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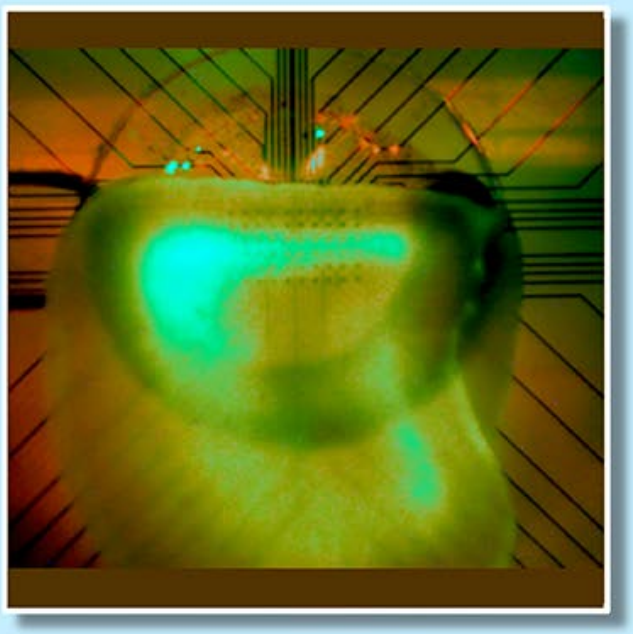

Explanted Mouse Pre-fontal Cortex
on a Microelectrode Array

Transcranial Current Stimulation Increases the Endogenous Wave Power of Norepinephrine Treated Mouse Cortical Slices *In Vitro*

Noninvasive transcranial electric current stimulation (tCS) has been experimentally effective in improving major depression and schizophrenia symptoms. As transcranial alternating current stimulation (tACS) increases the brain's alpha wave power, it has been hypothesized that the tCS anti-depressant property is a result of this increase (Vossen, et al, 2015). However, it is not known whether tCS will cause increases in alpha waves at the neuronal level. This study aims to create an *in vitro* mouse brain model in which tCS or chemical stimulation results in an increase of the endogenous wave power. For this purpose, we cultured slices of the pre-fontal cortex of juvenile mice (pFMCS) in artificial cerebral spinal fluid (aCSF). The multiunit neuronal activity of the slice was recorded by a 6x10 microelectrode array. During recording, the slices were perfused with 5 µM carbachol (CCh), 5 µM norepinephrine (NE), or pure aCSF. We carried out two types of tCS: high frequency electric field stimulation (HFEFS) and 2Hz sine wave tACS (2Hz tACS). Combined with HFEFS, NE increased the power of 2 Hz oscillations, compared with sham treated samples. In contrast, HFEFS-stimulated CCh-treated slices had less of an increase in firing rate than sham. After 2Hz tACS, the NE stimulated slices experienced a significant increase in spectral power than when compared to pre-stimulation. TCS applied to NE-treated slices appears to produce a result most similar to the effect of tCS on a human's brain waves. Therefore, the combination of tCS and NE treated pFMCS will be used in the future as a model to evaluate how variations in tCS properties affect neuronal activity.