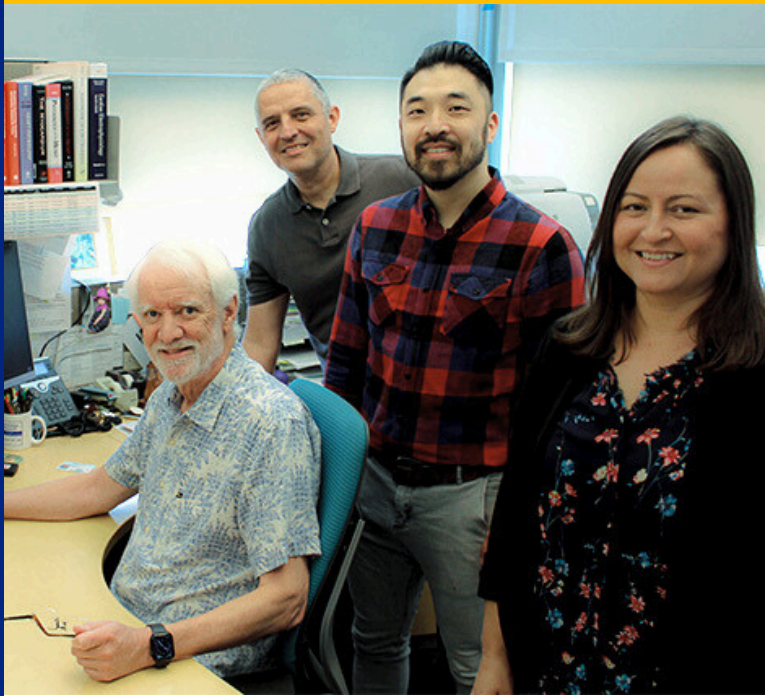


UC DAVIS
HEALTH

SCHOOL OF
MEDICINE

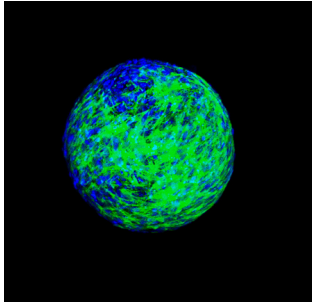
Office of Research



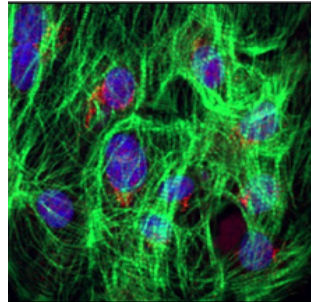
FY 2023-2024
UC Davis School of Medicine

Research Impact Report

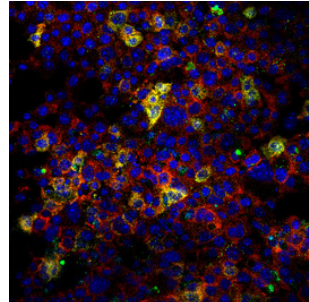
In 2024, the School of Medicine Office of Research instituted a Research Image Competition open to all School of Medicine research teams. A selection of the entrants are included in this report.



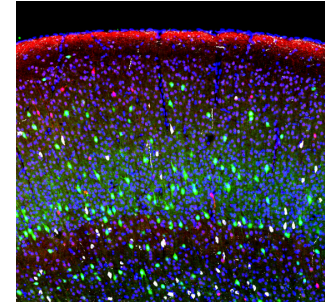
"Planet Earth." Induced-pluripotent stem cell-Mesenchymal stem cell spheroid. (c) Connor Dorais, Rahul Patel, Orthopaedic Surgery. Page 3



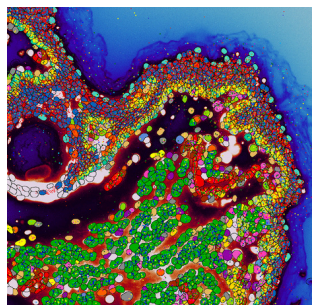
"Fireworks". Stem cell derived cardiac cells showing stress signal (ASC in red), nucleus (blue) and troponin T (green). (c) Padmini Sirish and Daphne Diloretto (Sirish Lab), Internal Medicine. Page 5



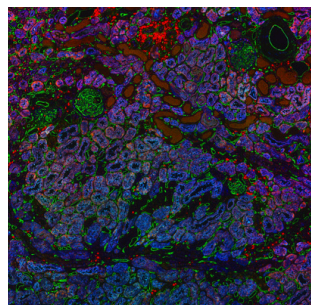
Mouse sustentacular cell culture infected by SARS-CoV-2. (c) Jiaying Li (Gong Lab), Cell Biology and Human Anatomy. Page 8



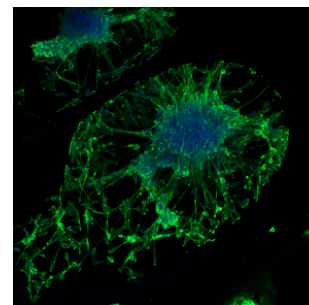
Expression of Interneurons markers - Parvalbumin (green), Somatostatin (white) and Calretinin (red) in the cortex of 21 days old male mice. (c) Arshi Mustafa, Konstantinos Zarbali, Pathology and Laboratory Medicine. Page 17



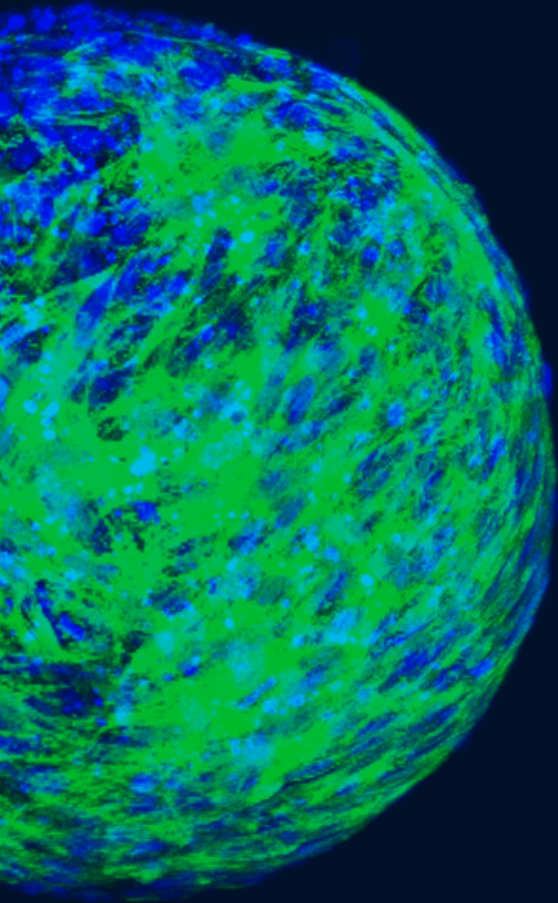
"Melanoma." The image shows the detection of mRNA as well as cell types in the melanoma in different colors. (c) Nicholas Love (Maija Kiuru Lab), Dermatology. Page 19



Multichannel immunofluorescence of kidney parenchyma highlighting vessels/capillaries inflammatory cells and tubules. (c) Kuang-Yu Jen; Alexander Borowsky; Qian "Jane" Chen, Pathology and Laboratory Medicine. Page 31



Mouse myoblasts colonizing a macroporous alginate scaffold. (c) Andrea Filler, Orthopaedic Surgery. Page 34



the social impact of research is measured by indicators of change outside universities and research institutions, in the real world

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Message from the Vice Dean for Research



Dear Colleagues,

I am pleased to present to you the FY 2023-2024 School of Medicine Research Impact Report.

In this snapshot, we are able to highlight just a few of the principal investigators (PIs) directing basic, translational and clinical research projects at UC Davis School of Medicine. Our research community is one of considerable breadth and depth, further strengthened by collaborations “across the causeway” with our sister Schools and Colleges. It is also important to note that along with each PI there is typically a team of colleagues, including professional researchers, students, clinical trainees and post-doctoral fellows, powering an engine of discovery.

This year’s report highlights the remarkable real-world impact of our research, showcasing the innovations that are making a tangible difference in patients’ lives and shaping the future of healthcare. Our groundbreaking clinical trials, such as those addressing spina bifida with prenatal interventions, are offering hope to families by improving outcomes for children born with this condition. Similarly, our pioneering research in medical technology, including the development of a brain-computer interface to restore speech function in patients with ALS, is pushing the boundaries of what is possible for people with neurodegenerative diseases.

Beyond the lab and clinic, our research is also influencing state policy, helping to drive evidence-based changes that improve health outcomes for all Californians. I am incredibly proud of the advances we are making together, and I look forward to seeing the continued impact of our efforts.

Kim E. Barrett, Ph.D.
Vice Dean for Research
Distinguished Professor of Physiology and Membrane Biology
UC Davis School of Medicine

A microscopic image of cells, likely stained with a fluorescent dye, showing a network of green and blue structures. The cells are interconnected, forming a complex, web-like pattern. The background is dark, making the glowing structures stand out. A teal rectangular box is overlaid on the top left corner of the image.

EXECUTIVE SUMMARY

UC Davis School of Medicine is renowned for its emphasis on primary care, public health, and biomedical research, making it a pivotal institution in advancing medical knowledge and healthcare delivery. In FY 2023-2024, UC Davis School of Medicine continued to prove itself to be a leading institution dedicated to improving lives and transforming healthcare through cutting-edge research and remarkable innovation. Known for its commitment to diversity and community service, the school offers a wide range of medical and health sciences programs. It boasts state-of-the-art facilities and a collaborative environment that fosters interdisciplinary learning and research.

US NEWS AND WORLD REPORT RANKINGS

U.S. News & World Report rolled out this year's "[Best Medical Schools](#) rankings with substantial changes.

