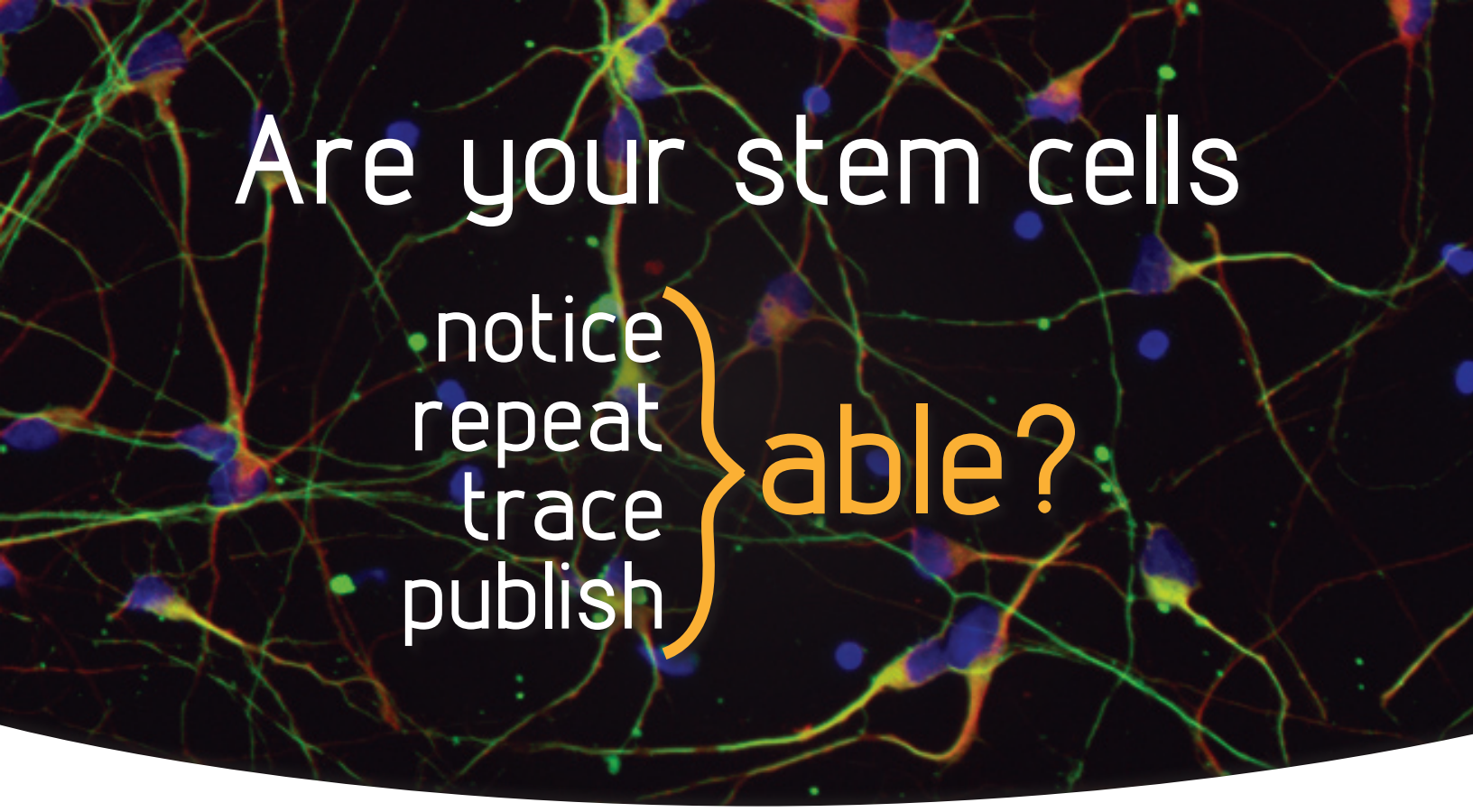

Make your breakthrough in stem cell research and transform data into unique biological insights with Molecular Devices. Robust instrumentation allows for consistent, live-cell imaging at high quality. Intelligent and flexible analysis helps track rare events with higher statistical significance over conventional microscopy. Unsurpassed service and support march alongside your vision to help achieve your goals.

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For more information, visit:
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Molecular Devices

3D Spheroid Imaging

Cancer spheroids are believed to represent tumor physiology more closely than cells plated to grow on a flat surface. With the ability to uniformly grow spheroids in a microplate format, anti-cancer drugs can be screened for efficacy in a high-throughput manner with high-content assays on the automated ImageXpress® Micro System.

