COMPUTATIONAL MODELING OF SENSORY CIRCUITRY IN THE NUCLEUS TRACTUS SOLITARII FROM ARTERIAL BARORECEPTOR AND SOMATOSENSORY INPUTS

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ABSTRACT

Baroreflex function regulates the arterial blood pressure in our body. The baroreflex is considered to be an integrated negative feedback system. NTS (Nucleus tractus solitarius) is one of key subsystems in this baroreflex loop. In the past, NTS has been considered primarily as a relay cell but later it was determined that it plays a major role in the baroreflex function. It has been found that the NTS is a site for the integration of sensory information from different variables in the body. This lead to further studies on the properties of the NTS neurons and how it affects the baroreflex function.

The present study is an effort to characterize the NTS at both the single cell and network levels using computational models which are subsequently used to investigate hypotheses regarding NTS functions. With known biological data about NTS cells, the models are used to investigate properties such as pulse synchronicity at intermediate stages in the NTS. The input-output relationship at the first synapse of the NTS is studied first using a single cell network and a transfer function model. The underlying causes for a lack of pulse synchronicity at the second order NTS neuron is then investigated using a population level network model. Finally, a somatic afferent is added to the population model through another GABA population to study the possible effect of exercise on this baroreflex function.