

SEARCH



COULD DOGS
HOLD THE KEY TO
CURING CANCER?

AGING RESILIENTLY • WIRING THE BRAIN


SPRING 2018 • VOL. 11 • NO. 1 • THE JACKSON LABORATORY

SEE A

ON THE COVER

A new ally has emerged in the quest to cure cancer: man's best friend. Through participating in the Tallwood Canine Cancer Research Initiative, pet owners can donate their dog's tumor and advance research for human cancers, too.





RNC

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MASTERS OF COMPLEXITY: UNLOCKING THE SECRETS OF THE BRAIN

I like to say that, at The Jackson Laboratory (JAX), we are masters of complexity. Just as our scientists are deciphering the complex language of the genome, we are using genomics to shed new light on the intricacies of the brain, its role in health and the diseases that affect it.

Much as the genes in the nucleus direct activities within a cell, the brain is the command center that controls everything our minds and bodies do. From complex thought and creativity involved in scientific research and other pursuits, to functions like breathing that we don't have to think about, to everything in between.

This issue of *Search* highlights JAX research that is expanding our knowledge of how the brain relates to health and disease in both expected and unexpected ways.

from the Pre

*did you
know?*

From understanding resilience in aging and Alzheimer's disease, to examining the brain's role in obesity to searching for brain cancer cures, scientists at JAX are leveraging their expertise in genomics, neuroscience and model organisms to unlock the intricacies and secrets of the brain.

Brain cancers are among the most devastating of all malignancies. Mice have been our partners in research since the Laboratory was founded, but more recently, JAX faculty in Connecticut have brought a new collaborator into the picture for cancer research: man's best friend.

Like humans, dogs get brain cancer. Professor Roel Verhaak hopes that by studying dog breeds at high risk for glioblastomas, he can discover ways to treat this deadly disease more effectively in both humans and dogs.

Verhaak and his collaborators are not alone in looking to our canine companions for help in solving the challenging problem of cancer. Our new Tallwood Canine Cancer Research Initiative, launched at the end of 2017 thanks to a generous gift from an anonymous donor, will create a biobank of dog tumors, giving Scientific Director Charles Lee, Ph.D., at JAX Genomic Medicine and his team new insights that can guide precision medicine.

The science is complex, but the goal is simple: better treatments and cures — for humans and dogs alike.



Edison Liu, M.D.

President and CEO, The Jackson Laboratory

President

The Jackson Laboratory is an open-source network of scientific information. By offering more than 10,000 strains of mouse models to more than 1,900 organizations across 75 countries, we are partners with most of the world in tackling diseases.

By sharing these models, we are helping to unlock treatments and cures for diseases such as Alzheimer's, diabetes, epilepsy, amyotrophic lateral sclerosis and cancer.

And, our research and scientific services not only make "team science" across the globe much easier, but this collaborative approach is also viewed as the ideal model for business partnerships — bringing potential treatments to patients faster.

No one else in the world combats human disease by creating and sharing its mouse models in this way.

connect with us





Sarah Neuner, Ph.D. student

BY CARRIE COWAN | PHOTOGRAPHY BY AARON BOOTHROYD & TIFFANY LAUFER

Sarah Neuner is searching for the genetic variations that can protect us from Alzheimer's disease.

Alzheimer's disease robs patients of their memories, their personalities and ultimately their lives. The struggle of living with Alzheimer's is especially difficult for those who are caring for a loved one who has lost his or her ability to function.

Working in the laboratory of Catherine Kaczorowski, Ph.D., Neuner is using genetically diverse mouse strains to identify the genes that make

some people more susceptible to the disease and others resistant to it. If successful with this bold new approach, we may see drug treatments that mimic those genes, with the goal of protecting us all from Alzheimer's.

Away from the laboratory, Neuner is working with local elderly communities and with patient and caregiver communities through the Alzheimer's Association, Maine Chapter.

Learn more at www.jax.org/endalz.....



Sarah Neuner with Andrew Ouellette in the Kaczorowski lab



V FOUNDATION

In November, JAX cancer researcher Olga Anczuków, Ph.D., joined WNBA Basketball Hall of Famer Rebecca Lobo as guest speakers at the 3rd Annual Hartford Fundraiser to benefit the V Foundation for Cancer Research.

Anczuków told the audience how, like many creative endeavors, movies contain only a fraction of the footage collected during filming. Indeed, hours of outtakes are removed — left on the cutting-room floor — and never make it into the final product.

Surprisingly the genome has a cutting-room floor too. In her lab, Anczuków is on the hunt for novel cancer therapies that can shrink a tumor or stop it from spreading. By studying gene splicing during normal breast and ovary development, Anczuków is learning how errors in this process can lead to cancer.

Learn more at www.jax.org/cancer-research.

GET THE LATEST NEWS AND INSIGHTS
Visit www.jax.org/news.



