RED MICROALGAE *PORPHYRIDIUM CRUENTUM* – MARKER OF NANOPARTICLE TOXICITY

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The development of nanotechnologies that is recorded in the last decades has seen a great success, in particularly in nano-materials, which is characterized by the eminence from the point of view of the basic knowledge and from the point of view of practical applications.

Along with the development of this branch of science, increases the risk of human exposure and nanomaterial environmental action. Since the aquatic environment is very vulnerable to direct or indirect contamination with nanoparticles, reaction study of aquatic organisms to the action of these materials is very opportune.

Nanomaterials hybrid systems – microorganisms offer the opportunity to make a perfect study of nanoparticle toxicity on organisms, but also of their potential beneficial effects. Microalgae present very convenient and representative objects, which offer enormous facilities in modeling various effects and determination of action mechanisms of diverse compounds on vital cell's processes, that is what these aquatic objects are very convenient models to determine potential toxic effects.

Currently several species of microalgae (*Chlamydomonas reinhardtii, Euglena gracilis, Chlorella vulgaris, Scenedesmul sp*. etc.) are used as models for establishing different types of nanomaterials toxicity. The method of determining

the toxicity of nanoparticles with the use of microalgae, requires the exposure of the crop's which is exposed to the exponential growth phase, the action of nanomaterials in various concentrations and calculation of growth inhibition rate or accumulation of the free radicals.

To reduce the duration of the existing tests, was proposed setting procedure of the nanoparticles toxicity using red microalgae *Porphyridium cruentum* CNMN-AR-01.

The process consists of algal crop incubation with nanoparticles for 6 hours with determining the nanoparticles' toxicity by the negative correlation between the malonic diadehyde quantity in the biomass at the early stages of action and biomass quantity at the end of the microalgae growth cycle.

One of the principles behind the selection of the *Porphyridium cruentum* crop as a marker of the nanoparticles' toxicity, is the increased content of polyunsatured fatty acids, which are exposed to peroxidation in the case of toxic action of xenobiotics. The reaction to foreign substances is a prompt action, which occurs in the first hours of interaction. The level of MDA (malonic dialdehyde) registered in the first hours of microalgae's *Porphyridium cruentum* interaction with xenobiotics, correlates with the biomass quantity at the end of the life cycle of the crop. Thus decreases the necessity to reproduce the whole life cycle to observe the inhabitation effect of the productivity, toxicity being expressed through the increase of the malonic diadehyde level. In the experiments for determination of the ZnSe and ZnS nanoparticles toxicity was demonstrated that the correlation between the increase of the MDA content in the biomass with the reduction of biomass accumulation (table 1)

Table 1

The level of MDA and biomass quantity of Porphyridium cruentum to the action of different concentration of ZnSe and ZnS nanoparticles

Monitoring indicator	Concentration of ZnSe nanoparticles, mg/l				
	0,1	0,5	1,0	1,5	2,0
Biomass ,%M	102,2±3,1	78,7±3,0*	54,6±2,4*	51,6±3,2*	47,6±3,0*
MDA, %M	100,9±2,6	124±2,6*	132,2±1,8*	135,3±3,0*	135,9±2,6*
Concentration of ZnS nanopaticles, mg/l					
Biomass ,%M	82,3±2,6	60,7±1,7*	53,6±2,4*	50,9±3,3*	45,1±3,0*
MDA, %M	114,5±2,6	126,7±3,0*	134,2±2,7*	135,6±2,5*	145,0±2,1*

* - $p<0,01$

The data in Table 1 demonstrates that the increase of MDA content in porfidrium biomass after 6 hours of contact with ZnSe and ZnS nanoparticles in concentration of 0,5 mg/l and above, associates with a decrease of biomass quantity which accumulates at the end of the growth cycle of the crop. The presented results confirm the possibility of early assessment of the toxicity level of nanoparticles in the test of determining the different products of lipid peroxidation.