THE Physiologist MAGAZINE
MARCH 2026



WHERE SHE BELONGS

How finding a community helped Patricia E. Molina shape a life of science.

PLUS: GETTING THE MOST FROM AN ACADEMIC CONFERENCE 16 | THE PHYSIOLOGY OF GLP-1s 28

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Learn more at physiology.org/comparative2026.

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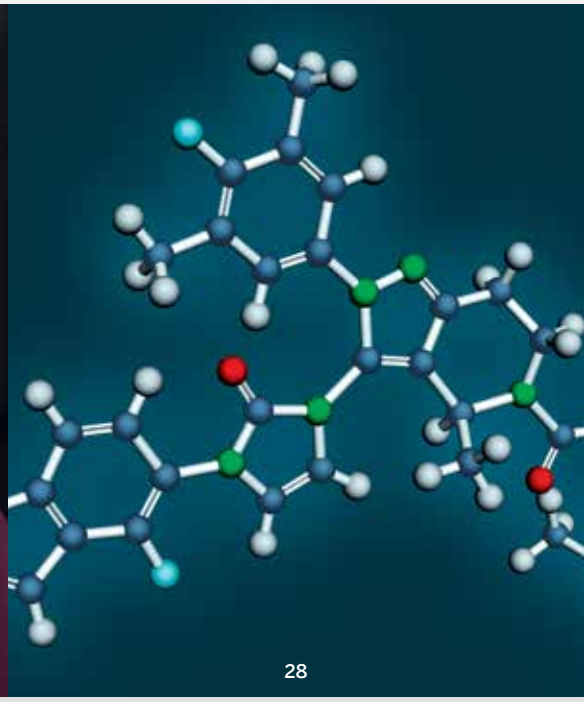
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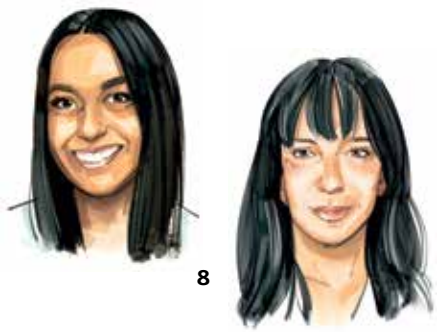

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Share Your Story

Has the American Physiological Society impacted your life and career?

Share your story and inspire the next generation of physiologists to build a rewarding and impactful career through Society membership, volunteerism, events, publishing, advocacy and more. Tell us:

- An APS experience that changed the trajectory of your career
- How APS connections led to lifelong partnerships or discoveries
- Ways that APS supported you on your professional journey

We can't wait to hear from you!

physiology.org/testimonial



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From Bedrock to Breakthroughs

BY AMANDA BERTHOLF, MA



Physiology is the science that explains how life works, and it's at the heart of today's most cutting-edge medical breakthroughs. By understanding how the body's systems work together, you help make things like cancer treatments safer and enable the development of new therapies for cystic fibrosis—helping people live longer.

This kind of work rarely moves fast. As you know, it unfolds over decades, shaped by inquiry, collaboration and iteration. But it is this "slow science" that allows breakthroughs to take root—protecting patients, preventing side effects and turning discovery into therapies that improve lives. What can look like an overnight success is almost always built on decades of physiological research.

"It is this 'slow science' that allows breakthroughs to take root—protecting patients, preventing side effects and turning discovery into therapies that improve lives."

Few discoveries illustrate this better than insulin. A century ago, careful study of how hormones and metabolism regulate blood sugar transformed diabetes from a terminal illness into a manageable chronic condition. That foundational physiological finding didn't just save lives. It paved the way for generations of advances in metabolic science that continue to shape medicine today.

We're seeing a modern version of this unfold with the emergence of GLP-1–based therapies. Widely recognized for their role in treating diabetes and obesity, these drugs are the product of decades of basic physiological research into hormones, metabolism and cellular signaling. Early studies exploring how the gut communicates with the brain to regulate appetite and blood sugar laid the groundwork. Even unexpected discoveries, such as a hormone found in Gila monster venom that mimicked human GLP-1, helped move the science forward.

The research continues today, driving new investigations into the potential benefits of GLP-1 therapies for cardiovascular, kidney and neurodegenerative diseases. In this issue, we examine GLP-1s through a physiology lens with perspectives from researchers at the center of this work. They are looking at how these therapies may affect the body beyond glucose regulation. In 100 years, will people talk about GLP-1s the way we talk about insulin? Read the story on page 28. It is also a reminder that progress in medicine depends on long-term, sustained investment in fundamental science.

Many of tomorrow's big scientific ideas are shaped when researchers come together to share their findings. As you prepare to attend the American Physiology Summit next month, we wanted to offer tips from other physiologists on how to make the most of your time at a conference. On page 16, you'll find a guide on how to plan before, during and after the Summit (and other conferences and meetings). You'll also find information on how to access and use the Summit's helpful and newly revamped app.

Someone who has made the most of APS connections—and spent a lot of valuable time at physiology conferences—is Patricia E. Molina, MD, PhD, FAPS, a past president of APS we are featuring this month. On page 22, you'll see why she wanted to become more involved in the Society and the unexpected directions it took her.

Amanda Bertholf, MA, is APS director of communications and the editor-in-chief of *The Physiologist Magazine*. Send questions or comments to the editor at tphysmag@physiology.org.

Fighting for Physiology

APS' Fight for Physiology campaign exists to support you—the scientists driving progress in labs, classrooms and clinics every day. We're telling the story of physiology's influence in biomedical research. View the latest updates at **fightforphysiology.org**.

THE SCIENCE *life* DEPENDS ON

THE Physiologist MAGAZINE

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APS*select*

Muscle and Bone Aging by Sex



Upper-body strength and bone health change with age, but research shows that men and women do not follow the same path. In a recent study in the *Journal of Applied Physiology*, researchers measured bench press strength, bone mineral density in the arms, and lean mass in adults in several age ranges to clarify how these systems age over time. Strength and bone density decline with age in both sexes but in different ways. Men experienced a steeper loss in upper-body strength, while women lost bone density more quickly. These differences became more apparent with advancing age. The relationship between upper-body strength and arm bone density became stronger with aging and was particularly apparent in women. Lean mass also contributed to bone density, although its link with strength weakened with age, especially in men. The results suggest clear sex-specific patterns in musculoskeletal aging and highlight the importance of maintaining upper-body strength to support long-term skeletal health, especially for women with an increased risk of osteoporosis.

Source: doi.org/10.1152/japplphysiol.00544.2025

Unless otherwise specified, all images: iStock

IN BRIEF

The Latest Research from APS Journals

Explore new peer-reviewed findings published across the Society's journals.



High salt levels in the blood change brain activity differently in men and women, even though thirst and blood pressure respond similarly.

doi.org/10.1152/ajpregu.00211.2025



Ten days of heat acclimation lower core temperature during exercise but doesn't reduce kidney stress, suggesting heat may still challenge renal function.

doi.org/10.1152/ajpregu.00215.2025



Just one day of reduced activity can change muscle gene activity and metabolism, affecting the body's response to exercise.

doi.org/10.1152/ajpendo.00379.2025

APS*select*

Hydration Keeps Stress Hormones in Check



Not drinking enough fluids may do more than leave you thirsty—it could make your body respond more strongly to stress. A study in the *Journal of Applied Physiology* showed that low hydration can boost levels of cortisol, the body's key stress hormone. Researchers tracked drinking habits (all alcoholic and nonalcoholic beverages) and hydration status in young adult volunteers for a week. The volunteers then faced a stress test involving a mock job interview and mental math tasks, with saliva collected before, during and after to measure cortisol levels. The participants who drank less fluid had higher baseline cortisol and a bigger spike in response to stress compared with those who stayed well-hydrated. These findings suggest that everyday hydration habits may play a larger role in how the body reacts to stress than previously noted, highlighting a simple and actionable way to support overall health.

Source: doi.org/10.1152/japplphysiol.00408.2025

EPISODIC MEMORY



The Complexity and Flexibility of Memory

Episodic memory lets us relive past experiences, but new research in *Physiological Reviews* showed it's more than just a simple replay. Memories are stored at multiple levels—from detailed, context-rich snapshots to broader, generalized impressions. The brain weighs these representations when we recall them. This balance determines whether we reproduce a memory exactly or reconstruct it to fit new situations. Studies find that the hippocampus area of the brain supports precise memory recall, while the medial prefrontal cortex helps generalize experiences and apply them to guide our behavior. By juggling detailed and flexible representations, our brain can adapt memories to fit our current goals and to reflect past knowledge and individual differences. This study highlights how the architecture of our memory allows our experiences to remain both stable and flexible.

Source: doi.org/10.1152/physrev.00005.2025



Comic books and a Brazilian poetry genre help physiology students learn complexity of airway reflexes.

doi.org/10.1152/advan.00215.2025



Obesity and menopause each reshape the gut microbiota, while estrogen therapy helps restore microbial balance and support metabolic health.

doi.org/10.1152/physiolgenomics.00184.2025



Heat strain changes calcium signaling in the heart, affecting calcium balance and heart cell responses in mice.

doi.org/10.1152/ajpheart.00616.2025



Boosting the aryl hydrocarbon receptor protein could help protect the lungs and fight inflammation in people with respiratory syncytial virus.

doi.org/10.1152/ajplung.00134.2025

Bottom left: Diego Dacal/Wikimedia Commons

LAB NOTES

MENTORING Q&A YOUR QUESTIONS ANSWERED
STREAMING SCIENCE APS JOURNAL PODCASTS
POLICY IQ PHYSIOLOGY ON THE HILL AND IN THE HALLS
UNDER THE MICROSCOPE OUR MEMBERS, UP CLOSE
PUBLISH WITH POLISH BUILD A BETTER RESEARCH PAPER
IN DEPTH DIVING DEEP INTO SCIENCE
STATS & FACTS PHYSIOLOGY BY THE NUMBERS



Sarah Dooley, PhD



Analia S. Loria Kinsey, PhD, FAPS

MENTORING Q&A | EARLY CAREER

Forward Momentum

How to set yourself up for a successful career.

Each issue, we ask a student or early-career member to pose their career questions to an established investigator and mentor. Here, **Sarah Dooley, PhD**, a postdoctoral fellow at the Medical University of South Carolina, asks **Analia S. Loria Kinsey, PhD, FAPS**, what career success looks like today. Loria Kinsey is an associate professor of pharmacology and nutritional sciences at the University of Kentucky College of Medicine.

Illustrations by Kagan McLeod

Q: What skills from your training ended up being most useful later on?
A: Honestly, a lot of the "boring" lab habits mattered way more than I expected. Keeping your CV updated and using a consistent format for publication references is huge. If you wait until you need to apply for something, it can turn into a nightmare. And one very simple thing that goes a long way: replying to emails in a timely manner. People really notice and appreciate it. Additionally, organizing your experiments requires "stoic discipline": keeping accurate lab notes, labeling samples properly, and maintaining clean, well-organized data. These skills don't feel exciting at first, but they save you a lot of stress and mistakes later.

Q: What advice do you have for trainees who feel unsure about what's next?
A: The academic world has changed a lot in the past 10 to 15 years, so my early experiences don't fully translate to today. Opportunities are more limited now, and people are much more aware of work-life balance, which can make decisions feel even harder. For PhD students and postdocs, I'd say: Think long term. Even if a position isn't your dream job, ask yourself whether it offers strong training, new skills or good mentorship. Those things are real investments that can make you more competitive later. Prioritizing solid training now can give you more flexibility in the future.

