

## **Abstract**

This study is the first to perform EEG recording and spectral analysis of the Power Spectral Density across specific frequency bands (delta, theta, alpha, beta, gamma) during late stages of development after flurothyl treatment in immature rats. This study hypothesizes that epileptogenic process followed flurothyl-induced repetitive generalized seizure in immature rats exhibit specific developmental and sex-dependent EEG pattern, which will be a suitable biomarker for diagnosis and monitoring of disease progression.

Our findings detected seizure activity (both electrographic seizure and interictal epileptiform events occurrence) in early postnatal stages (P12, P15, P25), with significant gender-specific differences, with higher seizure rates in males. Moreover, it reveals no silent phase, indicating rapid development of chronic epilepsy after recurrent seizure induction. Spectral analysis of EEG data showed altered neuronal excitability in flurothyl-treated groups compared to non-treated animals, indicating a potential biomarker based on the EEG correlates, that could serve as a tool for further research and clinical application.

**Keywords:** neonatal seizures, recurrent generalized spontaneous seizures, immature rats, flurothyl, EEG, Power Spectral Density