VOLUME 18, ISSUE 3

NIH MedlinePlus MAGAZINE

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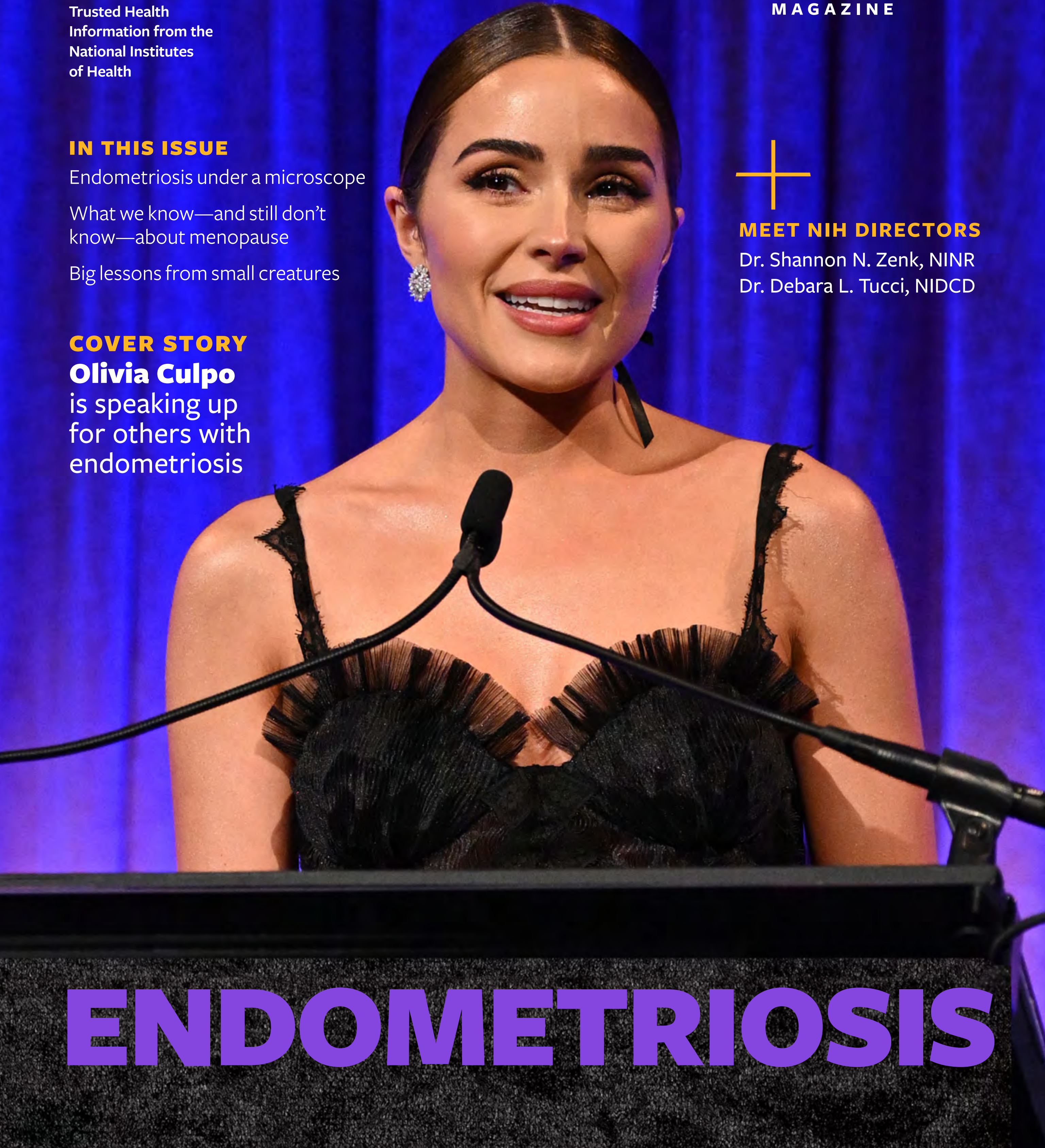

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In this issue

WELCOME TO VOLUME 18, ISSUE 3 OF NIH MEDLINEPLUS MAGAZINE.

This issue includes articles about endometriosis, menopause, and what animals can tell us about human aging. We also feature interviews with a former Miss Universe, as well as the Directors of the National Institute of Nursing Research (NINR) and the National Institute on Deafness and Other Communication Disorders (NIDCD).

This issue's cover star, model, and fashion and beauty influencer Olivia Culpo shares her experience with endometriosis. She describes her difficulty getting a diagnosis and why she advocates for others with this painful reproductive disease. We also take a deeper dive into endometriosis and what research NIH is supporting to better understand it.

Continuing our Meet the Director series, we ask Shannon N. Zenk, Ph.D., M.P.H., R.N., FAAN, of NINR why she wants nurses to have a prominent voice in biomedical research. We also interview Debara L. Tucci, M.D., M.S., M.B.A., of NIDCD. She describes how precision medicine can help us find more patient-centered treatments for people with sensory and communication disorders.

Plus, we breakdown the ins and outs of menopause—and why it can affect people's overall health as they age. Learn what research NIH is doing to help people manage their menopause symptoms. We also share some of the many resources from the National Institute on Alcohol Abuse and Alcoholism to help people manage or change their drinking habits for better health.

Learn all about these and many other vital health topics in this issue of NIH MedlinePlus Magazine! ■

NIH MedlinePlus
MAGAZINE

WHO WE ARE

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Olivia Culpo speaks at the 11th Annual Blossom Ball of the Endometriosis Foundation of America, for which she is an ambassador.

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IMAGE CREDITS: COVER AND ABOVE, OLIVIA CULPO; BOTTOM, GETTY IMAGES

Olivia Culpo

is speaking up for others with endometriosis

When Olivia Culpo was on stage after winning both the Miss USA and Miss Universe pageants in 2012, she was in pain, but she didn't know why. It wasn't until years later that the model, actress, and fashion and beauty influencer found the cause of her pain and other symptoms.

Endometriosis is an often painful disease where tissue that looks like the lining of the uterus grows in other places in the body, including the ovaries, fallopian tubes, and bladder. It affects an estimated 10% of people with a uterus who are of reproductive age. Since her diagnosis and successful treatment, Culpo has become an advocate for others with endometriosis. She recently spoke with NIH MedlinePlus Magazine about her diagnosis and the importance of self-advocacy and support from others when dealing with the disease.

How long did you experience symptoms before you were diagnosed?

I wasn't diagnosed until about 12 years after my first symptoms appeared. During that time, I went through at least a dozen doctors who didn't know what was wrong, including some who didn't *believe* anything was wrong. I was around 15 years old when the symptoms started, and they became much more intense in my early 20s. The most persistent and obvious symptom was horrible low back pain, but I also had bloating, nausea, and rectal bleeding.

