NEUROLOGY
Patient Page

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Both migraine and motion sickness may be due to low brain levels of serotonin

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Scientists believe that low levels of a brain chemical called serotonin may make people susceptible to developing migraine headaches. Many people with migraine also have a problem with motion sickness, but it is not clear why this might be. We know that many drugs to treat motion sickness increase brain levels of serotonin, an important brain chemical. It is possible that low brain levels of serotonin may also be responsible for motion sickness. In this issue of *Neurology*,[1] Drummond reports on a study that evaluated whether low brain levels of serotonin trigger motion sickness in people with and without migraine. More information about migraine can be found on the next page.

What is motion sickness?

Motion sickness occurs when messages from two motion detectors to the brain conflict. One of these detectors is the inner ear and another is the eyes. If the inner ear and the eyes detect motion even slightly differently, motion sickness can occur. Motion sickness is usually caused by riding in a car, boat, or airplane. Motion sickness can also be caused by motion in the visual surroundings while standing still. This is the technique that the researchers used in the study described in this Patient Page.

What are the symptoms of motion sickness?

- Dizziness
- Nausea nad occasionally vomiting
- Fatigue
- Pallor (loss of color)

How was the study done?

The investigators studied the effect of tryptophan on motion sickness in two groups of people: 39 people with migraine headaches and 37 people of similar age and gender without migraine. Tryptophan is a key ingredient used by the brain to make serotonin. We take in the tryptophan needed by the brain through our diet. The investigators gave half of study participants in each group capsules and a protein drink that did not have any of the amino acid tryptophan in it. The other half of each group got capsules and a balanced protein drink containing tryptophan. The researchers then tried to make the study participants motion sick. They did this by having them sit in a chair with their head inside a rotating drum painted with 24 pairs of vertical black and white stripes. When this drum was rotated, it created an optical illusion that made the subjects feel as though they were spinning. The drum rotated 10 times per minute for 15 minutes or until the subject felt as though he or she were going to vomit and asked to stop. Study subjects were asked to rate the intensity of nausea, dizziness, and headache on a scale of 1 to 10 (with 10 being the most severe) before the drum started rotating and every 3 minutes after the drum started rotating.

What did the study show?

The people with migraine who got the balanced protein drink (containing tryptophan) asked to stop the experiment earlier than people without migraine who got this drink (11 vs 14 minutes). People in the group without migraine who got the tryptophan-free drink asked to stop the experiment earlier than those who got the balanced protein drink (12 vs 14 minutes). People with and without migraine who got the tryptophan-free drink asked to stop the experiment at about the same time (12 minutes for each group).

People without migraine who got the tryptophan-free drink had an increase in nausea, dizziness, and a feeling of spinning while the drum was rotating. People with migraine had higher ratings of nausea, dizziness, and headache than those without migraine both before and during the experiment regardless of which drink they got. The tryptophan-free drink had no effect on headache at the time or for 24 hours after the experiment in any of the study subjects.

What do the results mean?

The tryptophan-free drink caused the same degree of motion sickness induced by the rotating drum in people without migraine that was experienced by people with migraine. Because tryptophan is required by the brain to make serotonin, this suggests that a lack of serotonin may increase the symptoms of motion sickness. It is interesting that the tryptophan-free drink did not have this effect on people with migraine. This suggests that people with migraine may have abnormally low brain levels of serotonin, and lowering them further had no effect. These low brain serotonin levels could be responsible for both headache and motion sickness in people with migraine.

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Patient Page — *ABOUT MIGRAINE*

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What is a migraine headache?

A migraine is a recurring, throbbing headache. It usually occurs on one side of the head. While it is much more common in young women, it can strike anyone, at any age. It often runs in families.

What causes migraine?

The exact cause of migraine is unknown, but may be related to low brain levels of an important chemical called serotonin. During an attack, changes in brain activity may cause blood vessels and nerves around the brain to become inflamed. Many women have attacks linked to their menstrual cycles.

What are the symptoms of migraine headache?

People with migraines may have very varying symptoms, which can include the following:

- Moderate to severe headache that lasts 4 to 72 hours
- Throbbing pain, often on one side of the head
- Increased pain after exercise or movement
- Sensitivity to bright light, sound, or odors
- Nausea or vomiting with the headache

One in five people with migraine have a warning before the headache. This is called an aura. You may see flashing lights, temporarily lose your sight, or go numb on one side of your body.

How is migraine diagnosed?

No medical test can tell you if you have migraine. You will need to provide details about your headache to your neurologist. Your doctor will also do a neurologic examination. Often, no further testing is needed.

How is migraine treated?

Although there is no cure, migraine is treatable with medications, stress management techniques, and a healthy lifestyle. Most people with migraine can find relief using some of the treatment approaches described below. Talk to your doctor about which treatment is best for you. Keeping a headache diary is a valuable tool for treating migraine. It will help you work with your neurologist to identify triggers and track how medical and nonmedical interventions are working.

What are some of the things I can do other than taking medicine to treat my migraine?

There are many ways to reduce the impact migraine has on your life.

Know and avoid your migraine triggers

Triggers may include the following:

- *Diet:* Missed meals, alcohol (especially red wine), foods with monosodium glutamate (MSG), excessive caffeine, and preserved meats with nitrates and nitrites
- *Sleep:* Too much or too little sleep
- *Stress:* Stress and release from stress
- *Environmental factors:* Weather change, glaring or fluorescent lights, strong odors, and high altitude

Research has shown that some cognitive and behavioral treatments can help prevent migraine:

- Relaxation training
- Thermal biofeedback with relaxation training
- Electromyographic biofeedback
- Cognitive-behavioral therapy (also called stress management training)

Medicines to treat the headache right after it has started

Acute, or immediate, treatments are used to stop an attack when it occurs or to treat its symptoms. These are listed below. Overuse of acute drugs can lead to a daily migraine-like headache called rebound headache.

- Nonprescription (over-the-counter) medications, such as aspirin, ibuprofen, or acetaminophen combined with aspirin and caffeine
- Prescription nonsteroidal anti-inflammatory drugs and analgesics
- Specific drugs used to stop migraine attacks such as triptans and ergot alkaloids

Medicines to prevent migraine

Daily preventive medications are available for people with frequent, debilitating headaches:

- Antidepressants
- Beta-blockers
- Calcium channel blockers
- Medicines also used to treat epilepsy
- Alternative treatments, such as vitamin B2, magnesium, and feverfew

For more information

The Brain Matters
American Academy of Neurology Foundation
www.thebrainmatters.org

American Council for Headache Education
www.achenet.org
(856) 423-0258

American Headache Society
www.ahsnet.org
(856) 423-0043

National Headache Foundation
www.headaches.org
(888) NHF-5552

Reference

1. Drummond PD. The effect of tryptophan depletion on symptoms of motion sickness in migraineurs. Neurology 2005;65:620–622.

