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light for life sciences

Applications from Autophagy to Zebrafish

Many life science applications benefit from the brilliance, spectral content and temporal control of light output provided by Lumencor light engines®. A glance at some recent research publications gives a perspective of the diversity of these applications.

Live Cell Imaging

Direct observation of protein complexes and membranes in living cells provides information on how they interact and when and where they are involved in the process of autophagy. Researchers from the Babraham Institute (Cambridge, UK) provide detailed protocols for live cell time-lapse imaging of three protein participants in the autophagy pathway, DFCP1, ATG13, and LC3, tagged with GFP, mCherry, and CFP, respectively. Excitation for CFP (434/17 nm), GFP (488/10 nm) and mCherry (560/25 nm) is supplied by a SPECTRA X light engine®. Correlative super resolution images from cells that have previously been imaged live reveal proteins or membrane assemblies that make a dynamic contribution to autophagosome formation but fall below the resolution limit of wide-field light microscopy.

- Reference: https://www.ncbi.nlm.nih.gov/pubmed/?term=28253951

Genomic Analysis

Rapid and accurate profiling of pathogen genotypes in complex samples remains a challenge for existing molecular detection technologies. A team from the University of California San Diego recently described a digital high resolution melting (dHRM) analyzer for identification of bacterial pathogen DNA sequences. The analyzer performs 20,000 simultaneous reactions comprising digital PCR followed by HRM sequence fingerprinting on a microfluidic chip. On-chip thermal control and fluorescence detection using a SPECTRA X light engine produce temperature-registered two-color fluorescence images of the chip that are transformed into 20,000 DNA melt curves by an automated image analysis algorithm.

- Reference: https://www.ncbi.nlm.nih.gov/pubmed/?term=28176860

Neuroscience

Signaling in neuronal axons and dendrites necessitates the maintenance and modification of their local proteomes. Local translation of mRNAs into protein is one solution that neurons use to meet synaptic demand and activity. Imaging mRNA in living cells using the MS2-GFP labeling system provides dynamic information to augment static snapshots obtained using fluorescence *in situ* hybridization. Moon and Park from Seoul National University describe protocols for imaging GFP-labeled endogenous β-actin mRNA in cultured neurons using a SOLA SE light engine® controlled by Micro-Manager image acquisition software. They note the importance of using low power, pulsed illumination and high EMCCD camera gain to minimize photobleaching and phototoxicity during image acquisition.

- Reference: https://www.ncbi.nlm.nih.gov/pubmed/?term=27241749

Intravital Imaging

How does hydrogen peroxide (H_2O_2) act to recruit subcutaneous antimicrobial leukocytes to a superficial injury site? This question has been addressed by imaging the penetration of exogenous H_2O_2 in wounded zebrafish larvae expressing the fluorescent H_2O_2 sensor HyPer. Time-lapse fluorescence ratio imaging of HyPer-transgenic zebrafish using the blue (438/57 nm) and cyan (475/28 nm) outputs from a SPECTRA X light engine was performed at 1 image pair per minute for 60 minutes. The data indicated that direct redox signaling by wound-derived H_2O_2 is largely confined to the wound margin.

- Reference: https://www.ncbi.nlm.nih.gov/pubmed/?term=28494970

For more recent research publications illustrating the many applications of Lumencor light engines, visit our online applications bibliography.