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Impact of functionalized carbon nanomaterials on human tumor cells.

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The goal of our work was to test the possibility of attaching to carbon “nucleus” (ultra dispersed diamonds, UDDs), specific antibodies to the tumor receptors and metabolic drug (Doxorubicin, DOX). As carbon “nucleus” UDDs were used. The UDDs were obtained by detonation synthesis and purified by strong oxidative acid treatment in concentrated HNO₃ at 750 °C for 1 day. Then UDDs were incubated with N-(3-dimethylaminopropyl) - N - ethyl-carbodiimide hydrochloride (Sigma) and functionalized the surfaces with amino groups. After adding DOX-lactose monohydrate in dH₂O and incubation at room temperature during 24 hours covalent binds between DOX and UDDs were formed. Thin films of UDD-DOX were placed on glass using Matrix-assisted Pulsed Laser Evaporation (MAPLE) deposition technology. Antibodies to Epidermal Growth Factor (# WH0001950M1 Sigma, for ELISA) or antibodies to Epidermal Growth Factor Receptor (# RMPD 20 clone SP9, Diagnostic Biosystems, for ICH) were deposited on the surface of the UDD-DOX films with MAPLE technology too. Biological properties of UDD-DOX- antibody constructs we determined by culturing it with tumor cells (MCF-7 cell line) and using microscopy, immune cytochemistry staining and ELISA. In result a stable compound of UDDs with Doxorubicin was obtained. The percentage of free Doxorubicin was 0.05%. Also we demonstrated that the UDD-DOX- antibody construct has dose-dependent cytotoxic effect on tumor cells (MTT-assay). Simultaneously, both antibodies after MAPLE deposition maintained from 75 to 83% of the functional activity and specificity. Thus, we can conclude about the prospects of selected methods and approaches for creating an antitumor agent with capabilities targeted delivery of drugs.