

Label Free Nanoparticle-Tissue Imaging and Hyperspectral Mapping

Ex-vivo confirmation of targeted nanoparticles in tissue is critical to determine the efficacy of any nano theranostic therapy. Quantitative techniques such as inductively coupled plasma-mass spectrometry (ICP-MS) can confirm that nanoparticles are present in the tissue. However, these destructive techniques provide no spatial insight regarding how the nanoparticles are localizing within the targeted tissue. Effective insight regarding the nanoparticle tissue interaction requires a label free imaging method for quickly observing nanoparticle localization across large areas of tissue without any special sample preparation.

CytoViva's Enhanced Darkfield Hyperspectral Microscopy is now being used extensively to optically observe and spectrally map label free nanoparticles in ex-vivo tissue. This includes metal, metal oxide, polymeric and carbon based nanoparticles in both stained and unstained tissue samples. Hyperspectral images of these samples can be captured in seconds or minutes and provide an optical spectral response measurement in every nanoscale pixel of the image. This pixel level optical spectroscopy can be used for nanoparticle mapping and other detailed image analysis.

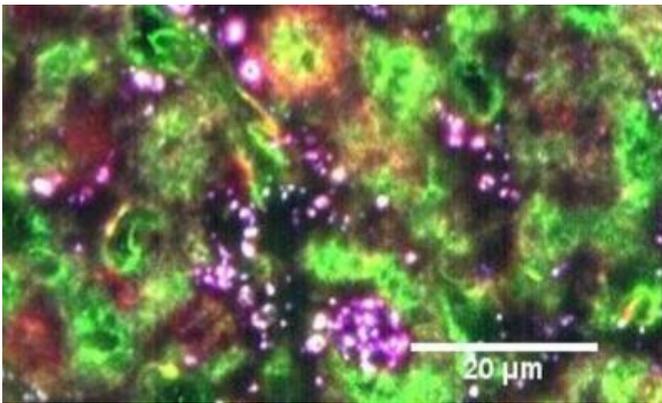


Figure 1: Fe₂O₃ Nanoparticle Aggregates in Stained Tissue

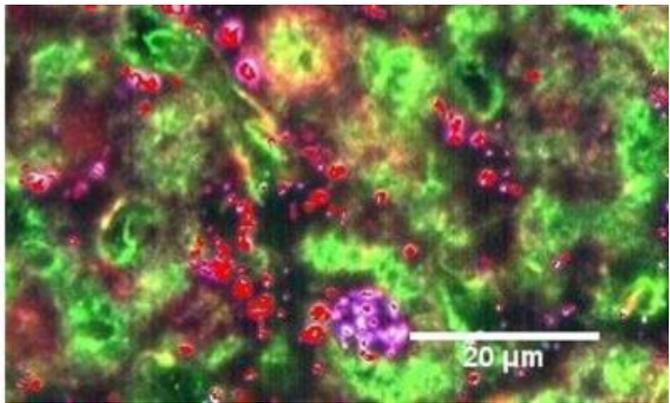


Figure 2: Spectral Mapping (in red) Fe₂O₃ in Tissue

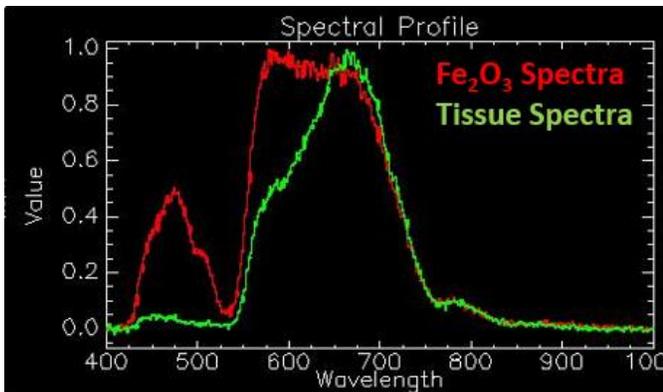


Figure 3: Pixel Level Spectra of Fe₂O₃ Nanoparticles and Tissue

Classification	# of Pixels Mapped	Percentage
Unmapped Tissue	101,935	94.47%
Fe ₂ O ₃ (red)	5,969	5.53%

Figure 4: Class Distribution Pixel Mapping of Fe₂O₃ Nanoparticles in the Hyperspectral Image

In figure 1 above, stained tissue with iron oxide (Fe₂O₃) nanoparticle aggregates is shown. The nanoparticle aggregates generally appear white or pink based on the influence of the stain. The unique spectral response of these nanoparticles as compared to control tissue (shown in figure 3) enables spectral mapping of all pixels

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containing nanoparticle spectra. In figure 4 the class distribution data illustrating the number and amount of pixels mapped in the total tissue area for Fe_2O_3 nanoparticles is shown.

CytoViva's Enhanced Darkfield Hyperspectral Microscopy was specifically designed to be a fast and effective tool for observing, spectrally characterizing and mapping label free nanoparticles in ex-vivo tissue and a wide range of other environments. Please contact CytoViva at info@cytoviva.com to learn more about this technique and how it may advance your nanoparticle related experiments. We would be pleased to discuss test imaging of your samples or an on-site demonstration if appropriate.

Please click on the Goggle Scholar link below to learn how other research labs are currently using CytoViva technology in nanoparticle - tissue studies.

[Google Scholar - Use of CytoViva in Nanoparticle Tissue Studies](#)