a-lifetime horse” to Dr. Laurie Goodrich, a veterinary surgeon and an associate professor of equine orthopaedics at Colorado State University’s James L. Voss Veterinary Teaching Hospital. Diagnostic tests revealed a torn meniscus, torn cartilage, and a possible torn ACL in Rio’s right hind leg.

It could have been catastrophic news for any athlete – horse or human – but Goodrich has dedicated her career to helping equine athletes live and compete pain-free. She is part of a team at CSU’s Gail E. Holmes Orthopaedic Research Center that has spent more than 20 years studying how biologic therapies can trigger and promote healing in damaged joints.
THE RACE TO HEAL

Goodrich performed arthroscopy to clean up some damage to Rio’s cartilage, meniscus, and ACL, but thought stem cell therapy was Rio’s best chance at getting back on the course. In 2007, Rio became one of Goodrich’s first patients to receive injections of her own stem cells, in a procedure called “culture expanded intra-articular stem cell therapy.” Goodrich and the team at the equine hospital harvested Rio’s stem cells from the bone marrow in her hip, grew them in culture for two weeks, and injected those cells into Rio’s injured knee.

To understand how stem cell therapy works, picture an orchestra: The stem cells behave as the conductor, signaling the existing cells – the musicians – to chime in and begin the healing process.

“It was like Rio healed right in front of our eyes. It was a pretty large tear and over time, it looked better and better on ultrasound until we couldn’t see it anymore. That was one of my first stem cell cases and it made me a believer,” said Goodrich, who has performed hundreds of stem cell injections since then. Rio returned to barrel racing and was highly competitive for seven more years.

Ghent has nothing but gratitude for her horse and the veterinarians who enabled her not only to stay standing, but to compete. “She’s just kind of our little miracle girl. That horse is everything to me,” Ghent said.

TACKLING COMMON DISEASES

Stem cell therapy is just one type of biologic therapy. Biologic therapies are essentially living machines made of natural agents such as stem cells, proteins, and antibodies. These machines harness nature’s ability to repair and regenerate and can sense and respond over time to disease, injury, and healing. Biologic therapies can be used to treat and heal ailments common to humans and animals, such as osteoarthritis, heart disease, and joint disease.

“Many therapies found to work well in the horse should translate directly into humans,” Goodrich said. “For example, the horse is a great model for osteoarthritis, because their joints are very similar to the human.”

In the coming years, CSU’s scientists and doctors will continue to research and understand the building blocks of life. Their efforts will be accelerated by two new state-of-the-art facilities. In 2017, CSU will break ground on the Translational Medicine Institute. At the TMI, scientists, veterinarians, doctors, and entrepreneurs will join forces to bring uncommon cures to the marketplace of medicine as quickly as possible. At the Helen and Arthur E. Johnson Family Equine Hospital, clinicians will offer cutting-edge care and novel therapies to equine patients and athletes. Co-located with the James L. Voss Veterinary Teaching Hospital, the new facilities will form a medical complex with the capacity to revolutionize translational medicine.
Dr. Laurie Goodrich studies biologic therapies for equine athletes at CSU’s South Medical Campus, the future home of the Translational Medicine Institute and the Helen and Arthur E. Johnson Family Equine Hospital.
W
hy do more women suffer from depression, the
leading cause of disability in the world, while more
men suffer from cardiovascular disease, the No. 1
cause of death globally for both sexes?

Robert Handa, a Colorado State University biomedical sciences
professor, and Stuart Tobet, a biomedical sciences professor
and director of CSU’s School of Biomedical Engineering, are
longtime collaborators with joint research interests in sex
differences and the co-occurrence of conditions such as
depression and cardiovascular disease.

“Part of that is looking at development, and the other part is
looking at particular places in the brain,” Tobet said. “And the
tie that binds it all together is that what might happen during
prenatal development may have a long-term impact on an
individual’s health and well-being.”

FROM PREGNANCY THROUGH ADULTHOOD
More than a decade ago, Handa and Tobet began collaborating
with Jill Goldstein, a professor of psychiatry and medicine at
Harvard Medical School and director of research at the Mary Horrigan Connors Center for Women’s Health and Gender Biology at Brigham and Women’s Hospital. The three researchers connected over their shared interest in sex differences in the development of the brain and how disruptions in fetal and early development can set the stage for psychiatric and medical disorders later in life.

