

NIH News in Health

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Digging Into Vitamin D All About the “Sunshine” Vitamin

Getting enough vitamins and minerals is important for your health, and there’s a long list of essential ones. Vitamin D is one you may hear a lot about. It helps your body absorb calcium, a mineral your body needs to build strong bones. Your heart, muscles, and nerves also need vitamin D. Even your **immune system** uses vitamin D to fight off germs. But just how much do you need?

“We actually need only small to moderate amounts of vitamin D, not mega-doses,” says Dr. JoAnn Manson, a vitamin D expert at Brigham and Women’s Hospital and Harvard University.

Current guidelines recommend adults get 600 to 800 IUs (international units) of vitamin D each day. Those amounts are very important. Not getting enough can lead to serious health issues. Children’s bones can’t develop properly without enough vitamin D. In adults, a long-term deficiency can lead to fragile bones, or osteoporosis.

It’s important to make sure you get enough vitamin D. But scientists are finding that more isn’t always better.

Where to Get It • You can get vitamin D from the sun and from your



diet. Your body makes vitamin D when your skin is exposed to the sun, which gives off UVB light.

But many people don’t go outside enough to get all the vitamin D they need this way. Other factors, such as clothing and sunscreen, can block how much vitamin D your skin makes when you’re in the sun.

How much melanin you have also plays a role. Melanin is a pigment that gives your skin color. Higher melanin levels cause darker skin complexions. The more melanin you have, the less vitamin D you can make from sunlight. This may put you at potential risk for vitamin D deficiency.

Sunlight exposure isn’t the only way to get vitamin D. Vitamin D is found naturally in some foods, like fatty fish. It’s also added to many dairy products and other fortified

foods (see the Wise Choices box).

With so many potential sources, most people in the U.S. aren’t at risk for vitamin D deficiency. But getting enough vitamin D from foods can be difficult for some. These can include breastfed infants and people with certain gut problems that limit how nutrients are absorbed.

Older adults can be at risk of vitamin D deficiency, too. “As we age, our ability to make vitamin D in the skin declines,” says Dr. Sarah Booth, a nutrition researcher at Tufts University. Older adults may also be less likely to get outdoors.

Experts don’t recommend screening healthy people for vitamin D. But if you’re in a high-risk group, talk with a health care professional. Vitamin D levels can be measured with a blood test. Vitamin D supplements are sometimes recommended for very low levels.

Is More Better? • Although most people get enough vitamin D to avoid deficiencies, researchers have long wondered if adding extra vitamin

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Definitions

Immune System

The system that protects your body from invading viruses, bacteria, and other microscopic threats.

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D could be good for overall health. Many studies have linked higher levels of vitamin D in the blood with healthier outcomes.

Manson and her team conducted a large clinical trial, called VITAL, to see whether vitamin D supplements could lower risk for some health problems. They compared health outcomes for over 25,000 people in the U.S. Participants were randomly assigned to two groups: half were given vitamin D supplements and half were given a placebo (an inactive pill that looked similar).

After five years, both groups had the same risk for most of the health problems studied. These problems included heart disease, cancer, depression, and bone fractures.



Definitions

Autoimmune Disease

A condition in which the body's disease defense system mistakenly attacks the body's own cells and tissues.

Cognitive

Related to the ability to think, learn, and remember.

NIH News in Health

ISSN 2375-6993 (Print) ISSN 1556-3898 (Online)

Editor Harrison Wein, Ph.D.

Managing Editor Tianna Hicklin, Ph.D.

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

Contributors Vicki Contie and Sharon Reynolds

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

“So, the vast majority of healthy people did not benefit from vitamin D supplements,” Manson says. “But we didn’t find any risk from the 2000 IUs per day that we tested.”

Other studies have also shown that taking moderate doses daily is safe over the long term. “However, at higher doses you’re going to have to start to worry about risks,” Manson warns. The upper daily limit for vitamin D is 4,000 IUs daily. Consuming more can lead to side effects like kidney stones, nausea, vomiting, and muscle weakness.

Too much vitamin D is almost always a result of taking too many supplements. But for people who can’t get enough vitamin D from the sun or their diet, vitamin D dietary supplements in moderation can help prevent a deficiency.

Finding New Uses • Scientists continue to study how vitamin D can help people, since it plays a role in many of the body’s functions.

Manson’s team is following up on their findings in VITAL that suggest taking vitamin D supplements may lower the risk for developing an **autoimmune disease** or advanced cancer. They’re also testing whether vitamin D can reduce the risk of COVID-19 infection, severe COVID symptoms, and Long COVID.

Booth and her team recently found that older adults with more vitamin D in their brains had a lower risk of dementia. But the study couldn’t tell whether vitamin D caused the lower risk. Her team is now doing more research to better understand how vitamin D affects brain health.

