

AXOL

INTRODUCING V2.0 KITS



Human iPSC-derived
SENSORY NEURONS

Supporting cosmetics & biopharma with better human disease models

How iPSC-derived sensory neurons are used in research

Chronic pain disorders have been estimated to affect **over 30% of people worldwide**, causing significant physical, emotional and economic burden¹. Alongside this, drug discovery has encountered significant regulatory clearance challenges from **adverse neurotoxic effects**, particularly in **chemotherapy-induced peripheral neuropathy**².

This has driven researchers to develop various model systems including **animal-based platforms** and **simple cell cultures** comprising rodent dorsal root ganglion neurons². While these models have provided some valuable insights, there remains a **translational gap** from bench to bedside that has hindered drug discovery and toxicology. The industry has therefore turned to more **human-relevant** model systems powered by **human iPSC-derived cells**.

Axol's sensory neurons respond to a range of **environmental** and **chemical** stimuli and are commonly used in **microfluidic** devices for cosmetic testing, pain models, and peripheral neurotoxicity models. axoCells sensory neurons can be used in conventional multi-well plates and have also been successfully integrated into a range of microfluidic platforms. Applications include **skin models, touch models, anti-aging research, pigmentation studies, wound healing and toxicity testing**.

axoCells™ iPSC-derived sensory neurons are used to support active research in:

- **Pain & sensation modeling**
- **Dermatology**
- **Cosmetics**



Taste, touch, itch, calming, pain, aging,
stimulation, soothing, relief, irritancy, heat

¹ Cohen et al. 2021 doi: 10.1016/S0140-6736(21)00393-7

² Xiong, C. et al. 2021 doi: 10.1111/cts.12912

What Axol Bioscience is doing to help?



“With over a decade of experience in the iPSC industry, we’re working towards a mission of building better, more human-relevant models for drug discovery. We’re using that expertise to unlock the utility of iPSCs for biotech companies, allowing them to focus on the science and accelerate drugs through the development pathway. Ultimately, that will translate to better treatments for patients worldwide.”

- Liam Taylor, CEO, Axol Bioscience

Here to help your science



We want to run a sensory neuron screen in-house.



We want to use a more 'human-relevant' sensory neuron model in our lab.



Can you run a compound screen for us using sensory neurons?

No problem, we can manufacture cells, media, supplements and a robust protocol



No problem, we can supply you with cells or we can build and test the model here, and then tech transfer to you.



Yes, we can run that screen for you.



What does a typical project look like?



1. Kick off

- Open discussions
- Rapid follow-up with competitive quote



2. Execution

- Ongoing communication
- Focus on quality of output guided by in-house expertise



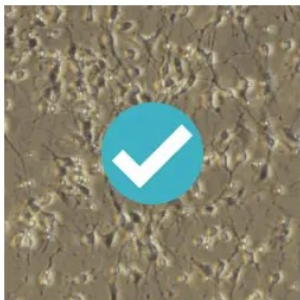
3. Output

- Debrief meeting
- Data sharing
- Ongoing support

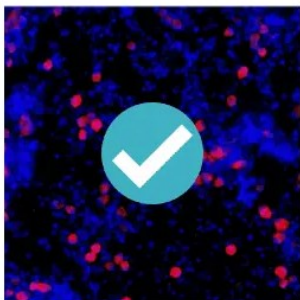
Want to discuss a project, including timelines and ballpark costings?
[Click here to speak to our scientists.](#)

axoCells iPSC-derived sensory neurons

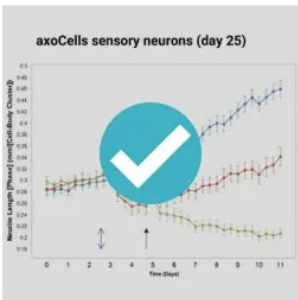
Axol's iPSC-derived sensory neurons express the neuronal sodium ion channel Nav1.7 and the DRG-specific, TTX-resistant channels Nav1.8 and Nav1.9, as well as the temperature sensitive TRP channels TRPV1, TRPM8 and TRPA1, sensors of pungency, bitterness and cold. iPSC-derived sensory neuron progenitors are available in large batch sizes for reliable and consistent results for high-throughput screening assays. The cells are also suitable for investigating disorders of the peripheral nervous system, pain, and itch.