For more than 20 years, Goldstein has followed a unique cohort of individuals from the historic New England Family Study, formerly known as the National Collaborative Perinatal Project that began in 1959 with the enrollment of approximately 60,000 pregnant women. A wealth of information about each mother’s health and pregnancy, including blood and placental samples, was collected and stored, and their children were closely followed until age 7.

Goldstein and her team re-recruited offspring from this study over the past two decades to conduct ongoing work with them, including brain imaging, as they move through their 50s. This provided the team with a valuable opportunity to investigate the early origins of why men and women are at different risks for disorders of the brain, and how problems during prenatal development and childhood may contribute to brain abnormalities in adulthood and the development of these disorders across the lifespan.

A DREAM TEAM

“Handa and Tobet are two of the leading experts in the world on the sexual differentiation of the brain,” Goldstein said. “They’ve taught me a great deal about the specific mechanisms of how hormones and genes regulate brain development and how these early exposures can have lasting effects on sex differences in the brain throughout life. Seeing how their work in animal models translates to the human brain and vice versa informs and stimulates the work that my team does at the clinical level. One of the first things we studied together was the fetal programming of sex differences in depression-like behaviors in animal models, which led to some really interesting findings about how the brain talks to the heart.”

A key value of the team is that Handa and Tobet can use results from Goldstein’s human studies to guide experiments in animal models and test mechanisms that may cause potential disorders. The team found that prenatal exposure to glucocorticoids (hormones secreted by the adrenal gland in response to stress and controlled by the brain) and inflammation can set the stage for things to go awry in adulthood. “One of the most common symptoms in neuropsychiatric disorders, particularly major depressive disorder, is problems with the stress response,” Handa said.

Their models showed that exposure to glucocorticoids in mid-to-late gestation can result in changes in cardiovascular and brain function in adulthood. In their studies on prenatal stress, they discovered that some of the same brain regions that regulate mood also regulate the heart. Their ongoing collaborative efforts include trying to identify specific processes in fetal development that contribute to the co-occurrence of depression-like behaviors and cardiovascular disease risk in animal models.

THE FUTURE OF HEALTH CARE

“We know that a pregnant woman’s health and nutrition influences a lot of what happens to her child in adulthood,” Handa said.

The team hopes their research will help lead to the development of better strategies for prenatal care and counseling and identifying people who might be at greater risk for disorders, as well as treating patients with various disorders and advancing the emerging field of precision medicine, a model of customized health care tailored to suit a patient’s unique needs.

“In this day and age of precision medicine, incorporating the impact of sex differences in medicine is absolutely critical,” Goldstein said. “Taking the lifespan perspective of looking at how development may have lifelong consequences is a very optimistic approach to thinking about intervention – because the earlier we can intervene with people who are high risk, the more likely we are to be successful.”

GIVE TO THE BIOMEDICAL SCIENCES PROGRAM

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ROOTS: I grew up on a small farm on the Navajo Nation. I learned what it means to be a caretaker for livestock and pets from my father. He cares faithfully for his cattle, sheep, horses, and other livestock. He speaks to them with kindness, prays for them, and treats them like family. In our Navajo tradition, we have songs for our livestock. I remember my father would sing for our horses as we fed and groomed them. The horse symbolizes strength, power, love, and harmony in the Navajo culture.

AMBITION: The Navajo Nation is about the size of the state of West Virginia. However, most families have to travel hours to reach the nearest veterinarian, so they face the hardship of losing their livestock and pets to curable and treatable diseases. I want to establish a veterinary clinic in my home community and to be an agent of positive change for my nation and people when I become a veterinarian. I hope as a veterinarian, my education will signify to young people throughout Native American communities that with hard work anything is possible.
The devil is in the data

Climate models prepare policymakers for a hot future

By Sarah Ryan

For the past decade, Colorado has faced one decisive weather event after another. Historic droughts followed by 100-year floods. Spring blizzards chased by tornadoes that tear towns and lives in half. Wildfire seasons that begin earlier, burn hotter, and end later than any on record.

Welcome to the Era of Extreme Weather. The headlines are colossal, but when it comes to climate-change research, the devil is in the data.

