Research/Clinical Abstract

A Novel Exo-Glow Nano-system for Cellular Imaging

Cotto NM[1,2], Adriano B[1,2], Chauhan N[1,2], Chauhan DS[1,2], Jaggi M[1,2], Chauhan SC[1,2], Yallapu MM[1,2]

[1]Department of Immunology and Microbiology, School of Medicine, The University of Texas Rio Grande Valley, McAllen, TX 78504, USA.
[2]South Texas Center of Excellence in Cancer Research, School of Medicine, University of Texas Rio Grande Valley, McAllen, TX 78504, USA.

Background: Indocyanine green (ICG) based Near-Infrared (NIR) fluorescent imaging is an attractive and safer technique used for number of clinical applications. However, ICG tend to have poor photostability, short half-life, non-specific proteins binding, and concentration-dependent aggregation. Therefore, there is an unmet clinical need to develop newer modalities to package and deliver ICG. Bovine milk exosomes are natural, biocompatible, safe, and feasible nanocarriers that facilitate the delivery of micro and macro molecules. Herein, we developed a novel exosomes based ICG nano imaging system that offers improved solubility and photostability of ICG.

Methods: Following acetic acid based extracellular vesicles (EV) extraction method, we extracted the bovine milk exosomes from a variety of pasteurized fat-free milks. The EVs were screened for their physicochemical properties such as particle size and concentration, and zeta potential. Stability of these exosomes was also determined under different conditions including storage temperatures, pH, and salt concentrations. Next, ICG dye was loaded into these exosomes (Exo-Glow) *via* sonication method and further assessed for its fluorescence intensity and photostability using an IVIS imaging system.

Results: Initial screening suggested that size of the selected bovine milk exosomes was from 100 - 135 nm with an average particle concentration of 5.8×10^2 particles/mL. Exo-Glow (ICG loaded exosomes) further showed higher fluorescence intensity of ~ 2×10^{10} MFI compared to free ICG (~ 8.1×10^9 MFI).

Conclusions: These results showed that Exo-Glow has the potential to improve solubility, photostability, and biocompatibility of ICG and may serve as a safer NIR imaging tool for cells/tissues.