Notably, the best institutions for research and primary care were sorted into tiers, rather than by ordinal rankings. U.S. News bases its rankings on two types of data: expert opinion about program excellence, and statistical indicators including the quality of a school's faculty, research and students and their post-graduate outcomes.

- UC Davis ranks in the top category, [Tier 1](#), for primary care education.
- UC Davis School of Medicine ranks in Tier 2 for research.
- U.S. News & World Report's latest rankings also place the UC Davis School of Medicine as the fourth most diverse in the country, only behind three well-respected Historically Black Colleges and Universities (HBCUs).

BLUE RIDGE RANKINGS

This year, an unprecedented total of nine School of Medicine departments ranked in the top 20 nationally in their respective fields, with four in the top 10.

- [Cell Biology and Human Anatomy](#) #15
- [Emergency Medicine](#) #16
- [Medical Microbiology and Immunology](#) #17
- [Neurology](#) #6
- [Physical Medicine and Rehabilitation](#) #20
- [Physiology and Membrane Biology](#) #10
- [Psychiatry and Behavioral Sciences](#) #17
- [Public Health Sciences](#) #6
- [Urologic Surgery](#) #10

YEAR IN REVIEW

UC Davis School of Medicine
Researchers continue to have a
tremendous impact on the
academic body of knowledge.

RESEARCHER RECOGNITION

- Andreas Bäumlér, Emanuel Maverakis, Luis Fernando Santana and Renée Tsois named Fellows of the American Association for the Advancement of Science
- Aijun Wang inducted to the American Institute for Medical and Biological Engineering (AIMBE) College of Fellows
- Brittany Dugger selected as a FY 2023-2024 UC Davis Chancellor's Fellow
- Elizabeth Morris named Society of Breast Imaging 2024 Gold Medalist
- Diana Farmer and Aijun Wang awarded nearly \$15 million for their groundbreaking work on a spina bifida treatment
- Jacqueline C. Stocking appointed to the editorial board of Critical Care Medicine, the premier journal of the Society of Critical Care Medicine
- Amy Brooks-Kayal selected as the 2023 recipient of the Child Neurology Society Bernard Sachs Award
- John Morrison elected president of the Society for Neuroscience
- Scott Fishman invited to join the National Institutes of Health (NIH) Interagency Pain Research Coordinating Committee (IPRCC)
- Diana Farmer appointed to a prestigious leadership position within the National Academy of Medicine (NAM)
- Christina Kim selected as a 2023 NIH Director's New Innovator Award recipient
- Erin Brown received the 2024 Hartwell Foundation Individual Biomedical Research Award
- Julie Sutcliffe received the 2023 Society of Nuclear Medicine and Molecular Imaging (SNMMI) Henry N. Wagner, Jr., Image of the Year award

RESEARCH HIGHLIGHT

[New brain-computer interface allows man with ALS to 'speak' again.](#)

A new brain-computer interface (BCI) developed at UC Davis Health translates brain signals into speech with up to 97% accuracy — the most accurate system of its kind. The researchers implanted sensors in the brain of a man with severely impaired speech due to amyotrophic lateral sclerosis (ALS). The man was able to communicate his intended speech within minutes of activating the system.





OUR TEAM

The School of Medicine Office of Research (SOMOR) plays an impactful role in advancing research at UC Davis. SOMOR's six units support investigators, foster collaborations and facilitate the efficient management of research resources. Although they each have their own area of focus, the units' collective work in support of School of Medicine researchers is an impressive portfolio of services and resources.

OUR TEAM

LEADERSHIP



Kim E. Barrett, Ph.D.
Vice Dean for Research



Ted Wun, M.D., F.A.C.P.
Associate Dean for
Clinical and Translational
Research



**Rachael Callcut, M.D.,
M.S.P.H., F.A.C.S.**
Associate Dean for Data
Science and Innovation



Melissa Bauman, Ph.D.
Associate Dean for
Research Infrastructure



**Anuurad Erdembileg,
M.D., Ph.D., M.A.S.**
Assistant Dean for
Research



Shawn Rasmussen
Director of Facilities

OUR TEAM

STAFF

Research Operations

- Nguyet Kong, Director of Research Operations
- Ida Shunk, Communications Specialist
- Oyunbold Jones, Financial Analyst
- Lucy Cai, Research Analyst
- Tasska Johnson, Administrative Officer

Grants Facilitation

- Erica Chedin, Ph.D., Director of Grants Facilitation
- Hardeep Obhi, Ph.D., Research Development Specialist
- Jeffrey Engler, Ph.D., Research Development Specialist
- Heather Hughes, Ph.D., Research Development Specialist

Evaluation

- Stuart Henderson, Ph.D., Director of Evaluation
- Amy Carillo, Ph.D., Evaluation Specialist
- Stacey Neves, M.A., Evaluation Specialist
- Rebecca Giacinto, Ph.D., M.P.H., M.A., Evaluation Specialist
- Melissa Sullivan, Evaluation Analyst

Research Administration

- Christopher J. Wang, M.B.A., C.R.A., Director of Research Administration
- Jennifer Sanchez, Trainer/Program Manager
- Matt Nguyen, Research Administrator 4
- Debbie Lim, Research Administrator 4
- Tammi Olineka, Research Space and Funding Data Analyst/Research Administrator
- Tracy Huff, Executive Assistant

Safety

- Brett Smith, Safety Officer
- Steve Libertini, Safety Officer
- Erik Hanke, Auto Equipment Operator
- Phillip Schroeder, Building Maintenance

Research Space Oversight

- Shawn Rasmussen, Director of Facilities
- Lilly Greatorex, Space Analyst
- Kristopher Galvan, Space Analyst
- Raquel Shintaku, Administrative Officer



RESEARCH OPERATIONS

Website

The Research Operations unit coordinated the transition of our website to the new UC Davis Health format. Our emphasis was customer-focused, with the intent of making our services and resources even easier to find.

Sponsored Program Support

The unit reviewed and processed approximately 1,446 proposals totaling over \$1.56 billion, and reviewed and processed 160 research-related forms on behalf of the School of Medicine Dean.

SOMOR Initiatives

The Research Operations unit supported several new funding initiatives. These include the Convergence Research Pilot award, the School of Medicine Impact Symposia award and the School of Medicine Research Image Competition.

The Research Operations unit facilitates research activities through a variety of services for proposal administration and analysis of research and funding metrics. In addition, the unit assists other units within SOMOR and collaborative units across campus regarding scheduling, ordering, website updates, marketing material, outreach to faculty/staff, event planning and other miscellaneous support activities.



GRANTS FACILITATION

Proposals

The GFU assisted researchers on the submission of 138 proposals during this fiscal year, the majority of which were new submissions (82%).

Early Career Investigators

The GFU supported sixty-two early-career investigator projects through 1:1 mentorship consisting of consultations and critical reviews as well as through the KOHORT program, a 5-month program comprised of lectures, small group peer review sessions, and a NIH style mock review.

Training Grants

Over the past year, the GFU invested significant effort in training award support, playing a critical role in the development and submission of ten NIH training grant proposals. This effort involved substantial support for the renewal of longstanding training grants.

The Grants Facilitation Unit (GFU) specializes in assisting investigators with numerous types of National Institutes of Health (NIH) mechanisms, including fellowship (F) awards for predoctoral and postdoctoral scholars, career development (K) awards for early-stage investigators, R-series awards (R03, R21, R01, etc.) for early-stage or established investigators, and institutional training grants (T32, K12) or research program and center grants (P or U series) for multi-investigator teams. The GFU also supports applications to a diverse range of foundations and national research funding institutions.



EVALUATION

Grant Support

In FY 2023-2024 the team developed evaluation plans for eight new grants and grant renewals, as well as provided letters of support for five new grants.

Consultations

This year, the evaluation team provided over 80 hours of consultation support to faculty, staff, and scholars. The consultations included support on evaluation design, qualitative research methods, survey development and design, and Qualtrics.

Evaluation Dissemination

The unit engaged in several dissemination activities at the national level, including peer-reviewed publications and presentations at the annual American Evaluation Association meeting. These efforts highlight the Evaluation Team’s influence on the evaluation field and demonstrates its reach beyond UC Davis Health.

The Evaluation Unit supports UC Davis Health’s faculty, staff and students’ efforts in educational training and research. The mission of the School of Medicine is “to improve health through the combined power of education, research, clinical care, and community.” The Evaluation Unit, with its diverse portfolio, provides support to programs and projects that impact each of these mission areas.



RESEARCH ADMINISTRATION

Pre-Award Services

The Research Administration unit offers centralized pre-award services. The Pre-Award service team strives to deliver comprehensive support, with its members acting as dedicated concierges for faculty members and departments/units.

Research Administrator Meetings

This year, the unit reinstated a quarterly meeting for Research Administrators, which serves as a vital platform for networking among research administrators, fostering open discussions on current trends, best practices, and career pathways within research administration.

Research Administrator Training

The unit is developing a Research Administration Training Program that will equip its participants with indispensable knowledge and skills essential for navigating the complexities of extramurally funded research projects at UC Davis School of Medicine.

The Research Administration unit provides pre-award support to School of Medicine departments and centers, assistance with interpreting contracts, and grants policies and general research administration support. The unit also serves as a resource for UC Davis School of Medicine research administrators.



SAFETY MANAGEMENT

WarnMe Update

The Safety Management unit identified a deficiency in the WarnMe System. To address this, the team improved the instructions for updating personal information in WarnMe, ensuring better preparedness for future emergencies.

Aggie Square Budget Projections

The unit focused on Aggie Square budget projections based on researchers' current footprint and the cost per square foot for waste management. These projections are vital for effective resource management and allow for anticipation of future needs.