What was your reaction when you were diagnosed with endometriosis?

The most shocking part was that I'd never heard of endometriosis until maybe a year or two before my diagnosis—when I found myself frequently crying in the bathtub while searching Google to try to diagnose myself. It was incredible to think I could suffer for so long with something I'd never heard of.

Note: if your symptoms tend to get worse near your period, tracking your menstrual cycle is a great tool to help your clinician understand your condition!

I felt relieved because I finally had an answer to all the pain I'd been experiencing. But I was equally scared because this had been going on for a very long time. I was 27 years old and concerned about my egg count, something I never imagined I'd have to worry about at that age. The first thing I did was check to make sure that was okay. Then I had a laparoscopy (surgery used to diagnose—and sometimes treat—endometriosis) in 2020.

How are you doing now?

I'm so much better since my surgery. Before that, I couldn't go to work without being in excruciating pain. Traveling on airplanes was always difficult because there was nowhere to go and nothing I could do about it. I usually had to curl up in a ball in my seat until we landed. Really, any activity was hard. But once that pain went away, my entire world opened up. I felt like I got my life back. I'm on birth control, which has helped a lot. I'm not pain-free, but I can do anything I want now.

What is your message to other people who have endometriosis or its symptoms?

The best advice I can give—and I wish I had known this from the beginning—is that you have to advocate for yourself. It's easy for us to assume our doctors know all the answers, but you have to remember that they may not be experts in certain [conditions]. You have to do your own research and find specialists who are experts in this area. If something doesn't feel right, you need to trust yourself, stay strong, and continue to search for answers until you find them.

> "The best advice I can give—and I wish I had known this from the beginning—is that you have to advocate for yourself."

IMAGE CREDITS: ABOVE, GETTY IMAGES; PREVIOUS PAGE, OLIVIA CULPO

What led you to become an advocate for people with the condition?

When I was going through the pain and trying to figure out what was wrong, I was searching all over the internet. I saw so many blogs, videos, and posts from women with endometriosis, and I could relate to so many of them. They made me feel much less alone and gave me hope. I feel like I owe so much to them, and I want to be that person for others. I want to be vulnerable with my story the same way those strong women were with their stories. They gave me the confidence to put my foot down and say, "My symptoms really aren't normal!" and, "I'm not alone!"

I started working with the Endometriosis Foundation of America as an ambassador to advocate for this disease and amplify the conversation around it. I am so excited to continue my work with them around the ENPOWR™ (ENdometriosis: Promoting Outreach and Wide Recognition)* program for adolescents later this year, which will bring a curriculum about endometriosis to schools.

How important is it to have the support of loved ones when dealing with endometriosis?

Support means absolutely everything, and those of us with the disease will never forget the people who were there for us and continue to be. I can't imagine being in that type of pain and not having a support system. It invalidates your feelings if you don't have anyone around you to tell you that it's not normal.

Olivia Culpo, center, poses with her sisters Sophia, left, and Aurora, right. She says support from her family has been important for living with endometriosis.

I've had my parents, siblings, and many friends behind me. When I was in Charlotte, North Carolina, one weekend visiting my fiancé Christian [McCaffrey, running back for the San Francisco 49ers] and in so much pain, he took it upon himself to call his NFL team physician. That physician connected me to the doctor who eventually performed my surgery. Until that point, I felt like I had essentially been my own doctor.

What should friends or family of someone with endometriosis know about this condition?

If you know somebody with endometriosis, be there for them. Educate yourself so that if someone describes their symptoms to you but doesn't know the cause, you can help them find treatment. Considering that at least 1 in 10 women has endometriosis, you likely know someone who has it or will have it in the future. That person could be your child, and it will be critical to diagnose their condition early. Even if you're not in the endometriosis community, we need you to be a voice for us. ■

FAST FACT:
Endometriosis affects as much as
10% of women of reproductive age.

SOURCE: MEDLINEPLUS

**NIH was not involved in the creation of the project, and reference to it does not constitute or imply endorsement by any federal agency.*

IMAGE CREDITS: TOP, OLIVIA CULPO; BOTTOM, GETTY IMAGES

Endometriosis: What you need to know

The uterus, or womb, is where a fetus grows in a person's body when they are pregnant. The uterus is lined with tissue known as the endometrium, which is key for implantation and growth of a fetus and the placenta. The endometrium is critical to a healthy pregnancy.

When someone of reproductive age is not pregnant, that tissue, along with some blood and mucus, sheds each month. This process is known as menstruation, or a period.

For people with a condition called endometriosis, tissue that is similar to the lining of the uterus grows in other places in their body, including:

- On the ovaries
- On the fallopian tubes, which carry eggs from the ovaries to the uterus
- Behind the uterus
- On the tissues that hold the uterus in place
- On the bowels or bladder

When this tissue grows in other places in the body, it can cause inflammation, bleeding, pain or irritation, and other complications.

Who is affected?

Endometriosis can affect anyone who has a period. Endometriosis is common. It occurs in about 10% of women of reproductive age.

IMAGE CREDITS: GETTY IMAGES

What are some risk factors?

- Periods that started at an early age (before age 11)
- Short monthly cycles (fewer than 27 days)
- Heavy periods that last more than 7 days
- Having other family members with endometriosis

What are the symptoms?

The main symptoms of endometriosis are pelvic pain and infertility or problems getting pregnant. This pain can happen anytime and is usually worse during menstruation. Other common symptoms include:

- Extreme lower abdominal pain or bloating
- Low back pain
- Pain with bowel movements or urination
- Nausea, vomiting, or feeling lightheaded
- Heavy periods or spotting in between periods
- Pain during sex
- Fatigue

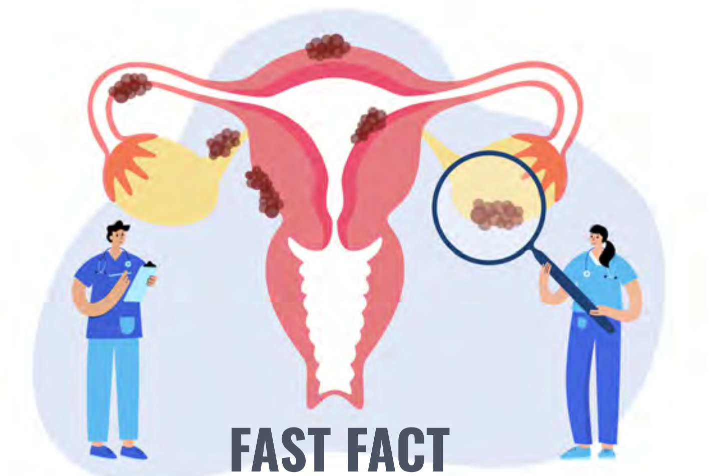
Those with endometriosis may have some or many of these symptoms. Because endometriosis can be difficult to diagnose, be sure to discuss all of your symptoms with your health care provider to make sure you are diagnosed correctly.

