Contribution ID: **335** Type: **Poster presentation**

Mathematical Analyze of Breakdown Transmembrane Potentials of Fish Eggs using Hen-egg model

Thursday, May 21, 2015 8:00 AM (3 hours)

The present study proposes another alternative approach to model the geometry of Nile tilapia egg for evaluation of the induced transmembrane potential. The actual shape of tilapia egg is an asymmetrical prolate spheroid with a short prolate spheroid bottom and a more elongate prolate spheroid at the top with a common equator rather than a symmetrical prolate spheroid. Unfortunately, the precise model of such non-spherical bioparticle does not exist as yet. In the past, the closest available model was as a shelled symmetrical prolate-spheroid which gave the large error to calculate transmembrane potential. This work proposes the complete "hen-egg model" to analyze the implicit value of electrical breakdown transmembrane potential. The two semi-minor axes (b, c) are set to equal one another. The ratio between the semi-major (a) and semi-minor axes is 1.3. We keep the volume of the egg constant throughout our analysis which is equivalent to that of the "hen-egg model" possessing the effective values of the semi-major a' and the semi-minor b' axes so that the polarization of the egg can be assumed to be the same over the whole egg volume. In the case of the egg possessing a single dielectric shell, it was also analyzed as the equivalent tri-phases of RC-circuit using three pairs of resistors and capacitors to represent the conductive and capacitive properties of the egg's shell, the inner part of the egg and the suspending medium, respectively. The complex specific impedances of each compartment of the fish egg were finally analyzed. The threshold transmembrane potential for electroporation of tilapia's egg is evaluated. This approach can not only be applied to the spheroid model but also to model of the ellipsoid, oblate-spheroid and spherical shaped object by changing the appropriate value of the depolarization factor depending
on the 3-D egg geometry.

Primary author: BUNTHAWIN, Sakshin (Biotechnology of Electromechanics Research Unit, Science of Physics, Faculty of Technology and Environment, Prince of Songkla University, Kathu, Phuket 83120, Thailand)

Presenter: BUNTHAWIN, Sakshin (Biotechnology of Electromechanics Research Unit, Science of Physics, Faculty of Technology and Environment, Prince of Songkla University, Kathu, Phuket 83120, Thailand)

Session Classification: Poster-2

Track Classification: Biological Physics and Biomedical Engineering