THE MAGAZINE OF **UC DAVIS COMPREHENSIVE CANCER CENTER** VOL 25 NO 2 / WINTER 2022

SYNTHESIS

Canine cancer patient *joins* clinical trial

PAGE 6

Is wildfire smoke a cancer risk?

PAGE 10

Diagnosing and removing lung cancer in a single surgery

PAGE 22

Cancer burden facing Asian Americans

PAGE 27

Dear Reader,

A year of discovery, innovation and collaboration closes as we embark on the exciting new year ahead to break barriers to beat cancer. Life-changing science happens every day at UC Davis Comprehensive Cancer Center. Our high-impact and compelling research tests us, transforms us and creates new opportunities to save lives. Such is the theme for this issue of Synthesis.

While cancer research is the hallmark of our reputation, compassionate care is our cornerstone. The cancer center is caring for a record-high volume of cancer patients — expected as the pandemic waned, and cancer screenings, as well as deferred cancer care, resumed. Delays in visiting the doctor, as we anticipated, resulted in an unfortunate number of advanced cases of cancer. We were ready. Our committed teams of oncologists, advanced practice providers, nurses, social workers, navigators, clinical trials staff, and support personnel sprang into action as we did our best to quickly get cancer patients screened, diagnosed and into treatment, leveraging the most advanced therapies and clinical trials.

We are determined to confront cancer from every angle. Read about our new Center for Experimental Therapeutics in Cancer that will serve as an incubator for promising cancer therapies, taking them from the lab to the bedside. A new National Center for Interventional Biophotonic Technologies, part of the new Aggie Square under construction, will advance two optical imaging technologies that were born at UC Davis and make microscopic removal of the smallest of tumors possible.

Wait until you meet Tyson — a canine cancer clinical trial participant on three legs (the fourth was removed due to bone cancer). He is helping to advance immunotherapy that is administered by inhalation rather than ingestion or intravenous delivery. He was given only weeks to live and now, a year later, he is running through life at full speed. Part of our comparative oncology program, Tyson is helping test whether the protein interleukin-15 can stimulate the immune system to fight cancer.

This issue of Synthesis reports on new pilot studies that look into the cancer risk posed by wildfire smoke. We also provide an overview in this issue about how the cancer center is supporting the early careers of oncology researchers through a variety of programs designed to also foster diversity and give researchers from underrepresented backgrounds the resources they need to succeed.

You will get a glimpse of Professor Yoshihiro Izumiya's lab in this issue. His team of scientists uncovered a cell protein that has enabled an HIV-related sarcoma to evade detection. We also introduce a new gene profiling technology that diagnoses melanoma in early stages, when it is more treatable.

Understanding who gets certain cancers and why — and which communities carry heavy cancer burdens — is as important as making strides in medicine and biotechnology. We devote an entire section in the magazine to examining cancers unique to Asian Americans and the role that racism may play in hindering Asian Americans from accessing care and benefiting from cancer research.

Synthesis brings together the vast moving parts of our collective undertaking to heal our communities and shape the future of groundbreaking cancer research and care. See the new vision statement we unveil as 2023 begins. We invite you to consider new philanthropic opportunities to accelerate the progress we are making. As much as we've achieved together, we've only just begun.

We hope you value the magazine. As always, we value your support.

Primo "Lucky" Lara Jr., M.D.
DIRECTOR, UC DAVIS COMPREHENSIVE CANCER CENTER

BREAKING BARRIERS TO **BEAT CANCER**℠

***Synthesis* is published twice each year by the UC Davis Comprehensive Cancer Center.**

If you receive multiple copies of this publication, please share them. To add your name to the mailing list or change your address, please call 916-734-9450.

EXECUTIVE EDITOR
Primo "Lucky" Lara Jr., M.D.
Director, UC Davis Comprehensive Cancer Center

EDITOR
Stephanie Winn

ART DIRECTOR
Barbara Hennelly

GRAPHIC DESIGNER
Serena Evans

PHOTOGRAPHERS
Wayne Tilcock
Christopher Nelson

WRITERS
Liam Connolly, Jeff March, Connor Murphy, Greg Watry, Stephanie Winn, Nadine Yehya

Scan this code to learn more about the UC Davis Comprehensive Cancer Center and its leadership.

UC DAVIS HEALTH
COMPREHENSIVE CANCER CENTER

cancer.ucdavis.edu

in this issue

THE MAGAZINE OF **UC DAVIS COMPREHENSIVE CANCER CENTER** VOL 25 NO 2 / WINTER 2022

Head and neck cancer authority Xiao-Jing Wang is the new chief science officer at UC Davis Comprehensive Cancer Center. She also has been designated associate director for basic science, the leadership role previously held by Luis Carvajal-Carmona, who was appointed the cancer center's inaugural chief diversity officer and director of the new Center for Advancing Cancer Health Equity.

Wang also received an appointment to the Department of Pathology and Laboratory Medicine and has been named the Stowell Endowed Chair in Experimental Pathology.

Previously, Wang was a tenured full professor at the University of Colorado Anschutz Medical Campus where she held joint appointments in the departments of pathology, dermatology, otolaryngology, radiation oncology and craniofacial biology. She was also the John. S. Gates Endowed Chair of Cancer Stem Cell Biology, as well as the founding director of the Head and Neck Cancer Research Program, the director of the T32 Training Program of Lung, Head and Neck Cancer, and co-director of the Colorado Head and Neck SPORE (Specialized Programs of Research Excellence) Program. The program advances translational research to improve survival and quality of life for head and neck cancer patients.

"Our research innovations and areas will broaden significantly with our appointment of Dr. Wang," said UC Davis Comprehensive Cancer Center Director Primo "Lucky" Lara Jr. "She brings to UC Davis not only a portion of the Head and Neck SPORE funding, but true programmatic collaborations as well with its exciting advancements of science leading to novel therapies for multiple cancer types."

The Wang Lab uses both mouse models and human cancer specimens for cross-species comparisons. The lab is especially focused on the role of tumor microenvironments in cancer progression and metastasis, and the properties of cancer stem cells. It also explores cancer immunotherapy and the mechanism of immune evasion of cancer.

"UC Davis Comprehensive Cancer Center's reputation as a research institution is growing internationally, and I'm humbled to join the institution at its rapidly growing phase with my significant efforts in developing team science, clinical translation, training-mentoring and innovation," Wang said.

Cancer center appoints new chief translational officer

A new chief translational officer and associate director for translational research is overseeing interdisciplinary efforts at the cancer center that translate laboratory discoveries into new cancer therapies for patients. Nicholas Mitsiades, professor with the Department of Internal Medicine, was also named the Albert Holmes Rowe Chair of Genetics III, Endowed Chair.

"We are very pleased Dr. Mitsiades has joined our NCI-designated comprehensive cancer center and anticipate he will greatly enhance our mission to leverage biomedical science, from bench to bedside, in an effort to increase efficacy of therapeutics while decreasing the toxicity of cancer treatments," said UC Davis Comprehensive Cancer Center Director Primo "Lucky" Lara Jr.

Mitsiades is a physician scientist and clinically trained medical oncologist and endocrinologist specializing in prostate cancer. He focuses on providing state-of-the-art care to socioeconomically disadvantaged patients and equitable access to molecular testing and to biomarker-driven targeted therapies and clinical trials.

"Translational science can best be described as taking laboratory, clinical and community observations and adapting them into treatment interventions that will make a meaningful difference in the lives of cancer patients and their loved ones," said Mitsiades. "I am honored to join UC Davis Comprehensive Cancer Center. It is truly a pathfinder in pursuing cancer health equity, and I look forward to building upon the multidisciplinary efforts underway to lessen the cancer burden for all."

Previously with Baylor College of Medicine, Mitsiades was associate professor of hematology/oncology and taught in the Department of Molecular and Cellular Biology. He was the principal investigator of a National Institutes of Health U54 minority PDX grant, which supports pre-clinical trials to test new therapies that may help minority populations.


Jan Nolta

Jan Nolta receives 2022 Chancellor's Lifetime Achievement Award in Innovation

Jan Nolta, director of the Stem Cell Program and Gene Therapy Center at the Institute for Regenerative Cures, received the 2022 UC Davis Chancellor's Lifetime Achievement in Innovation Award. This award recognizes researchers whose career accomplishments include innovations leading to a long-term positive impact on the lives of others and who are an inspiring influence for other innovators.

During the past few years, Nolta has been collaborating with an interdisciplinary team, including UC Davis professors Mehrdad Abedi, Joseph Tuscano and Gerhard Bauer to pioneer the California CAR-T program for cancer patients. To advance this innovation, Nolta's group is cultivating potent cancer killer cells to treat leukemia and lymphoma in relapsed patients. The approach may tackle kidney, ovarian and bladder cancers down the line. The team is helping to facilitate changes that would drive the cost of CAR-T therapies down while increasing accessibility so that lifesaving, cutting-edge therapies can be made available to all patients in an equitable manner.

Nolta's current research is focused on developing therapies that will use mesenchymal stem cells to help treat Huntington's disease and other disorders and injuries. She is the scientific director of the Good Manufacturing Practice clean room facility at UC Davis, where stem cells of various types are being isolated or expanded for clinical trials.

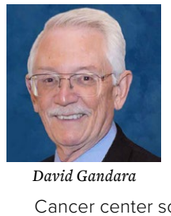
Nolta's desire to serve the community and to benefit the lives of people has been one of the major driving forces for many of her career accomplishments. Her group focuses on "bench-to-bedside" research, and she has been involved in numerous clinical trials of gene and cell therapies. Nolta has been an advocate of a diverse science and health care workforce of the future and is currently leading or assisting with numerous training programs. Her passion is in training other first-generation students, and those from diverse backgrounds and lived experiences.

Cancer news via podcast!

The cancer center has launched Beat Cancer, a new podcast that offers an in-depth discussion of the science, research and advancements taking place at UC Davis Comprehensive Cancer Center. Learn about the latest cancer news including prevention, screening and treatment—and how we are breaking barriers to beat cancer in our community and beyond. Find Beat Cancer on cancer.ucdavis.edu or your favorite podcast platform. Want a topic covered? Email us at **beatcancer@ucdavis.edu**.

New Center for Experimental Therapeutics in Cancer advances promising treatments

Kit Lam



David Gandara

UC Davis Comprehensive Cancer Center has launched a Center for Experimental Therapeutics in Cancer to advance cancer care by speeding promising cancer therapies from the lab to the bedside. The goal is to facilitate the commercialization of promising drugs emerging from UC Davis laboratories by establishing a hub for the development of startups and the acquisition of small business grant funding from the National Cancer Institute.

Cancer center scientists Kit S. Lam and David R. Gandara are co-leaders of the new center.

"We see the Center for Experimental Therapeutics in Cancer as an incubator for bringing multidisciplinary teams from throughout UC Davis together with biotech and pharmaceutical companies working hard to move anti-cancer agents through the drug development pipeline, from start to finish," Lam said.