How is endometriosis diagnosed?

First, a health care provider will take a full medical history and give a complete physical and medical exam. They will do this before performing a surgery, which is the only way to diagnose endometriosis.

The most common type of surgery to diagnose endometriosis is called a laparoscopy. In this surgery, a surgeon uses a tiny camera attached to a thin tube (called a laparoscope) to see inside the uterus, fallopian tubes, ovaries, and bladder and around the intestines. Sometimes a small sample of tissue, called a biopsy, is taken during surgery to confirm the diagnosis.

Doctors can also use imaging techniques such as an ultrasound or magnetic resonance imaging (MRI) to help diagnose the condition.



FAST FACT

Women with endometriosis have a **34% greater** risk of stroke than women without the disease.

SOURCE: *EUNICE KENNEDY SHRIVER* NATIONAL INSTITUTE OF CHILD HEALTH AND HUMAN DEVELOPMENT

How is endometriosis treated?

Although endometriosis can't be cured or prevented, it can be treated.

Certain medications that contain hormones, including pills, injections, or nasal spray, can help lessen pain and bleeding. However, symptoms can come back if the medicine is stopped. Over-the-counter pain medication may also be helpful.

Surgical treatments, including laparoscopies and *laparotomies*, to remove small sections of scar tissue are also available. A laparotomy is a more invasive surgery, where a cut is made in the abdomen to explore or remove scar tissue. Surgeons may also cut nerves in the pelvis to help with endometriosis pain.

If you suspect you may have endometriosis, talk to your doctor or gynecologist. They can review your medical history, discuss your symptoms with you, and help with diagnosis and potential treatment. ■

If you suspect you may have endometriosis, talk to your doctor or gynecologist.

IMAGE CREDITS: GETTY IMAGES

Endometriosis under a microscope

NIH-supported research can boost reproductive health, but it needs your help

Endometriosis is when cells from the lining of your uterus grow in other areas of your body. Some places they can grow are on or under your ovaries and fallopian tubes. This can be painful or cause heavy bleeding and bleeding between periods. It can also make it hard to get pregnant (infertility). This condition occurs in about 10% of women of reproductive age.

There is no cure for endometriosis, but NIH supports research to find new treatments.

Single study leads to dozens of different findings

The Endometriosis: Natural History, Diagnosis, and Outcomes (ENDO) Study observed two groups of women at risk for endometriosis. Researchers wanted to see whether there was a link between endometriosis and chemicals that interrupt the endocrine system (which produces hormones in the body). The ENDO Study found some chemicals were associated with higher rates of endometriosis. These included PFAS, which people can come in contact with through the environment, food, water, and household products.

Pelvic pain can change over time for adolescents with endometriosis

Pelvic pain from endometriosis can look different in teens and adults. A research team asked more than 1,200 adolescents and young adults with and without endometriosis about their pelvic pain. People with endometriosis had more frequent and more intense pelvic pain. But it decreased over two years. In comparison, those without endometriosis had fewer changes in their pelvic pain.

Endometriosis linked to higher stroke risk

Endometriosis can raise your risk for stroke and other cardiovascular conditions. A team used data from 110,000 women in the long-term Nurses' Health Study II. Women with endometriosis had a 34% greater risk of stroke than women without the disease. This increased risk may be due to higher levels of chronic, whole-body inflammation.

First FDA-approved medication for endometriosis pain

NIH supported research and development for the first FDA-approved medicine for endometriosis pain. The treatment is a prescription pill that works by lowering levels of hormones that can worsen endometriosis pain.

Join an endometriosis clinical trial and help find a solution

Endometriosis and women's reproductive health in general are growing areas of research. Including people from all backgrounds in clinical research helps scientists develop better treatments. This is important for reducing health disparities among racial and ethnic and gender minority groups. To get there, scientists need the public's help. One way to do this is by joining a clinical trial. ■

IMAGE CREDITS: GETTY IMAGES

Menopause: What you need to know

The stages, symptoms, and treatments when navigating the transition

If you menstruate (have periods), menopause is when your menstrual cycle ends for 12 consecutive months. It is a natural stage of life that happens when your ovaries reduce or stop producing the hormones estrogen and progesterone. Estrogen and progesterone regulate female reproductive health, including fertility and pregnancy.

Here's what to expect when entering menopause, how you can manage symptoms, and how it affects your overall health.

When does menopause begin, and how long does it last?

Menopause usually begins naturally, most often between the ages of 45 and 55. If you had an oophorectomy (surgery to remove the ovaries) or a hysterectomy with an oophorectomy and are not taking hormones, you may experience menopause symptoms sooner.

Menopause has different phases that may overlap. The entire process usually lasts about seven years but can take as long as 14 years. These phases include:

1. **Perimenopause.** This is when hormone levels first start to change and hot flashes or other symptoms may begin. You may also have irregular periods during this phase. For some people, perimenopause begins as early as age 40.
2. **Menopause.** This is when the ovaries slow their hormone production. You are officially in menopause 12 months after your final menstrual period. It occurs on average around age 51.
3. **Postmenopause.** This phase follows menopause and lasts for the rest of your life. Your symptoms may continue during this phase.

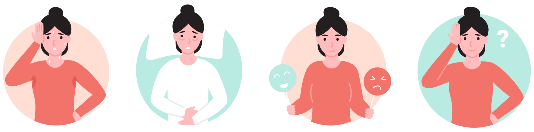
IMAGE CREDITS: GETTY IMAGES

The start of the menopausal transition and how long it lasts depends on many factors. These include genetics, the age it begins, your medical history or medications (such as chemotherapy drugs), and lifestyle habits (such as smoking). Race, ethnicity, and social factors such as stress and socioeconomic status may also impact your menopause experience.

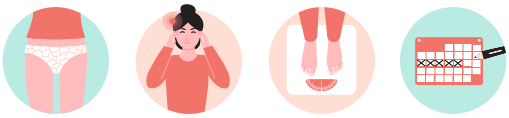
Although fertility declines in perimenopause, it is still possible to become pregnant until you have gone 12 consecutive months without a period. If you do not want to become pregnant, birth control or other types of contraceptives (such as condoms) are still recommended until that point. You can still get sexually transmitted infections (STIs) throughout your life.

What are the symptoms of menopause?

Hormone changes during menopause can cause a range of symptoms. These symptoms vary by intensity and frequency, which makes it difficult to know whether the transition has begun. Common symptoms include:



- Hot flashes and night sweats (if they occur late in the evening)
- Trouble sleeping
- Mood swings, depression, or anxiety
- Difficulty concentrating or memory issues
- Abnormal uterine bleeding
- Vaginal pain or dryness
- Pain during, or loss of interest in, sex
- Headaches
- Body aches and pains
- Heart palpitations
- Incontinence
- Weight gain or muscle loss



Everyone's experience is different—you may have many symptoms or hardly any. Communicate with your health care provider about any symptoms or concerns related to menopause. Some symptoms can be caused by other health conditions as well, so they may suggest some tests to rule out any other causes for the changes you're experiencing.

