

Reveal the hidden secrets of neuroscience

3D imaging that opens the door to diverse research approaches

Light sheet microscopy has come tantalizingly close to being the cheat code for understanding nature's complexity. But high-resolution 3D imaging of neuronal populations or brain structures in whole-brain samples or cerebral organoids has yet to truly deliver. In large part, this is due to challenges associated with effective tissue clearing and specific immunolabeling; Miltenyi Biotec's unique, complete workflow approach has solved those challenges. Our 3D immunofluorescence (3D-IF) antibodies enable detailed visualization of marker expression in cleared mouse brain tissue (figs. 1a, 1b)

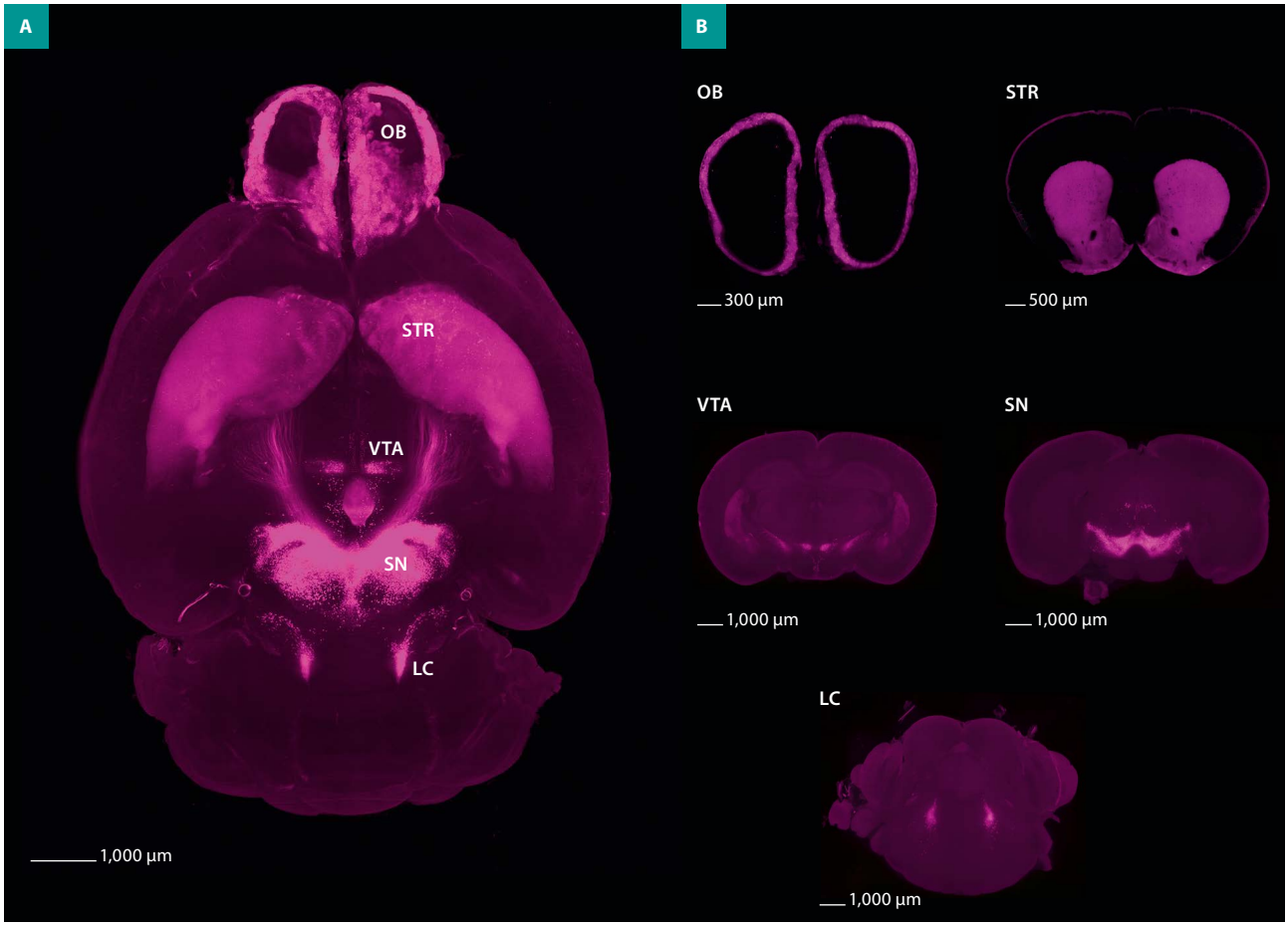


Figure 1a: Whole mouse brain immunostained with tyrosine hydroxylase, Vio® G570 antibody, and cleared using the MACS® Deep Clearing Kit. (A) 3D view of entire cleared brain. (B) Coronal section view, showing major anatomical regions: OB = Olfactory Bulb, STR = Striatum, VTA = Ventral Tegmental Area, SN = Substantia Nigra, LC = Locus Coeruleus.

