Lipid Nano Carriers and Hyperspectral Imaging

Because of their stealth nature, lipid based materials are widely accepted as effective carriers for targeted drug delivery, nanoparticle photothermal therapy and related theranostic applications. Liposomes, low density lipoproteins (LDL), solid lipid nanoparticles and similar constructs are most often used as they can be synthesized to closely mimic naturally occurring materials found in the body.

Often these lipid based carriers serve as a biocompatible "trojan horse" which houses drugs or other smaller nanoparticle cargo. These lipid carriers can be taken up directly by the targeted cells or can locate adjacent to the cell membrane and then release smaller nanoparticles or drugs which are taken up by the targeted cells. Development of these lipid based therapies requires the ability to validate uptake of smaller nanoparticles or drug therapies within or onto the lipids. Additionally, it is important to demonstrate how these lipid carriers interact with cells and tissue. CytoViva's Enhanced Darkfield Hyperspectral Microscopy can be an effective tool for both of these tasks.

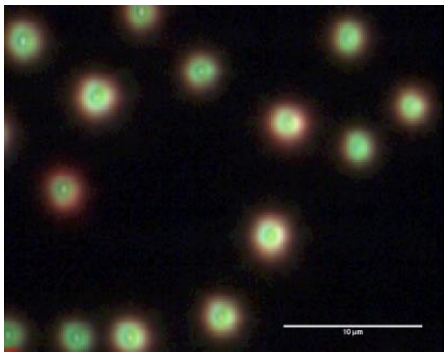

Figure 1: Liposomes with AuNP Loaded Bilayer.

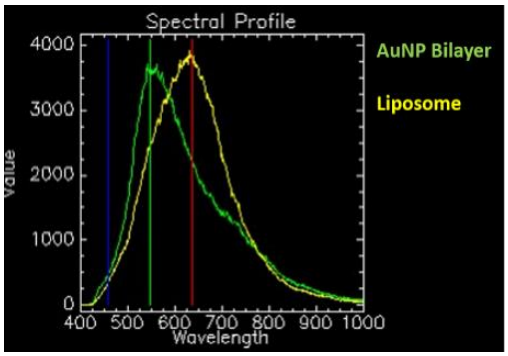

Figure 2: Spectral Response of Liposome Area (yellow) and Liposome Bilayer Area with AuNPs (green).

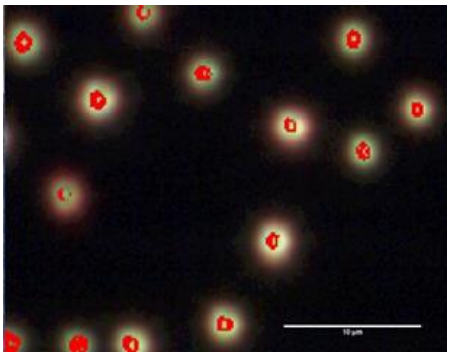

Figure 3: Mapping (red) of AuNPs in the Liposome Bilayer.

Figure 1 above illustrates an enhanced darkfield hyperspectral image of liposomes loaded with AuNPs (gold nanoparticles) in the bilayer. The AuNPs cause a shift in the spectral response in areas where they are present in the liposome. This spectral shift is illustrated in Figure 2, with the hyperspectral mapping of the AuNPs in the liposome bilayer illustrated in Figure 3
(in red).

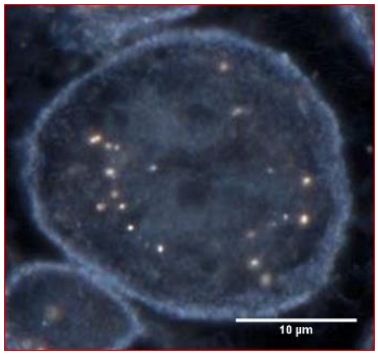

Figure 4: LDL Encapsulated AuNPs in Macrophage Cell.

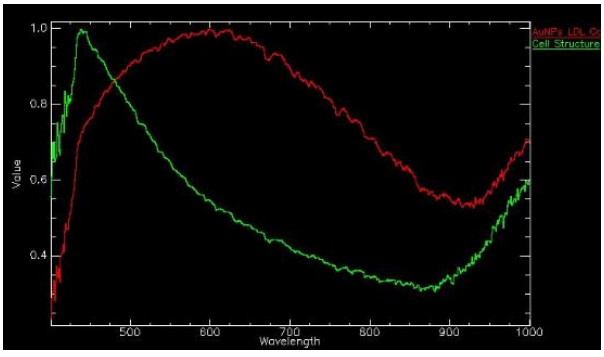

Figure 5: Spectral Response of LDL Encapsulated AuNPs (red) and Cell Structure (green).

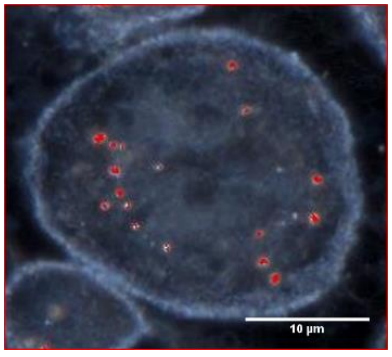

Figure 6: Mapping (red) of LDL Encapsulated AuNPs.

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Figure 4 above illustrates an enhanced darkfield hyperspectral image of LDL encapsulated AuNPs in macrophage cells*. The unique spectral response of the LDL encapsulated AuNPs versus the cell structure is illustrated in Figure 5. The hyperspectral mapping of the LDL encapsulated AuNPs is illustrated in Figure 6 (in red).

The ability to observe and spectrally confirm the nanoscale cargo within the lipid or the uptake of these lipid constructs into cells is critical for effective development and deployment of these therapies. CytoViva's Enhanced Darkfield Hyperspectral Microscopy is proven to be an effective method for supporting these applications.

You can contact CytoViva info@cytoviva.com to learn more about enhanced darkfield hyperspectral microscopy or to schedule a demonstration of the system with your samples.

**Samples courtesy of Avanti Polar Lipids, Inc., Alabaster, AL, US*