
Evolution into Epilepsy

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Epilepsy affects 3-5% of the population worldwide, affecting persons indiscriminately of age, sex or race. In the vast majority of cases, seizures arise from medial temporal structures that have been damaged months to years before onset of seizures. To better understand the functions of complex neurological changes in brain tissue, we propose to elucidate the mechanisms of pathological evolution of epilepsy by comparing and analyzing in-vivo microelectrode recording, multi-electrode array recording of in-vitro slices and MR imaging. By characterizing the latent development of epilepsy from traumatic insult to onset in the chronic limbic epilepsy rat model (a realistic animal model for human temporal lobe epilepsy and epileptogenesis), essential relationships between onset pathology and remodeling of the neural tissue will be determined.

In the past 6 months we have:

1. Developed facility and techniques for in-house microelectrode fabrication.
2. Perfected surgical technique for implanting electrodes.
3. Developed acquisition program: 32 channels per animal at 12kHz nonstop for six weeks.
4. Implemented high-quality video recording system to correlate behavioral signs of seizure with electrode data.
5. Stimulated and recorded high-quality microelectrode data on several animals.
6. Developed infrastructure for data storage and group data sharing.
7. Developed database to allow data coordination and searching within all data modalities for each animal.
8. Developed code for using distributed computing (XGrid) to analyze epilepsy data.
9. Have preliminary high resolution (14 Tesla) MRI ex-vitro data.
10. Have preliminary data from adult rat hippocampal slices in 3-D MEA, having overcome perfusion issues and noisy hardware.
11. Preliminary analysis using both linear and nonlinear methods to identify useful measures comparing normal and epileptic data.

Project Website

http://www.bme.ufl.edu/epilepsy