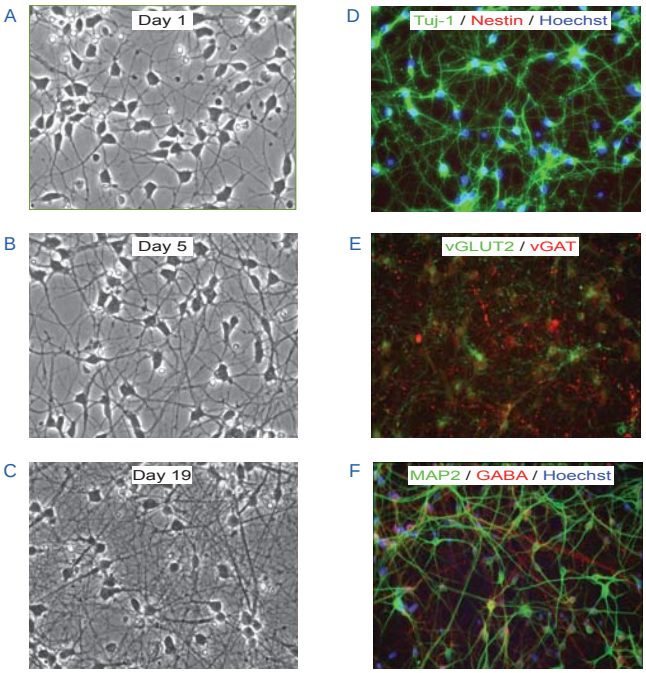
Cellular Dynamics international

iCell® Neurons

iCell® Neurons from Cellular Dynamics International (CDI) are derived from human induced pluripotent stem (iPS) cells and provide a unique in vitro system for preclinical drug discovery, neurotoxicity testing, and disease research. A better and more biologically relevant alternative to current cell models, iCell Neurons offer researchers access to commercial quantities of high quality, highly pure human neurons that possess typical phenotypic characteristics and functionality of mature neurons.

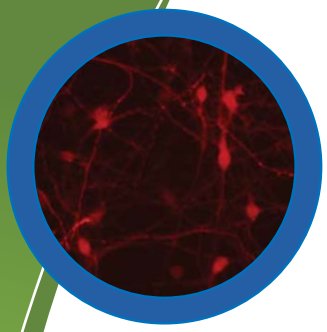
Historically, in vitro models have played an important role in the drug discovery process, including use during early stage disease modeling and candidate identification as well as pharmacokinetic and safety testing. Because of the complexity of the human brain, scientists currently use simplified models, such as primary cells isolated from rodent tissues and transformed cell lines. However, issues of biological relevance, reproducibility, and scalability can arise, and the reliance on inferior models may result in drug-induced neurotoxicity not being observed until late-stage clinical trials or after marketplace introduction. iCell Neurons overcome these limitations, providing a robust, well-characterized, highly reproducible in vitro model for preclinical drug discovery and safety testing.



▲ **Figure 1: iCell Neurons Exhibit Typical Morphology and High Purity** *(A - C) iCell Neurons, post-thaw, develop branched networks within 24 hours and remain viable for an extended culture period (≥14 days). Additionally, iCell Neurons represent a highly pure population comprised primarily of GABAergic and glutamatergic neurons with low levels of nestin as demonstrated by immunocytochemistry: (D) ß-III tubulin (tuj-1) and nestin, (E) synaptic markers vGAT and vGLUT2, and (F) MAP2 and GABA.*

Advantages

- **Human cells:** iCell Neurons are terminally differentiated from human iPS cells and exhibit neuronal characteristics and functions.
- **Homogenous and reproducible:** iCell Neurons are highly pure, providing biologically relevant and reproducible results.
- **Acute and long-term testing:** iCell Neurons remain viable and pure in culture for weeks, enabling assessment of both acute and sub-chronic responses.
- **Easy to implement:** iCell Neurons are shipped cryopreserved with cell culture media specifically formulated for optimal cell performance. Simply thaw and use.



Electrophysiological Characterization

Neurons are electrically active cells. Communication between neurons, and between neurons and other cell types and organs, is accomplished through electrical activity. Small molecule compounds can disrupt this communication, leading to decreased functionality of ion channels and ultimately altered synaptic transmission. iCell Neurons are spontaneously electrically active neurons, exhibiting typical electrophysiological and biochemical responses upon exposure to exogenous compounds for early assessment of potential effects.

