

# NIH News in Health

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**Inside News:** 3 Saliva 4 Intermittent Fasting and Diabetes 4 Youth Art Challenge 4 Kids' Eye Health

## Artificial Intelligence and Your Health

### How Computers are Helping Medicine

There's a lot of talk about artificial intelligence, or AI, these days. AI is everywhere—from virtual assistants to facial recognition software. The technology is even assisting doctors and scientists. So what exactly is AI? And how is it helping advance scientific research?

"AI is basically trying to teach computers to 'think' in the same way as the human brain," says

Dr. Despina Kontos, an AI researcher at Columbia University.

One approach to AI uses a process called machine learning. In machine learning, a computer model is built to predict what may happen in the real world. The model is taught to analyze and recognize patterns in a data set. This training enables the model to then make predictions about new data. Some AI programs can also teach themselves to ask new questions and make novel connections between pieces of information.

"Computer models and humans can really work well together to improve human health," explains Dr. Grace C.Y. Peng, an NIH expert on AI in medicine. "Computers are very good at doing calculations at a large scale, but they don't have the intuitive capability that we have. They're powerful, but how helpful they're going to be lies in our hands."

Researchers are exploring ways to harness the power of AI to improve health care. These include assisting



with diagnosing and treating medical conditions and delivering care.

**Mining Medical Images** • One area that AI is already being used daily is medical imaging. Computers help doctors comb through CT and MRI scans for signs of problems like heart disease and cancer.

"AI can look at images very closely, in a way that's much more detailed than we can do with the human eye," Kontos says. That means that the computer may be able to pick up on subtleties that a person might miss.

In medicine, catching early signs of certain diseases can be the difference between life and death. Kontos and her team are testing ways AI can be used to identify women who are at high risk for developing breast cancer. They're using AI to analyze different features in mammograms—X-ray pictures of the breast—such as breast density. Women who have a higher risk of breast cancer can take preventative steps, like more fre-

quent screenings. This approach could help lead to earlier diagnosis and more successful treatment.

The team is also testing whether they can use AI to individualize breast cancer treatment based on imaging results that show how breast tumors are responding. AI may better reveal who needs more intensive treatment, like chemotherapy, and who can safely skip it.

"That way, we could spare women who don't need intensive treatment from unnecessary side effects," Kontos explains.

**Connecting People With Care** • Over the last year, advanced "chatbots," like ChatGPT, have burst on the scene. These AI programs are designed to have realistic conversations with people. People are starting to use the technology to find health information.

Many chatbots are a form of "generative AI." This type of AI can create new content based on what it learns from analyzing existing

*continued on page 2*

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*continued from page 1*

data. Such chatbots use what's called large language models, which are trained on huge data sets that are gathered from across the internet. The training teaches them to predict what words are most likely to appear after another.

It may be tempting to ask these tools to answer medical questions. "But these chatbots don't actually understand what you're asking," Peng says. "They're just looking at the phrases and making predictions about what comes next." So it's important to use caution if you're using them to seek health advice.

"These tools also don't have a lot of context," explains Dr. Ellen Fitzsimmons-Craft, a mental health researcher at Washington University in St. Louis. "They may be able to state something that's the right medical advice in a general sense. But that may not be the right medical advice for you personally."

"We don't always know what information these tools like ChatGPT are trained on," Fitzsimmons-Craft adds. "We don't know if they're getting information from reputable sources or not."

Still, the idea of using chatbots in

medicine has promise, explains Fitzsimmons-Craft. Right now, there is a shortage of health care providers in many fields, including mental health. Chatbots may be able to fill in some gaps.

"Not many people follow through with recommendations provided after a mental health screening," Fitzsimmons-Craft says. "And we don't have enough providers to connect with every one of those people."

Fitzsimmons-Craft and her team are developing a chatbot to help guide people with eating disorders toward seeking care. Their chatbot is made using a rule-based model, with limited AI. Rule-based means that human experts write entire conversations beforehand. Then, the chatbot picks what to say based on the responses of the person using it.

"Nothing this chatbot says should come as a surprise," Fitzsimmons-Craft explains. "That's in contrast to generative AI, where you have to work a lot harder to build in guardrails."

Her team is now testing their chatbot to see which conversation pieces are the most effective. They'll then test whether it can increase the number of people seeking help after a screening for eating disorders.

Other NIH-funded researchers are studying whether chatbots can help in additional areas, like suicide prevention and encouraging heart-healthy diet changes.

**Looking Toward the Future** • As AI moves into more areas of health care, many ethical issues will need to be addressed, explains Kontos. "These systems learn from human data, so they may learn our biases," she says.

