

ExM

SERIES



BOOKLET

What is Expansion Microscopy (ExM)?

Expansion microscopy (ExM) is a super-resolution imaging technique. Biological samples can be isotropically expanded through expandable hydrogels, allowing for significantly improved resolution. This technique is compatible with various biological molecules and can be implemented using wide-field and confocal microscopes. For example, ExM can improve the effective resolution of wide-field microscopy from approximately 250 nm to 30 nm and that of confocal microscopy from approximately 120 nm to 15 nm. The uniform expansion preserves the spatial information of biomolecules.

Hydrogel Expansion in Three Dimensions

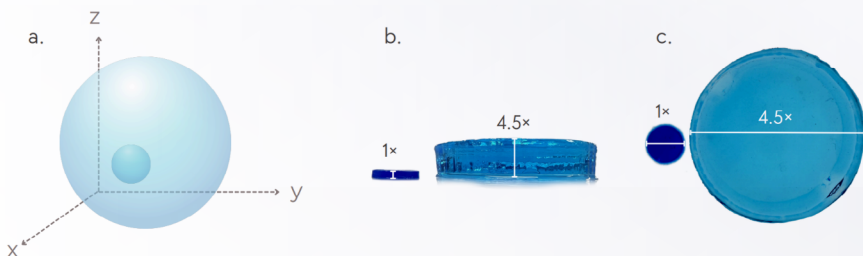


Figure 1. Gel Expansion Factor. Gel was prepared by adding copper phthalocyanine at a concentration of 0.05%. Expanded gels demonstrated a 4.5-fold increase in linear dimensions (X,Y,Z). Dye intensity decreased following expansion due to dilution of dye molecules in the expanded hydrogel. Schematic representation of gel expansion in three dimensions (a). Comparison of gel size before and after expansion in the yz direction (b) and the xy direction (c).

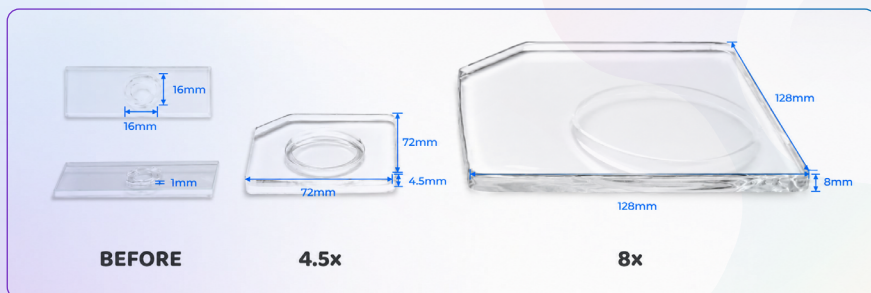


Figure 2. Comparison of Expansion Factors. The Cell ExM kit (CC6232A) shows 4.5× expansion, while the Cell ExM Plus kit (CC6233) shows 8× expansion.

Why Choose YamayBio ExM Kits?

01

Higher Resolution

Image resolution is significantly improved after expansion.

02

Preserves Spatial Information

Uniform expansion preserves the spatial relationships between biomolecules.

03

Simple and Efficient

Streamlined workflow for consistent and reliable results.

04

Standard Microscope Compatibility

No specialized equipment is required. Use what you already have.

05

Versatile Applications

Ideal for cells and tissues across a wide range of research areas.

- Animal cells
- Soft tissue samples



Enhanced Imaging Resolution

The Cell ExM Kit dramatically improves imaging resolution across various microscopy platforms.