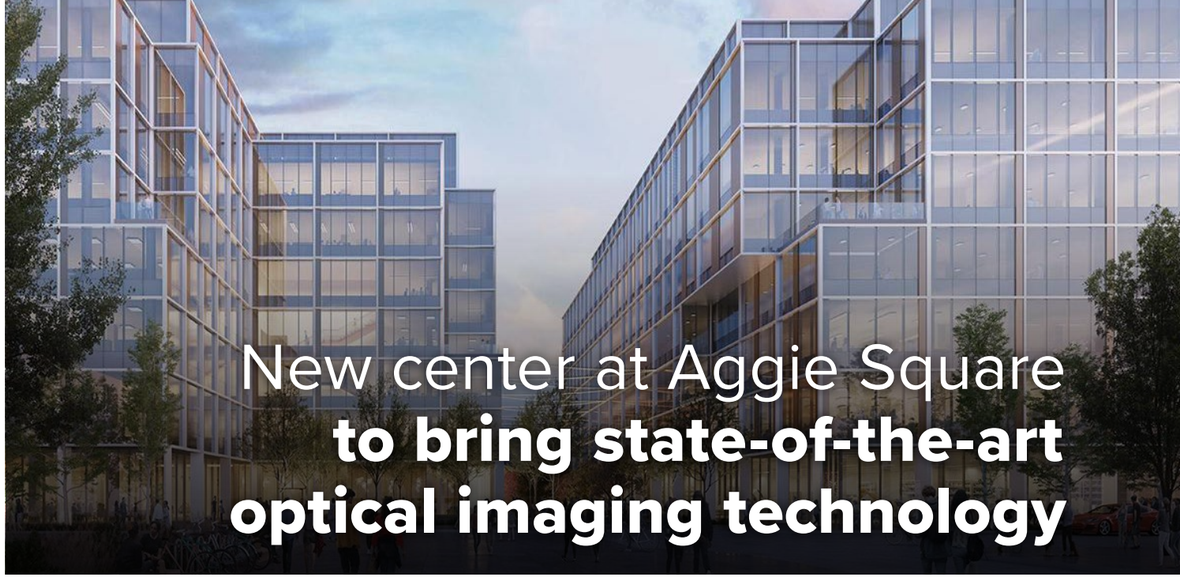
The idea is to advance more effective, less toxic cancer therapies to meet the demand for precision medicine. These treatments target individual patients with care customized to specific cancer biomarkers, using the latest biological therapies and drug agents.

"The next frontier has arrived, and we are poised to accelerate the discovery of novel cancer treatments based on a genetic understanding of a patient's cancer," said UC Davis Comprehensive Cancer Center Director Primo "Lucky" Lara Jr. "Rather than a one-drug-fits-all approach, precision medicine is leveraging novel pathways, biomarkers and other discoveries, which we want to coordinate through this new center, designed to translate research quickly into clinical settings."

The center will facilitate close collaboration with basic researchers, clinicians and translational scientists, including launching clinical trials to evaluate these newly identified anti-cancer agents. Researchers will work with pharma and biotech companies, venture capitalists, nonprofit foundations and academia, as well as the National Institutes of Health and National Cancer Institute.

In addition to rendering scientific and technical assistance, the Center for Experimental Therapeutics in Cancer will offer support for drug development by means of the Food and Drug Administration's Investigational New Drug application process. The new center additionally will facilitate communication with UC Davis experts in intellectual property, licensing and patents.

"We also want to ensure ongoing educational opportunities such as workshops and symposiums in addition to helping advance the careers of researchers who come from underserved communities," Gandara said. "We are committed to working with our Office of Community Outreach and Engagement to ensure that the research taking place also addresses cancer health disparities in our region."



New center at Aggie Square **to bring state-of-the-art optical imaging technology**

A new center, part of the Aggie Square under construction on the UC Davis Health campus, will soon advance better, safer and more precise imaging technology to help identify cancerous cells in the brain as well as in the head and neck.

The National Center for Interventional Biophotonic Technologies (NCIBT) will build upon two optical imaging technologies developed at UC Davis — interventional fluorescence lifetime imaging, or iFLIM, and interferometric diffuse optical spectroscopy, or iDOS. Researchers will combine them with an artificial intelligence (AI) program to provide real-time guidance of decision-making during medical and surgical procedures.

A $6.3 million P41 grant from NIH's National Institute of Biomedical Imaging and Bioengineering will fund the new center, which includes state-of-the-art laboratories, teaching space, and learning centers.

Both imaging technologies are noninvasive and measure fluctuations in light emanating from tissues — meaning how light is diffused or absorbed or emitted by the tissue or cells. IFLIM was developed by Laura Marcu, a professor in the UC Davis College of Engineering's Department of Biomedical Engineering. It uses light measurements through a handheld, pen like diagnostic probe in an open or endoscopic procedure to determine the tissues' molecular makeup. This information helps determine the prevalence of healthy versus altered tissue.

IDOS, developed by UC Davis Adjunct Associate Professor of Biomedical Engineering Vivek Srinivasan, uses similar light-based optical imaging that penetrates the scalp and skull to determine brain blood flow.

Cancer applications

"Decision-making about how extensive surgery must be to completely remove tumors relies heavily on the surgeon's experience, and sometimes requires repetitive and time-consuming lab analysis of tissue around the cancer to make sure all the tumor is gone," said David Lubarsky, CEO of UC Davis Health.

"This new national center will build on strengths unique to UC Davis' School of Medicine and College of Engineering, developing new optical tools to help surgeons everywhere more often provide complete cures for their patients," Lubarsky added.

During cancer surgeries, neurosurgeons need to identify and remove malignant tissues intertwined with normal, functional brain structures. Current imaging tools generally are not effective at detecting less aggressive tumors. They also require significant pre-surgical planning, special operating room setup and the administration of potentially toxic dyes to patients.

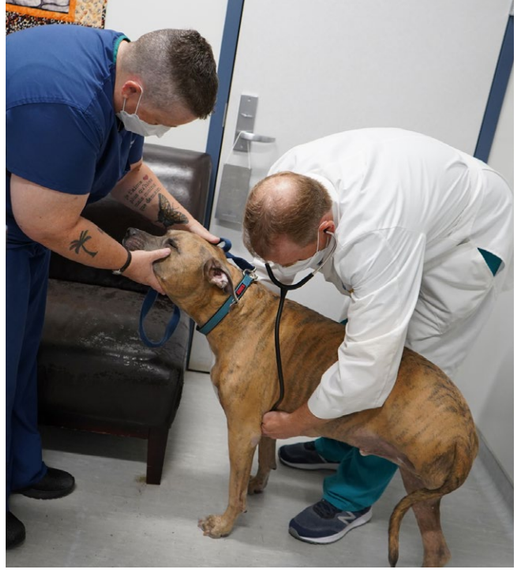
Marcu, founding director of NCIBT, has been exploring the use of iFLIM in partnership with neurological (brain) surgeon Orin Bloch and otolaryngologist (ear, nose and throat) surgeon Andrew Birkeland.

"This technology will help surgeons and other physicians make decisions in real time by assessing the local tissue, its physiology and pathology, and integrating this imaging data with preoperative and other intraoperative imaging data and information from a patient's history, to optimize the procedure," Marcu said.

Breath Test:

Dogs in clinical trial inhale immunotherapy agent to fight cancer

Cancer flourishes by operating in stealth mode. As cells mutate into abnormal, malignant forms, they craftily evade the body's defenses.



Scientists from UC Davis and other institutions believe a new approach may be at hand to trigger responses from the body's defense mechanisms: T-cells and natural killer (NK) cells. A protein that the body naturally produces could become an important new immunotherapy tool to destroy cancer.

In a first-of-its-kind Phase 1 clinical trial, a team of 24 researchers from multiple disciplines demonstrated that amplified concentrations of the protein interleukin-15 (IL-15) can stimulate immune system defenses against some cancers in dogs. IL-15 is one of several types of cytokines—substances that have signaling and regulating functions in immune system activity.

UC Davis Comprehensive Cancer Center surgical oncologist Robert J. Canter and veterinary oncologist Robert B. Rebhun, associate director of the cancer program in the UC Davis Veterinary Medicine Center for Companion Animal Health, were corresponding authors for the study.

"We are strong advocates of clinical trials in dogs, especially for immunotherapy, as a way to speed bench-to-bedside translation," said Canter, a professor of surgery in the UC Davis Division of Surgical Oncology. "Mouse models have limitations, especially for immunotherapy, which is the new frontier of cancer treatment. In contrast, the cancers that afflict dogs, including sarcomas, brain tumors, lymphoma and melanoma, are incredibly similar to cancers that humans develop."

Osteosarcoma and melanoma that develop elsewhere in the body commonly spread to the lung, in dogs as well as humans.

The researchers' study, titled "Inhaled Recombinant Human IL-15 in Dogs with Naturally Occurring Pulmonary Metastases from Osteosarcoma or Melanoma: A Phase 1 Study of Clinical Activity and Correlates of Response," was published in the Journal for ImmunoTherapy of Cancer.

The study participants included 21 pet dogs of various breeds that had metastatic lung disease resulting from osteosarcoma or melanoma. Although previously recognized for immunotherapy properties, IL-15 has undergone few human clinical trials because of toxicity risks associated with concentrated doses.

"No one previously had administered IL-15 as an inhalational treatment in dogs to deliver it directly to the site of the cancer. We came up with that idea as a means of reducing exposure to the rest of the body, in order to improve the benefit-risk ratio, to improve the immune stimulating effects, and to reduce toxicity," Canter explained. "In this study, we used interleukin-15 to reinvigorate the immune system to make it recognize the cancer cells that had evaded the immune system and eliminate them."

> "We are strong advocates of clinical trials in dogs, especially for immunotherapy, as a way to speed bench-to-bedside translation."
>
> –ROBERT J. CANTER, PROFESSOR OF SURGERY IN THE UC DAVIS DIVISION OF SURGICAL ONCOLOGY

Robert J. Canter (left), oncology surgeon, and Robert B. Rebhun (right), veterinary oncologist, partner on a clinical trial

Companion pet Tyson was enrolled in the IL-15 clinical trial

In the study, dogs inhaled a mist containing IL-15 twice daily. Doses were increased over time, to help determine not only effectiveness, but also tolerable levels and the ceilings above which toxicity would result. Dogs exhibited significant responses within 14 days after they began inhaling the IL-15 mist.

Tumors shrank dramatically in two dogs in the study, including one that went into complete remission for more than a year. Cancer that had been growing rapidly in five other dogs stabilized for several months. "Our overall response rate, the clinical benefit rate, was close to 40%," Canter said.

For that and other reasons, additional studies are needed, noted Rebhun, a professor in the UC Davis School of Veterinary Medicine's Department of Surgical and Radiological Sciences.

"The inhaled IL-15 responses that we've seen in dogs are better than prior human studies, but clinical benefit is seen in less than half of the dogs. Using IL-15 in people has led to potentially favorable immune responses but has not yielded good tumor responses. This indicates that combining IL-15 with other immunotherapies may result in additive or synergistic responses," said Rebhun, who holds the Maxine Adler Endowed Chair in Oncology.

In his view, the study yielded two significant findings: the therapy was well tolerated, and even a short two-week course of inhaled IL-15 could lead to sustained suppression of advanced and diffuse metastatic cancer. Both he and Canter noted that in eventual clinical application, IL-15 likely would be used not as a standalone therapy, but as a reinforcement in combination with other treatments.

"All of the canine patients in this study had advanced metastatic cancer, and the majority already had received prior chemotherapy, radiation therapy and, in some cases, immunotherapy. Studies are ongoing now to see whether we can predict which patients might respond to this therapy based on properties of the tumor or the patient's immune status," Rebhun said.

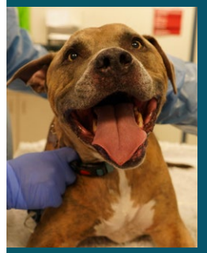
"This may help us identify patients that might respond to this therapy, as well as help us understand how to potentially combine other immunotherapies to improve response rates. We are grateful to the extremely dedicated clients who sought any and all possible care for their pets, elected to enroll them in this study, and even delivered the inhaled IL-15 to their dogs at home—in hopes that it could benefit their dog, other dogs, or possibly even people with advanced metastatic cancer," said Rebhun.

"It feels so good knowing that Tyson is also contributing to cancer research to save the lives of not just pets, but people."

–BRIANNA FIZULIC, TYSON'S OWNER

Tyson and owner Brianna Fizulic and her daughter Sophia

Meet Tyson



It takes a certain type of dog to weather cancer treatment with a smile, but Tyson isn't just any dog. Part English mastiff, part pit bull, he has a huge smile and falls in love with everyone he meets.