Key Morphology



Key Markers



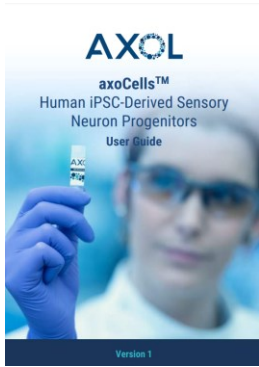
Key Performance



Assay Ready

axoCells iPSC-derived sensory neurons

Donor gender	Donor age	Source	Donor	Product code	Cells/ vial
Male	Newborn	Cord blood	Healthy	ax0555	3.2 million / 96 well plate quantity
Male	Newborn	Cord blood	Healthy	ax0055	1 million / approx. 1/3 rd 96 WP quantity



Key highlights include:

- Assay-ready in **21 days**
- Expression of the **key nociceptive ion channels**
- **Functional relevance** across multiple assays including capsaicin and menthol treatment, thermoception and neurite outgrowth with Paclitaxel
- Designed for **advanced *in vitro* model formats** including co-culture, microfluidics devices and organ-on-chip platforms
- Manufactured in our **ISO 9001-accredited production facility** with excellent **ISSCR Standards compliance**

How to get high functioning Sensory Neurons:

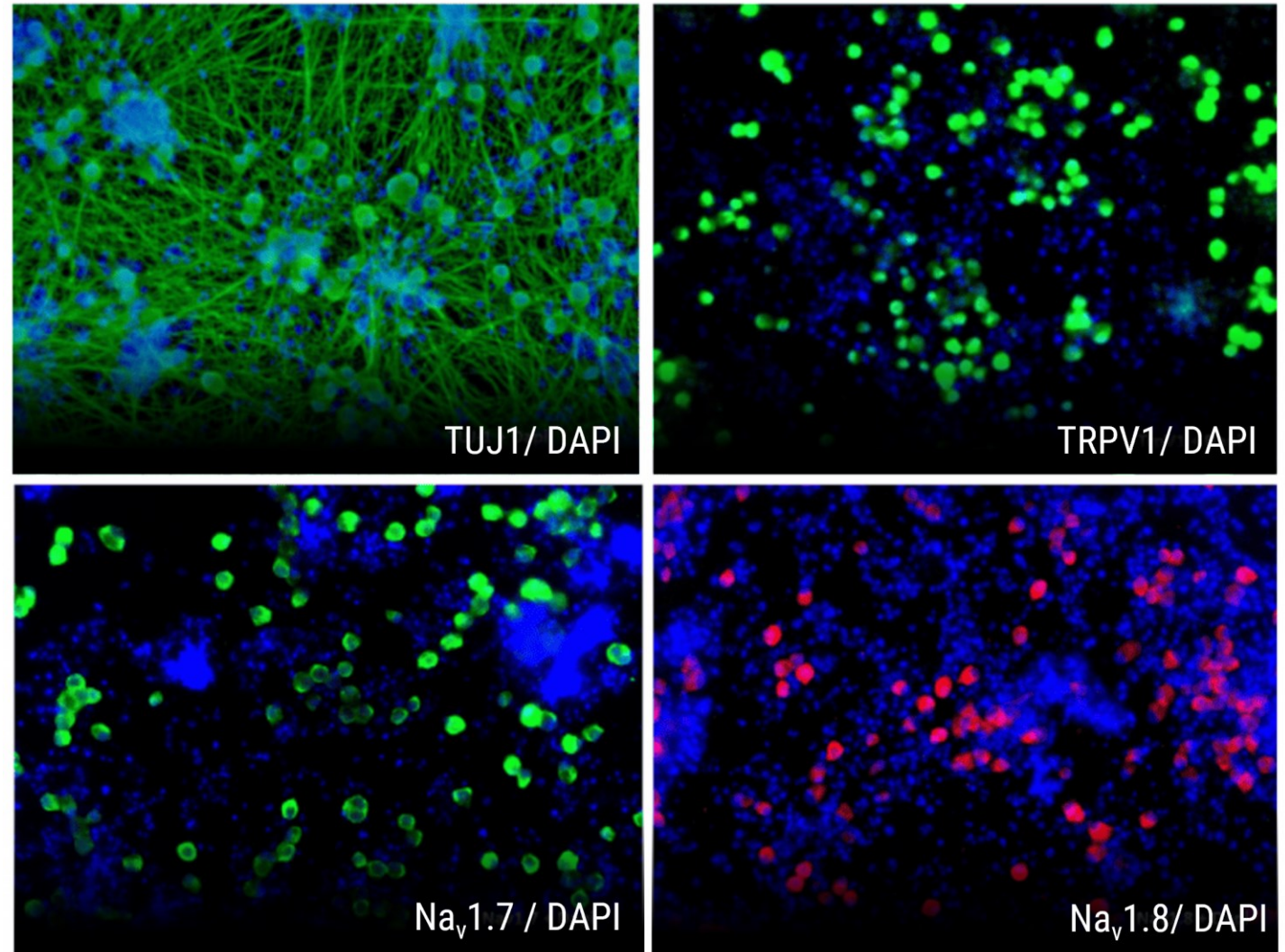
- You'll need a Sensory Neuron Kit [ax0157](#)
- In this you'll find Sensory Neuron Cells [ax0055](#) (1M) and reagents
- Follow the [protocol](#)
- 21 days later you will have high functioning sensory neurons

