Device from Sandia and Know Biological will warn people with epilepsy of oncoming seizures

Sandia National Laboratories

People living with epilepsy could soon have life-changing access to a portable device that will give them up to 30 minutes of advance warning before a seizure occurs, thanks to a partnership between Sandia National Laboratories and Know Biological.

Worldwide, there are nearly 65 million people with epilepsy, and more than 3.5 million in the U.S. alone. Epilepsy is characterized by recurring periods of abnormal or excessive electrical discharges in the brain that result in seizures. One-third of epilepsy patients experience seizures that cannot be controlled with medication or medical intervention.

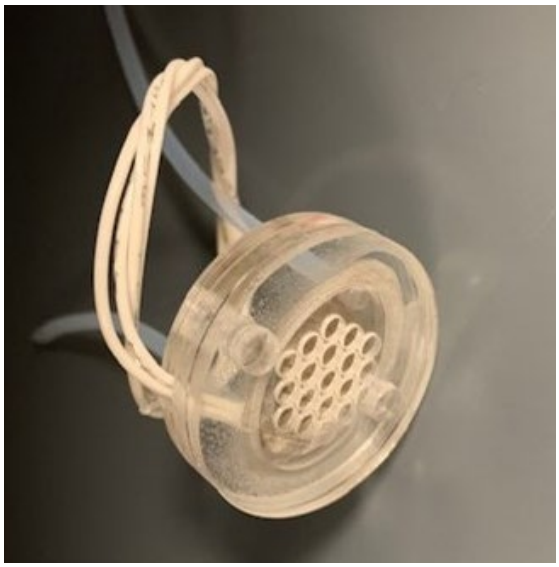
Unexpected seizures can result in accident, injury, embarrassment, and costly trips to the emergency room. They can be difficult to predict and can be dangerous, particularly when the patient is unable to contact family, a friend, or medical personnel.

The diagnostic device under development by scientists from Know Biological and Sandia will offer an impactful, meaningful improvement to the lives of epilepsy patients and their families by providing them with an actionable, early warning of seizure events.

Researchers at Know Biological have identified several key volatile organic compound (VOC) biomarkers—chemicals that the body emits through sweat, saliva, and exhaled breath—that are released five to 30 minutes prior to an epileptic seizure in humans. Service dogs for people with epilepsy have been taught to detect these chemicals and alert their owners of a coming seizure, but patient access to such dogs is limited, and no reliable alternative detection systems are yet available.

Under a cooperative research and development agreement (CRADA), Know Biological's biomarker expertise is being paired with Sandia's chemical sensing technology to create a wearable diagnostic monitor for VOC biomarkers that would warn patients of an upcoming epileptic seizure. This critical early warning will allow patients to protect themselves and otherwise prepare for the vulnerability caused by seizures.

The three-stage detection system consists of several microfabricated and miniaturized chemical sensing technologies developed at Sandia. The process starts with a device about the size of a watch face, with a thin film of synthetic material that captures VOCs from the patient's skin. The collected chemicals are separated using gas chromatography, and then identified using Sandia's miniature ion mobility spectrometer technology. Each stage will increase overall system sensitivity or selectivity.



Above: *Sandia's Skin Volatile Collector (SVC), about the size of a watch face, will be worn against the patient's skin to collect biomarkers diagnostic of future seizure onset. Integrated heaters and flow control will draw the biomarkers into the sensor system for analysis.*

Ultimately the complete system will produce a high-reliability diagnostic that patients can trust. The developers expect the diagnostic instrument to weigh less than five pounds and be readily portable to give patients full freedom of movement.

Know Biological has licensed six of Sandia's patented technologies related to VOC detection. In addition, Know Biological and Sandia have three patent filings that resulted from the CRADA; the first was awarded in June 2021. The two parties are also jointly filing a fourth patent in 2021, on a device that incorporates additional sensor technology and is applicable to health conditions beyond epilepsy.