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Your Body's Bugs

Nurturing Healthy Microbes

Microscopic bugs called microbes can be found in your eyes, mouth, gut, skin, and everywhere else. But don't be alarmed. Most of your microbes are useful. They help you digest food. They prevent dangerous infections in your organs. And so much more. They're vital for your health.

This collection of microbes in your body includes bacteria, fungi, and viruses. Together, it's called the human microbiome.

"The microbiome is just as important as the brain, liver, kidney, or heart," says Dr. Eugene Chang, who studies gut microbes at the University of Chicago.

Scientists have cataloged the types of microbes that live in the human body. They've found that changes in your body's bugs are linked with many health problems. These include diabetes, obesity, inflammatory bowel diseases (IBD), and cancer. They can also cause skin disorders and tooth decay.

Certain things can harm the helpful microbes in your body. These include using antibiotics inappropriately or eating an unhealthy diet. Now, studies are starting to uncover ways to use microbes to improve your health.

Restoring Balance • One of the big jobs for our helpful microbes is to take up space. They live in places in the body that might otherwise be filled by harmful microbes that can cause disease, says Dr. Yasmine Belkaid, an **immune system** expert at NIH. "This is one way your microbiome prevents infection," she says.

Your immune system normally attacks microbes that get into the body. But people grow up with their microbiome, Belkaid says. Many microbes are acquired from your mother at birth. So your immune system recognizes them as friendly and doesn't attack them.

If these helpful microbes aren't thriving, harmful ones can move in. But studies have shown that helpful microbes can be restored.

For example, people with a skin condition called eczema often have changes in their skin microbes. NIH researchers tested spraying a type of bacteria onto the skin of people with eczema. They found that it improved symptoms, including itching and rashes.

Your gut hosts lots of microbes. These can be thrown out of balance by many things, including antibiotics and diet. That can make room for harmful ones to grow.

One especially dangerous microbe is a type of bacteria that can grow in the intestines called *Clostridioides difficile*. *C. difficile* can cause fatal diarrhea, especially in older adults. It's often resistant to treatment.

Researchers have developed a type of treatment for *C. difficile* infection called fecal microbial transplant. A patient is given microbes from the large intestine of a healthy person. This is done by transferring stool (poop) via tubes or pills.

Researchers don't yet know exactly which of the microbes are needed for a healthy gut microbiome. So for now, they transfer the entire microbiome.

"Fecal transplants are a full-spectrum treatment. We're just trying to change things wholesale," says Dr. Gary Wu, a gut-health expert at the University of Pennsylvania.

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Definitions

Immune System
The body's defense against germs and microscopic threats.

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Wu is part of a nationwide team that's tracking the use of fecal transplants for *C. difficile*. In a nationwide study, they found that about nine out of 10 people who received fecal transplants were cured of *C. difficile*. "It works marvelously well for treating this infection," Wu says.

The team continues to track people who have had fecal transplants. They want to learn more about its long-term safety.

Researchers are also testing this treatment for other conditions. These include IBD and other conditions that cause gut **inflammation**.

Wu says scientists are working on more targeted treatments to repair or replace a damaged gut microbiome. Different collections of microbes grown in the lab may eventually be tailored to treat different gut diseases. "That's going to be the next generation of treatments," he says.

Definitions

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

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Editor Harrison Wein, Ph.D.

Managing Editor Tianna Hicklin, Ph.D.

Graphics Alan Defibaugh (illustrations), Bryan Ewsichek (design)

Contributors Erin Bryant and Sharon Reynolds

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National Institutes of Health
NIH...Turning Discovery Into Health®

Office of Communications & Public Liaison
Building 31, Room 5B52
Bethesda, MD 20892-2094
email: nihnewsinhealth@od.nih.gov
phone: 301-451-8224

Microbes and Obesity • Microbes in the gut do much more than just take up space, says Chang. "Gut microbes help regulate our metabolism—the digestion, absorption, and use of nutrients," he explains.

His research team and others study proteins that gut bacteria release into the bloodstream. "These tell us how much we eat, when to eat, and what to eat," he says.

This communication between our cells and our microbes seems to play a role in obesity. Chang and others have shown this in mice. They transplanted gut microbes from mice fed a high-fat diet into lean mice without any microbes. The lean mice then processed dietary fat differently and gained weight.