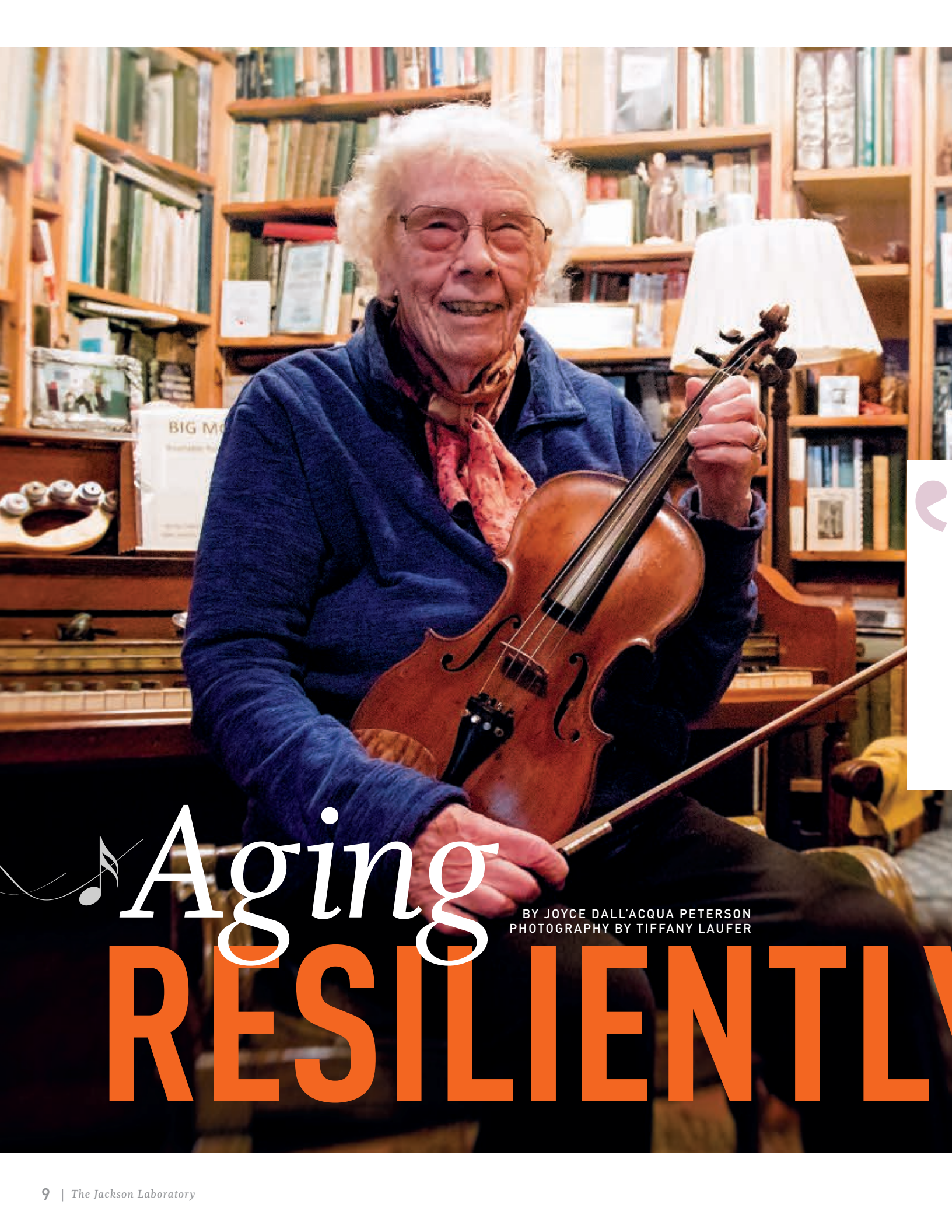
RARE BREAKTHROUGHS

The online world is evolving rapidly. In recent years, video content has come to dominate news consumption on popular social media platforms like Facebook. The Jackson Laboratory's solution? Bite-size science to help keep up with the latest breakthroughs.

Since October 2016, JAX has produced several informative "Minute to Understanding" videos, and has distributed them on social media. Topics include the microbiome, mouse models, human diversity, and the difference between genetics and genomics.

The episode "Genetics vs. Genomics" was screened at *Disorder: The Rare Disease Film Festival* last October in Boston. Social Media Strategist Dayana Krawchuk, Ph.D., who produces the video series, represented JAX at the event and participated in a panel discussion about breakthroughs in rare disease research.

Watch the videos at www.jax.org/minute.



Aging

BY JOYCE DALL'ACQUA PETERSON
PHOTOGRAPHY BY TIFFANY LAUFER

RESILIENTLY



This morning Ruth Grierson has filed her nature column in the local weekly newspaper and met a friend for a hike with her little dog, Sophie. She's giving a fiddle lesson to an eight-year-old this afternoon, and after dinner she's hosting a "porch party" of fellow musicians on the screened-in veranda of her comfortable log home on Maine's Mount Desert Island.

Grierson turned 90 in December.

Historically, disease research has focused on what goes wrong in people who get sick. Researchers at The Jackson Laboratory (JAX) are now exploring what goes right in healthy aging: What makes Grierson and other healthy older people thrive and avoid disease?

It's a difficult truth to face. As we grow older, the risk for heart disease, kidney failure and cancer rises. Age is the single greatest risk factor for dementia and Alzheimer's disease, and infections like pneumococcal pneumonia, influenza and clostridium difficile are more lethal in older patients.

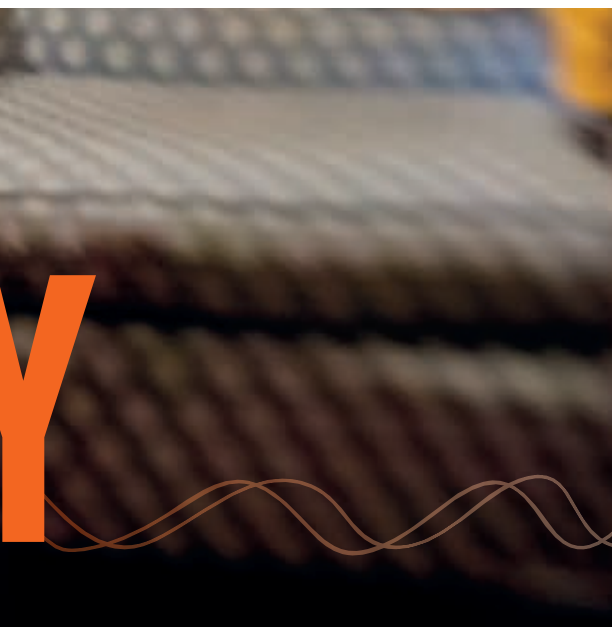
These diseases of aging — not aging itself — keep millions of older Americans from enjoying Grierson's kind of vital, active life. "When you talk to older adults," says UConn Health gerontologist and aging researcher George Kuchel, M.D., "what you hear overwhelmingly is that no one wants to die, but also that no one is interested in simply living longer if it's going to be at the cost of losing independence, and at the cost of a poor quality of life."

A major factor for increased susceptibility to disease in older people: The immune system declines with age. Kuchel and Professor and Director of Immunological Sciences Jacques Banchereau, Ph.D., at The Jackson Laboratory have received funding from the National Institute on Aging to better understand the biological reasons for this decline.

One might expect the researchers to study patients whose immune systems no longer effectively combat disease. Instead, they're recruiting healthy older volunteers to figure out why some people maintain their immune arsenal well into their eighth, ninth or even tenth decade. This includes response to vaccines, which typically work less well in older people.

No one is interested in simply living longer if it's going to be at the cost of losing independence.

— George Kuchel, M.D.



Kuchel and Banchereau are recruiting healthy older adults to receive one of two pneumococcal pneumonia vaccines free of charge, and are collecting blood samples at several time points to assess pneumococcal-specific antibody responses.

“Our hypothesis,” Banchereau says, “is that the altered immune responses of the elderly to pneumococcal vaccines are caused by genomic alterations associated with aging. These alterations result in dysfunction in immune cell types critical for adaptive immunity.”