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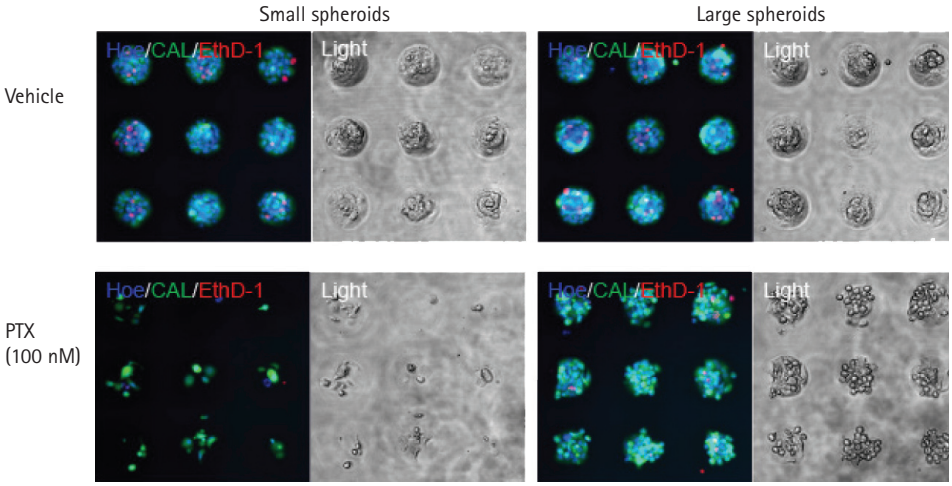
Watch Spheroids Experiment Video

Benefits

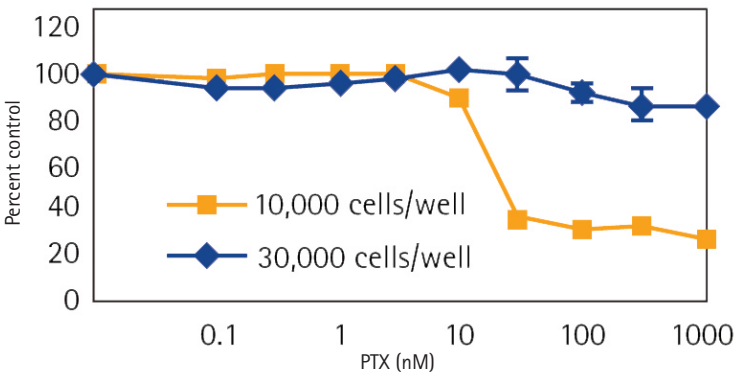
- Consistent live-cell imaging conditions maintained by environmental control
- Rapid z-stack imaging and 3D spheroid reconstruction
- Straightforward imaging workflow and readily available plates for studying spheroids

Effective dose of anti-cancer drug influenced by spheroid size



Images of diminished cell viability with fluorescent Live/Dead Cell viability assay after PTX treatment of DU145 human prostate cancer cells plated at 10,000 cells (left) or 30,000 cells per well (right). All nuclei are colored blue, live cells are green, dead cells are red. The transmitted light image shows reduced viability of spheroids at high dose of PTX.

Monitoring apoptosis and necrosis over time



Larger spheroids were found to be more resistant to PTX treatment.

Stem Cell Expansion and Differentiation

There is great interest in using neuronal cells as screening tools in early drug development. However, assays that monitor the expansion and differentiation of neuronal stem cells are complex, and manual analysis can be laborious and inaccurate. Here we demonstrate a streamlined high-content imaging and analysis workflow to automatically evaluate stem cell expansion and quantitate the extent of differentiation.

