

The Rocky Mountain MS Center Tissue Bank: Providing Building Blocks for the Future

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Human tissue is critical for multiple sclerosis (MS) research. Unfortunately, MS is such a complicated disease that basic science and animal model experiments can only provide a limited amount of information about what may be occurring in the human disease. Consequently, human tissue is absolutely essential to advance our understanding of the cause of MS, the ways in which MS affects the immune and nervous systems, and the best ways to treat the disease.

Introduction. The Rocky Mountain Multiple Sclerosis Center (RMMSC) Tissue Bank is one of the few tissue banks in the world dedicated solely to collecting and processing tissue for multiple sclerosis (MS) research, and the Human Brain and Spinal Fluid Resource Center (HBSFRC) at UCLA, one of the largest and most highly regarded neurological tissue banks in the world, have been collecting tissue for MS research for a combined total of 75 years. The banks were established to procure, process, preserve and distribute multiple sclerosis and non-MS (control) autopsy material to research laboratories involved in MS research. With the support of the National MS Society (NMSS), these 2 banks have established a collaboration to improve the quality, quantity, and variety of neurological tissue available. This allows us to standardize and tailor all of our methods in a way that will be optimal for MS tissue preparation. Human tissue is essential for advancing our understanding of MS because animal models do not adequately represent the human disease.^{1,2}

Tissue donations in Denver, Los Angeles, and surrounding areas are

particularly valuable. Protocols for the Los Angeles and Denver areas are more involved than the methods used to collect tissue outside those regions. We provide tissue collection from discrete brain regions, have specialized freezing methods, and, if needed, are able to process tissue by methods specifically requested by investigators.

Through this collaboration, there are nearly 800 samples and 2,500 potential donors. By making our tissue available to all interested researchers, we believe that we will be able to maximize the research value of the tissue. Recent postmortem studies of brain and spinal cord tissue have produced major discoveries in understanding MS. Samples from the 2 banks contributed to 16 publications in the past year.

Tissue Collection. Through routine pre-arrangements with potential donors, their families and local pathologists, postmortem time is minimized to preserve the cellular and subcellular components of the tissue. Brain, spinal cord, CSF and blood are collected as quickly as possible at Swedish Medical Center in Englewood, Colorado, or the VA Hospital on the UCLA campus. The



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brain and spinal cord are dissected in 1 cm coronal sections and then thoroughly examined for MS plaques and other pathology. Each section is digitally photographed before any lesions are dissected. Plaques are removed and then bisected, with one half frozen in liquid nitrogen and the other half placed in formalin.

For neuropathology, we are fortunate to have our co-investigator, Bette Kleinschmidt-DeMasters, MD, Professor of Pathology (Neuropathology), Neurology, and Neurosurgery at the University of Colorado at Denver and Health Sciences Center. Dr. Kleinschmidt-DeMasters reviews each case and provides expert neuropathologic diagnosis and MS plaque characterization.

Through internet access, MS researchers are able to easily view the tissue bank's inventory and to request the most suitable tissue for their studies. For investigators who want tissue from frozen slices, we use special power-driven dental equipment that provides precise dissections with reduced artifact. A digital image of the slice documents the location from which the samples were taken and also serves as a detailed map for locating remaining plaques and other features.

The Donation Process. Donation usually begins with the patient making an initial inquiry about the Tissue Bank or obtaining donation forms in a doctor's office (Figure 1). Donation forms are available at our website at www.mscenter.org or from the Tissue Bank office (see contact information at the end of the article). The patient returns the completed Organ Donation and HIPAA Authorization forms to the RMMSC Tissue Bank. Copies of the forms are included for the treating physician and family members,

Figure 1

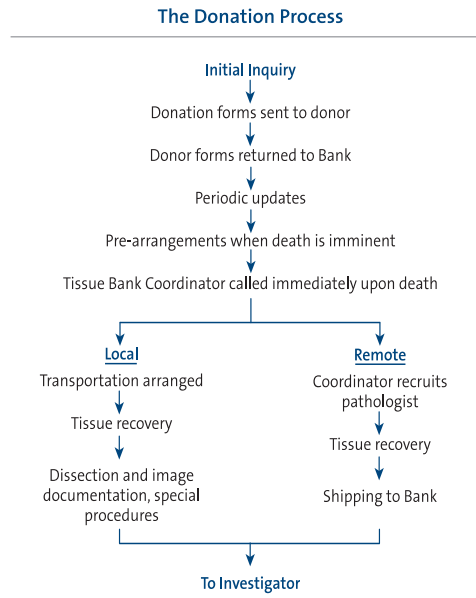
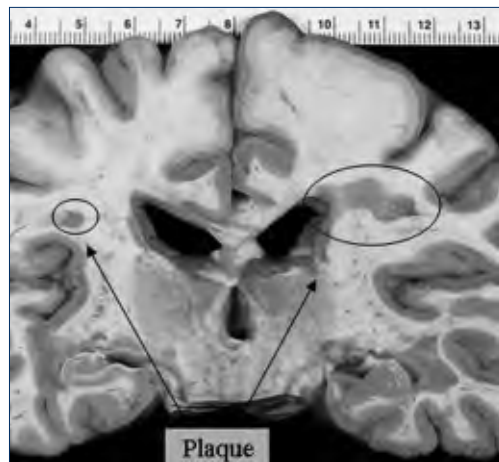


Figure 2: Coronal section of brain showing typical MS plaques (circled areas).



and a donation card with contact information for RMMSC Tissue Bank personnel is mailed to the patient. The family incurs no cost for the donation process.

Sample Distribution. Tissues are usually formalin fixed, snap frozen in liquid nitrogen, or quick frozen in a -150°C freezer. A list of available samples may be viewed online at www.mscenter.org. Tissue Bank personnel are available to discuss sample criteria, sample inventory, and the suitability

of different processing methods for specific studies. Clinical history and a neuropathologic diagnosis are provided for each sample.

The Physician's Role. The physician's obligations or time commitments are limited. Only two simple actions are requested. First, if it is in the doctor's role to pronounce the patient's death, doing so as quickly as possible is best. Our goal is to remove the brain within four hours of death. Second, a HIPAA-compliant request for the patient's clinical information will be sent to the physician's office after the tissue is obtained. Providing pertinent information, particularly notes regarding progression of disease and modes of treatment, is vital to research.

Other Brain Donations. MS patients are not the only ones who can give the gift of brain donation. People with MS sometimes gain a sense of contributing and "striking a blow" against the disease by donating — loved ones can do the same. There are far fewer donations of normal brains than MS brains, yet non-disease control samples are essential for research. To improve this situation, friends and loved ones of people living with MS may also agree to be donors.

Conclusion. Collaboration between 2 of the most prominent MS Tissue Banks in the world allows for more detailed and extensive experiments. Consistent, standardized methods increase the number of available samples for research. Reliably obtained tissue improves the results of each individual experiment by reducing variations between samples. Through standardized tissue processing, experiments throughout the MS research community may be more comparable. All of these factors increase the chances

of discovering the causes of MS and more effective treatments.

Neurological tissues from patients with MS are essential for research studies devoted to finding new therapies.^{3,4} Health care providers have a critical role in advancing research. Patient brochures are available and should be presented by health professionals to potential donors to allow them to contribute to MS research. There is no substitute for the personal donations from individuals and families committed to this research.

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