

# NIH News in Health

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## Mouth Microbes The Helpful and the Harmful

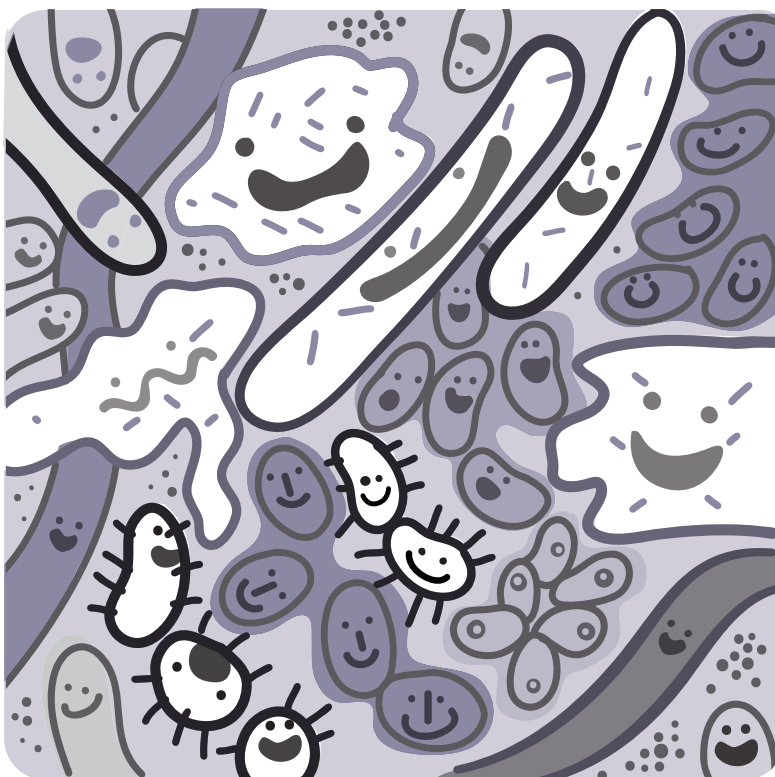
Do you know what's in your mouth? It's home to about 700 species of **microbes**. These include germs like bacteria, fungus, and more.

"Everybody has these microbes in their mouth," says Dr. Robert Palmer, an NIH expert on oral microbes.

Some microbes are helpful. Others can cause problems like tooth decay and gum disease. Troubles begin when microbes form a sticky, colorless film called plaque on your teeth.

Brushing and flossing help to keep your mouth clean. But after you brush and floss, germs grow again and more plaque forms. That's why you need to clean your mouth regularly.

**Community Growth** • Different microbes grow in different places. Some stick to your teeth. Others prefer your tongue. Some lurk in the tiny pockets between tooth and gum. Once they've found their homes, they form diverse communities with the other germs.



Mouth microbes work together to protect themselves with a slimy, sticky material called a matrix. The matrix in plaque makes it harder to remove it.

The communities within the matrix include both helpful and disease-causing microbes. The good microbes help keep the growth of bad microbes in check. Good microbes also help you digest food and can protect against harmful microbes in food.

Certain things you may be doing can help bad microbes grow better than the good ones. Sugary foods and drinks feed some microbes and help them increase in number and spread out.

Some of these sugar-loving microbes can turn sugar into matrix and acid. The acid destroys the surface of your teeth. The more sugar in your diet, the more fuel is available for these microbes to build up plaque and damage teeth.

"It's more productive to think about the community than it is to think about the single microbe that causes disease," Palmer explains.

You can't stop tooth decay by getting rid of just one type of acid-making microbe. There are several different types of microbes in the plaque that make acid.

The good news is that limiting sweets and brushing and flossing regularly can help prevent bad microbes from growing out of control.

**Helpful Neighbors** • "Many bacteria in our mouths depend on help from other members of their community to survive and prosper," says Dr. Floyd Dewhirst, a dental

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### Definitions

#### Microbes

Microscopic germs like bacteria, fungus, and viruses.

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expert who studies microbes at the Forsyth Institute.

Because microbes grow in communities, it's important to understand how both helpful and harmful microbes work. Dewhirst's team is trying to identify all the different germs living in the mouth and what they do.

Before the team can study a microbe, they have to figure out how to grow it. The challenge is that some microbes don't like to grow anywhere but in your mouth. About 30% of the 700 species haven't been grown in the lab yet.

Dewhirst's team is working on growing those microbes in the lab that no one has grown before. They're using **genetic** and other information to identify each one and learn more about them.