Characterization of axoCells iPSC-derived sensory neurons

Phenotypic characterization

We have extensively characterized our axoCells iPSC-derived sensory neurons using immunocytochemistry to identify key markers (fig.1).

Figure 1. Immunocytochemistry of axoCells Sensory Neurons shows expression of the key marker TUJ-1, indicative of neuronal development, and the nociceptive ion channels TrpV1, Nav1.7 and Nav1.8, responsible for the generation and maintenance of abnormal neuronal electrogenesis and hyperexcitability in the development of pathological pain.



Demonstrating functional relevance of axoCells iPSC-derived sensory neurons

We have performed extensive validation of our axoCells iPSC-derived sensory neurons across numerous assays including capsaicin and menthol challenge (**fig. 2**), thermoception (**fig.3**) and neurite outgrowth (**fig. 4**).

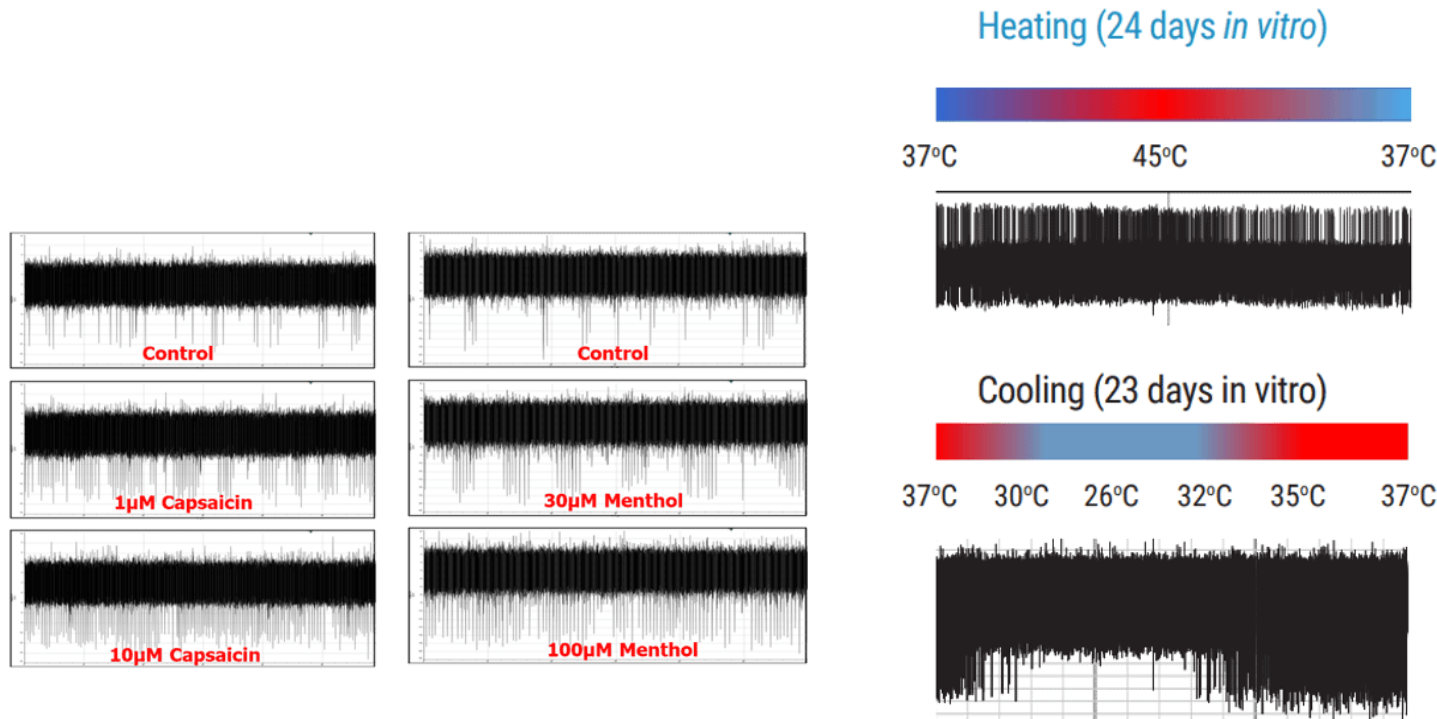