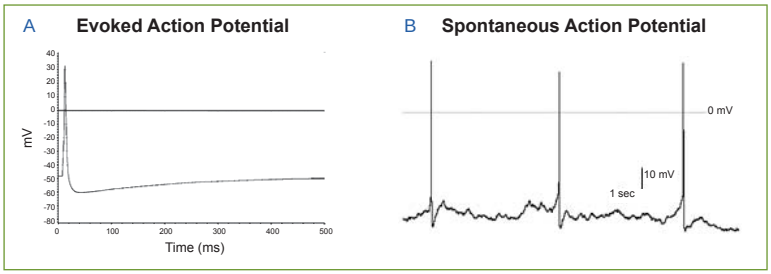
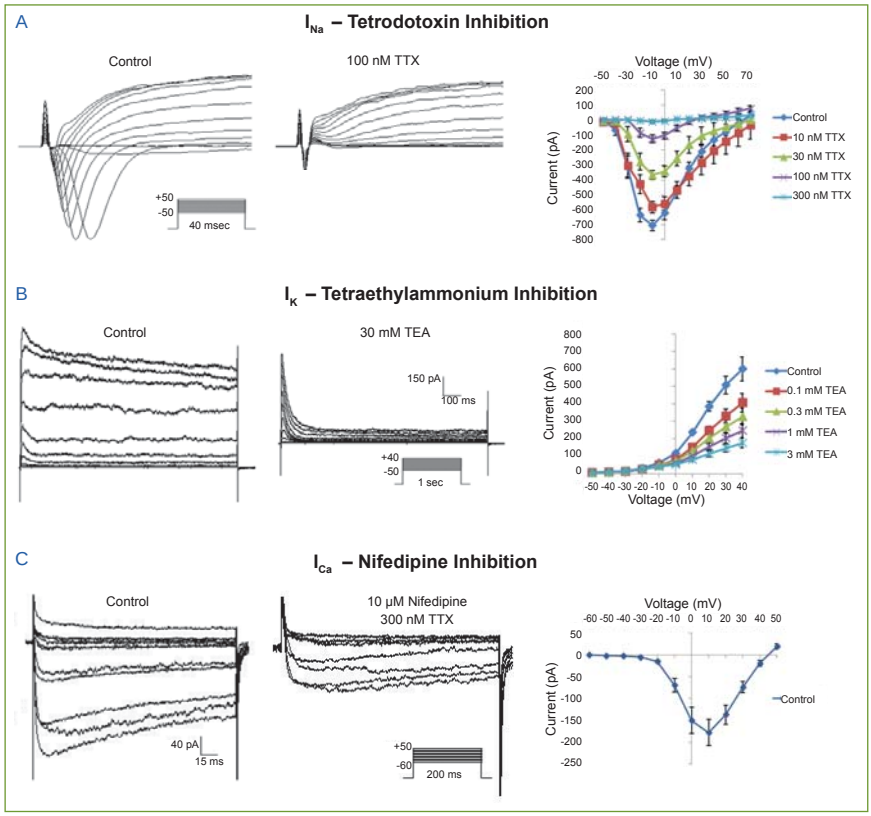


Figure 2: iCell Neurons Demonstrate Characteristic Action Potentials
Evoked and spontaneous action potentials were recorded from iCell Neurons (9 and 14 days post-thaw, respectively) using whole-cell current clamp techniques. The representative action potentials demonstrate an overshoot of the depolarization phase above 0 mV and an undershoot of the repolarization phase below the baseline.

Figure 3: iCell Neurons Respond to Ion Channel Blockers
The addition of classical neuron ion channel antagonists tetrodotoxin (TTX), tetraethylammonium (TEA), and nifedipine blocks (A) inward sodium currents, (B) outward potassium currents, and (C) inward calcium currents, respectively, in iCell Neurons (12 - 19 days post-thaw) as measured using a single-cell voltage patch clamp.



Toxicity Characterization

iCell Neurons' typical neuronal physiological functions and responses make them a viable model for in vitro toxicity screening and drug development. They exhibit stable transcriptional and phenotypic profiles over an extended period of time, thus enabling assessment of both acute and sub-chronic responses.

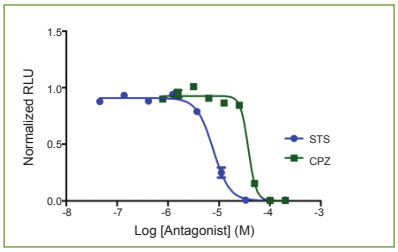


Figure 4: iCell Neurons Display Cytotoxicity Dose Response to Known Compounds
iCell Neurons were cultured for 7 - 14 days post-thaw and exposed to staurosporine (STS), an ATP competitive kinase inhibitor, and chlorpromazine (CPZ), a phenothiazine antipsychotic. They were subsequently assayed using the CellTiter-Glo® Luminescent Cell Viability Assay (Promega Corp.).

