Nanocomposites and nanomaterials

Photoexcited fullerene C_{60} overcomes resistance of leukemic cells to cisplatin by activation of proapoptotic pathways

D.V. Franskevych[1], I.I. Grynyuk[1], S.V. Prylutska[1], G.V. Pasichnyk[2], L. B. Drobot[2], O.P. Matyshevska[1], U. Ritter[3]

[1] Kyiv National Taras Shevchenko University, Volodymyrska Str., 64 - 01601 Kyiv, Ukraine
E-mail:dashaqq@gmail.com

[2] Palladin Institute of Biochemistry, National Academy of Sciences of Ukraine, Leontovicha Str.,9 - 01030 Kyiv, Ukraine

[3] Ilmenau Technical University, Ehrenbergstraße 29, 98693 Ilmenau, Germany

Representative of carbon nanostructures fullerene C_{60} is thought to be a candidate for modification of cancer cells signaling due to its ability to penetrate into cytoplasm, interact with biological molecules and produce reactive oxygen species (ROS) after UV/visible irradiation [1].

The aim was to investigate the possibility to enhance cisplatin cytotoxic effects in a low dose against drug resistant leukemic cells by using photoexcited fullerene C_{60}.

Homogeneous water colloid solution of fullerene C_{60} was used. Leukemic cells L1210 loaded with fullerene C_{60} (10^{-5} M) were irradiated (410–700 nm) with the use of light-emitting diode lamp.

Flow cytometric analysis of cell cycle distribution showed that after treatment with photoexcited C_{60} the number of cisplatin resistant leukemic cells (L1210R) in proapoptotic SubG1 phase was increased. More significant L1210R cells accumulation in SubG1 phase was detected after combined treatment with photoexcited C_{60} and cisplatin in a dose 1 μg/ml. With the use of Western-blot analysis activation of ROS-sensitive proapoptotic p38 kinase in L1210R cells after fullerene C_{60} photoexcitation was demonstrated. Using potential-sensitive fluorescent probe TRME it was shown that photoexcited fullerene C_{60} reduced the value of mitochondrial membrane potential in L1210R cells, while its combination with 1 μg/ml cisplatin was accompanied by dissipation of mitochondrial membrane potential. The data obtained indicate that combination of photoexcited fullerene C_{60} with cisplatin allows to restore sensibility of L1210R cells to cisplatin by enhancing extranuclear proapoptotic signaling pathways.

1. *Moor K., Snow S., Kim J.-H.* Differential photoactivation of aqueous C_{60} and C_{70} fullerene aggregates // Environ Sci Technol. – 2015. – **49**. – P. 5990–5998.