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Wearable Tech

Providing Insights into Health



Millions of Americans wear devices that track information about their health. These devices count steps, check heart rates, and help monitor fitness. They can be worn against the body or in clothing. Examples include smartwatches, rings, and headbands.

Wearable devices collect signals from the body using tiny sensors. These signals are translated into data on health apps. Researchers are studying how wearable devices can be helpful for many different health conditions including infections, diabetes, heart conditions, and more.

One large NIH initiative is analyzing health data from nearly 900,000 volunteers around the country. It's called *All of Us*. Over 68,000 of the participants share data from Fitbit wristbands about their heart rate, sleep, and physical activity.

"The data provides researchers with ongoing insights into an individual's lifestyle and how it can impact their health," says Dr. Josh Denny, who oversees the NIH *All of Us* Research Program. "That can help them design treatments that will have a positive impact."

Other NIH-funded researchers are studying different types of wearables. They're looking at whether the data can better identify or manage health conditions.

Improving Reproductive Health • Wearable devices may offer insight into women's reproductive health. Tracking your menstrual cycle and knowing when to expect your period can be helpful for women. This can be especially true for those trying to get pregnant or avoid pregnancy.

During the menstrual cycle, an ovary releases an egg to be fertilized. This is called ovulation. Eggs are released in response to certain hormones.

Right now, women who want to track ovulation have two options. They can test their urine daily for luteinizing hormone. Or, when they wake up, they can take their resting body temperature by mouth each day. Body temperature rises after ovulation. Both ways can be used to predict ovulation.

But both options can be burdensome for women, says Dr. Anne Marie Jukic, an NIH reproductive health expert. She and her collaborators have tested an easier option: smartwatch sensors that measure wrist temperature.

"Few studies had looked at whether wrist temperature can identify ovulation or predict the start of the next menstrual period," Jukic says.

The study enrolled 262 women and girls to track information about their cycles. Participants wore a smartwatch to track their daily wrist temperatures. They logged the dates of their periods as well. They also tested their urine daily for luteinizing hormone and recorded their body's resting temperature. These common ways of predicting ovulation were compared with the wrist temperature results.

Wrist temperature could predict most women's ovulation date within two days of the actual date. It could also predict when their next period would start within three days for most women.

"Using a passive wearable sensor made it easy to identify ovulation and when the next menses might occur," says Jukic. "This makes menstrual cycle tracking and understanding cycle patterns more accessible to people."

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Detecting Diseases • Wearable devices may be helpful for detecting certain diseases. Our bodies naturally let out tiny molecules that may give off distinct odors. These can be released through breath, skin, or urine.

Researchers can identify profiles, or "signatures," for groups of molecules given off by the body. Certain diseases may change these profiles. Scientists are testing wearables to identify the signatures of odors that are linked to 20 different diseases. These include skin, lung, joint, and connective tissue diseases.

"We're trying to figure out which groups of chemicals fit a particular disease," says Dr. Cristina Davis, a mechanical engineer at the University of California, Davis. Her lab is developing devices that detect and analyze the odors.

They've designed a system that uses a wearable patch to collect molecules from your skin. The patch can fit on your forearm. Right now, the researchers must analyze the molecules in the lab. But they're working on developing a patch that can analyze the molecules itself.

The team is also developing an electric glove to collect information. Sensors in the glove measure vital signs such as heart rate, skin temperature, and sweat.

"Combining information from the two wearable devices has improved their ability to detect diseases," Davis says.

The researchers are now building computer models to help link the molecules to health or disease.

Screening for Risk • Wearable devices are already being used to help manage certain health conditions. Continuous glucose monitors, for example, use a tiny plastic tube inserted under the skin to help people with diabetes track and manage their condition.

Researchers are testing whether other wearable devices can help identify people at risk for diabetes before symptoms appear.

Type 2 diabetes happens when your body doesn't use insulin well. Most of the food you eat is broken down into sugar and released into your bloodstream. Insulin is a hormone that helps control your blood sugar levels.

When your body doesn't use insulin well, your blood sugar rises above normal levels. That can lead first to a condition called prediabetes. Prediabetes increases your risk of developing type 2 diabetes. But not everyone goes on to develop diabetes. You can reduce your risk if you catch the signs early and make certain lifestyle changes.

People can have prediabetes for years without symptoms. This means you may not know you have prediabetes until serious health problems show up. A blood test is currently the only way to diagnose prediabetes.

NIH-funded researchers want to help more people get screened for prediabetes. "When someone is aware of their prediabetes status, they're more likely to make lifestyle changes such as exercise and a healthy diet," says Dr. Jessilyn Dunn, a biomedical engineer at Duke University.