Tell your doctor if your periods happen very close together, last more than a week, are heavy, or return after a year of no bleeding.

Can menopause affect my health in other ways?

Yes. Hormone changes during menopause can increase the risk of heart disease and osteoporosis (a condition that weakens bones and makes them vulnerable to breaking), so it's important to maintain healthy lifestyle habits.

You are also at greater risk for vaginal and urinary tract infections. Dyspareunia (pain during sexual intercourse) due to vaginal irritation from the lack of hormones can also have an emotional effect on you and your partner.

IMAGE CREDITS: GETTY IMAGES

What can I do to manage my symptoms?

Menopause is a natural process, but there are many safe methods to relieve symptoms that disrupt your daily life.

Some tips from the National Institute on Aging for better sleep and managing hot flashes

Zz	🔥	Carry a portable fan
Zz	🔥	Avoid alcohol, spicy foods, and caffeine (especially close to bedtime)
	🔥	Avoid smoking
Zz	🔥	Maintain a healthy weight and exercise regularly, but avoid strenuous activity close to bedtime
	🔥	Dress in layers that can be easily removed
Zz	🔥	Keep your bedroom a cooler temperature
	🔥	Drink small amounts of cold water before bed
Zz	🔥	Adjust the number of layers of your bedding
	🔥	Use mindfulness exercises such as meditation, yoga, or tai chi
Zz		Follow a regular sleep schedule and avoid naps in the late afternoon or evening
Zz		Take prescription or over-the-counter sleep medications such as melatonin

Medications are also available to treat hot flashes and prevent bone loss that can occur throughout menopause. These medications may include menopausal hormone therapy. They could have health risks for certain people with risk factors such as high blood pressure or a history of certain cancers. Talk to your doctor about whether these are right for you.

Pain during sex may be treated with over-the-counter vaginal lubricants and moisturizers, or your doctor may prescribe medication.

Complementary health practices such as natural products or mind and body practices can help manage your menopausal symptoms. However, talk to your doctor before using natural products (such as black cohosh or soy isoflavones) as they may cause other side effects, including liver damage.

MyMenoplan.org is a website that was developed with support from NIH. MyMenoplan.org has a tool to find treatment options based on your specific symptoms. ■

Staying Healthy During and After Menopause

These tips may help you lower your risk for heart disease and osteoporosis and keep you healthy.

IMAGE CREDITS: TOP, GETTY IMAGES; BOTTOM, NATIONAL INSTITUTE ON AGING

What we know—and still don't know—about menopause

NIH has led the way in menopause research, but many questions remain

If you menstruate (have periods), menopause is when your menstrual cycle ends for 12 consecutive months. Aside from the reproductive system, menopause also affects heart and bone health, brain function, sleep patterns, hormones, and more.

Findings from a 30-year-old groundbreaking study

The Women's Health Initiative (WHI) is a long-term study launched by the National Heart, Lung, and Blood Institute in 1991 that enrolled more than 161,000 women across the country. The goal was to prevent heart disease, certain cancers, osteoporosis, and other diseases that are common in postmenopausal women.

Sarah Temkin, M.D., Associate Director for Clinical Research in the NIH Office of Research on Women's Health (ORWH), called WHI a "groundbreaking" project.

"Until only a few years before WHI's launch, women of reproductive age had been excluded from clinical research," Dr. Temkin said. "So this idea of a massive research project centered around a health need that was experienced by women was really revolutionary for the time."

WHI clinical trials tested whether menopausal hormone therapy (MHT)—medication that replaces the hormones someone loses during menopause, including estrogen and progestin—could lower the risk of cardiovascular disease later in life. Researchers studied a combination of estrogen and progestin, and they studied estrogen only. For these MHT trials, they used the most commonly prescribed dosages of hormones at the time.

In 2002, the study found that postmenopausal women who received the combined hormones had a higher risk of breast cancer and heart disease. The news led to a huge drop in use of MHT for menopausal symptoms.

However, since then newer data shows that MHT can be safe for some women—particularly younger, healthy women—to relieve symptoms in early menopause. This data also shows that estrogen-only MHT may even *lower* breast cancer risks.

FAST FACT: Hot flashes are caused by special chemical messengers in the brain that send signals to blood vessels to flush the skin, causing sweating. About **10% of women** will have more than seven hot flashes per day during menopause.

SOURCE: STUDY OF WOMEN'S HEALTH ACROSS THE NATION

IMAGE CREDITS: GETTY IMAGES

That's why it's important to talk to your doctor about the best treatments for menopausal symptoms for you. If you need help finding more specialized care, the North American Menopause Society has a list of certified menopause practitioners across the United States.

The WHI study finished in 2005, but the data is still being gathered today. It also spurred other research on women's health and aging.

More research on menopause symptoms

In 1994, NIH launched the Study of Women's Health Across the Nation (SWAN). The goal was to understand physical, biological, physiological, and social changes that happen as women age. SWAN's 3,300 participants were more racially and ethnically diverse and were younger than WHI participants.

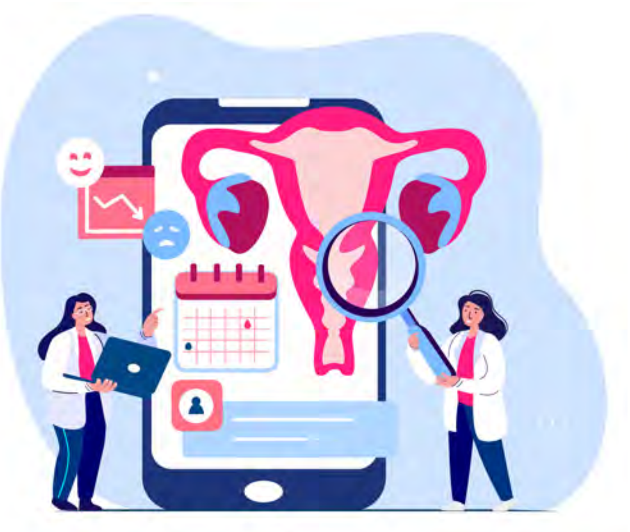
Then in 2008, the NIH-funded Menopause Strategies: Finding Lasting Answers for Symptoms and Health (MsFLASH) trials discovered that some antidepressants could reduce hot flashes (a common symptom of menopause). MsFLASH also found that moderate exercise could help with menopause-related insomnia.