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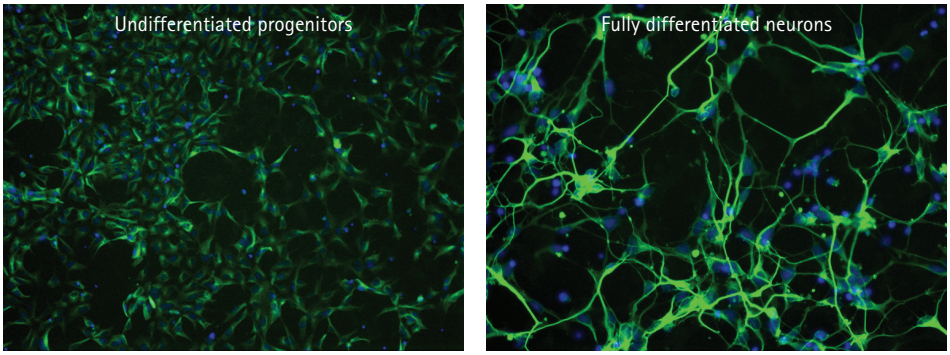
Benefits

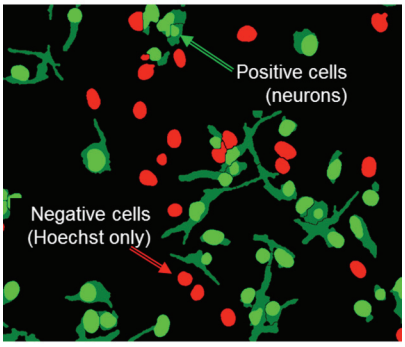
- Automated evaluation of stem cell expansion
- Instant identification of optimal media conditions
- Quantitative measurement of cell differentiation using pre-designed analysis modules

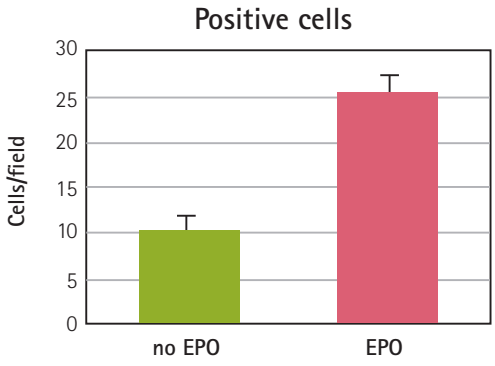
Differentiation of neural progenitors visualized by high-content imaging

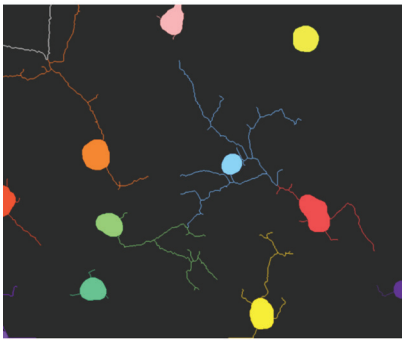


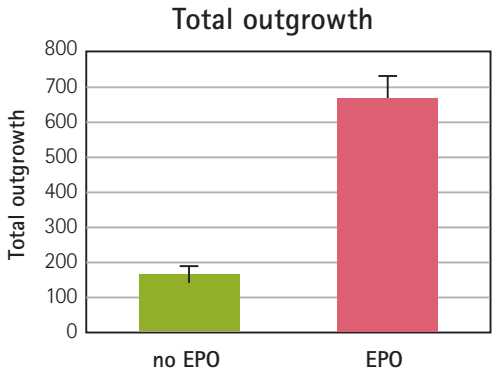
Overlayed images (green: anti-ß-tubulin; blue: hoechst) from wells containing hNP1 and differentiated hN2 cells. Images were acquired with ImageXpress Micro System using a 20x objective.

Phenotypic quantification using cell scoring and neurite outgrowth module









Multi-parametric outputs were generated from the cell scoring and neurite outgrowth modules (left). The number of developing neurons (top right) and total length of neuronal branches (bottom right) were also determined (error bars = 1 SEM, N=10).

Multiplexed Hepatotoxicity Assay

Drug-induced hepatotoxicity is an important cause for liver injury. Thus highly predictive assays for safety and efficacy testing are crucial for improving drug development. Here we demonstrate the development of multi-parametric hepatotoxicity assays utilizing the ImageXpress® Micro XL System. Each well or cell yields multiple compound-induced cellular responses, which are then analyzed using custom modules from MetaXpress® 5 Software.