Dunn's team is studying ways to alert people to signs of prediabetes using wearables like smartwatches. Digital devices can collect data linked to your risk of prediabetes.

The team is exploring if sending text messages to people whose data show they are at high risk will make it more likely that they go to the doctor. "We want to urge people with a higher risk to talk to their doctor about screening for prediabetes," Dunn says.

Other researchers are exploring more ways to use wearables to support people's health. See the Wise Choices box to learn more. ■

Wise Choices

New Uses for Wearable Devices

Researchers are studying whether wearable sensors can:

- Examine how sleep affects a person's attempts to quit smoking.
- Investigate the links between sleep, physical activity, and cancer.
- Track physical activity and sleep in children.
- Assess children's recovery from surgery after having their appendix removed.
- Help detect and manage heart problems earlier.
- Monitor and predict the body's response to shock and sepsis.
- Monitor fluid buildup around the brain and spinal cord after insertion of shunts that relieve pressure from excess fluid.
- Track whether people are taking their medicines for opioid use disorder.

Web Links

For more about wearable technology, see "Find More Information" in the online article: newsinhealth.nih.gov/2026/11/wearable-tech

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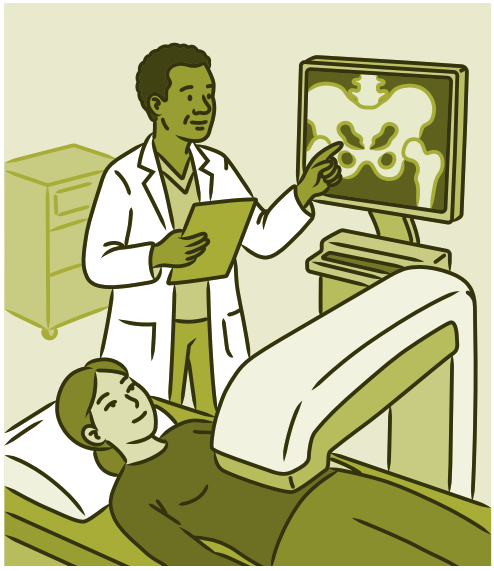
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Protect Your Bone Health

Getting Ahead of Osteoporosis



If our bodies were a house, our bones would be the structure. When that structure weakens, daily activities like walking, going up stairs, or even doing the laundry can become difficult. That's why it is important to protect our bones as we age.

Strong bones begin in early childhood. Our bodies use the nutrients and minerals from our diets to build **bone density**. As we age, we absorb fewer minerals, and we begin to lose bone density. This raises the risk of osteoporosis.

Osteoporosis is a disease where bones weaken to the point that they can break easily. It can develop when your bone density drops too low. It can also change the structure of your bones. Many people don't know they have osteoporosis until a bone breaks. It is one of the leading causes of fractures in women after menopause and older men. Most breaks occur in the hip, spine, and wrist.

"Osteoporosis is often misunderstood as just a women's issue," says Dr. Madhumathi Rao, a physician and bone health researcher at the University of Kentucky. But osteoporosis affects men and women. Many things can increase your risk, including your age, family history, diet, and certain medicines.

"There are so many causes for osteoporosis and so many conditions that can lead to bone loss, too," Rao explains.

Women face a higher risk of osteoporosis because they naturally lose estrogen with age. Estrogen helps protect bones by controlling the cells that break bone down. When estrogen drops during menopause, women may lose more bone than they build. In men, osteoporosis is often linked to certain diseases or long-term use of medicines that can cause bone loss.

When bone density is lower than normal but less severe than osteoporosis, it's called osteopenia. It can be an early warning sign of osteoporosis. Not everyone who has osteopenia will develop osteoporosis, but osteopenia can still increase the risk for fractures. Learning about bone loss early can help you take steps to prevent it from getting worse.

Doctors measure bone density using a test called a DXA scan. The scan can determine if your bone density is lower than average for your age. Routine scans are recommended for women 65 and older. A doctor may recommend testing earlier if you have other risk factors. These can include previous falls and underlying conditions like thyroid issues or rheumatoid arthritis. Taking certain drugs, such as corticosteroids, can also cause bone loss.

The DXA scan helps doctors determine if you have osteoporosis or osteopenia. Doctors may also do a fracture risk assessment. They use the test results together with clinical risk factors to estimate how likely you are to experience a fracture with minor trauma. To treat these conditions, doctors usually prescribe medicines that improve bone density.

