Assaying complex 3D tissues in microplates, learning from fluorescent scorpions

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As assays and cell models become more complex, scientists are pushing plate readers and imaging systems to the limit to achieve results. A key problem with heterologous assay systems is that single point reads are not representative of the whole experiment and therefore of limited use. 3D microtissues are gaining in popularity but are still relatively simple compared with whole tissue samples. At Venomtech understanding the biology of the venomous animals is almost as important as their venoms. Scientists have known about whole scorpion exoskeletons (exuvia) exhibiting biofluorescence long before we started using their venom, however this fascinating biology still has many mysteries. To try to understand this biological phenomenon further we investigated if the wavelength scanning and matrix scanning technology of the CLARIOstar+ (BMG LABTECH), which is designed to handle complex cell assays, could handle complex whole tissues with native biofluorescence. As scorpions shed their skin through a process of ecdysis the exuvia are available for research without harm. Dissected exuvia were initially imaged in black 96-well plates using wavelength scanning to understand excitation and emission spectra in more detail than has been performed before. 30x30 well-scanning was optimised for whole exuvia in clear 6-well plates. This allowed for a comparison of fluorescent intensity across anatomical regions. This technique was then also zoomed in to investigate transmission of emission wavelengths through the cornea, confirming that the scorpions have the potential ability to detect their own fluorescence. Presented here is the first high-resolution spectrograph of scorpion exuvia using SBS standard plates and an un-modified plate reader to learn more about this fascinating biology. In performing this study we have pushed the limits of what was thought possible with complex tissue assays and these learnings can be applied to other 3D tissues in drug discovery.