

Electron Microscopy Core Facility Services

We offer comprehensive specimen preparation, advanced imaging, and data analysis services to support a wide range of electron microscopy applications. Our expertise includes negative staining, biological sample preparation and resin embedding, ultrathin sectioning, immunogold labeling, correlative light and electron microscopy (CLEM), montaging, tomography, and small-volume three-dimensional electron microscopy (3D EM).

Consultation and Experimental Design

Service Description

We provide expert consultation and guidance in experimental design to support rigorous, efficient, and high-quality electron microscopy studies. Through close collaboration with investigators, we help develop well-structured experimental strategies and identify optimal sample fixation approaches prior to submission to the EM Core Facility.

Sample Preparation

Service Description

For transmission electron microscopy (TEM) studies of biological samples, specimens must be structurally preserved, gradually dehydrated, and infiltrated with resin, which is then polymerized into a hardened block, allowing ultrathin sectioning of approximately 60–70 nm. This process—encompassing chemical fixation, dehydration, and resin embedding—is collectively referred to as sample preparation and can be tailored to the sample type and specific research objectives.

Associated Instrumentation(s)

NA – This process is performed manually by highly trained staff.

Sectioning

Service Description

Since cells and tissue samples are too large for electron transmission, biological specimens are resin-embedded and sectioned by trained staff into ultrathin slices of typically measuring 60–70 nm (although substantially thinner or thicker sections can be prepared depending on experimental requirements), allowing electrons to pass through and generate high-resolution images of cellular ultrastructure in TEM studies.

Associated Instrumentation(s)

Leica Ultracut EM UC7 and Leica UC Enuity.

Cryo Sectioning

Service Description

Cryo-sectioning is a specialized technique in which experienced, fully trained staff cut frozen biological specimens into ultrathin sections while preserving their native ultrastructure. This method is commonly used for immunolabeling, immunogold labeling, and studies that require preservation of near native cellular architecture.

Associated Instrumentation(s)

Leica Ultracut EM UC7 Ultramicrotome equipped with a Leica EM FC7 Cryo Chamber.

Negative Staining

Service Description

Negative staining is a rapid TEM technique used to visualize small biological samples, including proteins, nucleic acids, small vesicles, viruses, and bacteria. In this method, a heavy metal stain surrounds the specimen, creating a dark background that makes the sample appear bright and highly contrasted. This approach preserves overall morphology and surface features, enabling quick assessment of particle size, shape, and structural details.

Associated Instrumentation(s)

NA – This process is performed manually by highly trained staff.

Immunogold Labeling

Service Description

Immunogold labeling is a TEM technique used to localize specific molecules within cells. The target is labeled with antibodies, similar to fluorescence labeling in light microscopy, but instead of a fluorescent tag, the secondary antibody carries electron-dense gold particles. These gold particles appear as dark spots under the electron microscope, allowing precise molecular localization while preserving cellular ultrastructure.

Associated Instrumentation(s)

NA – This process is performed manually by highly trained staff.

Correlative Light and Electron Microscopy (CLEM)

Service Description

This technique combines the strengths of light microscopy and electron microscopy to study biological samples. It enables researchers to first use fluorescence or other light-based imaging to locate specific molecules, proteins,

or structures within cells or tissues, and then examine the same regions in two- or three-dimensional electron microscopy datasets.

Associated Instrumentation(s)

Fluorescence or confocal light microscopy (performed by the user), TEM (JEOL JEM-120i), ultramicrotomes (UC7 or UC Enuity), and software tools such as ImageJ, Photoshop, Dragonfly, and others.

Serial Section 3D EM, Electron Tomography, and Montaging

Service Description

Serial-section three-dimensional electron microscopy (3D EM) reconstructs the ultrastructure of biological samples by imaging consecutive ultrathin sections with TEM and computationally aligning the resulting images to generate detailed volumetric models.

Electron tomography enables nanoscale three-dimensional reconstruction from a single relatively thick section by acquiring a tilt series of projection images in a transmission electron microscope. These projections are computationally reconstructed into tomograms, allowing visualization of complex intracellular architecture in its true spatial context.

Montaging expands the observable field of view by acquiring overlapping high-resolution images across large specimen areas and stitching them into seamless composite datasets. This approach preserves ultrastructural detail while providing broader spatial context across cells and tissue regions.

Associated Instrumentation(s)

TEM (JEOL JEM-120i), ultramicrotomes (UC7 or UC Enuity), and software tools such as SerialEM, ImageJ, Photoshop, Dragonfly, Blender and others.

Data Analysis

Service Description

We provide comprehensive TEM data analysis services to deliver detailed insights into cellular structure and function. Our services include:

- Morphological analysis and ultrastructural quantification – including identification of structural alterations in disease models or treatment conditions; analysis of membrane organization; pathogen detection; particle size measurements; organelle number and spatial distribution analysis; and measurements of membrane thickness and spacing.
- Structural and molecular analysis using immunogold labeling – to determine the localization and distribution of specific molecules.
- Electron tomography for 3D reconstruction – revealing complex arrangements of organelles, cytoskeletal networks, and virus–host interactions.
- Image processing and quantification – including segmentation, 3D modeling, and statistical analysis.

Associated Instrumentation(s)

Software (SerialEM and Etomo, ImageJ/TrakEM2, IMOD, Graphpad Prism, Dragonfly, Adobe Creative Cloud, Blender and Napari).