# ANNUAL REPORT

2019-2020

Columbine Health Systems
Center for Healthy Aging
COLORADO STATE UNIVERSITY

# MISSION

We unite and facilitate research teams across CSU's colleges and programs to bring convergence to the grand challenge of global aging.

# VISION

We are a transdisciplinary catalyst and nationally recognized resource for the discovery and application of research on biological, cognitive, psychological, social, and behavioral factors that lead to healthy and successful aging.

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**On the Cover:** *Butterflies are symbols of metamorphosis, enduring change, and the natural shift between life cycles. In 2020, the Center for Healthy Aging was its own site of transformation, pivoting our services as a newly established Center in order to respond to the COVID-19 pandemic. We dedicate the stories in this report to the countless faculty, students, colleagues, mentors, and community members who guided us as we grew and developed. Photo by Shutterstock.*

## Nicole Ehrhart, V.M.D., M.S.

Dr. Nicole Ehrhart is the director of the Columbine Health Systems Center for Healthy Aging at Colorado State University, where she leads an interdisciplinary research effort to identify basic and translational mechanisms that promote healthy aging. Ehrhart holds the Ross M. Wilkins M.D. Limb Preservation Foundation University Chair in Musculoskeletal Oncology and Biology. She is a board-certified veterinary surgeon (Diplomate ACVS; ACVS Founding Fellow in Surgical Oncology), a professor of surgical oncology in the Department of Clinical Sciences in the College of Veterinary Medicine and Biomedical Sciences, and a research faculty member at CSU's Robert H. and Mary G. Flint Animal Cancer Center. In her research lab, the Laboratory of Comparative Musculoskeletal Oncology and Traumatology, Ehrhart conducts translational aging, limb preservation, tissue engineering, and sarcoma research. Ehrhart holds joint faculty positions in the School of Biomedical Engineering, the Cell and Molecular Biology program, the Gates Regenerative Medicine Center at the University of Colorado, and the University of Colorado Cancer Center.

# A Note from the Director

It's safe to say CSU's Columbine Health Systems Center for Healthy Aging unfolded its wings at quite a unique moment in history.

When I stepped in to lead this nascent Center for Healthy Aging in August 2019 full of fresh ideas, excitement, and the goal to elevate our national prominence, I never would have anticipated that a global pandemic would prompt us to completely pivot our efforts just a mere eight months later. Our core team — including myself and my two extraordinary Associate Directors, Deana Davalos and Karyn Hamilton — set out with a plan, a strategic vision to grow this Center into a nationally recognized catalyst for interdisciplinary research on aging. Though our vision and mission have never changed, our journey certainly took an unexpected detour as the COVID-19 pandemic unfolded.

As you know, detours can sometimes lead to unexpected opportunities. This was certainly true for us. As the world began to grapple with lockdowns and uncertainty, the Center forged new relationships, strengthened existing ones, followed pathways we never expected, pivoted to serve our campus and community in a time of crisis, and the result has been — unexpectedly — *growth*. Our core team of three is now a team of seven full-time staff. Our recommendations for SARS-CoV-2 mitigation strategies in skilled nursing facilities and institutes of higher education have been heeded by public health officials in our state capitol and all the way in Washington, D.C. Meanwhile, our aging research and programming flourished and evolved through new cross-disciplinary collaborations and event offerings that have positioned the Center as a trusted resource on healthy aging both locally and nationally.

The talent, innovation, and passion of our campus, faculty, community collaborators, and supporters is the fuel that has ignited our progress and success. I invite you to review this annual report to learn more about our Center and its accomplishments, goals, and future directions. Most importantly, I wish to gratefully acknowledge our faculty, institution, and community for their support, contributions, creativity, and resilience that have resulted in a thriving Center for Healthy Aging.

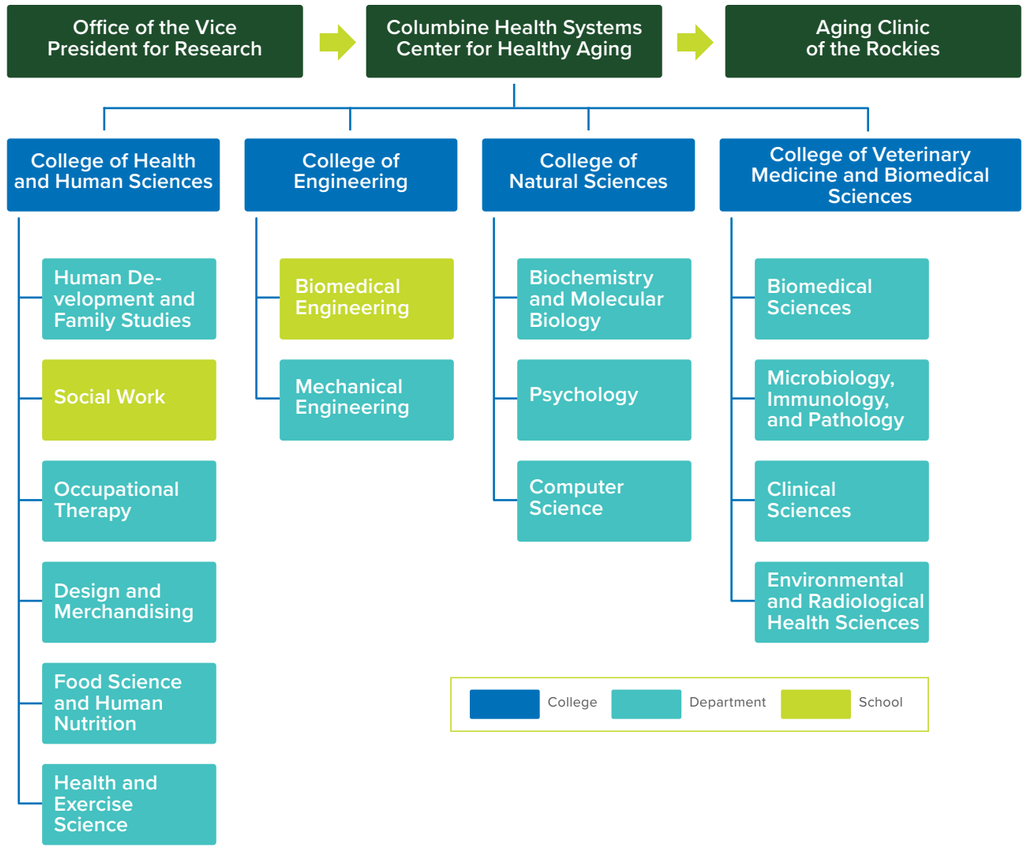
Warm Regards,

*Nicole Ehrhart*

# ABOUT THE CENTER

## Center Structure

Currently, 60 faculty members across four colleges and 15 departments are affiliated with the Center.




## Partnerships

Aging Clinic of the Rockies at Colorado State University

PAFC Partnership For Age-Friendly Communities in Larimer County

SENIOR ACCESS POINTS OF LARIMER COUNTY

LARIMER COUNTY

# ABOUT THE CENTER

## Leadership

### Deana Davalos, Ph.D.

Associate Director

Deana Davalos, Ph.D. is a licensed psychologist, director of the Aging Clinic of the Rockies, associate director of the Columbine Health Systems Center for Healthy Aging, and a professor in the Cognitive Neuroscience program in the Department of Psychology at CSU. She has published on issues surrounding cognitive aging and the neurophysiology of aging and is part of a multidisciplinary research team focused on developing community-based interventions for individuals with dementia-related diseases and their caregivers.

### Tom LaRocca, Ph.D.

Center Faculty Member; Healthy Aging Project Co-Founder

Tom LaRocca, Ph.D., is an assistant professor and director of the Healthspan Biology Lab in CSU's Department of Health and Exercise Science. He is also a faculty member at the Center for Healthy Aging. His laboratory studies the molecular biology and physiology of aging, and he is particularly interested in translational research (using laboratory science to develop practical applications or treatments that can help people). Current projects are focused on finding biology-based ways to increase healthspan, the period of life during which we are healthy and productive. LaRocca is also a former high school chemistry teacher and college instructor, so he enjoys bringing his interests into the classroom.

### Karyn Hamilton, R.D., Ph.D.

Associate Director

Karyn L. Hamilton, R.D., Ph.D. is a professor and the director of the Translational Research on Aging and Chronic Disease laboratory in the Department of Health and Exercise Science at Colorado State University. She also has the privilege of serving as an associate director of the Columbine Health Systems Center for Healthy Aging at CSU. Hamilton earned her Ph.D. at the University of Florida and completed postdoctoral fellowships at Baylor College of Medicine and the University of Florida. The overall objective of the TRACD laboratory is to understand the role of adaptation to stresses and maintenance of a functional mitochondrial proteome in the context of extending healthspan and maintaining function with aging. To accomplish this objective, she uses models of long life and increased healthspan including exercise, nutritional, pharmacological, and genetic models. In the TRACD lab, they enjoy using a highly collaborative approach and employ in vitro systems, in vivo animal models, and human participants to help identify mechanisms of healthspan extension and to translate their findings.



