Tracking Iron Oxide Nanoparticles in Macrophages

Iron oxide nanoparticles (Fe2O3 NPs) are primarily produced from magnetite and its oxidized byproducts. These particles are currently being evaluated in the biomedical field as high-sensitivity biomolecular magnetic resonance imaging (MRI) sensors for medical diagnosis and therapeutics due to their super para-magnetic properties. To be effective agents for MRI treatments, researchers must first evaluate the effectiveness of cell targeting proteins and biocompatible coatings associated with Fe2O3 NPs. The CytoViva Hyperspectral Microscope System allows researchers to optically observe and spectrally detect the location of non-fluorescent Fe2O3 NPs in cells and tissue for biosensor and therapeutic applications.

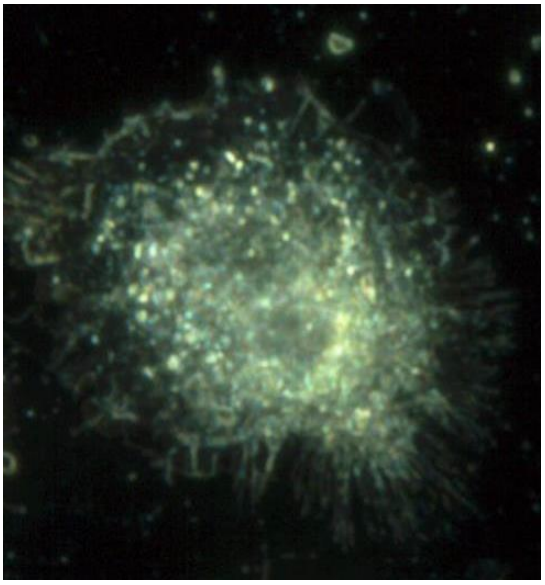

Figure 1. Macrophage incubated with Fe_2O_3

In the illustrated experiment, the CytoViva Hyperspectral Microscope System was used to evaluate the increase of cellular uptake of the non-fluorescent Fe2O3 NPs over time. The efficacy of targeted apoptosis is directly dependent on the concentration of Fe2O3 NPs in cells. Figure 1 is a hyperspectral image of a macrophage incubated with Fe2O3 NPs . To confirm the presence of Fe2O3 NPs in this cell, a hyperspectral image of Fe2O3 NPs in solution was collected (Figure 2).

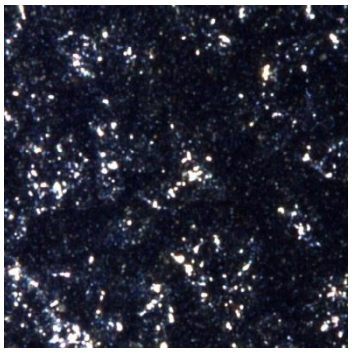

Figure 2. Fe_2O_3 NPs in Solution

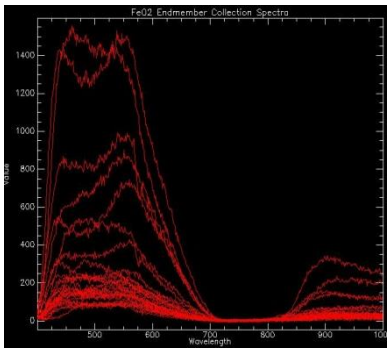

Figure 3. Spectral profile of Fe_2O_3 NPs

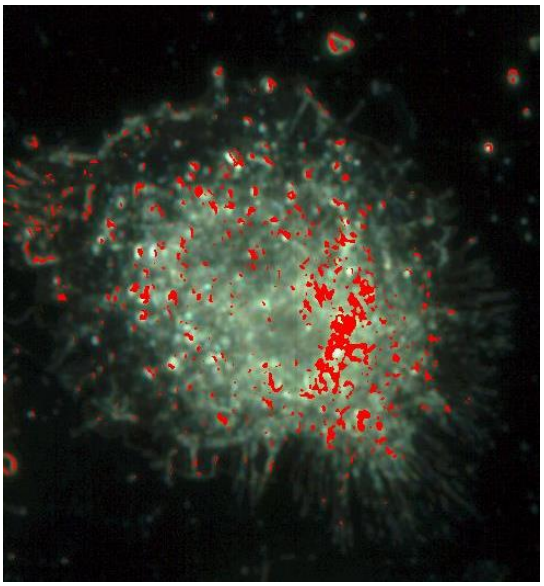

Figure 4. Red pixels confirm presence of Fe_2O_3 in macrophage

From the pure Fe2O3 NPs in solution, a complete spectral profile was created (Figure 3). The spectral profile was then used to spectrally confirm the presence of the Fe2O3 NPs in the macrophage. The red pixels in Figure 4 show the location of the spectrally confirmed Fe2O3 NPs in the macrophage.

The CytoViva Hyperspectral Microscope System can be used to optically detect and spectrally confirm the presence of non-fluorescent iron oxide NPs and their byproducts in cells.

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