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Nanocomposition based of polymer vector containing Silver nanoparticles and cisplatin for cancer therapy

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Non-specific delivery to tumor cells and poor biodistribution of drugs are among the limitations in current cancer therapy. Controlled targeting of drugs and reduced time of exposure at non-targeting tissues improve treatment of cancers and lower side effects. Macromolecules of soluble polymers, due to their biocompatibility with living cells and tissues and their possible load dosage forms, are used as nanocontainers (nanocarrier) or nanotechnology-based drug delivery systems.

This study based on using of the branched biocompatible polymer Dextran-graft-Polyacrylamide of various internal macromolecular structure as templates for preparation nanocarrier containing simultaneously both Ag nanoparticles and *anticancer drugs*.

The Ag nanoparticles of certain size and morphology were synthesized in situ in polymer matrices and characterized by UV-vis spectroscopy and Transmission electron microscopy and Zeta-sizer. It was shown that Ag nanoparticles were spherical in shape, 10-20 nm in size and sols were stable in time. Polymer/Ag nanoparticles systems were loaded by cistlatin and tested for cytotoxicity in both U-937 histiocytic lymphoma cells and K-562 myeloid leukemia cells. U-937 lymphoma cell line possesses a phagocytic activity, as well as K-562 cells have only slight phagocytic activity. The cytotoxicity of the nanoparticles was assessed by both MTT assay and trypan blue staining. Both assays gave consistent data on cytotoxic effects of the nanoparticles tested. The results of MTT assays showed a dose-dependent decrease in viability for both cell types exposed to the Ag nanoparticles and the ones conjugated to cisplatin. It was shown that dextran-polyacrylamide copolymers are not toxic at any concentration. At the same time the polymers loaded with cisplatin caused cytotoxic effect in both cell lines at 10 μg/ml (40-44% in U-937 and 81-83% in K-562 measured by MTT assay), and so did the Ag nanoparticles at the same concentration (72-76% in U-937 and 86-92% in K-562 provided by MTT assay). The data from our cytotoxic studies indicate that nanosilver induces toxicity in cells. The polymers conjugated to both nanosilver and cisplatin displayed less cytotoxic effect compared to conjugates of cisplatin and the polymers, and that was especially obvious in U-937 cells (57-60% for polymer/Ag/cisplatin and 40-44% for polymer/cisplatin at 10 μg/ml). These findings suggest that nanosilver attenuates cytotoxic function of the cisplatin. The data also indicate that U-937 and K-562 cells (more tolerant to the nanoparticles tested than U-937) show different responses to the nanoparticles, and presumably, this is the consequence of the difference in phagocytic activity of these cell lines.