Abstract

Impermeant anions (proteins, amino acids etc.) are non-uniformly distributed along dendrites. Using a multicompartment electrodiffusion based computational model we investigated the influence this distribution of impermeant anions may have on neuronal cellular physiology, passive cable properties and synaptic integration. We found that local differences in impermeant anion valences result in a non-isopotential dendrite with ionic microdomains, with fixed ionic driving forces across the dendrite. With volume controlled, non-uniform impermeant anion valences did not affect membrane time and length constants, or properties of synaptic integration and action potential propagation. These finding explain how neurons maintain their signalling integrity in the face of a constantly changing impermeant anion milieu.