Q: What influenced your career path, and how important were mentors?
A: One key moment for me was applying for an independent grant—and I probably wouldn't have done it without my mentor strongly encouraging me. Self-doubt is very common, especially in academia, and it can make goals feel completely out of reach even when they aren't. A good mentor can make a huge difference, not just emotionally but also practically, especially for grants and fellowships. For trainees, choosing the right mentor is one of the most important decisions you'll make, so it's worth paying attention to how supportive and invested they really are.

"Choosing mental health or quality of life over a traditional path is not something anyone should feel ashamed of."

Q: How do you think about productivity and well-being during intense periods?
A: This conversation is much more open now than it used to be. With current funding pressures, both principal investigators and trainees are under a lot of stress, and many of us aren't really trained to think about alternative career paths. Changing direction is often unfairly seen as failure. There's still this idea that you should stick to one plan no matter what and that leaving full-time research means you "gave up." I've come to respect people who make decisions based on their well-being. Choosing mental health or quality of life over a traditional path is not something anyone should feel ashamed of.

Q: How has your definition of success changed?
A: It's still about asking good questions, testing hypotheses and sharing results as clearly and honestly as possible. What has changed is how success looks from the outside. Now, success also means mentoring students who defend their theses, being a senior or corresponding author, visiting other institutions to talk about our work, and having people reach out for career advice. Those moments feel meaningful because they reflect impact, growth and trust—things that matter a lot beyond your scientific production.

Got a career question you'd like to submit? Email it to tphysmag@physiology.org. We may use it in an upcoming Mentoring Q&A.

STATS & FACTS

85%

of all jobs are filled through networking.

LinkedIn

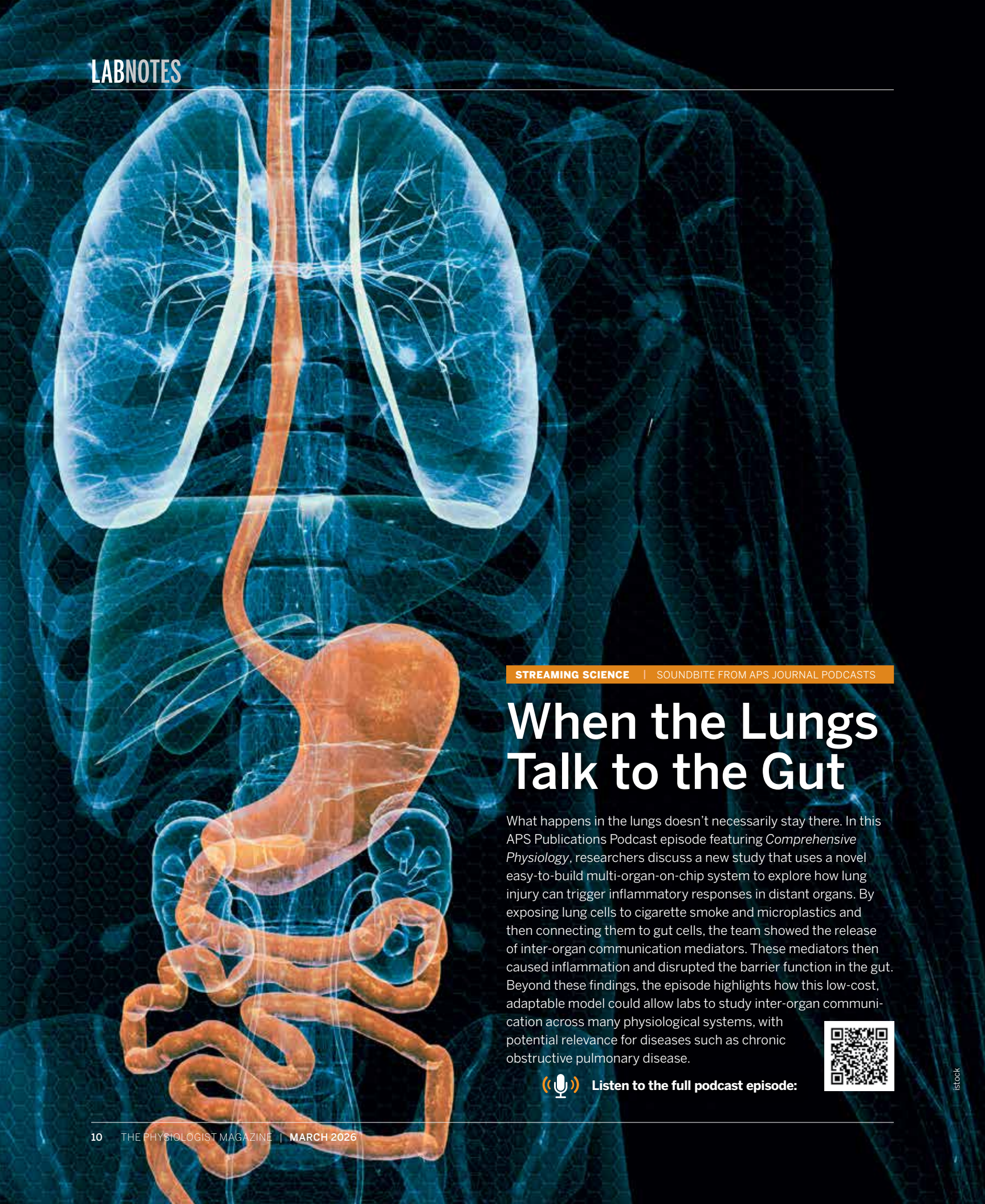
About one-fourth of doctoral students and 38% of postdocs surveyed who attended an international conference said the conference led to a publication project.

"What are the social and scientific benefits of participating at academic conferences? Insights from a survey among doctoral students and postdocs in Germany," *Research Evaluation*

251 million

people participate in various meetings and events in the U.S. every year.

Events Industry Council



STREAMING SCIENCE | SOUNDBITE FROM APS JOURNAL PODCASTS

When the Lungs Talk to the Gut

What happens in the lungs doesn't necessarily stay there. In this APS Publications Podcast episode featuring *Comprehensive Physiology*, researchers discuss a new study that uses a novel easy-to-build multi-organ-on-chip system to explore how lung injury can trigger inflammatory responses in distant organs. By exposing lung cells to cigarette smoke and microplastics and then connecting them to gut cells, the team showed the release of inter-organ communication mediators. These mediators then caused inflammation and disrupted the barrier function in the gut. Beyond these findings, the episode highlights how this low-cost, adaptable model could allow labs to study inter-organ communication across many physiological systems, with potential relevance for diseases such as chronic obstructive pulmonary disease.

Listen to the full podcast episode:

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POLICY IQ | FEDERAL GRANT POLICY

How Federal Grantmaking Is Changing

APS raises concerns as policy shifts at NIH reshape how research funds are awarded.

Beginning in January 2025, a rapidly shifting policy landscape upended the grantmaking process at federal research agencies, including the National Institutes of Health (NIH) and National Science Foundation (NSF).

By mid-summer, data showed that the number of competitive grants approved by NIH fell far short of previous years, leading to fears that the agency would be unable to completely spend its 2025 allocation.

By the end of the fiscal year (FY), NIH and NSF managed to spend nearly their entire budgets, but both agencies funded significantly fewer competitive grants than in previous years. The discrepancy was primarily due to increased use of multiyear funding, a policy that funds approved grants in full at the time of award. This was a directive from the White House Office of Management and Budget to increase budget flexibility. As a result, fewer new grants were funded in FY 2025 at NIH and NSF and grant success rates plummeted.

The outlook for FY 2026 is complicated by changes to peer review at both agencies. "The changes underway at NIH and NSF are reshaping how scientists plan their research, support their teams and sustain long-term programs," says Rebecca Osthus, PhD, director for Government Relations and Science Policy at APS. "When funding becomes less predictable and fewer new grants are awarded, it creates ripple effects across labs, institutions and career stages." Here's what we are facing:

NATIONAL INSTITUTES OF HEALTH

In November 2025, NIH released a policy directing institutes and centers (ICs) to update funding policies by the January Council round that prioritize a set of core tenets. These include alignment with the NIH mission, scientific merit, investigator career stage, distribution and geographic balance of funding, and availability of funds. ICs are prohibited from relying on paylines (cutoffs based on overall impact scores) as part of their spending plans. In December, NIH issued guidance to program officers on assessing whether current or future grants in their portfolios align with agency priorities, including how to renegotiate or terminate those that do not.

NATIONAL SCIENCE FOUNDATION

On Dec. 8, 2025, NSF updated its "Proposal and Award Policies and Procedures Guide" to allow grant proposals to be evaluated by one outside reviewer, with a second internal review by a program officer. This change was intended to ease the workload on NSF staff following significant workforce reductions last year, including external scientists who were serving as program managers in a temporary capacity (rotators). Additional changes, reported by *Science*, would allow program officers to reject more proposals without review, recommend high-priority proposals for funding without panel evaluation, and shorten proposal summaries from one page to three to five sentences.

These changes followed an August 2025 executive order that required federal agencies to identify a senior appointee to create a process for reviewing funding opportunity announcements and discretionary grants to "ensure that they are consistent with agency priorities and the national interest."

In response, APS and more than 60 other organizations from a variety of disciplines sent a letter asking congressional leadership to protect peer review, exercise its oversight authority, and work with the scientific community to strengthen the scientific enterprise.



APS also continues to raise concerns about changes at federal agencies directly with congressional offices, emphasizing how these affect scientists nationwide and within their states and districts. Stay up to date with APS' latest efforts by reading the monthly Science Policy News email and find out how you can get involved at **physiology.org/getinvolved**.

Send questions or comments to tphysmag@physiology.org.

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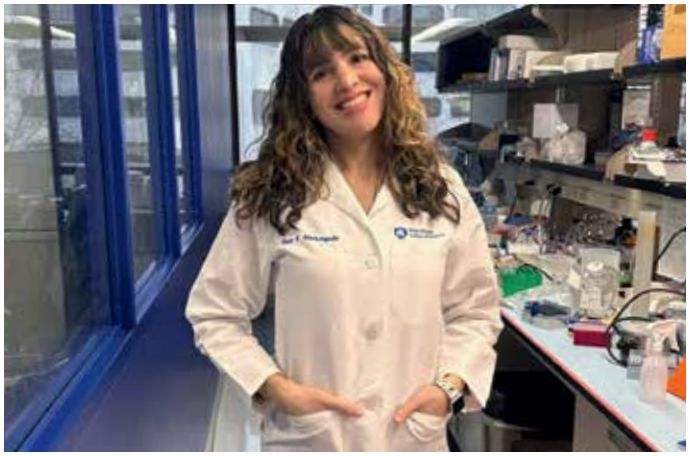
UNDER THE MICROSCOPE | SCIENTIFIC DISCOVERY

Life-saving Possibilities

Newly minted PhD researcher marvels in the power of physiology.



Raz Abdulqadir, PhD, is a graduate assistant in the biomedical program at Penn State College of Medicine. Her research specializes in intestinal epithelial barrier function and probiotic-host interactions. She is passionate about mentoring the next generation of scientists and advancing effective science communication.

A CLASSROOM SPARK. I've always been naturally curious about the world around me. As a child, I often found myself daydreaming in class. I didn't do well academically at first, but my curiosity never faded. My first real spark of interest came during a middle school science lesson when my teacher explained molecules and atoms and how they collide. It felt like unlocking a hidden universe. I often tell my son—and I want other children to know—that just because you don't like school right now, or you're struggling, doesn't mean you'll fail academically. Once you find your passion, or meet that one teacher who inspires you, everything can change.

