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### **A Mathematical Model of the Sleep/Wake Regulatory System**

The mammalian sleep/wake system is governed by several interacting populations of neurons in and around the hypothalamus. We present here a model of the sleep and wake promoting neuron populations in the ventrolateral preoptic nucleus (VLPO), basal forebrain (BF), parabrachial nucleus/precoeruleus area (PB/PC) and laterodorsal tegmental/pedunculopontine tegmental nucleus (LDT/PPT). The model is formed using Morris-Lecar firing dynamics for electrical input and chemical kinetics of receptor-neurotransmitter/neuromodulator interaction to quantify chemical synaptic input. We also present a novel but simple way of relating firing rates of neuron populations to corresponding concentrations of neurotransmitter/neuromodulator, allowing us to track both electrical and chemical output. Rate and equilibrium constants are obtained using appropriate mammalian data from the BRENDA enzyme database.