Emory Integrated Core Facilities

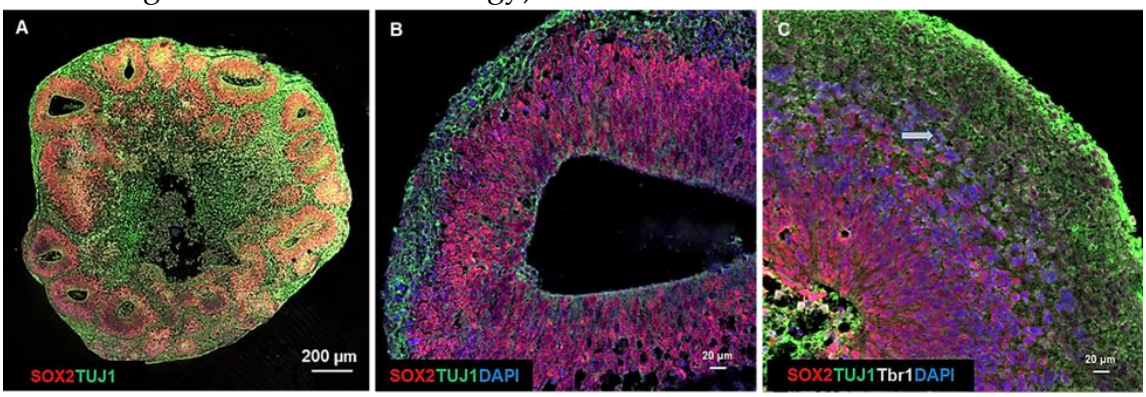
Emory Stem Cell Core

The Stem Cell Core is now providing a new service: human **induced pluripotent stem cells (iPSC)-derived 3D model systems for basic and translational research**. Patient tissue/fluid samples are first reprogrammed into iPSC and then differentiated into cerebral organoids.

Cortical organoids that recapitulate aspects of fetal brain development and mimic the in vivo architecture of brain tissue. These organoids can be used to model neurological diseases, identify disease mechanisms and test potential therapeutic strategies. This model system integrates collaborative efforts between basic scientists, clinicians and other core facilities (Genomics, Proteomics, Histology).

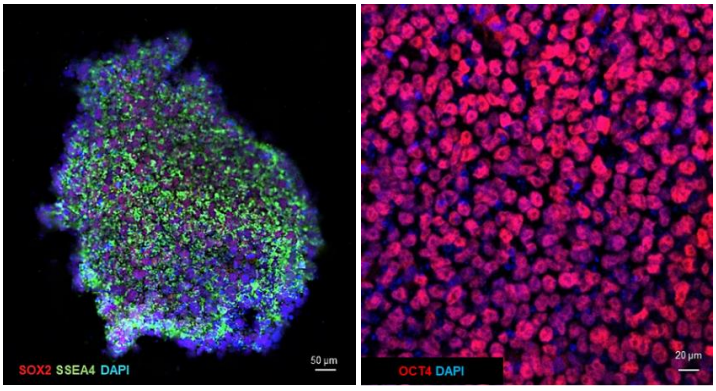
Services:

- Histology and confocal microscopy-assisted organoid characterization (in collaboration with Emory Neuropathology/Histochemistry and Integrated Cellular Imaging Cores, as well as Parker H Petit Institute for Bioengineering and Bioscience's Histology and Optical Microscopy Cores at Georgia Institute of Technology).



Brain cortical organoids (28 days in culture-A, B) reveal neuronal progenitors (Sox2+) and post-proliferation neurons (TUJ1+). At 60 days in culture (C), Tbr1+ early born neurons (arrow) participate in cortical plate formation.

- Perform downstream experiments as needed to collect data from organoids (e.g., drug screening) by IHC, WB, RNAseq, proteomics, etc.



Other services:

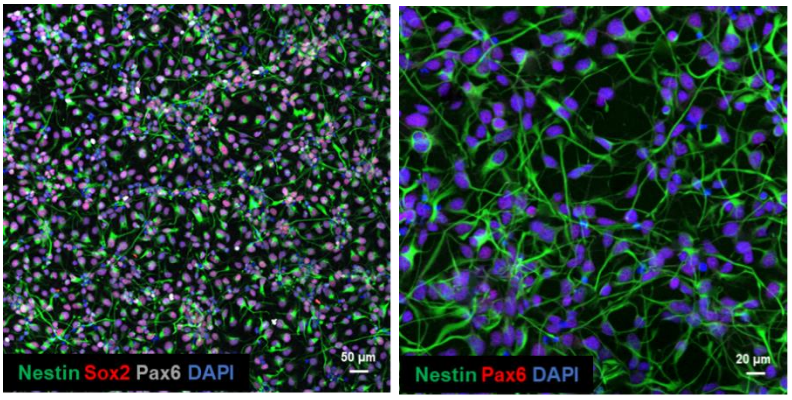
Induced pluripotent stem cells (iPSC) lines:

- Generation: patient-derived fibroblasts, blood cells and urine-derived cells reprogramming using non-integrating techniques (Sendai virus or episomal vectors)

Confirmation of pluripotency: iPSC express stem cell markers Sox2, SSEA4 (left) and Oct4 (right)

- ❖ Karyotyping (by WiCell)
- ❖ Authentication of pluripotency: stem cell markers expression (e.g., Sox2, Oct4, SSEA4 by IF), genetic analysis (by qPCR) and functional assay (trilineage differentiation).

iPSC differentiation to neural progenitor cells (NPC) and further to neurons and astrocytes



NPC express Nestin, Sox2 and Pax6

Future services:

- ❖ iPSC sorting and single cell plating using WOLF G2 system (NanoCellect Biomedical, Inc.), confirmation of patient mutation in iPSC and gene editing using CRISPR-Cas9 (in partnership with Emory Integrated Genomics Core-EIGC), establishment of an iPSC repository.
- ❖ iPSC differentiation to other cell types (endothelial cells, microglia etc);
- ❖ Development of other region-specific (e.g., choroid plexus) or organ-specific (e.g., lung, kidney) iPSC-derived organoids, selection of scaffolds to improve organoids viability and structure, generation of adult stem cells-derived organoids (e.g., small intestine, cancer), organ-on-a-chip models of cellular injury etc.

Other services:

- ❖ Mycoplasma testing
- ❖ Skin biopsy processing to generate fibroblasts
- ❖ Isolation and cryogenic storage of PBMC and erythroid progenitors from blood
- ❖ Cell transfection using Neon Transfection System (Thermo Fisher Scientific)
- ❖ Available reagents: iPSC and organoids culture media, Matrigel, Growth factors

Consultation services

- ❖ Project discussion
- ❖ Training (Future hands-on workshop/mini course for somatic cells reprogramming to iPSC and iPSC maintenance)
- ❖ Protocol sharing
- ❖ Letters of support for grant applications

Core location:

Whitehead Biomedical Research Building
Rooms 425 and 468
615 Michael Street, Atlanta, GA, 30322

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