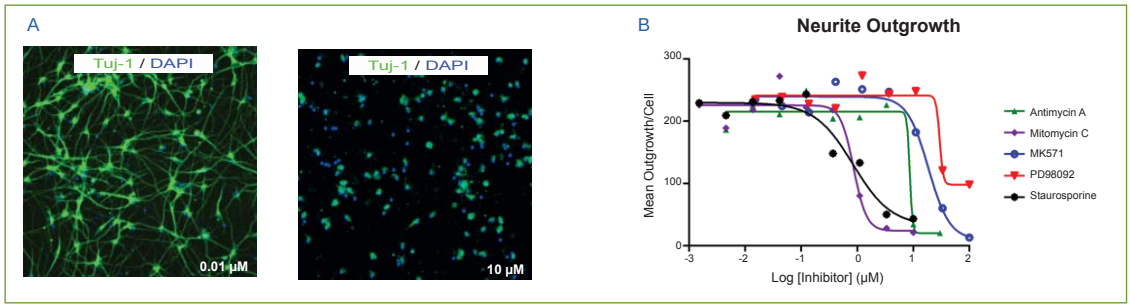


Figure 5: Compound Toxicity Was Determined through Neuronal Network Disintegration in iCell Neurons
iCell Neurons that were treated with increasing concentrations of antimycin A, mitomycin C, MK571, PD98092, or staurosporine were (A) stained for ß-III tubulin (tuj-1) and nuclei (DAPI) and analyzed using the ImageXpress™ Micro High Content System and MetaXpress™ Software. (B) The resultant dose response curves assess neurite outgrowth to cytotoxic compounds. Images are of cells treated with increasing concentrations of mitomycin C. (Data generated by Molecular Devices, Inc.)

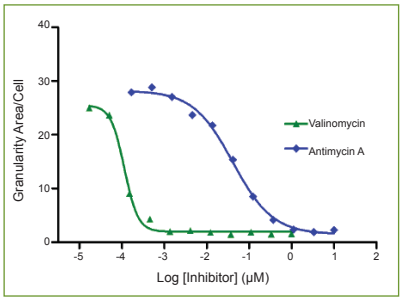


Figure 6: Mitochondrial Damage Was Observed in iCell Neurons after Treatment with Cytotoxic Compounds
The mitochondrial membrane potential of iCell Neurons was monitored after treatment with mitochondrial active dye JC-10 and exposure to antimycin A or valinomycin. These iCell Neurons were then imaged using the ImageXpress Micro High Content System. Mitochondrial damage and the loss of the mitochondrial membrane potential were analyzed using the MetaXpress Software. (Data generated by Molecular Devices, Inc.)

Applications

iCell Neurons are amenable to a variety of uses:

Cell-based Assays

- Apoptosis
- ATP production
- Cell viability
- Oxidative stress
- Mitochondrial dysfunction
- Neurite outgrowth/sprouting

Electrophysiological Applications

- Conventional patch clamp recording
- Microelectrode (MEA) recording

Specifications

Cell Type	Neurons
Organism	Human
Source	Differentiated from a CDI reprogrammed human iPS cell line
Quantity	>2.5 M platable cells/unit
Shipped	Frozen
Storage	Liquid nitrogen
Media	iCell Neurons Maintenance Medium iCell Neurons Medium Supplement

Ordering Information

Product	Kit Components	Catalog #
iCell Neurons	>2.5 x 10^6 platable cells Maintenance Medium Maintenance Supplement	NRC-100-010-001
iCell Neurons Maintenance Medium	100 ml	NRM-100-121-001
iCell Neurons Medium Supplement	2 ml	NRM-100-031-001

For More Information

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CDI Products & Services

iCell Cardiomyocytes

Human heart cells derived from induced pluripotent stem (iPS) cells and specifically designed for drug efficacy research, toxicity screens, and more.

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Human iPS cell-derived interior blood vessel cells for vascular-targeted drug discovery and predictive disease modeling.

iCell Neurons

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Human liver cells, produced from iPS cells, for disease modeling and preclinical drug development.

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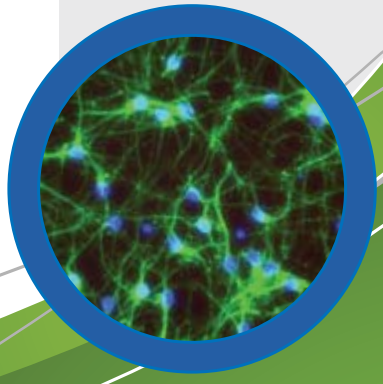
iCertification Training Programs

Master the use of iCell products by completing an iCertification Training Program.



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