Lab Decontamination

On two separate occasions, two lab cold rooms required decontamination. The team collaborated with Clean Harbors to coordinate the cleanup and ensure a safe return to operation.

The Safety Management unit sets the standards for safety management and complements individual laboratory safety programs and activities. The unit collaborates with faculty, staff, and students to improve the safety culture and regulatory compliance. It serves as a liaison between researchers, campus Environmental Health & Safety and outside regulatory agencies. The team provides technical expertise and assists labs to identify ways to mitigate hazards. We also work hand-in-hand with the research space oversight team, playing a pivotal role during laboratory setups and closeouts



RESEARCH SPACE OVERSIGHT

Aggie Square Space Planning

There are thirty-six labs slated to relocate into the Aggie Square wet lab space. Planning and scheduling for the dry lab space is ongoing. The unit also worked with a consultant this year to manage the complex moves.

Aggie Square Vivarium

Team members met with Teaching and Research Animal Care Services (TRACS), vivarium users, and other stakeholders to ensure biosecurity for animal and rodent research in Aggie Square. The team developed draft animal/rodent policies and a Memorandum of Understanding with TRACS.

Space Assessment Survey Tool

The unit's collaboration with the FacilitiesLink developer has resulted in the creation of a survey tool to refine future space assessments. This collaboration also prompted updates to research building floor plans within FacilitiesLink, involving multiple units to ensure efficiency, transparency, and user satisfaction.

The Research Space Oversight unit plays a vital role in the effective management of research space and facilities within the School of Medicine. The unit's primary responsibilities include conducting space assessments, assisting various departments and units in retaining and preparing spaces for new recruits, and collaborating closely with key stakeholders to address all research space and facilities needs. The unit actively engages in the validation and tracking of Memorandums of Understanding (MOUs) within the School of Medicine and between the school and other schools and colleges. It also facilitates essential tasks like laboratory cleanouts, move-ins, and equipment relocations.





RESEARCH

Highlights

School of Medicine investigators made high impact discoveries in FY 2023-2024. They tackled critical areas such as cancer treatment, neurological diseases and regenerative medicine, bringing innovative solutions closer to clinical practice. They conducted pioneering work in stem cell and gene therapies, as well as envelope-pushing use of technology, such as augmented reality-assisted surgery and brain-computer interfaces. These breakthroughs underscore UC Davis School of Medicine's leadership in biomedical research and a commitment to improve patient outcomes on a global scale.

[First Wilson Disease patient receives gene therapy at UC Davis Health.](#)

Researchers at UC Davis Health infused their first Wilson Disease patient with a gene therapy as part of a groundbreaking clinical trial.

[UC Davis Health surgeons use augmented reality during surgery and as education tool.](#)

Surgeons within the Departments of Otolaryngology, Neurological Surgery and Orthopaedic Surgery wear augmented reality goggles during surgery. They project 3D computed tomography and MRI scans that overlay critical information directly onto the surgeon's field of view.



[UC Davis study explores breakthrough CAR T-cell therapy for lupus.](#)

Researchers at UC Davis Health are striving to improve the quality of life for people living with lupus through a novel clinical trial evaluating CAR T-cell therapy as a treatment for the autoimmune disease.

[A groundbreaking material — engineered bone marrow \(eBM\) — has the potential to improve treatment for osteosarcoma, a malignant bone cancer with low survival rates.](#)

This work includes helping researchers learn how bone marrow cells affect osteosarcoma growth, testing cancer therapeutics, and potentially personalizing treatment.

[A team of UC Davis and University of Oxford researchers have developed an innovative tool: SparkMaster 2.](#)

The new software enables the automatic analysis of distinct patterns of calcium release in cells. This includes calcium "sparks," microscopic releases of calcium within cardiac cells associated with irregular heartbeats, also known as arrhythmias.

[A team of UC Davis scientists used dynamic total-body positron emission tomography \(PET\) to provide the first imaging of the human body's immune response to COVID-19 infection in recovering patients.](#)

The researchers used the EXPLORER total-body PET scanner, an innovative imaging technology developed at UC Davis.

[Researchers identify 'switch' to activate cancer cell death.](#)

A research team from the UC Davis Comprehensive Cancer Center has identified a crucial epitope on the CD95 receptor that can cause cells to die.

[A new study by researchers at UC Davis Health found human brains are getting larger.](#)

The researchers hypothesize the increased brain size may lead to an increased brain reserve, potentially reducing the overall risk of age-related dementias.

A microscopic image of cells, likely from a tissue section, showing various cell types and structures. The cells are stained in shades of blue, green, and red. A teal rectangular box is overlaid on the top left corner of the image, containing the text 'MAJOR FUNDING'.

MAJOR FUNDING

In FY 2023-2024, high impact research projects at UC Davis School of Medicine included several new obligated awards of \$1M+ for projects, for research programs and centers and for health contracts. These projects span diverse fields, from cancer research and precision medicine to public health and emerging infectious diseases. The influx of funding enabled UC Davis researchers to deepen their investigations and accelerate the translation of lab discoveries into real-world medical solutions. For instance, major grants supported cutting edge work in genomic medicine and funded public health projects focused on reducing health disparities.

NEW AWARDS

Selected new obligated awards of \$1M+ during fiscal year 2023-24



Bradley Pollock, \$37.6 million
California Department of Public Health
Project: Emergency Preparedness Support



Rachel Whitmer, \$4.6 million
NIH National Institute on Aging (NIA)
Project: Study of Healthy Aging in African Americans



Pranav Shetty, \$3.68 million
Medical Technology Enterprise Consortium
Project: Improving Modular Patient Admission Capacity Through Scalable Solutions (IMPACTS)



Shani Buggs, \$3 million
The Robert Wood Johnson Foundation
Project: Transforming the landscape of community-centered research to inform policy and practice related to community violence intervention and prevention



Diana Cassady, \$2.58 million
California Department of Public Health
Project: Statewide Rover Library



Shehnaz Hussain, \$1.997 million
University of California Office of the President
Project: Exposure assessment, health monitoring, and cancer control in wildland firefighters



Ramsey Badawi, \$1.83 million
Avid Radiopharmaceuticals, Inc.
Project: Biodistribution of 18F-FAP PET/CT in subjects with Non-alcoholic steatohepatitis (NASH)



Brian Fury, \$1.5 million
California Institute for Regenerative Medicine
Project: Creating A Collaborative California Cell and Gene Therapy Manufacturing Network



David Johnson
\$1.4 million, California Department of Public Health
Project: California Alzheimer's Disease Center, East Bay

\$1 million, DoD Congressionally Directed Medical Research Program (CDMRP)
Project: The Good Life healthy aging program to prevent cognitive impairment in diverse veteran communities; an embedded pragmatic clinical trial



Stephen Henry

\$1 million, NIH National Institute of Drug Abuse

Project: A multi-team system implementation strategy to improve buprenorphine adherence for patients who initiate treatment in the emergency department

\$1 million, DOJ Bureau of Justice Assistance

Project: Developing evidence-based, guideline-concordant updated patient safety PDMP alerts



Helen Kales, \$1.5 million
PHS (SAMHSA) Mental Health - Center for Mental Health Services

Project: Enhancing the Sub-Acute Facilitated Engagement and Transitions (SAFE-T) Program Using an Omni-channel Digital Platform for Persons Recently Incarcerated



Ricardo Maselli, \$1.5 million
California Institute for Regenerative Medicine

Project: Treatment of Myasthenic Syndrome due to Choline Acetyltransferase Deficiency Using AAV9-mediated Gene Therapy (DISC2 14982)



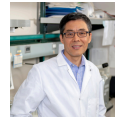
Heather Riden, \$1.5 million
California Department of Housing and Community Development

Project: California Farmworker Housing Study



Sarah Tomaszewski Farias, \$1.4 million
California Department of Public Health

Project: California Alzheimer's Disease Center



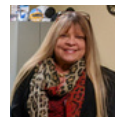
Hongwu Chen, \$1.4 Million
DoD Congressionally Directed Medical Research Program (CDMRP)

Project: Therapeutic targeting of a novel tumor-intrinsic signaling pathway for lethal prostate cancer



James Chenoweth, \$1.3 million
California Office of Traffic Safety

Project: Drug and Alcohol Use in Motor Vehicle Crash Victims



Jan Nolta, \$1.2 million
California Institute for Regenerative Medicine

Project: T-Pure: Peripheral Blood Processing Tool for Point of Care CAR-T Manufacturing

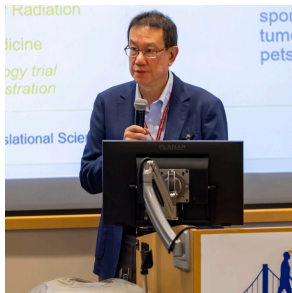


Michele Ornelas Knight, \$1.2 million
California Victim Compensation Board

Project: CalVCB -Trauma Recovery Center (TRC) Grant

RESEARCH PROGRAM & CENTER GRANTS

Research program and center grants are large, multi-project efforts that generally include a diverse array of research activities. Listed below are obligated awards for fiscal year 2023-2024 and do not reflect the overall funding for these programs.



Theodore Wun, \$4.91 million

NIH National Center for Advancing Translational Sciences

UC Davis Clinical and Translational Science Center. The Clinical and Translational Science Center (CTSC) serves as a catalyst to support biomedical research projects by providing services and resources to investigators, staff, scholars and trainees, and community partners.



Primo Lara, \$3.5 million

National Cancer Institute

Comprehensive Cancer Center Support Grant. The UC Davis Comprehensive Cancer Center discovers new knowledge that leverages and translates the best of UC Davis science to generate innovation and impact on its highly diverse catchment area and beyond.



