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Understanding Epilepsy

A Surge of Signals

Your brain contains a complex network of nerve cells, called neurons, that send signals to the rest of your body. These signals allow you to sense the world around you, control your body's movements, and experience emotions.

But sometimes things can go wrong. Groups of neurons may send abnormal bursts of signals all at once. This surge of brain activity is called a seizure.

Any seizure is a cause for concern. Epilepsy is a condition in which you have repeated seizures. But not all seizures mean you have epilepsy.

A seizure can cause strange sensations or feelings. You may experience uncontrollable movements or suddenly stare off into space.

These symptoms can be confusing. People who have them or see them may not realize they are signs of a seizure. The signs of a seizure depend on where signal surges happen.

Some people have a seizure only once or once in a while. But others have them regularly—even up to hundreds a day.

Scientists are still not sure what causes epilepsy in about one-half of people diagnosed with the disorder. NIH researchers are working to find better ways to diagnose and treat it.

Unraveling Symptoms • Anything that disturbs the pattern of normal brain activity can lead to seizures. Seizures may develop from illness, infections, damage or tumors in the brain, genetic factors, or problems during brain development.



There are two main types of seizures: generalized and focal. Generalized seizures start in both sides of the brain. Focal seizures start on one side but may spread to both sides. Some people have both types of seizures, with no clear pattern.

“People often get the wrong idea about generalized seizures from TV,” says Dr. Adam Hartman, an epilepsy specialist for children at NIH. “Usually someone is shown lying on the floor with all four limbs stiff or shaking. While that happens, other signs of generalized seizures are less obvious, like staring into space.”

During focal seizures, some people may be unaware of what’s happening. They may look confused or dazed, pick at their clothes, or smack their lips. They may be unable to answer questions or respond to directions for a few minutes.

People can lose consciousness in both types of seizures. When that happens, even briefly, they may fall or injure themselves. If seizures last longer than five minutes, seek medical care immediately. They can be life-threatening.

Children with delayed brain development and other developmental delays are more likely to have seizures. They’re also more likely to die suddenly. This is referred to as sudden unexpected death in epilepsy, or SUDEP.

Children who develop a rare type of epilepsy called Dravet syndrome are one example. Dr. Lori Isom, an epilepsy expert at the University of Michigan, is looking into why

they are less likely to survive. Studies have shown that people with this condition have genetic mutations, or changes to their DNA sequence.

“These genetic mutations affect not only the brain but also the heart,” says Isom. “They can cause the heart to beat irregularly, as well as seizures.”

Isom’s team is trying to unravel how the brain and heart each contribute to SUDEP. In previous years, they helped develop a gene therapy to treat Dravet syndrome. Their gene therapy showed promise for improving seizures in an animal model they developed with NIH funding. Now, a private company is testing the treatment in children in a clinical trial.

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Diagnosing Epilepsy • Epilepsy can develop at any age. But infants, children, and older adults are at the highest risk.

Diagnosing epilepsy involves a review of your medical history. You may have **neurological** testing and blood tests done. Blood tests can check for infections or genetic conditions. Several measures of brain activity can also help with diagnosis. These include electroencephalograms, or EEGs, and brain imaging scans.

Epilepsy can sometimes be hard to diagnose. Adults with the most common focal epilepsy, which occurs in the temporal lobes, often go undiagnosed or misdiagnosed. The tempo-

ral lobes are located on either side of the brain. Brain tissue in the area can deteriorate from seizures over time and with repeated seizures.

Faint patterns of brain damage can appear on MRI scans. But these aren't always visible to a **radiologist**. Dr. Carrie McDonald, a scientist who specializes in imaging at the University of California, San Diego, is testing artificial intelligence (AI) to identify these brain patterns on MRI scans. Her group found that AI could correctly identify over 80% of individuals with temporal lobe epilepsy.

"Using AI to identify brain areas with specific patterns of damage will not only help radiologists but also surgeons," McDonald explains. "Surgeons can use the information to help guide them with implanting electrodes in an individual's brain. The electrodes monitor seizure activity and can help pinpoint the location of seizures."

Combining this technique with other brain activity testing can help doctors locate where a person's seizures are coming from. Understanding where seizures happen can help doctors choose the right treatment.

