

## Development of high sensitivity flow cytometry for the advanced characterization of viral & non-viral drug delivery systems

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Viral & non-viral drug delivery systems with therapeutic genes or drugs encapsulated in viral capsids or synthetic nanoparticles less than 100 nanometers are the subjects of intensive investigation for the treatment and prevention of diseases. Due to the intrinsic heterogeneity of these nanocomposites, rapid characterization of their physicochemical and biochemical properties on a particle by particle basis is fundamental to realizing their promise in biomedicine. However, due to the small particle size and the limited amount of cargo molecules loaded, single nanoparticle characterization presents a significant experimental challenge. By integrating light scattering with strategies for single molecule fluorescence detection in a sheathed flow, we developed high sensitivity flow cytometry (HSFCM) to achieve this goal. Simultaneous side scattering and fluorescence detection of single nanoparticles is carried out as they transverse through the laser beam individually. Information regarding particle size and shape can be gathered via light scatter measurement, and biochemical attributes, such as the content of nucleic acids, anti-cancer drugs, and surface-immobilized antibodies can be quantified via fluorescent detection. We demonstrate single low-index nanoparticle detection down to 25 nm in diameter and high-resolution particle size distribution analysis in 1~2 minutes. Combining light scattering and fluorescence detection, discrimination of individual virions from empty viral capsids and free nucleic acids is achieved. Moreover, distributions of particle size and doxorubicin content of liposomes, and size and nucleic acid content of siRNA-loaded lipid nanoparticles are quantified. HSFCM provides a versatile and powerful platform for the advanced characterization of viral & non-viral drug delivery systems.

### Biography

Xiaomei Yan received her BEng (1990) and PhD (1996) from Xiamen University. Following post-doctoral research at the University of Florida, she moved to Los Alamos National Laboratory (New Mexico, USA) in 1997 and was promoted to technical staff member in 2001. In 2005, she returned to Xiamen University as a professor of chemistry. She is interested in the development of advanced instrumentation and methodologies for biochemical and biomedical analysis. She has published more than 50 papers in reputed journals and was awarded the National Science Fund for Distinguished Young Scholars in 2012.

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