Bursting in Neuronal Networks with and without Glia

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The phenomenon of spontaneous firings induced by low Mg2+ condition in primary cortical neuronal cultures with different amounts of glia are used to study the effects of glia on the dynamics of the network. Single cell patch-clamp measurements have shown that the forms of firing during spontaneous firings are different for networks with and without glia. In general, the synchronization of networks with glia is better than that of without glia. Furthermore, cultures originally without glia can be made to produce better synchronization and recover the form of firings similar to those from cultures with glia after glia have been added to the network. Our finding indicates that glia are interacting with neurons in the network to coordinate the firings. Furthermore, it seems that the presence of glia can change the form of firings of neurons from isolated action potentials to bursting; suggesting a new mechanism of bursting in a network. A computation model with glial release is studied to understand our results.