Confirming AuNP Cell and Tissue Uptake with Enhanced Darkfield Hyperspectral Microscopy

CytoViva® Illuminating the Future

Gold nanomaterials continue to evolve as the top potential nanoscale platform for theranostic related applications. During 2015, there were over 53,000 Google Scholar references for Au nanoparticles. In 2016, this grew to over 59,000 references. This is almost double any other nanoparticle reference in Google Scholar. The combined strength of high surface area for functionalization and diagnostic imaging potential provides distinct advantages for these plasmonic nanoparticles in a wide range of applications.

To demonstrate the efficacy of targeted Au nanomaterials in any theranostic study, a fast, label free imaging method is required to observe and confirm their presence in both in-vitro cell culture and ex-vivo tissue as illustrated below.

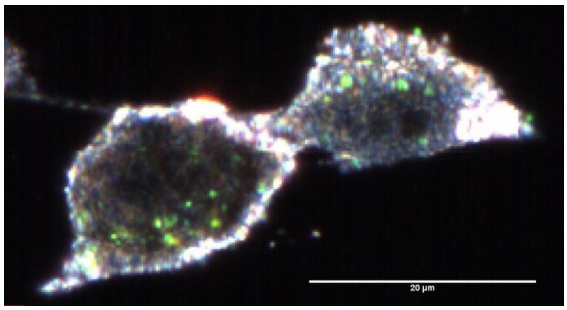

Figure 1: Au Nanorods (*Areas Observed as Green*) Dispersed in Cell 60x

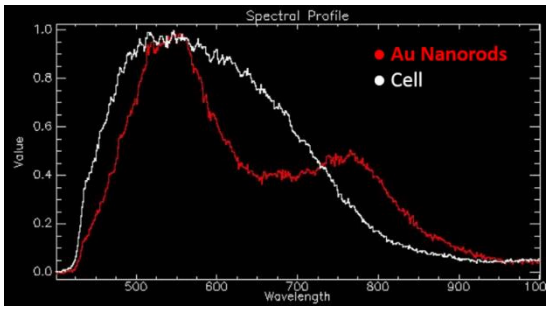

Figure 2: Spectral Response of Au Nanorods (red) and Cells (white)

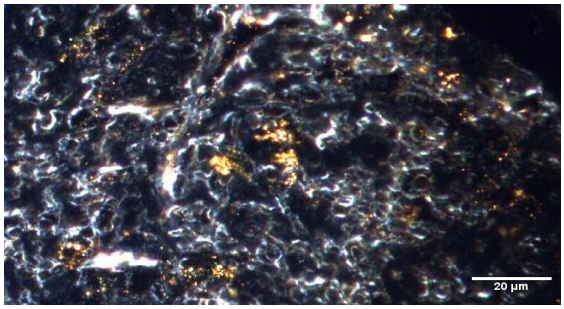

Figure 3: Au Nanoparticles (*Areas Observed as Gold*) Aggregating in Tissue 60x

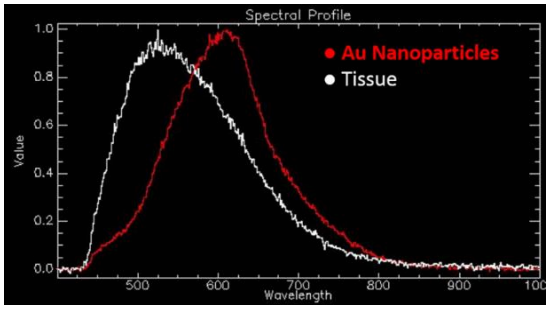

Figure 4: Spectral Response of Au Nanoparticles (red) and Tissue(white)

The images above and corresponding spectral data are created using CytoViva's Enhanced Darkfield Hyperspectral Microscope. This patented technique has become the standard for high throughput optical observation and spectral confirmation of plasmonic nanoparticle uptake in both cells and tissue. With this method, you can observe the nanoparticles interacting with live or fixed cells within seconds of mounting the sample onto the microscope. No fluorescent labeling or sample fixation is required. A full hyperspectral image of a large field of view can be captured in just a few minutes.