Getting Treatment • Doctors usually prescribe antiseizure drugs first to control seizures. But some people don't respond to these drugs. They may need to see a nervous system specialist, called a **neurologist**, who focuses on epilepsy.

Dr. Sara Inati, an epilepsy specialist at NIH, is researching better ways to evaluate and treat people with drug-resistant epilepsy. They may have repeated seizures that can damage specific areas of the brain over time.

Inati's recent study looked at brain scans of people with drug-resistant epilepsy. She analyzed scans with abnormal results. She found that the size of two brain areas, the

hippocampus and the amygdala, often changed. These brain changes were not in the same place that seizures happened. And they differed depending on which side of the brain seizures were located.

"Brain changes can start in one part of the brain and cause damage in other parts that doctors may not know about," says Inati. "Having this information can help them adjust their treatment plan."

Other treatment options can include surgery or implanted devices. These devices send electrical impulses to the brain. Some people may also benefit from changes to their diet.

Learning to live with epilepsy can be challenging. But many people do well with treatment and live a full life. ■



Definitions

Neurological

Related to the body's nervous system, which is made up of the brain, spinal cord, and nerves throughout the body.

Radiologist

A doctor who specializes in creating and analyzing images of the inside of the body. The pictures might be produced with X-rays, sound waves, or other types of energy.

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Web Links

For more about epilepsy see "Find More Information" in the online article: newsinhealth.nih.gov/2026/02/understanding-epilepsy



Wise Choices Managing Epilepsy

- Learn about your condition.
- Take your seizure medicines as prescribed.
- Check with your doctor before taking other medicines or supplements.
- Track your seizures to understand patterns.
- Learn what triggers your seizures and try to avoid them.
- Notify your doctor if your seizures continue or if you have side effects from your medication.
- Live a healthy lifestyle to keep other health conditions in check. Get enough sleep and physical activity. Eat a healthy diet. Maintain a healthy weight. Avoid tobacco products and limit alcohol.

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



Coping With Chemo

The Side Effects of Cancer Treatment

Cancer cells multiply in an uncontrolled way, making them difficult for your body to stop. Chemotherapy, or chemo for short, uses drugs to kill cancer cells or stop them from growing. These drugs usually target cells that are growing quickly. Normal body cells can also get caught in the crossfire of many chemotherapy drugs, causing unwanted side effects. Scientists are finding ways to lessen chemo's impact on your body.

Most of the cells in your body divide and multiply into new cells. Your body needs new cells to replace old or damaged ones. Some of the body's healthy cells multiply frequently, like those that line the intestines and those involved in hair growth. Chemotherapy drugs can kill these cells, too.

Chemo can have a range of unwanted side effects. Common ones include nausea and vomiting, mouth sores, fatigue, and hair loss. Which side effects a person with cancer has depends on many things. These include the type of cancer being treated and which chemotherapy drug is used.

Chemo can reduce your white blood cell count. These cells help your body fight off infections and disease. Fewer white blood cells can lead to a higher risk of infections. Some chemotherapy drugs can cause nerve damage called chemotherapy-induced peripheral neuropathy (CIPN). This leads to pain, tingling, numbness, and loss of balance.

"Chemotherapy does work," explains Dr. Ting Bao, a cancer specialist at the Dana-Farber Cancer Institute. "There are side effects, but they are becoming more and more manageable."

Antinausea drugs can help with nausea and vomiting. Changes to your diet can help to manage nausea, fatigue, and mouth sores. Physical activity and healthy sleep habits can help combat fatigue. Medications may also be available for some kinds of pain caused by chemo. For CIPN pain, however, there are very few options. Your doctor can recommend what may work for you based on your symptoms.

Researchers are looking for new ways to reduce the side effects of chemo. Studies suggest that acupuncture may help relieve nausea and vomiting. This ancient practice uses thin needles to stimulate specific points on the body. Scientists are also testing herbal remedies, like ginger, to see if they help with nausea.



Bao is testing acupuncture and yoga for treating CIPN. Yoga combines physical postures, breathing techniques, and meditation.

"These ancient modalities intrigue me because they don't have much side effects," Bao says. "For acupuncture, the most common side effects are a little bruising and bleeding. And for yoga, joint and muscle pain."

