

NIH News in Health

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Inside News: 3 Spotlight on Psoriasis... 4 Arthritis Variability... Encourage Early Learning... Genetics Education

What Your Nose Knows Sense of Smell and Your Health

Your sense of smell enriches your experience of the world around you. Different scents can change your mood, transport you back to a distant memory, and may even help you bond with loved ones. Your ability to smell also plays a key role in your health. If your ability to smell declines, it can affect your diet and nutrition, physical well-being, and everyday safety.

Whether coffee brewing, pine trees in a forest, or smoke from a fire, the things we smell are actually tiny molecules released by substances all around us. When we breathe in these molecules, they stimulate specialized sensory cells high inside the nose. Each of these sensory cells has only one type of odor receptor—a structure on the cell that selectively latches onto a specific type of “smelly” molecule. There are more smells in the environment than there are odor receptors. But a given molecule can stimulate a combination of these receptors, creating a unique representation in the brain of a particular smell.

“It’s estimated that the number of odors that people can detect is somewhere between 10,000 and 100 billion, or even more,” says Dr. Gary Beauchamp, a taste and smell researcher at Monell Chemical Senses Center in Philadelphia. We all have different combinations of odor-detecting cells in our noses, he explains, so people vary greatly in their sensitivity to smells. “In fact, when you or I smell the same



physical thing, our perceptions may be very different,” Beauchamp says.

Because smell information is sent to different parts of the brain, odors can influence many aspects of our lives, such as memory, mood, and emotion. For thousands of years, fragrant plants have been used in healing practices across many cultures, including ancient China, India, and Egypt. Aromatherapy, for example, aims to use essential oils from flowers, herbs, or trees to improve physical and emotional well-being.

To date, there’s little scientific evidence supporting aromatherapy’s effectiveness for most health issues. Yet memories of smell can be vivid and long lasting, which may have a positive effect.

“Lavender is a good example, which is touted as a relaxation odor,” Beauchamp says. “But the question is: Is that a relaxation odor because we’ve had past experience with this particular odor where we’ve been relaxed, and so we’ve learned the association?” Scientists continue to examine how different types of aromatherapies might affect our health and well-being.

Smell is also important for your perception of taste. Chewing your food releases aromas that travel from your mouth and throat to the nose. Without smell, we can detect only 5 basic tastes: sweet, salty, bitter, sour, and umami (savory). But our brains incorporate information from both taste and smell receptors to create the perception of many different flavors.

Some people may think they’ve lost their sense of taste if food begins to taste bland or slightly “off.” But in fact, they may have lost their ability to smell.

Many things can cause smell loss. A stuffy nose, or a harmless growth in the nose (called a polyp) can block air and thus odors from reaching

continued on page 2

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continued from page 1

the sensory cells. Certain medications, like some antibiotics or blood pressure pills, can alter smell. These effects are usually temporary. Your smell should come back once you've recovered or stopped the treatments.

But some things can cause a long-lasting loss of smell. A head injury or virus, for example, can sometimes damage the nerves related to smell. And your ability to smell may naturally fade as you get older.

"A good sized majority of people don't know they have a problem with their sense of smell," says Howard Hoffman, a public health expert at NIH. A national health and nutrition survey recently revealed that 12% of adults have a smell dysfunction.



Wise Choices Smell Loss and Safety

If you've lost your ability to smell, it's important to find other ways to detect:

- **Smoke.** Check your smoke detectors once a year to make sure they work.
- **Gas leaks.** Make sure you have a gas detector in your home.
- **Spoiled food.** Throw out food that's been in the refrigerator too long and practice other basic food safety. Learn more at www.foodsafety.gov.
- **Household chemicals.** Make sure there's fresh air where you live and work.

The problem increases with age, with 39% of those ages 80 and older showing a deficit.

"Quality of life issues from smell loss affect people differently depending upon their situation," Hoffman says. "The effects can be enormous." Food can become less enjoyable. You may lose interest in eating or change your eating habits, consuming a less healthy diet.

People who've lost their sense of smell sometimes try to boost flavor by adding more salt or sugar to their foods. But these additions might cause problems for those at risk for certain medical conditions, such as high blood pressure, kidney disease, or diabetes. Talk with your doctor if you think a smell deficit might be affecting your quality of life.

Smell loss can also put you in harm's way if you don't notice a "warning" smell. The recent national health and nutrition survey found that 1 in 10 people couldn't identify the smell of smoke, and about 15% couldn't identify the smell of natural gas. "As people get older, those rates go up," Hoffman says. For those ages 70 and older, 20% couldn't identify the smell of smoke, and 31% couldn't recognize gas odor.

"With age, there is a decline in the ability to smell to some extent in the nose, but much more in the brain itself," says Dr. Davangere Devanand at Columbia University, an expert on neurodegenerative diseases and smell loss. "The main reason appears to be that the functioning of the brain regions involved in smell and



Web Links

For more about sense of smell and your health, click the "Links" tab at: newsinhealth.nih.gov/issue/Aug2016/Feature1

memory become impaired as we grow older."