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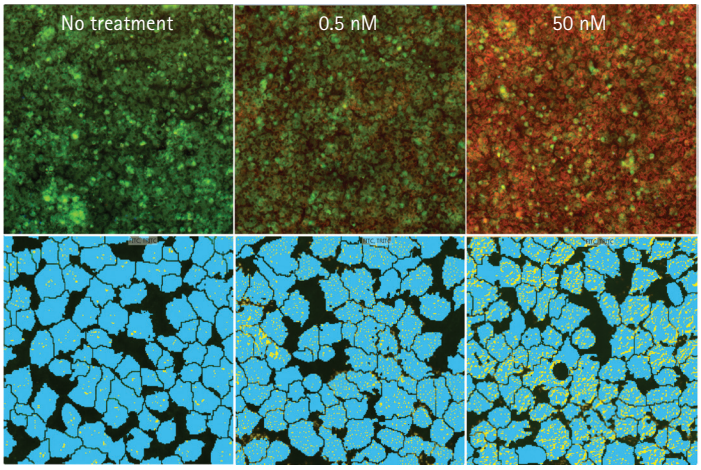
Benefits

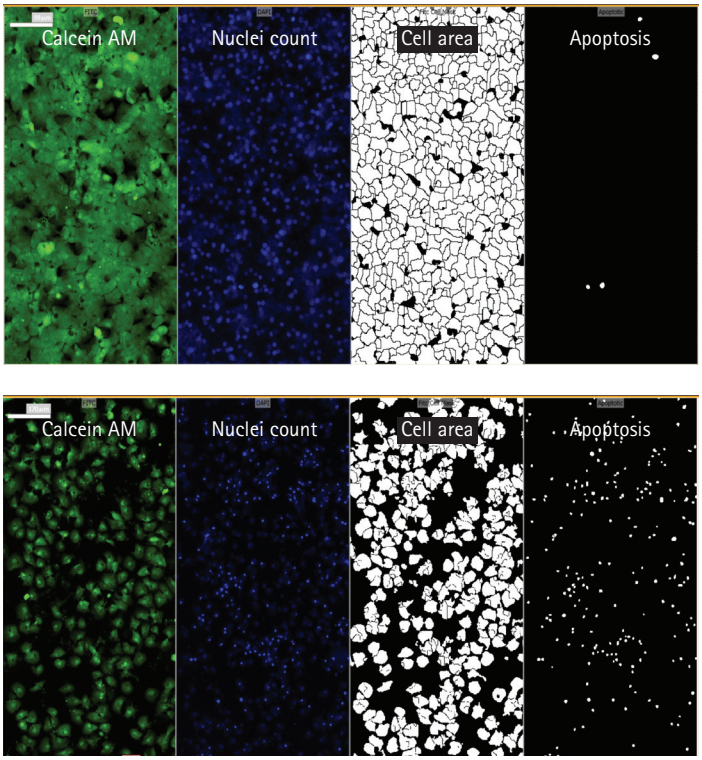
- Rapid screening for hepatotoxicity in a 96- or 384-well format
- Multiple hepatotoxicity effects measured in one assay
- Relevant output reported using custom modules

Disruption in mitochondria membrane potential



Hepatocytes treated with Valinomycin for 60 minutes. Live cells were stained with JC-10 and imaged with 10x objective. Top: Overlay of green cytoplasm and red mitochondria. Bottom: Resulting mask (zoomed) after analysis with custom module shows mitochondria identified (yellow) in a dose response to the compound.

Multi-parametric hepatotoxicity evaluation



A custom module was used to report measurement of cell area and incidence of apoptosis as well as number of live hepatocytes remaining in the well before (top; uncreated control) and after compound treatment (bottom; Amiodarone treated).

Automated Cardiomyocyte Screening

Off-target cardiotoxicity remains a significant cause of pre- and post-approval safety-based drug attrition due to the disconnect between the behavior of cultured immortalized cells and *in vivo* animal models. Here we present drug toxicity testing of cardiomyocytes using the ImageXpress® Micro XL System. This high-throughput cell-based approach enabled monitoring of cell cytotoxicity and mitochondrial membrane depolarization in real time for several days.