## Staff

### Annette Foster, CPA

Operations and Grant Manager

Annette Foster joined the Columbine Health Systems Center for Healthy Aging in late January 2020 as the director of operations and grants management. She plays a vital role in helping to facilitate grant submissions, post-award support, and overall operations of the Center's facilities and is providing invaluable leadership and vision during our growth phase. Foster is a graduate of Colorado State University's College of Business, a CPA, a former financial auditor and sole proprietor, and, prior to joining the Columbine Health Systems Center for Healthy Aging team, she served as a research project manager for CSU's Department of Atmospheric Science. She brings her extensive experience from all these various roles to contribute to the success of the Center, and hopes to gain some valuable tips for her own healthy aging as well! Foster was raised in Iowa and moved to Colorado with her husband in 1988. She has a daughter who graduated from CSU and a son who graduated from CU Boulder last spring (yes, there is a bit of rivalry during the Showdown), and her husband earned his master's degree at CSU. She loves to hike, ski, snowshoe, camp, backpack, and cycle, so Colorado is the perfect home and, clearly, CSU is a big part of her life.

### Alex Foster

Assistant Director of Development

Alex Foster comes to the Columbine Health Systems Center for Healthy Aging as part of the Vice President for Research development team. Foster's main focus is on raising funds for the Center, and he serves as lead support for philanthropic stewardship. He has a decade's experience building relationships in the sales profession, with his most recent experience in the veterinary industry. He received his degree in communication studies from Iowa State University and is currently seeking his M.B.A. from Colorado State University.

### Hannah Halusker

Communications and Outreach Coordinator

As the communications and outreach coordinator, Hannah Halusker develops multimedia communications and plans outreach events to help amplify the research and programming offered by the Center for Healthy Aging. She comes to the Center from South Carolina, where she received her B.S. in genetics (2017) and M.A. in communication, technology and society (2020) from Clemson University. At Clemson, Halusker served as a science writer in the College of Science and then as the director for a science and arts festival in nearby Greenville, S.C. She is thrilled to bring her passions for science communication and engagement to her role here at the Center. When she isn't working, you can find Halusker running, biking, reading, doing yoga, or hiking one of the many trails near her new home in Fort Collins.

### Ali Murphy

Administrative Assistant

Allison Murphy, or Ali as she likes to be called, is the administrative assistant at the Center for Healthy Aging. She recently moved to Fort Collins from Northern Virginia where she worked for a law firm specializing in special needs trusts, estates, and adult guardianship. Outside, she loves hiking, biking, trying her hand at artistic endeavors, cooking, and playing games with friends. Murphy is excited to facilitate faculty in all aspects of Center engagement and to be the friendly face you see at the reception desk when walking into the Center between 8 a.m. and 5 p.m. Please contact Murphy for help with directing clinical trials participants, room reservations, website update requests, office needs, mailing, Center AV issues, scheduling, and events planning.

# ABOUT THE CENTER

## Cutting-Edge Space, Growing Opportunities


*At right and above: The Center for Healthy Aging is located on the first floor of the CSU Health and Medical Center. Credit: Laura Pintauro*

In July 2017, the CSU Health and Medical Center opened its doors to the public with the mission of envisioning health for all faculty, staff, and students through its state-of-the-art facilities. Included in the brand-new building — which houses a walk-in urgent care, pharmacy, radiological imaging services, occupational health services, infusion therapy, and the entirety of the CSU Health Network for general and specialty medical services — is 7,000 square feet of space dedicated to the Columbine Health Systems Center for Healthy Aging, the Kendall Reagan Nutrition Center, and the Aging Clinic of the Rockies.

Suite 1400 at 151 W. Lake St. is bustling with research, education, and community engagement opportunities. The physical space at the Center for Healthy Aging includes two small conference rooms and two large multiuse classrooms and meeting spaces. Counseling rooms are used by KRNC and ACoR to provide nutrition and mental health therapy to CSU faculty, staff, and students and to Larimer County residents.

For faculty who are engaged in aging research, the Center also boasts a wet lab space, procedures room, three exam/intake rooms, a phlebotomy room, and several multiuse cubicles for graduate students or visiting faculty. This integrated suite is designed for collaborative research, fostering an environment in which cross-disciplinary research can take place and innovative ideas for healthy and successful aging can more easily flourish.

Since opening its doors, the Center has supported several research studies and clinical trials conducted by Center-affiliated faculty:

- The Adult Development and Aging Project research team uses the Center's classrooms to host the AgingPLUS clinical trial, which is designed to educate people about how to grow older in healthy ways. Each cohort of AgingPLUS attends four educational classes to explore strategies for successful aging and completes three sets of psychosocial and physical assessments over a 10-month period. AgingPLUS is supervised by principal investigator and professor, Manfred Diehl, of the Department of Human Development and Family Studies.
- Researchers in the MY-Skills Intervention for Chronic Pain enroll participants in an eight-week study to examine how gentle movement and education impact pairs of people – such as spouses, a parent and child, or friends – who both experience chronic pain and help each other manage their pain. Principal investigator and professor, Christine Fruhauf of the Department of Human Development and Family Studies, used the Center's classrooms to host the study until COVID-19 moved the intervention to an online setting.
- Assistant Professor Aga Burzynska of the Department of Human Development and Family Studies utilized space within the Center for her BrainFit study, in which participants engage in a variety of exercises to assess how physical activity relates to physical fitness, brain health, and cognitive aging.

Would you like to reserve the Center's research spaces, classrooms, or conference rooms? Are you interested in forming a cross-disciplinary research collaboration for a new project related to aging? Contact Ali Murphy at ali.murphy@colostate.edu to connect with the Center.

*Credit: Kristin Pintauro*

# The Center responds to the coronavirus pandemic

## Longitudinal COVID-19 screening study tracks virus in skilled nursing facilities

*Research associate Emma McGinnis performs a nasal swab. Credit: Sarah Ross, Health and Exercise Science*

The testing model developed at the Center was used as the standard of testing throughout the state of Colorado, and later the national model for COVID-19 surveillance in nursing home populations.

The Columbine Health Systems Center for Healthy Aging at Colorado State University has amassed one of the largest archives of longitudinally collected human samples of COVID-19 through their research in skilled nursing facilities.

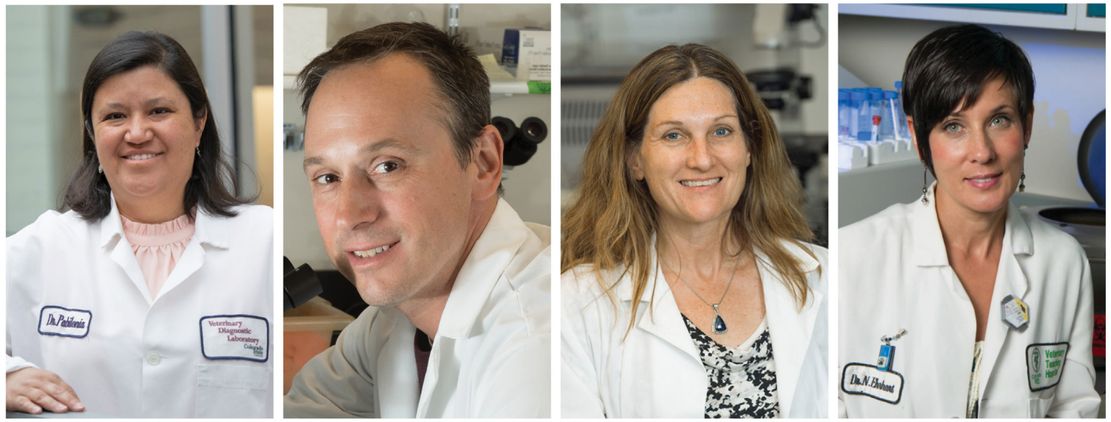
In the beginning of the COVID-19 pandemic, when other researchers were in the throes of developing diagnostic tests for COVID-19 or assessing the virus' infectivity in the population, the Center for Healthy Aging was thinking long-term: How does COVID-19 spread in nursing facilities, and how will the virus behave in the same nursing facility several months from now?

These initial research questions prompted the Longitudinal COVID-19 Screening Study in Senior Care Facilities. Researchers working on the study have now completed more than 350,000 COVID-19 tests in senior residential care communities throughout Colorado, poising the Center as a national leader in research on how COVID-19 affects older adults and rehab patients in senior nursing facilities.

