

# NIH News in Health

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## To Heal a Wound Helping the Skin Fix Itself

You've likely had countless cuts and scrapes in your life. Normally, when you get a small skin wound, your body can repair it quickly. But sometimes, the repair process doesn't work properly. If this happens, even a tiny tear in the skin can have trouble healing. That can lead to pain and distress and pose a risk for dangerous—or even deadly—infections.

Wounds that don't heal for three months or more are called chronic wounds. Your risk for getting a chronic wound increases with age. But there are ways you can help your body to heal.

**Rebuilding Skin** • When you have an open wound, blood can get out of the body, and germs can get in.

“So the body's goal is to seal that wound as quickly as possible,” says Dr. Maria Morasso, a skin biology researcher at NIH.

This normally involves an orderly series of steps. First, a clot forms over the wound to prevent blood loss. Next, cells from the **immune system** move into the area. These remove dead and damaged cells



from the wound. This makes room for new, healthy cells. Immune cells also fight off any germs in the area, like bacteria. This process causes inflammation—heat, swelling, and redness—around the wound.

The body next starts to make new cells to replace the damaged tissue. Finally, your skin begins to heal and creates a scar. This process is called remodeling.

Too much scarring can cause problems after a wound heals. Large scars may prevent nearby muscles and joints in the body from working properly. Scientists are looking for ways to help minimize this scarring.

Not all tissues in the body scar, explains Dr. Kaitlyn Sadtler, who studies the immune system at NIH. For example, the liver and the tissues inside the mouth can heal perfectly. Her lab and others are studying these tissues to find ways to coax other organs to grow back better.

**Roadblocks to Healing** • There are different ways the wound-healing process can go wrong. For example, too little or too much inflammation can lead to problems, Morasso explains.

Too much inflammation can damage nearby tissue. It can also prevent immune cells in a wound from working the way they're supposed to.

If immune cells aren't working properly or if there's too little inflammation, new tissue may not form over the wound. Then your body may not be able to protect

itself from germs. If germs get into a wound, infection can set in. Untreated infections can lead to serious complications and become life-threatening.

Health conditions that interfere with blood flow around a wound can also affect the healing process. These conditions include diabetes or problems with blood vessels, such as varicose veins. Smoking, obesity, and aging can also make wounds heal more slowly. Slow healing can put you at higher risk of developing a chronic wound.

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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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If you have diabetes, getting your blood glucose (or blood sugar) under control is crucial for healing, explains Dr. Geoffrey Gurtner, a surgeon who specializes in wound healing at the University of Arizona. High blood glucose levels “make a wound-healing problem much worse,” he says.

People with diabetes are at high risk of developing chronic wounds on their feet called foot ulcers. So it’s important to wear well-fitted shoes and check your feet regularly. This is true for everyone with diabetes, whether or not your blood glucose is under control, Gurtner says. But it’s especially important if you have nerve damage to your feet.

People with blood vessel problems may be advised to wear compression stockings to help stop small wounds from forming. And everyone can take steps to keep small cuts and scrapes clean and healthy. See the Wise Choices box for more about wound care.

If you have a wound that won’t heal, talk with your doctor. They may consider removing some of the old, damaged tissue to start

the healing process again. Or, they may give you special bandages or antibiotics. Some people may need surgery to place new skin over the wound or a special type of cast. But new treatments are needed to help chronic wounds heal better, Gurtner says.

**Finding New Treatments** • Researchers are working to develop new ways to treat chronic wounds. Morasso and her team are comparing mouth wounds—which heal very rapidly—with normal skin wounds and nonhealing wounds.

Her team’s recent study showed that diabetic foot ulcers lacked two proteins that are found in wounds that heal normally. Because the proteins were missing, immune cells weren’t able to move into the wounds.

“If we can find key proteins, we could target them with drugs to increase or decrease them as needed,” says Morasso. “This could help boost healing.”

Sadtler and her lab are studying how biomaterials can help wound healing. Biomaterials can be made from substances found in the human body or synthetically designed. Her team is testing whether biomaterials can be engineered to release different drugs at different times. These drugs would draw different immune cells into a wound in the order they’re needed for healing.

“Immune cells are the body’s defenders. But they’re also the construction workers that help build new tissues,” Sadtler explains. “We’re looking at how we can use them to heal wounds and prevent scar tissue.”

