Hyperspectral Confirmation of Liposome Cell Targeting and Drug Release

CytoViva® Illuminating the Future

Basic research of liposomal nanoparticles utilized as dug delivery vectors has led to numerous startup nano-drug delivery companies. Many of these companies are experiencing good success in FDA clinical trials.

Most of the current drug delivery applications are using liposomes as cancer chemotherapy vectors. The lipid bilayer of the liposomes is most often used for encapsulation of these chemotherapy drugs. Tumor cell targeting is most often accomplished by endocytic events or direct cell membrane fusion for eventual release of the drugs to the cell. However, the key challenges with this process are typically the development of effective targeting mechanisms of the liposomal carriers and proper time release of the drug therapy.

CytoViva's Enhanced Darkfield Hyperspectral Microscope is proving to be highly effective in helping researchers understand both the targeting of liposome carriers to cells as well as the timed release of their drug cargo.

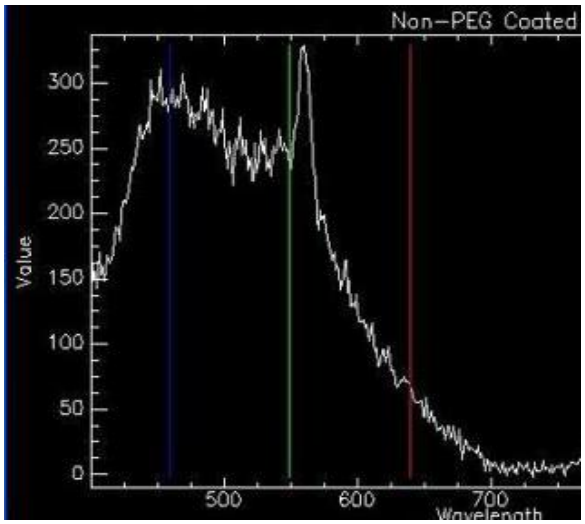

Figure 1: Liposomal Drug Representative Spectra

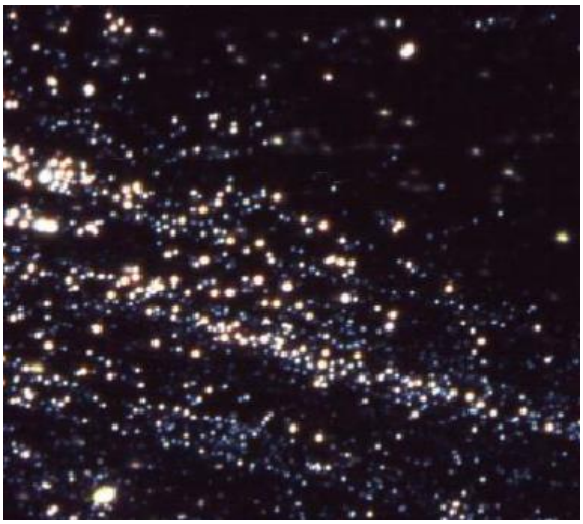
Figure 2: Liposomal Drug in Solution

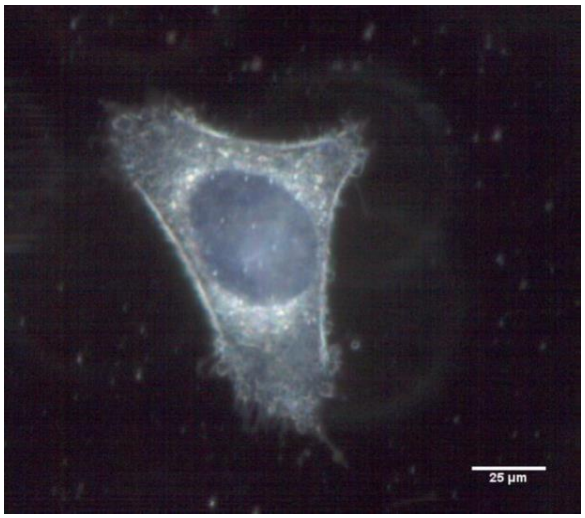

Figure 3: Cell Incubated with Liposomal Drug

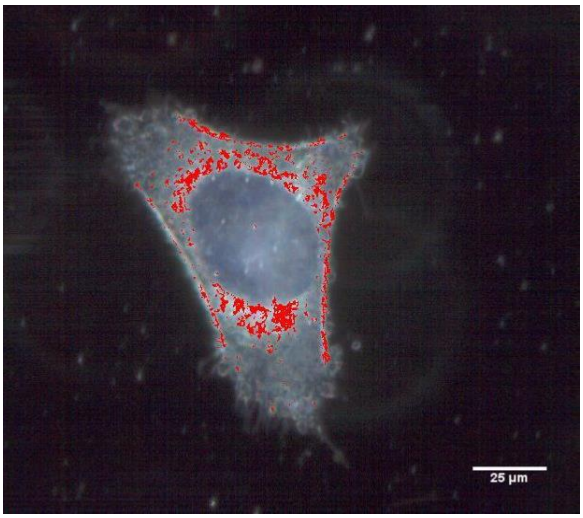

Figure 4: Red Pixels Map the Presence of Liposomal Drug in the Cell Based on the Spectral Response

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A specific example of the CytoViva system being used for this application is shown above. In this example, a prostate cancer specific peptide is added to a doxorubicin loaded liposome. With the CytoViva Enhanced Darkfield Hyperspectral Microscope system, the researcher is able to create a reference spectral library (figure 1) unique to the doxorubicin loaded liposome (figure 2). Note that the reference spectra illustrated in figure 1 has a very distinct peak at ~575nm that is consistent with the spectral properties of doxorubicin. Figure 3 shows a label free tumor cell that has been incubated with the liposome construct. The red pixels in figure 4 demonstrate the spectral mapping of the reference spectrum confirming the presence and location of the liposomal construct within the tumor cell.

A key benefit of the CytoViva system is that it does not require fluorescent labeling or other alteration of the cell structure or the liposomes for effective imaging and analysis. Additionally, these samples can be imaged as live cells using the SynVivo for CytoViva live cell microfluidics chamber. With this system, the nano-drug delivery construct can be added to the live cell culture and images can be captured over time, recording the dynamic interaction. This system can also be used as a "simulated in-vivo" system for observing nanoparticle fate in the biological environment.

With the ability to provide both high resolution spatial imaging and spectral characterization, CytoViva's Enhanced Darkfield Hyperspectral Microscope system can significantly impact your nano-drug delivery development work. Please contact us at info@cytoviva.com to learn more about the technique or to discuss test imaging of your samples.