### Asymptomatic spread

The study is fueled by a $4.3 million grant from the state of Colorado, awarded after a Spring 2020 pilot study in six senior care facilities showed that the number of new COVID-19 cases within facilities can be decreased by identifying asymptomatic staff or residents who are infected with the SARS-CoV-2 virus that causes COVID-19. In December 2020, researchers received additional funding to extend the study as the pandemic continues, bringing the total of the grant to $7.5 million.

The research team, led by Drs. Nicole Ehrhart, Greg Ebel, and Kristy Pabilonia, found that new infections were diminished by asking COVID-19-positive workers to self-isolate. By identifying these silent infections early, the researchers were able to minimize new infections over time, meaning that early detection of asymptomatic infections is an effective mitigation strategy in the fight against COVID-19.



*The research team includes, from left, Drs. Kristy Pabilonia, Greg Ebel, Sue VandeWoude, and Nicole Ehrhart.*

Genomic sequencing of the virus detected in the pilot research revealed that outbreaks were more often happening because the virus was spreading from person to person within the facility, rather than being repeatedly introduced to the facility via separate events.

With the funding from the state, the pilot study was expanded to 32 facilities where testing is ongoing. Genomic sequencing in the expanded cohort is examining how the virus spreads under the state's safer-at-home social guidelines, as compared to the restrictions imposed by the March 2020 stay-at-home order.

In the expanded study, researchers are administering weekly COVID-19 tests to workers and residents, as less-frequent testing has not provided adequate warning of an impending outbreak. The repeated testing of the same workers and residents is where the study gets its longitudinal component, allowing researchers to study questions such as: Why do some people recover more quickly from COVID-19 than others? Why are some people asymptomatic, whereas others become seriously ill from the virus?

Tracking the virus over time also helps researchers to map the epidemiology and pathology of the virus to know exactly when a person was infected and how far into their infection they might be, which is important in deciding how to treat the virus.

### Nationwide impact

Results from the longitudinal screening study are being continually shared with the Colorado Department of Public Health and Environment and have been solicited by the Centers for Disease Control to be shared with investigators in Washington, D.C. Ehrhart says the team often receives requests from researchers to study their dataset, due to its longitudinal design. The study continues to inform public health authorities and guide policy to minimize viral transmission within vulnerable populations.

Additionally, the testing model developed at the Center was used as the standard of testing throughout the state of Colorado, and later the national model for COVID-19 surveillance in nursing home populations.

Vivage Senior Living and Columbine Health Systems have also been instrumental partners in this ongoing work by actively assisting the research team in collecting data for these studies. ◆

# The Center responds to the coronavirus pandemic

## RESTARtT Study guides 'return to work' models for essential CSU staff and nursing facility workers


*Staff at the Human Performance Clinical Research Lab are conducting sample collections for the RESTARtT Study. Credit: Sarah Ross, Health and Exercise Science*

In partnership with the One Health Institute at Colorado State University, the Center has been co-leading the RESTARtT Study to understand how the SARS-CoV-2 virus spreads in senior care communities compared to a college campus – in this case, CSU – because it's likely that "one size does not fit all" when it comes to infection control recommendations and mitigation strategies, says Nicole Ehrhart, director of the Center for Healthy Aging. The RESTARtT Study intends to guide return-to-work models for these two vital Colorado workforce populations with different risk profiles to COVID-19: Colorado State University employees deemed "essential" staff during Colorado stay-at-home and safer-at-home orders and skilled nursing facility workers.

The ongoing study, funded by the Boettcher Foundation, has found that CSU employees working during stay-at-home and safer-at-home orders experienced an extremely low rate of COVID-19 infection, indicating a very low level of exposure (<.2%) from March to August 2020. This was much lower than the Larimer County positivity rate in August 2020, which speaks to the very high rule compliance in CSU staff regarding the University's COVID-19 Health and Safety Policy. Importantly, this analysis provides a national example of the ability of a complex workforce and institute of higher education to conduct business safely during the COVID-19 pandemic.

However, in contrast to the CSU employee population, serologic (blood) analysis of asymptomatic SNF workers indicates a high level of prior exposure to COVID-19. In other words, a high percentage of workers in senior care facilities that have had a prior outbreak have antibodies to COVID-19, suggesting that workers have been exposed to the virus in the workplace. Future studies will determine levels of exposure that correlate with "herd immunity" in SNF and the relationship between active infection, seropositivity, and viral neutralization titers.

Another takeaway from the study finds that several laboratory-based serologic assays perform with equivalent sensitivity to FDA emergency use authorization studies, placing CSU's COVID-19 screening tools on par with the more widely available and regularly used COVID-19 screens outside the University.

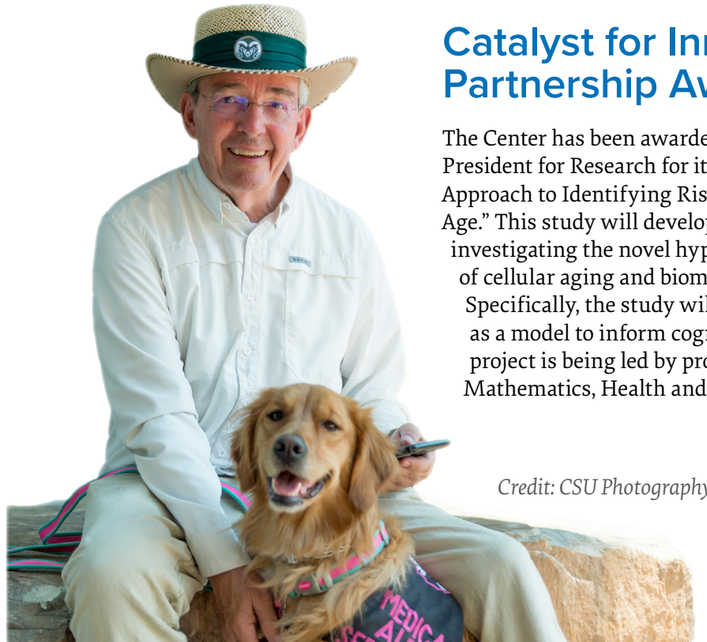
"CSU has been a leader in many aspects of COVID-19 research, and my colleagues, Drs. Greg Ebel, Kristy Pabilonia, and Sue VandeWoude, who have been working on these projects with me, have been essential partners in making this effort successful," Ehrhart said. "With the huge amount of data we have collected, I believe we will continue to answer some of the most pressing questions surrounding vulnerable populations and how to best protect these communities." ◆



## The Colorado Longitudinal Study

The Colorado Longitudinal Study is a biobank and health data collection effort designed to follow 1 million Coloradans over 10 years. Biological specimens (blood, urine, and stool) are collected once yearly over a 10-year timeline. Once collected, COLS is matching specimens with data on social determinants of health, lifestyle factors, and health history, investigating the link between genetics, metabolism, environment, and behavior to health outcomes and aging trajectories. This unique longitudinal biobank will be used to determine associations between environment and health and identify specific interventions to support healthy aging throughout the human life span. The Center for Healthy Aging is a "first engagement center" for the collection of participant specimens. Director of the Center, Dr. Nicole Ehrhart, and director of the Robert H. and Mary G. Flint Animal Cancer Center, Dr. Rodney Page, are collaborators on COLS, providing expert guidance to the COLS team. The Center, in partnership with COLS, is working to create a paired human-dog biobank as an extension to this longitudinal human specimen biobank. For this cohort, humans and dogs living in the same households will have specimens collected on the same day over a five-year period. The overarching goal is to identify common biomarkers between humans and dogs that influence aging and to determine if dogs are sentinels of human aging trajectories. The long horizon goal is to develop interventions to slow cellular aging and improve healthspan in both humans and companion dogs.

*Credit: CSU Photography*



## Catalyst for Innovative Partnership Award

The Center has been awarded a $200,000 grant from the Office of the Vice President for Research for its proposal, "A Translational and Comparative Approach to Identifying Risk for Cognitive Impairment with Advancing Age." This study will develop a cells-to-dogs-to-humans research pipeline, investigating the novel hypothesis that extracellular vesicles are drivers of cellular aging and biomarkers of risk for cognitive impairment with age. Specifically, the study will investigate age-related cognitive decline in dogs as a model to inform cognitive decline in humans. The transdisciplinary project is being led by professors in the departments of Psychology, Mathematics, Health and Exercise Science, and Clinical Sciences at CSU.