Brooke Anderson, assistant professor of epidemiology in the Department of Environmental and Radiological Health Sciences, is a self-confessed weather geek who uses big data sets to rigorously examine the nuanced and variable relationships between human activity, weather systems, and public health. Anderson and her collaborators at Colorado State University, Columbia University, National Center for Atmospheric Research, and other research institutions seek to help policymakers save lives by studying the health effects of heat waves and air pollution in a changing climate.

Too hot to handle

Heat waves are the deadliest weather phenomena in the United States. According to the U.S. Department of Health
and Human Services, they kill more Americans than floods, lightning, and storms combined. Scientists at the National Center for Atmospheric Research predict that in 50 years, summers will be hotter than any on record across 80 percent of the globe. Hot summers mean more heat waves. What can public officials do now to plan for the searing summers of the mid-century? And how can they make effective, science-based decisions to protect the lives of future citizens?

“We take data from climate models and combine it with information about environmental exposures to assess the potential impact of environmental hazards. In that way, we can tell policymakers what to expect,” said Dr. Elisaveta Petkova, research scientist at Columbia University’s National Center for Disaster Preparedness and one of Anderson’s coauthors. “We don’t normally think about short-term and long-term impact at the same time. Our research is trying to bridge that critical gap. You have a problem now and in the future, and you need to put it all on the same path.”

In a series of published and pending papers, Anderson and her collaborators have examined the frequency, intensity, and mortality risk of heat waves in urban communities across the United States and of smoke waves in
the Western United States. They use as many as 18 climate models at a time, including ensembles that provide up to 40 variations in which the starting conditions are adjusted by less than 1 degree F, resulting in a wide diversity of climate projections. They accommodate for even more uncertainty by applying scenarios for greenhouse gas emissions, population change, and heat adaptation to the models.

Their research predicts that in cities such as Portland and Chicago the combined impact of climate change, the urban heat island effect, and large concentrations of vulnerable populations such as the elderly, could result in a 120 percent increase in heat-related deaths by the 2080s. Moreover, more than 82 million Americans will experience a significant increase in the frequency and intensity of smoke waves. Especially in Colorado, Idaho, Montana, and Washington, smoke waves will adversely impact public health and will impose economic burdens on medical care, tourism, and property values.

**KEEP CALM AND CHOOSE**

The good news — yes, there is good news — is that in all of the studies the range of results depend more on human activity than climate variability. In other words, we can change the future. “Choice is very important,” Anderson said. “Our studies suggest that adaptation is a key element. When we assume that communities adapt to rising heat or that greenhouse gas emissions are reduced, it has a huge influence on mortality.”

At the national level, lower greenhouse gas emissions result in fewer extreme weather events and fewer weather-related deaths in every study conducted by Anderson and her colleagues. At the local and regional level, public officials can reduce heat- and smoke-related deaths in a variety of ways.

“There are two different approaches,” said Petkova, who collaborates with experts at the city and state level in New York. “One approach is to improve the heat warning system and heat resilience of cities, to make sure that you have adaptations in place and the population ready to react. You also have to have a long-term planning approach that mitigates the heat island and reduces emissions.”

In the first approach, cities can create heat plans that include proactive responses to heat events, such as information hotlines, cooling havens, power grids that won’t shut down when temperatures rise, and green spaces that counteract the urban heat island effect. In the second approach, cities, states, and regions can plan for sustainability in development, transportation, water and air quality, and health care systems. And in regions with high wildfire risk, policymakers can devise early warning systems, fire suppression policies, evacuation plans, and public health programs to reduce the frequency and impact of smoke waves.

Brooke Anderson, assistant professor of epidemiology in the Department of Environmental and Radiological Health Sciences, uses big data to examine the nuanced and variable relationships between human activity, weather systems, and public health.

**CHOOSE TO SUPPORT SCIENCE THAT PREPARES US FOR THE FUTURE**

**GIVE TO THE DEPARTMENT OF ENVIRONMENTAL AND RADIOLOGICAL HEALTH SCIENCES**

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PASSION: I’ve worked with CSU faculty on leprosy epidemiology and tuberculosis diagnostics, and I discovered a passion for oncology while researching immunotherapy at the Mayo Clinic. I learned that an oncologist is more than just a doctor. Oncologists develop very personal relationships with patients whom they may see weekly for years. They are friends and advisers, and they have to understand their patients’ goals when they recommend treatment.

AMBITION: I want to pursue an M.D./Ph.D. because there are big horizons in translational medicine. There are so many opportunities to make discoveries in immunotherapy, virotherapy, and radiation therapy, while maintaining the ability to work directly with patients. I want to care for those who suffer, and I want to always ask new questions.

