Evaluation of seizure sensitivity and potential excitation foci in Phf24-KO rats

Naofumi Kunisawa¹, Hiroaki Hisadumi¹, Masaki Kato¹, Saki Shimizu¹, Kazuaki Sato², Masato Kinboshi¹, Masao Matsuhashi³, Akio Ikeda³, Tadao Serikawa¹, Yukihiro Ohno¹

¹Dept. Pharmacol., Osaka Univ. Pharmaceut. Sci., ²Dept. neurol., Ijinkai takeda general Hosp., ³Dept. Epilepsy, Mov. Dis. and Physiol., Kyoto Univ.

Phf24 was identified as a potential causative protein for spontaneous convulsions of Noda epileptic rats (NER) (Behav. Genet., 2017). Moreover, we previously revealed that Phf24-KO rats have higher susceptibility to pentylenetetrazole (PTZ)-induced seizure than control rats (Behav. Brain Res., 2019). In this study, we performed the electroshock seizure test in combination with the brain mapping analysis of Fos protein, a biological marker of neural excitation, to clarify the brain regions involved in enhanced seizure susceptibility in Phf24-KO rats. Phf24-KO rats showed a significantly higher susceptibility to electrically-induced seizures than control (F344) rats and an increased Fos expression with the evoked seizures in the cerebral cortex (Cx), hippocampus (Hpc), amygdala (Amg), and thalamus. In addition, we analyzed the wide-band EEG recorded from the Cx, Hpc, and Amg during PTZ-induced seizures. Epileptiform discharges induced by PTZ were significantly longer in Phf24-KO rats than in control rats. Furthermore, we confirmed the appearance of high frequency oscillation (HFO) components (200 to 500 Hz) of EEG in Phf24-KO rats, specifically in the early stage of seizures. These results suggest that hyperexcitation of Cx, Hpc, and Amg is involved in the hypersensitivity to seizures in Phf24-KO rats.