It's not yet understood exactly how microbes help control metabolism. "But if we figure out how, that could be a game changer in preventing diet-induced obesity," Chang says.

Keep Your Microbes Healthy • Researchers have started testing whether altering microbes can impact other areas of health.

Belkaid and her team found that changing the gut microbiome may improve how well a certain cancer treatment works. They're also doing studies in mice to see if changing a female's microbiome during pregnancy can boost her offspring's immune system.

For now, what can you do daily to keep your helpful microbes healthy? "Diet is the major driver that shapes a person's microbiome," Chang says. Fortunately, your microbes respond quickly to changes in diet.

The dietary fiber found in plants is especially good for your gut bugs, says Belkaid. "One of the best things we can do for our microbes is to eat a healthy and diverse diet, and make sure it's rich in fiber," she explains.

Some types of foods may harm our microbiome, Belkaid adds. "These include foods high in carbohydrates, rich in sugar, or with too many artificial components," she explains. "These can enrich for microbes that are bad for your health."

"The microbiome is an extraordinary ally. It's a healthy partner in helping the body function," Belkaid says. See the Wise Choices box for other tips to help keep this partner healthy. ■

Wise Choices
Protect Your Body's Microbes

- **Take antibiotics exactly as prescribed.** Antibiotics are life-saving medicines. But they can also disrupt the healthy balance of microbes in your body.
- **Eat a diet high in fiber.** Fiber is found in plants, including fruits, vegetables, and whole grains.
- **Limit foods that can hurt your gut microbes.** These include sugar and fatty or highly processed foods.
- **Wash your hands** when preparing food, before eating, or after handling pets or garbage. Learn more at www.cdc.gov/handwashing.
- **Use hand sanitizer when you can't use soap and water.** Be sure it contains at least 60% alcohol. But washing with soap and water cleans more effectively.
- **Avoid antibacterial soaps and other products.** These have little or no health benefit. But they can harm the protective microbes on your skin.
- **Be wary of "probiotics."** These products can be food or supplements. They may claim to restore a healthy microbe mix, but many have not been properly studied. Learn more at go.usa.gov/x6szS.

Web Links

For more about the microbiome, see "Links" in the online article: newsinhealth.nih.gov/2021/08/your-bodys-bugs

Funky Fingertips?

What Nails Say About Your Health

Clues about your health could be right at your fingertips. Take a look at your nails. They could give insight about possible health concerns.

Many nail changes are normal and nothing to worry about. But sometimes changes in the way your nails look and grow can be a sign of disease. Nails are actually specialized skin cells. They're made of keratin, a protein also found in your hair and skin.

"Nails aren't just for appearances," explains New York University's Dr. Mayumi Ito, who studies how skin cells regenerate. Your nails protect the ends of your fingers and toes. They also help you grip objects and pick off small things. It would be harder to turn the pages of a book or pick up a thread without fingernails.

The part of the nail you can see is called the nail plate. Nails grow from a region at the base of the nail under the skin called the nail matrix. Here, new nail cells are made and packed together. Older nail cells are then pushed to the surface of the fingertip. Ito was the first to identify the **stem cells** in the nail matrix that cause nails to grow.

Certain things can affect nail growth. A serious illness or fever can halt the process. The interruption can cause indentations that run horizontally across nails. These are called Beau's lines. They can also result from injury to the nail, some vitamin deficiencies, and chemotherapy.

Tiny pits in the nail can also be a sign of disease. It's common among people who have psoriasis. Psoriasis is an **autoimmune disease** that causes red, scaly patches of skin. Nail pitting is also linked to an autoimmune condition that causes hair loss, called alopecia areata.

If your nails start to scoop inward like a spoon, you may not be getting enough iron. Spoon-shaped nails, or koilonychia, can be a sign of iron-deficiency anemia. Because of a lack of iron, your body can't make enough of the molecule that red blood cells need to carry oxygen.

Nail clubbing, where the nail tips enlarge and curve around the tip, is another nail problem. It could be a harmless trait that runs in your family. But it's also linked to lung and heart problems.