Figure 2. axoCells Sensory Neurons were challenged with capsaicin and menthol at 22 and 27 days respectively. As early as 22 days, 90% of the neurons responded to capsaicin challenge with increased spike measurements on a multi-electrode array (MEA) platform. Dose responses for both chemicals were observed, demonstrating their value in advanced in vitro models of pain, sensation, and peripheral neurotoxicity.

Figure 3. Electrophysiology recordings demonstrating increased firing of axoCells Sensory Neurons in response to heating and decreased firing in response to cooling. This demonstrates thermoception, an in vivo function, and shows the functional relevance of axoCells Sensory Neurons.

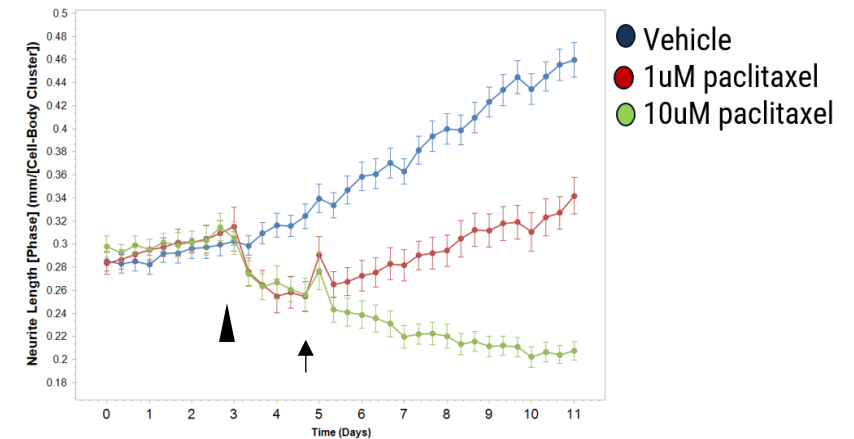


Figure 4. Response of day 25 axoCells Sensory Neurons to paclitaxel, a chemotherapy reagent, applied at 2.6 days (arrowhead) and washed off at 4.6 days (arrow)

Treatment of axoCells Sensory Neurons with the chemotherapy reagent **paclitaxel** results in **reduced neurite length** (axotomy) demonstrating the functional relevance of the sensory neurons (**fig.4**). This provides a model for both **acute insult** and **chronic peripheral neurotoxicity**.