For example, in the past, research studies have included far more men than women. This means that the resulting data may not be as accurate for guiding women's health care.

So, if this information is fed into AI models, that bias will follow.

Recognizing biases before they reach the machines may provide a chance to break this cycle. "Can we end up training the machines better because we learned from the mistakes that we have in our own society about training people?" Peng asks.

NIH-funded researchers are working on these issues, as well as many other ways to use AI in medicine. These include modeling the ways a virus might spread between countries and predicting if new drugs will be safe.

All of these projects need human imagination and computing power. So AI is not a replacement for people, says Fitzsimmons-Craft. "AI is just another tool in the toolbox, that's offering another form of help." ■



## Wise Choices Testing AI for Health

NIH funds studies to test AI in many areas of health, including:

- Predicting who's at high risk for breast cancer.
- Connecting people with quality medical information via chatbots.
- Modeling disease spread across countries.
- Identifying new drug candidates.
- Diagnosing Alzheimer's disease before symptoms develop.
- Predicting changes in blood sugar levels before they occur in people with diabetes.
- Creating "smart clothing" that can reduce back pain by warning the wearer about unsafe movements.
- Improving colonoscopies so colon cancers can be detected and treated at earlier stages.

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Links

For more about artificial intelligence and health, see "Links" in the online article: [newsinhealth.nih.gov/2024/01/artificial-intelligence-your-health](https://newsinhealth.nih.gov/2024/01/artificial-intelligence-your-health)

# Spit Happens

## The Surprising Importance of Saliva

Do you have a favorite food that makes your mouth water? The liquid that fills your mouth is called saliva. This remarkable fluid helps you digest food and stay healthy.

Saliva, or spit, has many important roles. It helps to moisten food, which affects its flavor and makes it easier to swallow. It contains proteins that help to break down food and begin the digestion process. Saliva also includes minerals that can strengthen teeth and prevent decay. And it contains antibodies, molecules that block germs and help keep your mouth clean and healthy.

Saliva can also give clues to your health. Saliva tests can quickly detect certain infections, like HIV or COVID-19, with no need for needles to draw blood for testing.

Saliva is made by several salivary glands in the mouth. It consists mostly of water (about 99%). It also contains over 1,000 different types of proteins and other molecules.

“We don’t think about saliva very often, but it’s always a part of our lives. When we’re healthy, we’re producing saliva all the time,” says

Dr. Blake Warner, a dentist and researcher at NIH. “Saliva even plays a role in our ability to communicate. When we talk, our lips, tongue, and teeth all move in ways that depend on having moisture in the mouth.”

We might take saliva for granted. But problems can arise if you have too little saliva, or even too much.

If you feel like you don’t have enough saliva, it’s a condition called dry mouth. Doctors call it xerostomia (pronounced ZEER-oh-STOH-mee-ah). It can be caused by a decrease in how much saliva you produce or by changes in your saliva’s makeup that make it feel different.

“Dry mouth can be simply a nuisance, arising briefly if you’re dehydrated, stressed, or while taking certain medications,” Warner says. “But if it lingers, it can have a major impact on your quality of life and overall health. It can make swallowing difficult and reduce your ability to taste and enjoy food.” Dry mouth can also make it hard to chew and speak. And it can raise the risk for tooth decay and mouth infections.

Dry mouth can have several causes. Many medications have side effects that can reduce saliva flow. Certain cancer treatments can harm the salivary glands. Some medical conditions can trigger dry mouth, too. These include diabetes, AIDS, and a disorder called Sjögren’s (pronounced SHOW-grins) disease.

Sjögren’s disease damages the glands that make saliva and tears. That leads to dry mouth and dry eyes. It can be hard to diagnose because its symptoms vary and are similar to other conditions. Warner and other NIH scientists have been



looking for better ways to diagnose, treat, and prevent this disorder.

In contrast to dry mouth, some people feel that they have too much saliva. When you have so much saliva that it flows outside your mouth, it’s called drooling. It’s normal for adults to drool when sleeping. Babies and toddlers often drool too. But sometimes drooling can be a symptom of certain infections or nervous system disorders, like Parkinson’s disease or stroke. Treatments for drooling can vary, depending on the cause.

