Researchers discover why stress leads to increased seizures in epilepsy patients

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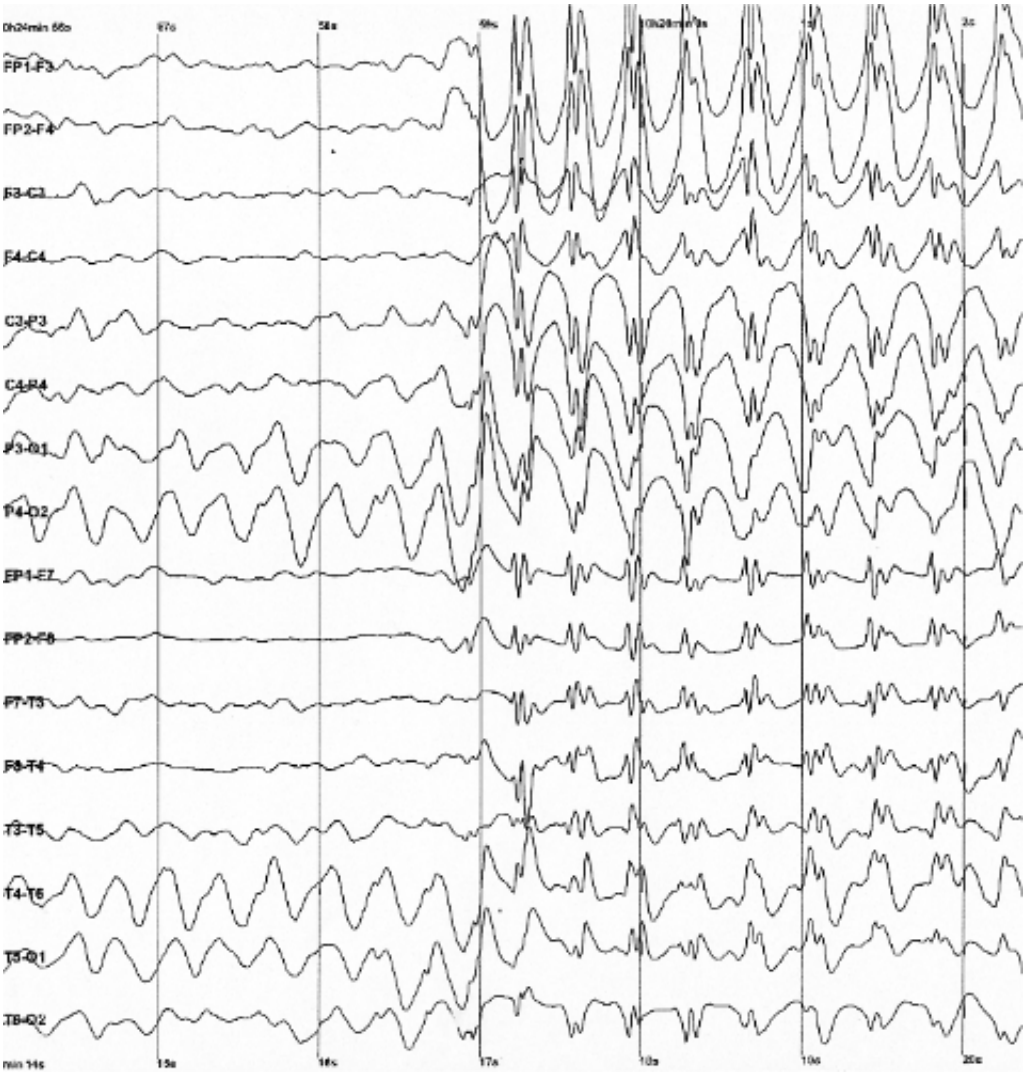

Generalized 3 Hz spike and wave discharges in a child with childhood absence epilepsy. Credit: Wikipedia.

For epilepsy patients, stress and anxiety can exacerbate their condition; increasing the frequency and severity of seizures. Until now, it was unclear why this happened and what could be done to prevent it.

In a study published today in the journal *Science Signaling*, researchers at Western University have shown that epilepsy actually changes the way the brain reacts to stress, and have used these findings to point to new drugs that may prevent stress-induced seizures.

Michael O. Poulter, PhD, Professor in the Department of Physiology and Pharmacology at Western's Schulich School of Medicine & Dentistry and a Robarts Research Institute Scientist explains that the disease produces changes in neuronal signaling that increases seizure occurrence by converting a beneficial stress response into an epileptic trigger.

Poulter and his team, including PhD candidate and first author Chakravarthi Narla, studied a neurotransmitter called corticotropin-releasing factor (CRF) that coordinates many behavioural responses to stress in the central nervous system. Using a rat-model of epilepsy, they examined the effect of this neurotransmitter on the piriform cortex, a region of the brain that easily supports seizures in humans.

They found that in a normal brain, CRF diminished the activity of this seizure-producing part of the brain, but in the diseased brain, it did the exact opposite - ramping up the activity of the piriform cortex instead.

"When we used CRF on the epileptic brain, the polarity of the effect flipped; it went from inhibiting the piriform cortex to exciting it," Poulter said. "At that point we became excited, and decided to explore exactly why this was happening."

"What we found is that there is a switch in the molecular signaling in the

brain. In the model of epilepsy, the CRF switches from signaling through one cascade to one that's completely different and we discovered that the catalyst for that is a protein in the brain called regulator of G protein signaling protein type 2 (RGS2)."

The research points to the possibility that CRF-blocking drugs would prevent stress-induced seizures in epileptic patients.

"We are very excited about this possibility for treating epilepsy patients," said Poulter. The broader implications are that brain diseases may induce changes in other neurochemical processes that make disorders like depression or schizophrenia worse than they might otherwise be.

Provided by University of Western Ontario

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