CHANGING LIVES. What motivates me most is knowing that the discoveries we make in the lab can one day save lives. That possibility inspires me to be part of a world where I can constantly learn new things while making a meaningful impact—a world where curiosity leads to breakthroughs that truly matter.

WESTERN BLOT BLOOPER. Like many scientists, I've had my share of Western blot mistakes. I was using a fluorescent dye to label bacterial DNA green so I could study its interaction with host cells. I carefully followed the protocol, fixed the cells and prepared them for imaging. But when I looked under the microscope, everything was glowing green—the bacteria, the intestinal cells, even the background! The dye was so strong that I couldn't see any details, just an overwhelming green blur.

FIRST WOMAN OF SCIENCE. One pioneer I would love to meet is Madame Marie Curie. I would love to learn about how she made her groundbreaking discoveries in radioactivity, how she navigated the challenges of being the first woman in a demanding and male-dominated field, and how she balanced her scientific career with motherhood. Her achievements not only transformed our understanding of physics and chemistry but also paved the way for generations of women in science.

LOVE OF LEARNING. My favorite part of my job is the constant learning and discovery. I love trying to understand the complexity within science, looking at new data and feeling that curiosity that makes me say, "Wow, this is so interesting."

> **"What motivates me most is knowing that the discoveries we make in the lab can one day save lives."**

BEYOND THE TRADITIONAL. Physiology has evolved far beyond traditional boundaries, incorporating cutting-edge technologies such as multi-omics integration, advanced imaging, organ-on-chip models, confocal microscopy, artificial intelligence-driven analytics and translational therapeutics to uncover complex mechanisms. Physiology is not static; it's a constantly evolving discipline that adapts with innovation, making it one of the most exciting and interdisciplinary areas of science.

Do you know someone we should meet? Email us at **tphysmag@physiology.org** and tell us more.

Photo courtesy of Raz Abdulqadir, PhD

PUBLISH WITH POLISH | AMERICAN PHYSIOLOGY SUMMIT

Meet Us in Minneapolis

Add to your Summit schedule opportunities to meet with APS Publications staff.



American Physiological Society and iStock

It's almost that time of year again when physiologists gather to share scientific discoveries and forge new collaborations: the American Physiology Summit! The annual APS meeting, which will be in Minneapolis, April 23–26, also provides the opportunity to connect with the APS Publications team. This is your chance to learn more about the publishing process and interact with journal editors and staff.

Beyond attending the game-changer and foundational science sessions, Summit attendees mingle in the PhysioHub at the convention center to view posters, connect with sponsors, and of course, visit the APS Homebase, where you'll find the APS Publications booth. Staffed by our knowledgeable managing editors and their colleagues, this is the place to find answers to all your questions. Are you working on your manuscript and have a question about how to submit? Want to learn more about how to become an APS peer reviewer? The managing editors are there to help. Not sure which journal is the right fit for your research? Check out the journal postcards, and review the scope descriptions of our 16 journals. As an added bonus, the journal editors often visit the booth, so there's a good chance you could rub elbows with them, too.

APS Publications will also be presenting a series of talks in the APS Homebase on topics such as transforming your research from poster to paper, publishing ethics, crafting a manuscript to engage with your audience, and participating in APS' open access publishing. By focusing on how to "publish with purpose" in APS journals, these presentations will show you how you can support the future of physiology. To view dates and times for these events and plan your schedule, download the Summit app by searching American Physiological Society in the Apple App Store or Google Play.

The Publications staff will also be out and about at various events throughout the meeting. Journal editors will be presenting top article awards at APS section banquets, and editors and staff will circulate among the posters to engage with presenters. We'll also be at the opening and closing lectures, as well as various receptions.

The Summit offers several opportunities to connect with APS editors and Publications staff. We are excited to meet with journal authors and readers and hear firsthand what is important to you in your publishing journey. So, bring your questions—we will see you in Minneapolis!

Stay Up to Date For the latest information on Summit status, safety and logistics, visit **physiology.org/summitstatus**.

STATS & FACTS

A protein from the Gila monster venom is about 50% identical to glucagon-like peptide-1 analog (GLP-1), a hormone released from the human digestive tract that helps to regulate insulin and glucagon.

University of North Carolina at Chapel Hill

2–4

The number of meals Gila monsters, with their slow metabolisms, can survive on in a year.

Arizona-Sonora Desert Museum

One GLP-1 medication reduced cravings in patients with opioid use disorder by 40% over three weeks.

Stanford Medicine



IN DEPTH | HEALTHY AGING

Brain Benefits of Working Out

Deciphering the ways exercise affects the brain can point to new strategies for healthy aging and countering neurodegeneration.

Henriette van Praag, PhD, is associate professor of biomedical sciences at Florida Atlantic University. In studies using rodents, her lab is uncovering how exercise supports brain health by increasing the production of new neurons, strengthening synaptic networks and enhancing memory function.

What sparked your interest in this work?
That was an unexpected discovery I made in 1999. Research in the lab had shown that housing rodents together in an enriched environment (a large group cage with toys, tunnels and a running wheel, which provides more opportunities for socialization, learning and activity) increases the number of new neurons in the hippocampus, a brain area that is essential for learning and memory. Most of the brain's neurons are formed before birth, but the hippocampus is an area where neurogenesis, the formation of new neurons, can happen in the adult brain.

I decided to separate out the components of that enriched environment and saw that just housing the animals with a running wheel caused a two- to three-fold increase in adult hippocampal neurogenesis. It was a very, very robust effect. I realized this might actually have profound implications for memory function and neuroplasticity. All of a sudden, I saw this path in front of me. I knew that this was what I was going to focus on.

What have you learned so far?
Our studies in mice have provided an enormous wealth of insight about how exercise affects the brain. The effects of exercise are particularly profound for the hippocampus because there it can elicit the growth of new neurons. It can also increase the production of growth factors such as brain-derived neurotrophic factor [BDNF, a protein involved in the growth and survival of neurons, as well as synapse formation], improve vascularization of the brain and reduce inflammation. We also see that there's functional outputs, such as increased synaptic plasticity, improved learning and memory, and reduction in anxiety-like and depression-like behavior in rodents.

More recently, we have learned that the positive effects of exercise on the

istock

brain may be triggered by factors released from peripheral organs. We identified a novel myokine, Cathepsin B (Ctsb), that is important for muscle-brain interaction.

How can this work help people?
Our work in mice, combined with research in humans, can inform the public of some of the lifestyle choices that would be beneficial for brain function throughout the lifespan. One of the things we have looked at in mice is whether the newly formed neurons are functional and how they connect to the rest of the brain. For instance, in middle-aged mice that are housed continuously with a running wheel, we see that certain pathways connecting between adult-born neurons and brain areas important for memory function are enhanced or maintained. This suggests to us that exercise can support optimal wiring of the brain, if done consistently over the lifespan.

> "The effects of exercise are particularly profound for the hippocampus because there it can elicit the growth of new neurons."

In other work, we have found that the effects of certain plant-derived nutritional components and exercise appear to be complementary, going hand in hand in maintaining brain functioning over the lifespan.

What are you excited to learn next?
For our newest work, we started to think, if we can improve the healthy organism with exercise, can we also do that in mouse models of neurodegenerative disease by harnessing the relevant pathways that lead from muscle to brain? If we can understand the role of peripheral organs during exercise and how they influence the brain, could you elicit some of these changes just by modifying muscle to produce factors such as Ctsb, even in the absence of exercise itself?

In our recent work in a mouse model of Alzheimer's disease, we apply a gene therapy-based approach to express Ctsb and show that this prevents decline of learning, memory and neuroplasticity. It's a new way of looking at neurodegeneration. Instead of trying to reduce plaques or inflammation, our idea is that we could find other routes to improve brain function. That's something I'm excited about because it has translational potential for a thus far incurable disease.

What advice do you have for scientists just starting out?
Basically what my adviser told me to do. His advice was to go in the lab and start doing experiments. Through being at the bench, interacting with other researchers, being involved in all aspects of research, that's how you get your feet wet. And if you enjoy it, keep doing it. That's very simplistic advice, but it's worked for me!

Also, I never thought too far ahead. It was a very gradual process. Sometimes students or postdocs already want to be at the end point, such as graduation or their own lab, but for me, it's like, enjoy the journey, enjoy doing every experiment. Be happily surprised if something does work, but accept the fact that sometimes 80 or 90% of your tests are just not going to. There's a lot of frustration with science, and also there's a lot of tedium and repetitiveness until you feel confident that a finding is solid, that this is really something I can publish. In science, there are no shortcuts.

Interview conducted by science writer Anne Frances Johnson. Send questions or comments to tphysmag@physiology.org.

STATS & FACTS

Less than 50%

of physicians or other health care providers ask people about their drinking habits, even though about 60% of the U.S. population drinks alcohol.

Gallup

> **"You have a substance that is being consumed by a large majority of our population—in excessive amounts by about 20% to 30% of our population—yet in a clinical setting, it's not really thought about unless it shows up in liver function tests."**
>
> **Patricia Molina, MD, PhD, FAPS, page 25**

31%

lower risk of dementia was found in participants with higher levels of physical activity in a 2022 study on physical activity and cognitive decline.

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Beyond THE BADGE

How to get the most out of attending an academic conference.

BY BRIAN BUSENBARK

Technological advances continue to make remote work and virtual collaboration more and more convenient, but one holdover of intrapersonal business continues to thrive: the professional conference. According to an Events Industry Council study, conferences attract about 251 million attendees each year in the U.S.—with no signs of declining.

For physiologists, the benefits of attending an academic conference are undeniable.

"I've met people at these meetings who I've ended up collaborating with, have been advisers for me, and have provided lots of great scientific input," says Hilary Coller, PhD, professor of molecular, cell and developmental biology at the University of California, Los Angeles. "I've gotten ideas at conferences that have impacted the direction of our work, and some of those conversations have changed the course of my life."

How can you realize life-altering results like these—and maximize the value of your next conference? It all begins in the weeks before you slip that badge and lanyard around your neck.

Illustrations by Mai Ly Degnan



BEFORE Plan Intentionally

You've registered for the conference and booked your travel arrangements. Now it's important to lay the groundwork for a successful conference. Some things to consider:

BUILD YOUR PERSONAL AGENDA

When she was a PhD student, Lindsey Ramirez, PhD, used to walk into conferences believing she needed to attend as many sessions as possible. But at her first major APS meeting, she realized the sheer volume of events made on-the-fly decision-making stressful. So, she built a simple solution: an Excel spreadsheet.

"I copy over every single thing I'm going to do," says Ramirez, a postdoctoral fellow at the University of Illinois-Chicago. "All my sessions, all the social events, mentoring meetings, poster sessions—everything. Seeing the entire conference laid out helps me stay organized, and I'm much less stressed."

Whether you rely on a spreadsheet, a notes app, a printed schedule or a digital calendar, the goal is the same: to see your time clearly. Many conferences, including the American Physiology Summit, also offer mobile apps that let you build a personalized schedule, browse sessions and receive real-time updates about events (see page 20). Whatever tool you choose, be sure to map the full picture of your meeting, including details many people forget—meals with collaborators, section meetups or time blocked for your own poster session.

Once you've figured out the logistics, step back and think strategically about how you want to spend your time. In building your conference schedule, be sure to explore topics outside your field of expertise. "Don't go just for the low-hanging fruit," says Nicholas Zachos, PhD, associate professor of surgery at Vanderbilt University Medical Center and APS Scientific Program Committee member. "Think more broadly—you may not realize how closely related your work might be to someone else's in a tangential field."

IDENTIFY WHO YOU WANT TO MEET

Effective networking is integral to a successful conference, and planning ahead to arrange those meetings is key.