*Credit: CSU Photography*

## ‘Innovative Research in Aging’ Pilot Grant Program

In partnership with the Office of the Vice President for Research, the Center has funded **five** pilot grants for a total of **$200,000** to unite investigators interested in aging research and to provide seed monies for high-risk, early-stage aging research:

### Enriching Experiences for Healthy Aging: Measuring Enhanced Well-Being for People With Cognitive Impairments and Their Informal Caregivers Through the Analysis of Telomere Length

*Meara Faw, Deana Davalos, Jennifer Cross, Laura Malinin, Susan Bailey, Wendy Wood, Agnieszka Burzynska, Lindsey Wilhelm; departments of Communication Studies, Psychology, Sociology, Design and Merchandising, Environmental and Radiological Health Sciences, Occupational Therapy, Human Development and Family Studies, Music*

In this project, researchers examined the effects of enriching experiences, such as attending symphony concerts, live theater events, and dance performances, on cognition and telomere length in adults with dementia and their caregivers. Telomeres, the caps at the ends of chromosomes, are known to shorten with age, contributing to the onset of disease and increased mortality. Preliminary data from the study suggests that adults who attended more social events showed promising changes in their telomere lengths when compared with those who attended fewer events. The team also found associations within caregiver-care recipient dyads, with their changes in telomere length mirroring one another over time. Faw says the team hopes to further unpack these findings in a larger project that examines cognitive test results and social well-being measures in conjunction with changes in telomere length among participants.

### Tissue Engineering Strategies for Promoting Rapid Fracture Healing in Osteoporotic Bone

*Nicole Ehrhart, Christian Puttlitz, David Prawel, Gerrit Bouma, Jeremiah Easley; departments of Clinical Sciences, Mechanical Engineering, Biomedical Sciences*

As the population ages, osteoporosis is emerging as a major public health problem, affecting both women and men and incurring $13.8 billion in direct medical costs per year. This unmet clinical need has garnered significant interest in the application of tissue engineering strategies to stimulate bone repair. In this project, the investigators sought to improve osteoporotic fracture healing using orthobiologic and osteoconductive technologies, which are biological and bioengineered substances that help musculoskeletal injuries heal quicker by improving the ability of cells to form new bone over time. The team designed 3D scaffolds made of mesenchymal stromal cells and studied the exosomes derived by the cells to see whether the cells secreted pro-regenerative signals that promoted fracture healing in a sheep model of osteoporosis. Results found some indication of bone-forming biologic activity across the 3D scaffolds, but no significant increase in mechanical stiffness, bone density, or bone area with the addition of stem cells or stem-cell-derived exosomes. The investigators are submitting a manuscript of their findings in early 2021 and are targeting a National Institutes of Health R01 grant submission to optimize their 3D scaffold in future studies.

### Identifying Cognitive Stimulation in Everyday Activity via Wearable EEG

*Allison Bielak, Don Rojas, and Christopher Brydges; departments of Human Development and Family Studies, Psychology*

This study evaluated the cognitive stimulation offered by different cognitive tasks by having older adults use wearable electroencephalography. The three cognitive tasks evaluated were a reaction-time task, a word-search task, and a piano-learning task. Of the 20 cognitively healthy older adults who participated in the study, researchers found significant differences in cognitive engagement via EEG across the three tasks, where the piano task elicited the highest level of engagement. The team’s study demonstrates the first objective evidence of the differences between lifestyle activities and the cognitive stimulation they provide.

### Contribution of Intra-Abdominal Immune Dysfunction to Musculoskeletal Inflammaging

*Kelly Santangelo, Michelle Foster, Karyn Hamilton, Christian Puttlitz, Katie Trella Sikes; departments of Microbiology, Immunology and Pathology, Food Science and Human Nutrition, Health and Exercise Science, Mechanical Engineering, Clinical Sciences*

Evidence suggests that age-associated increases in reactive oxygen species and inflammation, collectively referred to as “inflammaging,” are associated with the pathogenesis of musculoskeletal conditions such as osteoarthritis, sarcopenia (decline in muscle mass/function), and bone/skeletal fragility. The goal of this interdisciplinary study was to determine whether the gastrointestinal tract plays a fundamental role in the progression of musculoskeletal inflammaging. To date, researchers have found that ablation of the mesenteric lymph nodes, which are considered the “sentinels” of the intestine, decreased the progression of OA and sarcopenia in a rodent model of inflammaging, particularly in female animals. Work continues to determine the influence of this treatment on bone and tendon.

### Brain and Lifestyle Mechanisms of Healthy Cognitive Aging

*Michael Thomas, Agnieszka Burzynska, Kaigang Li; departments of Psychology, Human Development and Family Studies, Health and Exercise Science*

This project studies neural biomarkers of healthy and dementia-free aging using innovative magnetic resonance imaging techniques. The researchers have implemented state-of-the-art structural imaging protocols and developed a cognitive “mental stress test” that can be used to better understand brain changes with age. Future directions will explore how biomarkers of brain and cognitive health are affected by lifestyle (e.g., exercise) and occupational exposures (e.g., handling pesticides). The ultimate goal of the project is to provide clinicians and researchers with the tools and knowledge they need to promote successful aging.

# Colorado State University in pursuit of 'Age-Friendly University' status

The Center for Healthy Aging is spearheading CSU's efforts toward becoming an "Age-Friendly University," a designation that recognizes a culture of lifelong learning and age-inclusivity across programs and practices in institutions of higher education.

The AFU Global Network, created by Dublin City University and endorsed by the Gerontological Society of America and the Academy for Gerontology in Higher Education, consists of a growing list of more than 65 universities and colleges worldwide that have endorsed the 10 Age-Friendly University Principles.

Age-friendly universities have committed to developing educational and research opportunities that respond to the needs and desires of an increasingly older population. According to the Department of Health and Human Services' Administration on Aging, it is estimated that the number of older adults aged 65+ in the United States will double by the year 2060, from 48 million people in 2015 to 98 million people. Studies of this "population aging" predict a future where jobs in the aging industry are in demand; that older adults will have not one but two or more careers across their lifetimes; and globally, the status quo of education, work, urbanization, food and water security, and more will shift.

"Population aging means that more older adult learners are looking to higher education to meet their professional needs as they experience longer work lives, a return to work, or opportunities in encore careers," said Nicole Ehrhart, director of the Columbine Health Systems Center for Healthy Aging at CSU. "CSU's road map to achieve a designation as an Age-Friendly University will benefit all members of the academic community by expanding intergenerational learning opportunities and programs that support an age-diverse student body."

> Adding the designation of Age-Friendly University to CSU's list of accolades is a natural extension of programs and practices already in place locally and regionally.

## Guided by age-friendly principles

As an institution whose land-grant mission prioritizes research and innovation, inclusion and equity, service and engagement, education, and excellence, CSU has long been guided by principles that align with those of an Age-Friendly University. And, the University already has a compelling case for applying for AFU status.

The Center for Healthy Aging unites 60 faculty members across four colleges who are researching critical aging issues through lenses such as psychology, engineering, health and exercise science, veterinary medicine, behavioral science, and beyond. Clinical trials and research studies are regularly spearheaded by Center-affiliated faculty, making aging a core research focus at the University alongside areas of sustainability, energy, public health, infectious diseases, and more.

*Assistant Professor Aga Burzynska works with a participant in her BRAiN Laboratory. Credit: Joe Mendoza*

On the education front, the Department of Human Development and Family Studies offers bachelor's and master's degrees that introduce students to life span development from birth to adulthood, as well as an undergraduate interdisciplinary minor in gerontology that develops students' understanding of the aging process. Aging-related courses can also be found in a number of other departments and degree programs, such as Nutrition and Aging in the Department of Food Science and Human Nutrition, or Physical Activity Throughout the Life span in the Department of Health and Exercise Science.

In addition, CSU's Northern Colorado location is highly regarded for its commitment to healthy aging. Both Larimer County and the state of Colorado are enrolled in the AARP Network of Age-Friendly States and Communities, with elected officials and community leaders having pledged to make this region a healthy, accessible, inclusive place to live for both younger and older people.

## Gap analysis underway

Adding the designation of Age-Friendly University to CSU's list of accolades is a natural extension of programs and practices already in place locally and regionally. It would also position CSU as the first Age-Friendly University in the state — another perk to the endeavor.

To aid in the pursuit of AFU status, the Center for Healthy Aging partnered with the University of Massachusetts System and Lasell University in 2020 to take part in the Retirement Research Foundation for Aging grant-funded study, Taking the Pulse of Age-Friendliness in Higher Education in the U.S. Today. Using survey and inventory tools created for the study, the Center is planning to conduct a gap analysis in Spring 2021 that will identify CSU's current strengths, gaps, and opportunities for growth regarding age-friendliness and age-inclusivity in the campus community. The results of the gap analysis will be shared with University leaders to develop an action plan and working group for addressing age-friendliness on campus and will also bolster CSU as we apply for AFU status in late 2021. ◆

# ENGAGEMENT

Many of the Center's programs and services launched in 2020 after the Center came under new leadership and staffing, which coincided with the beginnings of the COVID-19 pandemic. As a result, all offerings listed here shifted to an online format in April 2020.


