In vitro platform for high-throughput screening of neurons enables automation of neurotoxicity assays

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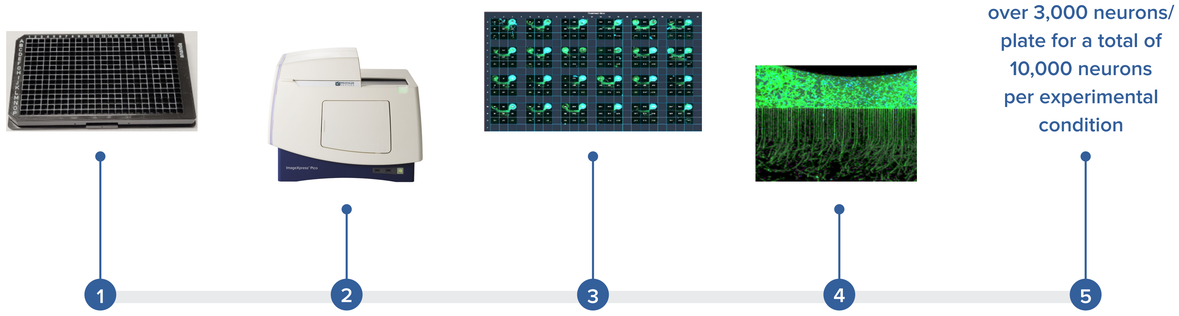
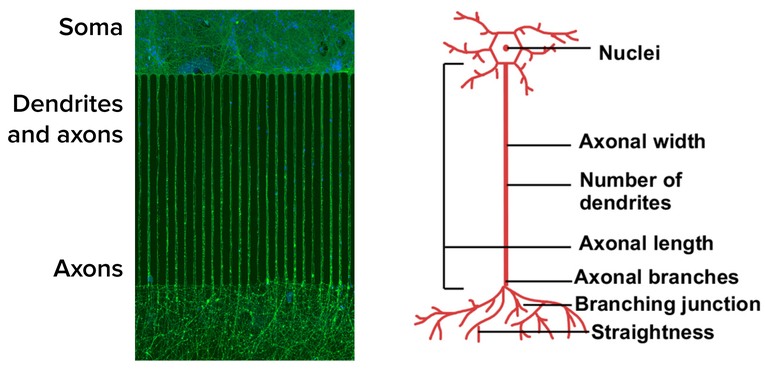
Materials and methods

1. Culture neurons in Ananda Devices NeuroHTS™ Microplate in medium A or B for 7 days
2. Image the plate in 20 min with the Molecular Devices ImageXpress® Pico Automated Cell Imaging System with a 10X objective
3. Define region of interest (ROI) using preconfigured labware definition to automatically align with imaging window
4. Analyze images using a custom module in MetaXpress® High-Content Image Acquisition and Analysis Software
5. Obtain a 7-factor neuronal morphological assessment for each sample.



Generate data from over 3,000 neurons/ plate for a total of 10,000 neurons per experimental condition

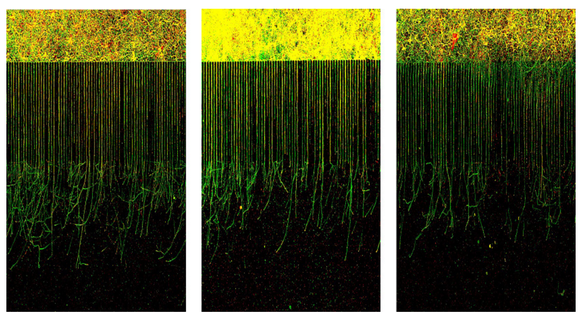
Morphological data



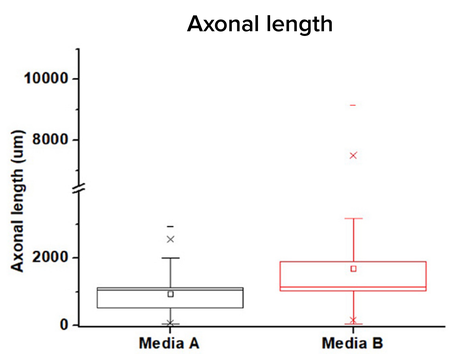
Reproducibility

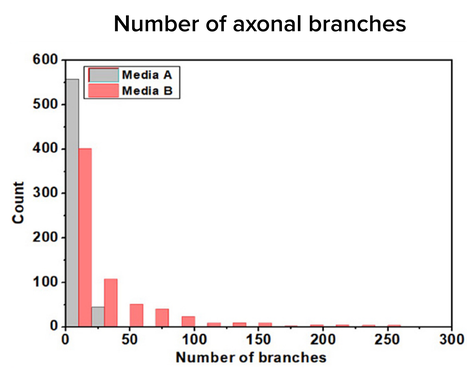
Neuronal Networks precisely organized in the same pattern in every well

Batch to batch reproducibility 88%



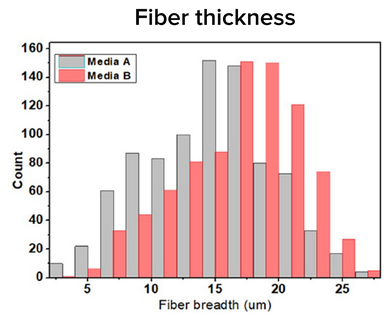
Results

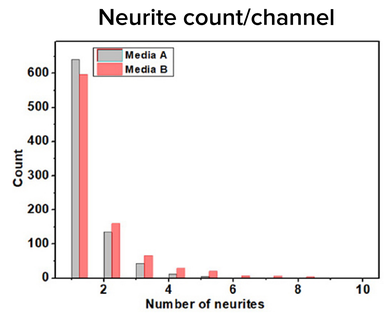


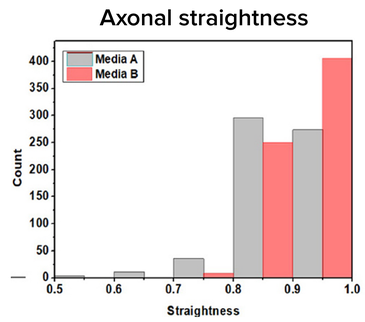


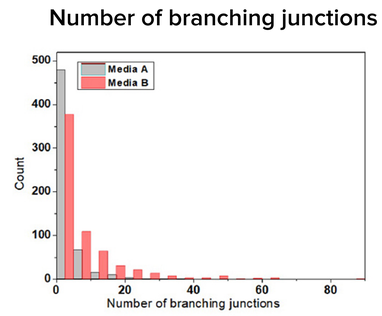
Median value

Parameters	Media A	Media B
1. Cell number	2403	2467
2. Axonal length	1055.35	1145.50
3. Fiber thickness	14.87	17.47
4. Neurite count /channel	1	1
5. Branching Number	2	12
6. Branching junctions	2	4
7. Neurite straightness	0.89	0.90









Conclusion

Our first-in-class automated 7-factor neuronal profiling assay enables comprehensive quantitative description of neuronal health. NeuroHTS™ maximizes the capacity of imaging-type of assays and generates a tremendous amount of data within one single assay. The robust assessment by high-content imaging and analysis, performed with the ImageXpress Pico system and MetaXpress software, provides a high level of standardization, reproducibility, and sensitivity, and can be deployed in the modeling and evaluation of neurodevelopmental toxicity as well as neurodegenerative disorders.

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