As a participant in the IL-15 clinical trial at the UC Davis Veterinary Medicine Center for Companion Animal Health — a comparative oncology study conducted in collaboration with UC Davis Comprehensive Cancer Center — Tyson has been meeting a lot of people. Among them are veterinary oncologist Robert Rebhun and oncology veterinary technician Jacque Young.

"All you have to do is say, 'Where's Jacque?' and Tyson goes crazy with excitement," said his owner, Brianna Fizulic.

Tyson's life had tough beginnings. Born at the Sacramento SPCA, he seems to take defying the odds in stride. Diagnosed in 2020 with osteosarcoma, or bone cancer, the nearly 90-pound Tyson had to undergo a leg amputation. A week later, he was hopping around, wagging his tail and playing with his "little sister," 6-year-old Sophia. "He is my daughter's playmate and constant companion," remarked Fizulic.

Unfortunately, the outlook wasn't good for Tyson. Even with the leg removed, he was likely to live only a month or two.

"I was devastated at the news," said Fizulic, a single mom who said she didn't know how she would pay for further cancer treatment but didn't want to let the dog she calls "my boy" down. "He has helped get me through so many of life's milestones," she said.

"That's when UC Davis suggested that I consider enrolling Tyson in a new clinical trial to test an inhaled immunotherapy using a treatment that might someday be used with humans," Fizulic said.

All of Tyson's expenses were covered in the trial, including conventional chemotherapy, scans and exams. A year later, Tyson can hardly contain his zest for life and his enthusiasm for follow-up visits.

"Not only is he thriving a year after initially being given no hope, it feels so good knowing that Tyson is also contributing to cancer research to save the lives of not just pets, but people, too," Fizulic added.

Tyson, born to a stray, was adopted into a loving home and is now on a special mission.

Exploring the link between wildfire smoke and cancer risk

UC Davis Comprehensive Cancer Center funds two pilot studies to examine impact of smoke from fires

Within the past six years, Californians have witnessed a troublesome trend in wildfires. Not only are wildfires larger, more frequent and more severe than in prior years, but they're also increasingly closer to home, crossing into a boundary known as the wildland-urban interface. This boundary, where wilderness meets civilization, is of special interest to research scientists.

"When wildfires cross this kind of invisible boundary, they start to consume the built environment, all the synthetic materials in homes, in cars, in infrastructure, and that changes the emissions landscape," said Keith Bein, an associate professional researcher with the UC Davis Air Quality Research Center. "That changes what those emissions are composed of, and that changes their impact on toxicity and thus public health."

UC Davis Comprehensive Cancer Center is funding two pilot studies designed to investigate how wildfire smoke changes the air that Californians breathe and the water they drink. Researchers conducting these studies also are investigating how those changes affect the risk for developing and surviving cancer.

One study is being led by Bein and another by cancer center Associate Director of Population Sciences Shehnaz K. Hussain.

"A lot of material in buildings and structures is going into the atmosphere, the air and the water," Hussain said. "Some of the elements in wildland-urban interface smoke have not been studied, so we just don't know what kind of risks for cancer these exposures are going to pose."

Pilot study #1: Sampling smoke

"One of the ways to study wildfire smoke, especially the health effects, is to go out to the fire and collect samples of air pollution," Bein said. "So, when a fire pops up, I want to be there to collect samples in close proximity to where those emissions are occurring."

And for the past handful of years, that's exactly what Bein has been doing: collecting air samples from wildfire events, including the 2018 Camp Fire and its connected airsheds, or regional air supplies.

"Not only are wildfires happening every summer, but they're also happening multiple times every summer," Bein said. "These kinds of repeated exposure scenarios may lead to diseases like cancer."

In the pilot study, Bein and his colleagues will analyze his wildfire smoke samples to better understand how chemical compounds can trigger cancer development. Specifically, the team is investigating the aryl hydrocarbon receptor (AhR) signaling pathway. Dysfunction of this pathway is one of the main cascading events that leads to the development and progression of lymphoma.

To study this, Bein and his team will use their lab to re-create atmospheric conditions of previous fires, like the Camp Fire. And that's where Bein's wildfire smoke samples come into play. He and his colleagues plan to re-aerosolize those samples and expose cellular and animal models to them.

"We're going to try to mimic what actually happened during the Camp Fire to the people in the Bay Area who got the biggest exposure from that fire," Bein said. "We're going to try to re-create that in a mouse model and see if they develop lymphoma."

The hope is that by re-creating such conditions, the team can determine whether — and how — wildfire smoke leads to lymphoma development at the molecular level.

Pilot study #2: Soot in the soil

In the second pilot study, Hussain will compare air quality data with the California Cancer Registry to study how increased exposure to wildfire smoke affects cancer risk, development and treatment response.

Public air quality monitors, including those that PurpleAir manufactures, allow continuous, real-time monitoring of particulate air pollution. That's become particularly handy for researchers who wish to conduct longitudinal studies of wildfire smoke risk.

"The idea is to compare people with cancer diagnoses in high wildfire smoke exposure areas to people with cancer diagnoses in low-exposure areas throughout the state and see if there are any differences in how they do," Hussain said.

She and her colleagues are not only interested in how wildfire smoke affects the air, but they also want to understand how it's changing California's groundwater — a much more difficult prospect to document.

"A lot of our region here in Northern California relies on well water, which is not monitored," Hussain said, noting that particulates from wildfire smoke can penetrate into the soil and seep into groundwater. "There's no law in California to monitor the composition of heavy metals and other things in well water."

To rectify this deficiency, Hussain and her team are seeking the public's assistance in building a groundwater quality database.

"Through a citizen science approach, we want to get people to contribute samples from their wells and get a baseline database," Hussain said. "In the future, we're hoping to study wildfire events that are in proximity or upstream of water from those people who are participating in our study, and then study changes that may be occurring in the water due to wildfire events."

For Hussain, this confluence of rich data and subject-area expertise puts UC Davis at the forefront of research into public health and wildfire smoke.

"Pulling all of these people together is really a no brainer," Hussain said. "It's the best example of team science that we can do here at UC Davis."

"Not only are wildfires happening every summer, but they're also happening multiple times every summer," Bein said. "These kinds of repeated exposure scenarios may lead to diseases like cancer."

KEITH BEIN, ASSOCIATE PROFESSIONAL RESEARCHER, UC DAVIS AIR QUALITY RESEARCH CENTER

"The idea is to compare people with cancer diagnoses in high wildfire smoke exposure areas to people with cancer diagnoses in low-exposure areas throughout the state and see if there are any differences in how they do."

SHEHNAZ K. HUSSAIN, PROFESSOR AND THE CANCER CENTER'S DIRECTOR OF POPULATION SCIENCES

Black cancer researcher receives national award to promote diversity


Alan Lombard

UC Davis cancer researcher Alan Lombard, with the Department of Urologic Surgery, has received the prestigious NCI Mentored Research Scientist Development Award to Promote Diversity (K01). With the aim of supporting underrepresented cancer researchers, this award gives Lombard the funding to conduct his own research as an independent investigator.

"As a Black oncology researcher, I'm hoping to use this award as a platform to inspire others from underrepresented backgrounds to achieve a career in science," said Lombard. "It is important to believe in yourself and to seek out the resources and other opportunities that will help provide a pathway for success."

Lombard, now an assistant professor, serves on the inaugural Scholar Council for the cancer center. He said his interest in cancer was sparked at the age of 4 after watching his mother answer the phone and react with shock and sadness to the news that a family member had died from cancer.

"My mom said I begged her to explain what cancer was, after seeing her reaction. After that, my interest in cancer took off," Lombard said.

Lombard went on to receive his doctorate in biochemistry, molecular, cellular and developmental biology from UC Davis while pursuing biotechnology and translational research. As a Ph.D. student, Lombard was awarded several grant opportunities, including the Howard Hughes Medical Institute Integrating Medicine into Basic Science program and the Biotechnology Fellowship.

Prostate cancer research is a priority

Lombard was awarded a Department of Defense Prostate Cancer Research Program training fellowship as a postdoctoral researcher working under urologist Allen Gao. In Gao's lab he helped investigate the causes of drug resistance in patients who have advanced prostate cancer.

Lombard is using his newest grant to better understand and define PARP inhibitor response and resistance in relation to prostate cancer. PARP inhibitors can help to treat cancer by exploiting certain mutations in cancer cells, destroying tumors while largely sparing normal, healthy cells.

Black men with prostate cancer are more than twice as likely as white men to die from it, according to the National Cancer Institute. Lombard hopes to work toward eradicating this disparity and improving outcomes for men diagnosed with this disease.

Scholar Council works to help future generations of investigators


Fred Meyers, Scholar Council sponsor

The cancer center turns to the Scholar Council for ideas about improvements in educational and training programs for cancer researchers early in their careers. Members of the council reflect a broad array of investigators, including medical and graduate students, postdoctoral scholars, and early-career faculty members.

"The program is unique in that it gives trainees and junior/early-stage investigators a platform to directly influence the training environment here at UC Davis," said council member Alan Lombard, an assistant professor of urologic surgery. "We have the voices and ability to create change, which will benefit the community for generations."

New initiatives

One of the Scholar Council's current projects is a grant resource to ease the application process for future generations of early investigators. It includes a library of previously submitted and successful grant and fellowship applications as models to follow.

Another goal of the Scholar Council is to establish a Near Peer Mentorship Program to help new investigators define professional goals and grow connections as well as promote a culture of interdepartmental collaboration.

"As Scholar Council members progress in their careers, the experience they gain through peer mentorship will help guide them to develop their own teaching abilities so they can serve as future mentors and help others in their fields," said council sponsor Fred Meyers, associate director of the Office of Education, Training and Career Development with UC Davis Comprehensive Cancer Center, and principal investigator for the Mentored Clinical Research Training Program in the UC Davis Clinical and Translational Science Center.

In addition to peer support, the Scholar Council is working on a web portal that will make it easier for early-stage investigators to find faculty mentors and projects in their field of interest.

SPOTLIGHT
ON EARLY CAREER INVESTIGATORS

Annual Spotlight on Early Career Investigators

The 16th annual Spotlight on Early Career Investigators: A Cancer Research Mini-Symposium highlighted cancer-related research being conducted by students, postdoctoral scholars, research residents, fellows in research and UC Davis staff members.

The Spotlight gives early-stage investigators a chance to meet experienced investigators, learn about potential research opportunities early in their career, and gain valuable career insights through presentations and networking.

"Events like these provide our junior colleagues and scholars with much-needed opportunities to hone their presentation and networking skills," UC Davis Comprehensive Cancer Center Director Primo "Lucky" Lara Jr. said.

Presentation winners this year included:

Oral presenter: Nicole Halmai

Mentor: Luis Carvajal-Carmona

Title: "Establishing and Characterizing Patient-Derived Models from Racial/Ethnic Minority Gastric Cancer Patients to Advance Cancer Precision Health Equity"

Poster presenter: Matthew Lara

Mentor: Jonathan Riess

Title: "A Phase Ia Study of Ceritinib + Trametinib in Patients with Advanced ALK Positive Non-Small Cell Lung Cancer"

New program strengthens **mentoring relationships**

To ensure that UC Davis scholars—undergraduate through early career faculty—pursuing careers in cancer research receive the highest quality mentorship, the cancer center has developed a mentorship program called MARC or "Mentorship Academy for Research in Cancer." MARC uses innovative, evidence-based best practices to achieve and sustain strong mentoring relationships. Led by Julie Schweitzer, professor of psychiatry and behavioral sciences, MARC is a comprehensive program providing mentees and mentors with training, resources and guidance to support each mentee's path from a mentored scholar to an independent cancer researcher.

MENTORING ACADEMY FOR RESEARCH IN CANCER (MARC)

Snapshot of program plan

INDIVIDUAL DEVELOPMENT PLAN

All mentees will have a high-quality individual development plan (IDP) that is regularly assessed and updated in partnership with their mentoring team.

MENTORSHIP TEAM

Each mentee will have a mentorship team. MARC leadership will assist in making team member recommendations and introductions.

