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2nd European Chemistry Conference
May 15-16, 2019 Amsterdam, Netherlands

Non-Viral Plasmid DNA Carrier with Cationic Modified Polymer-Gold Nanoparticles

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Physical properties from gold nanoparticles make them a very good option for gene vehicles development. Among several applications, in the medical field, gene therapy may be improved with gold nanoparticles, for the treatment of infections and monogenetic or polygenetic hereditary disorders. Gene addition or suppression are a few of many options for genetic manipulation. This work explores an alternative non-viral method for gene transfer by using metallic nanoparticles functionalized with organic polymers. Chitosan was used with three kinds of modifications, modified molecular weight, chain length and hydrophobicity. Mentioned composites were characterized by different microscopies and spectroscopies and interactions between them with gold nanoparticles and plasmid DNA were demonstrated with agarose gel electrophoresis. Performed transfections were evaluated by β-galactosidase activity and with plasmid DNA fluorescence (pIRES-2-EGFP). The obtained transfection efficiency with modified chitosan-gold nanoparticles complex was higher than that with Lipofect AMINETM2000 positive control. The obtained transfection efficiency with modified chitosan increases more than 50%. It can be observed that the size of gold nanoparticles with modified chitosan and their relationship between charge and morphology are factors that influence the efficiency of cellular transfection with plasmid DNA.