



Département de psychiatrie  
Centre de neurosciences psychiatriques  
Site de Cery  
CH-1008 Prilly - Lausanne

# Centre de Neurosciences Psychiatriques

## CNP SEMINAR

### ANNOUNCEMENT

Friday, December 2, 2016, 11:00 a.m.

## "Hypothalamic inhibitory circuitries: their role in sleep-wake transition behaviours"

### Dr C Gutierrez Herrera, PhD

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Invited by Benjamin Boutrel  
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During non-rapid eye movement (NREM) sleep, synchronous synaptic activity within the thalamocortical network generates predominantly low frequency oscillations (< 4 Hz) that are modulated by inhibitory inputs from the thalamic reticular nucleus (TRN). Whether TRN cells integrate sleep-wake signals from sub-cortical circuits remains unclear. Here, we identified a monosynaptic LH (lateral hypothalamus)<sub>GABA</sub> → TRN<sub>GABA</sub> transmission that exerts a strong inhibitory control over TRN neurons. We showed that optogenetic activation of this circuit recapitulated state-dependent changes of TRN neuron activity in behaving mice and induced rapid arousal during NREM, but not REM sleep. During deep anesthesia, activation of this circuit induced sustained cortical arousal. In contrast, optogenetic silencing of LH<sub>GABA</sub>-TRN<sub>GABA</sub> increased the duration of NREM sleep and amplitude of delta (1-4 Hz) oscillations. Collectively, these results demonstrate that TRN cells integrate subcortical arousal inputs selectively during NREM sleep and participate in sleep homeostasis.

#### Selected Publications:

- 1) Herrera CG et al. (2016) Hypothalamic feedforward inhibition of thalamocortical network controls arousal and consciousness. *Nature Neuroscience* 19(2):290-298
- 2) Herrera CG & Adamantidis A (2015) An integrated microprobe for the brain. *Nature Biotechnology* 33(3):259-260
- 3) Jégo S et al. (2013) Optogenetic identification of a rapid eye movement sleep modulatory circuit in the hypothalamus. *Nature Neuroscience* 16 (11) :1637-1643