## Definitions

### Genetic

Having to do with genes, the stretches of DNA that instruct cells how to make proteins and perform other tasks.

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“The question is,” he says, “once you know who is there and have a quick way of identifying them, what are all of these bacteria doing?”

Dewhirst's studies have shown that some microbes make certain substances that help their neighbors grow. His team is trying to identify what those substances are.

They also want to find out how these microbes may affect people's health. Being able to grow microbes in the lab lets scientists run tests to figure out how they're involved in health and disease. This information could one day help scientists come up with better ways of preventing and treating oral diseases.

**Partners in Decay** • An important health problem caused by mouth microbes is early childhood tooth decay. “In the U.S., about 23% of our children between the ages of 1 and 5 are affected by this disease,” says Dr. Hyun (Michel) Koo, a dental researcher and oral health expert at the University of Pennsylvania.

Tooth decay can get worse very fast. The microbe matrix and acid from bacteria are thought to be the main cause of tooth decay in young kids.

Koo's team has found that there's also fungus in the plaque of kids with rampant tooth decay. The fungus partners with the matrix- and acid-making bacteria to worsen tooth decay.

“Bacteria by itself can cause tooth decay,” Koo explains. “But when fungus is there, it boosts up the entire machinery.”

Koo's team has shown that some fungus can get energy from sugar that bacteria release while making acid. The fungus then releases substances that feed the bacteria's growth. This helps the bacteria form an even tougher matrix and make more acid.



## Wise Choices

### Keep Mouth Microbes in Check

These tips can help prevent tooth decay and mouth infections:

- Brush your teeth with a toothpaste that contains fluoride.
- Floss away the plaque between your teeth.
- Don't forget to brush your tongue.
- Limit sugary foods and drinks.
- Drink fluoridated water. Learn about fluoride levels in your water at [nccd.cdc.gov/doh\\_mwf](http://nccd.cdc.gov/doh_mwf).
- Get regular dental exams and professional cleanings.

**Busting Plaque** • Koo's team is looking for new ways to fight plaque buildup and tooth decay. They've developed tiny substances, called nanoparticles, that are small enough to get inside and destroy the matrix that protects microbes. The nanoparticles can also kill the acid-making bacteria without harming good bacteria in the mouth.

Koo's team has shown that these tiny substances can reduce acid damage to the tooth surface. The researchers hope to test the approach in people in the future.

Nanoparticles are just one approach now being studied to prevent or treat mouth diseases.

Future technologies may help keep our mouths healthier. But there are many things you can do to keep bad mouth microbes in check now. See the Wise Choices box for some tips. You can't have a healthy body without a healthy mouth. ■



## Web Links

For more about mouth microbes, see “Links” in the online article: [newsinhealth.nih.gov/2019/05/mouth-microbes](http://newsinhealth.nih.gov/2019/05/mouth-microbes)

# Mingling Senses

## Synesthesia Explained

What does the color blue taste like? Does guitar music smell sweet or spicy? These questions might sound like nonsense. But for people with a condition called synesthesia, they describe real experiences.

We have five senses: touch, sight, taste, sound, and smell. Most people experience their senses one at a time. In synesthesia, one sense can be experienced at the same time as another. For example, a person with synesthesia might feel something rough brush against their hand every time they smell a flower.

They can also experience the same sense in two ways. For example, seeing letters or numbers in a specific color, like the letter “A” always being red no matter what color it’s written in. This is the most common type of synesthesia.

Synesthesia isn’t very common. It sometimes runs in families. This makes researchers think that **genes** may play a role.

Synesthesia isn’t dangerous, and rarely causes problems for people. Most people with synesthesia say they enjoy their special senses.

For researchers, “studying synesthesia allows us to think about what the brain does,” explains Dr. Krish Sathian, a neurologist at Pennsylvania State University.

Scientists don’t know what happens in the brain to cause synesthesia. “There are a few explanations that have been put forward,” Sathian says. These involve the way neurons talk to each other. Neurons are the brain cells that process information from the senses.



### Definitions

#### Genes

Stretches of DNA you inherit from your parents that define features, like your risk for certain diseases.



Some researchers think that people with synesthesia have extra connections between neurons in some areas of the brain. Others think that the direction that information can flow between brain cells might be different.

Sathian’s lab uses imaging tests to watch how the brain works. They’ve found that, even in people without synesthesia, the senses often work together in ways previously unrealized.

