

## **FACILITIES & OTHER RESOURCES – PROVIDENCE VA MEDICAL CENTER (VAMC)**

**Providence VA Medical Center:** The Providence Veterans Affairs Medical Center (PVAMC) is a major teaching hospital and research affiliate of the Warren Alpert Medical School of Brown University and delivers a broad range of services in medicine, surgery, and behavioral sciences. Providence VA Medical Center is a 230-bed facility providing acute inpatient and ambulatory care in medicine, surgery, psychiatry and neurology. The hospital admits approximately 5,000 veterans annually and provides over 150,000 outpatient visits in 41 clinics. It is a regional center for treatment of post-traumatic stress disorder. The hospital also provides special medical services in the areas of dialysis, substance abuse treatment, rehabilitative medicine, and prosthetics. The Medical Center and its five community-based outpatient clinics in Rhode Island and southern Massachusetts serve as a primary care resource and a regional referral network for a variety of inpatient and outpatient programs. The PVAMC participates in the medicine, surgery, neurology, psychiatry and orthopaedic residency programs at Brown Medical School and is also a major clinical rotation for the Brown orthopaedic residency program. The PVAMC has a total of four buildings dedicated to providing Research Investigators with opportunity to collaborate on basic, animal and clinical research.

The Providence VA Medical Center has a large funded research and development program, including studies in Rehabilitation Medicine, Cardiology, Mental Health, Neuroscience, Substance Abuse, Health Services & Economics, and Pulmonary Disease. These studies enhance the Providence VAMC's ability to provide state-of-the-art techniques and treatments to patients. At the same time, the research program helps Providence VAMC recruit and retain the highest quality health care professionals who treat our Veterans in the VA Clinics on a daily basis. The main research facility, located in Building 35, 830 Chalkstone Ave. Providence, RI 02908, is a 13,000 square foot centralized research building that houses a total of six laboratories with 18 laboratory benches and chemical fume hoods, four common large equipment rooms, two tissue culture rooms, two chemical storage rooms, one dark room, one dedicated radioactive fume hood, two freezer rooms (-20 and -80), microscopy, multiple offices and clinical research spaces. The PI has access to all of the resources and will have dedicated 350 sq ft laboratory space in Room 123-124 of Research Building 35. Building 35 also houses Research Administration, and contains a conference room available for the use by all research staff, with overhead and LCD projectors, TV/VCR, and a conference phone. Additional research space includes: Building 32, which has over 15,000 square feet of lab and office space dedicated to research; Building #7 is another 2,062 square feet of wet lab space, and Building 9 has a total of 2,761 square feet of animal laboratories. Within all buildings there are several networked and non-networked PC's. The computers allow collaboration and exchange of information among colleagues at other Veterans Affairs Medical Centers and affiliated institutions. The PVAMC shares in the VISN 1 Knowledge Library, which provides access to a multitude of electronic and paper resources for research including access to electronic journals, textbooks, and educational materials.

**The Gait and Motion Analysis Laboratory** is a fully functional research lab focusing on rehabilitation of the musculoskeletal system. The science of motion is studied through computerized animation with an infrared camera system, electromyogram and metabolic comparisons. The lab's technology is used to evaluate the effectiveness of a prosthetic or orthotic device and evaluate surgical outcomes. Information collected in the lab can be used to drive human stimulation, design "smart" components for prosthetic limbs and develop training tools through machine learning and sensor integration. Motion capture can also be used to immerse a patient in a virtual environment during gait rehabilitation. The universal theme throughout the lab is the use of motion capture technology to drive the decision making process for design and treatment. The Laboratory occupies 1,800 sq. ft within the Rehabilitation Research Building. The building hosts 23,850 sq. ft of space for rehabilitation-focused research, including exam rooms, motion capture lab, virtual reality lab, conference room, meeting rooms, physical therapy suite, and office space. The intellectual environment is rich with extramurally funded investigators. Research equipment available at the Gait and Motion Analysis Laboratory/VR Laboratory includes: a 14 camera Qualisys motion capture system; a 16 channel wireless EMG system used to record muscle activity during movement; 2 force plates to measure ground reaction forces while walking over-ground, a portable metabolic testing unit used to test oxygen consumption, metabolic rate, energy expenditure and many more variables, a Biodex balance platform to analyze posture and balance, a dual belt, actuated treadmill used to study multiple strides during running or walking, 5 3D projectors with custom firmware for immersive virtual reality, and a range of 3D graphics and motion analysis software packages.

**The Center for Neurorestoration and Neurotechnology (CfNN)** began with a June 2012 funding award from the Department of Veterans Affairs Rehabilitation Research and Development Service. The Center is a collaboration between the Providence VA Medical Center, Brown University, Butler Hospital, Lifespan, and Massachusetts General Hospital. CfNN unifies distinguished researchers and clinicians to advance and translate neurotechnology to restore lost function. Through its three focus areas and three support cores, CfNN seeks to develop, test and implement new therapies and technologies that restore function for Veterans with disorders affecting the nervous system. The Center supports three focus areas: (1) Restoring Communication and Mobility (2) Restoring Affective and Cognitive Health (3) Restoring Limb Function and three Cores: (A) Neuromodulation and Imaging (B) Recording, Decoding, and Computational Neuroscience and (C) Assessment, Outcome Measurement, and Implementation.