WORKSHOPS

Workshops for mentees and mentors will be routinely offered in partnership with UC Davis Clinical and Translational Science Center. Additional workshops will be developed based on identified needs.

MENTORSHIP RESOURCES

MARC will help the cancer center to maintain a website of relevant tools for mentees and mentors.

LEADERSHIP

MARC will have a faculty director with expertise in mentorship providing intellectual leadership; staff to handle operations; and two faculty (one clinical and one research) focused on mentorship team building.

COMMUNICATION

The importance, impact and expectations around mentorship will be routinely communicated via varying channels by cancer center and MARC leadership.

RECOGNITION

Excellent mentorship relationships will be recognized to promote value of quality mentoring and the impact it has on professional development and career advancement.

OUTCOMES & IMPLEMENTATION

Mentorship outcomes, mentorship team building, IDP process use, workshop participation, and program problems will all be tracked and reported.

Early career faculty scholars receive NCI award **to advance research careers**

UC Davis Comprehensive Cancer Center promotes career development through a team-based, patient-oriented program designed to increase the number and diversity of scientists trained in clinical and translational cancer research.

This year, two scholars received the Paul Calabresi Career Development Award for Clinical Oncology. The early career faculty members will receive 75% protected time for research and formal mentoring in clinical cancer research. They'll also receive $100,000 per year (for up to three years) to support salary and benefits, and $13,000 per year (for up to three years) for research and travel expenses.

The program, funded by the National Cancer Institute (NCI), was initiated in 1991 and renamed in 1994 in honor of the late Paul Calabresi, a pioneering oncologist who led the development of cancer drugs.

Scholars are selected through a rigorous process and are expected to develop their own investigator-initiated clinical trial during the training period. The mentored research training plan is supervised by two senior, independently funded faculty members (one basic/translational mentor and one clinical mentor) who guide the scholars' research project development and conduct. Upon successful completion of the curriculum, scholars receive a UC Davis Comprehensive Cancer Center Certificate in Clinical Cancer Research.

Naseem Shams Esteghamat
assistant professor, Department of Internal Medicine

Felipe Godinez
assistant professor, Department of Radiology, specializing in radiology physics

Recently awarded scholars

Scholar: Naseem Shams Esteghamat, assistant professor, Department of Internal Medicine
Research: Phase I study to evaluate the safety of escalating doses of lymphodepleting conditioning chemotherapy prior to CD19 chimeric antigen receptor T cells in subjects with relapsed/refractory diffuse large B-cell lymphoma
Mentors: Ted Wun, professor and division chief, Division of Hematology and Oncology
Joseph Tuscano, professor of internal medicine, specialist in malignant hematology, cellular therapy and bone marrow transplantation, deLeuze Endowed Professor of Medicine

Scholar: Felipe Godinez, assistant professor, Department of Radiology, specializing in radiology physics
Research: Role of interventional MRI for targeted drug delivery in brain cancer
Mentors: Elizabeth Morris, professor and chair, Department of Radiology
Lorenzo Nardo, associate professor, Department of Radiology and chief, Division of Nuclear Medicine
Aiming Yu, professor, Department of Biochemistry and Molecular Medicine

Discovery of cell protein that keeps Kaposi sarcoma herpesvirus dormant

A team of UC Davis researchers has identified a protein in the cancer cell's nucleus as a critical agent keeping Kaposi sarcoma-associated herpesvirus (KSHV) dormant and undetected by the body's immune system. The virus, in the same family as the Epstein-Barr virus, is linked to AIDS-related Castleman disease and multiple cancers, such as Kaposi sarcoma and primary effusion lymphoma.

The number of people infected with the virus varies around the world. Fewer than 10% of people in the U.S. are infected with KSHV, compared to 50% of the population in some parts of Africa. Not everyone with KSHV will develop Kaposi sarcoma. Those who do generally have a weakened immune system due to HIV infection, organ transplant, being older or other factors.

The introduction of antiretrovirals to control HIV significantly reduced the prevalence of AIDS-related Kaposi sarcoma in Western countries; however, in sub-Saharan Africa, the disease continues to have a poor prognosis.

What keeps the Kaposi sarcoma-associated herpesvirus dormant?

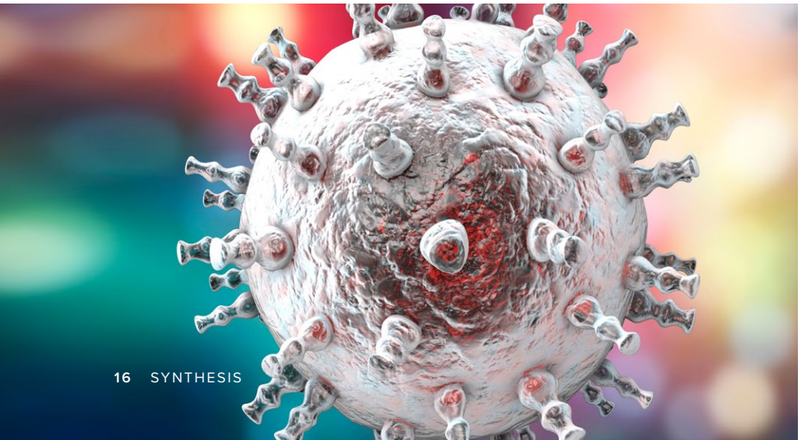
When the virus enters a human cell, it causes a hidden infection in the nucleus. During this stage, the virus latches onto parts of the cell's chromosomes and does not produce viral offspring.

Researchers who conducted a study published in the journal Cell Reports looked at KSHV's latent-lytic switch, a process in which the virus exits its dormancy state to replicate in the host cell. This replication phase, called the lytic cycle, ends with the disintegration of the cell and the release of the viruses, infecting neighboring cells.

"The virus likes to stay silent as long as possible to avoid being detected by the body's immune system," said Yoshihiro Izumiya, the study's senior author. Izumiya is a professor in the Department of Dermatology and director of the Viral and Pathogens Associated Malignancies Program at UC Davis Comprehensive Cancer Center.

The researchers wanted to uncover the mechanisms behind this latent-lytic switch and the role the host cell environment played in this process.

"Where the virus latches onto the host cell, how it manages to stay dormant, and what triggers its activation were very exciting and important puzzles to solve," Izumiya said.

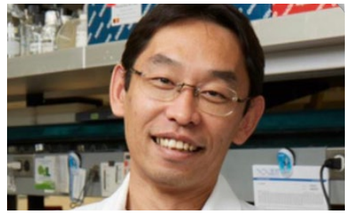


Finding the preferred ecosystem for the virus to stay dormant

The study identified where the virus genome could be found on the host genome.

Izumiya and his team used sophisticated chromosome capturing technology to profile and analyze chromosomal interactions on three cancer cell lines naturally infected with KSHV. They located the virus's preferred docking sites inside the host chromosomes. The binding patterns, similar among the three cancer cell lines, showed a nuclear ecosystem that can attract and help keep the virus in its silent form.

The team also found that CHD4 (chromodomain helicase DNA binding protein 4) binds to the virus's genomic elements. CHD4, a protein in the host cell's chromosomes, suppresses the work of the gene responsible for viral replication. The study showed that CHD4 is a key regulator of the KSHV latency-lytic switch.



"Where the virus latches in the host cell, how it manages to stay dormant, and what triggers its activation were very exciting and important puzzles to solve."

–YOSHIHIRO IZUMIYA

"The location where the virus genome attaches to the host chromosome is not random," said Ashish Kumar, a postdoctoral researcher in the Izumiya Lab and the paper's first author. "Without having enriched CHD4 protein, the virus starts to replicate, kicking in a cell destructive mode. For the virus to select CHD4 among many other host proteins, CHD4 must play a unique and important role in host cells."

Evolution shapes strategic viral protein binding to host

The study of viruses, known as virology, can help identify cellular proteins that are essential for cell homeostasis, which is the state of balance or equilibrium necessary to maintain health and proper functioning. Over millions of years, the virus's genome developed to encode or assemble a small number of very efficient proteins. These proteins strategically connect to host cell proteins to keep viral chromatin dormant and interfere with the host cell's tumor suppression function.

"We used virology as an entry point to shed light on the function of CHD4 in gene regulation in general. During virus-host co-evolution, KSHV cleverly learned to hijack host proteins that can help keep the gene responsible for viral replication dormant," Izumiya said.

CHD4 is critical for cancer cell growth in many different types of cancers. The researchers discovered a viral protein that affects the CHD4 function. They pointed to the potential of using a viral protein sequence as a starting point to create inhibitors regulating CHD4 function. They hope their work will inform cancer therapy development by utilizing this virus-host interaction.

The study is a collaboration among UC Davis researchers from the Genome Center, UC Davis Comprehensive Cancer Center and the Departments of Dermatology, Biochemistry and Molecular Medicine, and Pathology and Laboratory Medicine. It is also in partnership with researchers at the HIV Dynamics and Replication Program at the National Cancer Institute (NCI) and the Lifescience Division of Lifematics in Japan.

Team of researchers at Izumiya Lab

New gene profiling technology reveals melanoma biomarkers

UC Davis cancer researchers hope new technology will help diagnose and treat melanoma more successfully

A new UC Davis-led study sheds light on cell type-specific biomarkers, or signs, of melanoma. The research was published in the Journal of Investigative Dermatology.

Melanoma, the deadliest of the common skin cancers, is curable with early diagnosis and treatment. However, diagnosing melanoma in the clinic and under the microscope can be complicated by what are called melanocytic nevi — otherwise known as birth marks or moles that are non-cancerous. The development of melanoma is a multi-step process during which "melanocytes" — the cells in the skin that contain melanin — mutate and proliferate. Properly identifying melanoma at an early stage is critically important for improved survival.

"The biomarkers of early melanoma evolution and their origin within the tumor and its microenvironment are a potential key to early diagnosis of melanoma," said corresponding author of the study Maija Kiuru, associate professor of clinical dermatology and pathology at UC Davis Health. "To unravel the mystery, we used high-plex, spatial RNA profiling to capture distinct gene expression patterns across cell types during melanoma development. This approach allows studying the expression of hundreds or thousands of genes without disrupting the native architecture of the tumor."

Methodology

The study examined the expression of over 1,000 genes in 134 regions of interest enriched for melanocytes — which are cells in the skin and eyes that produce the pigment called melanin — as well as neighboring keratinocytes or immune cells. The tissue examined came from patient biopsies from 12 tumors, ranging from benign to malignant, using the GeoMx® Digital Spatial Profiler developed by NanoString Technologies.

"We found that melanoma biomarkers are expressed by specific cell types, some by the tumor cells but others by neighboring cells in the so-called tumor microenvironment. The most striking observation was that S100A8, which is a known melanoma marker thought to be expressed by immune cells, was discharged by keratinocytes that make up the outermost layer of the skin called the epidermis," Kiuru said. "Melanoma biomarkers in the epidermis have been largely overlooked in the past."

Keratinocytes are epidermal cells that have multiple functions, including forming a barrier against microorganisms, heat, water loss, and ultraviolet radiation. Normal keratinocytes also control the growth of melanocytes.

"Unexpectedly, we discovered that S100A8 is expressed by keratinocytes within the tumor microenvironment during melanoma growth," Kiuru said. "We further looked at S100A8 expression in 252 benign and malignant melanocytic tumors, which showed prominent keratinocyte derived S100A8 expression in melanoma but not in benign tumors. This suggests that S100A8 expression in the epidermis may be a readily detectable indicator of melanoma development."