Kuchel, who is also director of the Center on Aging at UConn Health, comments, “The concept of frailty has been at the core of geriatric medicine and gerontology. Basically, it’s trying to understand why some people are more vulnerable than others. But increasingly we’re looking at resiliency to better understand why one individual is able to fend off an infection with no problem, while another gets the infection and winds up hospitalized.”

If the researchers can identify the genetic factors that contribute to this resiliency, they could be the basis for new treatments to boost flagging immune systems and response to vaccines.

A broader look at resilient aging was launched a decade ago at the Scripps Translational Research Institute in La Jolla, Calif. Researchers there sequenced the genomes of more than 1,400 exceptionally healthy Americans over the age of 80, and are tracking their incidence of the diseases of aging, such as cancer, heart disease and diabetes. Among the first findings of the “Welllderly” study: The participants have a higher-than-normal presence of genetic variants that appear to protect against cognitive decline.

For Grierson, it wouldn’t be hard to make a genetic case for her exceptional mental clarity and vitality, even without genomic sequencing. Both her parents were writers and musicians, and her father, a newspaper writer, lived to 98. “He wrote until he died,” Grierson says.

Grierson also ticks all the boxes for lifestyle factors associated with healthy aging, which include staying physically active, socially connected and mentally engaged.

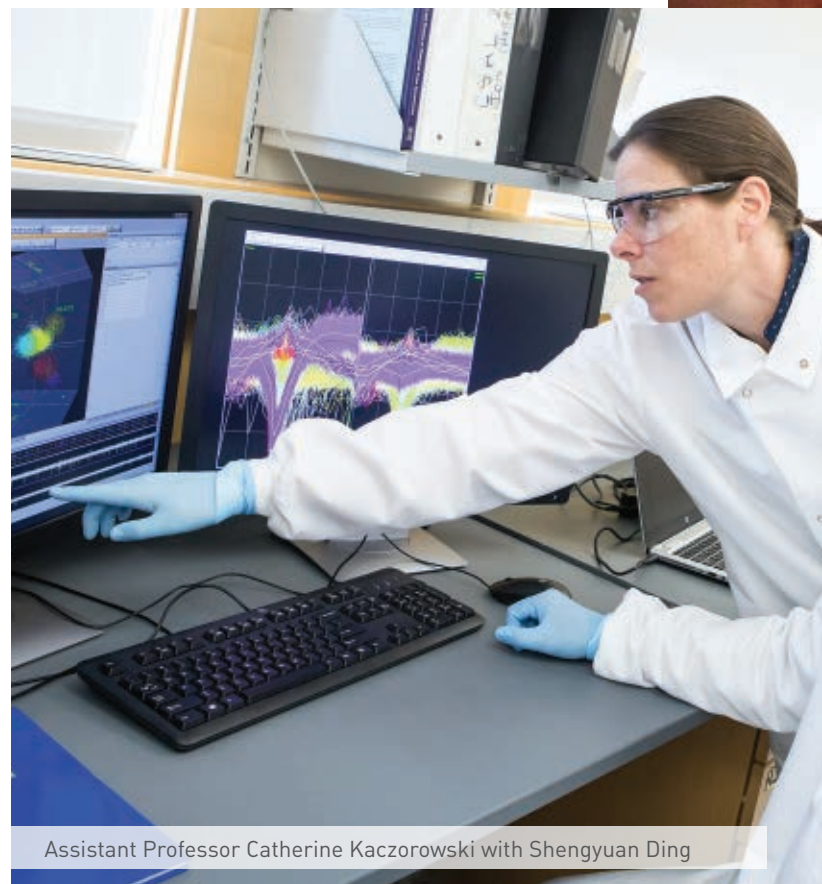
Her cozy woodland house is lined floor-to-ceiling with books, her own paintings, musical instruments and photos from her travels around the world. Her early musical training was classical, but when she moved with her husband to Maine in 1972, she says,

“I discovered this other kind of music,” bluegrass and traditional folk songs. “It’s great fun.” She picks up the violin she has had since the age of 12 and starts to play a haunting melody from the Civil War era.

Grierson was well into her 80s when she learned how to improvise. “When I went to college they didn’t teach us to improvise!” She and her friends get together to play music several times a week, either at each other’s houses or as in-demand performers at weddings, contra dances, public suppers and other celebrations, even open-mic nights at local bars and restaurants.

She is the mother of two and grandmother of three, but unlike many elderly people, her family is just a part of her lively social life.

Grierson walks or hikes every day with Sophie, often stopping to take photos of plants, one of her many interests. With a botanist friend she is working on her sixth book, this one about life at the edge of the sea.



Assistant Professor Catherine Kaczorowski with Shengyuan Ding



In both her genes and lifestyle choices, Grierson seems to have ironclad defenses against age-related cognitive decline. JAX Assistant Professor Catherine Kaczorowski, Ph.D., is interested in why some people with a family history of Alzheimer's disease, and even brain changes associated with the disease, nevertheless manage to maintain their cognitive capabilities.

Kaczorowski explores the genetic factors behind this so-called cognitive resilience, which could someday provide targets for treatment and prevention of Alzheimer's disease.

Several genetic mutations have been traced to a rare, early-onset type of Alzheimer's disease that runs in families and appears in patients as young as 30 years old. With funding from the National Institute on Aging, Kaczorowski studies

mice carrying these mutations to identify other genetic factors that may overcome the cognitive decline that usually comes with Alzheimer's disease.

These resilience factors could point the way to new treatments that promote healthy brain aging and resistance to Alzheimer's disease, including the more common, late-onset version of the disease for which there is no known genetic cause.

Gazing out over the wildlife pond near her house, Grierson comments, "You know, people give up too soon," Grierson says. "In their fifties they start to say, 'I'm getting old.' You're just beginning at 50!"



A close-up photograph of a dog's face, likely a pug or similar breed, with its eye and part of its snout visible. The background is a solid orange color.