*Organizers and panelists of the COVID-19 Expert Panel Q&A.*

## Events

### COVID-19 Expert Panel Series

The Center for Healthy Aging, in partnership with CSU Extension and Senior Access Points of Larimer County, created the COVID-19 Expert Panel Series to provide clarity to the emerging COVID-19 pandemic by giving CSU faculty experts a platform to answer community questions about public health safety, vaccines, virus transmissibility, mental health strategies, travel, caregiving, and more. Panelists include faculty members in gerontology, infectious disease, biosafety, psychology, food safety, and geriatric medicine. These webinars began in May 2020 and are ongoing. **An average of 31 community members attend these panels each month.**

### Healthy Aging Fitness

In line with the Center's mission to provide evidence-based outreach and education about healthy aging, Healthy Aging Fitness was established in November 2020 with the goal of offering a free, all-levels exercise class to older adults in Northern Colorado. The class also provides educational opportunities for student trainers from the CSU Rec Center and practicum students from the Department of Health and Exercise Science who create the workouts, lead the classes, and develop lessons about healthspan and healthy aging that are taught alongside the workout. **In November and December 2020, these workouts attracted an average of 17 participants each.**

### Healthy Aging Speaker Series

This seminar series showcases the latest in aging research coming from CSU faculty, students, and beyond. These lunch-and-learn-style talks occur on a monthly basis and feature speakers who specialize in biological, cognitive, psychological, social, and behavioral factors of aging. **In 2020, these seminars averaged 44 attendees per lecture.**

**APRIL 23**

**Great Danes and Granddads: How Man's Best Friends Hold the Key to Changing Aging.** *Nicole Ehrhart, Director, Columbine Health Systems Center for Healthy Aging*

**MAY 22**

**Ideas on How to Increase Healthspan.** *Tom LaRocca, Assistant Professor, Department of Health and Exercise Science*

**JUNE 18**

**Connect, Collaborate, Thrive: Moving Through Parkinson's.** *Lisa Morgan, Instructor, CSU Dance*

**JULY 16**

**Aging Well with Mindfulness.** *Stephanie Rayburn, Doctoral Student, Department of Human Development and Family Studies*

**AUG. 27**

**Lifestyle Modifiers of Brain Aging.** *Aga Burzynska, Assistant Professor, Department of Human Development and Family Studies*

**SEPT. 17**

**Determinants of Driving Function in Older Adults.** *Neha Lodha, Assistant Professor, Department of Health and Exercise Science*

**OCT. 22**

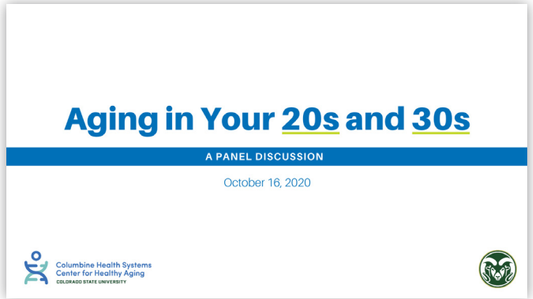
**Advance Care Planning.** *Mindy Rickard, Project Coordinator, Advance Care Planning Team, Health District of Northern Larimer County*

**NOV. 19**

**Banking on a New Understanding.** *Marta Castelhano, Director, Cornell Veterinary Biobank, Cornell University*

### "Aging in Your 20s and 30s" Panel Discussion

Research shows that people in their second and third decades rarely engage with the topic of healthy aging, even though aging is something that affects us all. This panel discussion aimed to provide evidence-based tips for young people on how to develop healthy living practices that support longevity and long-term health. Panelists included Assistant Professors Gloria Luong and Allyson Brothers from the Department of Human Development and Family Studies, Associate Professor Michelle Foster from the Department of Food Science and Human Nutrition, and Teaching Faculty Member Rick Perry from the Department of Health and Exercise Science. **This event was held on Oct. 16, 2020, and had 68 attendees.** The Center hopes to make this the first in a broader series of "Aging Across the Life Span" webinars that support CSU's Age-Friendly University initiative.




Interested in attending one of the Center's healthy aging events? To register, contact Hannah Halusker at hannah.halusker@colostate.edu.

# ENGAGEMENT

## Programs & Services

### Counseling Services and Neuropsychological Testing

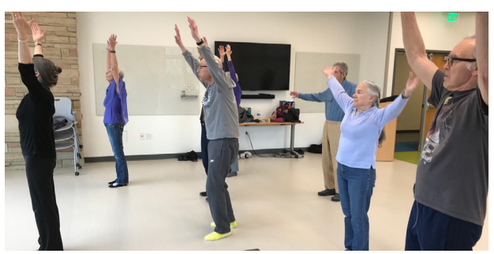
The Aging Clinic of the Rockies is a local nonprofit mental health agency that offers professional counseling services to address the psychological needs of older adults and their loved ones. The clinic is part of a network of mental health services in the Department of Psychology at Colorado State University and is physically located within the Center for Healthy Aging in the CSU Health and Medical Center.

From August 2019 to December 2020, the staff at ACoR provided:

- 180 hours of service for 25 clients in the Senior Peer Counseling program
- 94 hours of sessions for 11 clients in the Caregiver Counseling program
- six neuropsychological assessments

Each of these programs has seen a 25%-50% increase in services from August 2019 to December 2020 as compared to the same timeframe ending in 2018.

In July 2020, ACoR received a $61,700 grant from National Community Care Corps to establish the Caregiver Mentorship Program, designed to support novice caregivers by pairing them with experienced caregivers who are trained as peer counselors. By December 2020, ACoR staff had recruited seven mentees for the Caregiver Mentorship Program and provided approximately 75 hours of service.



*CSU dance instructor Lisa Morgan leads a group of older adults during a Moving Through Parkinson's session on campus in Spring 2018. Credit: CSU Photography*

### Moving Through Parkinson's

Led by CSU dance instructor, Lisa Morgan, these classes are designed for people living with Parkinson's disease and their caregivers who want to improve balance, combat stiffness and rigidity, and improve coordination and spatial awareness. Using dance as therapy, Morgan and students from CSU's Department of Occupational Therapy lead the group in small-motor tasks and full-body movements, all timed to music played by CSU music therapy students. Participants have come from Larimer and Weld counties and as far away as Denver, Steamboat Springs, Leadville, and Laramie to take part in Moving Through Parkinson's, which is supported by the Parkinson's Association of the Rockies and the Parkinson's Support Group of Larimer County. **In 2020, MTP served four-12 participants per class through in-person and virtual programming.**

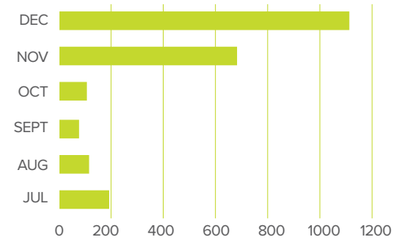
### THRIVE Project

This project, funded by CARES Act dollars from the Larimer County Office on Aging, provides student-facilitated virtual and telehealth services to address the needs of older adults who have been marginalized or isolated due to the COVID-19 pandemic. Participants work with a care coordinator to select a customized "menu" of services that best suits their immediate needs, such as technology assistance, guided social support groups, music connection, animal-related activities, care coordination, exercise and wellness activities, caregiver respite care, and nutrition counseling. Several CSU departments and programs have collaborated with the Center to provide services for the THRIVE Project, including faculty and students from the Aging Clinic of the Rockies, music therapy, Human-Animal Bond in Colorado, social work, gerontology, health and exercise science, human development and family studies, and the Kendall Reagan Nutrition Center. The THRIVE Project launched in November 2020 and is ongoing as the COVID-19 pandemic continues. **As of December 2020, THRIVE had enrolled 10 participants in Larimer County.**

## Social Media Growth from July to December 2020 | @CSU Healthy Aging

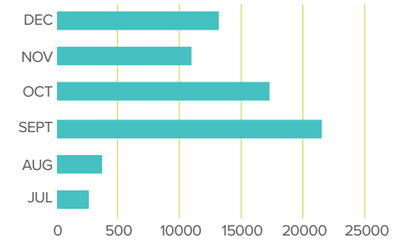
**280 ➡ 325 followers +45**

MONTHLY FACEBOOK REACH




**14 ➡ 97 followers +83**

MONTHLY TWEET IMPRESSIONS




### Top Posts from July to December 2020

"Announcing Dr. LaRocca's supplemental grant from the NIA"

MOST REACH: **556** PEOPLE

"Sharing Dr. Ehrhart's radio interview with KFFR 88.3"

MOST REACTIONS: **115** LIKES


"Announcing the creation of Healthy Aging Fitness"

**1,108** IMPRESSIONS | **16** ENGAGEMENTS

"Reporting on the results of the RESTARtT study"