Researchers are working on “smart bandages” that could help wounds heal, too. These use features like electrical stimulation to boost wound healing. Smart bandages can

also monitor wounds for signs of infection in real time.

Gurtner and others recently tested smart bandages in mice. They found that wounds underneath the bandage healed faster than those covered with a normal dressing.

“I think we’re going to see this type of bandage in the clinic in the near future,” Gurtner says.

For now, he encourages anyone with a wound that’s not healing to ask their doctor for a referral to a wound-care center if possible.

“These exist in most communities now,” he says. “Having the kind of coordinated care they provide really makes a big difference for helping wounds heal.” ■



## Wise Choices

### Take Care of Injured Skin

- **Keep open wounds clean.** Washing thoroughly with soap and clean water reduces the potential for infection.
- **Remove jewelry or clothing** that could further irritate the wound.
- **Apply a bandage.** Keeping the wound clean and protected reduces the chance of infection. Don’t cover wounds that can’t be cleaned, like bites or deep punctures, and see a health care provider.
- **Check the wound** every 24 hours for signs of infection. These include redness, swelling, or oozing. See a health care provider if your wound becomes infected.
- **Seek immediate medical care** if you have fever, increasing pain, shortness of breath, fast heart rate, confusion, or disorientation.

*Adapted from the U.S. Centers for Disease Control and Prevention (CDC).*

## NIH News in Health

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

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**Web Links**

For more about wound healing see “Links” in the online article: [newsinhealth.nih.gov/2023/10/heal-wound](https://newsinhealth.nih.gov/2023/10/heal-wound)

# Stamping Out Superbugs

## A Clear and Present Danger

Bacteria are found nearly everywhere. They're in your food, recreational waters, and even the air. Some bacteria help keep you healthy. But some can make you very sick.

If you're healthy, your body may fight off harmful bacteria on its own. But sometimes you need antibiotics. These are drugs that kill bacteria or stop them from growing. They can be critical for preventing or fighting a life-threatening disease. But over time, bacteria can become resistant to drugs that are misused or overused. That means that the drug will no longer stop them.

In the U.S., drug-resistant bacteria infect nearly 3 million people and kill more than 35,000 every year. These "superbugs" have evolved to

protect themselves against drugs. This can happen through changes in their **genes**. Sometimes antibiotics don't stop all the bacteria in an infection. Any bacteria that survive will continue to multiply. They may gain further drug resistance.

This makes it even more difficult to control them with antibiotics.

Drug-resistant infections pose many dangers. Bacteria that are resistant to one drug may still be treatable with stronger drugs. But these backup drugs can have more serious side effects. Bacteria that become resistant to too many drugs may be untreatable. Some medical procedures that carry a high risk of infection, like organ transplants, may become more dangerous without effective antibiotics.

Researchers are studying new ways to fight superbugs. Some are working on novel antibiotics. Another strategy uses phages, which are viruses that attack bacteria.

A team led by Dr. Vance Fowler, an infectious disease expert at Duke University, is leading a study of a phage mixture that attacks *Pseudomonas aeruginosa* bacteria. These bacteria tend to spread in hospitals and other health care settings. They're often resistant to many antibiotics. Fowler's team is testing whether phages can be used to treat people with the infection.

They're also working on a rapid test that can tell the difference between infections caused by bacteria and those caused by viruses. Doctors could use the test to decide how to treat the infection. That could help avoid unnecessary antibiotic prescriptions.



Antibiotics don't work against viruses. Viruses cause common colds and the flu, but some bacteria can cause similar symptoms. Sometimes, doctors must prescribe antibiotics before they have the test results that confirm a bacterial infection.

"When you have a critically ill patient in front of you, and you are not going to know what you're treating for several days, you have to make a decision," Fowler explains. Not starting treatment immediately can lead to life-threatening infections. But giving antibiotics to a patient who doesn't need them can also cause problems. They can cause side effects and lead to superbugs.

There are ways people can help guard against superbugs. Use antibiotics only when they're needed. If a doctor doesn't prescribe antibiotics, don't pressure them to change their mind. And when you do get antibiotics, take them exactly as prescribed.