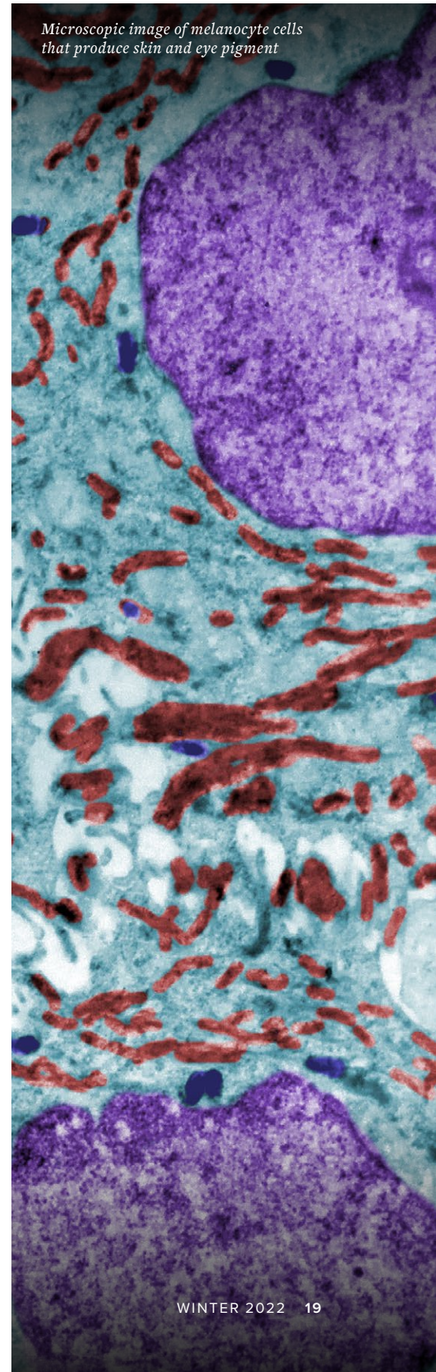
Many molecular tests for diagnosis and prognosis of melanoma are gradually being introduced but markers of early melanoma development, particularly in the tumor microenvironment, remain lacking. In addition, although the treatment of metastatic melanoma has changed drastically since the development of immune checkpoint inhibitor therapies, biomarkers predicting the duration a patient will be cancer-free are largely unknown. Previous research has utilized sophisticated methods, including single-cell RNA sequencing, but has largely focused on melanoma metastases, or secondary tumor growths. This has overlooked the keratinocyte microenvironment of primary melanomas.

Other authors of the study include Michelle A. Kriner, NanoString Technologies; Samantha Wong, UC Davis; Guannan Zhu, UC Davis and Xijing Hospital; Jessica R. Terrell, UC Davis; Qian Li, UC Davis; Margaret Hoang, NanoString Technologies; Joseph Beechem, NanoString Technologies; and John D. McPherson, UC Davis.

Funding came from the National Institute of Arthritis and Musculoskeletal and Skin Diseases, which is part of the National Institutes of Health (grant #K23AR074530) and the Dermatology Foundation through a Dermatopathology Career Development Award.

"The biomarkers of early melanoma evolution and their origin within the tumor and its microenvironment are a potential key to early diagnosis of melanoma."

–MAIJA KIURU, UC DAVIS MELANOMA RESEARCHER



Microscopic image of melanocyte cells that produce skin and eye pigment

Improving electronic health communication

Shin-Ping Tu

Kwan-Liu Ma

Cancer treatment commonly requires the involvement of clinicians from multiple disciplines. It may encompass, for example, diagnostic and interventional radiology, medical oncology, surgical oncology, hematology, immunology, neurology, psychology, pain medicine, physical therapy and other areas of specialization. But the electronic health record (EHR) systems that clinicians are required to use often complicate interprofessional teamwork and coordination of patient care.

A multi-institution research team in which two UC Davis faculty members have leading roles is tackling the problem, by studying and determining how interprofessional teamwork affects the quality of patient outcomes. The researchers will focus on how information sharing occurs among interprofessional clinical team members in EHR systems. They hope to identify ways medical team members can more fluidly synthesize and communicate information as they coordinate care of individual patients.

Shin-Ping Tu, chief of the Division of General Internal Medicine and Hibbard E. Williams Endowed Professor of Medicine, initiated the five-year research project. She brought together a team that includes multiple principal investigators. One of those is Kwan-Liu Ma, a distinguished professor in the Department of Computer Science and director of the UC Davis Center for Visualization.

The study is titled "SMART Cancer Care Teams: Enhancing EHR Communication to Improve Interprofessional Teamwork." The acronym "SMART" refers to Substitutable Medical Applications, Reusable Technologies, a security standard for EHR systems.

There are two principal investigators from other institutions. Daniel Sewell is an associate professor in the Department of Biostatistics at the University of Iowa and a member of the CDC's Modeling Infectious Diseases in Healthcare (MInD) Network. Xi Zhu is an associate professor in the Department of Health Policy and Management at the Fielding School of Public Health at UCLA and a member of the Jonsson Comprehensive Cancer Center at UCLA.

Changes in the way doctors communicate

"Doctors used to see each other face to face in the hospital or call each other, discuss and consult about individual patients. It is very rare that we talk to each other anymore, because of how clinical teams are now organized and because the electronic health record system constrains how we have to work," Tu said. "That is what motivated me to pursue this research study."

Tu has more than 25 years of experience in caring for patients in clinics and hospital settings. She has developed strong research interests in investigating existing health care delivery approaches and finding ways to improve how we take care of patients.

"The electronic health record system is a static repository of information. It does not process complex information. That still needs to be done by each doctor and communicated among the medical teams," Tu said.

For their study sample, the research team members will analyze the EHR data of patients with stage II or III breast, colorectal, and non-small cell lung cancer at three health care facilities that use the Epic EHR system. They will use social network analysis methods to illuminate patterns of how clinicians accessed the EHRs of de-identified individual patients to document or review data. As part of their research, they also will conduct interviews and focus groups with health care professionals, patients and caregivers, to gain insights about different EHR communication network structures and how effective they are.

Their analysis will illuminate which EHR communication structures are associated with poor patient outcomes. The researchers plan to use those findings and apply visual analytics technology to develop a tool that recommends potential communication structure changes to improve patient care.

"Our study is focusing on information processing and communication not strictly within each medical team, but also among groups of different medical teams," Tu explained. "We need to find different ways for doctors and nurses to be able to process information and communicate with each other more efficiently and effectively. I'm hopeful that our research will give us insights about how the ways in which we work together may need to be redesigned."

The investigation helps respond to a call by the National Cancer Policy Forum of the National Academies and the National Cancer Institute for new knowledge and innovative tools to improve interprofessional team-based cancer care.

New robotic procedure **offers diagnosis and removal of lung cancer during single surgery**

For the first time at UC Davis Health, physicians have performed a single-anesthesia robotic procedure that included both the diagnosis and treatment for lung cancer—all in one surgery.

The procedure, known as robotic-assisted bronchoscopy, reduces a patient's stress and anxiety by removal of a lung cancer mass at the time of diagnosis.

Interventional pulmonology is one of six specialties in which UC Davis Medical Center offers minimally invasive, robotic-assisted technology. The procedure also is available for gastrointestinal, cardiothoracic, gynecologic oncology, otolaryngology and urologic surgeries.

"Innovations such as the robotic bronchoscopy platform represent patient care at the absolute highest level, from diagnosis to treatment, with a multidisciplinary team approach," said Bahareh Nejad, director of the Department of Obstetrics and Gynecology's Division of Robotic Surgery. "As we continue to grow the UC Davis Robotics Program, the institutional support we have received has been instrumental. We are excited to facilitate more growth with robotic surgery to make patient treatment better and more efficient."

Streamlining patient care

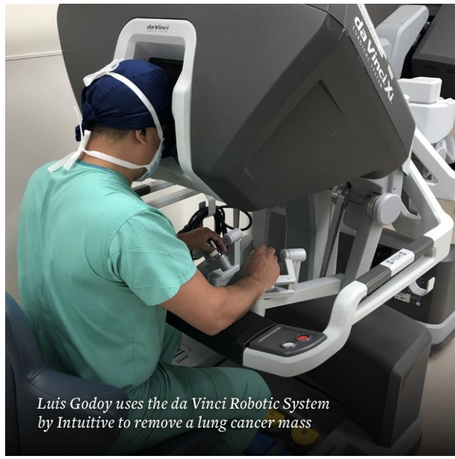
Traditionally, a patient who is diagnosed with a suspicious nodule or mass in a lung is referred to a pulmonologist, who may perform a biopsy to confirm if it is cancerous.

If the lung nodule or mass is confirmed to be cancer, the patient may be referred to a thoracic surgeon who determines if it can be surgically removed. If surgery can be performed, the patient undergoes another procedure on a separate day that requires additional anesthesia. On average, patients may wait up to three months from the time a nodule or mass is first discovered until receiving a diagnosis and treatment.

where it is marked and biopsied with precision and stability. Lymph nodes also are biopsied during the same procedure, using ultrasound. The samples are then evaluated on-site.

If the lung nodule is determined to be an early-stage cancerous tumor, the surgical team uses the same navigational route to mark the area with dye to prepare for its removal. Then the patient, while still under anesthesia, has a second robotic procedure to remove the lung cancer a short time later.

As an example, the UC Davis Health team identified a roughly half-inch long nodule in the right upper lobe of a patient's lung, performed a biopsy, identified malignant cells and injected an inert dye for marking, all within 45 minutes. Surgeon Luis Godoy subsequently used the da Vinci Robotic System by Intuitive to safely remove the lung cancer. The patient was discharged and returned home 24 hours after being diagnosed and surgically treated for lung cancer.



Luis Godoy uses the da Vinci Robotic System by Intuitive to remove a lung cancer mass

Waiting months between a biopsy and a diagnosis can be an emotionally difficult and exhausting experience for patients. By utilizing the robotic-assisted bronchoscopy platform we can help reduce the anxiety and unnecessary waiting times that patients traditionally experience."

–CHINH PHAN

"Waiting months between a biopsy and a diagnosis can be an emotionally difficult and exhausting experience for patients," said Chinh Phan, director of the UC Davis Interventional Pulmonology Program. "By utilizing the robotic-assisted bronchoscopy platform, we can help reduce the anxiety and unnecessary waiting times that patients traditionally experience."

The robotic-assisted bronchoscopy procedure utilizes the Ion endoluminal system developed by Intuitive Surgical Inc. The high-tech platform creates a 3D map of the patient's lungs using a CT scan. The software then generates the safest and most efficient route through the lung to the nodule or mass. Once the route is determined, an ultrathin and ultra-maneuverable catheter is guided to the site of the lung nodule or mass,

"With these two robotic technologies, we now have the ability to diagnose and treat suspected early-stage lung cancer patients in one anesthetic event," Phan explained. "To put it into perspective, the National Comprehensive Cancer Network guidelines for time from diagnosis to surgical treatment of lung cancer is eight weeks; we have set a new standard for innovative and efficient patient care."

Shift in preventive screening

Lung cancer is the leading cause of cancer-related death in the United States among men and women, making up almost a quarter of all cancer mortalities. It tends to spread quickly, shows no symptoms unless it is very advanced, and can silently spread to virtually any part of the body. This makes early screening and treatment critically important.

"The most effective method for treating cancer is to catch it early and to start treatment as soon as possible," Phan explained. "With these new screening guidelines and our robotic-assisted bronchoscopy platform, we are introducing a paradigm shift in lung cancer treatment that will further advance health equity for our community and others."

Study finds promising saliva and urine-based biomarkers to help detect head and neck cancer

Could screening for head and neck cancer be as simple as a urine or saliva test?

The members of a UC Davis Health research team are hoping to develop a noninvasive, low-cost test to help screen for possible head and neck cancer. Their study, published in Diagnostics, found that the levels of three polyamine molecules in saliva and urine samples of head and neck cancer patients were significantly higher than those in healthy individuals.

Detecting head and neck cancer

Head and neck cancer forms in the mouth, throat, voice box, salivary glands, sinuses or nasal cavity. With over 800,000 new cases and 400,000 deaths annually, it is the seventh most common cause of cancer-related death.