SHORT-NOSED DOGS ARE UNEXPECTED PARTNERS FOR BRAIN CANCER RESEARCHERS

BY JOYCE DALL'ACQUA PETERSON
PHOTOGRAPHY BY ERIN BLINN & TIFFANY LAUFER
ILLUSTRATION BY KAREN DAVIS





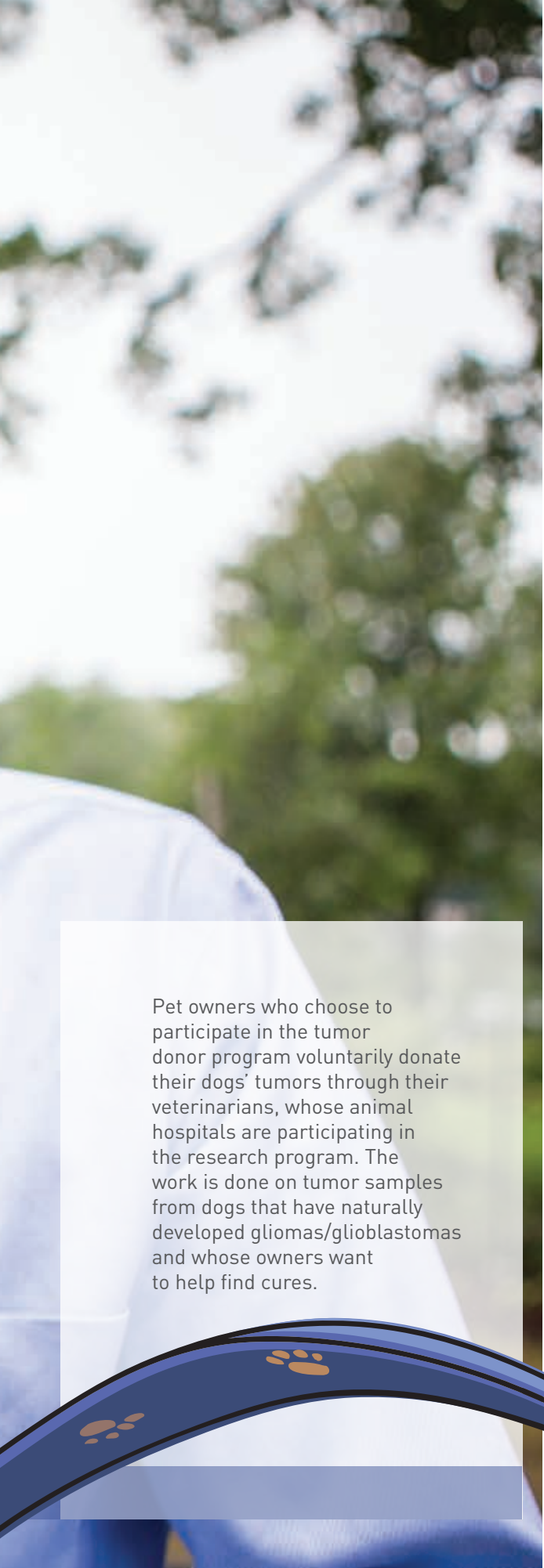
**Boston terriers, pugs,
French bulldogs,
Shih-Tzus, Pekingese:**

Known as YouTube stars, celebrity arm candy and Instagram sensations, these breeds are also making important contributions to research in one of the most deadly kinds of cancer.

That's because these and other short-snouted breeds — the technical term is brachycephalic — have an elevated risk for developing glioblastomas and gliomas, brain tumors that have a particularly high mortality rate in humans and dogs.



JAX cancer researcher Roel Verhaak, Ph.D., at his Connecticut home with his pet Chihuahua, Lola



Pet owners who choose to participate in the tumor donor program voluntarily donate their dogs' tumors through their veterinarians, whose animal hospitals are participating in the research program. The work is done on tumor samples from dogs that have naturally developed gliomas/glioblastomas and whose owners want to help find cures.

Roel Verhaak, Ph.D., is one of the world's leading experts in these brain cancers, whose work has literally defined the categories of glioblastomas for the research and medical communities. Before joining The Jackson Laboratory last year as a professor, Verhaak was on the research faculty of The University of Texas M.D. Anderson Cancer Center in Houston, and was approached by a neurosurgeon colleague, Amy Heimberger, M.D.

"Amy asked me if I wanted to be involved with this canine cancer project," Verhaak explains. "My first reaction was, like many people, I love dogs and they're important to me, but I study human cancers — why would I work on canine disease?"

But Verhaak says he "saw the light" when Heimberger explained the value of dogs in studying cancer immunotherapies. Not only do dogs get the same kinds of brain cancers as humans, but their immune systems also react very similarly to treatments aimed at harnessing immunity to combat tumors.

"To study immunotherapy preclinically is very difficult," Verhaak says. "Cell cultures don't have immune cells. Mice have some level of immunity but may not represent the full human immune response."

Dogs, on the other hand, have a fully developed immune system. This is an adaptation to the typical doggy lifestyle, which involves digging in the garden, exploring the kitchen trashcan or eating who knows what on morning walks. "Anybody who owns one knows that there are a lot of immunological challenges in the life of a dog," Verhaak says.

And, unfortunately, some dogs develop canine gliomas or glioblastomas.

Verhaak's first encounter with canine cancer occurred in his childhood, when the family dog developed a tumor late in life. A healthy and charismatic Chihuahua called Lola is now part of his family.

Verhaak and Heimberger obtained a grant from the National Cancer Institute to fund preclinical immunotherapy trials in dogs. Working with Texas A&M University in College Station, which has a collaborative network of veterinary clinics, the researchers collected 180 postmortem samples from dogs with brain tumors: cancer and normal samples from 70 dogs, and cancer-only samples from another 40 dogs.

The canine cohort, the largest ever assembled, includes samples from brachycephalic breeds, many of which carry genetic markers related to predisposition to canine brain cancers, but also some Doberman pinschers, Labrador retrievers and other breeds.

Verhaak's lab has been conducting whole-genome and RNA sequencing of the samples, and is just now "scratching the surface" of analyzing the data, he says. It's a complicated, labor-intensive project that takes a lot of hands-on time in the lab.

"We've already confirmed that there are similarities, from a molecular perspective, between markers for human gliomas and those for dogs," Verhaak says. "I think once we have our full cohort completed we'll be able to see markers that may be more canine specific. That in itself will be interesting: What do you see in canines but not in humans, and vice versa?"

Those differences will be important, he explains, in understanding the outcomes of preclinical immunotherapy trials in dogs. "Unless we know molecularly if they're similar to humans, we don't really know how to interpret the results. If immunotherapy works in dogs, we need to be able to pinpoint why it works in those dogs, so that we can improve the efficacy of immunotherapies for human cancer patients."