Rebecca Schmidt, \$3 million

NIH National Institutes of Health Office of the Director

Prenatal Environment and Child Health (PEACH) in ECHO. The overarching goal of PEACH is to understand the influence of early environmental factors such as maternal nutrition, stress, contaminants and mental health during gestation on child neurodevelopment and other health outcomes. PEACH is part of the national 'Environmental influences on Children's Health Outcomes' (ECHO) Program.



Charles DeCarli

\$9.5 million

NIH National Institute of Neurological Disorders & Stroke

The Clinical Significance of Incidental White Matter Lesions on MRI Amongst a Diverse Population with Cognitive Complaints (INDEED).

\$3.1 million

NIH National Institute on Aging

UC Davis Alzheimer's Disease Center. The UC Davis Alzheimer's Disease Research Center conducts basic and clinical research including clinical trials, clinical evaluations, community outreach and education, professional education, and research training.



Irva Hertz-Picciotto

\$2.3 million

NIH National Institutes of Health Office of the Director (OD)

Revisiting ReCHARGE: ECHO Follow up on Middle Childhood and Adolescence. ReCHARGE: ECHO is part of the national 'Environmental influences on Children's Health Outcomes' (ECHO) Program.

\$1.57 Million

National Institute of Environmental Health Sciences

UC Davis Environmental Health Sciences Core Center (EHSC). The mission of the EHSC is to advance understanding of environmentally induced disease and disability and to translate this knowledge into interventions, new practices or policy changes.



Alexander "Sandy" Borowsky, \$2.911 million

NIH National Institute of Child Health & Human Development

California Partnership for Personalized Nutrition. The California Partnership for Personalized Nutrition Clinical Center was established to study the variance in dietary patterns and physiological responses to patterns and specific foods that are shaped by disparate factors including complex genetic, microbiome, psychosocial, human ecology, and metabolic variables.



Diana Miglioretti, \$2.87 million

NIH National Cancer Institute (NCI)

Advancing Equitable Risk-based Breast Cancer Screening and Surveillance in Community Practice. This project focuses on providing evidence to improve the equity and effectiveness of breast cancer screening and surveillance.



Kimberly McAllister, \$2.8 million

NIH National Institute of Mental Health (NIMH)

UC Davis Conte Center: Neuroimmune Mechanisms of Psychiatric Disorders. The UC Davis Conte Center brings together investigators with a unique combination and wide range of complementary expertise to address a critical gap in knowledge related to the potential links between immune dysregulation and psychiatric illness.



Dennis Hartigan-O'Connor, \$1.54 million

National Institute of Allergy and Infectious Diseases

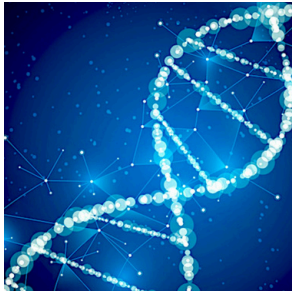
Multi-omic understanding of the transformed host T-cell response to HIV following therapeutic vaccination. This project aims to discover what features of the vaccine and host allow therapeutic vaccination to elicit a superior immune response that may control the HIV virus after daily antiretroviral therapy is stopped.



James Trimmer, \$1.44 million

National Institute of Neurological Disorders & Stroke

Recombinant Immunolabels for Nanoprecise Brain Mapping Across Scales. This project is aimed at enhancing dissemination of a valuable resource of renewable affinity labels, in the form of monoclonal antibodies, for brain mapping across scales.



Alice Tarantal, \$1.34 million

NIH National Institutes of Health Office of the Director (OD).

Center for Somatic Cell Genome Editing in Nonhuman Primates. The NIH Center for Somatic Cell Genome Editing (CSGE) in Nonhuman Primates was established to provide collaborative opportunities to NIH investigators nationwide.



Leonard Abbeduto, \$1.25 million

National Institute of Child Health & Human Development

MIND Institute Intellectual and Developmental Disabilities Research Center (IDDRC). The IDDRC supports a translational science agenda focused on intellectual and developmental disabilities.



Luis Carvajal-Carmona, \$1.061 million

NIH Cancer Institute

University of California and UT Southwestern D-PDTC. The “Diversity Patient-Derived Xenograft (PDX) Development and Trial Centers” grant is diversity-focused, with a goal of establishing and characterizing at least 120 new PDXs from racially and ethnically diverse populations.



HEALTH SCIENCE

Contracts

Health science contracts are agreements that govern collaborative research between the University and external organizations, whether those organizations are funding the research or are participating in the conduct of the research itself.



Diana Farmer, \$9 million

California Institute for Regenerative Medicine

The CuRe Trial: Cellular therapy for in utero Repair of Myelomeningocele



Alan Koff, \$2.2 million

AstraZeneca AB

A Phase I/III Randomized, Double-blind Study to Evaluate the Safety and Neutralizing Activity of AZD5156/AZD3152 for Pre-exposure Prophylaxis of COVID-19 in Participants with Conditions Causing Immune Impairment (SUPERNOVA).



Rachael Calcutt, \$2 million

CSL Behring

BE1116_3006 - A Prospective, Multicenter, Randomized, Double-Blind, Placebo-Controlled, Large Simple Trial Evaluating the Use of BE1116 (4-Factor Prothrombin Complex Concentrate [Kcentra® / Beriplex®]) to Improve Survival in Patients with Traumatic Injury.



Jonathan Riess

\$2.1 million

Revolution Medicines, Inc.

RMC-LUNG-101 : A Platform Study of RAS(ON) Inhibitor Combinations in Patients with RAS-Mutated Non-Small Cell Lung Cancer (NSCLC)

\$1.3 million

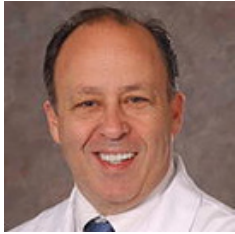
Beijing Avistone Biotechnology Co., Ltd.

PLB1004-I-US01: A Phase 1 Open-label, Multi-dose, Dose Escalation and Dose Expansion Study of the Oral EGFR inhibitor PLB1004 in Non-Small Cell Lung Cancer

\$1.25 million

Revolution Medicines, Inc.

RMC-6291-101 - Phase 1b, Multicenter, Open-label, Dose Escalation and Dose Expansion Study of RMC-6291 in Combination with RMC-6236 in Participants with Advanced KRASG12C-Mutated Solid Tumors



Joseph Toscano, \$1.64 million
Regeneron Pharmaceuticals, Inc.

A Placebo-Controlled, Double-Blind, Parallel Treatment Arm, 216 Week Study to Evaluate Efficacy and Safety of Treatment With BAN2401 in Subjects With Preclinical Alzheimer's Disease and Elevated Amyloid (A45 Trial) and in Subjects With Early Preclinical Alzheimer's Disease.



Naseem Esteghamat, \$1.4 million
Estrella Immunopharma Inc.

EBUS22CD19AR100: An Open-Label, Dose Escalation, Multi-Center Phase I/II Clinical Trial of EB103 T-Cell Therapy in Adults with Relapsed/Refractory (R/R) B-Cell Non-Hodgkin's Lymphoma (NHL).



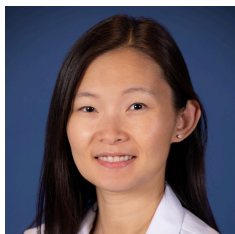
Helen Chew, \$1.4 million
Genentech, Inc.

WO43919 - A Phase 3, Multicenter, Randomized, Open-Label Study Evaluating the Efficacy and Safety of Inavolsib Plus Fluvestrant Versus Alpelisb Plus Fluvestrant in Patients with Hormone Receptor-positive, HER2-negative, PIC3CA mutated, Locally Advanced or Metastatic Breast Cancer Who Progressed During or After CDK4/6 Inhibitor and Endocrine Combination Therapy.



Brooks Kuhn, \$1.2 million
Inhibrx, Inc.

INBRX101-01-201 - A Phase 2, Active-Control, Parallel Group Study to Assess INBRX-101 Compared to Plasma Derived ALPHA-Proteinase Inhibitor (A1PI) Augmentation Therapy in Adults with ALPHA-1 Antitrypsin Deficiency (AATD) Emphysema.



Doris Chen, \$1.2 million
University of Southern California

Alzheimer's Disease Neuroimaging Initiative (ADNI4).



David Richman, \$1.2 million
Cabaletta Bio, Inc

CAB-201-004 - A Phase 1/2, Open-Label Study to Evaluate the Safety and Efficacy of Autologous CD19-specific Chimeric Antigen Receptor T cells (CABA-201) in Participants with Generalized Myasthenia Gravis.



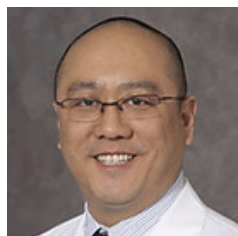
Brian Jonas, \$1.2 million
Kymera Therapeutics, Inc.

KT253-AL-101 - Phase 1, Open-Label Study to Evaluate Intravenously Administered KT-253 in Patients w/ High Grade Myeloid Malignancies & Acute Lymphocytic Leukemia, Lymphoma and Advanced Solid Tumors



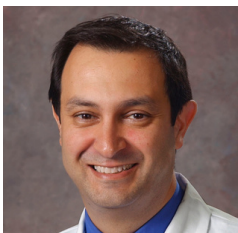
Alexandra Duffy, \$1.2 million
Genentech, Inc.

BN42489 - A Phase 2, Randomized, Double-Blind, Placebo-Controlled, Dose-Finding Study To Evaluate The Safety, Biomarkers, And Efficacy Of Tominersen In Individuals With Prodromal And Early Manifest Huntington's Disease.



