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Gold Aryl nanoparticles coated with polyelectrolytes for adsorption and protection of DNA against nuclease degradation

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Binding DNA on nanoparticles was pursued to form nanoplatform for formation of non-viral gene system. Carboxyl derivatized gold-aryl nanoparticles can bind with biodegradable cationic polyelectrolytes such as polydiallyldimethylammonium chloride (PDADMAC). In our study, we used gold-aryl nanoparticles (AuNPs) treated with PDADMAC to form conjugates with non-thiol or non-disulfide modified oligonucleotide DNA. Both AuNPs-DNA and PDADMAC-AuNPs-DNA biomaterials were characterized using UV-Vis, dynamic light scattering (DLS), atomic force microscopy (AFM), transmission electron microscopy (TEM) and agarose gel electrophoresis. UV-Vis showed a red shift in the plasmon peak as compared with unconjugated AuNPs. DLS measurements also showed difference in the size of AuNPs-DNA and PDADMAC-AuNPs-DNA. AFM and TEM results showed proper conjugation of DNA with AuNPs. Gel electrophoresis proved the presence of interaction between PDADMAC-AuNPs and negatively charged DNA. The binding of DNA in the described bioconjugate enhanced its protection against nuclease degradation and prolonged its presence in the digestive environment of DNase-I. From the results we expect that these biomaterials can be used in nanomedicine with emphasis on non-viral gene system.