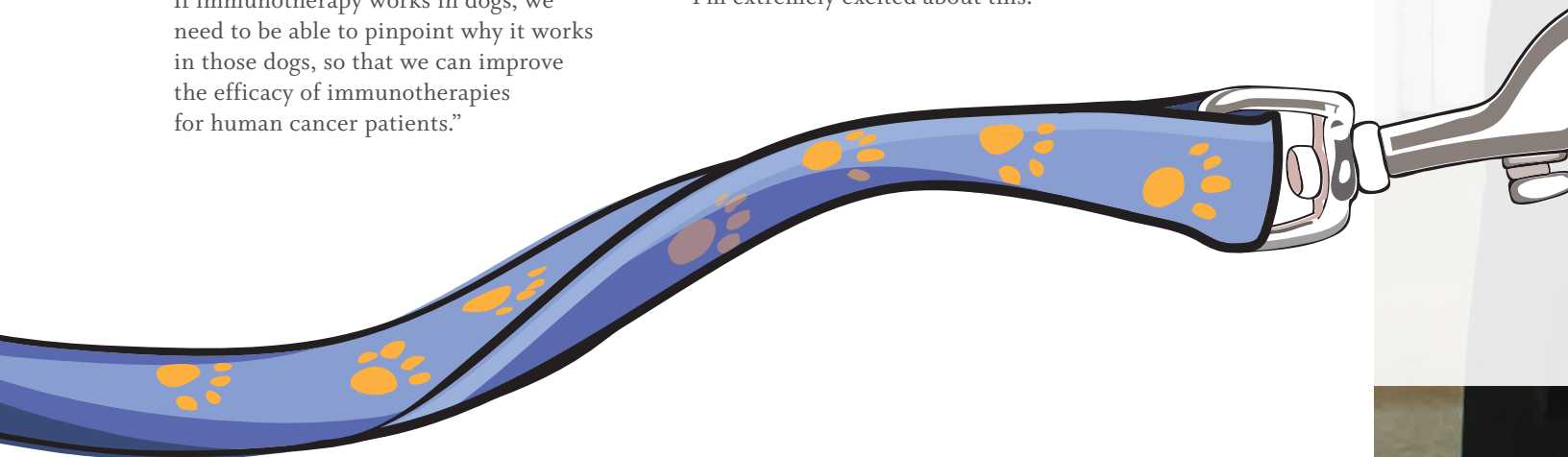
"Ultimately our project will benefit dogs and humans alike, and I'm extremely excited about this."

— Roel Verhaak, Ph.D.

Verhaak is also interested in why dogs develop tumors at all. For human glioma patients, most are diagnosed around 60 years of age, their bodies having accumulated 60 years of genetic damage. The dogs in the study averaged about 10 years old when they developed the canine form of the disease — that's about the same in "dog years" but their cells' genetic damage is somehow accelerated.

Besides differences between adult human and canine gliomas, Verhaak will also be comparing canine glioma to pediatric glioma. "Our goal is to do a three-way comparison because pediatric and adult gliomas are not the same diseases either.

"To understand canine cancer will help us to better understand human cancer, particularly from the angle of immunotherapy," Verhaak says. "I think we're going to learn an incredible amount by comparing the species in this way. Ultimately our project will benefit dogs and humans alike, and I'm extremely excited about this."





The Tallwood Canine Cancer Research Initiative

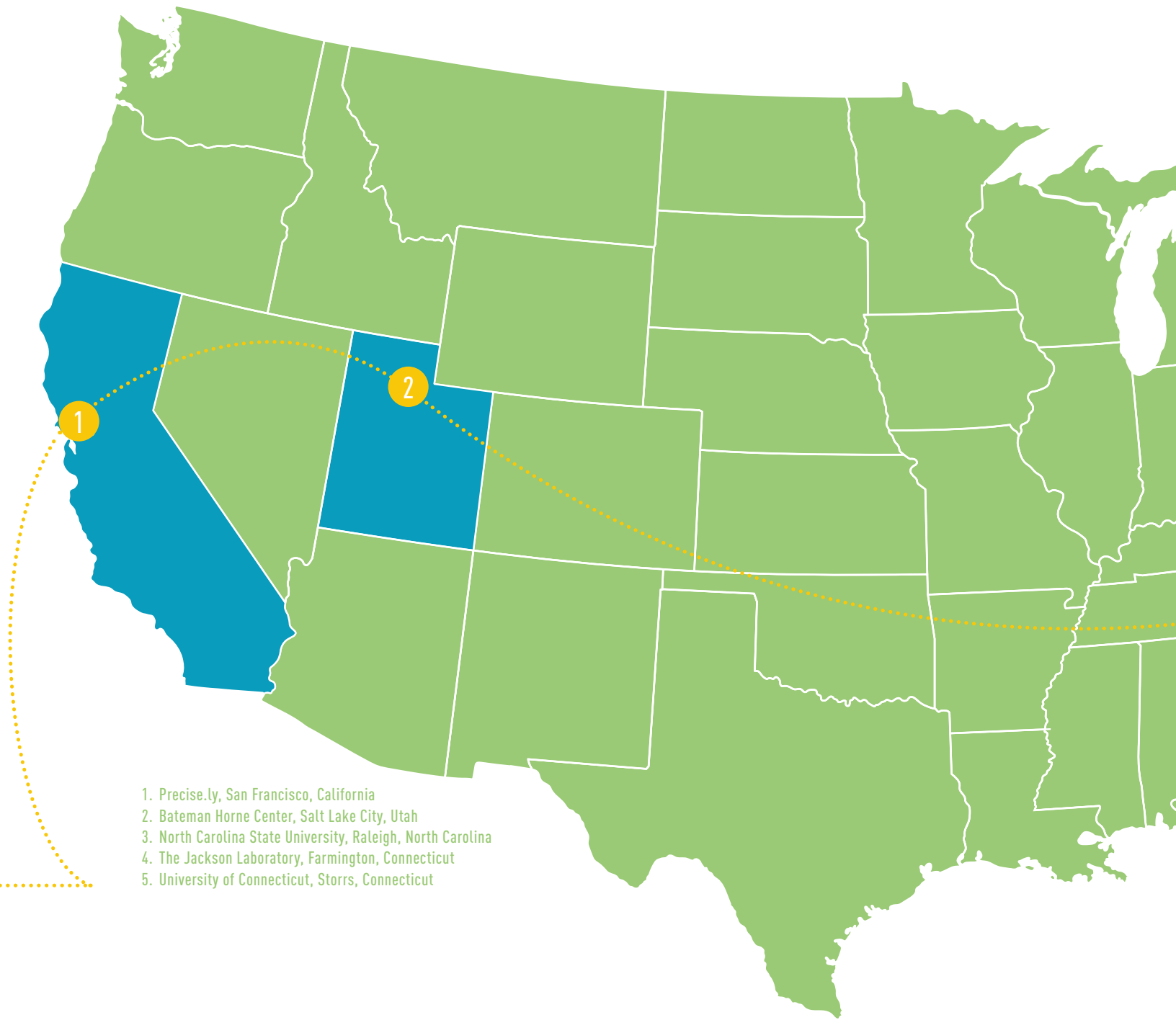
A \$500,000 gift by an anonymous donor from Connecticut has helped JAX launch a major new research initiative focused on finding cures for human and canine cancers.