EDUCATE TOMORROW’S PIONEERS IN SCIENCE AND MEDICINE

GIVE TO THE CVMBS SCHOLARSHIP ENDOWMENT

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STATE YOUR PURPOSE
TO KNOCK OUT DRUG-RESISTANT TUBERCULOSIS
If you could design a perfect bacterium, it would be *Mycobacterium tuberculosis*. It spreads through the air. Its thick, waxy cell wall makes it extremely hardy. It can lie dormant, it can hide in human immune cells, and it can exist in any organ in the body. It grows very slowly, dividing just once a day, compared to every 20 minutes for *E. coli*. The bacteria typically form complex lesions in the lungs that also protect them from the immune system. Even if the disease is suppressed with antibiotics, it can survive in a latent form for years or decades. Finally, there are thousands of unique strain variations of this bacterium.
all over the world, and each strain has adapted in virulence and antimicrobial resistance to its host environment.

**GO FOR THE BODY (OR WHAT TO DO WHEN COMBINATIONS FAIL)**

Anne Lenaerts, professor of mycobacterial therapeutics, has spent 20 years studying the numerous challenges to treatment posed by this slow-growing superbug. “There are four mainline drugs for treating active TB. We always use drugs in combination because it’s more efficacious and prevents resistance,” said Lenaerts, who came to CSU in 1999 to join the largest group of TB investigators in the world.

Active TB can be treated with daily combinations of four antibiotics for six months. The drug regimen should be administered with counseling and support by a trained professional, but access and implementation vary widely, especially in the developing world. When treatment fails, the disease can develop drug resistance.

“There have been no new frontline drugs for the last 40 years,” said Lenaerts, long enough for multidrug-resistant TB to emerge in more than 100 countries. The treatment for MDR-TB is even more complex, debilitating, and expensive. It requires daily chemotherapy injections and multiple pills with severe side effects for nine months to two years, and the World Health Organization estimates it’s available to only one out of five eligible patients. Extensively drug-resistant TB is resistant to four of the commonly used drugs and is nearly impossible to cure.

The World Health Organization End TB Strategy calls for a 90 percent reduction in TB deaths and an 80 percent reduction in the TB incidence rate by 2030. The development of faster, simpler, and more affordable treatments is essential to reaching those targets, and Lenaerts is a leader in the drug development field. One of the prominent research initiatives is the TB Drug Accelerator Program, the brainchild of the Bill and Melinda Gates Foundation.

The TBDA brings together 18 pharmaceutical companies and research institutions with the common goal of discovering a universal drug regimen for TB that will cure both drug susceptible and resistant patients in one month. It typically takes more than 10 years to develop a new TB drug. The TBDA aims to shorten that timeframe by developing new methods and tools, and to develop multiple novel drugs in combination at once because that is the only way to defeat TB. Lenaerts’ laboratory focuses on the development of new approaches and models for preclinical drug discovery, and implementing these to more rapidly identify new TB drugs.

As the best candidates for drug combinations move onto clinical trials, Lenaerts and her collaborators will continue to screen backup candidates. “I’ve worked in TB research for 20 years, but I feel more hopeful now than ever before that TB can be cured,” said Lenaerts. “The funding is there, the critical people are sitting together at the table, and we are thinking outside the box about new technologies and approaches. All of the low-hanging fruit has been picked. We have to go in new directions.”

**KNOCKOUT STRATEGY HITS XDR-TB**

Lenaerts started her research career hoping to find a cure for cancer, but her postdoctoral work took her to South Africa for...
two years where she saw firsthand the effects of endemic tuberculosis compounded by the HIV epidemic.

“My eyes were opened,” Lenaerts said. “Many people were living under terrible conditions, and those conditions became all the more devastating if they were affected by TB/HIV. I recognized that better drugs for treating TB would have a huge impact on people’s lives and help get people out of poverty.”

In South Africa, the public health system was slow to respond appropriately to HIV, a disease that suppresses the immune system and makes patients more susceptible to TB. Today, 70 percent of the TB patients in South Africa are also positive for HIV, compared to about 10 percent of HIV patients globally. XDR-TB is on the rise, which is why the TB Alliance, another participant in the TBDA, began clinical trials of Nix-TB in South Africa in 2015. Nix-TB is the first all-oral drug regimen for extensively drug-resistant TB, and could become a universal regimen for all TB patients.

