

Nanoparticles (NPs) and Biology

The interfacing of nanoparticles (NPs) and biology is a paradigm shift for non-viral medical gene therapeutics. In a NP-gene construct, controlled assembly allows controlled gene delivery and cellular manipulation. Using a DynaPro Titan DLS system, the formation of a NP-gene construct formed from 13 nm gold (AuNP) and a 1900 base pair gene which encodes for dsRed express fluorescent protein can be systematically evaluated for different gene assembly strategies onto the surface of a AuNP.

Data were acquired at 20°C on a DynaPro-Titan Dynamic Light Scattering (DLS) instrument. Analysis of the autocorrelation function for the DLS data reveals the size of the construct and the compaction of the gene around the central AuNP is controlled. The autocorrelation functions (Figure 1) show the results for two different NP-gene construct approaches: one based on a construct formed by direct surface appendage of the gene to the AuNP via a gene base pair modification to provide a covalent linker (direct), and the other NP-gene construct via non-specific interactions to a AuNP in the absence of gene (non-specific). Also shown are correlation functions of the free gene and the free AuNP. The change in the hydrodynamic radius for the NP-gene construct reveals the importance of the non-specific molecular level interactions for the formation of the NP-gene construct.

Understanding the propensity of aggregate formation in the coupling reactions of AuNPs to the DNA complex is key to effective nanoparticle-based gene delivery methods. In this study we can directly correlate the experimentally observed changes that occur *in vitro* gene release studies with the observed compaction in construct size for a variety of linkage strategies.

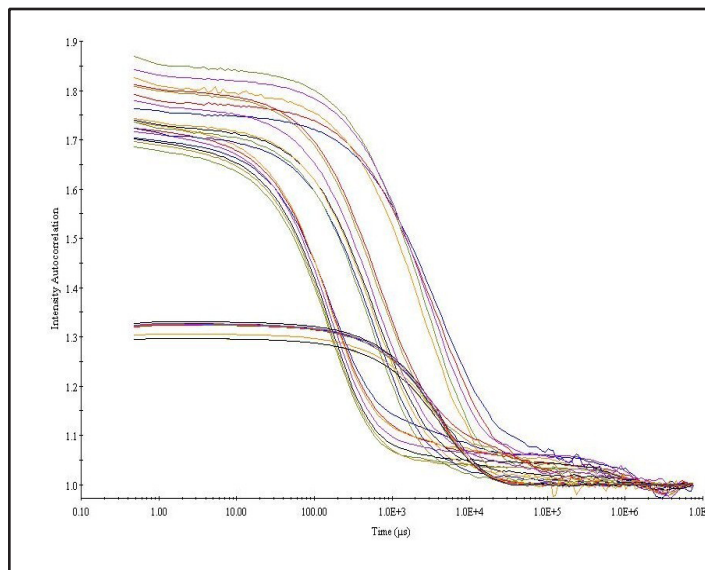


Figure 1. Autocorrelation function: Several scans were collected and the figures shows autocorrelations for (Left to Right) Free AuNP; AuNP nonspecifically bound to gene; AuNP specifically bound to gene (max at 1.3); and free gene.

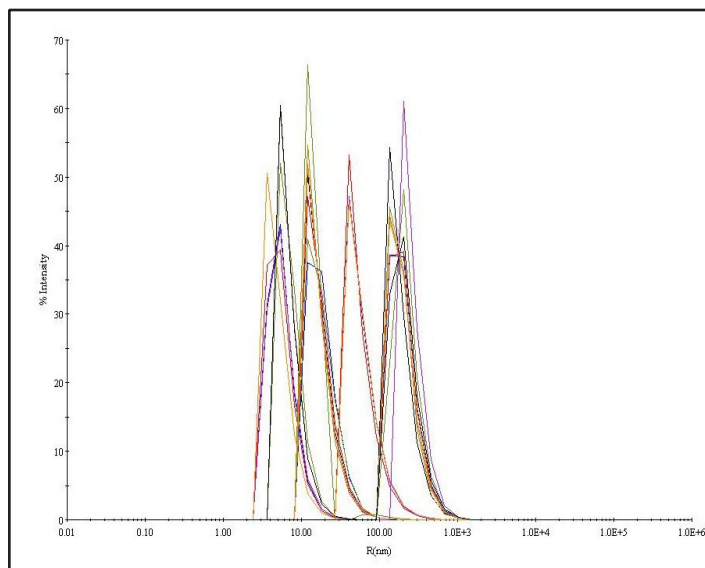


Figure 2. Particle size histograms for (Left to Right) Free AuNP; AuNP non specifically bound to gene; AuNP specifically bound to gene; and free gene.

This note graciously submitted by Megan Murowski (Lab: Prof. Geoffrey Strouse), Florida State University, Chemistry Dept., Tallahassee, FL