The Tallwood Canine Cancer Research Initiative is the first of its kind. It will create a biobank of fully sequenced dog tumors that scientists around the world can use in their cancer research.

JAX is working with veterinarians to collect blood samples from healthy dogs, and tumor samples from canine cancer patients, whose owners volunteer to participate.

Learn more or donate at www.jax.org/tallwood.

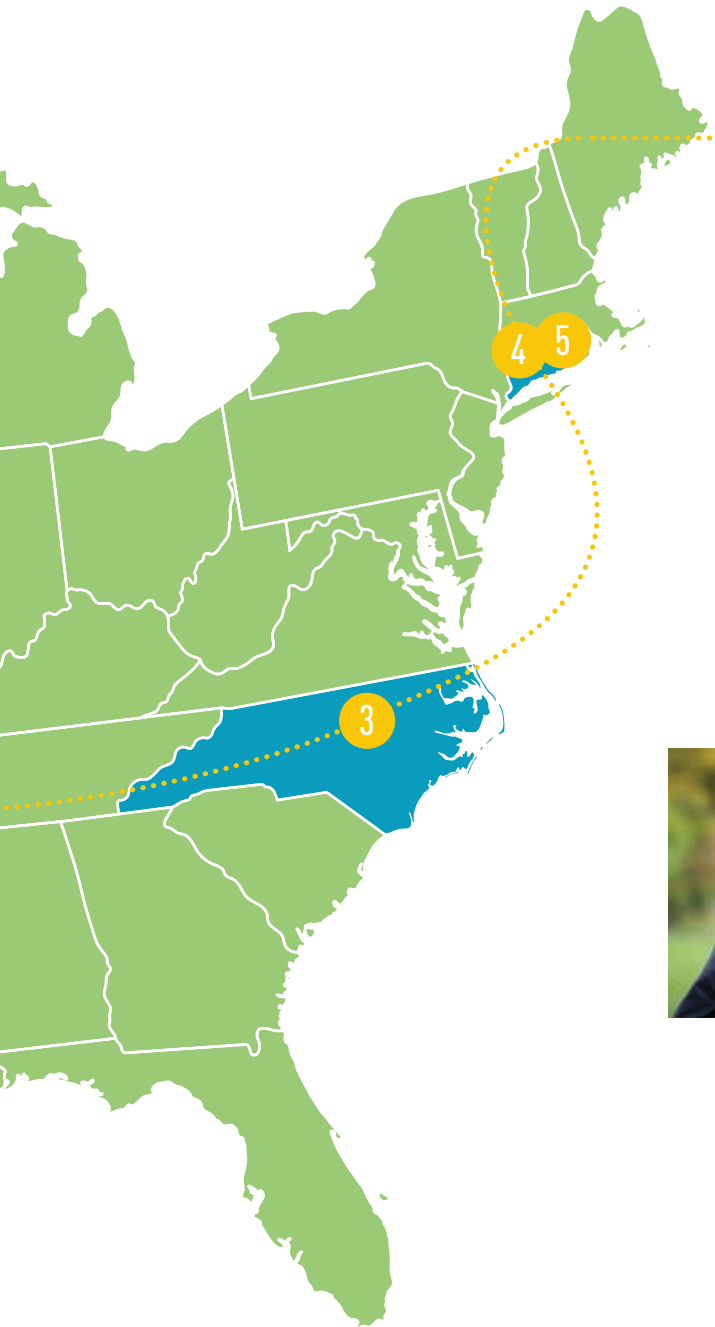
Patrick the Irish wolfhound visits with his veterinarian and JAX scientists Susan Mockus, Won Yeong Kang and Eliza Cerveira.



1. Precise.ly, San Francisco, California
2. Bateman Horne Center, Salt Lake City, Utah
3. North Carolina State University, Raleigh, North Carolina
4. The Jackson Laboratory, Farmington, Connecticut
5. University of Connecticut, Storrs, Connecticut

Unraveling the mysteries of chronic fatigue syndrome

BY JOYCE DALL'ACQUA PETERSON | PHOTOGRAPHY BY MARIE CHAO
ILLUSTRATION BY REBECCA HOPE WOODS



An emerging hypothesis is that ME/CFS involves perturbations of the components and interplay among a patient's immune system, metabolism and microbiome (the collection of microorganisms that live in and on each of us).

"For a long time we knew very little about the biological basis of ME/CFS," says Unutmaz. "Patients presented with a combination of cognitive and debilitating but general physical symptoms. Thus, it has been very difficult to diagnose and there is a great need to develop reliable biomarkers for diagnosis."

Using systems biology approaches, he says, "We now have the opportunity to determine the biological correlations of this chronic disease that can pave the way for precise diagnosis, and we can develop novel therapies to help patients."



ME/CFS has been very difficult to diagnose, and there is a great need to develop reliable biomarkers for diagnosis.

Derya Unutmaz, M.D., JAX professor, is part of a major new multi-institutional research effort to understand and treat myalgic encephalomyelitis/chronic fatigue syndrome (ME/CFS), a highly debilitating disease that is poorly understood. The research is possible thanks to a \$10.5 million grant from the National Institutes of Health.

According to the U.S. Centers for Disease Control and Prevention, between 836,000 and 2.5 million Americans suffer from ME/CFS. Symptoms may vary widely in severity and include profound fatigue, cognitive dysfunction, sleep abnormalities and pain.

Under the grant, Unutmaz will collaborate with Cindy Bateman, M.D., and Suzanne Vernon, Ph.D., at Bateman Horne Center of Salt Lake City, Utah; Xudong Yao, Ph.D., of the department of chemistry at the University of Connecticut in Storrs, Conn.; and Alison Motsinger-Reif, Ph.D., of the statistics department at North Carolina State University in Raleigh, N.C. The San Francisco, Calif.-based company Precisely is involved in clinical tracking of the broader patient community.

This team will work with JAX experts in computational biology and the microbiome to generate one of the largest and most highly detailed collections of clinical and biological ME/CFS patient data in the world. The data will be analyzed using sophisticated new computational technologies such as machine-learning approaches.

Unutmaz says the goal of the research is to "transform the landscape of knowledge of ME/CFS" by tracking down the immune, metabolic and microbiome changes that lead to the disease, "so that the knowledge gained through the work of the Centers becomes an inflection point toward the goal of treating a disease that causes terrible suffering in millions of patients."