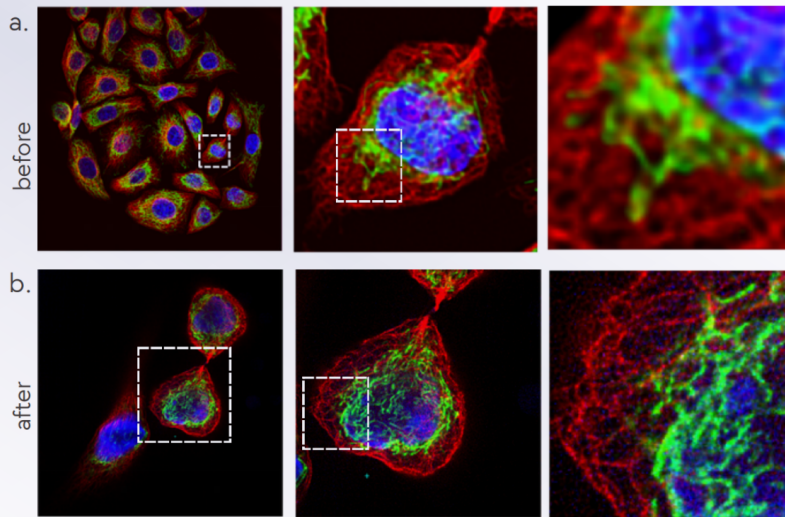


Figure 3. Higher Cellular Resolution. HeLa cells were imaged before (a) and after (b) expansion using a Nikon CSU-W1 confocal microscope followed by deconvolution with ImageJ. **Hsp60** (green) labels mitochondria, **tubulin** (red) labels microtubules, and nuclei are stained with **DAPI** (blue).

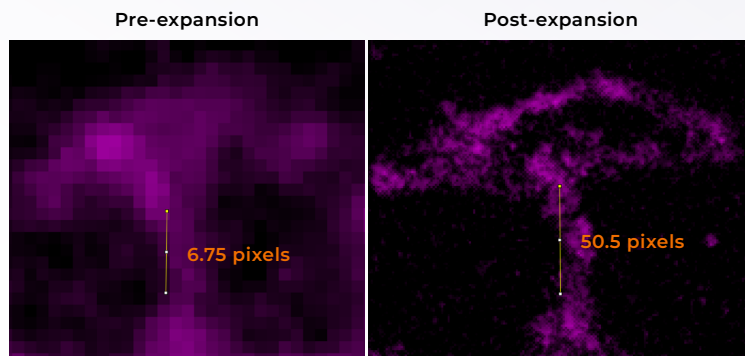


Figure 4. Higher Subcellular Resolution. Mitochondria were imaged before and after expansion using an Olympus IX53 fluorescence microscope. **Hsp60** (magenta) labels mitochondria. The same distinctive mitochondrial feature was identified before and after expansion, and its length was measured in pixels. The resolution improvement factor was calculated as $\text{Post/Pre} = 50.5/6.75 = 7.48$.



Preserved Spatial Information

Enhanced resolution achieved through expansion microscopy enables more detailed visualization of the spatial relationship between proteins. For example, the separation between mitochondria and microtubules becomes more readily distinguishable after expansion.

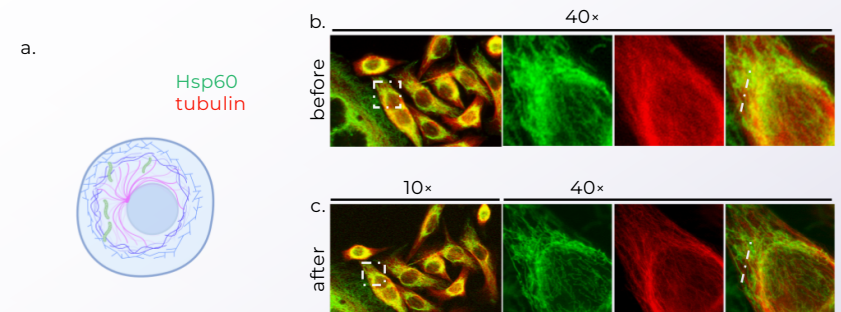


Figure 5. ExM Confirms Spatial Separation. Schematic representation of subcellular localization of mitochondria and microtubules (a). HeLa cells were imaged before (b) and after (c) expansion using an Olympus CKX53SF 40× microscope and subsequently deconvolved using ImageJ. **Hsp60** (green) labels mitochondria, and **tubulin** (red) labels microtubules.

ZO-1 and Claudin-1 are two well-established markers of cell-cell tight junctions, commonly used for analyzing protein-protein colocalization. Following expansion microscopy, improved resolution revealed finer structural details. Notably, signal intensity decreased due to the dilution of dye molecules within the expanded hydrogel.