Accelerated maturation with our Maximizer Supplement



Maturation Maximizer media supplement ensures **faster maturation** of iPSC-derived sensory neurons compared to those cultured in traditional maintenance media. It works by **mimicking *in vivo* signals** between sensory neurons and their supporting cells. The supplement contains signaling factors present in the peripheral nervous system and the native environment of sensory neurons.

Utilizing this supplement **accelerates the maturation** of iPSC-derived sensory neurons to drive **mature, functional neurons in just 21 days**. It also raises **basal electrical activity** which is useful for assays measuring inhibition of sensory neuron activity (**fig. 6**).

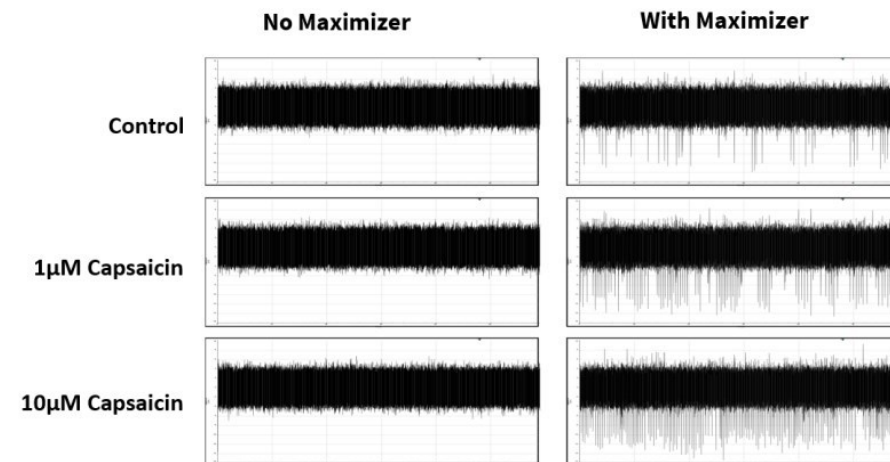
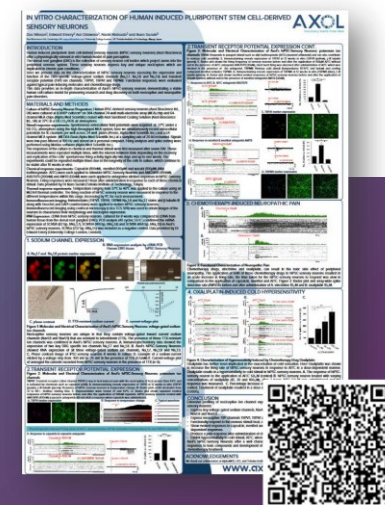


Figure 6. Electrophysiology responses comparing axoCells Sensory Neurons grown with and without Maximizer supplement, with increasing concentrations of capsaicin, measured at day 22 in culture.

21 days > Assay Ready

Maximizer Supplement enables rapid maturation of sensory neurons to a functional state



NEW! Human iPSC-Derived V2.0 Xeno-Free Sensory Neuron Bundle Kit

Axol’s market leading iPSC-derived sensory neurons are now available in these V2.0 kits.

Bundle kits include 1M or 3.2M cells and the media and supplements for either 1/3rd of a 96-well plate, or a full 96-well plate. Some additional 3rd party components are required.

Why you should be excited about Axol’s new V2.0 Sensory bundle kits!

- 1. **New simpler, automation friendly protocol** to save you time, money and enable scalability
- 2. **Smarter ‘trial size’ and ‘96-well plate size’ format** to reduce material wastage
- 3. **Now Xeno-Free** for great compliance compatibility
- 4. **We’ve lowered the price** of 96-well kit down from \$4,609 to \$3,793!

