Unique brain channel combats epileptic seizures

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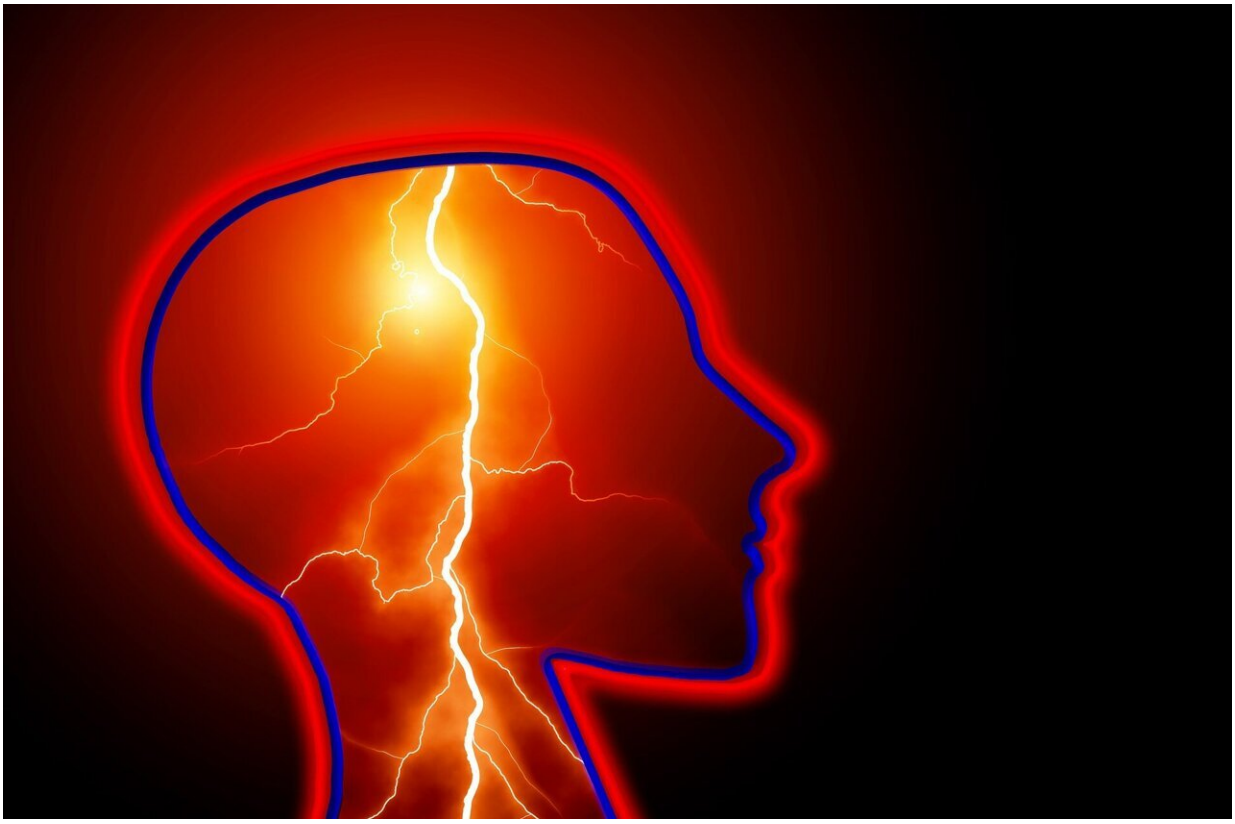

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Epilepsy, a chronic brain disorder that causes seizures, affects around 50 million people worldwide.

New research from the lab of Department of Biomedical Sciences Professor Susan Tsunoda that was recently featured in the *Journal of Neuroscience* showed for the first time that a channel in the brain called dSlo2 suppresses epileptic seizures.

Epilepsy, caused by excessive activity in certain brain cells, is characterized by episodes of involuntary movement that can sometimes lead to loss of consciousness. Epileptic seizures vary in frequency and can range from brief muscle spasms to lengthy convulsions. People with epilepsy may be physically injured while having seizures, tend to experience higher rates of anxiety and depression, and face an increased risk of premature death.

Put to the test for the first time

For decades it has been thought that the dSlo2 channel might play a role in reducing the hyperactivity that causes seizures, but it had not been tested until now. Using a fly model (Drosophila) and CRISPR technology, Tsunoda's lab discovered that the dSlo2 channel actually does play a preventative and protective role during seizures.

In epilepsy and other seizure conditions, neurons in the brain become overexcited resulting in high levels of sodium ions. The research, led by recent biomedical sciences Ph.D. graduate Nathan Byers, found that the dSlo2 channel, which is activated by excessive levels of sodium ions, quiets this hyperactivity during seizures by releasing potassium ions from neurons. And when the channel is missing, seizures worsen and become more frequent.

"Whenever there's too much sodium coming in, these channels are present and get activated immediately," Tsunoda said. "Now that we know this, next we are going to look more closely at the regulatory sites of the channel to see which ones are most important for seizure

suppression."

Genetic mutations that alter this key channel have been associated with different types of epilepsy and could be contributing to the severity of symptoms experienced by those with epilepsy. Better understanding how it works is crucial to informing future research and the development of therapies that could help improve quality of life for people suffering from certain types of epilepsy and other neurological disorders.

More information: Nathan Byers et al, Slo2/KNa Channels in Drosophila Protect against Spontaneous and Induced Seizure-like Behavior Associated with an Increased Persistent Na+ Current, *The Journal of Neuroscience* (2021). DOI: 10.1523/JNEUROSCI.0290-21.2021

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