Contribution ID: **126** Type: **Poster Presentation**

Multi-Parameter Analysis in Single-cell Electroporation Based on the Finite Element Model

Thursday, 7 July 2016 14:40 (20 minutes)

Pulsed electric fields have recently been the focus of considerable attention because of their potential application in biomedicine. However, their practical clinical applications are limited by poor understanding of the interaction mechanism between pulsed electric fields and cells, particularly in different effect of electroporation exposed in different parameters, and the optimal pulsed parameter is still vague. A multi-shelled dielectric model considering the inner membrane was established by the finite element software COMSOL in this paper. Different shock protocols (different pulsed duration/strength/frequency/polarity) was exposed to the cell model respectively to simulate and analyze the influence of pulse parameters on varying degrees of electroporation by comparing the dynamic development of the pore radius and electroporation region (include the distribution of recoverable, non-recoverable, and non-electroporation areas on the cell). Results showed that the conventional pulses have better efficiency in electroporation than high frequency pulses; The monopolar pulses with cumulative effect have much better electroporation effect than the bipolar pulses which have weakening effect when duration of single pulse reduced to nanosecond; and electric field strength was the major factor that induced electroporation, particularly in the recoverable pore, but it had minimal effect on pore expansion. However, pulse duration affects the non-recoverable pore, such that the high-intensity wide pulse is more useful in the field of irreversible electroporation. The high-intensity short pulse can increase permeability and maintain cell viability. This work done by this paper maybe exploited further to investigate the behavior of more complicated cell systems and to promote the optimized application of pulsed electric fields in clinical.

Primary author: Ms LIU, Hongmei (Chongqing University)

Co-authors: Dr YAO, Chenguo (Chongqing University); Dr LI, Chengxiang (Chongqing University); Mr DONG, Shoulong (Chongqing University); Mr ZHAO, Yajun (Chongqing University); Dr MI, Yan (Chongqing University); Mr LV, Yanpeng (Chongqing University)

Presenters: Dr YAO, Chenguo (Chongqing University); Ms LIU, Hongmei (Chongqing University)

Session Classification: Poster 2-A

Track Classification: Biological, Medical, and Environmental Applications of Power Modulators