Since 2016, the Menopausal Vasomotor Symptoms and Brain Aging in Women (MsBRAIN) trial has studied menopause's effects on short- and long-term brain health. Researchers also want to know whether these effects can help doctors detect Alzheimer's disease because women are at higher risk than men for the condition.

MyMenoplan.org is a website that was developed with support from NIH. MyMenoplan.org has a tool to find treatment options based on your specific symptoms.

How do health disparities and social determinants of health affect menopause?

Menopause symptoms vary across racial and ethnic populations and by socioeconomic background. For example, the SWAN study found that hot flashes are more intense and more frequent for some races. It saw major differences in cardiovascular health among racial and ethnic groups. Black women are also more likely than White women to undergo hysterectomies, which sometimes include oophorectomies (surgery to remove the ovaries). Oophorectomies can bring on menopause symptoms earlier.



> "There's not a one-size-fits-all to experiencing the menopause transition. There's a right time and a right place for the right patient to find a way to manage their symptoms."
>
> **– Dr. Sarah Temkin, Associate Director for Clinical Research in the NIH Office of Research on Women's Health**

Other factors that affect people's experiences of menopause include access to medical care and health insurance. Nutrition or obesity may also play a role in your menopause symptoms. Cultural variations like social stigma or the celebration of menopause are factors as well, Dr. Temkin said.

It's unclear whether environmental factors can influence menopause and related aging or disease risk. That's something NIH hopes more research will uncover. You can be a part of these future discoveries by joining an NIH clinical trial.

What is clear, Dr. Temkin said, is that menopause treatments should meet each person's health care needs, preferences, and goals.

"There's not a one-size-fits-all to experiencing the menopause transition. There's a right time and a right place for the right patient to find a way to manage their symptoms," Dr. Temkin said. ■

IMAGE CREDITS: GETTY IMAGES

Meet the Director: National Institute of Nursing Research

Shannon N. Zenk, Ph.D., M.P.H., R.N., FAAN

Nursing is the largest health care workforce in the United States. As Director of the National Institute of Nursing Research (NINR), Shannon N. Zenk, Ph.D., M.P.H., R.N., FAAN, wants nurses' perspectives included in research to end health disparities nationwide. Health equity has been a main focus throughout her career, and Dr. Zenk has brought that focus to her vision for NINR. She talked to NIH MedlinePlus Magazine about what shaped her interest in research and about major initiatives at NINR.

Would you tell us about your background and how you ended up at NINR?

Early in my career I worked as a nurse case manager. In that role, I would visit people in their homes to provide a wide variety of care such as wound care, self-management, and medication adherence. But really, what I got out of that experience was what I observed in terms of the differences in the resources people had. This is one of the main things that shaped my way forward in research.

Some folks struggled with having the resources to promote and restore their health. Others had plenty of resources. There were dramatic differences in the home and community environments of the people I was visiting to provide care. It was difficult to talk to people about healthy eating, for example, when what they really needed was far more fundamental. They needed *enough* food to eat, housing, reliable electricity, and a safe environment. These types of experiences motivated me to go back to school and learn more about what I could do to help solve these problems. I wanted to help not only the patients I interacted with but also communities everywhere.

I had a number of experiences going through school, including in my Ph.D. program while spending time in communities in Detroit, that shaped the specific area of focus I started out with. We conducted some of the early work on food deserts in the United States. Since that time—that was more than 20 years ago—those results have been replicated around the country. We've also linked issues of access to food with health behaviors and obesity risk. That's what got me started in research and in developing this really deep commitment to researching social determinants of health more generally.

I was happy with what I was doing. I had a long career in academia, mentoring and training nursing students and folks from other disciplines at every stage of their careers. I was approached about this opportunity [to be NINR Director].

IMAGE CREDITS: NATIONAL INSTITUTE OF NURSING RESEARCH

NINR Director’s Lecture

Prevention and Health Promotion

Shannon N. Zenk, PhD, MPH, RN
Director, NINR

May 3, 2023

NIH National Institute of Nursing Research

Watch: NINR Director’s Lecture Series on YouTube

Dr. Zenk hosts the NINR Director’s Lecture Series, which brings together top experts from across the nation to share their insights on nursing science. This year, the series focused on different aspects of NINR’s strategic plan for research. You can watch all past lectures on NINR’s YouTube channel.

As I learned more, it struck me as this amazing opportunity to shape science and advance areas where I thought nursing could be important. Chief among them is drawing on nursing’s expertise focused on people and on very holistic [treating the whole person and not just symptoms] and contextualized approaches to health.

What is the role of a nurse or nurse researcher outside of a hospital or clinical setting?

We often think of nurses as being in hospitals and clinics, and those are certainly important settings where nurses practice. But nurses practice pretty much everywhere: schools and workplaces, homes, long-term care facilities, policy and justice settings, and communities more generally around the globe—from urban to suburban to rural.

The scope of our practice extends from improving the health of individuals to that of an entire population. Nursing is fairly unique in terms of the health professions. We have always focused on people in the context of their lives and living conditions. We’ve always seen that as fundamental to improving population health and addressing health equity.

In your own words, how would you describe the mission and focus of NINR?

We are committed to driving bold and innovative solutions to bring about the changes we need to improve the nation’s health. From the beginning, NINR has supported research to provide the scientific basis for practice as well as policy. In recent years we have been emphasizing nursing’s unique perspective—what we bring as a health discipline to the research enterprise.

We revisited our mission and revealed a new strategic plan during National Nurses Month in May of 2022. The plan lays out our commitment to advancing health equity through research. The plan has five research “lenses”: health equity, social determinants of health, population and community health, prevention and health promotion, and systems and models of care. We started releasing funding opportunities aligned with the strategic plan as well as our first imperative under that plan, which is firearm injury prevention. That is an area we think would benefit from nursing and nursing science and the unique perspective and experience we bring.

To read more about NINR and why Dr. Zenk thinks the country needs more nurses, check out her full interview online at NIH MedlinePlus Magazine! ■

> “
> Nurses practice pretty much everywhere: schools and workplaces, homes, long-term care facilities, policy and justice settings, and communities more generally around the globe—from urban to suburban to rural.

IMAGE CREDITS: NATIONAL INSTITUTE OF NURSING RESEARCH

Galapagos tortoises can live for more than 100 years.

Learning about aging from turtles and other cold-blooded critters

Some animal species live much longer than others. Scientists want to know why—and what it could mean for humans.

As we get older, our bodies change in ways that can affect our health and well-being. Over time, our cells age and change and our organs may not function as well. This increases our risk for chronic diseases and other health problems.

More than just a number

Ever wondered why some people seem younger or older than their actual age? It's because age is more than just a number! Although aging is a natural process that happens to all of us, it doesn't affect every body in the same ways.

Some animals seem to have a slower aging process and tend to live longer lives. Cold-blooded animals such as reptiles and amphibians have some of the longest lifespans for their size. Take turtles, for example—some species of this reptile can live for over 150 years!