But problems with your ability to smell may be more than normal aging. They can sometimes be an early sign of serious health conditions, such as Parkinson's disease, Alzheimer's disease, or multiple sclerosis. Devanand's group is currently studying the relationships between smell dysfunction and Alzheimer's disease.

If your food doesn't smell or taste the way you think it should, talk to your doctor. Health care providers can give you a "scratch and sniff" smell identification test to help assess the kind of smell disorder you might have. This test alone can't diagnose more serious health problems, but it can be informative when used alongside other tests.

Smell may be the most mysterious of our 5 senses, Beauchamp says. "We know quite a bit about smell loss and can diagnose this fairly well. But, for the most part, we have no treatments that are reliable and widely accepted" for long-lasting cases of smell loss. Some studies suggest that smell training may help you improve your ability to discriminate and identify odors. It may stimulate growth of new receptors or improve your brain's ability to interpret low levels of odors, Beauchamp explains. But researchers are still learning how and whether this works.

Like all of your senses, your sense of smell plays an important part in your life. If you think you're experiencing a loss of taste or smell, see your health care provider. There may be ways to help fix the problem. If not, your doctor can help you learn to cope with the changes in smell and taste. ■

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Office of Communications

& Public Liaison

Building 31, Room 5B64

Bethesda, MD 20892-2094

nihnewsinhealth@od.nih.gov

Tel: 301-402-7337

newsinhealth.nih.gov

Editor Harrison Wein, Ph.D.

Managing Editor Vicki Contie

Contributors Vicki Contie, Alan Defibaugh (illustrations), Claire Donnelly, and Tianna Hicklin

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Spotlight on Psoriasis

Preventing Patches of Itchy, Sore Skin

You may have heard of psoriasis, but do you know what it is? Psoriasis is a long-term, or chronic, skin disorder that affects more than 6.7 million U.S. adults. Symptoms can vary, but it's usually recognized by itchy or sore patches of thick, red skin with silvery scales. There's currently no cure, but treatment often helps.

Psoriasis occurs when skin cells quickly rise to the surface of the skin and build up into thick patches, or plaques. Ordinarily, skin cells mature as they rise from their origins below the surface of the skin. In psoriasis, these cells pile up before they've had a chance to properly mature.

Psoriasis actually begins in the immune system, which normally protects the body against infection and disease. In psoriasis, the immune system becomes misdirected and overactive. This can cause redness and swelling (inflammation) and lead to the rapid buildup of skin cells.

Plaques are most often found on the elbows, knees, or scalp. But they can also affect the face, fingernails, toenails, soft tissues of the genitals, or any skin-covered region.

"Patients can have a lot of symptoms like itching, cracking, and bleeding that can disrupt their sleep and their social relationships," says

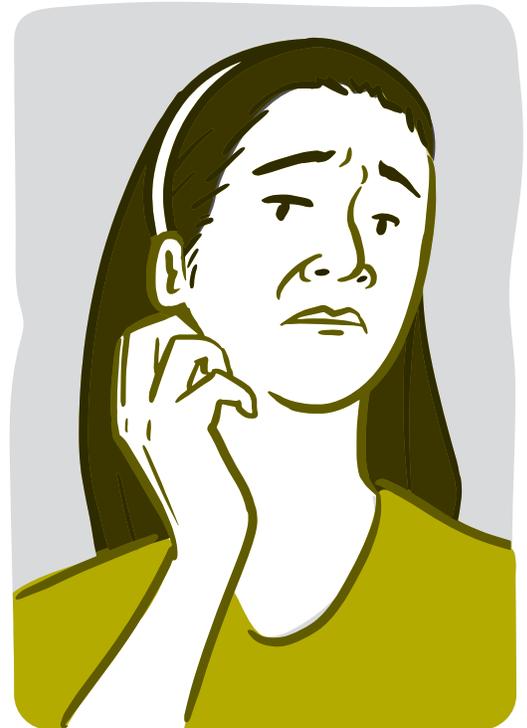
Dr. Joel Gelfand, a skin specialist (dermatologist) at the University of Pennsylvania. People with moderate to severe psoriasis may feel self-conscious or have a poor self-image, which can lead to depression or social isolation.

Some people with psoriasis also experience joint inflammation that produces arthritis-like pain. This condition is called psoriatic arthritis. Gelfand and other NIH-supported researchers have found that psoriasis—especially severe psoriasis—is linked to certain other disorders as well, such as heart conditions, obesity, high blood pressure, and diabetes.

Psoriasis can occur at any age, but it typically first appears in young adulthood. Many people with psoriasis have a family history of the disorder. Researchers have been able to identify certain **genes** linked to the disease, but they still don't fully understand the disease process. They do know that it isn't contagious. You can't "catch" psoriasis by touching someone who has it.

