Researchers discover micro-gene that protects brain from developing epilepsy

By Judy Siegel-Itzkovich
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Recognizing the importance of miR-211 could open new avenues for diagnosing and interfering with epilepsy.

A scientist looks through a microscope. (photo credit:INGIMAGE)

For some people, exposure to intensely bright flashing lights can trigger bouts of epilepsy, while others remain unaffected.
Two decades ago, for example, on December 16, 1997, hundreds of Japanese children who had been watching an episode of the Pokémon TV show were brought to hospitals suffering from epilepsy-like seizures.
Doctors determined that their symptoms were triggered by just five seconds of flashing lights on the popular program.

In new research published in the Proceedings of the National Academy of Sciences, a team of researchers headed by Hebrew University of Jerusalem Prof. Hermona Soreq explained why the majority of Japanese children watching the show did not suffer from seizures.
Drawing on her previous research, Soreq – of the Edmond and Lily Safra Center for Brain Sciences and the Alexander Silberman Institute of Life Sciences – suggested that healthy brains may be protected from epileptic seizures by rapidly produced molecules called short RNAs, or microRNAs.

To test this idea, Soreq and her Hebrew University colleagues developed a transgenic mouse that produced unusually high amounts of one microRNA called miR-211, which the researchers thought was involved. The levels of this molecule could be gradually lowered by administering the antibiotic doxycycline, enabling tests of its potency to avoid epilepsy.

Working with colleagues at Ben-Gurion University of the Negev and Dalhousie University in Canada, the researchers suppressed excess miR-211 production in the engineered mice to the levels found in normal brains. Within four days, the mice displayed electrically-recorded epilepsy and hypersensitivity to epilepsy-inducing compounds.

“Dynamic changes in the amount of miR-211 in the forebrains of these mice shifted the threshold for spontaneous and pharmacologically induced seizures, alongside changes in the cholinergic pathway genes,” said Soreq.

These findings indicated that miR-211 plays a role in protecting the brain from epileptic seizures in the engineered mice.

Noting that miR-211 is known to be elevated in the brains of Alzheimer’s patients who are at high risk for epilepsy, the researchers suspect that in human brains as well, elevated miR-211 may act as a protective mechanism to reduce the risk of epileptic seizures.

“It is important to discover how only some people’s brains present a susceptibility to seizures, while others don’t, even when subjected to these same stressors,” noted Soreq. In searching for the physiological mechanisms that allow some people’s brains to avoid epilepsy, we found that increased levels of micro-RNA 211 could have a protective effect.”

The researchers suggested that recognizing the importance of miR-211 could open new avenues for diagnosing and interfering with epilepsy.

By understanding how miR-211 affects seizure thresholds, scientists could potentially develop therapeutics that lead to greater miR-211 production, they said.