Her recent studies suggest that these techniques could help ease some of the symptoms of CIPN. She now has larger trials ongoing.

Other research teams are trying to understand the molecular underpinnings of CIPN and testing drugs that target them.

If you're preparing for chemo, ask about possible side effects. Your doctor can help you make a management plan. Most cancer centers offer treatment education sessions. These sessions provide information about expected side effects. Patient support groups are also available to help you navigate cancer treatment. ■



Ask Your Doctor

If you're undergoing chemotherapy treatment, find out more about managing side effects. Ask your health care team:

- What side effects am I at higher risk for based on my cancer type or treatment?
- When might side effects start? How long might they last?
- What signs or symptoms should I call you about?
- What steps can I take to feel better?
- What precautions should I take to stay safe?
- What medicines can help?
- What foods and drinks do you advise? Which should I avoid?
- Could you refer me to a specialist who could give me further advice?



Web Links

For more about chemotherapy's side effects, see "Find More Information" in the online article: newsinhealth.nih.gov/2026/02/coping-chemo





Health Capsules

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

Health Coaching May Improve Surgery Recovery

Patients often stress and worry about an upcoming surgery. But stress can lessen your body's ability to heal. It can increase inflammation—the swelling or heat your body makes to protect against injury or illness. You can take steps to improve your health before surgery. This is called prehabilitation. A new study showed that personalized prehabilitation programs lowered problems after surgery.

Fifty-four participants were enrolled. They were divided into two groups. One group had a

standardized program. The other had a personalized program.

Everyone was given information on exercise, healthy eating, and how to improve mental health. The standardized program group was given an information booklet. The personalized program provided one-on-one coaching. It included online exercise programs and guided meditation. It also gave daily reminders and meal suggestions.

The personalized group showed better physical and mental health after surgery. Only four of 27 in this

group had mild to serious problems. Some showed fewer signs of inflammation. Eleven of 27 people in the standard group had mild to serious problems after surgery. They showed improvement in one measure of physical health. But they didn't show improvements in mental health or inflammation.

“You can think of prehab as a way to really prepare for this major trauma of surgery,” says Dr. Brice Gaudillière at Stanford University. Better health before surgery can ease your recovery. ■

Reducing Arsenic Exposure Lowers Chance of Dying

Arsenic is a naturally occurring element. It's found in soil, water, and air. Long-term exposure can cause health problems. Millions of people rely on water sources with unsafe levels of arsenic. A new study showed that reducing arsenic exposure can lower the chances of death from cancer and heart disease.

The study tracked adults living in Bangladesh. Researchers measured the levels of arsenic in participants' drinking water and urine. They

checked levels multiple times over 20 years. During those years, a mitigation program labeled unsafe wells. The government also installed deeper wells with less arsenic. The scientists tracked deaths from cancer and heart disease over the two decades.

Participants' arsenic levels dropped by over one-half on average. Their chances of dying from cancer and heart disease also changed. Those whose arsenic levels dropped were less likely to die. People whose

exposures rose over time had a higher risk of death. Some participants' arsenic levels started out high but ended low. They were half as likely to die than people whose levels remained high.

“Our research suggests that improved access to low-arsenic water, periodic testing, and clear signage to mark safer water are useful tools to help improve long-term health around the world,” says Dr. Yu Chen at NYU Langone Health. ■



Featured Website

Your Healthiest Self: Wellness Toolkits

www.nih.gov/wellnesstoolkits

We each have a unique “healthiest self.” We have different minds, bodies, living situations, and people helping to shape our health and well-being.

This website offers science-based health tips in five different areas. Find ways to improve your relationships, emotional and physical well-being, and your surroundings.



Your Surroundings

Learn how to make your environment safer and limit your exposure to potentially harmful substances to stay healthier.



Your Feelings

Find out how to successfully handle life's stresses and adapt to change and difficult times.



Your Body

Discover which physical health habits can help decrease your stress, lower your risk of disease, and increase your energy.



Your Relationships

Learn how to create positive social habits that help you stay healthier mentally and physically.



Your Disease Defense

Find out what steps you can take to protect your health and prevent diseases.

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