Please note we will continue to supply and support our current ‘V1.0’ kit (ax0157) and reagents (ax0033 and ax0060). Our ax0055 and ax0555 iPSC-derived sensory neurons are compatible with both versions of the kits and protocols.

ax4055	Human iPSC-Derived V2.0 Xeno-Free Sensory Neuron Bundle Kit, 1M	axoCells™ Human iPSC-Derived Sensory Neuron Cells, Xeno-Free Media, Supplement and Coating kit, male donor, ≥1M cells for 1/3rd of a 96-well plate
ax4555	Human iPSC-Derived V2.0 Xeno-Free Sensory Neuron Bundle Kit, 3.2M	axoCells™ Human iPSC-Derived Sensory Neuron Cells, Xeno-Free Media, Supplement and Coating kit, male donor, ≥3.2 M cells for 1 x 96-well plate



Newly structured ‘trial kit’ and ‘96-well plate’ kit size

Now Xeno-free

2.0

Prices reduced!

Now automation friendly using Axol’s Axscnt reagent

axoCells Sensory Neuron citations

SARS-CoV-2 papain-like protease activates nociceptors to drive sneeze and pain

 Sonali S. Mali, Ricardo Silva,  Zhongyan Gong, Michael Cronce, Uyen Vo, Cliff Vuong,  Yalda Moayed,  Jeffery S. Cox,  Diana M. Bautista

Use of a human induced pluripotent stem cell-derived dorsal root ganglion neurone model to study analgesics *in vitro*: proof of principle using lidocaine

[Pascal S.H. Smulders](#)¹ · [Werner ten Hoope](#)^{1,2} · [Carmen Bernardino Morcillo](#)¹ · [Jeroen Hermanides](#)¹ · [Markus W. Hollmann](#)¹   · [Nina C. Weber](#)¹

In Vitro Pain Assay Using Human iPSC-Derived Sensory Neurons and Microelectrode Array

[Aoi Odawara](#), [Mikako Shibata](#), [Yuto Ishibashi](#), [Nami Nagafuku](#), [Naoki Matsuda](#), [Ikuro Suzuki](#) 

Macrophage memories of early-life injury drive neonatal nociceptive priming

[Adam J. Dourson](#)¹ · [Adewale O. Fadaka](#)¹ · [Anna M. Warshak](#)¹ · ... · [Daniel Lucas](#)^{3,8} · [George S. Deepe, Jr.](#)⁹ · [Michael P. Jankowski](#)^{1,8,10,11}   ... [Show more](#)

New human in vitro co-culture model of keratinocytes and sensory neurons like cells releasing substance P with an evaluation of the expression of ZIKV entry receptors: A potent opportunity to test Zika virus entry and to study Zika virus' infection in neurons?

[Claire Bocciarelli](#), [Nadège Cordel](#), [Raphael Leschiera](#), [Matthieu Talagas](#), [Christelle Le Gall-Ianotto](#), [Weiguo Hu](#), [Pascale Marcorelles](#), [Gaëlle Bellemere](#), [Stéphanie Bredif](#), [Joachim Fluhr](#) ... [See all authors](#) 

Novel artificial nerve transplantation of human iPSC-derived neurite bundles enhanced nerve regeneration after peripheral nerve injury

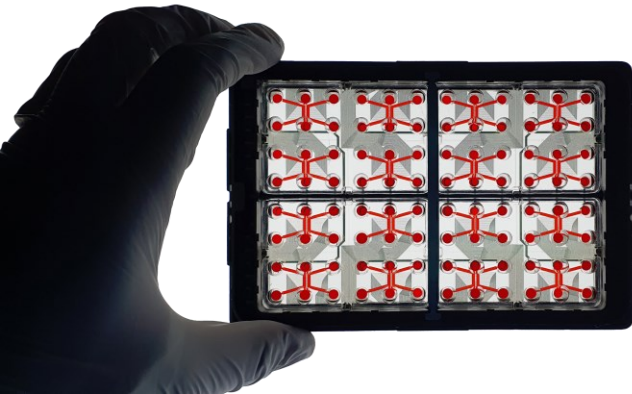
[Takayuki Nishijima](#), [Kentaro Okuyama](#), [Shinsuke Shibata](#) , [Hiroo Kimura](#), [Munehisa Shinozaki](#), [Takehito Ouchi](#), [Yo Mabuchi](#), [Tatsukuni Ohno](#), [Junpei Nakayama](#), [Manabu Hayatsu](#), [Keiko Uchiyama](#), [Tomoko Shindo](#), [Eri Niiyama](#), [Sayaka Toita](#), [Jiro Kawada](#), [Takuji Iwamoto](#), [Masaya Nakamura](#), [Hideyuki Okano](#) & [Narihito Nagoshi](#) 