Psoriasis can be hard to diagnose, because it can look like other skin diseases. Your doctor might need to look at a small skin sample under a microscope. It's often best to make an appointment with a primary care doctor or a dermatologist to get an accurate diagnosis.

There are many approaches for treating psoriasis. Safe and proven treatment options include creams, light therapy, and medications given as pills or a shot.



"Treatment decisions in psoriasis need to be highly individualized and tailored toward the patient's clinical condition and underlying health status, as well as their preferences and goals," Gelfand says. Be sure to ask your doctor about the best treatment options for you.

Psoriasis symptoms may briefly worsen, or flare. These flares can arise when people are stressed or experience a traumatic event like the death of a family member or friend. Smoking, heavy alcohol use, and being overweight can also aggravate psoriasis. See the "Wise Choices" box for tips on avoiding flares.

Gelfand and other NIH-funded researchers have been working to develop better therapies. "It's a great time to be hopeful and optimistic about this disease," Gelfand says. "Most of the therapies coming out now seem to be well-tolerated and have impressive effectiveness." ■



Wise Choices Avoid Psoriasis Triggers

Factors that may trigger psoriasis or make it worse include:

- physical and emotional stress.
- injury to the skin such as cuts or burns.
- infections, especially strep throat.
- cold weather.
- smoking or heavy alcohol use.



Definitions

Genes

Stretches of DNA, a substance you inherit from your parents, that define characteristics such as eye color and your risk for certain diseases.



Web Links

For more information about psoriasis, click the "Links" tab at: newsinhealth.nih.gov/issue/Aug2016/Feature2



Health Capsules

For links to more information, see these stories online:
newsinhealth.nih.gov/issue/Aug2016/Capsule1

Arthritis Mechanisms May Vary by Joint

Knee and hip joints with rheumatoid arthritis have differing genetic markers linked to inflammation, suggesting that different joints may have varying disease mechanisms. These new findings may lead to more effective, personalized therapies for rheumatoid arthritis.

People with rheumatoid arthritis have swelling and pain in joints throughout the body. These problems arise when the immune system, which protects the body from germs and infections, mistakenly attacks the joints. For unknown reasons, different joints are affected differently in people with rheumatoid arthritis.

An NIH-funded research team previously found that certain cells in joints have unique patterns of chemical tags—called epigenetic mark-

ers—that differ between rheumatoid arthritis and osteoarthritis. Such tags can affect when genes turn on or off and can regulate immune function.

In the new study, the scientists examined epigenetic patterns in joint cells from 30 people with rheumatoid arthritis and 16 with osteoarthritis. Rheumatoid arthritis and osteoarthritis cells had differing patterns of epigenetic tags as expected. But unexpectedly, in patients with rheumatoid arthritis, the patterns in knee joint cells differed from cells in hip joints.

The scientists next assessed the affected biological pathways that distinguish different joints. Knee and hip joints with rheumatoid arthritis had differing activated genes and biological pathways. Many of these pathways were related to

immune system function.

The team also found that new drugs for treating rheumatoid arthritis may affect some of these pathways. Their findings might offer an opportunity for developing more precise approaches to treating different arthritic joints.

“We showed that the epigenetic marks vary from joint to joint in rheumatoid arthritis,” says study coauthor Dr. Gary S. Firestein of the University of California, San Diego. “This might provide an explanation as to why some joints improve while others do not, even though they are exposed to the same drug.” ■

Help Young Kids Become Lifelong Learners

Research shows that what kids learn in their first few years of life—and in their day-to-day conversations with parents—can have lasting effects on their future success and health. Simple things like encouraging early math, reading, and language skills can lead to higher grades, a better chance of staying in school and going to college, fewer teen pregnancies, improved mental health, and even a longer life.

Get tips and watch brief videos of NIH experts who offer ideas to encourage early learning at www.nichd.nih.gov/health/topics/early-learning/topicinfo/Pages/promote.aspx. Each day offers opportunities to help your child learn. ■



Wise Choices Encourage Early Learning

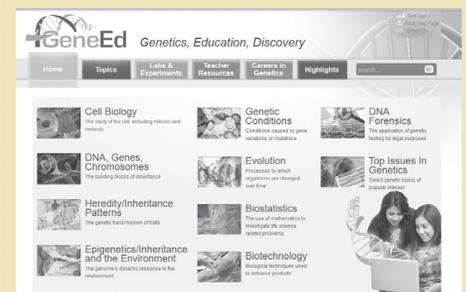
- Read to your child, beginning when she or he is an infant.
- Listen and respond to kids as they learn to talk. Pause to give them a chance to “speak” in coos, grunts, and eventually words.
- Practice counting together.
- Point out and talk with children about the names, colors, shapes, numbers, and sizes of objects around them.



Featured Website GeneEd: Genetics, Education, Discovery

geneed.nlm.nih.gov

Want to know more about genes and how they work? Or learn about DNA forensics, biotechnology, and related careers? This educational website has up-to-date information, animations, games, interactive tutorials, and teacher resources designed for students and educators in grades 9 to 12.



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