УДК 544.6

STUDY AND DETECTION OF CELL-CELL COMMUNICATION VIA ION CHANNELS

Zyryanova P.I. (ITMO University), **Noskova Y.V.** (ITMO University)
Supervisor – Dr. Ulasevich S.A.
(ITMO University)

Annotation. The research work describes the study of calcium channels of the C2C12 cell line by means of electrochemical methods, ion-selective electrodes. Channel activation is carried out with the help of norepinephrine and calcium chloride.

Introduction. Ion channels are commonly represented as integral membrane proteins that control the channel of several ions (Na^+, K^+, Ca^{2+}, and $Cl^–$) through lipid membranes in cells. Ion transport through an open ion channel is deter-mined by an electrochemical gradient for specific ions through the considered membrane. Various electrophysiological, biochemical, pharmaco-logical, genetic, and other methods are used to study ion channels in excitable tissues. Electrophysiological methods consist of registration of potentials and currents flowing through the membrane of an excitable cell. The cellular currents are usually subdivided into intra- and extracellular.

Main part. This research aims to study the cell-cell communications and interactions via ion channels using ion-selective electrodes. We will focus on the measurement of the extracellular current using ion-selective electrodes. This approach has advantages such as high efficiency, accuracy, and selectivity. Moreover, it is most suitable for studying calcium channels.

The ion-selective electrodes (ISEs) were prepared on carbon fiber and modified with polyelectrolytes by layer-by-layer (LbL) deposition. The LbL assembly was successfully implemented on cation exchange membranes, which includes an ionophore that reversibly binds to a specific ion. This approach provides high stability during sensor measurement and storage. The ISEs were immersed into solutions of the corresponding salts (KCl, NaCl, $CaCl_2$). The concentration of the solution was changed step-by-step after each addition of the standard solution. The potential values were monitored continuously using the potentiostatt. The electromotive force was measured between the working ISE and the reference electrode.

The C2C12 muscle cells were selected for the study as the control cell line due to its their sensitivity to Ca^{2+} ions. After calibration, the electrodes were immersed in a medium with cells to detect the current originated calcium ions. These current jumps could be associated with cell communication.

Conclusion. Thus, the obtained developed system is promising for monitoring cell-cell communication. Moreover, this system will be optimized for the detection of cell communication.