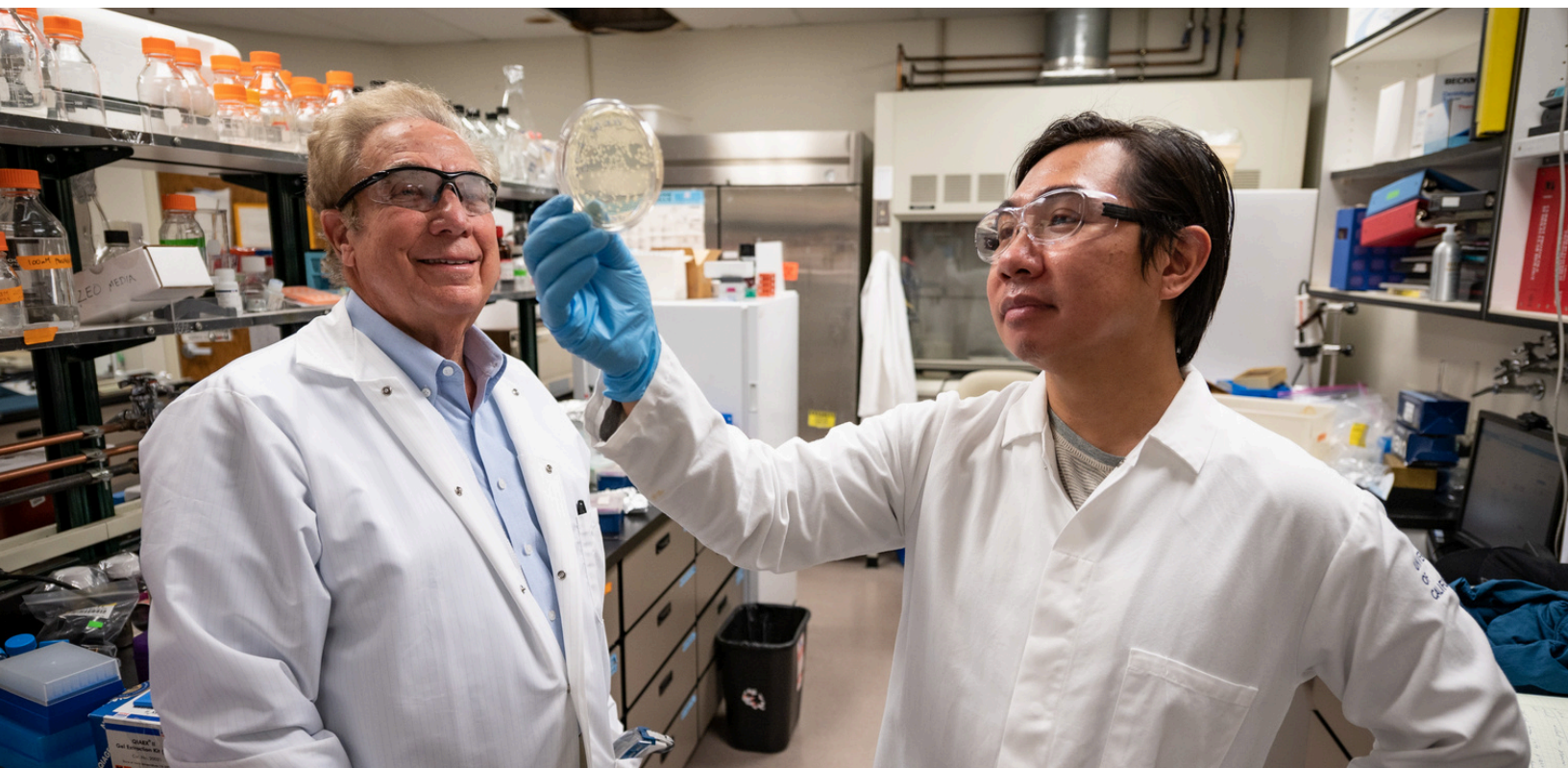
Edward Kim, \$1 million
Astellas Pharma Global Development, Inc.

2074-CL-0101 - A Phase 1/1b Study of ASP2074 in Participants with Metastatic or Locally Advanced Solid Tumors



Mehrdad Abedi, \$1 million
Cabaletta Bio, Inc

CAB-101: A Phase 1, Open-label, Safety and Dosing Study of Autologous Desmoglein 3 Chimeric Autoantibody Receptor T Cells (DSG3-CAART) in Subjects with Active, Anti-DSG3, Mucosal-dominant Pemphigus Vulgaris



AGGIE SQUARE



Photo by Bikramdeep Singh for the monthly Aggie Square Photo Competition

At Aggie Square, leading-edge UC Davis research, innovative companies and startups, and talent from across our community will come together to create a thriving new Sacramento innovation district. Among its future occupants will be a number of School of Medicine researchers moving their labs into this new space.

Selecting the School of Medicine labs that will move into Aggie Square has been a significant coordination effort involving multiple stakeholders. Creating research “themes” allowed us to make equitable laboratory assignment decisions that will use the new space efficiently and to its highest potential.

AGGIE SQUARE WET LABS

200 Aggie Square - Life Sciences, Technology and Engineering East (LSTE-E) will house School of Medicine “wet labs” and VA partners.



Life Sciences, Technology and Engineering. LSTE-E is indicated by the arrow.

Occupants

Themes

- Surgical Bioengineering
- Neurosciences
- Biophotonics
- Cancer

Inaugural Cores

- Flow Cytometry
- Molecular Pharmacology
- Immune Modeling, Analysis and Diagnostics
- Rodent Behavioral Testing Facility

AGGIE SQUARE

DRY LABS

Life Long Learning (LLL) will house School of Medicine “dry labs”; some of the wet lab themes will also be represented here.



Life Long Learning

Occupants

Centers and Programs

- Center for Healthcare Policy and Research
- Center for Reducing Health Disparities
- Office of Community Outreach and Engagement (Cancer Center)
- Office of Population Health (Cancer Center)
- Cancer Center Office of Inclusivity, Diversity, Equity, And Accessibility
- Tobacco Cessation Policy Research Center (Cancer Center)
- Health Informatics (Public Health Sciences)
- Center for Occupational and Environmental Health (Public Health Sciences)
- Epilepsy and Systems Neuroscience Lab (Neurosciences)
- EPI-CAL Program (Neurosciences)
- Flow Cytometry
- Molecular Pharmacology
- Immune Modeling, Analysis and Diagnostics

A microscopic image of tissue, likely a cross-section of an organ, stained with blue, green, and red dyes. The blue staining highlights the nuclei of cells, while the green and red staining highlight specific cellular structures and components. The tissue shows a complex, interconnected network of cells and fibers.

SOCIAL IMPACT

The social dimension of research is another important aspect of its impact. Medical research can provide evidence-based data to inform policy solutions and estimate public costs. Research often drives innovation and economic impact through the development of new technologies and products. It transforms clinical practice and improves community health. The following are just two examples of the measurable, wide-ranging impact of UC Davis Health research.

30 Years of Impact

Center for Healthcare Policy and Research (CHPR)

Facilitating research, promoting education and informing policy

This year, the UC Davis Center for Healthcare Policy and Research (CHPR) celebrates its 30th anniversary. Established in 1994, CHPR seeks to advance science and practice to achieve healthier and more equitable communities. The Center's work encompasses healthcare research, policy, practice, and community health. Additionally, CHPR offers educational opportunities, mentorship, and training for staff, students, and faculty. Below are example highlights of CHPR's impact in the clinical, policy, community and economic arenas.

California Health Benefits Review Program (CHBRP)

Coverage and cost-sharing changes proposed for medical services and staffing

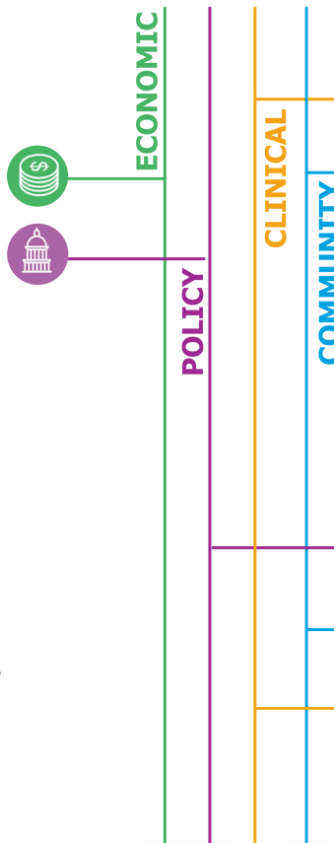
100+ reports submitted to the lawmakers over the past 20 years

CHBRP reviewed an expanded prenatal coverage bill, a version of which was later enacted into law, leading to higher quality and better outcomes for Californians.



We analyze scientific evidence about the medical effectiveness or public health impacts of proposed bills so legislators can make informed policy decisions.

—Elizabeth Magnan, CHBRP vice chair and associate professor in the Department of Family and Community Medicine.



Healthcare Quality and Safety



Dozens of patient safety measures over the past 30 years



National patient outcomes improved 2002-2022

The CHPR team developed outcome measures for hospital-acquired complications such as pressure injuries, falls with injury, respiratory failure, and acute kidney injury, which have become standard and/or required processes for reporting to the federal government and other payers.

CA Quits



CA Quits-informed policies adopted in other states



Increased care to marginalized communities



100+ public hospital clinics, community clinics, Medicaid managed care plans, and public health partners engaged

Since 2018, CHPR's CA Quits statewide project has focused on the implementation of tobacco treatment best practices with health systems and health plans serving California's Medicaid population, which covers 1 in 3 Californians.

CHPR Leadership Through the Years

CHPR was founded in 1994 as the "Center for Health Services Research in Primary Care." It was renamed in 2006.



