

Researchers stimulate human amygdala to gain key insight into SUDEP

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Sudden unexpected death in epilepsy (SUDEP) is becoming increasingly recognized as a very real and devastating problem in which impaired breathing is thought to play a critical role. Researchers believe breathing may be impaired during and after seizures, without the patient's knowledge.

By using [electrical stimulation](#) to activate the [amygdala](#), a group of University of Iowa researchers has identified areas of the human brain in which [breathing](#) is controlled and, in some cases, impaired, providing an important insight into SUDEP.

Their study - which marks the first time researchers have stimulated the amygdala in humans and reported loss of breathing - is published in the July 15 issue of the *Journal of Neuroscience*.

Using a research participant with medically [intractable epilepsy](#) - epilepsy which can't be well-controlled with two or more medications - whose brain was already being monitored to map the focus of [seizures](#), researchers found that when seizures spread to the amygdala, the patient stopped breathing. That effect could be reproduced by electrically stimulating the amygdala. Strikingly, the patient wasn't aware he wasn't breathing even though he was wide awake at the time. This finding was reproduced in two other human subjects.

"Amazingly, the patient was completely unaware that he had stopped breathing," says Brian Dlouhy, M.D., assistant professor of neurosurgery

at UI Carver College of Medicine and lead author of the study. "It was remarkable to all of us that one of the essentials of life - breathing - could be inhibited and the patients themselves were completely unaware of this."

"The patient just sat there, unconcerned that he was not breathing," says John Wemmie, M.D., Ph.D., professor of psychiatry, [molecular physiology](#) and biophysics, and neurosurgery at the UI Carver College of Medicine, and an author of the paper. "If we asked him to hold his breath for the same duration of time, it was difficult for him and he could barely do it. But when the amygdala was stimulated, he didn't even notice that his breathing had stopped."

Dr. George Richerson, M.D., Ph.D., professor and chairman of neurology, and professor of molecular physiology and biophysics, and neurosurgery at the UI Carver College of Medicine, also an author on the paper, says, "These findings provide an explanation for why SUDEP occurs after seizures, because patients would stop breathing but be completely unaware that their [blood oxygen levels](#) are progressively dropping to fatally low levels. The lack of awareness would prevent activation of the reflex that is needed to restore oxygen levels back to normal."

The team's findings may be key in helping to decrease instances of SUDEP, Dlouhy says.

"Identifying brain areas where seizure spread interferes with breathing may help identify [patients](#) at risk for SUDEP and lead to preventive strategies," he says.

Provided by University of Iowa

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