If an attendee list is not available, consult colleagues or mentors to determine if people you'd like to meet will be on hand. Once you've identified potential contacts, email them to secure time on their conference calendar. "Ideally, you'll reach out about three months in advance, but at least one month," Zachos says.

Critically, he says, tell them why you want to meet. "Give them a specific reason—maybe you need a reagent, want to learn a protocol or want advice on a particular finding," Zachos says. "Specificity matters—people want to know the conversation will be worthwhile for both of you."

SET YOUR GOALS

It's critical to define what a successful conference means to you. What do you want to learn and, conversely, share? Who do you want to meet? The goals can be scientific, practical or career-focused, such as:



Create a spreadsheet of your schedule: "All my sessions, all the social events, mentoring meetings, poster sessions—everything. Seeing the entire conference laid out helps me stay organized."

—Lindsey Ramirez, PhD

- Learning a new method
- Exploring a different subfield
- Meeting potential advisers
- Connecting with mentors or collaborators
- Discovering funding or service opportunities

Setting goals helps you navigate meeting choices and create an elevator pitch to use to introduce yourself.

PREPARE YOUR STORY AND POLISH YOUR PRESENCE

Even if you're not presenting, you'll introduce yourself countless times. Prepare a 20-second version of who you are and your area of research. For poster presenters, the process of preparing your poster doubles as intellectual preparation. "It forces you to think through the logic of your project," Coller says. "And at the meeting, the questions people ask help refine your narrative."

Ramirez also encourages attendees to do a light tune-up of their online profiles. "Make sure your photo, affiliation and research areas are up to date," she says. A simple pre-meeting post or a few online interactions can help others recognize you on-site.



DURING Make the Most of Your Time

Once you're at the conference, your plan becomes a guide, not a rigid script. Conferences thrive on spontaneity, but purposeful choices will keep you from feeling overwhelmed. The key, according to Zachos, is not to overextend yourself. "Know what you can handle within a day," he says. "You don't need to network for the sake of networking. Prioritize quality over quantity."

PLAN FOR OVERLAP

"It's inevitable that you'll need to be in two places at once," Zachos says. If you're attending with lab mates or colleagues, you can divide and conquer. Coordinate your schedules, assign different sessions to everyone, and gather afterward to share notes.

And even if you're not traveling with your lab, you can still collaborate socially. "If you hear someone say they're going to a session you can't attend, ask if you can follow up later," Zachos says. "Most people are in the same boat."

TACKLING THE EXHIBITION HALL

The poster area is one of the most scientifically dense environments of the meeting. Zachos believes it requires its own strategy. Here's his approach:

- Make a list of priority posters.
- Allocate time—even five minutes each adds up.
- Scan early during coffee breaks when crowds are thinner.

BEYOND THE LAB

Prep for Success

Whether it's your first meeting or your 15th, arriving prepared can make all the difference. APS' Preparing for a Scientific Meeting course is designed to help scientists approach meetings with confidence, clarity and purpose. Through a series of short, expert-led videos, this free course for members covers essential skills for navigating scientific meetings—from preparing and presenting posters or talks to summarizing your research clearly, communicating with diverse audiences, and building a professional network.

Each module includes learning objectives and practical guidance you can apply immediately. If you're looking to sharpen how you present your work, connect more effectively with colleagues, or build visibility for your research, this course offers a an easy, structured way to get ready before your next conference. Check out the course at **bit.ly/scientificmeetingprep** or scan the QR code:

- Be flexible—some posters may take two minutes, others 20.
- Return later if a presenter is swamped.

"You don't want to walk away saying, 'I missed that poster because I ran out of time,'" he says. Coller adds that the poster hall is also a place for meaningful, technical conversation. Ask thoughtful questions. Follow up. Some of your most valuable insights—and collaborations—may come from those aisles.

FIND YOUR PEOPLE

Zachos offers one piece of advice especially for trainees: Meet your contemporaries.



"It's important to work in those breaks so that when you're networking, you're fresh and able to engage with people."

—Hilary Coller, PhD

"It's natural to want to meet senior leaders," he says. "But the people at your same career level—those are the friendships that last. You grow together. You watch each other's careers develop." He likens it to remembering classmates from school: "You share milestones. It becomes a community."

KNOW THAT YOU BELONG

It's important to remind yourself that you've earned your place at the conference, according to Ramirez. "A lot of us in academia have imposter syndrome and feel like we're not supposed to be there," she says. "I've spoken with high school students at poster presentations who were very engaging. Everyone has something to offer and deserves the opportunity to achieve their goals."

The preparation work you do pre-conference will only further enhance your confidence.

TAKE CARE OF YOURSELF

Conference days are long, and the networking aspect requires attendees to always be "on," which can be taxing, especially when it places you outside your comfort zone. Managing your self-care is crucial to making the most of your conference experience.

"My lab colleagues think I'm an extrovert because I'm typically upbeat, but I'm a total introvert," Ramirez says. "While I enjoy meeting interesting people at conferences, doing this all day for five days can leave you feeling overwhelmed."

When constructing your conference agenda, be sure to leave open some time slots for downtime—and stick to it. "It's important to work in those breaks so that when you're networking, you're fresh and able to engage with people," Coller says.

A CLOSER LOOK

Your Summit, at Your Fingertips

A full conference schedule, multiple sessions to choose from and only so much time in the day—having the right tools matters. This year, APS is introducing a redesigned American Physiology Summit mobile app to help you plan ahead, stay organized and navigate the conference with ease. Use the checklist below to see how the app can support your Summit experience before, during and throughout the meeting.



Before the Summit

- ☐ Download the Summit app, available in late March (search American Physiological Society in the Apple App Store or Google Play).
- ☐ Browse the full program by topic, time or speaker.
- ☐ Build a personalized schedule with your must-see sessions.

During the Summit

- ☐ Check session details, room locations and start times on the go.
- ☐ Use your saved schedule to move easily between sessions.
- ☐ Stay up to date with real-time announcements and program updates.
- ☐ Make last-minute plan changes without flipping through a printed program.

Make the Most of It

- ☐ Use the app as your single source for Summit logistics and session information.
- ☐ Spend less time organizing and more time engaging with the science and networking.
- ☐ Keep sessions, updates and schedules in one place.

The redesigned app supports how you experience a busy scientific meeting, whether you plan every session in advance or decide as you go. Learn more about the Summit at **physiology.org/summit**.



AFTER Keep the Momentum Going

Once you're home, the conference itself may be over, but your work is not. "The follow-up is so important," Coller says. "Even a simple 'thank you' email goes a long way to cement the connections you made."

SOLIDIFY YOUR CONTACTS

Remember that everyone else at the conference likely also met a lot of new people, so it's best to reach back out shortly after the event, ideally within three days of returning home. "Keep the connection fresh," Zachos says. "Be specific about what you discussed, what you got out of it, and any agreed-upon action items." This not only reinforces the relationship, it keeps everyone accountable.

SHARE TAKEAWAYS WITH YOUR LAB

A debrief with your lab colleagues when you return home helps translate your experience into shared value. Whether it's an informal conversation, a lab meeting summary or emailed list of highlights, these downloads should include:

- New techniques
- Emerging trends
- Advances in lab equipment
- Surprising talks
- Potential collaborators
- Ideas sparked by posters or workshops

TURN IDEAS INTO ACTION

Sometimes a chance meeting can lead to a breakthrough. At one conference, Coller happened to sit next to an expert on flow cytometry on immune cells, which was something she and her team had been working on. She followed up after the event and cultivated a year-long relationship that resulted in significant strides in the lab's work. "That collaboration really advanced our research and our understanding of the processes that we were studying," Coller says.

CONFERENCES CAN SHAPE CAREERS

Attending a conference is an investment—in resources and in time away from the lab. But they provide irreplaceable, face-to-face connections that can't be replicated in any other experience. Diligent preparation, thoughtful engagement and timely follow-up can ensure that investment produces meaningful returns for both your research and career.

"You never know when an initial interaction will turn into a years-long collaboration," Zachos says. "Some of the most important directions in my research—and my most trusted advisers—came from people I met at conferences."



"You never know when an initial interaction will turn into a years-long collaboration. Some of the most important directions in my research—and my most trusted advisers—came from people I met at conferences."

—Nicholas Zachos, PhD



WHERE SHE BELONGS

How finding a community helped Patricia E. Molina shape a life of science.

BY MIKE DE SOCIO

In the late 1990s, Patricia E. Molina, MD, PhD, FAPS, found herself feeling lonely during a critical transition in her career. She had relocated to New Orleans with her family, but she was super-commuting twice a month to her lab at the Brookhaven National Laboratory in New York. With her professional life geographically scattered, Molina was yearning for a place to belong.

She turned to two of her colleagues active in APS to help her get more involved. "You guys need to get me on a committee at APS," she told them. "I need to get involved so that I can feel that I belong to something."

Facing page: photo by Bryan Tarnowski



Left: Molina at the American Physiology Summit with physiology faculty and trainees from the Louisiana State University Health Sciences Center. Above: Molina with mentees and faculty colleagues at the APS annual meeting at Experimental Biology when she was APS president.

Molina's two friends suggested she join the Women in Physiology Committee, an idea she initially resisted. "I want something else," she told them. "I want to do something, but not because I'm a woman."

Instead, she drew on her experience as an immigrant and joined the International Committee. But now, 25 years later, she realizes her reluctance to engage with the women's committee reflected her lack of understanding in the importance of its work.

In 2015, when Molina was elected APS president, she became the first Hispanic woman to serve in the position. During her term, she began to fully grasp the power of representation. "I didn't realize that people were so hungry to see a brown Latina woman up on the podium," she says. "I did not realize how necessary that was."

At meetings, colleagues repeatedly approached Molina to share what it meant to them to see someone like her serve in the Society's highest leadership role. She eventually lost count. "Somebody's life was impacted" by that representation, she says. "Somebody's hope was impacted, and to me, that's incredibly valuable."

A LIFELONG PASSION FOR MEDICINE

Molina's experience as APS president came decades into an academic career that has taken her across disciplines and across the world. She was born and raised in El Salvador, in a family that placed a high value on education. She attended a bilingual school and became fluent in English. "[I had] very, very strict parents who expected me to do well in every single subject. And I did. I was a very good student," Molina says.

When she finished high school, she pursued her lifelong dream of becoming a pediatrician. "I just wanted to be a doctor so badly. I wanted to take care of things, of people," Molina says. As a child, she would often take care of animals, and she had her heart set on a life helping people in need.

She carried that drive to medical school where, during her fourth of six years, she married a classmate. Molina had her first child right as she was finishing her last internship rotation. The transition was difficult. "I struggled after my child was born. I felt I was not ready to leave him at home or in a daycare," she says. Molina finished the requirements for her degree before deciding to focus fully on caregiving.

At the same time, some of her mentors and classmates encouraged her to stay connected to medicine. Their conversations led to an arrange-

Photos, pages 24 and 25, courtesy of Patricia E. Molina, MD, PhD, FAPS





Left: Molina celebrates Father's Day in 2025 with her husband, Miguel Molina, MD; her daughter-in-law, Kristin Molina, DNP; her middle son, Alex Molina, MD; and grandson Max. Above: Molina hikes at Arches National Park in Utah with her husband; youngest son, Javier; and oldest son, Miguel Molina, MD, PhD.

ment with faculty at the medical school: working two hours a day helping students plan their research and write their theses.

It was during this time that Molina received a visit that would help shape the course of her career. A friend from medical school was now pursuing a PhD in the U.S. While traveling home to Guatemala, she stopped to visit Molina, and the two had a candid conversation about Molina's career.