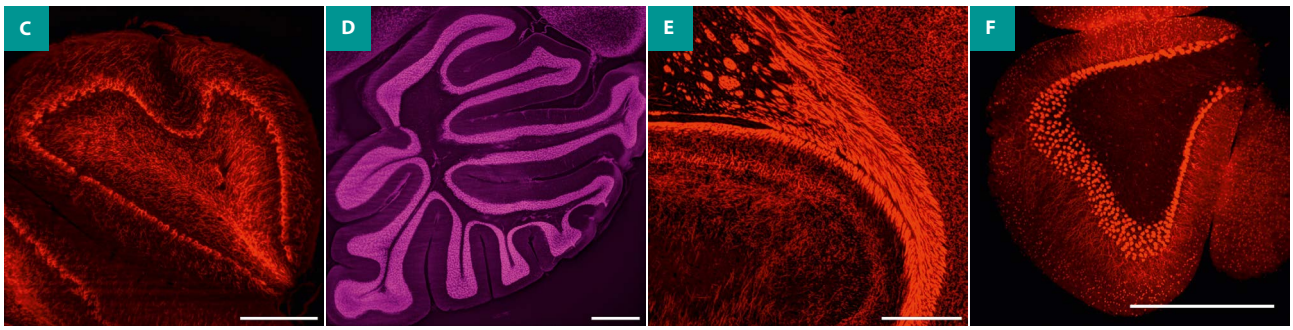


Figure 1b: High-resolution views of selected mouse brain regions immunolabeled with (C) neurofilament antibody, Vio R667, (D) NeuN antibody, Vio 780, (E) MBP antibody, Vio R667 and (F) GFP antibody, Vio R667. Respective samples are cleared using MACS Clearing Kit (C, D, F) and iDISCO⁺ (E). All images acquired using the UltraMicroscope Platform.

Robust and bright labeling of human cerebral organoids

The 3D-IF portfolio extends beyond mouse brain research and is widely applied in organoid studies (fig. 2). By combining deep tissue labeling with tissue clearing and high-resolution imaging, we can also give you a detailed visualization of cellular architecture and marker expression in complex 3D human cerebral organoid models.

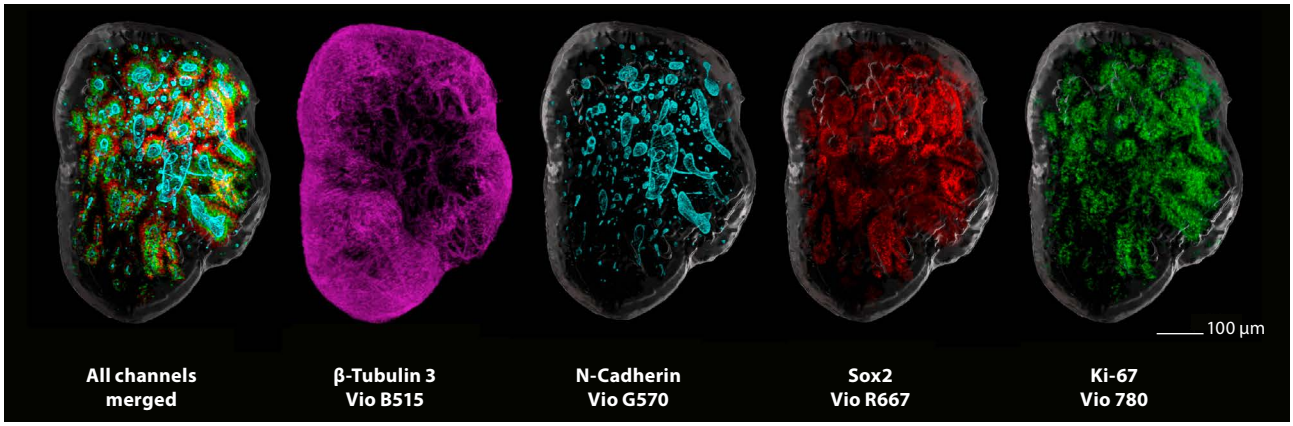


Figure 2: A human cerebral organoid cleared with the MACS Clearing Kit and labeled in four channels using 3D-IF antibodies.