1994-1996
Klea Bertakis, M.D., M.P.H.
Founder/Director



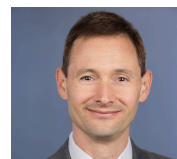
1996-2006
Richard Kravitz, M.D., M.S.P.H.
Director



2006-2021
Joy Melnikow, M.D., M.P.H.
Associate Director/Director



2021-2022
Anthony Jerant, M.D.
Interim Director



2015-Present
Jeffrey Hoch, Ph.D.
Interim/Associate Director



2023-Present
Courtney Lyles, Ph.D.
Director

At a glance: CHPR

In fiscal year 2023-2024, CHPR had:

39

Funded research projects

\$15 million

Funding

35+

Support staff researchers

120+

Affiliated faculty members

CHPR received funding from a variety of sources. Current sponsors include:

- NIH
- AHRQ
- CDC
- U.S. Department of Justice
- U.S. Department of Defense
- California Tobacco Control Program
- California Department of Public Health
- PCORI
- CalPERS
- National Opinion Research Center
- Mathematica Inc.
- California Hospital Assessment and Reporting Task Force
- UC Tobacco-Related Disease Research Program

Enhancing Impact through Inclusive Research

\$112 million

in federal grants
funded

7+ projects

that recruited

6500+

research participants from
communities traditionally
underrepresented in
medical research

who provided data for

10+

new funded opportunities
led by other PIs doing
research in:

- lipids
- green space
- climate change
- residential segregation
- social exposome
- air pollution
- super agers
- occupational complexity
- glycemic control
- school segregation
- hypertension

Brain Health for All

Professor Rachel Whitmer is an epidemiologist with a passion for identifying modifiable risk factors for brain health and dementia in diverse populations that have previously been underrepresented in population-based research.

Rachel Whitmer is ranked in the top 0.05% in the world for science impact of dementia.



Societal benefits and impact of research



Changed Clinical Practice

- 1st to identify midlife risk factors for dementia
- Created and validated the 1st diabetes risk score (that can be implemented in routine medical care) to estimate 10-year dementia risk for individuals with type 2 diabetes
- Identified risk factors and developed screening standards



Improved Community Health

- Provided blood pressure screening and brain health education throughout the Sacramento region
- Provided lifestyle intervention that enhances health promotion and disease prevention
- Improving quality of life by identifying protective factors for brain health



Influencing Policy Change

- Participated in multiple NIH committees for:
- Division of Neuroscience strategic plan
 - Alzheimer's disease and related dementias research summit
 - Health equity policy committee

Created 50+ research reports related to policy

Dr. Whitmer's work is cited in the policy documents of 20 countries as well as the European Union and Intergovernmental Organizations



Reducing Costs of Illness

Reducing social and economic impact of dementia, the latter of which is currently estimated at \$1313.4 billion annually worldwide.*

*2023 publication: <https://alz-journals.onlinelibrary.wiley.com/doi/10.1002/alz.12983>

Photo: Whitmer's team includes over 60 staff from the Department of Public Health Sciences and the UC Davis Alzheimer's Disease Research Center.



A microscopic image of a cell cluster, likely a tumor or a neural network, showing a dense network of cells with blue and green fluorescence. The cells are interconnected, forming a complex, branching structure. The background is dark, making the fluorescent cells stand out.

FEATURED RESEARCH

The researchers featured here are just a few of many who made substantial strides this year in their work. For five of these featured projects, new funding was awarded this year to further their work in cancer research, violence prevention, early psychosis treatment, novel imaging research and emergency medicine. These features offer an in-depth look at these diverse projects - beyond the numbers. The sixth project - David Brandman and Sergey Stavisky's work with brain-computer interfaces to restore speech - received major national recognition this year in the *New England Journal of Medicine* and subsequent media coverage. It was an amazing year for research at UC Davis Health.

SHANI BUGGS

“How do we build peace and well-being and health and safety for everybody?”



Early in the Biden administration, Congress sought out scholars of color to share their perspectives on potential solutions for action on gun violence prevention. Dr. Shani Buggs, an assistant professor in the Department of Emergency Medicine, was one such researcher. Buggs, who studies the drivers of and public health interventions for gun violence, in turn contacted her own network of Black and brown scholars, seeking their input on the most important gun violence issues of the moment.

**Shani A. L. Buggs, Ph.D., M.P.H., Assistant Professor
Department of Emergency Medicine**

Specialties: Population Health, Public Health, Health and Public Policy, Health Equity

Major funding FY 2023-2024:

- Transforming the landscape of community-centered research to inform policy and practice related to community violence intervention and prevention \$3,000,000
- Urban Peace Institute (UPI) CalVIP Proposal for South Park Peacemakers to Reduce Community Violence \$300,324

The result was the formation of the Black & Brown Collective for Community Solutions to Gun Violence (“the Collective”), a multidisciplinary network of scholars from academic and research institutions nationwide, whose efforts have been boosted by a three-year, \$3 million grant award from the [Robert Wood Johnson Foundation](#). Buggs, a co-founder of the network, is the principal investigator for the award and an advisory member of the group. She is a health and public policy scholar in the UC Davis [Violence Prevention Research Program](#) and an assistant professor in the [Department of Emergency Medicine](#).

The award allows Dr. Buggs and the Collective to formalize an infrastructure to establish a grant-making program for researchers who come from historically underrepresented backgrounds. It is intended to address inequity in research funding for scholars who are committed to equity-centered and community-engaged violence prevention research. It helps to allow the Collective to establish a program for funding scientists studying community-centered violence prevention and community safety.

There will be tiers for scholars at various career stages: predoctoral, postdoctoral or early career, and mid-career. The idea is to have funding available for each because there is a history of inequitable funding and inequitable opportunity for scholars from underrepresented backgrounds throughout their professional journeys.

Dr. Buggs sees the potential of this grant to spark future investment. By demonstrating the establishment of a grant-making program, additional funds will hopefully be more readily available in the future. She sees great need in expanding research with people who are at the center of violence, whether they be survivors of violence, those who cause harm themselves, or those who are on the frontlines of community-led violence intervention, navigating and responding to those instances. She also envisions more research on not just how systems and policies create harm and influence conditions of safety, historically and in the present day, but also on how communities and policies create and maintain safety, healing, and prosperity.

The Collective brings together scholars from different disciplines who have the skills and expertise to conduct high-quality research - but who also have deep commitment and accountability to community, seeking to elevate community perspectives and insights to help better illuminate how peace can be sustainably ensured, particularly for those who have long endured high rates of interpersonal violence in their neighborhoods.

“Our role is not to be on the front lines, but we are in community with people who are, and we navigate our own challenges in our institutions, navigating the struggles, obstacles and challenges that come with being researchers in academic institutions or research organizations who feel deep urgency for helping our communities. We can relate to what each of us is going through, so there is great comfort in being in communion as a Collective.”



TARA NIENDAM



In California, geography creates significant barriers to people getting early psychosis treatment, as it does for an array of other mental health treatments. That's partly because California's 58 counties have 58 different public mental health programs, each with its own set of covered services designed to meet local needs. Only about two dozen counties have early psychosis programs. Most lack the money or capacity to make them available to all county residents. Often, the only people eligible are those without insurance or on Medi-Cal for low-income Californians.

**Tara Ann Niendam, Ph.D., Professor in Residence, Vice Chair for Research
Department of Psychiatry and Behavioral Sciences**

Specialties: Pediatric and Transition-age Youth Mental Health, Mental Illness

Major funding FY 2023-2024:

- California Early Psychosis Intervention Network of California (EPI-CAL) Learning Health Care Network Expansion and Training and Technical Assistance Center \$23,000,000

In Sacramento County, we have the UC Davis Early Diagnosis and Preventive Treatment Clinic (EDAPT Clinic), a state-of-the-art program that provides services for 2 years, focusing on reducing and managing symptoms and distress of early psychosis, and improving individuals' ability to live their best lives.

Tara Niendam is executive director of UC Davis Early Psychosis Programs and a leader in a statewide effort to set up programs elsewhere. She is the PI of the California Collaborative Network to Promote Data Driven Care and Improve Outcomes in Early Psychosis (EPI-CAL). In 2023, the program was awarded \$23 million from the California Department of Health Care Services to support implementation of CSC programs with harmonized data collection across the state.

EPI-CAL was based on prior collaborations with California counties and their early psychosis (EP) programs as well as experiences using mobile health technology to measure individual outcomes in EP care. It is a network of community and university EP programs that will systematically collect relevant outcomes data from individuals being served within California's EP clinics who are at clinical high risk for psychosis or who have experienced their first episode of psychosis. The relevant outcomes data will be immediately available to program leadership so that it can be quickly shared with stakeholders or shift program practice.

The goal is for these harmonized data to be used to inform decisions and develop learning opportunities for individuals, staff, programs, and administrators, to improve service user outcomes in EP care. Additionally, the project will result in development and testing of a measure of duration of untreated psychosis (DUP) for use in community settings.

In addition to data collection, EPI-CAL provides training and technical assistance to over 40 California counties who have or are creating EP programs for their communities. In collaboration with UCSF and Stanford, EPI-CAL offers EP program staff a suite of trainings in Coordinated Specialty Care (CSC). More specifically, the training content covers evidence-based assessment and treatment of individuals experiencing early psychosis, with a particular focus on fidelity to the CSC model. Additionally, each of the over 40 counties is assigned a county liaison to provide individualized, structured, and responsive technical assistance to support the development of their CSC EP care programs. The program hosted its first statewide TTA conference this September to create a sense of community and share new knowledge with EP providers from across the state.

Broader Impact (US & Beyond)

- Data from the learning health care network founded by EPI-CAL will also help in the understanding of the effectiveness and cost effectiveness of EP care.
- The data will also give allow for examination of a broad group of risk factors, such as risk for homelessness.
- California's program is the only statewide initiative including youth at clinical high risk for psychosis. This is one of the states unique contributions to the national network.