See above in Figure 1 a CytoViva Enhanced Darkfield Hyperspectral Image of Au nanorods dispersed in a mammalian cell culture. Because hyperspectral imaging records the spectrum in every pixel of the image, you can easily identify the unique spectral response of these plasmonic nanorods. They produce a distinct peak and shoulder spectral response as is illustrated in red in Figure 2. This spectrum is unique and highly repeatable based on their specific aspect ratio. It is also distinctly different from the cell spectrum shown as white.

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Au nanoparticles can also be easily observed and spectrally characterized in ex-vivo tissue using the CytoViva system. See above in Figure 3 Au nanoparticles aggregating in unstained tissue along with the spectral response from these nanoparticles as recorded in Figure 4 versus the tissue spectrum.

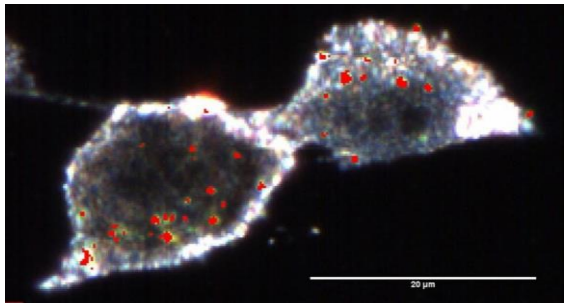

Figure 5: Au Nanorods Mapped (red) in Cell 60x

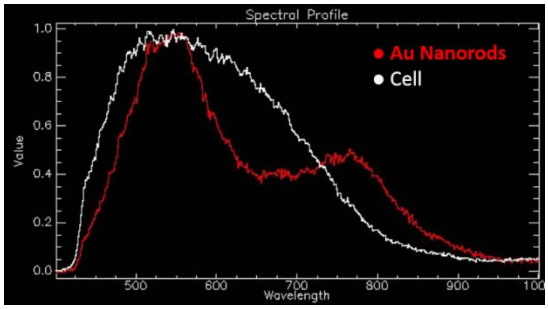

Figure 6: Spectral Response of Au Nanorods (red) and Cells (white)

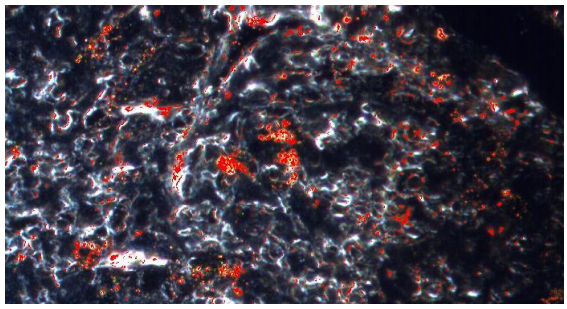

Figure 7: Au Nanoparticles Mapped (red) in Tissue 60x

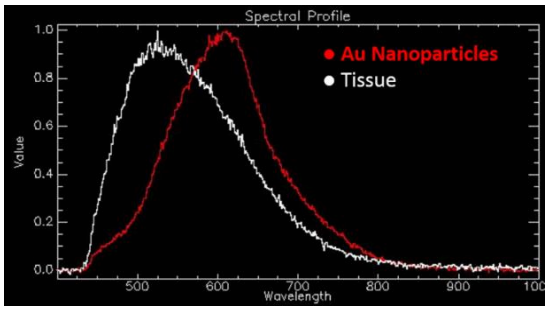

Figure 8: Spectral Response of Au Nanoparticles (red) and Tissue (white)

By employing the spectral mapping function of the CytoViva Hyperspectral Imaging Software, it is easy to map both the Au nanorods in cell culture and the Au nanoparticles in the unstained tissue sections as is illustrated above in Figure 5 and Figure 7. This spectral mapping feature serves to confirm the presence and location of these nanomaterials throughout the biological environment.

If your team is studying Au nanoparticles or other nanoparticles in theranostic or related applications, and you need a fast, effective method for observing and spectrally confirming these nanoparticles in any environment, please reply to this email or contact us at info@cytoviva.com. CytoViva will be pleased to discuss your research and conduct test imaging of your samples to help you confirm the efficacy of this technique.