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RESEARCH OF THE IMPACT OF CERIUM NANOPARTICLES ON THE *SACCHAROMYCES CEREVISIAE Y-2519* ACTIVITY

The main purpose of the study was to detect the effect of nanoparticles of different cerium salts on the growth and development of the model eukaryotic organism *Saccharomyces cerevisiae*.

The object of the study was the activity of the yeast Saccharomyces cerevisiae B-2519 in the presence of cerium salts of different valences. The strain is available in the depository of microorganisms of Danylo Zabolotny Institute of Microbiology and Virology NAS of Ukraine. *Saccharomyces cerevisiae* is one of the most intensively studied eukaryotic model organisms in molecular and cell biology, similar to *Escherichia coli* as a model bacterium. It is useful in cell cycle research because it is easy to grow, but as a eukaryote, it shares the complex internal structure of animal and plant cells. The *S. cerevisiae* genome was the first fully sequenced eukaryotic genome [1].

The yeast genome database is very well annotated and remains an important tool for the study of the function and organization of eukaryotic genetics and physiology. Another important genetic database of *S. cerevisiae* is maintained by the Munich Information Center for Protein Sequence (MIPS). The genome consists of about 13 million base pairs and 6,275 genes, although it is estimated that only about 5,800 of them are valid functional genes. Yeast is estimated to share about 23% of its genome with the human genome [2, 3].

Research methods and tools. The nanoparticles of cerium dioxide (CND, particle size of 4-6 nm), salts of Ce (III) and salts of Ce (IV) are used as reagents in the work. Cell culture was grown on agar YEPD culture medium for 24 hours under

thermostatic conditions (28°C) in Petri dishes to achieve a stationary phase of population growth.

YEPD nutrient composition:

1% – yeast extract

2% – peptone

2% – glucose

2.5% – agar-agar

The medium in the autoclave was sterilized at a temperature of 116°C at an additional pressure of 0.5 atm. The washings were performed with distilled water. The measurements of the optical density of the cell suspension were performed on a photoelectrocolorimeter KFC-2 UHL and brought to D540 = 0.1. The final prototypes were read on a tablet analyzer. All work was performed under sterile conditions to prevent contamination of microorganisms.

The practical significance of the results obtained. The research work on solving topical issues related to the problem of creating nanobiocompositions based on cerium dioxide nanoparticles was conducted for the first time at Danylo Zabolotny Institute of Microbiology and Virology NAS of Ukraine. It requires a systematic approach to the study and evaluation of the biological effects of this complex.

Research results. The studies were performed on one- and five-day culture of yeast cells. A 96-well plate was made with a model organism and a solution of cerium salts of different valence and concentration. Three replicates were made for each sample of a given concentration. The concentration of the samples ranged from 1 mM to 0.1 nM. A test sample, in which Cerium was replaced with distilled water, was made nearby. Then, the test samples reading with the usage of a tablet analyzer was conducted. The samples were MTT-tested and centrifuged. The calculations, graphs, histograms and static processing were performed with the usage of the Microsoft Excel 2010 computer program. According to the results, the 1mm solution of Cerium (III) has a positive effect on the growth of microorganisms, with five

samples showing a tendency to increase the optical density compared to control. In most cases, cerium dioxide nanoparticles gave a decrease in optical density at all concentrations from 1 mM to 0.1 nM.

Conclusion. The study of topical issues related to the study of the biological action of cerium nanoparticles of different valences requires a comprehensive approach. Cerium dioxide nanoparticles have different effects on the optical density of the suspension of the model eukaryotic microorganism *S. cerevisiae* throughout the study. The experimental data of the MTT test of the culture of *S. cerevisiae Y-2519* after application of different concentrations of solutions of cerium salts (Ce (III), Ce (IV), cerium dioxide nanoparticles) indicate a nonlinear influence of the experimental nanobiocompositions and need further study.

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