

# Anti-dandruff compound may help fight epilepsy

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Researchers at Johns Hopkins have discovered that the same ingredient used in dandruff shampoos to fight the burning, itching and flaking on your head also can calm overexcited nerve cells inside your head, making it a potential treatment for seizures. Results of the study can be found online in *Nature Chemical Biology*.

Epilepsy and other seizure disorders result when nerves excessively or inappropriately “fire” in the brain. The brain’s “off” switches fail in part due to protein defects that prevent potassium from exiting nerve cells and calming them. “Channels that carry potassium,” says Min Li, Ph.D., professor of neuroscience at Johns Hopkins, “must open on cue to make sure nerve cells only fire for defined periods of time.”

In their studies of these channels, Li and his colleagues developed a new way of testing thousands of druglike molecules to find any that could turn the potassium switch on or off. Their approach involved chemically shaving off all the potassium channels on the cell surface and forcing the cells to make new channels. By measuring the activity of the new channels, the researchers could identify molecules that accelerated the recovery.

One chemical that proved quite effective in improving channel recovery was zinc pyrithione (ZnPy), the active ingredient in many dandruff shampoos. Li explains that ZnPy has a shape that allows it to fit into the gate region of the channel protein and allow more potassium flow. “If you think of these channels as doors on the cell’s surface,” Li says, “then

ZnPy made this door both easier to open and stay open longer. It's like a tunable hinge that helps sticky doors swing freely.”

The researchers then tested defective channels that contain the same mutations known in humans to cause mild epilepsy-like seizures in infants. Bathing cells with small amounts of ZnPy caused the mutant potassium channels to let three times as much potassium flow through, raising the possibility of restoring normal nerve cell activity.

“Most drug discoveries uncover chemicals that stop things from working - it's a lot easier to close or block a door than open it,” Li says. “But here we found a chemical that makes a defective protein work better. So now we have a chance to actually try to fix the causes of epilepsy, rather than traditionally circumventing them. Plus, this study really shows that we don't fully appreciate the biological roles of many familiar chemicals that surround us.”

Source: Johns Hopkins Medical Institutions

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