Powering microfluidic devices with axoCells Sensory Neurons

axoCells Sensory Neurons are being used as the “fuel” to power high-throughput NeuroFluidics devices for pre-clinical neuroscience research, cosmetics testing and drug discovery. These organs-on-chip (OOC) kits facilitate the use of dedicated disease models for conditions including **pain** and **nerve injury**. By incorporating high-quality axoCells Sensory Neurons into compartmentalized and MEA-compatible OOC devices, these kits can offer researchers **better predictivity** and **translational outcomes**.

At Axol, we're excited to see the launch of this organ-on-chip (OOC) range, which will be powered by axoCells iPSC-derived sensory neurons. Combining the **quality and consistency** of Axol's sensory neurons with OOC capabilities, the company will be able to deliver **robust *in vitro* model systems** of the peripheral nervous system.

Built in a **high-throughput format**, these OOC kits will enable the generation of **larger, faster, and more predictive datasets**. Ultimately, this collaboration will help to drive the adoption of OOCs in biopharma, enabling better *in vitro* modeling to boost neurological research and drug discovery.



NETRI
NeuroFluidics
sensory neuron kit
powered by
axoCells Sensory
Neurons

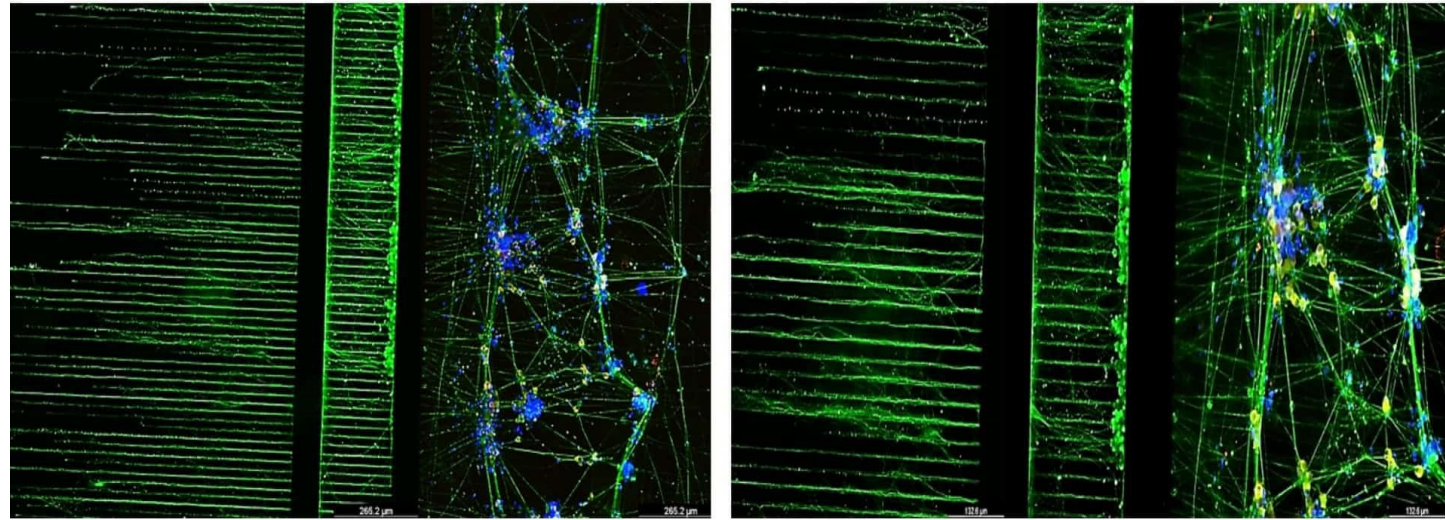


Figure 7. axoCells Sensory Neurons growing on the NETRI NeoBento™ microfluidics platform. Image at 10x and 20x magnification, staining for TUJ-1 (neuronal marker, green), Na_v1.7 (a key sensory neuron ion channel, yellow), and DAPI (nuclear stain, blue), demonstrating the presence of mature sensory neurons.