Changes in nail color are common. Yellow nails are often caused by nail fungus. In some cases, they can point to something more serious like lung disease. If you notice your nails have become mostly white, it may just be a sign of aging. But sometimes it's due to serious conditions like liver and kidney disease or diabetes.

Dark streaks running down the length of the nail that appear suddenly should be checked to rule out skin cancer. Certain infections, especially of the heart, can cause red streaks to appear under the nails.

Talk with your health care provider if your nails start to look abnormal. Your doctor may send you to see a dermatologist. This type of doctor specializes in diseases that affect the skin and nails.

For things you can do to keep your nails healthy, see the Wise Choices Box. ■

Wise Choices

Preventing Nail Problems

- Try not to bite, pick, or tear at your nails.
- Clip hangnails. Be careful not to tear or remove cuticles, as that may lead to an infection.
- Keep your fingernails dry and clean to prevent bacteria from growing under nails.
- Moisturize your nails and cuticles with hand lotion.
- Limit your use of harsh nail care products like nail polish remover.
- Ask your health care provider about medicines that can help with abnormal nails. If you have a nail infection, you may need antifungal or antibacterial drugs.

Definitions

Autoimmune Disease
A condition in which the body's immune system mistakenly attacks and destroys the body's own cells.

Stem Cells
Cells that have the potential to develop into many different cell types in the body.

Web Links

For more about fingernails and health, see "Links" in the online article: newsinhealth.nih.gov/2021/08/funky-fingertips

Health Capsules

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

Single-Shot COVID-19 Vaccine Protects Against Variants

Vaccines against COVID-19 were developed early in the pandemic. But the virus has been changing. Now there are different versions, called variants, all over the world. Researchers found that the single-shot COVID-19 vaccine still protects against new variants.

In the study, 20 volunteers received the Janssen/Johnson & Johnson vaccine. Researchers took blood samples about two months later.

The samples were tested for different cells and antibodies that can fight the disease. The team looked at whether these provided protection against the original virus. They also looked for protection against the alpha, beta, and gamma variants.

Overall, the vaccine offered strong protection against both the original virus and the variants. The team found lower amounts of neutralizing antibodies to the variants than to the original virus. These are a type of antibody that can block infections. But other immune responses were similar.

"These data show that this vaccine has strong protection against many of the COVID-19 variants in the world today," says Dr. Dan Barouch from Beth Israel Deaconess Medical Center.

A follow-up study showed protection against other variants, including the delta variant. More research is still needed to better understand how the body fights off COVID-19. ■

Understanding Heart Inflammation

Inflammation is your body's response to infection or injury. Ongoing inflammation can cause many serious health problems. When it affects your heart muscle, it's called myocarditis.

Myocarditis can affect small or large sections of the heart muscle. Severe cases may cause abnormal heart rhythms or make it harder for the heart to pump blood. That can lead to heart failure.

Symptoms of myocarditis can include chest pain, fast or abnormal heartbeat, shortness of breath, and swelling in your feet or legs.

Viral infections are a common cause of myocarditis. Other infections can also cause the condition. These include bacteria, fungi, or parasites.

Myocarditis may also be a part of an autoimmune disease. This happens when your body's disease fighting system, called the immune system, mistakenly attacks and destroys your own cells.

Certain medications can also put you at risk for myocarditis. A health care provider can diagnose the disease with a physical exam, blood tests, and tests of your heart function. The cause of the disease will determine your treatment.

Mild cases of myocarditis might only require rest, close monitoring, and follow-ups with the doctor. More severe cases may need medication.

If you're diagnosed with heart inflammation, it's important to follow your treatment plan and receive follow-up care. Talk to your health care provider if you have any concerns about your heart health.

For more information, visit: www.nhlbi.nih.gov/health-topics/heart-inflammation. ■

Featured Website

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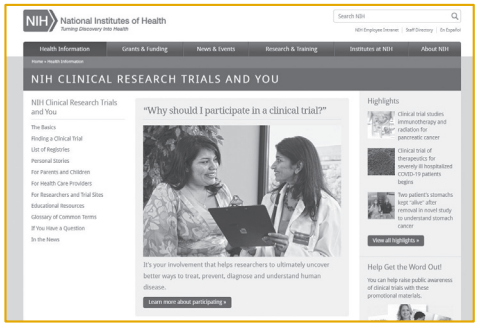

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