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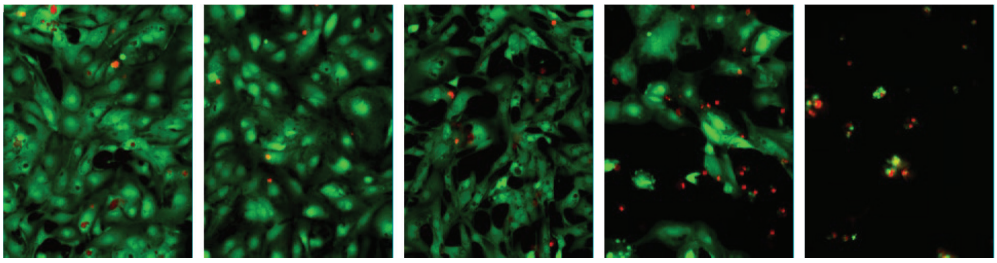
Benefits

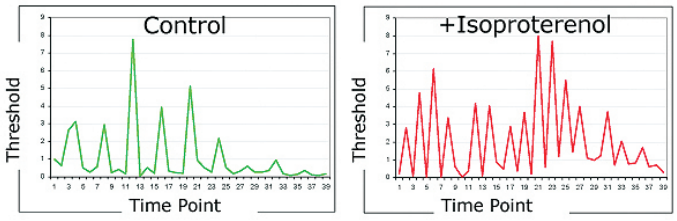
- Longitudinal monitoring of live-cell assays for several days
- Flexible time-point evaluation of kinetic effects
- Sophisticated analysis of compound dose effect on beat rate

Cytotoxicity assessment of compound treated cardiomyocytes

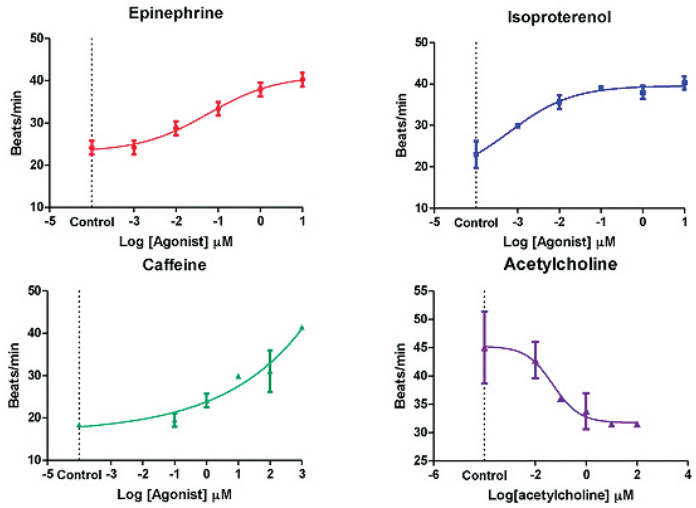


Cardiomyocytes exposed to increasing levels of a toxic compound (left to right). Live cells exhibited green fluorescence while an increasing incidence of red stained dead cells was evident at higher doses. Images of cardiomyocytes were acquired at 20x magnification using ImageXpress Micro System.

Drug effect on beat rate



Automatic analysis of the fluorescent images led to a plot of threshold intensities vs time. Beat frequency was determined 10 min after compound addition and generally the beat rates remained stable between 5-60 min after compound addition.



Dose dependent beat rate modulation of iPSC-derived cardiomyocytes was as expected for these four compounds.

Cell-based Assays Using Imaging Cytometry

The ability to combine a general cell health assay with a measurement of a specific effect increases confidence in the quality of toxicity results. The SpectraMax ® MiniMax™ Imaging Cytometer is an intuitive platform that supplements microplate reader assays with imaging cytometry to provide more biologically relevant data to non-imaging specialists. Here we present results of viability and toxicity assays using iPSC-derived cells performed on the imaging cytometer.

