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# Tendon Trouble

## Finding a Fix for Injured Tissue

Tendons connect muscles to bones. Without them, your muscles couldn't move your body. When you injure a tendon, it can affect your everyday activities.

"No matter how strong your muscle is, you're not going to be able to have the functionality and the stability that you need if a tendon is impaired," says Dr. Nelly Andarawis-Puri, a bioengineering researcher at Cornell University.

Tendon troubles can arise from **inflammation**, a rupture, or breakdown (degeneration) of the tendon tissue. These conditions are called tendinopathies. Symptoms include swelling, pain, stiffness, and weakness.

Problems can stem from a sudden, awkward movement. But they're usually a result of overuse. Overuse injuries are common in athletes. But daily activities that require repetitive movements can put anyone at risk. For instance, repeated exercises that require jumping may cause knee problems. Typing all day at work may lead to pain in your hands.

Tendon injuries can lead to long-term (chronic) issues if they don't fully heal. And they often don't. That's because our bodies' ability to repair tendon tissue declines with age.

Researchers are trying to unravel why tendons often don't heal properly and what's needed to repair them.

**Breaking the Cycle** • "The most common type of tendon injury is an overuse, or wear-and-tear, injury," explains Andarawis-Puri. "It's not necessarily painful once it starts and can be silent for a long time. Essentially, you predispose yourself to more and more accumulation of damage. Then, eventually you have degeneration."

Getting treatment early can help keep tendon problems from getting worse. Your doctor may recommend icing the area, pain relievers, and resting the tendon.

These treatments don't help repair your tendon. "But they can make you less miserable and manage the pain and the discomfort," Andarawis-Puri says.

Physical therapy is often recommended for treatment as well. But there is a fine balance between exercise that promotes healing or causes damage. "That's tricky," Andarawis-Puri says, "because that's different for every person."

Her team is studying the biology of tendons to better understand how and when exercise promotes healing.

Tendons are made up of cells called tenocytes and bundles of a protein called collagen. These bundles form long helical chains.

"These helices look almost like springs—that allows them to coil and uncoil," says Dr. Adam Abraham, an expert on chronic tendon disease at the University of Michigan. Coiling helps the fibers absorb the force from your body movements.

"A tendon is a unique connective tissue that's highly ordered and made primarily of collagen. That's what gives it its strength," explains Dr. Jenna Galloway, a regenerative medicine expert at Massachusetts General Hospital and Harvard Medical School. "When you do too much movement, you can damage some of

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## Definitions

**Inflammation**
The heat, swelling and redness caused by the body's protective response to injury or infection.

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those collagen fibers. Normally, we can repair a little bit of damage. But if you do this over and over again, you change the properties of the tendon."

When collagen fibers are injured, they look kinked under a microscope, says Andarawis-Puri. Her team has shown in animals that exercising too soon after an injury worsens that kinking. They've also found that waiting two weeks before letting the animals exercise gives time for the coils to straighten out.

"Our research shows that with the right timing and conditions, movement can actually trigger the tendon to repair," Andarawis-Puri says. Her team hopes to find ways to easily tell when exercise will help rather than hurt.

**Reversing Chronic Conditions** • The highly organized nature of tendons is key for them to work properly.

"But tendons are a rather lazy organ," Abraham explains. "They are slow to adapt, if they adapt at all."

Abraham's team is trying to understand the changes tendons undergo from chronic injuries. They've developed a system that allows them to grow 3D tendon-like structures using cells from patients' tendons.

"We're developing a system that basically allows us to make microtendons," Abraham explains. "The goal is to grow hundreds to thousands of these from a single person. That may sound very large, but they're the size of a human hair."

This 3D system allows the researchers to expose the microtendons to different conditions. Then, they can look at how the microtendons respond. They're comparing microtendons grown with cells taken from people who have healthy tendon tissue to those with chronic tendinopathies.

"We can stress out healthy microtendons and get them to behave like those from patients with chronic injuries," says Abraham. "The cells that come from patients with a chronic condition are already stressed. They become locked in this stressed state."

His team is trying to restore chronically injured cells to a healthy state. "We're hoping with this 3D system, we will be able to synthesize many hundreds of different environments at the same time. So we can screen what might be a possible fix," he explains.