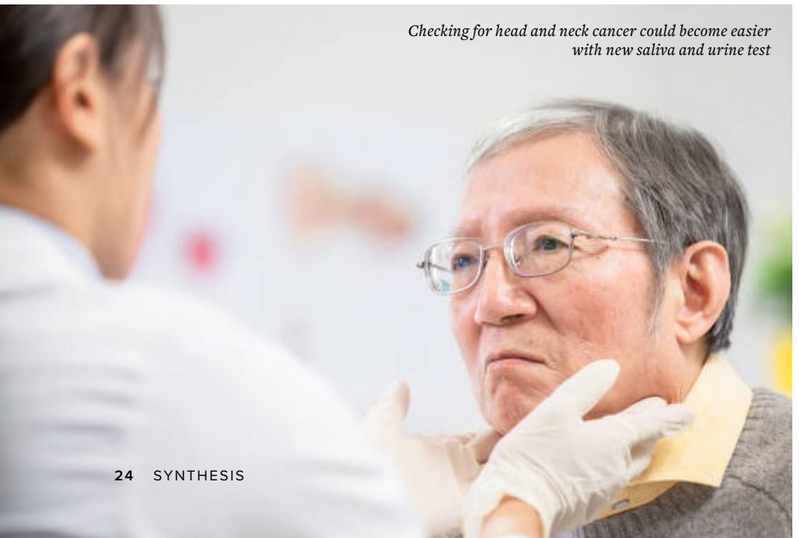
Early detection is critically important for effective treatment. In most cases, head and neck cancer is not detected in its early stages.

"Around two-thirds of patients have advanced stage III or IV tumors at the time of diagnosis," said Andrew C. Birkeland, assistant professor in the Department of Otolaryngology — Head and Neck Surgery and co-lead author of the study. "We are always looking for better ways to detect cancer early and catch signs of possible recurrence after treatment."

Andrew Birkeland

Johnathon Anderson

Patients usually seek medical care after their cancer spreads to their lymphatic system, or they have symptoms linked to later-stage disease. These symptoms include pain, bleeding, ulcers, earache and difficulty swallowing.



Checking for head and neck cancer could become easier with new saliva and urine test

Looking for signs of head and neck cancer in biofluids

Polyamines are metabolite components necessary for cellular growth and tumor progression. Higher polyamine levels have been found in breast, colon and prostate cancer patients and are linked to worse cancer results.

Using very sensitive techniques to study metabolites, the researchers analyzed 107 saliva and 124 urine samples from 39 head and neck cancer patients and 89 healthy participants. Nineteen of the patients had cancer in its early stage and 20 in its late stages. Most patients had cancer in their oral cavity or the back of their mouth.

The team measured the levels of three polyamines: N1-acetylspermine (ASP), N8-acetylspermidine (ASD), and N1,N12-diacetylspermine (DAS).

They found higher levels of ASD and DAS polyamines in the urine and ASP in the saliva of the cancer patients compared to that of healthy individuals.

"Changes in metabolite levels in biofluids such as the saliva or urine can be important indicators of abnormal cell proliferation," said Johnathon Anderson, assistant professor in the Department of Otolaryngology and co-lead author of the study.

Saliva and urine samples can be obtained in an easy, noninvasive and inexpensive manner. Saliva testing allows patients to gather their samples at home, saving health care costs and enabling a convenient way to collect multiple samples.

"Given the noninvasive nature of saliva and urine collection and the potential cost-effective metabolite analysis options, there are opportunities for developing screening tools for at-risk patients," Anderson said.

This is a proof-of-concept study to help assess the feasibility of using polyamines to detect early-stage cancer. Large-scale studies are needed to more definitively evaluate the preclinical and clinical development of these biomarkers for screening head and neck cancer.

"To our knowledge, this is the first study to identify elevated levels of ASP, ASD and DAS polyamines in saliva and urine samples of head and neck cancer patients," Birkeland said. "We hope science will advance to make testing for head and neck cancer as simple and accessible as an at-home pregnancy test."

Exploring low vaccination rate for cancer-causing HPV

Julie Dang

Cancer center joins with Harvard Law School to create guidebook to address vaccine hesitancy

The COVID-19 pandemic has complicated efforts to increase the rate of vaccinations. That includes attempts to prevent the human papillomavirus (HPV), which is linked to six types of cancer, including head and neck cancers.

HPV is the most common sexually transmitted infection in the U.S. As states consider ways to increase vaccinations, UC Davis Comprehensive Cancer Center has joined the Center for Health Law and Policy Innovation of Harvard Law School to create a new resource called the HPV Vaccine Policy Landscape, Public Health Strategies.

The new guidebook highlights the roles that state policy makers, educational institutions, and health care providers can play in increasing HPV vaccination rates by navigating the policy landscape more effectively.

The cancer center's Office of Community Outreach and Engagement reports that Northern California has some of the highest rates of HPV-related cancers in the state. HPV has long been associated with cervical cancer, and chances of being diagnosed with cervical cancer could be reduced 90% by getting the HPV vaccine. In fact, the shot could prevent about 33,000 cancer cases every year in this country — if only the majority of those eligible to receive the vaccine, got the vaccine.

"While HPV vaccination rates have increased after a dramatic drop during the COVID-19 pandemic, there is still major catching up that needs to happen in order to save lives," said Julie Dang, executive director of the cancer center's Office of Community Outreach and Engagement. "Our hope is that this report will provide targeted policy solutions to navigate the landscape that COVID-19 has forever changed so that we can see a significant uptake in HPV vaccination rates."

New study shows racism may be contributing to delayed breast biopsies among **Black, Hispanic/Latina, and Asian American women**

Structural racism, within and beyond health care, may increase the likelihood that Black, Hispanic/Latina and Asian American women experience significant delays more commonly than white women in getting breast biopsies after a mammogram identifies an abnormality.

UC Davis cancer researcher Diana Miglioretti, who helped lead a study that was published in the journal JAMA Oncology, said the findings show that interventions are needed to reduce cultural barriers to timely diagnosis after abnormal mammogram results. Miglioretti is a professor and the chief of the Department of Public Health Sciences' Division of Biostatistics.

"Unfortunately, our research shows that Black women were the most likely to experience delays in diagnostic resolution after adjusting for multilevel factors," said Miglioretti, who collaborated with Michael Bissell, also with UC Davis' biostatistics division. Other key researchers on the study included lead author Marissa Lawson and senior author Christoph Lee, both from the University of Washington.

The study reviewed the cases of 45,186 women whose screening mammograms had shown a tissue abnormality that called for a biopsy to ascertain whether it was cancerous. Across the study population, 34.6% of women were not biopsied within 30 days, 16% were not biopsied at 60 days, and 12% were not biopsied within 90 days.

"The delays are concerning because previous studies have indicated that the benefit of screening diminishes with time, and these lags are associated with later-stage disease at time of diagnosis," Miglioretti said.

Using the time-to-biopsy of white patients as the benchmark, the researchers found that:

- At 30 days out, Asian women had a 66% higher risk of not undergoing a biopsy, Black women, 52% higher, and Hispanic/Latina women, 50% higher.
- At 90 days out, Black women had a 28% higher risk of not undergoing a biopsy. Among Asian women and Hispanic/Latina women, the risk was 21% higher and 12% higher, respectively.

With that unadjusted model, the researchers then examined whether specific factors of individual patients, their neighborhoods and their screening facilities influenced the time to biopsy among women of different races and ethnicities.

"Controlling for individual- and neighborhood-level factors, we saw that risk was not very different from the unadjusted model," Lawson explained. "But when we controlled for the screening facility attended, delays in time to biopsy were reduced."

Digging deeper, the investigators examined the influence of predesignated site-level factors — academic affiliation, screening-exam modality and the availability of onsite biopsy — and were surprised to find that none of those factors explained the overt difference.

"The findings indicate that there are some differences among the screening facilities associated with the time to biopsy. We just don't know what the specific differences are," Lawson said.

The screening sites are all associated with the Breast Cancer Surveillance Consortium, a U.S. network of breast imaging registries that is representative of the country's population in terms of age, race and ethnicity.

The study's authors encourage radiology departments to consider using navigators to help guide patients through the process of scheduling exams and procedures, as a means of reducing wait times for biopsies.

'Mammovan' to roll out precision **breast cancer screening for underserved women**

Mock up of the UC Davis Comprehensive Cancer Center mammovan rolling out soon

A mobile mammography van to serve marginalized and hard to reach populations will soon increase access to breast cancer screening and diagnostic services. It will also serve as a data collection hub for health equity research. The cancer center's first-ever "mammovan" will be part of a new study conducted by cancer researcher Diana Miglioretti.

Services will include multilingual care, health education, genetic screening and breast imaging. Data collected from this program will help build a repository of longitudinal data on breast cancer screening, diagnosis and treatment to develop effective, individualized care for women who may not otherwise have access to a cancer prevention clinic. The data collected also will be used to evaluate risk prediction models and screening strategies that are primarily based on white patients and therefore may not be accurate for all women.

The project will draw on expertise from Shadi Aminololama-Shakeri, chief of breast radiology at UC Davis Health, as well as Laura Fejerman, a leading researcher of breast cancer in the Hispanic/Latina population and co-director of the cancer center's new Women's Cancer Care and Research Program (WeCARE).

Cancer burden facing Asian Americans partly caused by racism

Commentary in the *Journal of the National Cancer Institute* suggests racism affects Asian American cancer inequities

The cancer center's work to unravel the role racism is playing in cancer health disparities continues. Moon Chen Jr., associate director for the cancer center's Office of Community Outreach and Engagement, recently led a national study examining the significant cancer burden that Asian Americans experience.

Chen was a featured speaker in July 2021 at the U.S. Food and Drug Administration Oncology Center of Excellence 2021 conference titled "Conversations on Cancer: Advancing Equity in Asian American and Pacific Islander Communities: Racism and Injustice."

With assistance from researchers participating in that conference, Chen helped compile findings in a commentary titled "Charting a Path Towards Asian American Cancer Health Equity: A Way Forward," which was published in the June 2022 issue of the Journal of the National Cancer Institute.

Chen said the neglect of Asian American cancer inequities stems from multiple factors. They include historical prejudices against Asian Americans and the myth of Asian Americans as the model healthy minority, compounded by language and cultural barriers as well as racism.

"Asian Americans are unique as the first U.S. population to experience cancer as the leading cause of death," said Chen. "Bigotry against Asian Americans, pervasive since the 19th century, but especially during the COVID-19 pandemic, is only exacerbating the cancer disparities that are costing Asian Americans their lives."

The other authors of the commentary include Richard J. Lee, Massachusetts General Hospital; Ravi A. Madan, National Cancer Institute (NCI); Van Ta Park, UCSF; Scarlett L. Gomez, UCSF; Tracy Sun, Asian & Pacific Islander American Health Forum; and Susan M. Shinagawa, co-founder and past chair, Asian & Pacific Islander National Cancer Survivors Network. The work was supported by the National Institute on Minority Health and Health Disparities and the NCI.

Asian Americans and cancer: **unique, unusual and underrepresented**

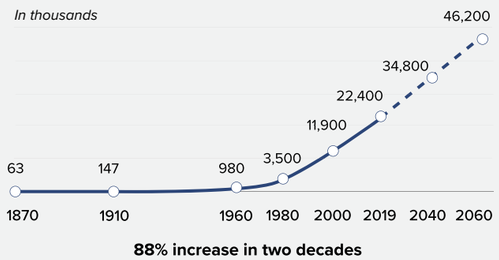
UC Davis Comprehensive Cancer Center's Office of Community Outreach and Engagement (COE) envisions a future free of disparities in cancer outcomes for all. Moon Chen, Jr., the COE's associate director for community outreach and engagement, is a leading expert in studying the cancer burdens facing underrepresented populations. He has led nationwide programs intended to help identify and mitigate cancer health disparities among various racial and ethnic groups.

Chen presented his most recent findings this past May before the Asian American, Native Hawaiian and Pacific Islander Health Research Conference at the National Institutes of Health (NIH). His presentation focused on characterizing the **unique** and **unusual** cancer burden confronting Asian Americans who, Chen said, are significantly **underrepresented** in cancer clinical trials.