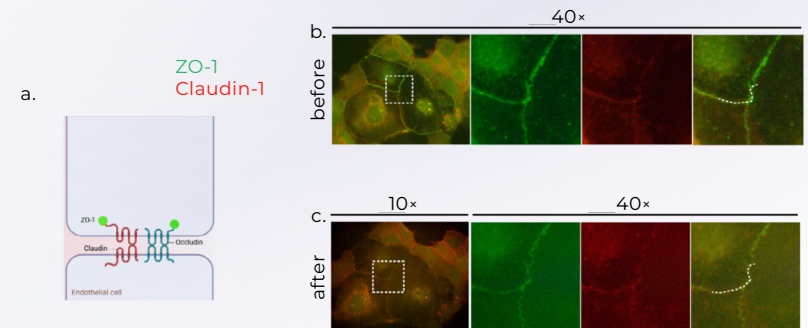


Figure 6. ExM Confirms Colocalization. Schematic representation of cell-cell tight junction in Caco-2 cells (a). Caco-2 cells were imaged before (b) and after (c) expansion using an Olympus CKX53SF 40× microscope and subsequently deconvolved using ImageJ. **ZO-1** (green) and **Claudin-1** (red) label cell-cell tight junctions.



Cell ExM Experimental Data

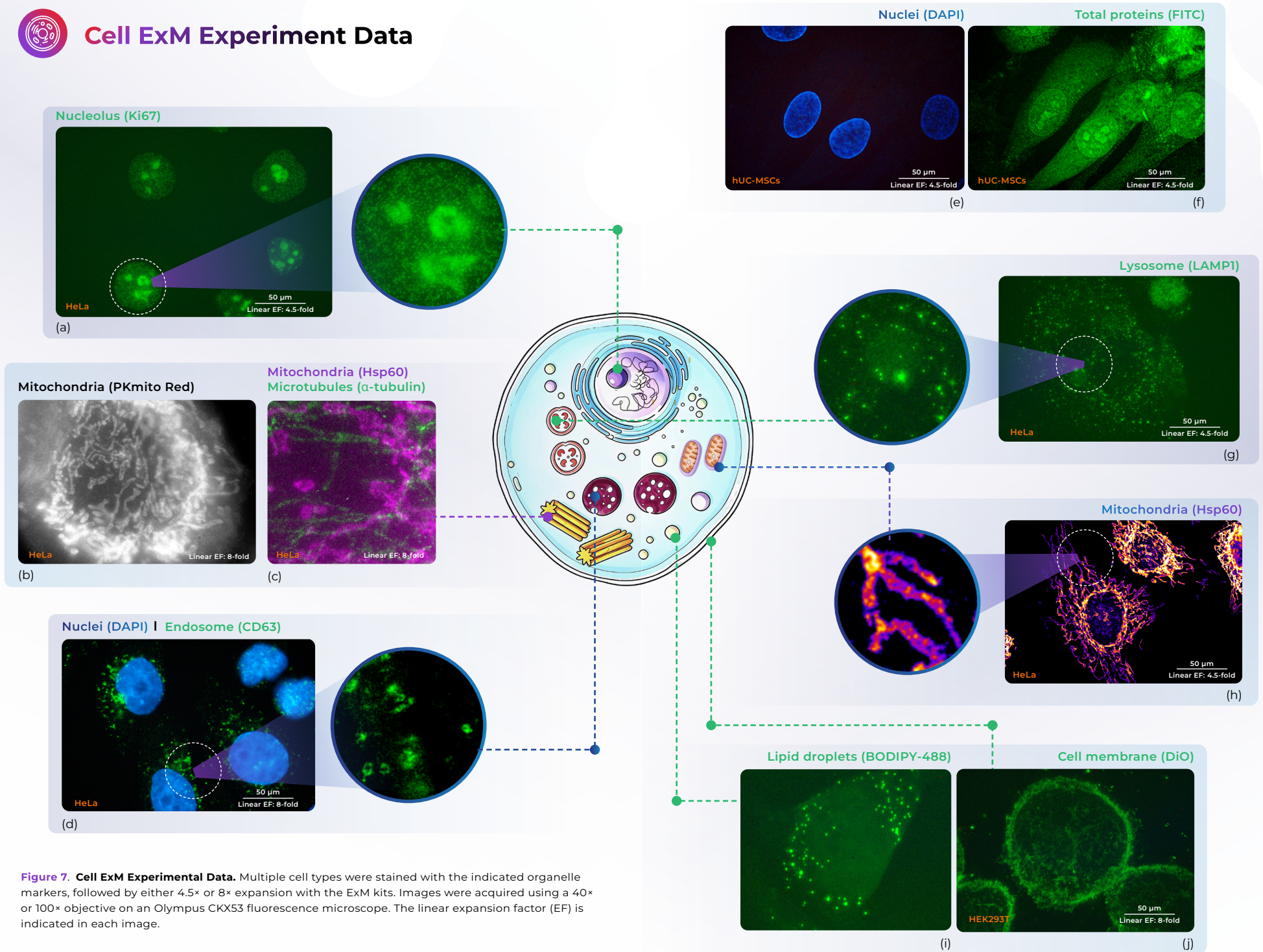
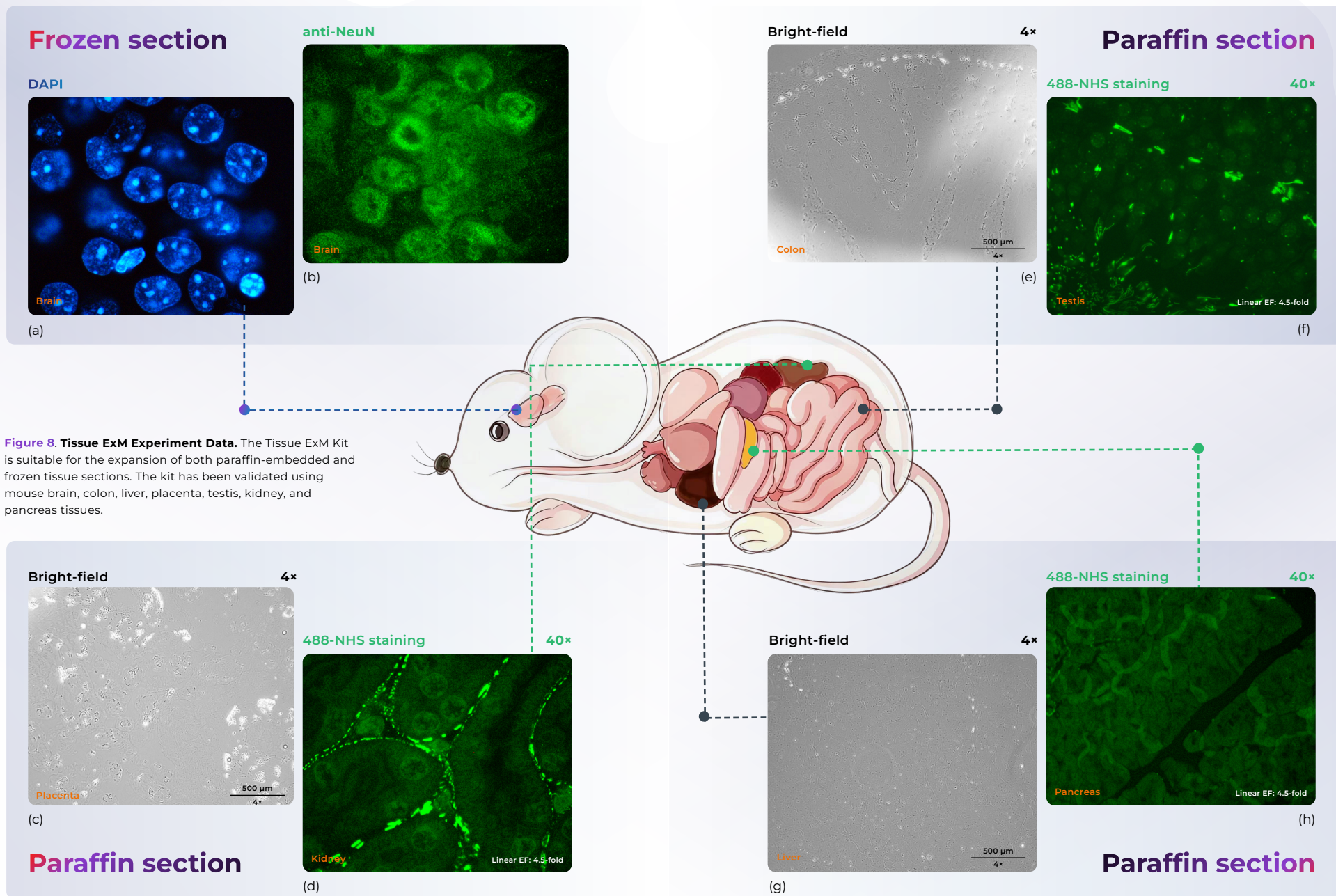


Figure 7. Cell ExM Experimental Data. Multiple cell types were stained with the indicated organelle markers, followed by either 4.5 $\times$ or 8 $\times$ expansion with the ExM kits. Images were acquired using a 40 $\times$ or 100 $\times$ objective on an Olympus CKX53 fluorescence microscope. The linear expansion factor (EF) is indicated in each image.