What can we learn from these long-lived creatures? In a recent large study, funded in part by the National Institute on Aging, an international team set out to answer that very question.

Chronological age: The number of years you've been alive.

Biological age: How old your cells, tissues, and organs appear to be based on your body's overall health and functioning. This can be different from your actual age. It accounts for factors like your genetics and lifestyle and how your body is affected by the aging process.

Aging rate: How quickly or slowly your body changes as you get older (such as developing wrinkles or gray hair). While some people seem to age more slowly, others seem to age more quickly. Factors like exercise, diet, stress management, and sleep habits can all influence your aging rate.

IMAGE CREDITS: GETTY IMAGES

Turtles, crocodiles, and salamanders had particularly low aging rates and long lifespans for their sizes.

Clues from reptiles and amphibians

While most research on aging variation in animals has focused on birds and mammals, this team examined 77 different species of reptiles and amphibians in the wild. They started by collecting data from more than 100 populations of cold-blooded, four-legged animals (called "ectothermic tetrapods") around the world. Comparing this data to similar data from birds and mammals, the researchers uncovered links between animal aging rates, longevity, environments, traits, and behaviors—and made some surprising discoveries.

Cold-blooded animals rely on heat from the environment to stay warm. Some scientists thought these animals might have longer lifespans due to their slower metabolic rates and lower energy demands, resulting in less damage to their cells and tissues and a slower aging process.

But it turns out that temperature regulation doesn't seem to hold the secret to animal aging. Overall, the cold-blooded animals in this study did not age more slowly or live longer than their warm-blooded counterparts.

They *did* have more diverse aging rates and lifespans, though. Some aged very quickly and others aged extremely slowly. At least one species in each group of ectotherms, which included turtles, crocodiles, and salamanders, had slower aging rates and longer lifespans than other similarly sized animals.

The researchers uncovered links between animal aging rates, longevity, environments, traits, and behaviors—and made some surprising discoveries.

Protective traits and aging rates

The researchers also discovered a few key factors that appeared to affect how quickly or slowly the cold-blooded animals aged and how long they lived:

- **Protection against predators**. Reptiles and amphibians that had protective traits—such as a hard shell, scales, or a venomous bite—aged more slowly than those without them.
- **Environmental temperature.** In warmer environments, reptiles aged more quickly, while amphibians aged more slowly.
- **Reproductive age.** Reptiles that began reproducing later in life aged more slowly and lived longer. While amphibians that began to reproduce at later ages lived longer, they did not age more slowly. However, amphibian aging rates were associated with the number of eggs they laid each year: Species that laid more eggs per year tended to age more quickly.

This study sheds light on the evolution of aging and how it varies across species. It also adds to our understanding of the complex factors that contribute to aging, including how quickly or slowly certain animals age. These insights can help inform conservation strategies for reptiles and amphibians in the wild, many of which are threatened or endangered. Someday they could even help humans lead longer, healthier lives! ■

Traits such as venom, shells, and armor may help animals live longer by protecting them from predators.

IMAGE CREDITS: GETTY IMAGES

Meet the Director: NIH National Institute on Deafness and Other Communication Disorders

Debara L. Tucci, M.D., M.S., M.B.A.

Debara L. Tucci, M.D., M.S., M.B.A., is excited by opportunities to encourage and support research that can enhance human communication. As Director of the National Institute on Deafness and Other Communication Disorders (NIDCD), it's her job to bring together scientists and other experts who are trying to improve our understanding of these conditions. She spoke to NIH MedlinePlus Magazine about her path to NIDCD and what she hopes the future will bring to this area of medicine.

What brought you to the field?

I've dedicated my career to understanding the causes and impact of hearing loss and to developing treatments to restore hearing. I began my career as a clinical audiologist at the University of Virginia (UVA) Health Sciences Center. Next, I attended medical school at the UVA School of Medicine to become an otologist (a physician or surgeon who specializes in the structure and diseases of the ear). After my residency at UVA, I completed a clinical fellowship in otology, neurotology (the study of the ear's connection to the brain and nervous system), and skull base surgery at the University of Michigan.

As an otolaryngologist surgeon-scientist, I treated individuals with ear, hearing, and balance challenges. I've always had a passion for research. It gives me hope that with more scientific progress in the field of communication disorders, we could help even more people.

> "I've dedicated my career to understanding the causes and impact of hearing loss and to developing treatments to restore hearing.

How did you end up at NIDCD?

My path to NIDCD started nearly 30 years before I became the institute's Director in 2019. I had advised NIDCD for many years by participating on boards, committees, and working groups. The move was seamless because of the exceptional NIDCD workforce. We have made progress on many exciting initiatives by working together. I look forward to continued progress toward our shared vision in the coming years.

How would you describe the mission and focus of NIDCD?

Our vision statement so clearly explains what NIDCD does and why: "Advancing the science of communication to improve lives." NIDCD conducts and supports research and research training in the normal and disordered processes of hearing, balance, taste, smell, voice, speech, and language.

Think about the many ways communication connects us to each other and to the world. And consider that communication conditions and disorders will affect a growing part of the population, especially as the U.S. population ages in the coming years. Now you can

IMAGE CREDITS: NATIONAL INSTITUTE ON DEAFNESS AND OTHER COMMUNICATION DISORDERS

imagine the range and impact of NIDCD's research. The institute began in 1988, so it is young by NIH standards, but we've accomplished so much.

What research are you particularly excited about?

I'm delighted about the research focus and direction described in our 2023–2027 NIDCD Strategic Plan. This is a collaboration between NIDCD, the scientific community, members of the public, and professional organizations. It addresses major themes to drive our work over the next five years.

One theme that I'm particularly excited about is a new focus on precision medicine research that could accelerate the development of patient-centered treatments for people with sensory and communication disorders. I'm also looking forward to seeing how interdisciplinary teams can harness large data sets using artificial intelligence and machine learning. This data-driven discovery could provide novel insights into prevention, diagnosis, and treatment for individuals with deafness and communication disorders.

How is NIDCD working to close health disparities gaps and promote diversity, equity, inclusion, and accessibility in and outside the institute?

Diverse teams are important for so many reasons: They are more creative and innovative. They're more likely to ensure that clinical trials include underrepresented groups. And they're better able to address questions that are meaningful to all communities.

NIH has a long history of supporting professional advancement for underrepresented minorities and building and sustaining a diverse workforce. These have also been among my chief priorities since coming to NIDCD. Our new Chief Diversity Officer, Cendrine D. Robinson, Ph.D., M.P.H., is strengthening our diversity, equity, inclusion, and accessibility strategy. She's helping us broaden and deepen our understanding of structural barriers to equity in the biomedical workforce and helping identify how these issues impact our work. She also ensures that our plans consider accessibility issues for those with disabilities, including hearing loss.