The best way to protect yourself and your family against harmful bacteria is to avoid infection in the first place. See the Wise Choices box for tips. ■



### Wise Choices

#### Guard Against Bacteria

- Maintain a healthy lifestyle, including proper diet and exercise. This can help prevent illnesses.
- Get all recommended vaccinations. To learn more, visit [www.cdc.gov/vaccines/schedules](http://www.cdc.gov/vaccines/schedules).
- Wash your hands with soap and water regularly.
- Cover your mouth when you cough or sneeze. Stay home when you're sick.
- If you're prescribed an antibiotic, take it exactly as instructed by your doctor. Don't share your antibiotics with others or save them for future use.
- Don't pressure your doctor to prescribe an antibiotic or take antibiotics prescribed for someone else. Overuse and misuse of antibiotics can create drug-resistant bacteria.

Adapted from the U.S. Centers for Disease Control and Prevention (CDC).



### Definitions

#### Genes

Stretches of DNA that define an organism's characteristics.



### Web Links

For more about antibiotic resistance and an online-only Q&A, see "Links" in the online article: [newsinhealth.nih.gov/2023/10/stamping-out-superbugs](https://newsinhealth.nih.gov/2023/10/stamping-out-superbugs)



## Health Capsules

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

### Treating Hearing Loss to Help Brain Health

More than 6 million people in the U.S. are living with dementia. The condition causes loss of thinking abilities, memory, and other cognitive skills. Safe and affordable ways to prevent or slow the age-related loss of brain health are greatly needed.

Past studies have linked hearing loss to the development of dementia. So, treating hearing loss may be a way to slow or prevent brain problems. A new study tested whether hearing aids could help.

Researchers recruited nearly

1,000 older adults with substantial hearing loss. Half of them were given hearing aids. The other half received an education program about healthy aging. The researchers then measured cognitive decline over the next three years.

Participants who received hearing aids found that their ability to communicate improved. Those in the other group saw no improvement. Overall, both groups had similar rates of cognitive decline. However, people at increased risk of developing dementia, such as those

with diabetes or high blood pressure, benefited most from the hearing aids. Among these, the people with hearing aids had about half the rate of cognitive decline as those who had similar risks but didn't get hearing aids.

"Hearing loss is very treatable in later life," says Dr. Frank Lin from Johns Hopkins University. "We recommend for general health and well-being that older adults have their hearing checked regularly and any hearing issues properly addressed." ■

### What is Palliative Care?

Palliative care is a specialized type of medical care for people who have a serious or life-threatening illness. It can help relieve pain, discomfort, stress, and other symptoms. It aims to improve quality of life when a person is seriously ill.

You may receive palliative care while getting treatment for a serious illness. It can help you deal with side effects of medical treatments. You might consider it if you have pain or other symptoms caused by any serious illness. This can include

cancer, heart disease, multiple sclerosis, kidney failure, and more.

Palliative care can be provided in a hospital, during outpatient visits, or at home. It involves a team of specialists who focus on ways to improve quality of life for patients and their families. The team may include doctors, nurses, social workers, nutritionists, and others.

Palliative care is different from hospice care. Hospice focuses on the final months of life. People in hospice always receive palliative care to help

relieve suffering. But you don't have to be at the end of life or in hospice to receive palliative care.

If you think you might need palliative care, talk to your health care provider. Ask how to access palliative care in your area. You may need a referral to get palliative care services. It's never too early to start palliative care if you have a serious illness.

Learn more about palliative care by visiting [go.nih.gov/NIHNIHOct-23PalliativeCareHospice](https://go.nih.gov/NIHNIHOct-23PalliativeCareHospice). ■



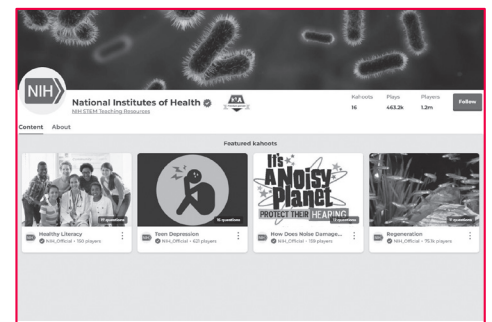
### Featured Website

NIH Interactive Quizzes

[bit.ly/nihkahoot](https://bit.ly/nihkahoot)

Test your knowledge of science and human health. NIH has partnered with the *Kahoot!* gaming platform to create free, interactive

quizzes for K-12 teachers and learners. Topics include super-bugs, health literacy, lung health, and more.



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