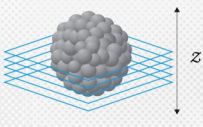
3D IMAGING
-ADVANTAGE-

There has been significant development of three-dimensional (3D) cell cultures as systems that better mimic *in vivo* physiology. Today, 3D cell cultures are emerging, not only as a new tool in early drug discovery, but also as potential therapeutics to treat disease.

Imaging procedures for 3D cell models can seem intimidating, however, new developments in 3D cell image acquisition and analysis workflows offer greater ease of use and allow wider adoption across various applications.

WHAT'S IN AN IMAGE?

Z-STACKING: acquiring serial Z-plane images at various depths with the same x,y position. Multiple images taken at diffrent distances provide a means to analyze the sample in its entirety.



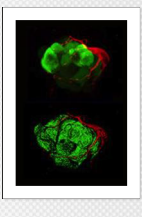
Speed is essential to minimize photobleaching and phototoxicity that can extend to all planes. The thickness of each optical section is determined by the numerical aperture of the objective and the diameter of the confocal pinhole.

Projection: digital processing that combines multiple images taken at different focal distances to provide a composite image representing the objects entire depth of field.

3D Imaging requires a balance between high signal-to-noise ratio and temporal resolution while keeping the excitation power low to minimize photobleaching and phototoxicity.

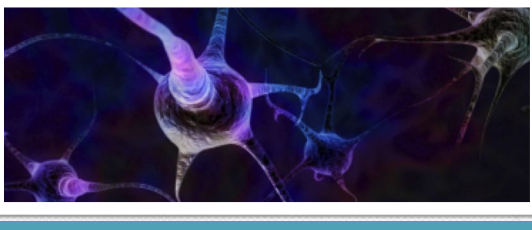
2D projection of a Z-Stack taken in widefield

The same as above but taken in confocal



Confocal imaging and 3D analysis allows quantitative characterization of complex phenotypic effects.

3D neuronal models can be successfully used for toxicity evaluation, disease modeling, and compound screening.



High-content imaging and analysis aids evaluation of treatment effects on neuronal networks.

3D IN X, Y, AND Z PLANES – THE TECHNOLOGY

GENERATION OF A 3D IMAGE: begins by collecting a series of images, each captured at pre-defined z planes at fixed x and y geometrical positions. The entire x,y and z plane series of images is then reconstructed to represent an image volume or displayed as a collection or series of images through the cell or tissue sample.

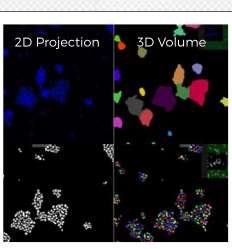
A LOOK INTO A MICROSCOPE

AgileOptix™ spinning disk technology refers to scanning disk with symmetrically placed spirals of pinholes through which illumination light is passed. These pinholes split illumination lights into multiple 'mini-beams'. When the disk spins, the light scans the sample to generate a high quality, high-resolution image.

The system is well suited for high-speed, live cell imaging with reduced phototoxicity.

VOLUMETRIC 3D IMAGING

3D volumetric data is a group of 2D image slices, stacked to maintain all data points for a more accurate representation of the cell. Confocal imaging allows you to investigate every aspect of a cellular pathway and explore more physiologically relevant 3D models.



iCell Hepatocytes were used to prepare 3D cultures. The liver micro tissues were treated with compounds for 72 hours, then stained and imaged. Z -planes were acquired using the **ImageXpress® Micro Confocal system**, with better than 25 nm resolution in X, Y, and Z axes.

Hepatotoxicity assay using 3D spheroid liver micro tissues derived from iCell Hepatocytes.

The acquired Z-plane images were used to generate sets of 2D and 3D images, which were analyzed to quantify key phenotypic features of the 3D cultures. 3D analysis more accurately determined the size of liver micro tissue.

ACQUISITION

The ImageXpress Micro Confocal High-Content Imaging System acquires a stack of images at specified intervals in the Z-axis of the 3D model and reconstructs the information in 3D space.

ANALYSIS

MetaXpress® Software 3D Analysis Toolkit enables true 3D quantification of volume, shape, and distances within cells, spheroids, or organisms in multi-well workflows. Visualize raw images with segmentation in the 3D space.

Use interactive, high-resolution renderings to generate more accurate data from your 3D sample.

MOLECULAR DEVICES