If you have concerns related to saliva and your mouth, it’s important to talk with your health care provider. “In our society, we may think that saliva is gross or unpleasant. So some people might hesitate to talk with a doctor or dentist about any salivary problems they have,” says Warner. “But salivary symptoms could be early signs of disease, so it’s worthwhile to bring up. It’s important to be mindful of your saliva and oral health.” ■



### Wise Choices

#### Easing Dry Mouth Symptoms

- Drink plenty of water.
- Chew sugarless gum or suck on sugarless hard candy to trigger saliva flow.
- Avoid tobacco, alcohol, and drinks with caffeine. They can dry out the mouth.
- Sip water or a sugarless drink during meals to make chewing and swallowing easier.
- Use a humidifier at night.
- Talk with your doctor or dentist if the problems don’t go away.



### Web Links

For more about saliva and health, see “Links” in the online article: [newsinhealth.nih.gov/2024/01/spit-happens](https://newsinhealth.nih.gov/2024/01/spit-happens)



## Health Capsules

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

### Intermittent Fasting and Type 2 Diabetes

Around 1 in 10 Americans live with type 2 diabetes. In this disease, levels of blood glucose, or blood sugar, stay too high for too long. Diabetes can lead to serious health issues.

Weight loss is often recommended for those with excess weight and type 2 diabetes. Reducing calorie intake is a common weight-loss strategy. But many people find it hard to cut back on calories.

An NIH-funded research team tested a different strategy. It's called time-restricted eating, or intermit-

tent fasting. With this approach, people eat only during a certain time period each day. During that time, they can eat anything they want.

The researchers recruited 75 people with obesity and type 2 diabetes. Participants were assigned to one of three diet groups. One group tried intermittent fasting. They ate only between noon and 8 p.m. Another group was asked to reduce their calorie intake by 25%. A third group had no dietary changes.

After six months, people in the fasting group had lost an average of

3.6% of their body weight. In comparison, people in the reduced-calorie group did not lose much weight. Both groups had similarly healthy decreases in blood glucose levels.

“Our study shows that time-restricted eating might be an effective alternative to traditional dieting for people who can't do the traditional diet or are burned out on it,” says Dr. Krista Varady of the University of Illinois Chicago. For safety, people with diabetes who want to try intermittent fasting should talk to their doctor first. ■

### Enter NIH's Youth Art Challenge on Prevention

NIH invites teens and young adults to enter a new art challenge. It's called “How Prevention Can Create Better Health for Everyone.” Prevention means taking steps to avoid getting sick or injured, instead of treating health problems after they happen.

Prevention can include actions like eating healthy foods or getting a flu shot. It can also mean making changes to the environment, such as creating a walking path or reducing air pollution.

Prevention is especially important

for people within groups who often have worse health than the general population. These include people from certain racial or ethnic groups, those with lower incomes, and people with disabilities. Entries to the art challenge should show how people from these groups might benefit from prevention.

There are two age categories for artists: teens and young adults. Teens must be 13 to 17 years old at the time of submission. Young adults must be 18 to 22 years old. NIH judges will

review all submissions. Artwork will be scored based on originality, creativity, impact, and other criteria.

Cash prizes for winning entries range from \$500 to \$3,500. Artwork may be featured on NIH websites or social media. The deadline for submissions is January 31, 2024, at 11:59 p.m. ET. Participants must be U.S. citizens or permanent residents.

For more details, see [go.nih.gov/NIHNiHJan24ArtChallenge](https://go.nih.gov/NIHNiHJan24ArtChallenge). ■



### Featured Website

#### Eye Health for Kids

[www.nei.nih.gov/learn-about-eye-health/nei-for-kids](https://www.nei.nih.gov/learn-about-eye-health/nei-for-kids)

Want to know more about your eyes? How do they work, and how can you keep them healthy? This website has lots of fun facts especially for kids.

Watch videos about how your eyes work. Learn about optical illusions. Get tips for protecting your eyes. And learn how to tell eye facts from eye fiction.

**NEI for Kids**

**All About Vision**

- About the Eye
- Ask a Scientist Video Series
- Healthy Vision Tips
- The Visual System
- Your Eyes' Natural Defenses

**Eye Health and Safety**

- Eye Aid Tips
- Healthy Vision Tips
- Protective Eyewear
- Sports and Your Eyes

**Fun Stuff**

- Cool Eye Tricks

Most people rely on their eyes to see and make sense of the world around them. If you're reading this, your eyes are hard at work. There's your eye for you! (And other things, too. Be sure to wear your seat belt, please. And, looking for that green light, an ambulance, and for the neighborhood's angry dog. That's why it's important to take care of your eyes.)

Here you can learn about your eyes, how they work, and how to keep them healthy. Plus, you'll discover lots of fun eye facts.

**Ask a Scientist**

Watch our NEI scientists explain and answer what your eyes do while you sleep, and more.

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