“We will help to bolster the growing iPSC market through co-development of advanced iPSC platforms that rely on the **functional quality** and **consistency** of axoCells in combination with NETRI's high-relevance & high-throughput *in vitro* OOC models.”

Liam Taylor, CEO Axol Bioscience

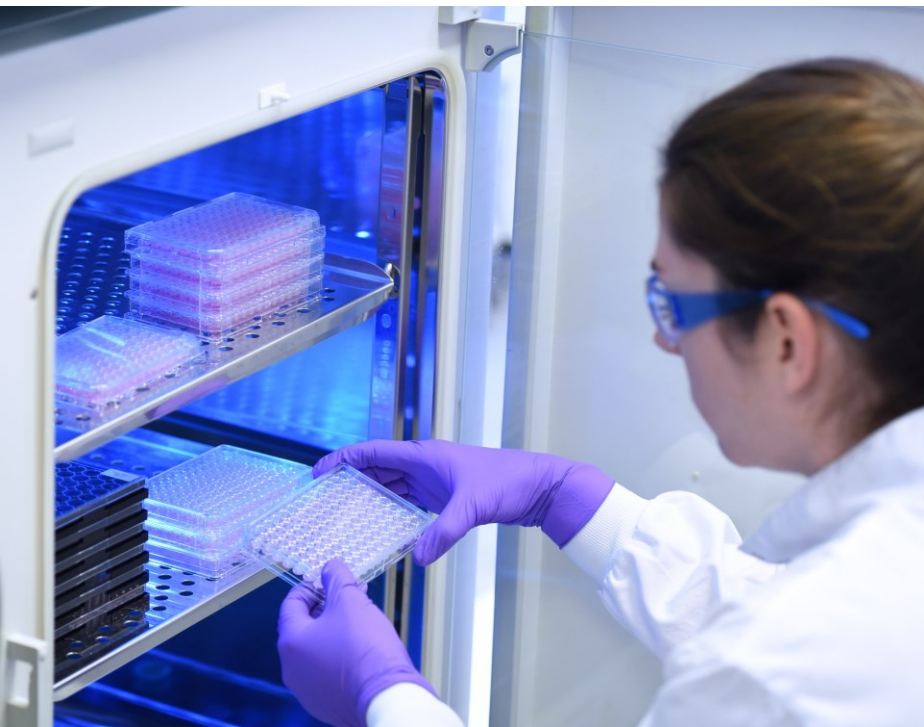


Outsourced scientific services

With **over a decade of 'hands-on' experience**, Axol Bioscience offers outsourced scientific services to support biotechs and pharma. From **assay development, model building and characterization to compound testing and profiling**, we are here to help. We work true to our values of **transparency and collaboration**.

We provide a range of technical iPSC-related services including **reprogramming, advanced gene-editing, stem cell differentiation, banking and expansion**.

We have expertise in **cellular profiling and compound testing** with access to **flow cytometry, 'omics, real-time imaging assays, plate base assays, multi-electrode array**.



Custom manufacturing of iPSC-derived sensory neurons

Recognized as experts in the field of **iPSC-differentiation**, Axol is the **lead in cellular manufacturing from iPSCs**.

Our lines, your lines, third-party lines, we can manufacture a wide range of cell types building in **QC** throughout the process. Our manufacturing is **scalable** and **customizable**. We work closely with clients to ensure **quality** and **consistency** of supply.

We can ship to the client or a third-party provider (CRO) or use the cells within Axol service projects.

iPSCs? How can we help.

Contact operations@axolbio.com



Let's work together

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@Axol Bioscience Ltd.
www.axolbio.com