**1,039** IMPRESSIONS | **21** ENGAGEMENTS

## Website Traffic from Jan. 1, 2020, to Jan. 1, 2021

### Top Webpages

Aging Basics: "Body Temperature"

**2,000** VIEWS

Aging Blogs: "Vegetarianism for a Long Life"

**721** VIEWS

**20,189** UNIQUE PAGE VIEWS
includes all pages on our website

**4.30%** OF VIEWS
within all OVPR websites

VIEWERS FROM **5** COUNTRIES
includes U.S., Canada, Kenya, Singapore, Australia

# FINANCIAL REPORT

## Total Operating Expenses

**$323,422** 2019-2020

## Projected Expenses

**$401,300** 2021 **$500,300** 2022

### In 2019-2020, aging research at CSU resulted in:

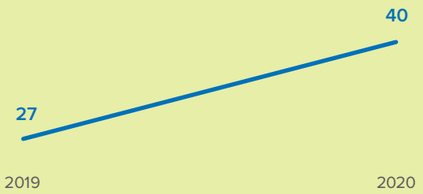
PROPOSALS SUBMITTED **67**

PROPOSAL FUNDING REQUESTED **$36.4M**

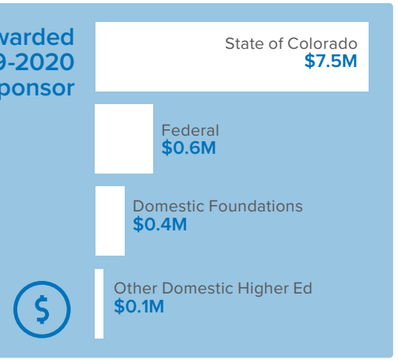
**$8.6 MILLION** TOTAL FUNDED IN 2019-2020

## Aging-Related Research Proposals

**# Submitted**

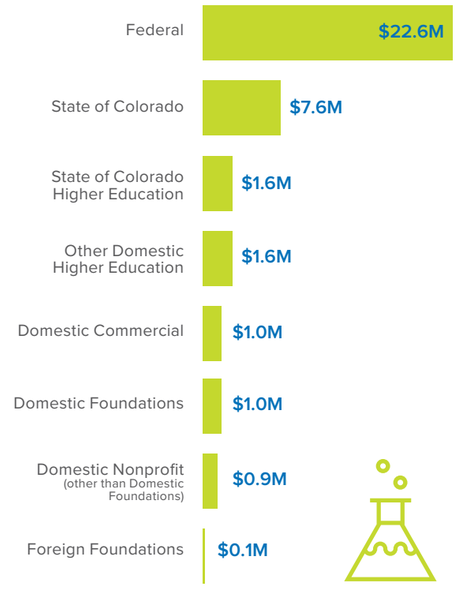



## Total Awarded in 2019-2020 by Sponsor




## Aging-Related Research Proposals

**$36.4M Requested by Sponsor**






The Center is supported by a number of partners, both internal and external to the university and across government and industry. To those who supported us in 2019-2020, we thank you for helping us to grow the Center for Healthy Aging in this pivotal moment.

## External Awards

**$7,944**
7/1/20 TO 3/31/21
**Larimer County** *(PI Ehrhart)*
Participate in collaborative project with Larimer County to address critical needs of the aging populations through their Next50 Initiative. Develop relationships with Senior Access Points and Larimer County to meet the Center mission for engagement.

**$7,471,459**
5/19/20 TO 6/30/21
**Colorado Department of Public Health and Environment**
*(PI Ehrhart, Co-PIs Ebel and Pabilonia)*
Repeated surveillance testing of both workers and residents in skilled nursing facilities to provide: (1) an early warning system to enable public health officials and SNF managers to appropriately monitor exposure risks of highly vulnerable residents and, (2) a plan for redeployment of a recovered workforce to provide appropriate standards of care.

**$250,000**
5/12/20 TO 1/31/21
**Boettcher Foundation**
*(PI VandeWoude, Co-PIs Ehrhart, Ebel, Nelson, and Lynn)*
Paired PCR surveillance and serotesting in two unique, but critical workforce communities in Colorado: skilled nursing facility workers, and University community members, to guide return-to-work models.

**$109,220**
5/12/20 TO 1/31/21
**One Health Institute, Ebel Lab, CSU Health Network, OVPR, CHA**
Provided funding to support work for Boettcher Foundation project.

**$42,694**
11/16/20 TO 9/30/21
**Larimer County Department of Human Services**
*(PI Davalos, Co-PI Ehrhart)*
An interdisciplinary approach to meeting older adults' health needs in addition to cognitive stimulation to maintain and promote health in older adults during the pandemic period and beyond.

**$7,881,317** **TOTAL EXTERNAL AWARDS**

## Internal Funding

**$200,000**
12/1/20 TO 5/31/23
**OVPR Internal CIP Funding**
*(PI Hamilton)*
Develop a cells-to-dogs-to-humans research pipeline, investigating hypothesized drivers of cellular aging and biomarkers of risk for cognitive impairment with age.

**$20,000**
APR 2020
**Internal Funding from CHHS, WSCOE, CNS, and CVMBS**
Support pilot study for SARS-CoV-2 testing in skilled nursing facilities.

**$20,000**
JUN-AUG 2020
**Internal Funding from CNS, CHHS, CAS, and Engagement**
Support Data Science Research Institute – senior care facility unique predictive COVID-19 response biomarker dataset.

**$240,000** **TOTAL INTERNAL FUNDING**

## Donations

| | |
|---|---|
| **$670** | **Crowdfunding Campaign** 2019 |
| **$5,000** | **International Neuroscience Network Foundation** MARCH 2020 |
| **$1,635** | **Crowdfunding Campaign** 2019-2020 |
| **$60,000** | **Arrow Electronics** SEP 2020 |
| **$67,305** | **TOTAL DONATIONS** |

## Miscellaneous

**$240,000** **Ortho Diagnostics** OCT-DEC 2020
Support for the longitudinal COVID-19 screening study sample archive.

# AFFILIATE FACULTY

**A key goal of the Center is to bring together faculty working on cutting-edge research in topics related to healthy aging. Currently, 60 faculty members across four colleges and 15 departments are affiliated with the Center. Please email healthyaging@colostate.edu if you are interested in finding out more about the Center or having your information included on this page.**

## College of Engineering

**Jianguo Zhao** | **Mechanical Engineering**
Design and control of robotics devices.

**Stu Tobet** | **School of Biomedical Engineering**
Structures in the brain that control neuroendocrine functions; Microbiome and aging.

**Zhijie Wang** | **Mechanical Engineering**
Cardiovascular biomechanics at different scales (single segment of artery to whole organs, including the heart and lungs).

## College of Health and Human Sciences

**Allyson Brothers** | **Human Development and Family Studies**
Promotion of healthy aging throughout the lifespan; attitudes toward aging and awareness of age-related change; the influence of attitudes toward aging on health, well-being, and health behaviors; rural aging experiences.

**Laura Malinin** | **Design and Merchandising**
Age-related cognitive decline and enriched environments.

**Chris Gentile** | **Food Science and Human Nutrition**
Novel treatments to preserve endothelial function in aging.

**Sarah Johnson** | **Food Science and Human Nutrition**
Functional foods, cardiovascular disease, and post-menopausal women.

**Mike Pagliassotti** | **Food Science and Human Nutrition**
Aging and nonalcoholic fatty liver disease, novel treatments.

**Tom LaRocca** | **Health and Exercise Science**
Biological mechanisms of aging; interventions for increasing healthspan.

**Chris Bell** | **Health and Exercise Science**
Diabetes; control of blood glucose in aging.

**Barry Braun** | **Health and Exercise Science**
Effects of physical activity and pharmacology on prevention and management of Type 2 diabetes.

**Frank Dinenno** | **Health and Exercise Science**
Regulation of blood flow and how the basic control mechanisms become impaired with aging and disease.

**Brett Fling** | **Health and Exercise Science**
Neuromechanics, brain imaging, gait, and balance in multiple sclerosis, Parkinson's, aging.

**Karyn Hamilton** | **Health and Exercise Science**
Integrative, comparative, and translational approaches to increasing human healthspan.

**Dan Lark** | **Health and Exercise Science**
The contribution of secreted extracellular vesicles (i.e., exosomes) to age-related metabolic disease.

**Heather Leach** | **Health and Exercise Science**
Physical activity interventions to minimize recurrence and optimize physical health and well-being in cancer survivors.

**Neha Lodha** | **Health and Exercise Science**
Neurophysiology and motor skill rehabilitation in stroke and TIA.

**Brian Tracy** | **Health and Exercise Science**
Examining the mechanisms that explain neuromuscular decline with aging and the physical functional consequences of the changes.