Unique

The Asian American population in the U.S. nearly doubled between 2000 and 2019 and is projected to surpass 46 million by 2060. The population group is expected to become the largest immigration group in the country, surpassing Hispanics/Latinos by 2055. The Asian American cancer burden is unique because, among all racial groups in the United States, they were the first to experience cancer as the leading cause of death.

Asian population in U.S. nearly doubled between 2000 and 2019 and is projected to surpass 46 million by 2060

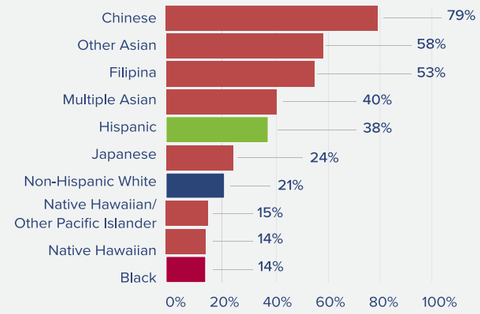


Pew Research Center

Unusual

The cancer burden that affects Asian Americans is unusual because, more than any other racial or ethnic group, Asian Americans experience proportionally more cancers of infectious origin, such as cervical, liver, nasopharyngeal and stomach cancers. Asian Americans also experience the highest rates of lung cancer among females who never were smokers.

Percentages of Female Never-Smokers with lung cancer



DeRouen, et al. 2022. Incidence of lung cancer among never-smoking Asian American, Native Hawaiian and Pacific Islander females. J Natl Cancer Institute

High rates of certain cancers in Asian Americans:

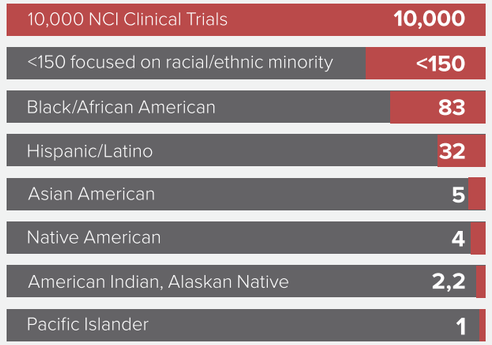
- Cancers due to infectious origin, such as cervical cancer, which can be caused by the human papillomavirus (HPV). For example, incidence of cervical cancer in the United States is higher among Vietnamese American women than among any other racial or ethnic group.
- High rates of liver cancer caused by chronic hepatitis B virus (HBV) infection rates among Asian and Southeast Asian Americans, including Hmong Americans.
- Nasopharyngeal cancers, occurring in the upper part of the throat behind the nose, affecting Chinese Americans at high rates.
- Stomach cancers, which occur more commonly among Korean Americans than in any other racial or ethnic group.
- Lung cancer among people who never smoked disproportionately affects Asian American women more than twice as commonly as it does non-Hispanic white women.

Underrepresented

Chen said that Asian Americans are underrepresented in clinical trials, only 1% of which emphasize racial and ethnic minority participation as a primary focus. Only five such trials in the U.S. focus on Asian Americans, as compared with 83 for African Americans and 32 for Hispanics/Latinos.

"Classifying Blacks and Latinos as underrepresented minorities in clinical trials is helpful, but it is regrettable that our national policy excludes designating Asian Americans as underrepresented minorities," Chen said. "There is a myth that Asian Americans don't get cancer, but that is far from the truth."

Underrepresented: In clinical trials



Chen MS et al., 2014

Asian Americans are underrepresented in the NIH budget

Chen said that an "infinitesimal proportion" of the NIH budget funds research that includes Asian Americans, even though the population has been growing faster than any other racial group in the U.S. percentage-wise over the past three decades. Between 1992 and 2018, only 0.17% of the total NIH budget funded research on Asian Americans. A portfolio analysis of grants funded by the National Cancer Institute's Division of Cancer Control and Population Sciences showed a very limited number of studies focused on Asian Americans, with none at the time addressing the causes of cancer.

What must happen to eliminate cancer inequities?

1. Partition data for Asian Americans into subgroups (people from Cambodia, China, India, Japan, Korea, Malaysia, Pakistan, the Philippines, Thailand and Vietnam). Chen said a separate focus should be created for Native Hawaiians and other Pacific Islanders.
2. Assess the impact of lived experiences and historical trauma. Culturally competent oncology care is required to improve access to health insurance and health care, including reducing language barriers that prevent Asian Americans from obtaining the medical help they need.
3. Listen to community voices. Rich diversity and unique experiences within Asian American communities are best understood and appreciated by listening to and partnering with patients and community advocates. Research must ensure community representation, buy-in and engagement.

The voice for

non-smoking Asian American women facing lung cancer

Singing in the Voice of Overseas Chinese Choir was one of the many pleasures that made the life of Susan Sun Huang fulfilling. She also enjoyed participating in fundraising for her community within Sacramento and she used her cancer story to advocate for the large population of Asian American women diagnosed with non-smoker lung cancer.

Huang, who never smoked, passed away in June from lung cancer. Before she died, Huang participated in a UC Davis Comprehensive Cancer Center clinical trial that allowed her to help with research for a cure and gave her more years with her family.

"The independent yet kind and loving spirit of Susan will be missed by the community but continues to thrive through her family's continued advocacy and support for clinical trials and research for Asian American cancer patients," said her UC Davis oncologist, Tianhong Li.

Together, with friends who wished to memorialize Susan, the family raised $15,000 that they presented in July to UC Davis Comprehensive Cancer Center.

"Thank you, on behalf of the men and women of the cancer center," said UC Davis Comprehensive Cancer Center Director Primo "Lucky" Lara Jr. during the gift presentation. "This donation shows your commitment to helping us end cancer."

Susan Sun Huang as a young woman in China

Her story

Huang and her husband Peter immigrated to the U.S. from China in 1986 in search of better access to university educations for their children. Their daughter, Amy Tong, fulfilled her parents' dream of obtaining a college degree in America and went on to earn her MBA before beginning a career in public service. She is currently Secretary of the California Government Operations Agency. Her brother, Jesse Huang, is a UC Davis graduate with degrees in both electrical and computer engineering. Both Amy and Jesse are married and raising their families in Sacramento.

"Our mother instilled in us the importance of hard work, but also humility, kindness and love," Tong said. "She was also very courageous and never afraid to make tough decisions."

Subtle symptoms led to unexpected news

Shortly after completing her performance with the Voice of Overseas Chinese Choir on the steps of the State Capitol one chilly winter day, Huang began to feel what she thought was a chest cold coming on.

"We thought her cough was a result of the damp weather. Little did we know a silent killer was at work," Tong said.

Huang's choice to seek care at UC Davis was an easy decision. "UC Davis has a reputation for cancer care that rivals Stanford and UCSF," added Tong. Chest X-rays that followed a visit to the doctor revealed her mother's grim diagnosis.

"The news of terminal lung cancer was surprising to all of us. And then to learn that she was part of a concerning trend of Asian American women who never smoked succumbing to this cancer was very disturbing," Tong said.

Even second-hand smoke wasn't a factor as her husband also was a non-smoker, and no one else around her smoked.

It is truly mystifying to see the number of Asian American women who have lung cancer," Li said. "At UC Davis Comprehensive Cancer Center, we are determined to find the root cause, conducting the research to move the needle toward early detection and cure."

Stigma follows diagnosis

Huang, typically optimistic, initially was depressed upon hearing her cancer diagnosis. "Not only because it was stage IV lung cancer, but because of the stigma associated with the disease," Tong recalled.

Huang was one of a growing number of Asian American women given the devastating diagnosis of lung cancer — which most often is associated with white male smokers.

"The shock factor was felt by the whole family," Tong said. "With breast cancer, there is less shock and more compassion. Yet, with lung cancer, there is judgement and people wonder, 'well, your life choices caused it,' but my mother didn't smoke. She didn't do anything to cause her lung cancer. She had been perfectly healthy all her life".

Clinical trial led to precision lung cancer treatment

Li submitted Huang's tumor specimen for a comprehensive tumor genomic profiling test to match her specific tumor mutation to a targeted drug. That analysis revealed that her lung cancer exhibited a fusion of two genes that never had been reported in a patient before. This fusion led to high expression of a cancer protein called anaplastic lymphoma kinase or ALK.

Li enrolled Huang in a clinical trial through a congressionally directed medical research program administered by the U. S. Department of Defense called the Lung Cancer Research Program, which involved biospecimen collection. Through this protocol, Huang donated her pleural effusion, the excess fluid that builds around diseased lungs, for research. Her sample was used to confirm the ALK expression and was matched to an oral targeted therapy, alectinib (Alecensa).

Unlike conventional chemotherapy, the targeted treatment did not render her sick or weak. In fact, the 80 year old returned to her walks and tai chi, and she lived nearly five more years, with the loving support of her family.

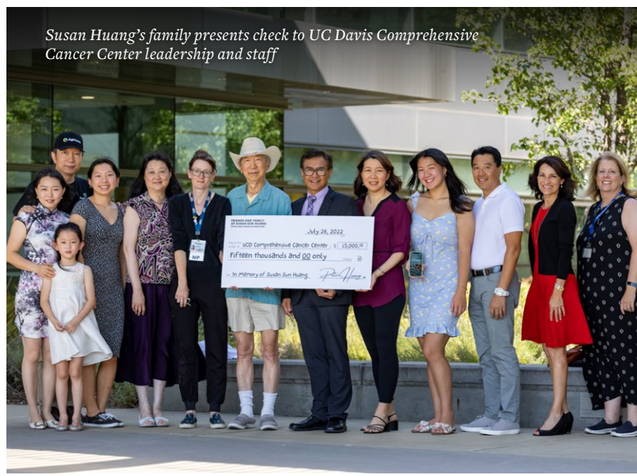
The Huang family shortly after immigrating to Sacramento in 1986

Continued advocacy and early detection

"What gave my mother hope and what made her fight was the progress being made in precision medicine," Tong said.

Tong and her family want to help advance the cancer center's pursuit of leading-edge treatments for the benefit of other cancer patients and promote early screenings, so lung cancer is caught when it is treatable. They were touched by the generosity of others in the community who also wanted to contribute to the philanthropic gift in memory of Huang.

"My family is grateful for the care my mother received at UC Davis, and we hope the gift will help raise awareness about this 'silent killer' of Asian American women," Tong said.



Susan Huang's family presents check to UC Davis Comprehensive Cancer Center leadership and staff

Grateful patient ‘pays it forward’ by helping fund research and breakthroughs

Peter Belafsky and his patient Steve Fox

Texas-tough, Steve Fox is not a quitter. Decades after surviving stage III oropharynx cancer, the El Paso car dealership owner and motorcycle racing champion was running into complications from a feeding tube in his stomach. He also wished he could return to enjoying a meal with family and friends. The effects of surgery that Fox had undergone years earlier to remove the tumor in his throat, along with subsequent radiation, prevented him from swallowing food safely.

Oncologists in the Lone Star State said nothing could be done — no procedure, no treatment that would enable him to eat normally once again. He was wholly dependent on his feeding tube, a medical device that allows nutrition to be consumed through a flexible tube inserted into the stomach.

“I’m a social person and a lot of socializing is done around a table with good food,” Fox said. “All I could do was sit there and watch, feeling demoralized by not being able to share in the meal.”

Additionally, his weight was dropping, and he was enduring severe lung infections. The toxicity from the radiation treatment also had damaged his vocal cords, tongue and his upper respiratory system.

“Treatments to cure cancer have come a long way,” Fox said. “What has fallen behind are treatments for the side effects caused by eliminating the cancer.”

Fox didn’t give up seeking relief. Finally, a doctor at MD Anderson Cancer Center in Houston said, “There is a doctor at UC Davis who might be able to help you.”

