A Long-term Seizure Detection and Electronic-Diary Platform

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Clinical Need

- One million people in the U.S. suffer from unpredictable, drug-resistant seizures.
• Seizure onset may be observable from scalp EEG for up to 10 seconds or more before clinically debilitating symptoms (LOC, convulsions).
Electrographic EEG Seizure Detector

1. **Safety**
2. **Improved treatment**
3. **Long-term EEG**
Existing Seizure Detection Technology

1. Intracranial detectors
   - Invasive
   - High Maintenance
   - Inaccurate
   - **Unsafe and Unreliable Materials**
2. Sensory detectors

- Non-invasive
- **Alert after debilitation**
- Unsuitable to detect non-convulsive seizures
3. Scalp EEG detectors

- Excellent accuracy (>96%, <0.2 FP/h)
- Burdensome and impractical
- Amplified stigma
- Invisible
- Accurate
- Unobtrusive
Seizure detection earpiece with Long-term EEG

Sensitive/specific detection algorithms (Swappable Battery)

Phonecall to EMS or family

Closed-loop activation of neuro-stimulator to abort seizures
Sub-dermal electrodes under the scalp (outside skull)

Few scalp-incisions, local anesthetic

Wirelessly powered by the earpiece

Transfers EEG signals wirelessly to earpiece

Seizure Detection EEG storage

Implantable EEG Recorder
Sub-dermal Electrodes

Wireless Power & Data EEG Amplifier/Recorder

Low-power Detection Algorithms Compatible with Embedded Chips

Ultra-low Power EEG Amplifier

24-channel wearable Long-term EEG recorder

Results to Date

Eye Blinks Lowpass Filtered f-cutoff = 55 Hz
An ETP Award Could Help

- Integrate system components to perform seizure detection in awake, behaving animals
- Validate earpiece-based seizure detection in humans using scalp electrodes
- Fabricate sub-dermal electrodes using FDA-unrestricted materials
- Develop a business and fundraising pathway for medical device development
Thank you for your consideration!