Other examples include our diversity-targeted R25 programs. These aim to enhance mentoring networks and provide research opportunities. Another program supports newer scientists from diverse backgrounds to conduct research in any of our scientific areas. And the NIDCD Diversity Scholars Program helps researchers apply for supplemental funding to add students, postdocs, and eligible faculty from diverse backgrounds to their labs.

NIDCD Mission

The NIDCD mission is to conduct and support research and research training in the normal and disordered processes of hearing, balance, taste, smell, voice, speech, and language.

NIDCD Vision

Advancing the science of communication to improve lives.

In addition to these efforts, we have championed initiatives to ensure that treatments for communication disorders are accessible and affordable. One recent example is the new availability of over-the-counter hearing aids. This FDA rule change provides easier access to affordable, safe, and effective hearing aids for adults who believe they may have mild to moderate hearing loss. We hope this will prompt those who could benefit from hearing aids to try them.

To read more about NIDCD and how Dr. Tucci unwinds from work, check out her full interview online at NIH MedlinePlus Magazine! ■

IMAGE CREDITS: NATIONAL INSTITUTE ON DEAFNESS AND OTHER COMMUNICATION DISORDERS

BIG *lessons from* SMALL *creatures*

Vision research with animal models is eye-opening

For centuries, scientists have used small animal models to study everything from how genes work to how diseases develop. And these pint-sized creatures continue to play important roles in scientific discoveries of all kinds, including vision research.

Small animals teach researchers big lessons about how vision works, how it can go wrong (and why), and new ways to treat eye diseases.

Fruit flies are easy to catch and breed and are often grown on old banana peels or other rotting fruit.

How fruit flies transformed human vision research

In the early 1900s, a young graduate student named Mildred Hoge discovered a group of fruit flies with eyes that were unusually small…or missing completely. She mapped the gene responsible for this mutation and named it *eyeless*. Her later research with fruit flies showed that this gene plays a key role in how their eyes and optic nerves develop.

Almost a century later, scientists discovered that humans have their own version of the *eyeless* gene, called PAX6. Genetic mutations that affect PAX6 can lead to significant issues such as cataracts and aniridia (a condition that affects the iris of the eye).

NIH-supported researchers continue to study fruit fly development, asking questions like, "What makes an eye an eye?" and "What keeps it from turning into some other body part?"

FAST FACT

Fruit flies share **about 60%** of their genes with humans.

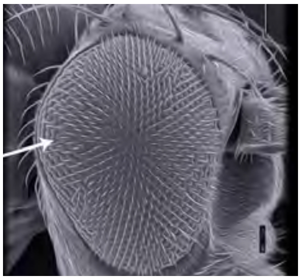
SOURCE: NATIONAL HUMAN GENOME RESEARCH INSTITUTE

What makes an eye…an eye?

Justin Kumar, Ph.D., studies and teaches developmental biology at Indiana University, Bloomington. He uses fruit fly models to study how a cell becomes one kind of tissue (like an eye) and not another (like a wing or an antenna). PAX6 provides instructions for making proteins that drive tissue development in the fruit fly eye by turning on "eye" genes and turning off "non-eye" genes. But just changing PAX6 on its own doesn't let a cell become any type of tissue.

Dr. Kumar discovered that PAX6 proteins work together with another type of protein (called an epigenetic enzyme) to control how DNA is used in cells. This helps cells decide what kind of tissue they will become. He and his team found a way to study this process by turning off or "knocking out" both proteins at the same time. Suddenly, eye tissue could turn into all sorts of things—including a wing!

By looking at the changes to the modified cell, Dr. Kumar can tease out what makes a tissue one type versus another.



Watch this video to learn more about fruit flies as animal models in vision research.

IMAGE CREDITS: TOP, GETTY IMAGES; BOTTOM, JUSTIN KUMAR

"When you knock them out together, it's this kind of magic bullet, but that's hidden when you look at them individually," he explained.

Let's explore how other NIH-funded vision researchers are using different animal models in their work.

Studying lens regeneration in newts

Some animals have remarkable abilities that seem almost supernatural. For example, newts can regenerate (regrow) body parts, including tissues of the eye. Katia Del Rio-Tsonis, Ph.D., of Miami University, Ohio, uses a 3D imaging technology called optical coherence tomography (OCT) to watch newts' lenses regenerate.

"The newt can basically regenerate anything," she said. "The eye is really a fantastic model, too, because it's easily manipulated."

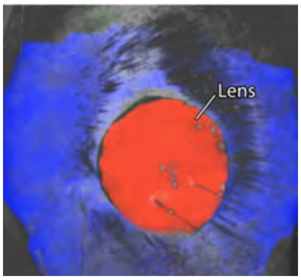
When the lens is removed from a newt's eye, the immune system clears out any damaged cells and debris. Iris cells transform into new lens cells that grow over time to create a new lens. Eventually, the new lens detaches from the iris and reattaches to the normal connecting tissue. And with OCT, Dr. Del Rio-Tsonis can see how cells and tissues rearrange themselves to rebuild a critical part of the eye.

Learning how zebrafish regrow parts of their eyes could help scientists develop new treatments for blindness

Newts aren't the only animals with impressive regenerative abilities. Tiny zebrafish can also regrow parts of the eye, including neurons in the eye's retina (the light-sensitive tissue at the back of the eyeball). Researching this ability could someday help scientists treat blindness in humans.

The eye's retina is made up of photoreceptor (light-sensitive) cells and nerve cells in the optic nerve (which connects the eye to the brain). In humans, if these cells die, they cannot be replaced. Diseases that damage the retina or optic nerve (such as glaucoma) can lead to permanent blindness.

Zebrafish's immune systems respond differently than ours. In humans, our immune response causes scar tissue to form, which can stop parts of the retina from responding to light. But when a zebrafish's retina is damaged, certain cells trigger the affected tissue to regrow and restore vision, a process called "retinal regeneration."



Discover more about the newt eye lens as a research model in this video.

Daniel Goldman, Ph.D., of the University of Michigan, studies how zebrafish regenerate their eyes. He hopes that this knowledge will lead to treatments that enable humans to regrow neurons in their own eyes. He said that after an optic nerve injury, "[the fish] regain sight…and it happens really fast. Over a two-week period, they'll reconnect with the brain, and the fish can see again."

Researching rare diseases with geckos

For clinical scientists like Robert Hufnagel, M.D., Ph.D., animal models can shed light on what's happening to specific patients who come to the clinic.

In his lab at the National Eye Institute, Dr. Hufnagel worked with several animal models—including geckos—to study some of the rare diseases he sees in his patients.

"Being able to create relevant animal models to help study these rare diseases is important to our patients," he explained.