Discover the tools to help you unlock neuroscience in 3D

1. Antibodies for large and cleared tissues

We offer one of the largest catalogs of fluorochrome-conjugated antibodies specifically validated for 3D immunofluorescence. Our antibodies are optimized for many popular applications, saving you time, money, and precious sample material. Benefit from reagents that are:

- Validated on tissues cleared with the MACS Clearing and Deep Clearing Kits
- Able to stain 50% faster than indirect methods, since they are fluorophore-conjugated primary antibodies
- Compatible with other clearing methods like iDISCO⁺
- Capable of delivering superior signal-to-background ratios, thanks to our unique, bright, and photostable Vio Dyes
- Engineered for reproducible results, enabling standardization that makes comparisons far easier for you and your collaborators

2. Obtain tissues that are crystal clear

The perfect complement to our fluorochrome-conjugated antibodies, the MACS Deep Clearing Kit facilitates immunostaining and clearing of large specimens, such as whole mouse brains. Together with the MACS Clearing Kit, which is optimized for smaller samples like brain organoids, we offer a comprehensive solution for tissue clearing across a broad range of sample sizes. Benefit from:

- A fast and efficient organic solvent–based clearing
- An easy-to-follow protocol
- Non-toxic and user-friendly formulation



	Antibody	Example target	Clone	Reactive species
Neurons	β-Tubulin 3	Developing neurons /neurons	REA1152	Human/mouse
	NeuN	Neurons	REA1131	Human/mouse/rat
	Neurofilament	Neuronal axons	REA1127	Human/mouse
	Tyrosine Hydroxylase	Dopaminergic neurons	REA1159	Human/mouse/rat
	OTX2	Development studies	REA1178	Human
	VGLUT2	Glutamatergic neurons	REA1144	Human/mouse/rat
Glia	GFAP	Astrocytes	REA335	Human/mouse/rat
	GLAST (ACSA-1)	Astrocytes	ACSA-1	Human/mouse/rat
	MBP	Oligodendrocyte-myelin sheet	REA1154	Human/mouse
	Iba1	Microglia	REA1448	Human/mouse/rat
Interneurons	Calretinin	GABAergic interneurons	REA1157	Mouse/rat
	Parvalbumin	GABAergic interneurons	REA1126	Human/mouse/rat
General	CD31	Endothelial cell surface	REA784	Mouse
	GFP	Expressed GFP	GG4-6F6	–
	PAX-6	Neural progenitor cells	REA507	Human
	Sox2	Neural stem cell	REA320	Human/mouse

Table 1: Overview of 3D-IF antibodies for neuroscience research. Each row lists the antibody, cross-reactivity, example target cell type, antibody clone, and the corresponding antibody product. NB: CD31 antibody is not compatible with MACS Deep Clearing Kit.

Our 3D-IF–validated antibodies are conjugated to Vio Dyes. Known for their brightness, Vio Dyes are highly photostable and generate excellent signal-to-background ratios. Whilst staining in four channels (fig. 2), benefit from fluorophores that are comparable in many characteristics to commonly used Alexa Fluor dyes, perfectly matching the laser/filter combinations widely used in 3D imaging.

REAfinity Recombinant Antibodies

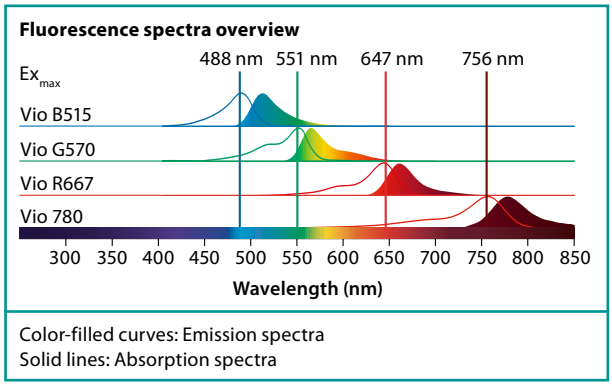


Figure 3: The excitation (empty curve) and emission (filled curve) spectra of Vio Dyes. Their respective excitation maxima (Ex_{max}) align with those of commonly used Alexa Fluor dyes.

ViO Dyes

LEARN MORE

Check out our portfolio of 3D-IF antibodies.

▸ **miltenyibiotec.com/3DIF**

And whilst our 3D-IF antibodies are obviously optimized for use with our own UltraMicroscope Platforms, they will slot seamlessly into your light sheet and confocal workflows regardless of your light sheet microscopy hardware.
With no need for large capital investment in new equipment, you can get started right away: get the insights you've always wanted!



Miltenyi Biotec

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