

## Estimation of natural nanoclay toxicity for mammalian cells

Научный руководитель – Фахруллин Равиль Фаридович

*Камалиева Руфина Фархадовна*

*Аспирант*

Казанский (Приволжский) федеральный университет, Казань, Россия

*E-mail: kamaliewa1988@list.ru*

Our research focuses on assessing the biocompatibility and cytotoxicity of halloysite for mammalian cells. It should be noted that the possibility of loading substrates of various nature into the nanotube cavity opens prospects for the practical application of the natural halloysite mineral. Halloysite nanotubes have external diameters of  $\approx 50$  nm, internal diameters of 10-15 nm, and length of  $\approx 1000$  nm.

Adenocarcinomic human alveolar basal epithelial cells (A549) were obtained from American Type Culture Collection (ATCC, USA). The cells were cultured in Dulbecco's modified eagle medium (DMEM) (Sigma, USA) supplemented with 10% (v/v) of heat-inactivated fetal bovine serum (FBS) (PAA, Austria), 45 I.U/ml penicillin and 45  $\mu\text{g}/\text{ml}$  streptomycin (PAA, Austria). The cells were cultured at 37°C in 80% humidified atmosphere with 5% CO<sub>2</sub>. A change of metabolic activity of the cells was assessed by the following indicators: 1. Activity of lactate dehydrogenase in the extracellular medium that is an indicator of irreversible cell death due to cell membrane damage; 2. Decrease of the total activity of the mitochondrial dehydrogenase by the MTT assay, reflecting the inhibition of cellular respiration rate 3. The resazurin reduction assay that is an indicator of inhibition of the cellular respiration; 4. Decrease of the rate of the endocytosis of the neutral red vital dye that correlates with the lysosomal function.

The results show that halloysite led to the dose-dependent cell response. Thus the IC<sub>50</sub> value for A549 treated with the halloysite (5, 11, 33, 100, 300, 900) for 24 hours was 300  $\mu\text{g}/\text{ml}$ . LDH test demonstrates the increased viability in halloysite-treated samples, while resazurin and neutral red tests suggest that the increased concentrations of halloysite administered to A549 cells inhibit the enzymatic activity of the cells.

We have shown that the native halloysite provides a physiological influence on the functional characteristic of the cultured cells (human breast adenocarcinoma A549 cell line) after 24 hours of treatment. Similar were obtained with magnetic nanoparticles for 2D and 3D cells.

The work is performed according to the Russian Government Program of Competitive Growth of Kazan Federal University, partially was funded by the subsidy allocated to Kazan Federal University for the state assignment in the sphere of scientific activities (project 16.2822.2017/4.6) and with RFBR according to the research project 18-29-25057.