"What are you doing? What's next for you?" the friend asked.

"I don't know. I mean, this is what I'm doing right now. I'm helping medical students write their thesis," Molina replied.

"No," her friend said. "You went to medical school to be a doctor. You don't know how to do research. If you want to learn how to do research, and if this is something that you like, you need to do a PhD."

Her friend helped her with the application for the University of South Alabama. "And one day I just got this packet saying, you have been accepted to the graduate program," Molina says. "I was like, 'Oh my God.' I didn't know what I was getting myself into. And so that is how my professional life took such a sharp turn."

RESEARCH THAT SPANS THE WHOLE BODY

Molina relocated and joined the physiology department at South Alabama, focusing her research on the cardiovascular system. After a year, she transferred to Louisiana State University (LSU), where she began to research the impact of alcohol in the body, specifically how alcohol intoxication affects metabolism. Her dissertation asked how energy in the cells might get disrupted by alcohol, potentially inhibiting the body's ability to fight infections.

This focus on energy metabolism "brought me into the field of not focusing on one particular organ but looking at the whole body," Molina says. "It is something that I feel has distinguished me from many of my peers, and it is something my training as a physician set the stage for me to be able to do that."

Molina has now been doing research into alcohol's effects across the body for three decades. The work has important clinical implications. Less than 50% of physicians or health care providers ask people about their drinking habits, according to Molina, despite the fact that about 60% of the U.S. population drinks alcohol. "Here you have a substance that is being consumed by a large majority of our population—in excessive amounts by about 20% to 30% of our popula-

tion—yet in a clinical setting, it's not really thought about unless it shows up in liver function tests."

But it's not just the liver that clinicians should be worried about. "Every single system in our body is impacted by alcohol," Molina says. "In some systems, we can ride it out. But there are some systems that are way more susceptible, and there are some systems that you don't even think about."

For example, one of the organs most frequently affected by excessive alcohol use is muscle: Well before a person shows any signs of liver problems, they might have issues with skeletal muscle or losing muscle mass, according to Molina.

A MORAL OBLIGATION TO GIVE BACK

Molina now serves as Richard Ashman Professor, department head and senior associate dean of research at the LSU School of Medicine. Though her research hasn't directly supported a pharmaceutical intervention, she sees value in the basis of information and knowledge she has generated on the topic. It's even more impressive when you consider how Molina's research was nearly wiped out when Hurricane Katrina hit New Orleans in 2005.

The effect was stark. Her lab's pre-clinical studies were canceled. Because they lost access to their building for months, everything in the freezers thawed and became unstable. They lost their reagents. Not to mention, systems were down, making it almost impossible to communicate.

This is another moment when APS played a critical role in Molina's life: After the hurricane, the Society helped reestablish lines of communication, waived membership fees, provided travel awards so trainees could attend the annual conference and invited speakers who would boost morale.

"I felt so valued. I felt that there was somebody out there that knew what we were going through and that they were not going to let us be forgotten," she says.

The contrast with her experience in another professional society was striking. She recalls a meeting in which a participant mentioned a drop in research posters being submitted that year. Molina pointed out that the organization had a strong contingent at LSU, which was still recovering and rebuilding from Katrina.

"The response caught me off guard," Molina says. "Someone said, 'But it's been six months.' I almost had tears in my eyes. I remember thinking, 'You have no idea how we have survived.' At that point, we were not even back in our building."

The experience highlighted just how much the support from APS mattered to Molina—and why it cemented her dedication. She calls it a "moral obligation" to give back. Over time, that commitment translated into service. She went on to chair committees, was elected to the Council, and eventually became president. She's proud of several accomplishments from her time as president, including diversity initiatives. But still, what remains in Molina's mind was the power of her visibility.

"What mattered most was recognizing my responsibility as a role model," she says. "Not because I'm so extraordinary, but because I don't fit the traditional image people associate with leadership in science. Seeing someone like me up there helped others believe, 'If she made it, maybe I can, too.'"

A CLOSER LOOK

6 Questions with Patricia E. Molina

Best career advice: Find your passion and use your talents to take you on a lifelong journey. Be persistent and optimistic.

Tips for physiologists to talk about physiology: Use simple words. Use analogies or situations that all have experienced or witnessed to highlight the importance of understanding physiological systems.

Favorite thing about New Orleans: The city and its people do not allow me to feel like a foreigner. The warmth and laissez-faire approach to life nurtures my soul.

Favorite place in the world: So many places I have gone back and would go back again. But to get away, nothing beats an evening on the terrace of our home in Antigua, Guatemala. It is paradise on Earth.

Your message to physiology students or early-career scientists: APS has been my scientific home, my scientific environment and the place where I can always come back and affirm the importance of the discipline in my teaching and in my research. Students and early-career scientists looking for a place to belong should look no further than APS. Whether to learn, be mentored, grow or serve, there is a place for you and a community dedicated to support your path.

What else should we know about you? I love to dance, sing, cook, read, exercise and travel.

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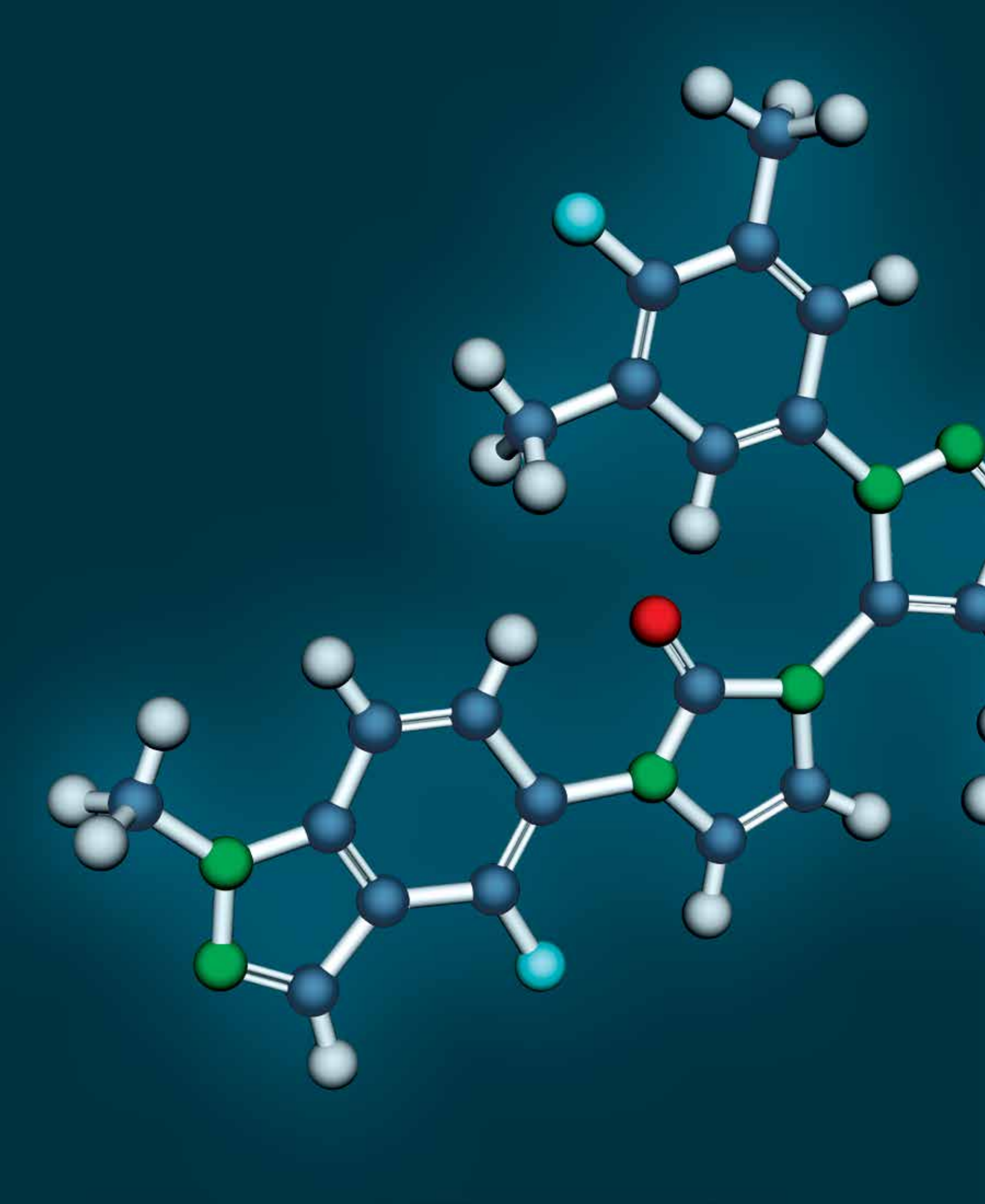
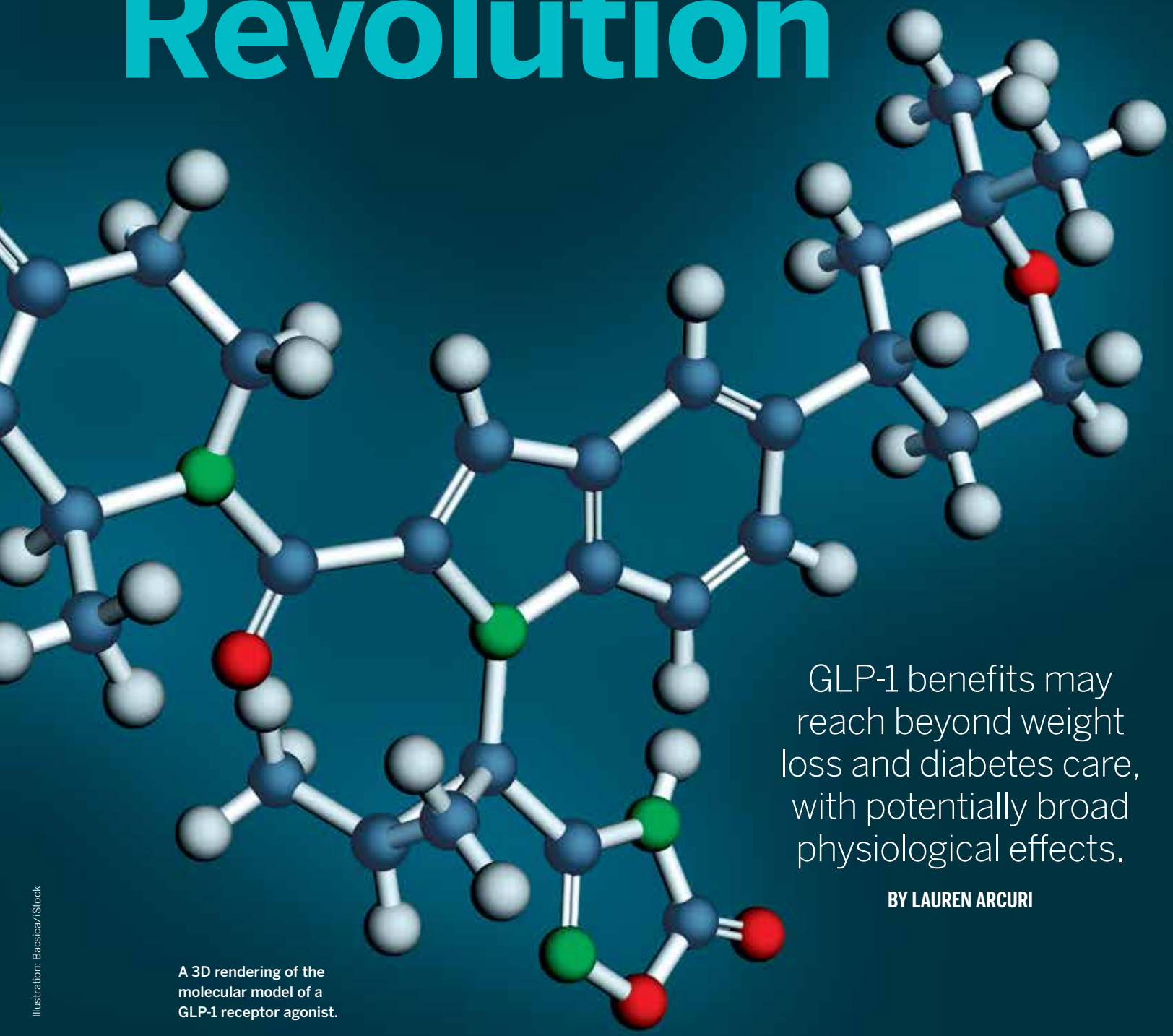


A GLP-1 Revolution



A 3D rendering of the molecular model of a GLP-1 receptor agonist.