Restoring quality of life

Fox immediately contacted UC Davis head and neck surgeon Peter Belafsky, a professor in the Department of Otolaryngology and chair of the Division of Laryngology, seeking the help no other doctor was able to provide. Belafsky, director of the UC Davis Health Center for Voice and Swallowing, quickly became a hero to Fox.

“I feel so fortunate to have learned about Dr. Belafsky,” said Fox. “He is the most courageous doctor I know and has given me back my quality of life.”

Through a series of procedures, Belafsky repaired Fox’s badly damaged esophagus, throat, vocal cords and tongue. The outcome restored Fox’s ability to swallow and speak, but Belafsky is careful to note that the results will not last forever. “Due to its cumulative effect, radiation toxicity cannot be cured,” he said.

Although Fox still requires a modified feeding tube with a much smaller profile to consume liquids, he is eating and swallowing food again, thanks to Belafsky and his team. His body gained strength and he resumed what he never thought he would be able to enjoy again — motorcycle racing. In fact, Fox finished first in his age group in the Gasit Off-Road Racing, New Mexico Championship Series in 2021.

“I’m back to doing what I love. Dr. Belafsky is truly an innovator and a compassionate human being,” Fox said.

Bringing hope to cancer survivors

Belafsky regards hope as his primary passion, observing that without hope, the quest for leading-edge treatments for profound swallowing disorders is a lost cause.

“Traditionally, the medical community has given up on head and neck cancer survivors, including tongue cancer survivors. They are told, ‘you’re cured, deal with it,’” Belafsky said. “I felt called to do something. These are people who are desperately trying to hold on to their dignity and lead full lives.”

Inspired by his patients and their families who struggled to cope with the aftermath of head and neck cancer treatment, Belafsky has dedicated his life and his practice to giving them what they cannot give themselves. Among many of his innovations in the field, he created a medical device that can manually control the upper esophageal sphincter, which cancer treatment commonly damages. Belafsky also is working on a first-of-its kind dilator to treat upper esophageal sphincter stenosis — narrowing of the esophagus caused by radiation.

“The goal is to develop a comprehensive swallow propulsion system and make life better for those who have been ‘cured’ — and forgotten,” Belafsky said.

Stem cell therapy

Belafsky is also pursuing the use of muscle stem cells to help with dysphagia, or swallowing difficulty. After years of promising preliminary research, Belafsky was awarded a grant in May from the California Institute for Regenerative Medicine (CIRM) to fund a phase II clinical trial testing stem cell therapy to help cancer patients heal from the devastating effects of radiation therapy (see the accompanying article).

“We like to say we are ‘giving hope to the hopeless as we continue our search for a cure for the cure,’” said Belafsky, who recently held a cancer survivors’ retreat for patients and their partners. “Radiation toxicity, which cures the cancer, causes devastating injuries that impact the ability of survivors, and their loved ones, to lead ‘normal’ lives.”

Patients around the world have been seeking treatment from Belafsky. Fox describes him as the only doctor he knows who does not let the emotional toll of working closely with cancer patients prevent him from developing

> As we continue to enhance survival and make a difference, that hope becomes a living thing — that hope is changing the world.”
>
> –PETER BELAFSKY

Patient Steve Fox returning to motorcycle racing in 2021.

close, interpersonal relationships with the people he is trying to help.

"It takes passion, dedication and innovation to find solutions to the devastating challenges facing these survivors," Belafsky said. "But none of that happens without hope. We approach it as a team, and many patients want to 'pay it forward.' As we continue to enhance survival and make a difference, that hope becomes a living thing — that hope is changing the world."

One technology Belafsky has under development is the evaluation of a wearable advanced biometric device that can measure, among other things, oxygen level, heart rate and skin temperature. The goal is to detect early signs of life-threatening aspiration pneumonia, which results from inhaling food or liquids into the airway or lungs. That condition afflicts many head and neck cancer survivors, including Fox, due to the progressively worsening side effects of radiation.

"It becomes a daily battle of survival for many patients like Steve," said Belafsky. "Radiation is the gift that keeps on giving, robbing survivors over the years of their ability to swallow, speak and even breathe."

Fox is well-aware of the complications that he and other survivors still face and is determined to be part of the effort to forge new breakthroughs. He and his wife, Nancy, recently donated $1.1 million directly to Belafsky's research, and they encourage others to join in the transformative research underway — the cutting edge of hope.

"The university has created an environment for the Peter Belafskys of the world to flourish. We just need to join in this team effort," Fox said.

With 250 employees and an expansive chain of car dealerships, Fox said he knows something about successful entrepreneurship. "Everyone is important on the team, and that includes those who invest in what they believe. This is only the beginning and with the right financial support, all barriers will be removed, and we'll be able to 'find a cure for the cure' because beating cancer also means surviving it in order to live life to its fullest," Fox said.

To contribute to the fund to advance hope for head and neck cancer survivors, go to: **give.ucdavis.edu/MOTO/PBVOICE**

> "Treatments to cure cancer have come a long way. What has fallen behind are treatments for the side effects caused by eliminating the cancer."
>
> –STEVE FOX

Steve Fox following his cell therapy procedure

$11 million investment in cell therapy to **help throat cancer patients heal**

The California Institute for Regenerative Medicine (CIRM) is investing more than $11 million to fund a UC Davis clinical trial testing a cell therapy to help throat cancer patients heal from the devastating effects of radiation therapy. The phase II trial is being conducted by otolaryngology (ear, nose and throat) professor Peter Belafsky, who is also director of the UC Davis Health Center for Voice and Swallowing.

Every year more than 65,000 Americans are diagnosed and treated for head and neck cancer, according to the National Institute of Dental and Craniofacial Research. One devastating and debilitating side effect of the treatment is dysphagia, or difficulty swallowing.

Belafsky and his team are developing a therapeutic approach using autologous muscle-derived progenitor cells (AMDC) obtained from a biopsy of the patient's own muscle elsewhere in the body. Progenitor cells, which are derived from stem cells, can produce specialized cell types. Autologous stem cell transplantation is a procedure in which the patient's own healthy stem cells are used to replace stem cells that radiation or chemotherapy have damaged. The healthy cells are injected into the tongue of the patient, where they fuse with existing muscle fibers to increase tongue strength and ability to swallow.

Peter Belafsky

"This is a potential game-changer for the countless cancer survivors living with the consequences of radiation toxicity," Belafsky said. "This is an incredible win for our team at UC Davis and our patients who have been in relentless pursuit of a 'cure for the cure.'"

Patients with head and neck cancer often undergo surgery and/or radiation to remove tumors. As a result, they may develop problems swallowing, which can lead to serious complications, such as malnutrition, dehydration, social isolation or a dependence on using a feeding tube. Patients also are subject to inhaling food or liquids into their lungs, causing infections, pneumonia and possibly death. The only effective therapy is a total laryngectomy — removal of the larynx (voice box), leaving the person unable to speak.

"Dysphagia is not only a serious problem for people recovering from head and neck cancer, it's also a problem for millions of older Americans," says Maria T. Millan, president and CEO of CIRM. "This approach has the potential to make life better for millions of Californians who are experiencing swallowing disorders but have no effective treatment options."

With $5.5 billion in funding and more than 150 active stem cell programs in its portfolio, CIRM is one of the world's largest institutions dedicated to cellular medicine, currently funding more than 80 clinical trials.

CIRM
CALIFORNIA'S STEM CELL AGENCY

UC Davis oncologist and researcher receives **local cancer award**

Landgraf Family and Amador Cancer Research Foundation held Spaghetti Western event to help fund award

UC Davis Comprehensive Cancer Center selected oncologist and clinical researcher **Mamta Parikh** as the 2022 Christine and Helen Landgraf Memorial Research Award recipient. Parikh, an assistant professor of internal medicine in the Division of Hematology and Oncology, will receive $25,000 to help fund her research evaluating the role of immunotherapy in bladder cancer.

The 15th Annual Spaghetti Western was held June 18 to help raise money for the Christine and Helen S. Landgraf Memorial Fund, which supports groundbreaking research at the cancer center. The Amador Cancer Research Foundation hosted the food and wine event at Cooper Vineyards in Plymouth.

"I want to express my deepest gratitude to the Landgraf family and the Amador Cancer Research Foundation for this award. Funding from the grant will allow us to conduct a pilot clinical trial in patients with bladder cancer to determine how we can stimulate the body's immune system to fight cancer more effectively in patients suffering from this devastating disease," Parikh said.

While immune checkpoint inhibitor therapy has been shown to be an active treatment for bladder cancer, many patients do not respond to it. Parikh and her collaborators are evaluating novel treatments aimed at improving the efficacy of immunotherapy by determining how the drug pembrolizumab (Keytruda) interacts with peptides that target key immune-related pathways.

Parikh's clinical research is focused on improving outcomes in bladder, kidney and prostate cancer by investigating new agents in clinical trials. She received her medical degree from the UC Davis School of Medicine and her undergraduate degree in chemistry from Boston University. She also has a master's in organic chemistry from UC Irvine.

The Christine and Helen S. Landgraf Memorial Fund has given annual grants to UC Davis cancer doctors and research scientists since 1973 at UC Davis Comprehensive Cancer Center since 1973. The original endowment was established in memory of Christine Landgraf, who passed away from Hodgkin's lymphoma at the age of 27.

The memorial fund awards an annual scholarship to a junior faculty member engaged in cancer research. Landgraf's parents, John and Helen Landgraf, long-time residents of Sacramento and Sutter Creek, started the fund.

The case for bringing the community together **through philanthropy to accelerate progress**

The cancer center is inviting friends and supporters who share its vision for high-impact research, innovative care and advanced therapies to partner in a philanthropic endeavor to create promise and possibility for cancer patients and survivors everywhere.

The newly published Transforming Today's Care and Accelerating Tomorrow's Breakthroughs is a guide for discovering ways to make a difference by contributing to the exciting progress underway at UC Davis Comprehensive Cancer Center.

"As much as we've achieved together, we've only just begun," said cancer center Director Primo "Lucky" Lara Jr. "We invite you to join us in making our ambitious vision a reality. Philanthropy propels our research, clinical care, teaching and outreach to the next level. Together, we will drive healthier and more equitable outcomes for everyone we serve."

To get a print copy of Transforming Today's Care and Accelerating Tomorrow's Breakthroughs, contact Assistant Vice Chancellor of Health Sciences Brenda Betts at **bkbetts@ucdavis.edu** or call **916-734-9583**.

UC Davis Comprehensive Cancer Center vision:

- Stop cancer in its tracks through early detection and high-impact research
- Change the trajectory of the most difficult cancers through precision treatment and control
- Help people live longer, better lives by enhancing preventive strategies and making cancer survivable
- Train the next generation of diverse cancer researchers and clinicians
- Equitably deliver world-class cancer care to optimize health for all

UCDAVIS HEALTH | COMPREHENSIVE CANCER CENTER

2279 45th Street
Sacramento, CA 95817

Address service requested

NONPROFIT ORG
US POSTAGE
PAID
Davis, CA
Permit No. 3

We have **better cancer treatments** today because **people like you participated in a clinical trial.**

If you're interested in exploring new treatment options, a clinical trial may be right for you. **Ask your doctor today about clinical trials.**

Breaking Barriers to Beat Cancer

UCDAVIS HEALTH | COMPREHENSIVE CANCER CENTER

NCI Comprehensive Cancer Center
A Cancer Center Designated by the National Cancer Institute

Synthesis — the art of bringing distinct elements together to form a cohesive whole — is the name of our magazine and our strategy as the Central Valley's only National Cancer Institute-designated comprehensive cancer center. Leveraging UC Davis strengths in innovative cancer models and technologies, precision therapeutics, transformative imaging and mitigation of cancer risks and disparities, we aim to reduce the cancer burden in our region and beyond. Uniting physicians, scientists and public health experts, we are committed to making cancer discoveries and delivering them quickly to patients so they have the best possible outcomes.

***Synthesis* — linking the best in cancer science to improve patients' lives — is our promise.**