World Academy of Science, Engineering and Technology
International Journal of Chemical and Materials Engineering
Vol:9, No:05, 2015

Two Dimensional Finite Element Model to Study Calcium Dynamics in Fibroblast Cell with Excess Buffer Approximation Involving ER Flux and SERCA Pump

Authors : Mansha Kotwani

Abstract : The specific spatio-temporal calcium concentration patterns are required by the fibroblasts to maintain its structure and functions. Thus, calcium concentration is regulated in cell at different levels in various activities of the cell. The variations in cytosolic calcium concentration largely depend on the buffers present in cytosol and influx of calcium into cytosol from ER through IP3Rs or Raynodine receptors followed by reuptake of calcium into ER through sarcoplasmic/endoplasmic reticulum ATPs (SERCA) pump. In order to understand the mechanisms of wound repair, tissue remodeling and growth performed by fibroblasts, it is of crucial importance to understand the mechanisms of calcium concentration regulation in fibroblasts. In this paper, a model has been developed to study calcium distribution in NRK fibroblast in the presence of buffers and ER flux with SERCA pump. The model has been developed for two dimensional unsteady state case. Appropriate initial and boundary conditions have been framed along with physiology of the cell. Finite element technique has been employed to obtain the solution. The numerical results have been used to study the effect of buffers, ER flux and source amplitude on calcium distribution in fibroblast cell.

Keywords : buffers, IP3R, ER flux, SERCA pump, source amplitude
Conference Title : ICCME 2015 : International Conference on Chemical and Materials Engineering
Conference Location : Rome, Italy
Conference Dates : May 05-06, 2015