PRANAV SHETTY

If an emergency event led to a surge of ill and injured patients that could overwhelm existing hospital capacity, what would it take to build a pop-up hospital?



This is a question that was recently posed by the US Department of Defense (DOD) and the Defense Health Agency (DHA). Public health emergencies like the COVID-19 pandemic and recent international conflicts have made it clear that hospital surge capacity is an important facet of adequate and effective emergency preparedness. Hospital surge capacity is a hospital's ability to care for a large number of patients that exceeds its normal operating capacity.

**Pranav Prathap Shetty, M.D., M.S., M.P.H., Assistant Professor
Department of Emergency Medicine**

Specialties: Emergency Medical Services, Disaster Medicine, and Global Health

Major funding FY 2023-2024:

- Improving Modular Patient Admission Capacity Through Scalable Solutions (IMPACTS) \$3,680,375

UC Davis Health was awarded more than \$3.5 million to answer this question. Led by Assistant Professor of Emergency Medicine [Pranav Shetty](#), medical director of disaster management at UC Davis Health, a team of researchers is working to deliver a plan to create a modular surge facility (MSF). The MSF is an auxiliary care space that is designed to rapidly provide additional patient care capacity for a patient surge event. Shetty is the PI for the project, known formally as Improving Modular Patient Admission Capacity Through Scalable Solutions or IMPACTS. It is a pilot program in partnership with the [National Disaster Medical System \(NDMS\)](#) and the DHA.

The goal is for the team to develop procedures to set up a hospital tent in just hours, creating a blueprint for health care facilities. The team began by analyzing and defining the technical, operational, and staffing requirements to manage health care surge across escalating scales of patient need. They then designed and created the 56-bed MSF to address a future patient surge event in partnership with Western Shelter Systems. The structure may look familiar (it is the same type of tent used by NDMS Disaster Medical Assistance Teams). Inside, the tent hospital contains everything that would be needed to handle a sudden surge of patients, particularly those in the military: beds, a lab, a pharmacy and even radiology. It also has a six-bed intensive care unit.



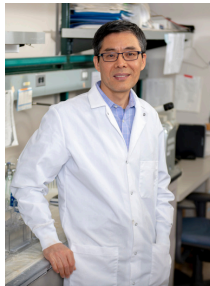
The 56-bed Modular Surge Facility deployed on Vanderhoef Lawn.

Next, the team deployed its design by building a sample MSF on the UC Davis Health campus' Vanderhoef Lawn as well as on Travis Air Force Base in Fairfield. Finally, the team will create an operational and training manual that describes the processes and considerations for deployment in civilian and military healthcare environments.

“We feel honored to be part of this project,” said Shetty. “It's a national project that we're working on and which really exemplifies our role within our health care system and relationship with our Department of Defense and military service members.”

A YouTube video player thumbnail. The top bar is yellow and contains the UC Davis Health logo on the left, followed by a search icon, a magnifying glass icon, a head icon, a gear icon, a play button icon, a 'Watch later' button, and a 'Share' button. The main content area has a dark blue background on the left with the text '-DRIVING DISCOVERY- Designing a Pop-Up Military Hospital for Department of Defense' in white. A red YouTube play button icon is overlaid on the text. On the right side of the thumbnail, there is an aerial photograph of the modular surge facility, showing its white, geometric, interconnected structure on a grassy field.

HONGWU CHEN



“Prostate cancer is the most common cancer in men in 112 countries, and accounts for 15% of cancers. In this Commission, we report projections of prostate cancer cases in 2040 on the basis of data for demographic changes worldwide and rising life expectancy. Our findings suggest that the number of new cases annually will rise from 1.4 million in 2020 to 2.9 million by 2040.”

– The Lancet Commission on prostate cancer, April 2024

Hongwu Chen, Ph.D., Professor and Vice Chair for Research Department of Biochemistry and Molecular Medicine

Specialties: Prostate Cancer, Breast Cancer, Epigenetics, Metabolism

Major funding FY 2023-2024:

- Therapeutic targeting of a novel tumor-intrinsic signaling pathway for lethal prostate cancer; DOD \$1,446,500
- Targeting aberrant circadian regulator in advanced prostate cancer; NIH Cancer Institute \$348,607

Prostate cancer is a serious and rising health concern, and research is moving forward rapidly to meet this issue. Hongwu Chen's prostate cancer research focuses on finding new therapeutic targets to combat resistance to treatments, particularly in advanced stages. A significant area of his work involves the role of hormone receptors and chromatin regulators, which are essential in how cancer cells manage growth and evade therapies.

Chen's research utilizes advanced genomics, bioinformatics, and metabolomics to explore these molecular pathways, aiming to develop safer, targeted therapies. He is also interested in creating biomarkers to predict how well tumors might respond to these new treatments, making strides toward more personalized medicine for prostate cancer patients. This work could help develop effective treatments specifically for lethal, therapy-resistant forms of prostate cancer, addressing a major gap in current cancer care.

One of his current studies is “Therapeutic targeting of a novel tumor-intrinsic signaling pathway for lethal prostate cancer,” for which he was awarded \$1.5 million in FY 2023-2024. This study aims to understand why some prostate cancers become resistant to therapy and progress to more dangerous forms. Researchers have found that a specific alpha-adrenergic receptor protein might drive this resistance and help cancer cells change their characteristics to survive treatment. Their initial work suggests that when cancers progress to these lethal forms, one receptor normally targeted by β -blockers becomes inactive, while the alpha-receptor and its related genes become more active, helping the cancer resist treatment.

Chen's research is testing this thesis, with three main goals:

- 1) Use various genetic approaches to show how the alpha-receptor signaling makes tumors resistant to standard therapies and helps them spread.
- 2) Understand the signaling pathway and see how it maintains a feedback loop that could support the tumor's survival and adaptability.
- 3) Evaluate new drug candidates that block alpha-receptor signaling to see if they can effectively stop the growth of resistant cancers without harmful side effects. The team will then study indicators to predict which tumors might respond.

This research could reveal new targets for treating lethal prostate cancer and could potentially offer new treatment options that are both effective and safe. In the longer term, it could also help researchers understand how nerve-like signaling in these cancers leads to treatment resistance and aggressive tumor behavior.

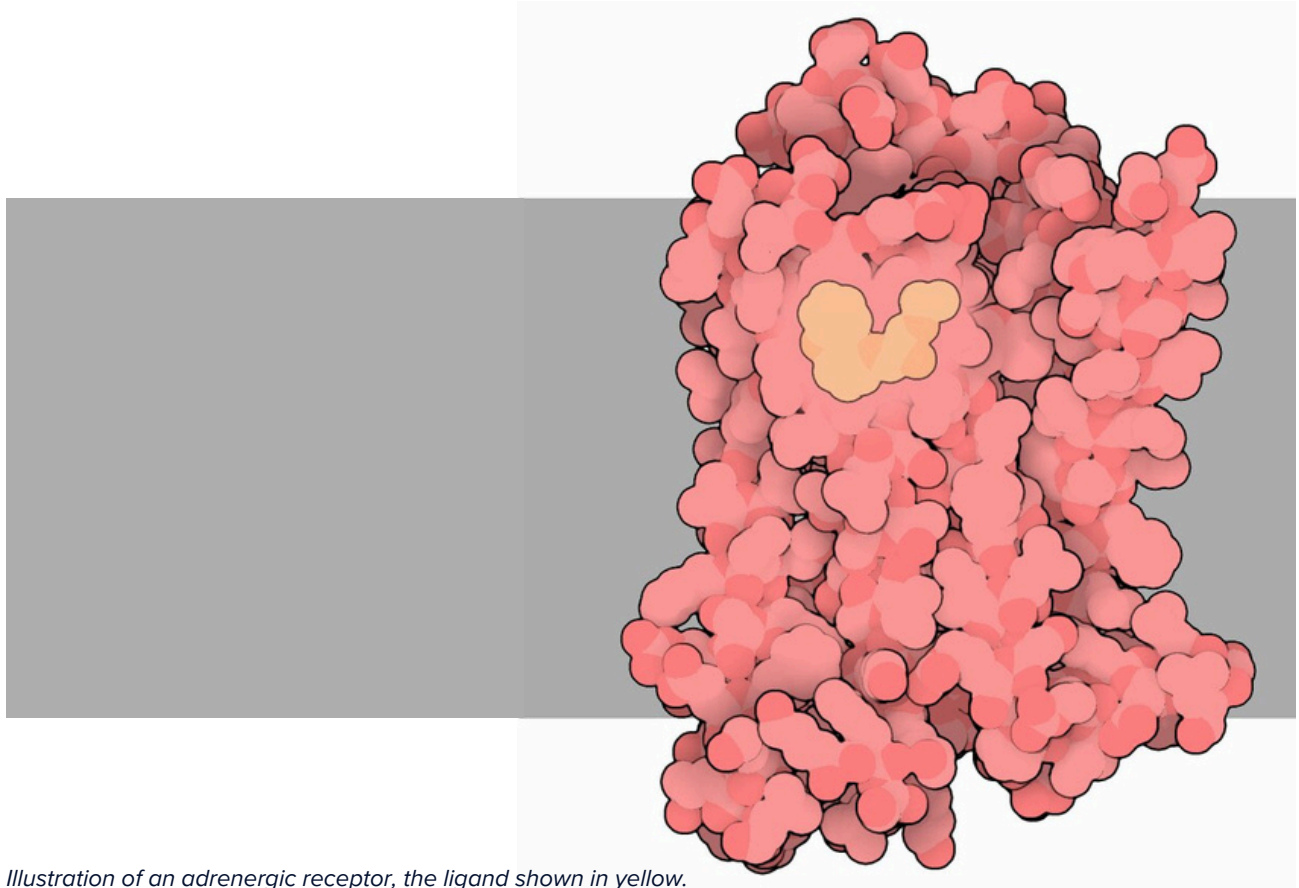


Illustration of an adrenergic receptor, the ligand shown in yellow.

