ECO-HYGENIC ASPECTS OF USE OF DESTRUCTOR-BACTERIA FOR CLEANING OF WATER AND SOIL FROM OIL'S CARBOHYDRATES

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Use of microbiological methods for liquidation of oil pollution of water often is practically the only opportunity to restore natural biocenosis. Besides microbiological methods are the cheapest ways, in comparison with other ways (separation, high-temperature burning, etc.). By virtue of these circumstances bacterial preparations for recycling of oil products have been widely used, in Ukraine and abroad.

In Ukraine the most known preparations are: «Desna», the Consortium of microorganisms, «Devoroil». In Russia are widely used «Putidoil», «Olevorin», «Devoroil », «Valentis», «Naftoks», «Micromycet», in Belarus - «Rodobel-Ò», in Germany – "Konsan", "Noggies", in USA "Petrobac", "Fenobac".

The composition of these preparations includes monocultures or associations of more than 20 species of various petrooxidizing microorganisms: bacteria, fungi, yeast. However among hydrocarbon destructors of oil there are plenty of pathogenic microorganisms whose use in ecological purposes could lead to negative consequences in eco-hygienic aspects. Therefore important issue is the creation of nonpathogenic microbic preparations of new generation, which are capable to take up and destruct hydrocarbons of oil; not causing eutrophication processes, and promote improvement for the environment.

Faculty of microbiology and virology of ONU I.I.Mechnikova is developing new microbic cleaning biotechnology of an environment from hydrocarbons of oil, which provides use of a new bacterial preparation - immobilized on a natural substratum of three strains of destructor-bacteria, family Pseudomonas, which were allocated from sea water.

The purpose of our work was to estimate eco-hygienic safety of use of destructor-bacteria, which are utilized for water and ground purification from hydrocarbons of oil. Objective of research included studying pathogenic properties of destructor-bacteria in model test-systems: which are representatives of aquatic biocenosis and in vitro culture of cells of human and animals.

As a result of researches it has been established, that the selected preparations bioproduced strains did not cause negative biological influence on all parts of aquatic ecosystems, including on plants – 5 species (*Ðistia stratiotes, Vallisneria spiralis, Ceratophyllum demersum, Echinodorus amazonicus R., Canadian-Elodea canadensis R.*); molluscs – 3 species (*Poecilia reticulatus P., Xiphophorus helleri H., Hyphessobrucon callistus minor*).

In human cell culture (Hep-2, Hela) and animals (Vero) cytotoxic and invasive properties of destructor-bacteria of carbohydrates of oil were not established.

This work was supported by the Ministry of Education and Science of Ukraine (grants no. 422, ЗМ/321-2008, ЗМ/323-2008 and ДЗ/300-2008).

RESISTANCE OF HETEROTROPHIC BACTERIA OF ZMIINY ISLAND COASTAL WATERS TO HEAVY METALS AND ANTIBIOTICS

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Introduction. Currently, there is increasing interest in the pollution of water masses of heavy metals as a selective factor in increasing resistance to antibiotics. Relationship between resistance to antibiotics and heavy metals can be explained co-resistance in which the various determinants of sustainability presented in the same genetic elements - plasmids, integrons and conjugative transposons and cross-resistant which is one mechanism for antibiotics, and for metals (for example an efflux pump) [1, 2, 3]. Studying of reaction of bacteria on action of heavy metals and antibiotics in island water area Zmiiny in communication as with geological activity, and an anthropogenous press from outside the rivers Danube, and also intensive development of an infrastructure of island is actual.

The aim of this work was to study the resistance of the dominant heterotrophic bacteria aquatorium Zmiiny island to heavy metals and antibiotics.

Materials and methods. In the course of the research has examined the response of heterotrophic bacterioplankton isolated at 7 stations located in the coastal zone of the water area of Zmiiny island, the effect of 7 heavy metals (Cu^{2+}, Ni^{2+}, Co^{2+}, Cr^{2+}, Pb^{2+}, Cd^{2+}, Hg^{2+}) and 9 of antibiotics (benzylpenicillin, cefotaxim, streptomycin, gentamycin, erytromycin, tetracyclin, chloramphenicol, nalidixic acid, rifampicin).

Results. In the period of lead through of 3 expeditionary works a summer and autumn 2008, and also by a spring 2009 maintenance of heavy metals in the studied aquatorium, mainly, did not exceed MCL, except for a copper the level of which arrived at 6 MCL. It is set that in the probed aquatorium there are bacteria, capable to grow at the concentrations of heavy metals, considerably exceedings maintenance of pollutatants in marine water. In a summer and autumn period practically a seasonal dynamics was not marked minimal inhibitory concentrations (ÌICs) of heavy metals. A decline is sprint exposed of ÌIC Ni^{2+}, Co^{2+}, Cd^{2+} for the representatives of heterotrophic bacterioplancton of all studied stations. Similar tendencies were marked for Cr^{2+} and Pb^{2+}, while ÌIC of mercury increased. ÌIC of Cu^{2+} in different seasons did not suffer changes that can be related to the stably high level of copper in this aquatorium. For the first time received the data on the levels of resistance and the seasonal dynamics of the values of ÌIC of antibiotics in the investigated region. The maximum level of antibiotic resistance was observed in summer, and the minimum - in the spring. In summer and autumn, the highest levels of resistance to cefotaxim, chloramphenicol, tetracycline and erytromycin found at stations that have the greatest load of tourists. Spring noted increased levels of resistance to most antibiotics on 3 stations, which is characterized by a relatively high level of ÌIC values of chromium, lead and mercury.

Conclusion. Changes in levels of resistance to antibiotics can be explained as a seasonal anthropogenic load of tourists, and the influence of xenobiotics, in particular heavy metals. Further research perspective to the study the genetic bases of multiresistant water microorganisms to the action of various toxicants.

This research has been supported by the Ministry of Education and Science of Ukraine (grants no. ЗМ/321-2008, ЗМ/323-2008, ГБ 422 and ДЗ/300-2008).

References

1. Baker-Austin C., Wright M.S., Stepanauskas R., McArthur J.V. Co-selection of antibiotic and metal resistance // Trends Microbiol. – 2006. – Vol. 14. – P. 176-182.

2. De Souza M.J., Nair S., Loka Bharathi P.A., Chandramohan D. Metal and antibiotic-resistance in psychrotrophic bacteria from Antarctic Marine waters // Ecotoxicology. – 2006. – N 5(4). – P. 379-384.

3. Wright M.S., Baker-Austin C., Lindell A.H., Stepanauskas R., Stokes H.W., McArthur J.V. Influence of industrial contamination on mobile genetic elements: class 1 integron abundance and gene cassette structure in aquatic bacterial communities // ISME J. – 2008. – N 2(4). – P. 417-428.