Dr. Daniel Everitt, senior medical officer of the TB Alliance, reports that early data suggests Nix-TB will shorten treatment for XDR-TB to six months or less. “Some of the patients in our trial have undergone daily treatment for five years. They talk about feeling like they have a death sentence and they weigh as little as 70 pounds,” Everitt said. “On Nix-TB, they start gaining weight within weeks. It turns their lives around.”

As the TB Alliance prepares for more clinical trials in South Africa, Lenaerts continues preclinical studies using mouse models to determine long-term efficacy of Nix-TB, and to improve the drug pipeline by identifying which preclinical models are most predictive of clinical outcome. This is an excellent example of the TBDA’s ability to simultaneously improve and shorten the drug development pipeline.

“The chances of identifying a successful compound are very low. Effectiveness, safety, drug interaction — all of these factors add up to a high attrition rate. My job is to keep filling the drug pipeline, and to train future scientists in the process,” Lenaerts said.

She added thoughtfully, “There are many setbacks, but this is not about me. It’s about the work we can do and how it can help. I look for that in students; the awareness that we have a really good life here and an opportunity to do something for people who are less fortunate.”

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PUT DRUG-RESISTANT TUBERCULOSIS ON THE ROPESSUPPORT MICROBIOLOGY, IMMUNOLOGY, AND PATHOLOGY RESEARCHcol.st/cvmbsimpact

*According to the World Health Organization*
MOTIVATION: I joined the U.S. Army after high school and served as a squad leader and mission commander during two tours in Iraq. I spent a lot of time watching people and animals interact in the streets, and I realized I wanted to change attitudes toward animals in the developing world. As a veterinarian, I will work with shelters and disaster relief organizations in the United States and overseas.

GRATITUDE: It’s hard to express how grateful I am for my scholarship. It will help me to keep my student loans small, so that I’ll be able to devote more of my time to helping others and less time worrying about loan payments. I don’t believe there are words to express how grateful I am for scholarship support. It is invaluable, and I will never forget it.
DOCTOR’S ORDERS

HEALTH EDUCATION OUTREACH CENTER MEETS RISING DEMAND FOR WORLD-CLASS MEDICAL EDUCATION

By Rhea Maze

Emily Cunis has been interested in pursuing medicine since junior high school. After living in Bushnell, Neb., population 118, Cunis was inspired to write a paper on health care in remote areas of the United States. “There’s a huge lack of basic resources,” Emily Cunis is a junior in biomedical sciences and environmental health. She also works as vice president of leadership development for CSU’s Residence Life’s Student Leadership Program. “I love interacting with people,” Cunis said. “My job allows me to gain experience communicating, managing conflicts, and problem solving – key skills that will help me succeed in my medical career.”
Cunis said, “Doctors who treat patients in remote settings have to maneuver around so many challenges, but they can really impact people's lives.”

“I want to help alleviate some of the health care disparities faced by the most vulnerable populations in the United States.”

Cunis chose to study biomedical sciences at Colorado State University after hearing about its renowned anatomy program and low student-to-cadaver ratio. Her ultimate goal is to attend medical school to become a Doctor of Osteopathic Medicine and practice family medicine for underserved populations.

“CSU’s anatomy program is awesome,” Cunis said. “The abundance of resources available to students is phenomenal, and the instructors are always there to help. This program got me even more excited to practice medicine because it allowed me to apply what I learned in an interactive, hands-on way.”

The Department of Biomedical Sciences is gearing up to break ground on a new facility that will allow more students like Cunis to achieve their goals of working in health care, while also connecting them with an even larger network of students, professionals, and opportunities to engage with the public. The Health Education Outreach Center will continue CSU’s exceptional anatomy and neuroanatomy instruction for all interested students, while also attracting new cohorts of future health care professionals and physicians to Colorado.

“Our goal is to build a state-of-the-art facility that rivals those of the best medical schools in the United States,” said Tod Clapp, assistant professor in the Department of Biomedical Sciences and head of its human anatomy program. “The center will allow us to provide students and clinicians access to a world-class facility and many

The Health Education Outreach Center will increase undergraduate enrollment in biomedical sciences and expand access to experiential learning for students and professionals of all ages.
opportunities to interact and learn from each other.” The center will enable the department to gradually increase undergraduate enrollment, expand its experiential learning opportunities for high school students, and potentially offer classes to medical students through collaborations with the National Western Center in Denver and the University of Colorado School of Medicine.