..... Answering the most important questions

BY MARK WANNER
PHOTOGRAPHY BY JARED SKOLNICK

There was noticeable energy in the air at the start of the 2017 Forum on Healthcare Innovation. Francis Collins, M.D., Ph.D., director of the National Institutes of Health (NIH), was about to deliver the keynote address at the Forum, which gathers leaders from across the healthcare spectrum for talks and networking at The Jackson Laboratory for Genomic Medicine in Farmington, Conn.

Collins has overseen the NIH since 2009, guiding it through the rise of rapid genomic sequencing, genetic editing and the advent of precision medicine. Sometimes hope and expectation can run ahead of results, and it often seems that the deeper scientists dig, the more complexity they find. As Collins said in his talk, “We’ve found that it’s pretty hard to take 6 billion letters [from a genome] and translate them into actionable data.” Nonetheless, it’s been a time of incredible research progress that’s beginning to produce concrete benefits in the clinic.

Two NIH projects under way are directly focused on improving patient care. Individualized cancer care and targeted therapies are arguably the most significant precision medicine advances, Collins noted, and the national Cancer Moonshot project is seeking to further improve cancer patient outcomes.

A lot of the Cancer Moonshot effort is focused on establishing and expanding cooperation and collaboration between researchers and research centers, as data sharing is vital for continued progress.

In the same vein, the goal of another program, All of Us, is to obtain and coordinate extensive patient data from across the

country. In limited beta testing now, the program will be expanded to more than 100 locations next spring. The ultimate goal is to sign up more than 1 million participants, whose pooled data has the potential to inform healthcare, including prevention initiatives, for many years.

Moving forward, Collins is concerned about budgeting for the NIH and emphasized the importance of developing and broadcasting compelling messages about the benefits of biomedical research. In addition to standard grant mechanisms, he is looking to grow high-risk, high-reward programs to support particularly innovative research. Collins also wishes to bolster the research workforce, which has seen troubling trends in recent years, including the loss of many talented young scientists because of early-career training and funding challenges.

After his talk, Collins spoke with JAX President and CEO Edison Liu, M.D., who used to work at the NIH. The former colleagues discussed several topics, and one of particular interest to the Forum audience was the private-public partnerships the NIH is setting up with pharmaceutical companies to accelerate drug development and approval pipelines.

They also discussed the benefits of healthy behaviors, which can help people minimize or avoid pharmaceuticals altogether. At this point, however, such preventative measures are hard to quantify, so they’re not well supported.

According to Collins, “Our medical system is a ‘sick care’ system, so means of prevention like exercise don’t get the support they should.”



JAX President and CEO Edison Liu and NIH Director Francis Collins at the 2017 Forum on Healthcare Innovation in Farmington, Conn. ●●●●●●●●●●



WIRING THE BRAIN

THE POSSIBLE KEY TO EFFECTIVE OBESITY TREATMENTS

BY JAMIE PANDEY
PHOTOGRAPHY BY TIFFANY LAUFER
ILLUSTRATION BY REBECCA HOPE WOODS

Kristen O’Connell, Ph.D., is showing how abnormal neuron activity can drive overeating, providing a promising target for better therapies.

For people struggling with weight loss, it can be frustrating when current treatments for obesity are neither helpful nor low risk.

“A lot of pharmaceuticals aren’t very effective, and many have serious side effects,” says O’Connell, an assistant professor at The Jackson Laboratory (JAX). “Gastric bypass surgery can be really effective, but it’s highly invasive and can trigger complications.”

Obesity in the United States has been on the rise for many years, followed closely by its consequences — diabetes, stroke, heart disease and other health risks. Though exercise (or lack thereof), diet and lifestyle all play key roles in obesity, it starts with the brain.

“If we are successful we will find a way to cure obesity by making it easy for people to change their diet and change their lifestyle, because that’s the hard part,” O’Connell says.

Because of the limited effectiveness and serious side effects of currently available pharmaceuticals targeting obesity, they are primarily used only when their benefits outweigh their risks. Further complicating the issue, many health problems can frequently be the cause of obesity, making it even more difficult for those with chronic illnesses to maintain a healthy weight.

O’Connell recently received a \$1.6 million grant from the National Institute of Diabetes and Digestive and Kidney Diseases to allow her to continue to investigate the role of the brain and how it regulates the appetite.

Her research shows that in obese mice the hypothalamus is not as responsive to the appetite suppressant leptin as compared to normal-weight mice. This means the body is not listening when the brain is communicating that it should not be hungry.

While most scientists in the field are neuroendocrinologists (studying the nervous system and the hormones it produces), O’Connell



Assistant Professor Kristen O’Connell recently received a \$1.6M grant to investigate how our brains and central nervous systems interact with our diets.

is an electrophysiologist who studies how electricity flows through neurons to communicate with the body, and how hormones interact with parts of the brain associated with the regulation of food intake.

