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THE ASSESSMENT OF EFFECT OF NANOPARTICLES ON *RHODOCOCCUS RHODOCHROUS* CNMN-Ac-05

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Introduction

The metabolic versatility of bacteria of the genus *Rhodococcus* spp. makes them well-equipped for industrial uses, such as biotransformation and the biodegradation of xenobiotic compounds. Recently, nanoparticles (NPs) of different nature are used to enhance the biodestructive capabilities of the rhodococci.

The purpose of our research was to determine the influence of nanoparticles on the viability and phenotypic heterogeneity of *Rhodococcus rhodochrous* CNMN-Ac-05 cells.

Materials and methods

The encapsulated Fe₃O₄/PVP, and Fe⁰/PVP magnetic NPs were synthesized by chemical co-precipitation method in accordance with the modified synthesis procedure, in the presence of poly-N-vinylpyrrolidone (PVP) used as a stabilizer. Fe₃O₄/PVP SR NPs was produced in the multifunctional reactor VGR-50, at the same conditions.

Fullerene C₆₀ powder was purchased from NeoTechProduct, Research and Production Company, Ltd., Saint Petersburg, Russian Federation. The number of viable bacterial cells was estimated by colony-forming units (CFU). The morphological features of the rhodococci colonies have been described according to the usual microbiological method.

Results and conclusions

Magnetite NPs had a positive effect on the viability of *R. rhodochrous* CNMN-Ac-05 cells. In all experimental variants, regardless of the used NPs and their concentration, growth stimulation was established, and the amount of biomass exceeded the control values. The effect of magnetite NPs on *R. rhodochrous* CNMN-Ac-05 cells differed depending on the concentration and the method of their preparing. In the case of Fe₃O₄/PVP NPs the optimal concentration was 25 mg/L, and in the case of Fe₃O₄/PVP SR NPs was 50 mg/L.

Zero-valent iron (Fe^0) nanoparticles inhibited the growth of bacterial cells, expressed by decreasing the number of CFU/mL up to 43% compared to the control. The inhibitory effect of the NPs was slightly dependent on their concentration within 10-100 mg/L.

The optimal concentrations of fullerene C_{60} for rhodococci cell multiplication were 1-25 mg/L. At these concentrations, the growth of the strain was stimulated by 2.4-2.8 times compared to the control samples. The highest CFU count value was obtained at a concentration of 10 mg/L. However, an increase in the fullerene C_{60} concentration up to 50 and 100 mg/L obviously decreased the rhodococci capacity of multiplication and growth. The values of the CFU number were lower by 29.5% and 38.0% compared to the control samples.

The colonies formed by *R. rhodochrous* cells, grown on TS agar medium, correspond to basic morphological type S (smooth shape), had a homogeneous pink color and slightly glistering surface. After the contact with NPs, the strain dissociated, forming original smooth (S), rough (R) and smooth altercolor (Sa) colony types.

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