For example, when you touch an object and try to identify its shape, the part of your brain that processes sight becomes active along with the area that processes touch.

Sathian’s team showed that people had more difficulty sensing an object’s shape by touch when the brain area that processes sight was blocked using magnets.

His team has wondered if synesthesia is an extreme version

of these brain collaborations. They tested whether people with synesthesia are better at tasks that use more than one area of the brain. People with synesthesia performed faster at a task that linked language with a specific shape than people without the condition. But they weren’t any better at other tasks requiring more than one sense.

Synesthesia remains a mystery for now. But Sathian and other NIH-funded researchers plan to keep studying it. The condition may hold keys to understanding things that are fundamental to being human, such as language and memory.

“It’s been shown that people with synesthesia have better memories than people who don’t,” Sathian says. “Maybe understanding synesthesia could give us insight into some of the mechanisms that underlie memory. And then perhaps eventually to some better treatments for people who have memory disorders.” ■



### Wise Choices

#### Signs of Synesthesia

Synesthesia is different for everyone who has it. People with the condition may experience:

- Seeing certain letters or numbers in specific colors
- Having a certain taste in your mouth triggered by hearing a word
- Feeling a sensation of touch when you smell something
- Seeing a color or shape in response to hearing a sound



### Web Links

For more about synesthesia, see “Links” in the online article: [newsinhealth.nih.gov/2019/05/mingling-senses](https://newsinhealth.nih.gov/2019/05/mingling-senses)





## Health Capsules

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

### Making Up Sleep May Not Help

Catching up on sleep doesn't reverse damage to the body caused by sleep deprivation, according to a new study. In fact, so-called recovery sleep may make some things worse.

About one of every three adults regularly gets less than seven hours of sleep a night. Over time, lack of sleep can lead to changes in **metabolism**. These increase the risk for obesity and diabetes.



### Definitions

#### Metabolism

Chemical changes in the body that create the energy and substances you need to grow, move, and stay healthy.

Some people try to make up for a lack of sleep by sleeping more on their days off. A research team studied this strategy for two weeks in 36 men and women. After three nights of normal sleep, the participants were split into three groups.

The first group slept up to nine hours a night. The second group was allowed a maximum of five hours of sleep a night. The third group had a maximum of five hours a night for five days, but were then allowed to sleep in for two days. They then had two more days of sleep deprivation.

Those who had only five hours of sleep a night gained about 3 pounds on average during the study. They also had a 13% decrease in a

key measure of metabolism called insulin sensitivity. Insulin sensitivity is the body's ability to use insulin properly and control blood sugar levels.

Those who had recovery sleep gained about 3 pounds but had a 27% decrease in insulin sensitivity. Their natural body rhythms were also disrupted. They were more likely to wake up during the nights following the period of recovery sleep.

"Catch-up sleep does not appear to be an effective strategy to reverse sleep loss-induced disruptions of metabolism," says Dr. Kenneth Wright, Jr., who led the study at the University of Colorado. ■

### Getting a Genetic Test

Your doctor may suggest a genetic test to detect your risk of certain health problems, such as cancer. If you have symptoms of a disease, a genetic test may help with diagnosis.

Genetic testing looks for changes in genes. It's usually done in a lab using a blood sample. Thousands of genetic tests are currently available.

Deciding whether to get a genetic test isn't easy. It's important to

consider what you may learn. Test results can be a relief. They may give you peace of mind to know that you don't carry a genetic change linked to a certain disease.

But test results can be alarming, too. Learning that you're at risk of developing a certain disease may make the future seem uncertain. Keep in mind that such results may not mean that you'll get that disease.

Genetic counselors are one type of health professional who can help you understand the risks and benefits of genetic testing. Your doctor may refer you to one. They can help you decide whether to undergo testing. And they can help explain what test results mean.

Learn more about genetic testing at [www.genome.gov/19516567/faq-about-genetic-testing](http://www.genome.gov/19516567/faq-about-genetic-testing). ■



### Featured Website

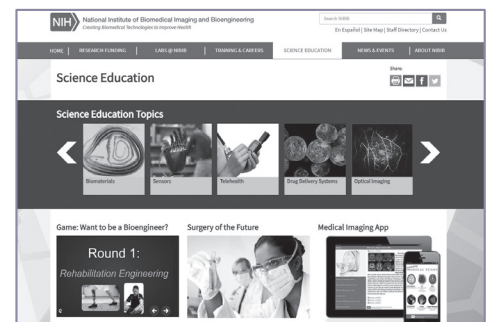
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