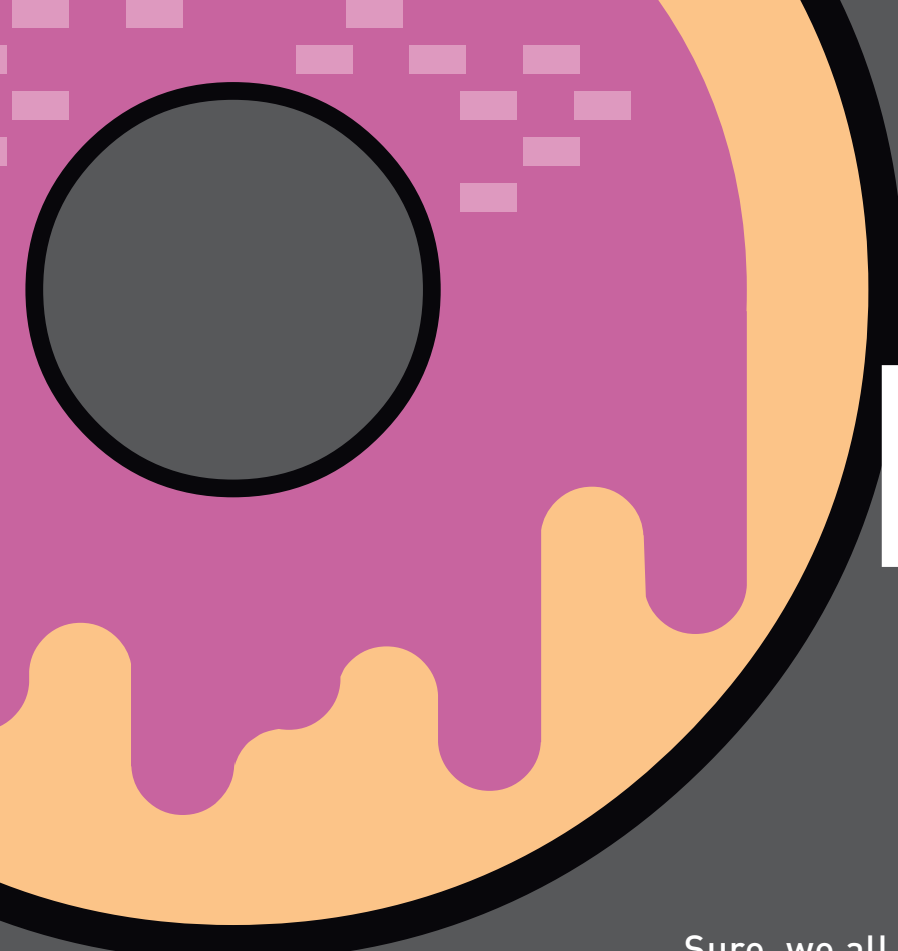
One aspect of O’Connell’s research is investigating how certain obesity-targeting drugs work in mouse models. Obesity is sometimes caused by genetic defects, as seen in a range of conditions called ciliopathies, some of which, like Bardet-Biedl syndrome, cause uncontrolled appetites. Researchers believe that these conditions involve defective neurons lacking normal signaling capabilities. O’Connell is testing several potential drug treatments to see if they can bypass the nonfunctioning neurons and enlist other, healthy neurons.

O’Connell also studies astrocytes, neurons that have numerous structural and functional roles in the brain, and their role in obesity. Many currently available obesity drugs are unable to pass through a filtering mechanism in the brain called the blood-brain barrier, which is formed by astrocytes and other cell types. She has found that the drug setmelanotide is capable of passing through this barrier, pointing the way to a better approach to obesity drug development.

Highlighting the breadth of her work, O’Connell intends her research to provide new therapies not only for obesity, but also “for all kinds of other diseases that are affected by body weight, by diet, by lifestyle.”

Adult brains are not as “plastic” or capable of change as children’s brains, O’Connell notes. “Figuring out a way to rewire the adult brain could help adults change their lifestyles by helping their brains make the more difficult, but healthier, choices.”

With the worldwide increase in hypertension, diabetes and other conditions associated with obesity, the results from O’Connell’s research at JAX may be just what the doctor will order.



LIFE

**Sure, we all want to live long lives —
but not at the expense of our health!**

Even the mythical fountain of youth was thought to do two things: extend life span and cure sickness.

Thanks to scientifically based public health advances, the average human life span has doubled since 1900. But decreasing mortality for certain diseases has paved the way for other late onset ones like diabetes, chronic kidney disease and Alzheimer's.

These health issues are expensive to treat and often require prolonged care. But what if there was a way to help us extend our health span, delaying age-related health issues, repairing damaged organs and improving our quality of life?

V

HEALTH



BY JOSEPH BLANCHETTE | ILLUSTRATION BY ZOË REIFSNYDER

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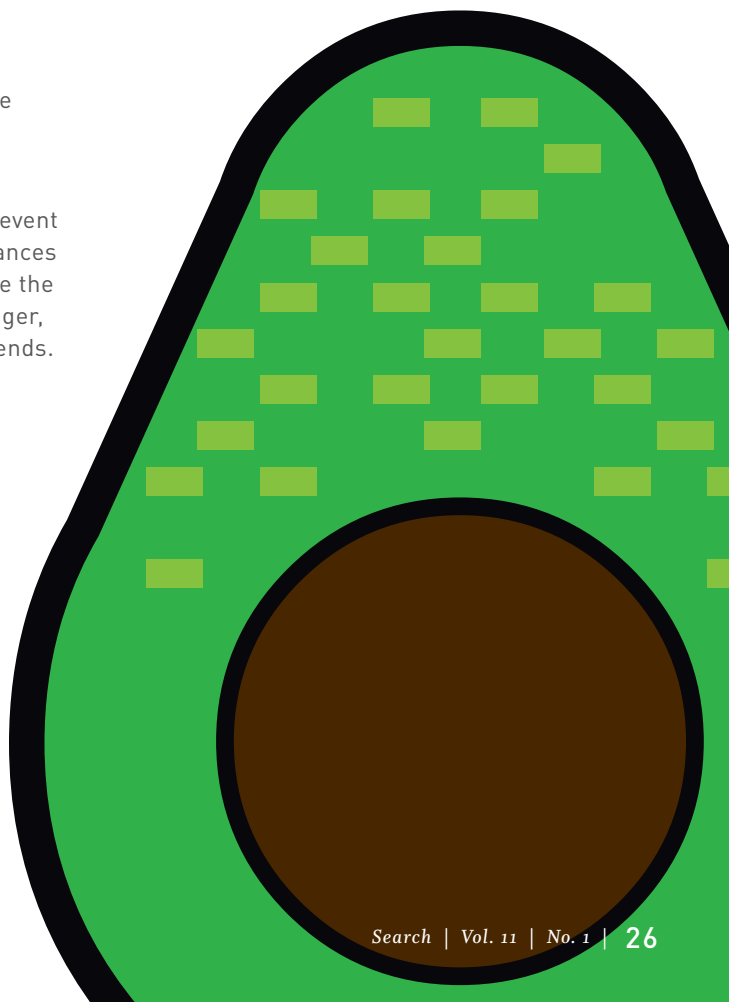


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Research shows that lifestyle factors have a major influence on our health span. Each of us can take control of our own health by being physically active, eating healthy foods, staying mentally active and minimizing stress. We can also avoid tobacco use and not skip out on those appointments to see the doctor and dentist.

As for the big, genetically complex diseases of aging? It might be a long time before we can prevent Alzheimer's disease, for example, but with advances in research we could delay the onset and reduce the symptoms of the disease. And that means a longer, healthier life to spend with our families and friends.

SPAN





600 Main Street
Bar Harbor, ME 04609-1523

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Mission

We discover precise genomic solutions for disease and empower the global biomedical community in our shared quest to improve human health.

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Bar Harbor, Maine
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Editor

Joseph Blanchette

Design & art direction

Karen Davis
Danielle Meier
Zoë Reifsnyder
Rebecca Hope Woods

Copy editors

Carol Lamb
Rebecca Hope Woods

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