RAMSEY BADAWI



Ramsey Badawi is an imaging innovator at UC Davis. Along with Simon Cherry, he is the co-creator of EXPLORER at UC Davis, the world's first medical imaging scanner that can capture a 3-D picture of the whole human body at once, operational since 2019. EXPLORER is a combined positron emission tomography (PET) and X-ray computed tomography (CT) scanner. Because the machine captures radiation far more efficiently than other scanners, EXPLORER can produce an image in as little as one second and, over time, produce movies that can track specially tagged drugs as they move around the entire body.

Ramsey D. Badawi, Ph.D., Professor, Vice Chair for Research Department of Radiology

Specialties: Nuclear Medicine, Diagnostic Radiology

Major funding FY 2023-2024:

- Biodistribution of 18F-FAP PET/CT in subjects with Non-alcoholic steatohepatitis (NASH) \$1,836,404
- Multi-Center Academic-Industrial Partnership For Personalized AI-Enabled High Count PET \$132,285

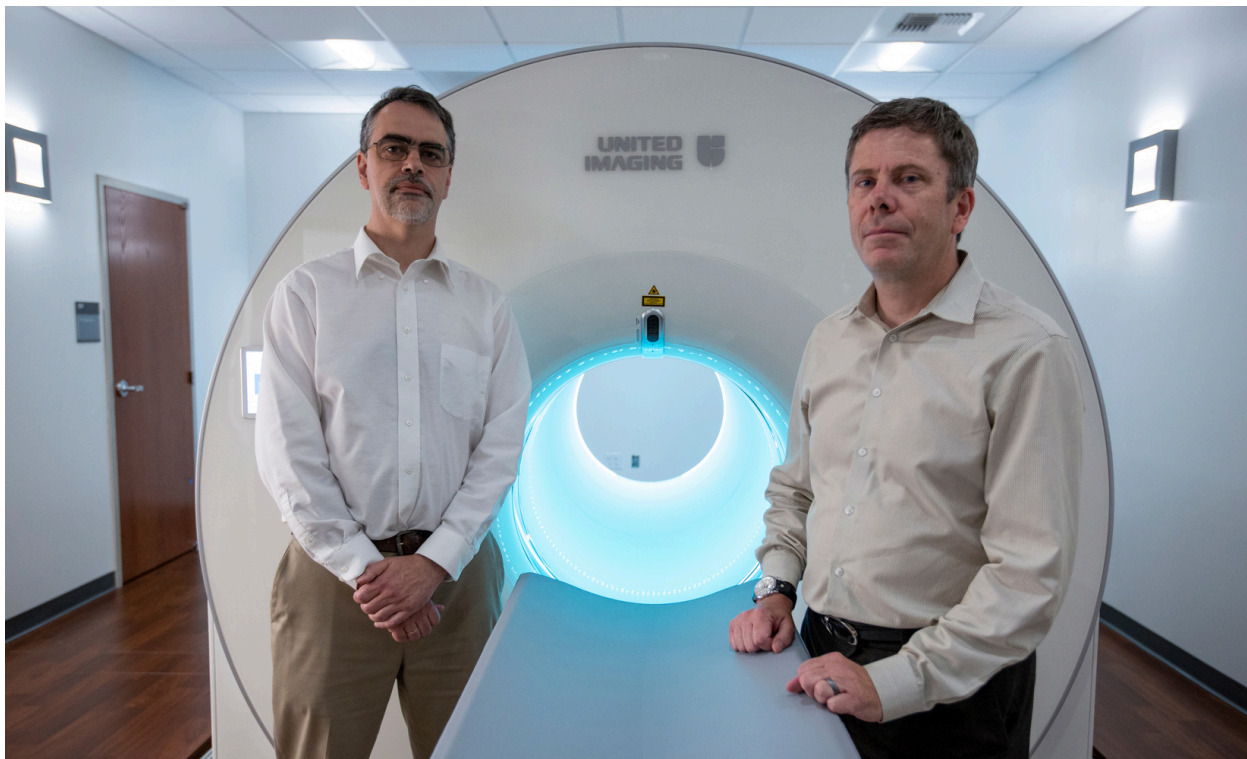
When they invented EXPLORER, Drs. Badawi and Cherry expected the technology to have countless applications, from improving diagnostics and tracking disease progression to researching new drug therapies. In the subsequent years, this has proven to be the case. Current UC Davis clinical trials using EXPLORER include research on blood flow/glucose utilization, chronic back pain, rheumatoid arthritis and cancer.

Badawi has two imaging research projects that received major funding this year. One is the "Multi-center Academic-Industrial Partnership for Personalized AI-Enabled High Count PET." This project, in collaboration with colleagues at Yale and Massachusetts General Hospital, seeks to increase the accuracy of diagnostic imaging. High image noise, or fuzziness, in PET scans can lower the accuracy of diagnosis and lead to overestimated results, which may mistakenly show disease where there isn't any. This extra noise can also make doctors less confident in their decisions, potentially causing them to order more tests or even invasive procedures that may not be really needed. New deep learning methods are promising in reducing this noise, but so far, they mostly improve images taken with lower doses of radiation or shorter scan times. This project, however, aims to improve the quality of standard clinical PET scans by making them resemble ultra-clear, high-dose images without the actual high doses. The goal is to create an advanced, accessible tool that allows for clearer PET scans across various medical centers, enhancing diagnostic accuracy and reducing unnecessary follow-up procedures.

Badawi and his radiology collaborators, together with internal medicine professor Valentina Medici and surgery associate professor Victoria Lyo from Surgery, have also been awarded \$1.8 million for the study “Biodistribution of 18F-FAP PET/CT in subjects with Non-alcoholic steatohepatitis (NASH).” NASH is a serious liver disease that occurs when fat builds up in the liver and causes inflammation and cell damage. About 3%–5% of Americans suffer from NASH and diagnosis is important because it is associated with an increased risk of cancer.

Traditionally, the gold standard for the diagnosis of NASH has been liver biopsy. As with any invasive procedure, complications may occur, the most important in this case being bleeding. Additionally, due to its invasive nature, acceptance by patients is low, leading to poor compliance, especially if repeated biopsies are required during follow-up. Another major limitation of liver biopsy is that it evaluates only a very small portion of the liver, which can lead to diagnostic errors.

Modern imaging techniques such as MRI and PET provide a noninvasive way to study the liver. 18F-FAP PET is a new technique that shows great promise for the evaluation of liver scarring and potentially liver inflammation as well and may become a one-stop shop for assessing the whole liver in a non-invasive way. The derived measurements have the potential to be highly precise, accurate and reproducible with the promise of eventually replacing biopsy as the new “gold standard” for diagnosis of liver disease.



Drs. Badawi and Cherry and the EXPLORER machine

DAVID BRANDMAN & SERGEY STAVISKY

“Not being able to communicate is so frustrating and demoralizing. It is like you are trapped.”

Casey Harrell, then aged 45, had lost the ability to communicate effectively. The neurodegenerative disorder amyotrophic lateral sclerosis (ALS) had gradually paralyzed him. As the effects spread to his lips, tongue and jaw, his speech devolved into indistinct sounds. ALS, also known as Lou Gehrig's disease, affects the nerve cells that control movement throughout the body. The disease leads to a gradual loss of the ability to stand, walk and use one's hands. It can also cause a person to lose control of the muscles used to speak, leading to a loss of understandable speech.



Harrell is a participant in BrainGate2, a multi-site clinical research trial being led at UC Davis by neurosurgeon David Brandman and neuroscientist Sergey Stavisky. Their team developed a new brain-computer interface (BCI) that translates brain signals into speech with up to 97% accuracy — the most accurate system of its kind. In July 2023, Harrell received the investigational BCI device. Brandman placed four microelectrode arrays into the left precentral gyrus, a brain region responsible for coordinating speech. The arrays are designed to record the brain activity from 256 cortical electrodes, each of which can detect the activity of individual neurons.

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Stavisky, Brandman and their team [described the new BCI](#) on August 14 in the *New England Journal of Medicine*.

Harrell isn't the first person with paralysis to talk with his thoughts. But his BCI is easier to use and far less error-prone than previous devices. Using the BCI, Harrell's desire to speak can be translated as words on a computer screen. The computer also reads each completed sentence out loud in a voice that sounds like Harrell's, because it is recreated with AI from videos taken before he lost his ability to speak by himself. This allowed his young daughter to hear him speak in his voice for the first time.

In essence, what the BCI does is bypass the injury. The researchers recorded from the part of his brain that is trying to send speech commands to his muscles. Using machine learning, the BCI translates those patterns of brain activity into phonemes, the individual sounds that make up words. In other words, the BCI is not reading people's minds; it's detecting their attempt to move their muscles and to create the individual sounds that make up speech.

However, text communication fails to capture the nuances of human speech such as prosody, intonation and immediately hearing one's own voice. In new work that is still a pre-print undergoing peer review, Stavisky, Brandman and team demonstrate a "brain-to-voice" neuroprosthesis that is able to quite accurately synthesize Harrell's voice with the BCI immediately, so that he can hear the sounds he's trying to speak as soon as he tries to make them. Updated with new algorithms, the device instantaneously synthesizes more than just the phonemic content (i.e., what words Harrell was trying to say). It also is able to decode so-called paralinguistic features of speech from his brain activity, which let him modulate his BCI-synthesized voice in real-time to change intonation, emphasize words, turn a sentence into a question, and sing short melodies. These results take the project a step closer to providing a "virtual vocal tract" that allows people with paralysis to speak intelligibly and expressively through a BCI.



Casey Harrell (foreground) .

FY 2023-2024 RESEARCH IMPACT REPORT

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