Illustration: Bacsica/iStock

GLP-1 benefits may reach beyond weight loss and diabetes care, with potentially broad physiological effects.

BY LAUREN ARCURI

Glucagon-like peptide-1 (GLP-1) receptor agonist drugs such as semaglutide and tirzepatide were originally developed to treat type 2 diabetes. Over the past few years, however, they have surged in popularity, largely because of their remarkable effectiveness for weight loss. A November 2025 KFF Health Tracking Poll found that roughly 1 in 8 U.S. adults is now taking a GLP-1 drug for weight loss, diabetes or another indication.

At a basic level, GLP-1 receptor agonists work in two well-established ways: They slow gastric emptying, and they act on the brain's appetite-regulation centers to reduce food intake. Many people describe the drugs' effects not simply as appetite suppression, but as a quieting of persistent "food noise."

But as clinical trials expand and preclinical research continues, evidence is accumulating that these medications exert much broader physiological effects than previously thought. Researchers are finding that GLP-1 agonists influence multiple pathways involved in inflammation, cardiovascular health, mood, motivation and reward—benefits that appear to extend beyond the downstream effects of weight loss alone.

Although scientists do not yet fully understand the mechanisms underlying these wide-ranging actions, a clearer picture is beginning to emerge. In some cases, results from large human trials are already in. In others, promising findings from animal studies are driving new clinical investigations.

In 2025, semaglutide received approval from the U.S. Food and Drug Administration (FDA) for reducing cardiovascular and kidney disease risk after a major study showed significantly lower rates of heart attack and stroke among people with type 2 diabetes and established atherosclerosis.

For other potential indications such as substance use disorders or depression, more randomized controlled trials in humans are still needed. Nevertheless, the consistency of preclinical findings has fueled optimism that GLP-1–based therapies may ultimately find uses far beyond diabetes and obesity.

AFFORDABILITY AND OTHER BARRIERS

Despite their popularity, access to GLP-1 medications remains uneven. More than half of respondents in the KFF poll reported that the drugs were difficult to afford, and 1 in 4 described them as very difficult to afford. While many insurance plans cover GLP-1 agonists for type 2 diabetes, coverage is far less consistent when the primary indication is weight loss.

In January 2026, Novo Nordisk, the makers of Ozempic (semaglutide), released the drug as daily oral pill. The pill is far less expensive to produce and does not require refrigeration like the injectable form. The cost is also much less expensive than the injectable, potentially making the therapy accessible to more people who would not qualify for insurance to cover it.

Cost and side effects are the most common reasons people discontinue treatment. Gastrointestinal symptoms—including nausea, vomiting, dizziness and headaches—are frequent, particularly during dose escalation. Nausea is the most commonly reported adverse effect.

There are additional concerns. Multiple analyses show that when treatment is stopped, most people regain some or all of the weight they lost—sometimes more—and that the cardiometabolic benefits do not persist off-drug.

In addition, although earlier GLP-1 medications have been used safely for decades in people with diabetes, the long-term effects of lifelong use of newer, more potent agonists remain unknown. Clinicians are also cautious about prescribing these drugs to individuals with a history of eating disorders, where appetite suppression and weight loss may trigger relapse.

THE HISTORY OF GLP-1S

GLP-1 is an endogenous hormone that lowers blood glucose levels after eating. It was independently identified in the 1980s by two research groups, including one led by Danish physician and physiologist Jens Juul Holst, MD, DMSc, at the University of Copenhagen. Holst's laboratory played a central role in characterizing the active intestinal form of GLP-1, demonstrating its therapeutic potential in diabetes, as well as obesity treatment, and developing early drug analogs.

A major challenge was that native GLP-1 is rapidly degraded—within about two minutes—by the enzyme dipeptidyl peptidase-4 (DPP-4). To create viable therapeutics, researchers had to engineer GLP-1 analogs that resist enzymatic breakdown and persist long enough to exert physiological effects.

The first FDA-approved GLP-1 receptor agonist, exenatide, was introduced for type 2 diabetes in 2005 and required twice-daily injections. Clinicians soon noticed that many

patients experienced substantial weight loss, often without intentional dietary changes. Exenatide also improved glucose stability compared with other diabetes medications available at the time, though nausea was common during treatment initiation.

Over the next two decades, formulations evolved toward longer-acting, once-weekly injections with greater potency. When semaglutide was tested in obesity trials, participants lost an average of about 15% of their body weight—far exceeding the results seen with earlier anti-obesity drugs. This marked a turning point, shifting GLP-1 agonists from diabetes-focused therapies to primary obesity treatments.

More recent agents include dual agonists such as tirzepatide, which activates both GLP-1 and glucose-dependent insulinotropic polypeptide (GIP) receptors and produces even greater weight loss. Triple, quadruple and quintuple agonists are now in development, as is an expanded range of oral formulations.

EFFECTS ON FOOD INTAKE AND METABOLISM

From the outset, GLP-1 agonists were known to lower blood glucose by stimulating insulin secretion and reducing food intake. Crucially, they trigger insulin release only when glucose is already present in the bloodstream, minimizing the risk of dangerous hypoglycemia seen with some older diabetes drugs.

What has become clearer is just how widely GLP-1 signaling is distributed throughout the brain. "Originally, GLP-1 likely evolved to control metabolism or processes linked to feeding status," says Karolina Skibicka PhD, professor of nutritional neuroscience at the Hotchkiss Brain Institute, University of Calgary. "What we've learned is that GLP-1 acts on widely distributed but metabolically relevant brain circuitry. That broad action is probably one of the biggest reasons for its success—it's not targeting a single neuronal population or process."

"GLP-1 acts on widely distributed but metabolically relevant brain circuitry, [which] is probably one of the biggest reasons for its success—it's not targeting a single neuronal population or process."

—Karolina Skibicka, PhD

Most of the GLP-1 molecules cannot cross the blood–brain barrier directly. Instead, peripherally administered GLP-1 analogs access the brain via circumventricular organs—regions bordering the third and fourth ventricles where the barrier is specialized to permit signaling between blood and cerebrospinal fluid. The neurons in these areas that express the GLP-1 receptor interact with GLP-1 analogs, indirectly influencing central circuits.

Within the hypothalamus, GLP-1 interacts with pro-opiomelanocortin (POMC) neurons in the arcuate nucleus (it seems to have limited direct access here), a classic site involved in appetite regulation and energy expenditure. But, Skibicka notes, this is only one of many relevant sites.

GLP-1 also acts in the hindbrain, particularly in the caudal nucleus of the solitary tract, which integrates visceral sensory information and stress signals. "It's a really important site of effect," she says. This nucleus is the first stop for all the signals coming from the gastrointestinal tract via the vagus nerve, and it's directly connected to many other brain areas controlling feeding. "The influence of GLP-1 analogs there can quickly spread throughout the brain," Skibicka says.

Beyond these regions, relevant GLP-1 receptor populations have been identified in at least 10 additional brain areas, pointing to physiological roles that extend well beyond feeding.

EFFECTS ON REWARD CIRCUITS

One of the most intriguing findings is GLP-1's interaction with the brain's mesolimbic reward system. GLP-1 receptor-expressing neurons are located near dopamine cell bodies and communicate directly with dopamine circuits involved in motivation and reward. Peripherally administered GLP-1 thus indirectly activates neurons of the amygdala.

"The mesolimbic system is very much wired to listen to GLP-1," Skibicka says. "That's hugely important for feeding behavior and cravings. Many people report that food no longer drives their thoughts or behavior in the same way."

In 2012, Skibicka's lab was the first to demonstrate reduced alcohol reward and motivation in animal models treated with a GLP-1 analog. Since then, hundreds of preclinical studies have reported reduced intake, reward or relapse across a wide range

INSIDE STORY

Where GLP-1 Acts in the Body

GLP-1 is more than a gut hormone or appetite signal. It is a distributed endocrine-neuroimmune modulator that acts across multiple systems involved in metabolism, autonomic control, cardiovascular protection, and inflammation and immune tone.

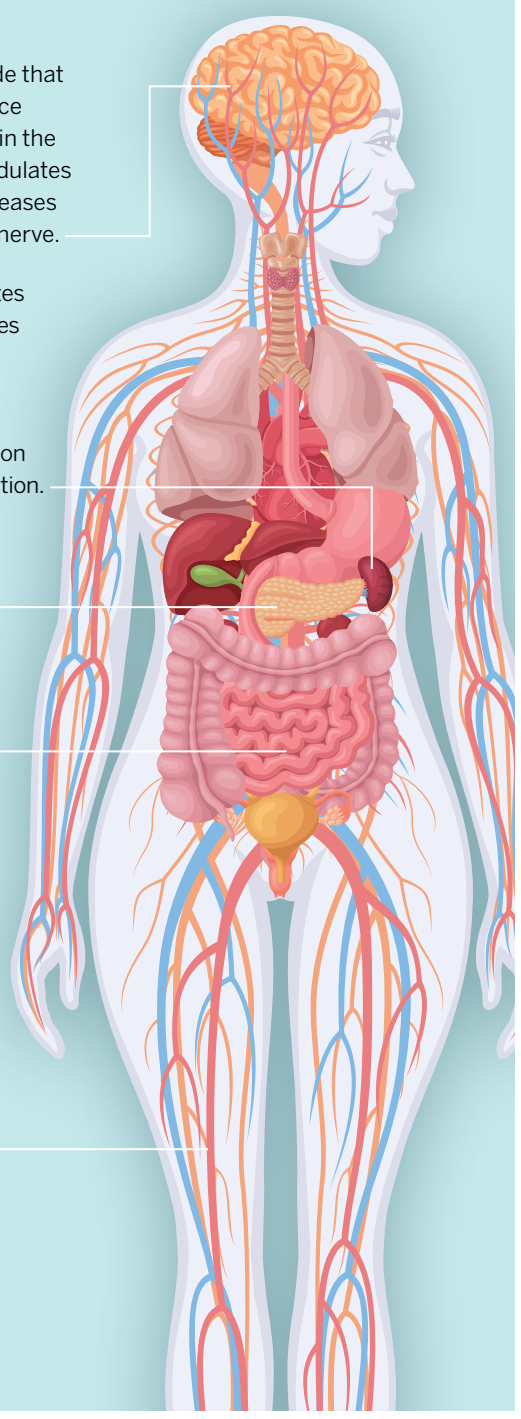
Brain: GLP-1 acts as a neuropeptide that regulates appetite and energy balance via interaction with GLP-1 receptors in the hypothalamus and brainstem. It modulates reward processing systems and increases satiety by interacting with the vagal nerve.