**Allison Bielak** | **Human Development and Family Studies**
Normal and pathological cognitive changes in adulthood; influence of lifestyle factors on cognitive aging; intraindividual variability in cognitive speed and how it relates to cognitive ability, health, and possible dementia prediction.

**Aga Burzynska** | **Human Development and Family Studies**
Interconnections between brain structure and function, cognitive functioning, and physical health in older age.

**Manfred Diehl** | **Human Development and Family Studies**
Awareness of age-related change and its role in successful aging; personality development in adulthood and its contribution to successful aging; experience and regulation of emotion in adulthood.

**Christine Fruhauf** | **Human Development and Family Studies**
Grandparent and grandchild relationships; grandparents raising grandchildren; GLBT grandparenting.

**Gloria Luong** | **Human Development and Family Studies**
Socioemotional dynamics and emotion regulation across the life span; emotional and physiological stress reactivity and recovery; developmental links between social relationships, emotions, health, and well-being.

**Karen Atler** | **Occupational Therapy**
Satisfaction and meaningfulness of time use and everyday activity.

**Anita Bundy** | **Occupational Therapy**
Fitness to drive; everyday time use.

**Aaron Eakman** | **Occupational Therapy**
Meaningfulness of everyday activity; behavioral (i.e., non-pharmacological) interventions to promote sleep.

**Matt Malcolm** | **Occupational Therapy**
Self-management of chronic conditions, especially diabetes, in primary care settings. Management of big data sets esp. related to responsiveness to therapeutic interventions.

**Mackenzi Pergolotti** | **Occupational Therapy**
Occupational therapy interventions for older adults with cancer; policy and management of large data sets, especially related to uptake of therapeutic interventions; disparities in access to health care.

**Pat Sample** | **Occupational Therapy**
Reflections of wise elders.

**Arlene Schmid** | **Occupational Therapy**
Complementary and integrative therapies such as yoga for fall prevention in older adults and people with stroke or other neuro conditions; self-management of chronic conditions.

**Wendy Wood** | **Occupational Therapy**
Long-term residential care for dementia; animal-assisted interventions for older adults.

**Eunhee Choi** | **Social Work**
Aging, health, and policy, particularly for older workers and volunteers; research methodology and program evaluation.

**Jennifer Portz** | **Social Work**
Public health, gerontology, and the use of technology interventions with older adults.

# AFFILIATE FACULTY

## College of Natural Sciences

**James Bamburg** | **Biochemistry and Molecular Biology**
Role of the actin cytoskeleton in neuronal growth and regeneration, pathfinding, and in neurodegenerative diseases, especially Alzheimer's disease.

**Eric Ross** | **Biochemistry and Molecular Biology**
Yeast prions as a model for amyloid diseases, including Alzheimer's disease, Parkinson's disease, and transmissible spongiform encephalopathies.

**Michael Thomas** | **Psychology**
Schizophrenia, aging, and dementia; Development of tests to improve the collection and interpretation of cognitive and brain imaging data.

**Tingting Yao** | **Biochemistry and Molecular Biology**
Regulatory mechanisms in DNA repair and gene expression; ubiquitin signaling in macroautophagy

**Shrideep Pallickara** | **Computer Science**
Cloud computing, distributed systems, content distribution networks, streaming systems.

**Jeanette Cleveland** | **Psychology**
Understanding self and other age-related perceptions (and also affect and behavior) that influence the decisions, productivity, and well-being of (and regarding) middle-aged and older workers.

**Deana Davalos** | **Psychology**
Understanding the development of time-processing abilities over the life span, including older adults, with emphasis on processing time accurately.

**Ed DeLosh** | **Psychology**
Aging and memory, including effects of physical fitness on age-related declines in memory.

**Gwen Fisher** | **Psychology**
Health and well-being among older workers; retirement, work ability, and prolonged working life; work/non-work interface, including work/non-work conflict, enhancement, and work/life balance.

**Matt Rhodes** | **Psychology**
Understanding individual differences in memory, including the impact of healthy aging on memory function.

**Silvia Sara Canetto** | **Psychology**
Cultural scripts of suicide and hastened death; the paradox of U.S. older-adult white men's suicide vulnerability; Stereotypes of gender, sexual orientation, and aging.

## College of Veterinary Medicine and Biomedical Sciences

**Susan Bailey** | **Biomedical Sciences**
Role of chromosomes and telomeres in cancer and other human disease states, tumorigenesis, and aging.

**Adam Chicco** | **Biomedical Sciences**
Various aspects of heart health and disease from the molecular to systemic levels and relation to aging.

**Frederic Hoerndli** | **Biomedical Sciences**
*C. elegans* genetics and in vivo microscopy to study synaptic aging and neurodegeneration.

**Seonil Kim** | **Biomedical Sciences**
Neurobiological mechanisms in aging and Alzheimer's disease.

**Julie Moreno** | **Microbiology, Immunology, and Pathology**
Cellular stress mechanisms in protein misfolding neurodegenerative diseases, and aging.

**Mike Tamkun** | **Biomedical Sciences**
Neuronal response to stroke/ischemia; cell biology of traumatic brain injury.

**Susan Tsunoda** | **Biomedical Sciences**
Drosophila genetics to study neurodegenerative disease; aging and Alzheimer's disease.

**Ron Tjalkens** | **Environmental and Radiological Health Sciences**
Neuroinflammatory mechanisms in neurodegenerative disorders, particularly disorders of the basal ganglia such as manganism and Parkinson's disease.

**Edward Hoover** | **Microbiology, Immunology, and Pathology**
Prion biology.

**Candace Mathiason** | **Microbiology, Immunology, and Pathology**
Examining the impact that physical and mental functioning have on the health disparities (e.g., chronic diseases) experienced by older adult Latinos and their caregivers.

**Kelly Santangelo** | **Microbiology, Immunology, and Pathology**
Osteoarthritis, aging, and obesity; translational analyses that combine therapeutic interventions with molecular mechanisms, advanced imaging, and assessments of mobility.

**Glenn Telling** | **Microbiology, Immunology, and Pathology**
Mechanisms of prion replication, prion species barriers and strain diversity, and the molecular basis of inherited human prion diseases.

**Mark Zabel** | **Microbiology, Immunology, and Pathology**
Early lymphoid system distribution of prions and employs vector systems expressing prion-targeted interfering RNA molecules as therapeutic strategies for prion infections.

**Felix Duerr** | **Clinical Sciences**
Small-animal musculoskeletal problems, including arthritis, sports injury treatment, and prevention; canine-to-human translational applications.

**Stephanie McGrath** | **Clinical Sciences**
Seizure and spinal cord disorders, inflammatory brain diseases; canine-to-human translational applications.

**Nicole Ehrhart** | **Clinical Sciences**
Translational aging, limb preservation, tissue engineering, and sarcoma research; bone and muscle regenerative medicine; canine-to-human translational applications.

# FACULTY PUBLICATIONS

**6-month aerobic walking training increases T1w/T2w signal in the white matter of healthy older adults.** (2020). Colmenares AM, Voss MW, Fanning J, Salerno EA, Gothe NP, Thomas ML, McAuley E, Kramer A, Burzynska AZ. medRxiv. https://doi.org/10.1101/2020.11.09.2022862

**A systematic review of older adults' request for or attitude toward euthanasia or assisted-suicide.** (2019). Dransart DAC, Lapierre S, Erlangsen A, Canetto SS, Heisel M, Draper B. Aging & Mental Health. https://doi.org/10.1080/13607863.2019.1697201

**A temporal analysis of bilateral gait coordination in people with multiple sclerosis.** (2020). Richmond SB, Swanson CW, Peterson DS, Fling BW. Multiple Sclerosis and Related Disorders. https://doi.org/10.1016/j.msard.2020.102445

**Aging and forgetting: Forgotten information is perceived as less important than is remembered information.** (2019). Witherby AE, Tauber SK, Rhodes MG, & Castel AD. Psychology and Aging. https://doi.org/10.1037/pag0000322

**ATLAS: A Distributed File System for Spatiotemporal Data.** (2019). Rammer D, Pallickara SL, Pallickara S. Proceedings of the 12th IEEE/ACM International Conference on Utility and Cloud Computing. https://doi.org/10.1145/3344341.3368802

**Augmentation of endothelium-dependent vasodilatory signalling improves functional sympatholysis in contracting muscle of older adults.** (2020). Hearon, C, Richards J, Racine M, Luckasen G, Larson D, & Dinenno, F. The Journal of Physiology. https://doi.org/10.1113/jp279462

**Cannabidiol Induces Apoptosis and Perturbs Mitochondrial Function in both Human and Canine Glioma Cells.** (2020). Gross C, Ramirez D, Dickinson P, Gustafson D, McGrath S. FASEB Pharmacology. https://doi.org/10.1096/fasebj.2020.34.s1.04176

