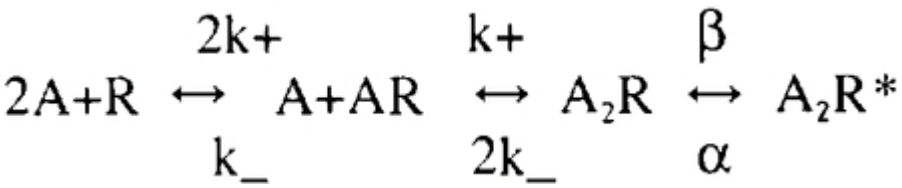
Abstract View

A SENSITIVITY ANALYSIS OF CHEMICAL KINETICS PARAMETERS FOR THE NEUROMUSCULAR JUNCTION.

T. Bartol[1]; T. Sejnowski[1]; B. Land[2]; E. Salpeter[2]; M. Salpeter[2*]

1. Salk Institute, La Jolla, CA,
2. Cornell University, Ithaca, NY,

The simplest chemical kinetics scheme for the development of miniature endplate currents (mepcs) at the neuromuscular junction (NMJ) is: To explain mepc characteristics (e.g. rise-time, amplitude, fall-time) with a simulation one has to assign numerical values to the four kinetics parameters, plus a diffusion constant (D) and quantal packet size. Previous measurements on lizard neuromuscular junctions (NMJ's) under various experimental conditions have led to one set of MCell simulation parameters (http://www.mcell.cnl.salk.edu) that match observed mepc characteristics. A major question of interest now is uniqueness of these simulation parameters and their relevance to other synapses. We carried out 47000 MCell simulations of a simplified NMJ to derive a table of 1568 sets of simulation parameters and their predicted mepc characteristics. With a slight loss of accuracy, only four parameters: β/α, β/k_, k+/k_ and D/k_ needed to be varied, allowing a wide range to be covered. The simulations were performed at the San Diego Supercomputer Center on BlueHorizon, an IBM SP with 1152 processors. The table is summarized in graphical form. An algorithm is presented for searching and interpolating the table for determining the range of simulation parameters which will equally well match mepc characteristics and for comparisons to other synapses.
Supported by: NIH NS-09315 NSF IBN-9603611, and by NSF to the San Diego Supercomputer Center.



close