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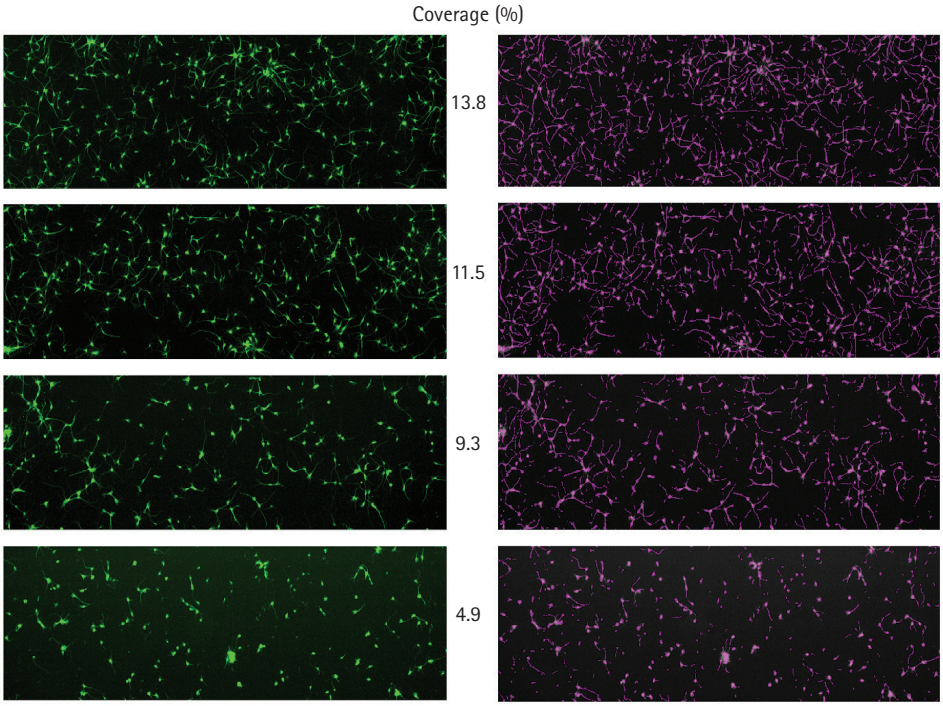
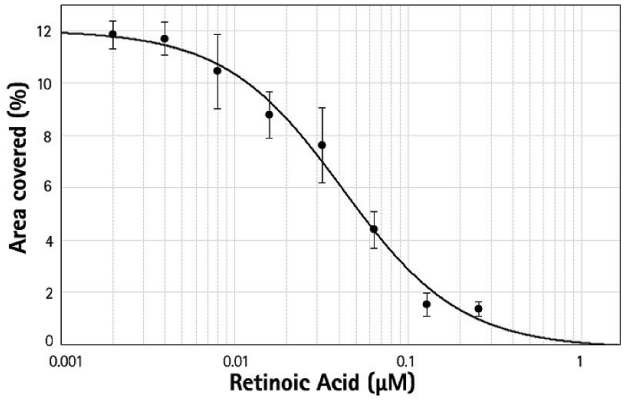
Benefits

- Simplified cellular imaging following a familiar microplate reader workflow
- Streamlined data analysis with built-in key protocols
- Quick visual assessment of cells before running *in vitro* assays

Dose-dependent inhibition of neurite outgrowth



As concentration of retinoic acid increased (top to bottom; top row - control), amount of neurite outgrowths decreased. Cell bodies and outgrowths were identified by the purple mask (right column).



Purple masked area plotted as a function of retinoic acid concentration.

Neuronal Toxicity Testing with iPSCs

High-content imaging using induced pluripotent stem cells (iPSCs) of human origin can be applied to examine neurotrophic, neuroprotective, or neurotoxic effects of pharmaceutical drug candidates or environmental contaminants. This note demonstrates neuronal toxicity screening via automated endpoint and live-cell assays using iPSCs and Molecular Devices instrumentation and software.

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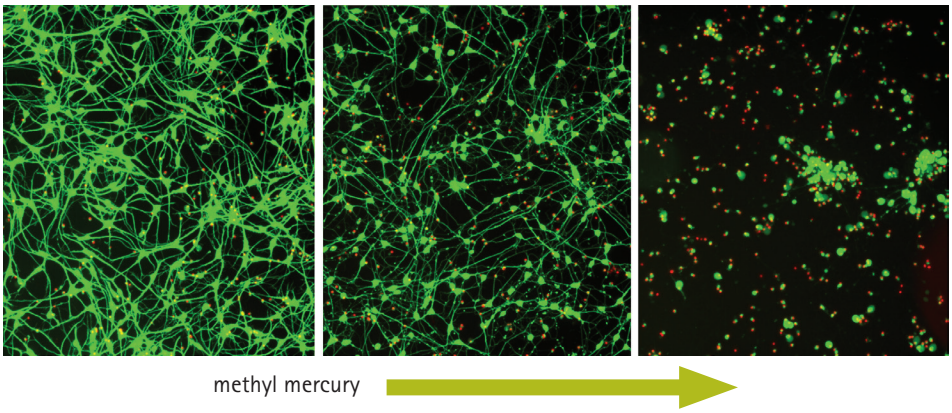
Benefits