The center’s partnership with the National Western Center will bring its renowned educational outreach programs in health care and the life sciences to visiting students and families from around the world. Proposed programs include providing both urban and rural populations with unique opportunities to dissect organs, participate in simulations, and actually see the difference between healthy and diseased parts of the body. These interactive learning opportunities provide students who’ve never before considered a career path in science or medicine with exposure to new possibilities.

High school students traveled from across Colorado and the nation to attend Anatomy Camp in 2016. Many campers took their first steps toward careers in health and medicine during the weeklong immersion in human gross anatomy.

COLORADO DESERVES WORLD-CLASS STUDENTS, PROGRAMS, AND FACILITIES

GIVE TO THE ANATOMY AND NEUROANATOMY LEARNING LAB

col.st/cvmbsimpact
AMBITION: Environmental health teaches me to approach health issues with a broad holistic view and to focus on causes at the population level. After I graduate, I want to research vector-borne diseases, such as Zika, dengue, and yellow fever, to improve awareness and prevention in hard-hit areas, such as Latin America. My goal is to earn my Ph.D. in epidemiology and to improve global health, especially in response to epidemics that will be exacerbated by climate change.

GRATITUDE: I pay for my tuition and fees on my own, so I know the value of my education. I can’t even begin to explain how valuable it is to spend more time taking advantage of the opportunities at CSU. Scholarship support has made it possible for me to do an Honors thesis on cookstove air pollution, including fieldwork in Honduras. Thank you from the bottom of my heart for your generosity.
Dr. Rebecca Packer is obsessed with the brain – its mysteries, its miracles, and its missed opportunities. Packer is an associate professor of neurology and neurosurgery at the James L. Voss Veterinary Teaching Hospital who studies minimally invasive surgical techniques and new therapies for the treatment of brain tumors in pets and, eventually, humans.

“I’m just fascinated by all our missed opportunities with the brain, in part because I see what can be done in human medicine, so I’m trying to raise veterinary standards to human standards,” Packer said. “I think our pets should have the same access to care that we give their human counterparts.”

MYRIAD REASONS FOR HOPE
In the span of a week, a lively miniature Australian shepherd named Cricket Hope went from dashing through flyball courses to lying nearly comatose on a bed. Cricket’s owners,
Chari and Mike Leleck, brought her to the Voss Veterinary Teaching Hospital. During a diagnostic scan with magnetic resonance imaging, Packer and Dr. Lisa Bartner, a neurology resident, saw a mass that was causing the rest of the dog’s brain to shift, putting pressure on her brain stem. It was granulomatous meningoencephalitis, an aggressive form of inflammation that behaves like a tumor.

Packer and Bartner consulted with the Lelecks and then took Cricket straight into a seven-hour surgery. They removed the mass with a tool called the NICO Myriad, a narrow wand that cuts out abnormalities without damaging surrounding brain tissue. Packer was the first veterinarian in the United States to use the Myriad, and CSU is the only veterinary hospital currently using the system, said Joe Mark, NICO co-founder and inventor of the device. About 2 millimeters in diameter, the size of a coffee stirrer, the Myriad is typically used in minimally invasive surgeries to remove soft-tissue abnormalities from the brains and spines of people.

Packer cautioned the Lelecks that if Cricket survived the surgery, her ability to function would still be uncertain, but intensive physical therapy has helped Cricket recover most of her function. As she masters each new challenge, Cricket continues to surprise her owners and her doctors. Two years since her surgery, Cricket has a slight head tilt, but she’s returned joyfully to flyball competition.

“Her quality of life is 101 percent,” Chari said. “We have our dog back, and thank you, thank you, thank you. We have our Cricket back.”

Packer is equally grateful for the Lelecks. “If everyone always euthanizes their pet instead, we never know if they can make it,” Packer said. “Now we know what the potential is. Even though I don’t have a lot of cases to be able to say the majority do well, now I can say it is possible.”