Osteoporosis can be caused by the breakdown of bone, but this is not the only cause. Not building enough new bone can also contribute. Medicines that slow the breakdown of bone are often what doctors prescribe. Rao's team is studying whether targeting the cause of bone loss could better treat osteoporosis. Her team is testing if bone-forming drugs might work better for certain patients.

While some bone loss is normal with age, you can take steps today to help maintain healthy bones.

"Regular physical activity, especially weight-bearing exercise and resistance training, is probably the secret to maintaining your bone health," says Rao. She also recommends getting enough protein, calcium, and vitamin D in your diet. ■

Wise Choices

Keep Your Bones Healthy

- **Eat foods that support bone health.** Get enough calcium, vitamin D, and protein each day. Low-fat dairy, leafy green vegetables, and fish are good sources of calcium.
- **Get active.** Choose weight-bearing exercises like strength training, walking, hiking, jogging, tennis, or dancing. These can help build and strengthen your bones.
- **Don't smoke.** Smoking increases your risk of weakened bones.
- **Limit alcohol consumption.** Too much alcohol can harm your bones. Drink in moderation or not at all.

Definitions

Bone Density
A measure of the amount of minerals contained in a certain volume of bone.

Web Links

For more about protecting your bone health, see "Find More Information" in the online article: newsinhealth.nih.gov/2026/11/protect-your-bone-health

Health Capsules

For links to more information, please visit our website and see these stories online.

Finding Treatments for Tick-Related Red Meat Allergy

Ticks cause hundreds of thousands of new illnesses each year in the U.S. Most of these illnesses are from ticks spreading disease-causing germs. But tick bites can also lead to an allergy to red meat and other products from animals like cows, pigs, and lambs. This condition is called alpha-gal syndrome (AGS). A new study may point to a way to help prevent these allergic reactions.

Some ticks carry a sugar molecule called alpha-gal in their saliva. Your body can develop an allergy to it. Alpha-gal is also found in red meat and other products from these same animals. After you develop an allergy, eating foods that contain alpha-gal can cause a reaction, too.

Symptoms vary from stomach and intestinal problems to life-threatening reactions. Right now, there are no treatments specifically for alpha-gal syndrome, only treatments for allergic reactions. The only way to avoid the allergic response is to avoid tick bites and to not eat animal products that cause a reaction.

Researchers searched for antibodies that could attach to molecules involved in the allergic response and potentially stop it. Antibodies are molecules the body normally makes to help get rid of invaders.

Using lab tests, the team found 13 antibodies that targeted different molecules linked to the allergic responses. But more research is needed to test if they can prevent them.

"This discovery ... is the first step in potentially identifying ways to prevent AGS and develop new targeted therapies for people before they are affected by this disabling condition," says Dr. John Powers, acting director of NIH's National Institute of Allergy and Infectious Diseases.

A Link Between Depression and the Brain's Memory Center?

Depression is one of the most common mental health conditions in the country. People with depression tend to focus on negative memories and information. A team of NIH-funded researchers wanted to learn more about why.

The team focused its studies on the hippocampus. This brain area is vital for forming memories. Inside the brain are billions of brain cells called neurons. Neurons send messages to your body for everything that you do: breathe, talk, eat, walk, think, and more. The hippocampus is one of a few parts of the brain that keeps making new neurons throughout a person's life.

Researchers looked at the hippocampus of 30 brain donors. Eleven of the donors had a history of depression. The people with depression had several differences from those without the condition.

In the donors with depression, new brain cells appeared to stop maturing. These cells showed changes in genes linked to stress, the body's disease defenses, and connections between brain cells.

Mature brain cells from donors with depression also had changes in their gene activity. These changes involved genes that affect how brain cells connect and share information with one another. Learning and memory depend on the brain's ability to form such new connections.

"Without the ability to create new neurons, people with depression may not have the resilience to effectively adapt to the environment," explains Dr. Maura Dupont of Columbia University, who led the study.

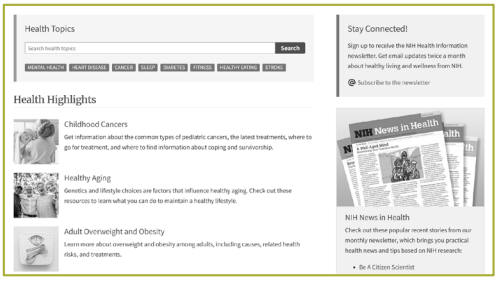
More research is needed to better understand the links between new neurons, memory, and mental health.

Featured Website

NIH Health Information Portal

www.nih.gov/health-information

The NIH Health Information Portal provides reliable, science-based health resources from NIH. Explore various health topics to keep you and your loved ones informed. Stay up to date by subscribing to our biweekly email newsletter.



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