Immune system: GLP-1 modulates innate and adaptive immune responses via GLP-1 receptor activation on immune cells, resulting in reduced pro-inflammatory cytokines, altered macrophage polarization, and reduction of both systemic and tissue inflammation.

Pancreas: GLP-1 stimulates the release of insulin and inhibits glucagon secretion.

Gastrointestinal tract: Endogenous GLP-1 is produced in the intestine by enteroendocrine L cells after nutrient intake, and it enters the circulatory system from here. It slows gastric emptying and enhances a feeling of fullness.

Cardiovascular system: GLP-1 appears to be cardioprotective, improving endothelial function, reducing inflammation and oxidative stress, and modulating heart rate and blood pressure.



of substances, including alcohol, nicotine, cocaine, amphetamines and opioids. Human trials are ongoing, but even modest effects in opioid use disorder could be clinically meaningful given the favorable safety profile of GLP-1 drugs compared with existing treatments.

EFFECTS ON THE BRAIN

GLP-1 receptors are also present in brain regions involved in emotional regulation. Receptors in the amygdala suggest potential interactions between GLP-1 signaling and anxiety or stress processing. Others are located in the dorsal raphe nucleus, which produces nearly all of the serotonin used by the forebrain—the same neurotransmitter system targeted by selective serotonin reuptake inhibitors.

"It's a very active circuit and very ready to respond to GLP-1," Skibicka says. Her lab has shown that GLP-1 signaling through serotonin neurons contributes to reduced food intake, and animal studies suggest broader effects on mood and emotionality.

In preclinical models, chronic GLP-1 administration improves depression-like behaviors even in lean animals, an effect not mediated by weight loss. Clinically, many patients report fewer depressive symptoms while taking GLP-1 agonists, sometimes alongside reduced antidepressant use. However, some studies have reported neutral or negative mood effects, underscoring the need to understand individual variability.

GLP-1 receptors are also found in the hippocampus, a key structure for learning and memory. This has raised interest in potential applications for Alzheimer's disease and other neurodegenerative conditions. Although a recent clinical trial failed to show significant benefit, Scott Kanoski, PhD, professor of biological sciences at University of Southern California,

Illustration: Alonzo Design/iStock

Women, on average, lose more weight than men on equivalent doses, possibly due to interactions between GLP-1 signaling and estrogen.

cautions against closing the door on this area.

"Some of the earlier GLP-1 compounds appear to access the brain more readily than semaglutide," Kanoski says. "And preclinical models consistently show benefits for Alzheimer's-like pathology."

In addition, "a combination of their anti-inflammatory effects and effects on the vasculature likely explain some of the beneficial effects on dementia reported in observational studies," Holst says.

Beyond the nervous system, GLP-1 signaling intersects with immune regulation. Multiple studies have shown reductions in inflammatory markers among people taking GLP-1 agonists, and patients frequently report improvements in inflammation-related conditions.

"You see profound effects in organ systems that don't themselves express GLP-1 receptors," Holst says. In the gut, intraepithelial lymphocytes express high levels of GLP-1 receptors and can influence broader immune responses. These pathways are well-characterized in rodent models, though further confirmation in humans is needed.

MORE RESEARCH QUESTIONS

As researchers map GLP-1 receptor distribution, they are also searching for unifying mechanisms that could explain the drugs' systemic effects. "One pathway that may be underappreciated is the vagus nerve," Kanoski says. Endogenous GLP-1 released from the gut acts directly on vagal afferents, which relay information from the abdomen to the brain and regulate multiple physiological systems.

GLP-1 receptors are also expressed in blood vessels, suggesting effects on vascular function and circulation. Holst suspects this may help explain how GLP-1 agonists influence organs that lack direct receptor expression, including parts of the central nervous system. "If you maintain or improve the circulatory system, you can also help organ function," he says.

Despite their effectiveness, GLP-1 therapies are not without limitations. Gastrointestinal side effects lead some patients to discontinue treatment, and weight regain after stopping therapy is common. A recently published study in *The British Medical Journal* found that overweight or obese adults regained the weight they had lost within 1.7 years once they stopped taking the drugs. The cardiometabolic benefits of lower HbA1c, fasting glucose, lipids and blood pressure also disappeared by 1.4 years post-treatment.

"It's predictable," Holst says. "But it means it's even more important to plan what happens after weight loss—dietary change and physical activity remain essential."

Ongoing research is exploring maintenance-phase strategies, lower dosing and alternative compounds that might preserve metabolic benefits while minimizing side effects.

One major research goal is to separate appetite suppression from nausea. In some brain regions, GLP-1 receptor activation triggers both effects, but in others, like the hippocampus or the ventral tegmental area, food intake reduction occurs without nausea.

"This tells us it's possible to dissociate these effects," Kanoski says, "and that's exactly what we want."

Sex differences are another active area of investigation. Skibicka's lab has found that women, on average, lose more weight than men on equivalent doses, possibly due to interactions between GLP-1 signaling and estrogen.

Long-term safety remains a central question. While earlier GLP-1 drugs have decades of data behind them, newer high-potency agonists and multi-agonist combinations will require extended monitoring as their use expands.

GLP-1 receptor agonists have reshaped how clinicians and researchers think about metabolic disease, revealing a hormone system that links appetite, reward, emotion, inflammation and cardiovascular health. What began as a strategy for controlling blood sugar has evolved into a window into deeply integrated physiological networks.

As research continues to clarify mechanisms, refine formulations and define long-term risks and benefits, GLP-1–based therapies may ultimately serve as a model for a new generation of treatments—ones that work not by targeting a single pathway, but by engaging the body's interconnected systems as a whole.











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Time	Thursday	Friday	Saturday	Sunday
7 a.m.		7–7:45 a.m. Trainee Meetup		
7:30 a.m.				
8 a.m.	8 a.m.–4 p.m. Pre-conference Programming	8–9:30 a.m. Foundational Science Sessions	8–9:30 a.m. Foundational Science Sessions	8–9:30 a.m. Foundational Science Sessions
8:30 a.m.				
9 a.m.				
9:30 a.m.				
10 a.m.		10–11:30 a.m. Game-changer Sessions *Four Concurrent Sessions*	10–11:30 a.m. Game-changer Sessions *Four Concurrent Sessions*	10–11:30 a.m. Closing General Session with Keynote Speaker Jennifer Lippincott-Schwartz, PhD, FBS, FRMS, FASCB
10:30 a.m.				
11 a.m.				
11:30 a.m.				
12 p.m.				
12:30 p.m.		12:30–2 p.m. Foundational Science Sessions	12:30–2 p.m. Foundational Science Sessions	
1 p.m.		8 a.m.–7 p.m. PhysioHub Open	8 a.m.–7 p.m. PhysioHub Open	
1:30 p.m.				
2 p.m.				
2:30 p.m.		2:30–4 p.m. Foundational Science Sessions	2:30–4 p.m. Foundational Science Sessions	
3 p.m.				
3:30 p.m.				
4 p.m.				
4:30 p.m.	4:15–5:45 p.m. Opening General Session with Keynote Speaker Tracy L. Bale, PhD, FAAAS	4:30–7 p.m. Poster Reception	4:30–7 p.m. Poster Reception	
5 p.m.				
5:30 p.m.				
6 p.m.	5:45–7 p.m. Welcome Festival			
6:30 p.m.				
7 p.m.	7–9 p.m. Presidents' Reception *Invitation Only*	7–10 p.m. (or later) Special Events, Including Section Banquets	7–10 p.m. (or later) Special Events, Including Section Banquets	
7:30 p.m.				
8 p.m.				
8:30 p.m.				
9 p.m.	9–11 p.m. LGBTQIA+ Meetup			
9:30 p.m.				
10 p.m.				
10:30 p.m.				











american physiology summit

APRIL 23–26, 2026
MINNEAPOLIS

AWARDS

Recognizing Excellence in Physiology

APS honors its 2026 major award recipients and distinguished lecturers, who will be featured speakers at the American Physiology Summit in Minneapolis. Recognized for their significant contributions to the field, these researchers represent excellence across the breadth of physiological science. Learn more about them at **physiology.org/awardlecturers**.

Marion J. Siegman Award Lecture
Dilson Rassier PhD, Simon Fraser University
Douglas Swank, PhD, Rensselaer Polytechnic Institute

Bodil M. Schmidt-Nielsen Distinguished Mentor and Scientist Lecture
Alexander Staruschenko, PhD, FAPS, University of South Florida

CARDIOVASCULAR SECTION
Robert M. Berne Distinguished Lectureship
Yang Kevin Xiang, PhD, University of California, Los Angeles

CELL & MOLECULAR PHYSIOLOGY SECTION
Hugh Davson Distinguished Lectureship
Thomas Hawke, PhD, FAPS, McMaster University

CENTRAL NERVOUS SYSTEM SECTION
Joseph Erlanger Distinguished Lectureship
Jeff Dage, PhD, Indiana University School of Medicine

COMPARATIVE & EVOLUTIONARY SECTION
August Krogh Distinguished Lectureship
Theodore Garland Jr, PhD, University of California, Riverside

ENDOCRINOLOGY & METABOLISM SECTION
Solomon A. Berson Distinguished Lectureship
Philipp E. Scherer, PhD, University of Texas Southwestern Medical Center

ENVIONMENTAL & EXERCISE PHYSIOLOGY SECTION
Edward F. Adolph Distinguished Lectureship
Karyn Esser, PhD, University of Florida

GASTROINTESTINAL & LIVER PHYSIOLOGY SECTION
Horace W. Davenport Distinguished Lectureship
Pradeep Dudeja, PhD, University of Illinois Chicago

NEURAL CONTROL & AUTONOMIC REGULATION SECTION
Carl Ludwig Distinguished Lectureship
Eric Lazartigues, PhD, FAPS, LSU Health New Orleans

RENAL SECTION
Carl W. Gottschalk Distinguished Lectureship
Janos Peti-Peterdi, MD, PhD, University of Southern California

RESPIRATION SECTION
Julius H. Comroe Jr. Distinguished Lectureship
Michael Beers, MD, FAPS, University of Pennsylvania Perelman School of Medicine

TEACHING OF PHYSIOLOGY SECTION
Claude Bernard Distinguished Lectureship
Lisa Harrison-Bernard, PhD, FAPS, LSU Health New Orleans

WATER & ELECTROLYTE HOMEOSTASIS SECTION
Ernest H. Starling Distinguished Lectureship
Anita Layton, PhD, FAPS, University of Waterloo, Canada

AWARDS

Cannon and Bowditch Award Lecturers Named

APS has named **Gerald I. Shulman, MD, PhD, FAPS**, and **Anna E. Stanhewicz, PhD**, as recipients of its 2026 Physiology in Perspective lectureships. Both awardees will deliver Physiology in Perspective lectures at the American Physiology Summit in April.


Gerald I. Shulman, MD, PhD, FAPS


Anna E. Stanhewicz, PhD

Shulman will receive the Walter B. Cannon Award Lectureship, APS' highest honor, which recognizes lifetime achievement by an established investigator. He is the George R. Cowgill Professor of Physiological Chemistry and professor of internal medicine and cellular and molecular physiology at Yale University, as well as investigator emeritus of the Howard Hughes Medical Institute. Over four decades, Shulman has transformed understanding of insulin resistance and type 2 diabetes, pioneering nuclear magnetic resonance approaches that revealed how ectopic lipid accumulation and impaired signaling in muscle and liver drive metabolic disease.

