Thematic area of your work «Nanocomposites and nanomaterials»

Change in functional activity of Ehrlich carcinoma cells after treatment with hybrid nanocomplexes

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Development of tumors is the consequence of expansion of poorly differentiated cells with an unlimited potential of self-maintenance, cancer stem cells (CSCs). The task of oncology is the search for the structures identifying and neutralizing CSCs. The use of new forms of nanocomposites able to bound with CSCs and induce tumor destruction is prospective. The research aim was to study the functional activity of CSCs in the content of Ehrlich carcinoma (EC). EC cells were cultured for 7 days in mice peritoneal cavity (PC) prior to and after their incubation with hybrid nanocomplexes and their components. The method of obtaining the hybrid nanocomplexes on the base of nanoparticles of orthovanadate of rare earth elements and cholesterol was described in the paper [1]. EC development intensity was determined by the volume of accumulated ascitic fluid in PC taking into account a cell concentration. Phenotypic analysis of EC cells by CD44, CD24, CD117 and Sca-1 markers was performed with flow cytometer (Facs Calibur, BD, USA). The expression level of *nanog*, *oct-4*, *sox-2* genes in EC cells was assessed by RT-PCR. The degree of EC growth inhibition after their treatment with hybrid nanocomplexes was determined as the relation of difference between absolute content of EC cells in PC prior to and after treatment to this index in animals with pathology [2].

It was found that treatment of EC cells with spherical nanoparticles involving in composition of hybrid nanocomplex promoted tumor growth inhibition by 58.2%. Administration of cholesterol into hybrid nanocomplex enabled acquiring maximum from tested samples suppression of EC growth according to the tumor inhibition (76.6%). This was accompanied by a significant (17 times) decrease of concentration of the most carcinogenic $CD44^{hi}CD24^{-}$ cells. Pretreatment of EC cells with hybrid nanocomplexes caused the formation of pool of tumor cells with the decreased level of all the studied genes, in particular main gene *nanog* providing self-maintenance of CSCs. Relative expression of this gene after treatment of EC cells with hybrid nanocomplexes 2 times reduced.

The findings allow suggesting that the presence of cholesterol in nanocomplex is the condition for address delivery of nanoparticles to the very tumor cells.

Realization of regulation mechanisms of anti-tumor therapy using hybrid nanocomplexes based on the orthovanadates gives the prospect for the treatment of patients with different forms of oncopathology.

1. *Goltsev A.N., Babenko N.N., Gaevskaya Yu.A. et al.* Identification of tumor cells with hybrid complexes based on non-organic nanoparticles and organic bioactive compounds // High technology, research, education, finance: Coll. of papers, St. Petersburg, Russia, 2013. – P.121-131.
2. *Gubler E.V.* Computational methods of analysis and identification of pathological processes. – Leningrad: Meditsyna, 1978. – 193 p.