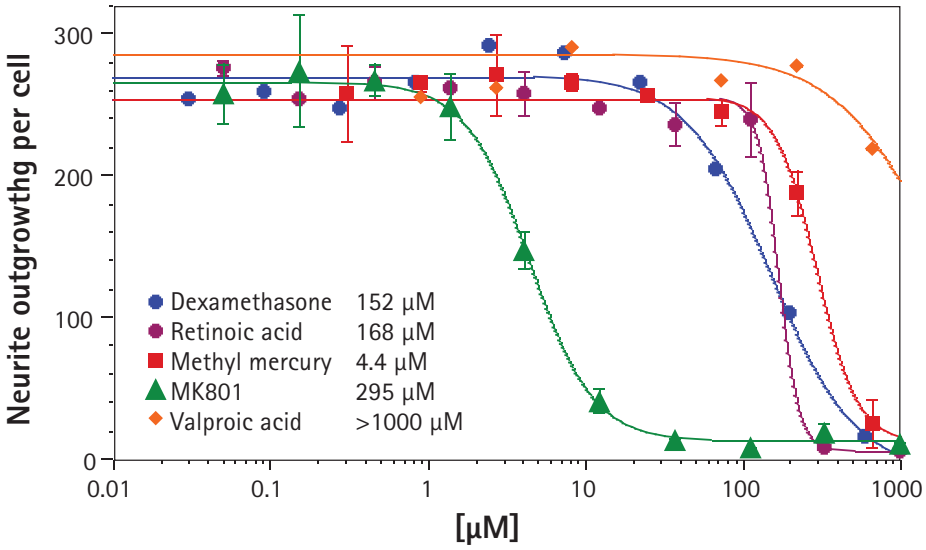
- Accurate monitoring of live-cell toxicity under environmental control
- Automated workflow from start to finish
- Quantitative measurement of neurite outgrowth and mitochondrial membrane potential

Effect of methyl mercury on neurons



Images showing the dose-dependent toxic effect of methyl mercury on neurons. The presence of Calcein AM indicated metabolism of living cells (green).

Dose-response curve of neurotoxic compounds



IC_{50} curves of cytotoxic compounds as determined by neurite outgrowth.

Live Cell Time-lapse Imaging

The ability to monitor responses in living cells over a specific period of time offers researchers key advantages for assay development. For routine cell-based screening, time-course results can determine the correct time to read end-point assays. Here we demonstrate how high-content time-lapse imaging can be used to characterize cell health kinetics, and to monitor cell proliferation or death.

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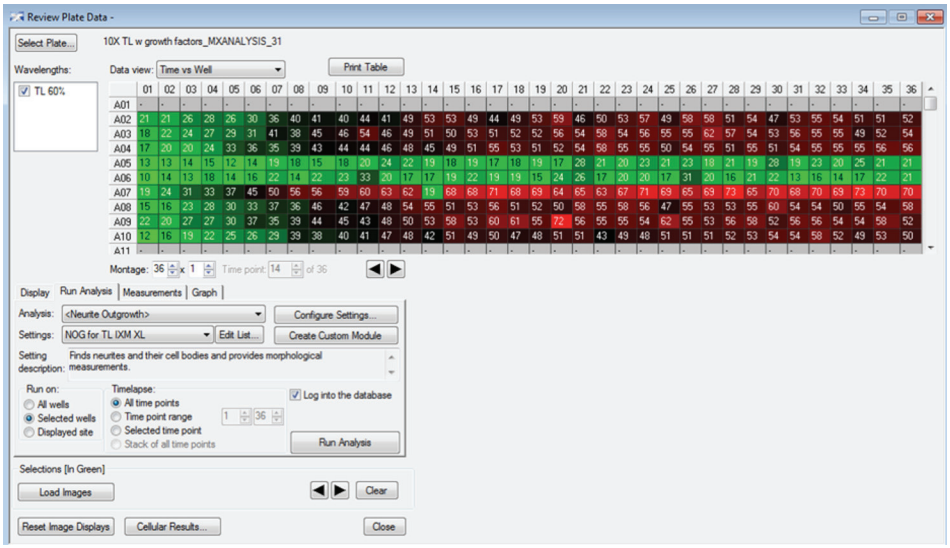
Benefits