She thinks the answer is likely to be complicated. “Vitamin D is important,” Booth says. “But there’s no evidence that a single nutrient will slow **cognitive** decline or prevent Alzheimer’s disease.”

Another research team, led by Dr. Sushil Jain at Louisiana State

University, is investigating the connection between diabetes, vitamin D, and a molecule called glutathione. Glutathione helps the body use vitamin D efficiently.

Black Americans have a relatively high risk of both vitamin D deficiency and diabetes. They’re also more likely to have low levels of glutathione. Jain’s team is testing if boosting both glutathione and vitamin D levels can help prevent diabetes in Black study participants.

For now, most people concerned about vitamin D would get the greatest benefit from living a healthy lifestyle, Manson explains. This includes getting outside, being physically active, not smoking, and eating a variety of healthy foods rich in vitamin D.

“A dietary supplement will never be a substitute for a healthy diet or a healthy lifestyle,” she says. ■



Wise Choices

Get More Vitamin D

Vitamin D can be found in many foods and beverages:

- **Fatty fish.** Trout, salmon, tuna, mackerel, sardine, and fish liver oils naturally contain high amounts of vitamin D.
- **Dairy milk.** Almost all cow’s milk in the U.S. is fortified with vitamin D. But be sure to check the label.
- **Some plant-based milks.** Some brands of soy, almond, oat, or other milk alternatives are fortified with vitamin D. See the labels for how much they include.
- **Many brands of breakfast cereals, orange juice, yogurt,** and other foods also contain added vitamin D.
- **Egg yolks, cheese, and mushrooms.** These foods naturally contain a small amount of vitamin D.



Web Links

For more about vitamin D, see “Links” in the online article: newsinhealth.nih.gov/2023/04/digging-into-vitamin-d

Fishing for Clues to Human Health

Tiny Zebrafish Give Big Insights

The difference between a little fish and a human may seem enormous. But in some ways, fish and people are surprisingly similar. That's why scientists around the world have been studying a striped fish called the zebrafish. These little fish—about an inch or two long when fully grown—have a lot to teach us about human health.

Like us, fish have a spine, brain, heart, gut, ears, eyes, and other organs. Fish and people use similar processes for eating, moving, fighting germs, and more. And fish and people change in very similar ways from a fertilized egg to a developing embryo.

In recent decades, zebrafish research studies have led to important insights about cancer, heart disease, and stroke. They've also shed light on conditions like anxiety and autism. Zebrafish have even helped scientists find and test potential new drugs.

"Zebrafish are a good model for humans in many ways," says Dr. Brant Weinstein, an NIH expert in zebrafish biology. "We have a lot of the same **genes** as zebrafish. We

have a lot of the same organs and **tissues**. And we develop in much the same way, using the same genes and processes."

In fact, zebrafish and people share more than 70% of their genes. So they're ideal for studying how various genes can affect the health of both fish and people.

Zebrafish have other traits that are helpful to researchers. They grow up quickly, from a single cell to a free-swimming larval (baby) fish within a few days. And they're transparent during these early life stages. "You can literally see right through them and watch as all their organs develop," Weinstein says.

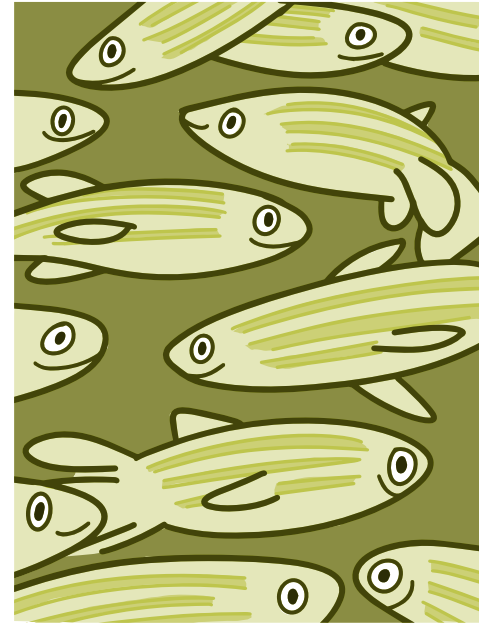
Researchers can add genes that make various tissues glow in a rainbow of colors as the fish mature. "The colors make it easy to track how various tissues grow and change inside living animals," Weinstein explains.

Scientists can even add genes that make living brain cells glow when they're active, giving new insights into how the brain works.

Unlike humans, zebrafish can regrow damaged limbs and other body parts. Scientists are working to better understand this ability. What they learn could help to improve human treatments for injuries, burns, and even vision or hearing loss.

