Unilateral-onset spike and wave discharges (SWDs) following fluid percussion injury (FPI) in rats have been used for nearly two decades as a model for complex partial seizures in human post-traumatic epilepsy (PTE). This study determined if SWDs with a unilateral versus bilateral cortical onset differed. In this experiment, 2-month old rats received severe FPI (3 atm) or sham surgery and were instrumented for chronic video-electrocorticography (ECoG) recording (up to 9 months). The anti-seizure drug, carbamazepine (CBZ), and the anti-absence drug, ethosuximide (ETX), were administered separately to determine if they selectively suppressed unilaterally- versus bilateral-onset SWDs, respectively. SWDs did not significantly differ between FPI and sham rats on any measured parameter (wave-shape, frequency spectrum, duration, or age-related progression), including unilateral (~17%) versus bilateral (~83%) onsets. SWDs with a unilateral onset preferentially originated ipsilateral to the craniotomy in both FPI and sham rats, suggesting that the unilateral-onset SWDs were related to surgical injury and not specifically to FPI. ETX profoundly suppressed SWDs with either unilateral or bilateral onsets, and CBZ had no effect on either type of SWD. These results suggest that SWDs with either a unilateral or bilateral onset have a pharmacosensitivity similar to absence seizures and are very different from the complex partial seizures of PTE. Therefore, SWDs with a unilateral onset after FPI are not a model of the complex partial seizures that occur in PTE, and their use for finding new treatments for PTE could be counterproductive, particularly if their close similarity to normal brain oscillations is not acknowledged [1)].

1)

Tatum S, Smith ZZ, Taylor JA, Poulsen DJ, Dudek FE, Barth DS. Sensitivity of Uni- vs Bilateral Spike-Wave Discharges to Ethosuximide and Carbamazepine in the Fluid Percussion Injury Rat Model of Traumatic Brain Injury. J Neurophysiol. 2021 May 5. doi: 10.1152/jn.00098.2021. Epub ahead of print. PMID: 33949882.