**Cholinergic Synaptic Homeostasis Is Tuned by an NFAT-Mediated α7 nAChR-Kv4/Shal Coupled Regulatory System.** (2020). Eadaim A, Hahm ET, Justice ED, Tsunoda S. Cell Reports. https://doi.org/10.1016/j.celrep.2020.108119

**Co-activation of selective nicotinic acetylcholine receptors is required to reverse beta amyloid–induced Ca2+ hyperexcitation.** (2019). Sun JL, Stokoe SA, Roberts JP, Sathler MF, Nip KA, Shou J, Ko K, Tsunoda S, Kim S. Neurobiology of Aging. https://doi.org/10.1016/j.neurobiolaging.2019.09.005

**Cultural differences in coping with interpersonal tensions lead to divergent shorter- and longer-term affective consequences.** (2020). Luong G, Arredondo CM, & Charles ST. Cognition and Emotion. https://doi.org/10.1080/02699931.2020.1752153

**Development of a play-based coaching intervention to improve quality of life and wellbeing for mothers with cancer and their young children.** (2020). Roman-Oyola R, Bundy A, Castro E, & Castrillo O. Journal of Clinical and Translational Science. https://doi.org/10.1017/cts.2020.121

**Disrespect at Work, Distress at Home: A Longitudinal Investigation of Incivility Spillover and Crossover Among Older Workers.** (2020). Marchiondo LA, Fisher GG, Cortina LM, Matthews RA. Work, Aging and Retirement. https://doi.org/10.1093/workar/waaa007

**Establishment of adult right ventricle failure in ovine using a graded, animal-specific pulmonary artery constriction model.** (2020). Nguyen-Truong, M, Liu, W, Boon, J, Nelson, B, Easley, J, Monnet, E, & Wang, Z. Animal Models and Experimental Medicine. https://doi.org/10.1002/ame2.12124

**Evaluation of acupuncture for the treatment of pain associated with naturally-occurring osteoarthritis in dogs: a prospective, randomized, placebo-controlled, blinded clinical trial.** (2020). Baker-Meuten A, Wendland T, Shamir SK, Hess AM, & Duerr FM. BMC Veterinary Research. https://doi.org/10.1186/s12917-020-02567-1

**Exploring Social Ecological Determinants of Physical Activity Among Adult Survivors of Childhood Cancer.** (2020). Dugan KF, Hidde MC, Chard CA, Graham DJ, Withycombe JS, & Leach HJ. Journal of Adolescent and Young Adult Oncology. https://doi.org/10.1089/jayao.2019.0169

**Fall risk factors for individuals under the age of 65 years with type 2 diabetes mellitus.** (2020). Swink LA, Schmid AA, Atler KE, Klinedinst TC, Marchant TP, Marchant DR, Malcolm MP. British Journal of Occupational Therapy. https://doi.org/10.1177/0308022619876552

**Functional Consequences of the Variable Stoichiometry of the Kv1.3-KCNE4 Complex.** (2020). Solé L, Sastre D, Colomer-Molera M, Vallejo-Gracia A, Roig SR, Pérez-Verdaguer M, Lillo P, Tamkun MM, Felipe A. Cells. https://doi.org/10.3390/cells9051128

**Functional implications of impaired bimanual force coordination in chronic stroke.** (2020). Patel P, Lodha N. Neuroscience Letters. https://doi.org/10.1016/j.neulet.2020.135387.

**Grandparent Caregivers' Resilience: Stress, Support, and Coping Predict Life Satisfaction.** (2020). Mendoza AN, Fruhauf CA, MacPhee D. The International Journal of Aging and Human Development. https://doi.org/10.1177/0091415019843459

**Health-related quality of life changes after the merging yoga and occupational therapy for Parkinson's disease program: A mixed-methods study.** (2020). Swink L, Fruhauf C, Atler K, Fling B, Klinedinst T, & Schmid A. Complementary Therapies in Clinical Practice. https://doi.org/10.1016/j.ctcp.2020.101156

**Horticultural therapy support group for older adult caregivers: Examining intervention effectiveness using psychometrically validated measures.** (2019). Ascenio J, Wojtaszek M, & Davalos DB. The Journal of Therapeutic Horticulture. https://www.ahta.org/journal-of-therapeutic-horticulture-29-2---2019

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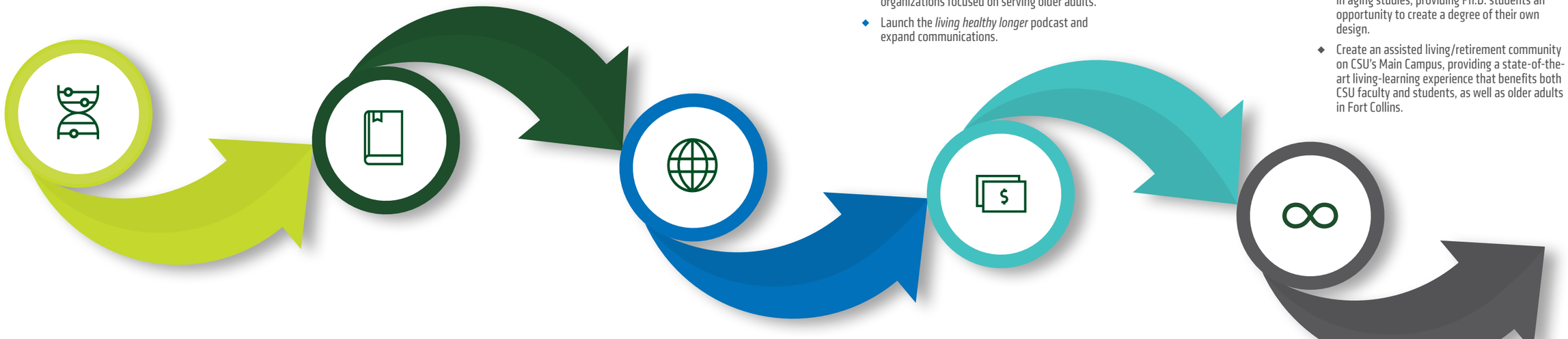
# ROAD MAP TO THE FUTURE

## The Center's Top Growth Priorities

Next 1-3 Years



### CORE 1: Transdisciplinary Research

- Expand comparative aging research opportunities (basic and applied).
- Develop a longitudinal biospecimen and data management core for aging biomarker discovery.
- Build and maintain a robust research participant registry.
- Engage faculty through an official membership agreement.
- Recruit additional core faculty.

### CORE 2: Educational Opportunities

- Obtain "Special Academic Unit" status in order to provide aging-related courses and credits.
- Submit a federal training grant proposal to provide funding for predoctoral and postdoctoral research training and support for innovative exploratory and developmental research.
- Apply for "Age-Friendly University" designation for CSU.
- Create an interdisciplinary online educational degree in clinical research management.
- Launch certificate programs that supplement students' and community members' skills and training.
- Facilitate summer capstone projects for M.D., D.V.M., and Ph.D. students in interdisciplinary aging studies
- Launch the Interdisciplinary Aging Research Mentored Pilot Grant Program.

### CORE 3: Community Engagement

- Create and engage an external advisory board.
- Expand reach at state and national levels.
- Continue to increase presence within local organizations focused on serving older adults.
- Launch the *living healthy longer* podcast and expand communications.

### CORE 4: Finances + Philanthropy

- Forge external partnerships with foundations and industries to elevate aging research and programming within the Center.
- Seek prospective donors for translational and comparative research.
- Create growth opportunities through clinical trials, longitudinal biobanking, and industry partnerships.

## Stretch Goals

5+ Years from Now

- Develop an interdisciplinary doctoral program in aging studies, providing Ph.D. students an opportunity to create a degree of their own design.
- Create an assisted living/retirement community on CSU's Main Campus, providing a state-of-the-art living-learning experience that benefits both CSU faculty and students, as well as older adults in Fort Collins.

### Diversity, Equity, and Inclusion Statement

The Columbine Health Systems Center for Healthy Aging strives to uphold CSU's Principles of Community. We embrace diversity, equity, and inclusivity across race, gender, ethnicity, religion, identity, ability, culture, and age. As a new Center, we seek to build a culture that encourages, supports, and celebrates diverse perspectives and where all people feel empowered to be their authentic selves.


# Make an IMPACT

## on the future of healthy aging

Your gift to the Columbine Health Systems Center for Healthy Aging at Colorado State University promotes successful, healthy aging for adults across the Front Range and beyond. With your donation, you enable research, education, and community outreach to create and share innovative, interdisciplinary solutions to the challenge of global population aging.

Gifts can be general in nature or dedicated to any activity listed in the annual report. If interested in donating, contact Director of the Center for Healthy Aging, Nicole Ehrhart, at nicole.ehrhart@colostate.edu. Thank you for considering a donation.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