"If you uncover a process or treatment that works in zebrafish, that's a good basis for moving forward to see if the same thing also happens in other animals or even people," Weinstein says. "The fish can give you early evidence that you're on the right track—that a particular therapeutic approach might be useful."

Weinstein and his team study the basic biology of blood vessels. Blood vessels can play roles in heart disease and cancer, because tumors



can't grow without a blood supply. The researchers found a way to block key proteins that fuel the growth of new blood vessels in zebrafish. Then they showed that blocking those proteins in mice could reduce tumor growth. These findings suggest new ideas to improve cancer treatment.

It's important to uncover such basic processes that are essential to life, even if it doesn't immediately lead to a new treatment or cure.

"We don't always know where new findings in zebrafish might lead," Weinstein says. "But they lay the foundation for future discoveries that can improve human health." ■



Wise Choices

Why Study Zebrafish?

- **Transparency.** Scientists can watch how the fish's internal organs grow and change.
- **Regeneration.** Understanding how fish repair body parts can help improve human treatments.
- **Similar genes.** Zebrafish can help researchers figure out which genes cause human illness.
- **They can glow!** Scientists can add genes to zebrafish to make certain cells or tissues glow different colors. This can reveal new details about how tissues and organs develop.



Definitions

Genes

Stretches of DNA you inherit from your parents that define features, such as eye color or your risk for certain diseases.

Tissues

Groups or layers of cells that work together to perform specific functions.



Web Links

For more about zebrafish, see "Links" in the online article: newsinhealth.nih.gov/2023/04/fishing-clues-human-health





Health Capsules

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

3D Repairs for Damaged Skin

To repair burns and other skin injuries, surgeons can grow new patches of skin in the lab. But these patches are usually small, and their shapes are limited. Using such patches on complex structures like the hands or face requires lots of cutting and stitching. This can cause damage and scarring.

Researchers are working to find ways to grow 3D skin in the shape of complex body parts. In a new study, a team tested a system to grow skin in the shape of a human hand. They also grew 3D skin grafts to

fit the shape of mouse legs. These “wearable” skin grafts are designed to fit on the body like clothing.

The researchers scanned body parts and then used 3D printers to create hollow scaffolds in the desired shapes. Then they grew skin cells on the scaffolds. The cells were bathed in different liquids to encourage the growth of layers similar to natural skin.

After a month, the grafts had a uniform covering of outer skin cells. When tested, the new 3D skin was stronger than standard flat grafts.

The team finally tested their 3D grafts by transplanting them onto injured mouse legs. The mice regained full functioning of their legs within four weeks.

“Three-dimensional skin grafts that can be transplanted as ‘biological clothing’ would have many advantages,” says Dr. Hasan Erbil Abaci of Columbia University, who led the study. “They would dramatically minimize the need for stitches, reduce the length of surgeries, and improve the look of repaired skin.” ■

What Is Menopause?

Menopause is the time when a woman’s menstrual periods stop for good, and she can no longer get pregnant. You’ve reached menopause when you haven’t had a period for one year. It’s a normal part of aging. But the transition to menopause affects every woman differently.

The menopausal transition often begins between ages 45 and 55. It can last for many years. During this time, women may notice changes to their periods. They may have hot flashes,

sleep problems, and mood changes. They may also have problems with bladder control or weight gain. Sex may be uncomfortable. Body changes during this transition can also raise the risk for certain health problems, like heart disease or osteoporosis.

For some women, symptoms are mild and need no treatment. Lifestyle changes can help to relieve certain symptoms. But if symptoms are severe or bothersome, it’s a good idea to talk with a doctor about treatment.

After menopause, symptoms may continue for years. Deciding whether and how to treat these symptoms can be complicated and personal. The benefits and risks of some treatments may vary, depending on your medical and family history.

Learn more about the changes that happen during the menopausal transition. Get links to more information, including videos and shareable infographics. Visit www.nia.nih.gov/health/what-menopause. ■



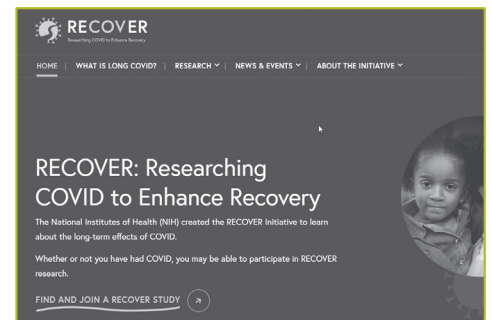
Featured Website

RECOVER: Researching COVID to Enhance Recovery

recovercovid.org

Some people who’ve had COVID develop lasting health problems. NIH created the RECOVER Initiative to learn more about this condition, called Long COVID.

Thousands of children and adults have joined the RECOVER studies. You may be able to participate, too. Learn more and sign up for email updates about research findings.



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