Ashley Rasys, D.V.M, Ph.D., worked as a postdoctoral student in Dr. Hufnagel's lab. She explained that gecko and human eyes have similar developmental pathways and structures. They also both have a fovea, which is the part of the retina that allows us to see clearly and focus on objects directly in front of us.

Dr. Hufnagel will use a gene-editing tool to introduce changes to the gecko's DNA that mimic those in his human patients. This will help him learn more about how these genetic changes cause disease. And it will allow him to test new treatments and therapies in the geckos to see how they might work in humans. ■

Because their eyes have similar structures to ours, geckos (like this Antilles gecko) are useful models for studying vision in humans.

**This article was adapted from a longer story by the National Eye Institute. Read the original article to learn more about animal models and the vision researchers that work with them.*

IMAGE CREDITS: TOP, KATIA DEL RIO-TSONIS, HUI WANG, AND WEIHAO CHEN; BOTTOM: ASHLEY RASYS AND ANDREW WEGERSKI

Alcohol's health effects: What you need to know

Drinking alcohol is so common that people may not question how even one beer, cocktail, or glass of wine could impact their health. Alcohol is a part of cultural traditions all around the world…and it's also a drug that chemically alters the body. People of all ages need to understand these effects.

The National Institute on Alcohol Abuse and Alcoholism (NIAAA) has information on how alcohol impacts your health. It also has resources to help those looking to change their drinking habits.

What does alcohol do to your body?

Just one or two alcoholic drinks can impair your balance, coordination, impulse control, memory, and decision-making. This increases your risk of injuries. Too much alcohol can also shut down parts of your brain that are essential for keeping you alive. Over the long term, alcohol can increase your risk of more than 200 different diseases, including in the liver and pancreas, and certain cancers.

FAST FACT

As of 2021, **29.5 million** people ages 12 and older had an alcohol use disorder in the past year.

SOURCE: NATIONAL SURVEY ON DRUG USE AND HEALTH

The alcohol you consume resides mostly in the body's water. Because women tend to have less water in their bodies than men, if a woman and a man of the same weight drank the same amount of alcohol, the woman's blood alcohol concentration (BAC) would likely be higher. This could help explain why women are more likely to have negative effects from alcohol.

NIAAA Director George F. Koob, Ph.D., said that as of May 2023, the institute is not aware of specific health guidelines on alcohol consumption for transgender or gender-nonconforming individuals.

IMAGE CREDITS: GETTY IMAGES

How much alcohol is safe to drink?

No amount of alcohol is "safe" or beneficial for your health. In fact, alcohol's harmful effects (such as risk of developing certain cancers) start at fewer than one drink per day. Some people should not drink at all, including:

- People under the legal drinking age of 21
- People with certain medical conditions
- People who are pregnant or who may become pregnant

Drinking alcohol during pregnancy can lead to symptoms of fetal alcohol spectrum disorders (FASD). FASD can cause a range of neurodevelopmental and physical effects in the child after birth.

Mixing alcohol and medicines can be harmful. If you are on any medications, talk to your health care provider about how alcohol may affect them.

What is binge drinking?

Binge drinking is drinking enough alcohol to raise one's BAC to 0.08% or above. Women typically reach this level after about four drinks and men after about five drinks in two hours. Binge drinking—and heavy drinking—is a type of alcohol misuse (a spectrum of risky alcohol-related behaviors).

What is alcohol use disorder?

Alcohol use disorder (AUD) is a chronic brain disorder that makes it difficult to control alcohol use, even when it's causing problems. AUD can be mild, moderate, or severe.

Alcohol misuse at an early age increases the risk of developing AUD. Genetics or a family history of alcohol misuse increases that risk as well. Childhood trauma, mental health issues, and stress can also lead people to begin drinking or drink more than usual.

But there is good news! No matter how severe the problem may seem, evidence-based treatment can help people with AUD recover.

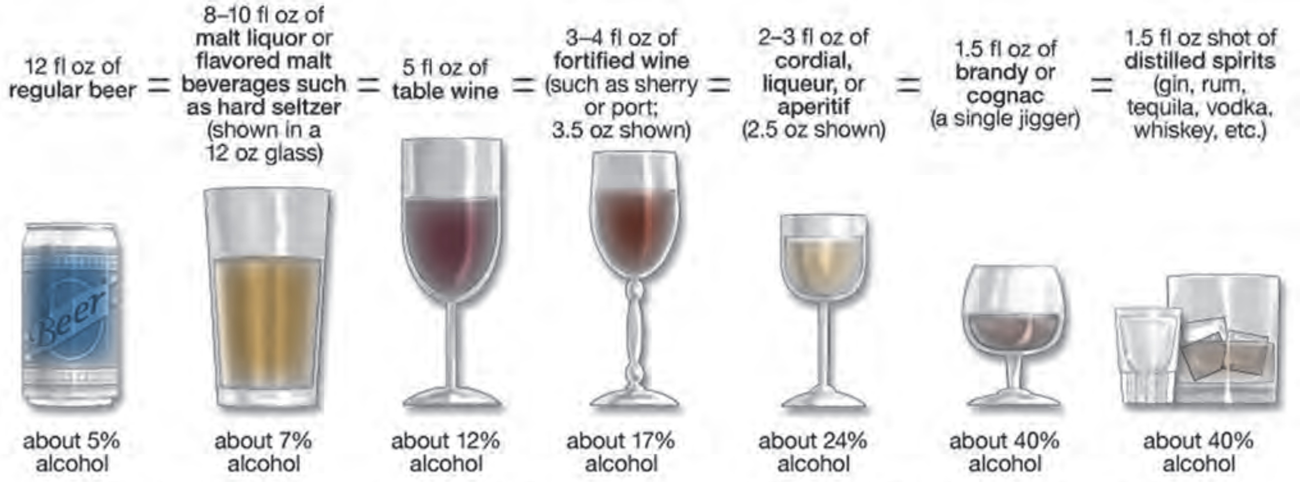
Where can someone find treatment for AUD?

While there is no one-size-fits-all method for recovering from AUD, there are lots of effective treatment options. Some examples include behavioral treatments, support groups, and FDA-approved medications. NIAAA can help people find information and resources about AUD and treatments that might work best for them.

- Rethinking Drinking is a series of self-guided questions to help you understand your relationship with alcohol and change your drinking habits.
- The NIAAA Alcohol Treatment Navigator is an online tool to help you understand AUD and how to treat it. It can also find treatment options by health care provider, location, and method—both virtual and in person.

What is moderate alcohol use?

According to *Dietary Guidelines for Americans*, moderate alcohol use is consuming two drinks or less in a day for men and one drink or less a day for women. But what is a standard drink?



Each drink shown above represents one U.S. standard drink and has an equivalent amount (0.6 fluid ounces) of "pure" ethanol.

IMAGE CREDITS: NATIONAL INSTITUTE ON ALCOHOL ABUSE AND ALCOHOLISM

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