Stanhewicz has been selected as the 2026 Henry Pickering Bowditch Award lecturer, which recognizes outstanding physiological research by an early-career investigator. She is an associate professor in the Department of Health, Sport and Human Physiology at the University of Iowa. Her research focuses on microvascular dysfunction and its role in cardiovascular and metabolic disease, with particular emphasis on women's health. Stanhewicz's work has helped elucidate how pregnancy-related complications such as preeclampsia and gestational diabetes contribute to long-term vascular impairment.

SUMMIT

An Innovator in Live-cell Imaging

The closing keynote of the 2026 American Physiology Summit will feature one of the most influential innovators in modern cell biology. **Jennifer Lippincott-Schwartz, PhD**, will deliver the final keynote on April 26, at 10 a.m. CDT at the Minneapolis Convention Center.



A senior group leader and head of 4D Cellular Physiology at the Howard Hughes Medical Institute's Janelia Research Campus, Lippincott-Schwartz has transformed how scientists study living cells. She pioneered the use of green fluorescent protein-based technologies to label, image and quantitatively analyze proteins and organelles in real time. These tools have reshaped the understanding of intracellular trafficking and organelle dynamics and are now used widely across the research community. Her work also helped lay the foundation for super-resolution microscopy, enabling scientists to visualize cellular processes that were once thought beyond reach.

Across her career, Lippincott-Schwartz's discoveries have influenced thinking about the biogenesis, function and maintenance of subcellular organelles, as well as their coordination with fundamental processes such as metabolism, aging and cell fate determination. More recently, her research has expanded into neurobiology, examining cellular physiology in the context of brain function and disease.

Her scientific leadership has been recognized with election to the National Academy of Sciences, National Academy of Medicine and American Academy of Arts and Sciences, along with numerous international honors. She is also a past president of the American Society of Cell Biology and a co-author of the textbook *Cell Biology*. Learn more at **physiology.org/summit**.

MEMBER NEWS

Michael Caplan, MD, PhD, FAPS, received the Arthur C. Guyton Distinguished Lectureship Award at the Association of Chairs of Departments of Physiology's annual conference. The honor recognizes outstanding and cutting-edge research in physiology or related areas. Caplan is the C.N.H. Long Professor and chair of the Department of Cellular and Molecular Physiology at Yale University School of Medicine. His research focuses on understanding the mechanisms responsible for autosomal dominant polycystic kidney disease and identifying targets for new therapies. Caplan is editor-in-chief of *Physiology*.



Helen E. Collins, PhD, is a recipient of the International Union of Physiological Sciences' 2025 International Early-Stage Faculty Prize. The award recognizes excellence in teaching and service during a physiologist's first seven years of faculty appointment. Collins is an assistant professor of medicine at the Center for Cardiometabolic Science, Division of Environmental Medicine, at the University of Louisville. Her work focuses on understanding the mechanisms contributing to female cardiovascular health and resilience.



Dao H. Ho, PhD, received the Naval Medical Research Unit (NAMRU) San Antonio's 2025 Science Staff Civilian of the Year Award. She is a research immunologist in the Combat Casualty Care and Operational Medicine directorate at NAMRU San Antonio and lead principal investigator for the in vitro testing of the Fieldable Solutions for Hemorrhage with Biological Artificial Resuscitation Products in Independent Verification and Validation program. This award recognizes Ho's work in the development of novel blood products for hemorrhage control in the battlefield.



Paule Valery Joseph, PhD, MSN, RN, was elected in October 2025 to the National Academy of Medicine, which is one of the highest honors in the fields of health and medicine. The designation recognizes those who have demonstrated outstanding professional achievement and commitment to service. Joseph is a tenured senior investigator and co-director of the National Smell and Taste Center at the National Institute on Alcohol Abuse and Alcoholism and National Institute on Deafness and Other Communication Disorders. She studies how our senses—especially taste and smell—shape eating habits, metabolic health and brain function.



Jennifer Pollock, PhD, FAPS, a professor of medicine at the University of Alabama at Birmingham Heersink School of Medicine, received the school's Featured Discovery Award, which celebrates notable research contributions made by faculty. Pollock was honored for her study about time-restricted feeding as a strategy to reduce cardiovascular and kidney disease risk in obesity. She also received the Outstanding Service Award from the Association of Chairs of Departments of Physiology at its annual conference. Pollock was APS president from 2021 to 2022.



DATES & DEADLINES

AWARDS APPLICATION DEADLINES

Award deadlines vary and may be subject to change. For the latest information, including award descriptions, amounts, eligibility requirements and to apply, visit ***physiology.org/awards****.*

MARCH 9

CARDIOVASCULAR SECTION

Carl J. Wiggers Award

Gabor Kaley Lectureship and Symposium

Robert M. Berne Distinguished Lectureship

MARCH 14

RENAL SECTION

Mid-career Achievement Award

MARCH 21

ENVIRONMENTAL & EXERCISE PHYSIOLOGY SECTION

Edward F. Adolph Distinguished Lectureship

Honor and Impact Awards

APRIL 22

CENTRAL NERVOUS SYSTEM SECTION

Joseph Erlanger Distinguished Lectureship

MAY 15

CELL & MOLECULAR PHYSIOLOGY SECTION

Hugh Davson Distinguished Lectureship

COMPARATIVE & EVOLUTIONARY PHYSIOLOGY SECTION

Scholander Award

CALLS FOR PAPERS

CROSS-JOURNAL CALLS FOR PAPERS

Opioids and respiratory depression

April 30

Plus: Explore our ongoing cross-journal calls for papers on key women's health research topics:

- Alzheimer's disease
- Autoimmune diseases
- Breast cancer
- Cardiovascular disease
- Hormone replacement therapy and menopause
- Migraines
- Novel perspectives on sex as an investigative variable
- Pregnancy and postnatal conditions:
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  - Gestational diabetes
  - Preeclampsia
  - Polycystic ovary syndrome

Join APS in advancing our mission to improve health care outcomes and promote greater scientific understanding of women's health. Learn more about this special call for papers at **journals.physiology.org/womens-health-research-initiative**.

Comprehensive Physiology

June 30

- Kidney-Heart-Lung Axis Communication in Health and Disease
- Gut-Brain Communication in Metabolic and Cognitive Control
- Heart-Lung Interactions in Pulmonary Vascular Disease
- Liver-Lung Interactions in Health and Disease

Journal of Neurophysiology

April 30

- Now and Then

June 1

- Sleep Disorders

June 30

- Human Cellular Neuroscience and the Uniqueness of the Human Brain
- Integrative Research on the Functional Logic of Neural Circuits
- Neuroimaging Meets Neurophysiology
- Neurophysiology of Exposure to Extreme Environments—Pressure, Temperature and Microgravity

Physiological Genomics

June 30

- Environmental Effects on Physiological -Omics
- Spatial -Omics

More details: physiology.org/calls

MEETINGS & EVENTS

2026 CONFERENCES

American Physiology Summit
April 23–26
Minneapolis

Control of Renal Function in Health and Disease
June 22–25
Fontana-on-Geneva Lake, Wisconsin

Comparative Physiology Conference
September 17–21
Orlando, Florida

More details: physiology.org/professional-development/meetings-events

Apply for Society Awards

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Access awards and fellowships designed to move your work and career forward. Apply for APS awards to gain recognition in your field and access new and meaningful opportunities.

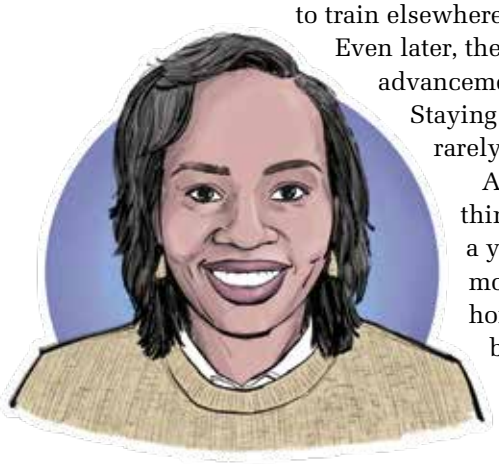
Learn more about all award opportunities and apply for the awards highlighted below at physiology.org/awards.

John F. Perkins Jr. Research Career Enhancement Award	up to $20,000	Honors a member with the ability to receive special training or development of new skills in areas of developing interest.	June 27
Teaching Career Enhancement Award	up to $10,000	Provides an individual with the ability to develop innovative and potentially widely applicable programs for teaching and learning physiology.	June 27
Local Undergraduate Research Awards in Physiology	Society Recognition	Established to foster interest and encourage undergraduates in physiological research. Recognizes APS members at their home institution.	Ongoing

To Leave or Not to Leave

BY KEISA W. MATHIS, PHD

Early in my scientific training, I learned that success in biomedical science often came with an unspoken rule: You were expected to keep moving. Undergraduate students were encouraged to leave their home institutions for graduate school. Graduate students were expected to train elsewhere as postdoctoral fellows. Even later, the message lingered that real advancement required another move. Staying was possible, but it was rarely encouraged.



At the time, this way of thinking felt reasonable. As a young trainee, I believed mobility meant growth. I left home for graduate school because I wanted to see what else was out there, both professionally and personally. Eventually, however, I returned to my home state to complete my PhD in physiology. Being closer to family mattered more to me than I had anticipated. When I finished my degree, though, it was clear that if I wanted a future in academia, I would need to leave again.

By the time I began my postdoctoral training, I was married and thinking seriously about starting a family. During those years, I had children, secured fellowship funding and began building an independent research program. I was also building something else that I had not planned for: We formed a village. Friends from daycare, colleagues, neighbors and members of our church became the people who helped us raise our children. We lived far from extended family, and that sense of community became essential.

"Mobility should be a choice, not a measure of dedication or success."

When it was time to move again for a faculty position, I did what many scientists do: I weighed opportunities, research and institutional fit, and the resources needed to succeed. I also felt the weight of leaving behind a community we had worked hard to build. Starting over was necessary, but it was not easy. The idea of moving again felt heavier—not because I lacked ambition but because our village and stability had become a source of strength.

What strikes me now is how often this question still comes up. In the past year, I have had conversations with multiple postdocs trying to decide whether staying in place will quietly count against them. They are asking thoughtful questions about family, finances and sustainability, yet they still worry that choosing stability may be interpreted as a lack of commitment to science.

I have also watched colleagues who chose to stay, training and advancing at the same institution. Many of them thrived. They became well-funded, deeply connected and often rose into leadership roles. Their longstanding knowledge of their institutions, the people, the systems and the culture allowed them to move efficiently and lead effectively.

This is not an argument against mobility. Training in different environments can be incredibly valuable and broaden perspectives. However, mobility should be a choice, not a measure of dedication or success. When staying is quietly viewed as a lack of ambition, we risk pushing out talented scientists who value stability, caregiving or community.

If physiology is to remain a field that attracts and retains strong scientists, we may need to reconsider what progress looks like. Excellence is not defined by how often we move but by the quality of our work, the care we bring to mentoring and the impact we make. To trainees navigating this decision now know that building a meaningful career does not require leaving behind the life you are also trying to build.

Keisa W. Mathis, PhD, is an associate professor at UT Southwestern Medical Center in Dallas, where she studies neuroimmune mechanisms in chronic inflammatory diseases, including hypertension and systemic lupus erythematosus.

Illustration by Brett Affrunti

Control of Renal Function in Health and Disease

June 22–25, 2026

Fontana-on-Geneva Lake, Wisconsin

Advance Registration Deadline:
April 30

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Join us for the 13th conference featuring leading experts in the field of renal physiology. Gain exclusive access to groundbreaking research, unpublished data and global perspectives. Network with leading experts and foster collaborations to shape the future of kidney research.

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Advance Registration Deadline: April 1, 2026

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