Chemotherapy Hyperspectral Mapping in Tissue

Cancer chemotherapy agents such as doxorubicin are well known to cause damage to vital organs such as heart tissue. An important element in the toxicity evaluation of these small molecule chemotherapy drugs is the ability to spatially understand their interaction with organ tissues, such as the heart, based on different time and dosage criteria.

CytoViva's Enhanced Darkfield Hyperspectral Microscopy has proven to be an effective tool for gaining insight on how these small molecule drugs spatially interact with vital organ tissues. This technique combines high resolution spatial and spectral imaging to enable identification of these drugs and how they accumulate in tissue over different time and dosage exposures. Most importantly, with this technique no special sample preparation is required to identify the presence of these drugs in the tissue.

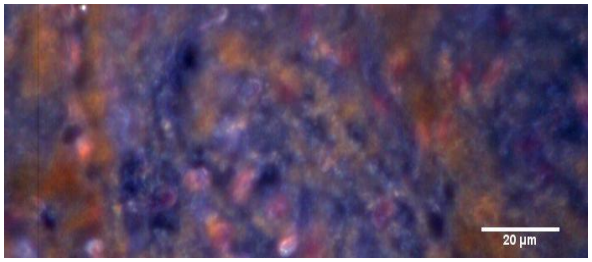

Figure 1: Ex-Vivo Stained Heart Tissue Control.

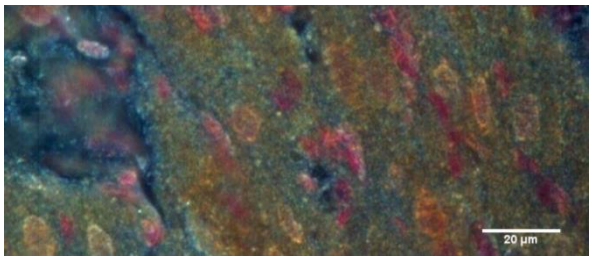

Figure 2: Ex-Vivo Stained Heart Tissue Exposed to Doxorubicin.

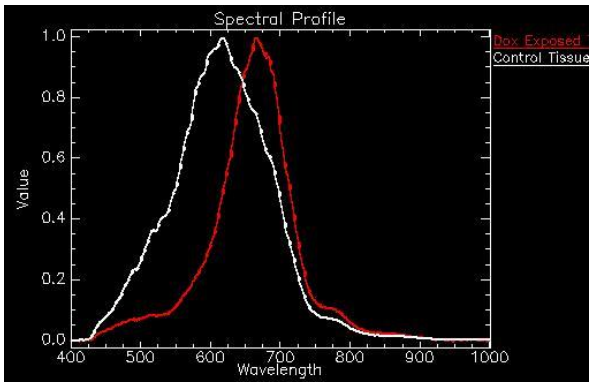

Figure 3: Spectral Difference Between Doxorubicin Exposed and Non-Exposed Ex-Vivo Stained Heart Tissue.

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Figure 4: Mapping (in red) of All Pixels Matching the Spectral Response of Doxorubicin Exposure.

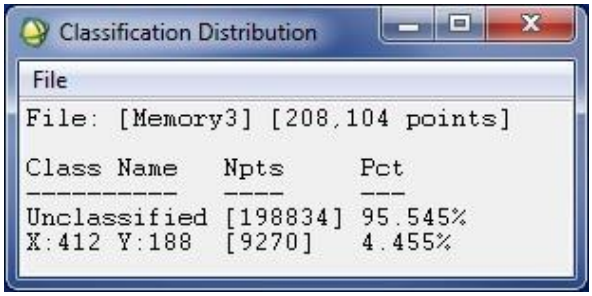

Figure 5: Class Distribution Identifying Total Number and Percentage of Pixels Mapping for Doxorubicin Exposed Tissue.

Figure one above illustrates an enhanced darkfield hyperspectral image of ex-vivo stained heart tissue from a negative control animal. Figure 2 shows an identical area of heart tissue from an animal exposed to doxorubicin. These images were each captured by the CytoViva system in 1-2 minutes. From a qualitative visual perspective, there is very little difference to

be discerned between these two samples. However, because these are hyperspectral images, each pixel in the image contains the optical-spectral response from 400nm - 1,000nm. By comparing the spectral response of the pixels in the control tissue versus the exposed tissue (using hyperspectral image analysis software), it is possible to identify distinct tissue/pixel areas which contain spectrum unique to the exposure of the doxorubicin drug. This spectral difference between exposed and non-exposed tissue is illustrated in figure 3 above, showing a 50nm peak wavelength difference in the doxorubicin exposed areas. As the system produces approximately 2nm of spectral resolution in each pixel across the entire spectral range, this 50nm shift is very significant.

Figure 4 maps (**in red**) all pixels in the image of the exposed sample where the unique spectral response for doxorubicin exposure is identified. The chart in figure 5 provides a class distribution identifying the total number and percentage of pixels in the tissue image which mapped for the doxorubicin exposure.

Not only can CytoViva's Enhanced Darkfield Hyperspectral Microscope identify doxorubicin exposed tissue, many other small molecule chemotherapy drugs such as cisplatin, paclitaxel and mitoxantrone can be studied using the system.

If your laboratory could benefit from the ability to observe and identify these small molecule drugs in tissue, please contact CytoViva at info@cytoviva.com. We can discuss imaging of your samples or conduct an onsite demonstration if appropriate.