Cell ExM Kit Workflow Overview

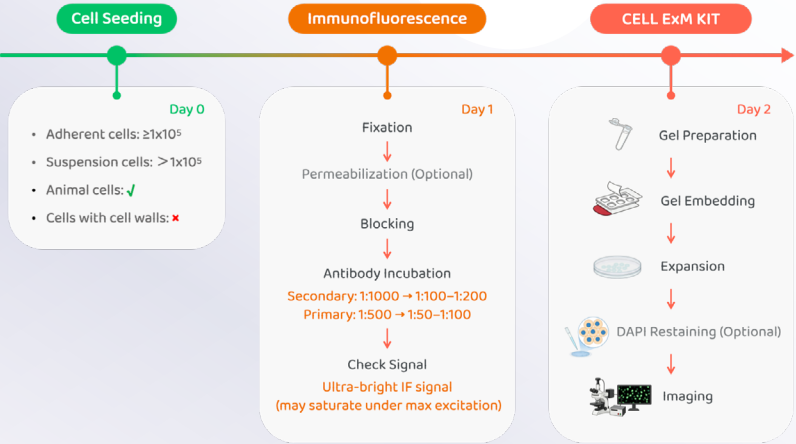


Figure 9. Cell ExM Workflow. Sample preparation steps include cell seeding (left) and immunofluorescence labeling (center). Cell ExM Kit steps include gel preparation, gel embedding, expansion, and imaging (right).

Tissue ExM Kit Workflow Overview

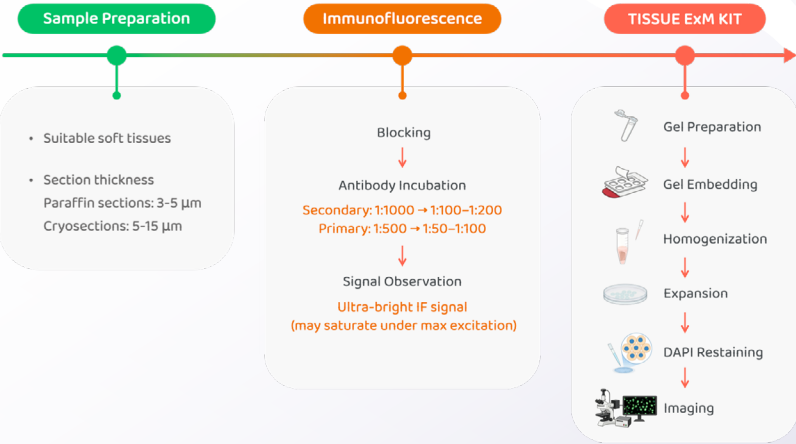


Figure 10. Tissue ExM Workflow. Sample preparation steps include proper tissue selection (left) and immunofluorescence labeling (center). Tissue ExM Kit steps include gel preparation, gel embedding, homogenization, expansion, DAPI restaining, and imaging (right).

Products	Cat. No.	Size	Sample Compatibility
Cell ExM Kit	CC6232A	20 Assays	Applicable cell types: Animal Cells - Adherent cells: $\geq 1 \times 10^5$ cells per sample. - Suspension cells: $> 1 \times 10^5$ cells per sample. Not applicable to: Plant cells or other cells with cell walls
Cell ExM Plus Kit	CC6233	20 Assays	Applicable cell types: Animal Cells - Adherent cells: $\geq 1 \times 10^5$ cells per sample. - Suspension cells: $> 1 \times 10^5$ cells per sample. Not applicable to: Plant cells or other cells with cell walls

Products	Cat. No.	Size	Sample Compatibility
Tissue ExM Kit	CC6234	20 Assays	Applicable sample type: Suitable for soft tissue samples. Validated tissues: Brain, placenta, liver, kidney, fetus, testis, pancreas, and colorectum tissues. Not applicable to: Hard tissues such as bone, dentin, enamel.



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