# Calcium/calmodulin-dependent protein kinase II

Calcium/calmodulin-dependent protein kinases (CaMKs) are key regulators of calcium signaling in health and disease. CaMKII is the most abundant isoform in the heart; although classically described as a regulator of excitation–contraction coupling, recent studies show that it can also mediate inflammation in cardiovascular diseases (CVDs). Among CVDs, cardiorenal syndrome (CRS) represents a pressing issue to be addressed, considering the growing incidence of kidney diseases worldwide.

Choy et al. developed an optogenetic kindling model through repeated stimulation of ventral hippocampal CaMKII neurons in adult rats. They then combined fMRI with electrophysiology to track brain-wide circuit dynamics resulting from non-afterdischarge (AD)-generating stimulations and individual convulsive seizures. Kindling induced widespread increases in non-AD-generating stimulation response and ipsilateral functional connectivity and elevated anxiety. Individual seizures in kindled animals showed more significant increases in brain-wide activity and bilateral functional connectivity. Onset time quantification provided evidence for kindled seizure propagation from the ipsilateral to the contralateral hemisphere. Furthermore, a core of slow-migrating hippocampal activity was identified in both non-kindled and kindled seizures, revealing a novel mechanism of seizure sustainment and propagation [1].

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Choy M, Dadgar-Kiani E, Cron GO, Duffy BA, Schmid F, Edelman BJ, Asaad M, Chan RW, Vahdat S, Lee JH. Repeated hippocampal seizures lead to brain-wide reorganization of circuits and seizure propagation pathways. Neuron. 2021 Oct 23:S0896-6273(21)00778-9. doi: 10.1016/j.neuron.2021.10.010. Epub ahead of print. PMID: 34706219.