Abraham's team is also testing an injectable hydrogel to mimic a healthy environment. They hope to deliver it to injured tissue to restore an organized tendon structure.

**Coaxing Repair** • Unlike people, some animals can fully repair tendon tissue as adults. For instance, zebrafish completely regenerate tendons throughout their lives. Galloway hopes to learn from them.

Her group has shown that tenocytes can repair fully torn tendon tissue in zebrafish. Her recent study showed that the cells bridge fully severed tissue back together.

People and other mammals have tenocytes, too. But after a tendon is injured in mammals, the tissue usually doesn't recover. Instead, a scar forms and disrupts the carefully crafted collagen structure.

There's something different about how mammals respond to a fully torn tendon injury, Galloway says. "The cells in the zebrafish can respond to an injury to regenerate the tissue, but the cells in mammals cannot," she adds. Her team is comparing differences between fish and mammals after a tendon injury. And they're testing potential compounds in injured tissue in mammals. They hope they can make the process of healing go better for them, too.

Scientists are still trying to fully understand tendon biology. In the meantime, it's important to protect your tendons (see the Wise Choices box) and get injuries treated early. ■

## Wise Choices
### Protect Your Tendons

- Warm up or stretch before exercise.
- Do strengthening exercises for the muscles around your joints on a regular basis.
- Don't sit still for long periods.
- Take frequent breaks when doing activities that require repetitive motions.
- Practice good posture and position your body properly for tasks.
- Begin new physical activities slowly. Gradually increase the intensity over time.
- Stop activities if they cause you pain.
- Cushion your joints while using tools and sports equipment. Try padding, gloves, or grip tape.

## Web Links

For more about tendinopathies, see "Find More Information" in the online article: newsinhealth.nih.gov/2025/12/tendon-trouble

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# Getting a Grip on Gastroparesis

## Understanding Slowed Digestion

After you eat, your stomach breaks down the food before pushing it along. How long it takes for your stomach to empty depends on many factors. Meals that are big, fatty, or high in calories will empty more slowly, but it also depends on your health. Some people have a condition that makes food empty slower than it should. It's called gastroparesis.

Gastroparesis isn't common. But about 1 in 4 people have symptoms similar to those of people with gastroparesis. The only way to know if a person has gastroparesis is to measure how fast the stomach empties.

"Patients don't come in telling you they have a gastric delay," says Dr. Braden Kuo, chief of gastroenterology at Columbia University and New York Presbyterian. "They come with symptoms."

Those symptoms may include nausea or vomiting, feeling full quickly, and belly pain or discomfort. To diagnose gastroparesis, doctors must rule out other causes, such as a blockage, ulcers, or inflammation, Kuo explains.

"When all those other tests come back negative and the patient still has complaints, then it raises the possibility of gastroparesis," Kuo says.

Most cases of gastroparesis are idiopathic. That means they happen for unknown reasons. But certain conditions can damage the nerves involved in gut sensations or gut motility.

Uncontrolled diabetes is the most common known cause. High blood sugar can damage nerves, including the vagus nerve. The vagus nerve sends signals between the brain and gut that tell your stomach muscles to contract or relax. They also give you the feeling of fullness after a meal.

Certain autoimmune diseases and nerve damage from viral illnesses can slow digestion, too.

"Many people get sick during a viral illness with gastrointestinal upset and most people recover within a couple of days or a week," Kuo says. "But some people never fully recover from nausea, vomiting, pain, or discomfort. So the virus somehow changed the nerve endings in the gut and how they function and sense things."

To better understand and treat gastroparesis, NIH created the Gastroparesis Clinical Research Consortium (GpCRC). For the last 17 years, the GpCRC has enrolled adults and children with gastroparesis to learn more about the disorder and test ways of treating it.

One GpCRC study showed that 9 in 10 people with gastroparesis have abdominal pain. In about 1 in 3, the pain was severe to very severe. Other studies looked at how often people with gastroparesis end up in the emergency room.

Kuo, who is a member of the consortium, mentions studies of tissue samples capturing the whole stomach wall. "We're really beginning to identify the changes at the cell level, in the nerve endings, and at the inflammatory level that are contributing to these patients' conditions," he says.

