

## Abstract View

A MODEL OF RETICULAR THALAMIC SPINDLE OSCILLATIONS MEDIATED BY GABA<sub>A</sub> DEPOLARIZATION.

[A.R. Houweling<sup>1\\*</sup>](#); [M. Bazhenov<sup>1</sup>](#); [I. Timofeev<sup>2</sup>](#); [M. Steriade<sup>2</sup>](#); [T.J. Sejnowski<sup>1</sup>](#)

1. Salk Institute, La Jolla, CA, USA

2. Neurophysiology, Laval University, Quebec City, PQ, Canada

Intracellular recordings from reticular thalamic (RE) neurons in vivo suggest that in RE cells hyperpolarized below the Cl<sup>-</sup> reversal potential, reversed inhibitory postsynaptic potentials (IPSPs) can directly trigger a low-threshold Ca<sup>2+</sup> spike. In a large-scale, two-dimensional (2D) network model of the RE nucleus with membrane potentials lower than the Cl<sup>-</sup> reversal potential, GABA<sub>A</sub>-mediated synaptic excitation led to propagating patterns of spike-burst activity, which could be transformed into self-sustained oscillations (Nature Neurosci. 2:168, 1999). However, the mean membrane potential of the majority of RE cells in vivo is more positive than the Cl<sup>-</sup> reversal potential. Here we investigate whether the patterns of RE excitation can propagate or sustain in the 2D RE network model if only a small fraction of RE cells is hyperpolarized below the GABA<sub>A</sub> reversal potential. Resting potentials of RE cells were randomly set between -65 and -75 mV. Self-sustained oscillations were found in the 2D RE network when only 25% of RE cells were hyperpolarized below the Cl<sup>-</sup> reversal potential. Activity patterns appeared in the form of spiral waves moving irregularly over the network domain. The size of these patterns decreased when the fraction of cells depolarized above -70 mV increased. The average membrane potential exhibited recurring periods of oscillations in the frequency range 10-15 Hz with duration that depended on network size and synaptic and intrinsic parameters of RE cells. Thus, this model predicts that GABA<sub>A</sub>-mediated excitation can robustly generate sequences of spindle-like oscillations in the isolated RE nucleus.

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