CANINES TRAILBLAZE TUMOR VACCINES
Advances in human medicine made Cricket’s miracle surgery possible. Packer now hopes that a vaccine developed by her colleague, Dr. Steven Dow at the Robert H. and Mary G. Flint Animal Cancer Center, will benefit pets and people with brain disease. The Canine Brain Tumor Vaccine Clinical Trial, a collaboration between the hospital’s neurology service and the FACC’s Tumor Immunology and Immunotherapy Laboratory, is enrolling dogs that have intra-axial tumors, which are usually in the glioma family and tend to grow deep within the brain.

“This is one of the tumor types that is most devastating to dogs and humans, and because of that, it is one of our greatest needs for effort in brain tumor research,” Packer said.

Most of us think of a vaccine as a shot that keeps us from getting a disease, but
a tumor vaccine is for a cancer that has already taken root.
“The term ‘vaccine’ means you are getting the immune system to fight something that you are targeting. In this case, it’s after the fact,” Packer said. “With a tumor vaccine, we are preventing the cancer from growing further. Because we are telling the immune system what cells to react to, we hope that the immune system reacts to the cells that are already there.”

Just as Packer began seeking dogs for the tumor vaccine trial, Nancy Brook and Mike Carlson of Billings, Mont., had started down a path with their dog, Lucky, that would lead to Packer’s clinic. The 14-year-old black lab mix was having seizures their veterinarian thought were probably caused by a brain tumor.

Brook and Carlson drove 12 hours in a midwinter ice storm to consult with Packer’s team. An MRI confirmed Lucky had a mass deep within her brain. Packer reviewed treatment options: medications, radiation, or surgery. Anti-seizure medication was somewhat controlling Lucky’s seizures, and Brook and Carlson weren’t sure the senior dog could withstand radiation or surgery. But they had come so far, and when Packer told them about a new clinical trial for a vaccine that might halt the tumor’s growth, they agreed to give it a shot.

“We thought ‘we’ve got nothing to lose,’” Brook said. “And if she was a part of this study, her life had meaning and she could help other dogs and people.”

Lucky was the first dog to enroll in the Canine Brain Tumor Vaccine Clinical Trial, and for the next month Lucky received a weekly cancer vaccine designed to stop the tumor’s growth, and hopefully, reverse it.

“Her neurological signs improved a lot, she was more alert, walking around better, and not having as many seizures,” Brook said. Halfway through the trial, Lucky’s kidneys began to fail and she died at the hospital.

“We were just really grateful to be there,” Brook said. “The thing that impressed me so much about CSU is it was like being in a human clinic. It was amazing to have that level of expertise, and it really did give us peace of mind.”

The tumor vaccine Lucky received targets cancer initiator cells that play a large role in tumor recurrence and metastatic disease. Unlike chemotherapy, which targets cancer cells through drugs that can have difficulty penetrating the blood-brain barrier, immunotherapy seeks to use the body’s own system to fight the cancer. Despite advances in chemotherapy, brain tumor outcomes have not really improved, Packer said.

“A tumor is sneaky and it co-opts the immune system,” said Dr. Amanda Guth, who also is working with the FACC’s Dow on the tumor vaccine. “You can throw radiation and chemo at tumors, but our best bet is to use the immune system. We are trying to battle against the tumor by arming the immune system to fight.”

As Packer enrolls more dogs in her trial, she hopes her research will build on the Tumor Immunology and Immunotherapy Lab’s work, and eventually lead to human trials.

Dr. Rebecca Packer collaborates with the Flint Animal Cancer Center to study minimally invasive surgical techniques and new therapies for the treatment of brain tumors.
ROOTS: I’ve always wanted to be a veterinarian. As a first-generation college student, it wasn’t until I started my undergraduate college education in my mid-20s that I realized this was a possibility. I could have a career I enjoy in a noble profession and make a difference every day. I have been married to my lovely wife, Nicole, for 13 years, and we have three terrific children. We talk about why I’m still in school, and my children understand the importance of higher education. My kids think it’s great that I’m going to be a veterinarian, and my daughter is also already showing a great interest in animals.

GIVING BACK: I definitely have two full-time jobs – as a parent and a student. It’s demanding, but fortunately I’m not alone. My wife and I are a great team. Also, the number of student-parents is on the rise, so a fellow veterinary student and I founded the CSU Vet Parents club. We wanted to create a club where veterinary students who are parents, are thinking of becoming parents, or simply want to support our cause could come together for support. We help each other juggle the rigor of this program and family life, collaborate on child care resources, plan family-friendly outings, and have guest speakers on parenting topics.

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