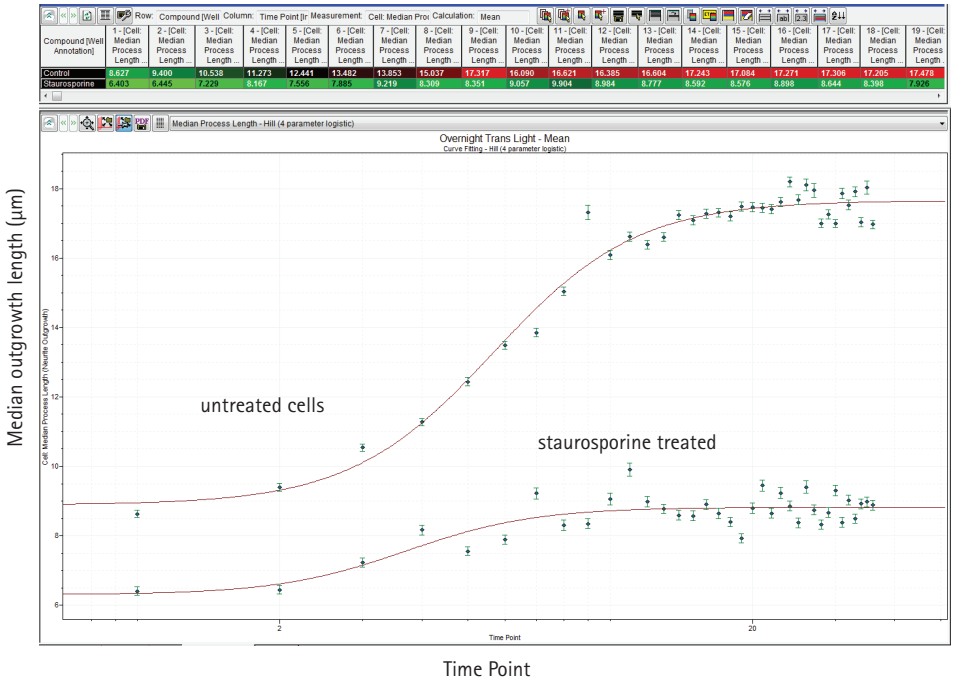
- Decreased analysis times up to 40x with parallel image processing
- Compatible analysis using either pre-designed application modules or user-created custom modules
- Instant identification of trends or outliers with visual heat map

Quick evaluation of time-lapse responses with heat map visualization



Change in neurite outgrowth visualized through a time vs. well heat map over 36 time points across 18 hours. Neurons in the wells of rows A05 and A06 wells were treated with 10 µm staurosporine. In all other wells, neurons were either untreated or treated with a growth factor only.

Neurite outgrowth tracked over time in unlabeled cells

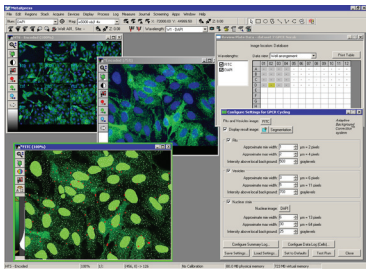


Data analyzed in AcuityXpress High-Content Informatics Software showed median length of each cells, neurite processes (*y*-axis) per time point (*x*-axis). Untreated cells demonstrated significant outgrowth lengths (top trace) vs. cells treated with the kinase inhibitor staurosporine (bottom trace).

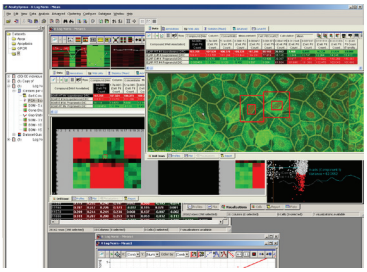
Stem Cell Imaging Solutions

For detailed information, select the images or text.

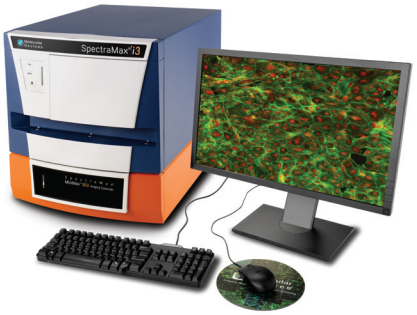
ImageXpress Micro XLS Widefield High-Content Imaging System (label-free and live-cell capable)



Metaxpress High-Content Image Acquisition and Analysis Software



AcuityXpress High-Content Informatics Software



SpectraMax i3 Multi-Mode Detection Platform with SpectraMax MiniMax 300 Imaging Cytometer (label-free capable)

EarlyTox Cardiotoxicity Kit

EarlyTox Cell Integrity Kit

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