Researchers are tracking patients over time to see how their symptoms change. Kuo is studying the role of the gut-brain connection and whether a type of talk therapy, called cognitive behavioral therapy, may improve symptoms. This approach helps patients better understand their condition and its connection to the brain. It teaches techniques to relax the vagus nerve. Patients also learn to overcome the fears of eating that often come with gastroparesis. The trial is currently enrolling patients.

"We're giving them tools they can control that can make a big difference in their clinical outcome," Kuo says. ■

### Wise Choices

#### Consider Your Eating Habits

Gastroparesis can make it hard to nourish yourself. It can help if you:

- Eat more frequent, smaller meals with less fat and fiber.
- Cook and chew your food well.
- Drink lots of water or other liquids, such as clear soups or vegetable juice.
- Take walks after you eat.
- Avoid fizzy drinks, alcohol, and lying down after a meal.

### Web Links

For more about gastroparesis, see "Find More Information" in the online article: newsinhealth.nih.gov/2025/12/getting-grip-gastroparesis

# Health Capsules

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

## DASH-Style Diet Helps Control Blood Sugar

For over 30 years, doctors have recommended the DASH diet to help people reduce high blood pressure. Studies have repeatedly shown that the DASH eating plan can improve heart health. The DASH diet seems to have other health benefits. But its effects on blood glucose, also called blood sugar, in people with type 2 diabetes were unclear.

The DASH diet encourages eating fruits, vegetables, whole grains, and low-fat dairy. It favors beans and lean meats for protein. It suggests limiting saturated fats and sugar-sweetened food and drinks.

In a new study, researchers tweaked the DASH diet to help improve glucose control. The adjusted diet for diabetes is called DASH4D. It includes slight changes, such as eating even fewer sweets and starchy foods like potatoes.

Researchers studied 89 people with type 2 diabetes. Participants followed four different diets, in random order, for five weeks each. Two of the diets were variations on DASH4D. The other two were similar to the typical American adult diet.

Compared to a typical diet, the DASH4D eating plan led to more time with blood glucose in the recommended range. The results suggest that a modified DASH diet could help control blood sugar levels in adults with type 2 diabetes.

"The original DASH diet has long been recommended for people with diabetes and other health conditions due to its effectiveness in lowering blood pressure," says Dr. Elizabeth Selvin at Johns Hopkins University. "But this is the first time a controlled study has shown a significant improvement in glucose control as well." ■

## Pink Eye

Pink eye, or conjunctivitis, causes swelling and redness inside your eyelid and the white part of your eye. Your eye may also feel itchy and painful. The condition is common and can sometimes spread very easily.

Anyone can get pink eye. It's usually caused by a virus or bacteria. You can also get it from allergies irritating your eyes. Symptoms include pain in your eye, a very red eye, and a lot of fluid coming from your eye. You may also notice blurred vision or light sensitivity.

Pink eye can cause serious health problems for newborn babies. Check for symptoms like puffy red eyelids and unusual fluid discharge from your baby's eye. Call a doctor immediately if you see these symptoms.

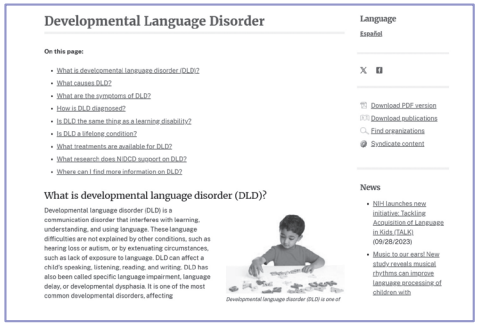
If you have symptoms of pink eye, talk with your doctor. Usually, it gets better on its own in about 7 to 10 days. But you might need treatment.

The best way to prevent pink eye is good hygiene. Wash your hands often with soap and water, especially if you're around someone with pink eye. And be sure to have clean hands before touching your eyes. Don't share personal items, like makeup, towels, eyeglasses, or pillows, with someone who has pink eye. Learn more about pink eye at go.nih.gov/NIHNiHDec25PinkEye. ■

# Featured Website

Developmental Language Disorder
go.nih.gov/NIHNiHDec25DLD

Developmental language disorder, or DLD, affects about 1 in 14 children who are in kindergarten. DLD is a communication disorder. It can cause problems with learning, understanding, and language. Early treatment during preschool years can improve the skills of many kids with language delays. Visit the website to learn more.

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