



# Neuropathology

The nervous system is complex and delicate, and you need to know all the possible effects that your biologic might have on it. Charles River combines world-class neuropathologists with highly trained technical staff to offer specialized services in neuropathology. We provide assistance in study design, development strategies, and regulatory submissions for a wide variety of compounds, viruses, genes, and stem cell introductions affecting the nervous system.

Our pathologists routinely and consistently work in concert with toxicologists to design and execute quantitative neurotoxicology studies as well as analyze, interpret, and report quantitative data within a GLP environment.

## Whole-Body Perfusion

Our technical staff conducts whole-body or regional neural perfusion using fixatives that are compatible with the staining techniques and ultrastructural needs of any project. Such fixatives include modified McDowell-Trump's or other glutaraldehyde-based and paraformaldehyde-based selections. The anatomic knowledge and dexterity of our personnel assure preservation of critical tissues.

## Brain Sectioning

Using the sledge microtome, frozen full coronal sections of nonrodent animal brains are prepared. Combined with special staining techniques, these sections are particularly useful for tracing cerebral inoculations to define the exact penetration or deposit sites.

## Nerve Tissue Embedding

Methacrylate embedding techniques provide optimal preparation of tissues and allow the application of a wide range of staining techniques. We have the equipment and expertise to prepare serial cryosections of whole brains and to stain those sections with specialized and routine tissue stains, such as immunoperoxidase or immunofluorescent methods.

## Photographic Documentation

Documenting pathological processes with clear images is extremely important, particularly in the area of neuropathology. Our state-of-the-art photography documents lesions, and the images can be directly inserted into both hard copy and electronic-formatted reports.

## Services

- Whole-body perfusion
- Brain sectioning
- Nerve tissue embedding
- Subanatomic detail
- Specialized staining
- Immunohistochemistry
- Imaging
- Ultrastructural analysis
- Electron microscopy (EM)
- Magnetic resonance microscopy (MRM)
- Morphometric analysis

## Subanatomic Detail

Our neuropathologists have years of experience identifying specialized cortical and subcortical regions of the brain. An examination of nervous system components, such as the hippocampal CA1-4 fields, locus coeruleus, and specific basal ganglia, is available. Each area is examined in detail, recorded, and analyzed using computer-assisted systems.

## Specialized Staining

One of the challenges of neuropathology is identifying the earliest morphological changes in neurons and glia. The application of Fluoro-Jade B (FJB) and the more intense Fluoro-Jade C (FJC) using ultraviolet light, specialized silver stains, and immunohistochemical detection of glial fibrillary acidic protein (GFAP) and microtubule-associated protein 2 (MAP2) can identify neurodegenerative changes before routine hematoxylin and eosin (H&E) stains. Others include: Bielschowsky blue, Luxol fast blue, cresyl violet, and X-gal.

## Immunohistochemistry

The demand for clear imaging and identification of components in the nervous system is resolved by the use of immunohistochemical methods. Our laboratories are leaders in the modification, application, and interpretation of these sensitive methods for components such as neurotransmitters, neurofilaments, and synapses. We also offer the Y chromosome *in situ* hybridization method for male stem cell localization in female recipients.

## Ultrastructural Analysis and Microscopy

Charles River features multiple transmission electron microscopy (TEM) scopes plus scanning electron microscopy (SEM) capabilities to interpret ultrastructural changes in the nervous system. We perform nerve tissue post-fixation utilizing a number of techniques. One such technique involves post-fixing with osmium tetroxide, mounting in an epoxy resin, preparing semi-thick sections on glass slides, and then staining with toluidine blue for light-level microscopy, thin section selection, and subsequent TEM evaluation.

## Magnetic Resonance Microscopy (MRM)

Our neuropathologists have distinct experience in the use and interpretation of findings acquired with MRM technology. We apply this powerful imaging modality to neuropathological assessments, which allows extraordinary lesion resolution and permits noninvasive imaging of fixed brain samples in multiple dimensions.

## Morphometric Analysis

Morphometry consisting of direct and computer-assisted, semiquantitative, quantitative, and stereologic techniques is applied to critical microscopic and ultrastructural interpretations. Charles River has expertise in numerous image analysis technologies as well as unbiased stereologic methodologies, which are considered the gold standard for quantification in the field of neuroscience.