**BrainGate:** The BrainGate Research Team at Brown University, Massachusetts General Hospital, Stanford University, Case Western Reserve University, and Providence VA Medical Center comprises neurologists, neuroscientists, engineers, computer scientists, neurosurgeons, mathematicians, and other researchers – all focused on developing brain-computer interface (BCI) technologies to restore the communication, mobility, and independence of people with neurologic disease, injury, or limb loss. Our research is focused not only on improving the ability to operate a computer, but also on providing people with ALS, spinal cord injury, and stroke with reliable, constant control over their environment. The collaborative, diverse BrainGate team creates and tests the devices that are ushering in a new era of transformative neurotechnologies. Using an array of micro-electrodes implanted into the brain, our pioneering research has shown that the neural signals associated with the intent to move a limb can be “decoded” by a computer in real-time and used to operate external devices. This Investigational Device, called BrainGate has allowed people with spinal cord injury, brainstem stroke, and ALS to control a computer cursor simply by thinking about the movement of their own paralyzed hand and arm.

**Prosthetics and Orthotics Research Laboratory:** This Laboratory is the coordinating site for the Home Study, a study is to examine the feasibility, acceptance of home use of an advanced upper limb prosthetic device as well as the logistical support requirements utilized during three months of home usage. Participants are recruited at VANYHHS (Manhattan Campus), James A. Haley VAMC (Tampa, FL), and the Center for the Intrepid (CFI at Brooke Army Medical Center in San Antonio, TX). Data from this study will help inform future VA Prosthetics and Sensory Aids clinical guidelines for prescription of advanced prosthetic technology. A secondary aim of the Home Study program is to describe normative active range of motion during everyday tasks, and describe movement patterns utilized by three subjects using both their conventional prostheses and the DEKA Arm. Clinically this data will add to the body of knowledge available to prosthetists and therapists for assessment, intervention and goal setting.

**COIN: Center of Innovation in Long-Term Services and Supports for Vulnerable Veterans; Providence, RI.** The vision for this Center is to stimulate and develop research that will enhance the implementation of programs to support the mission of VA's Geriatrics and Extended Care Service (GEC) in maximizing Veterans' social participation and quality of life in the least restrictive setting possible. This Center uses the World Health Organization's International Classification of Functioning, Disability and Health (ICF) conceptual framework as a guide. This model is particularly suitable for its primary research agenda in long-term services and supports (LTSS), given VA's emphasis on community-based LTSS in the least restrictive settings possible. This conceptual framework also will be useful in guiding work in outside areas, including long-term services and supports delivered to homeless and disabled Veterans. The goals of the Center include (1) Advancing the science in the focused area of LTSS by applying the overarching concepts of the ICF model to this Center's research; (2) Fostering health services research outside of the primary research focus that can apply the ICF model and leverage the intellectual and infrastructure available through the Center; (3) Training the next generation of VA health services researchers through a cohesive mentoring and career development program; (4) Encouraging collaborations across VA to produce research to improve Veterans' experience with LTSS; and (5) Building and developing relationships with VA Geriatrics & Extended Care, and other relevant stakeholders to increase this Center's capacity to disseminate and implement research findings. This young Center has already made contributions to its partners—from the evaluation of innovative transformational programs to the production of reports on existing programs, such as home-based primary care and contract nursing homes. Center researchers have extensive knowledge on using VA data, as well as data from the Centers for Medicare and Medicaid Services (CMS).

## **Clinical and Translational Research Program at the Providence VAMC**

The Clinical and Translational Research Program (CTRP) at the Providence VA Medical Center is comprised of project managers, research associates, and research assistants as part of a centrally managed research support team. The CTRP provides researchers with the infrastructure to conduct a wide range of clinical trials in the outpatient or inpatient setting. The Providence VAMC is a unique research site in the heart of academic-rich southern New England. We have more than 230 research projects totaling over 17 million dollars in VA, National Institutes of Health (NIH), Department of Defense (DoD), National Science Foundation (NSF), and commercial grants. The CTRP supports every aspect of clinical and translational research studies, including regulatory and coordination of support, data collection, sample collection, data entry, analysis and publication of results.

### **Molecular Genetics Lab Resources**

The Molecular Genetics Lab at the Providence VA Medical Center comprises approximately 2000 square feet of Research Building 32. The space is equipped to handle small and mid-range molecular genotyping and DNA methylation characterization requirements. Lab staff also have access to shared research space and equipment at the Providence VA Medical Center including a dark room, tissue culture room, autoclaves, and centrifuges, 30° C, 4° C, and -20° C rooms, and a radioisotope room.

Major equipment in the lab includes an ABI 3500 automated DNA sequencer, an Illumina HiScan system, a Pyromark Q96 ID, a Biomek FXp liquid handling system with Cytomat suite and plate washing capabilities, Sequenom MassARRAY genotyping/epigenetics system (384-well format), Ion Torrent PGM and One touch system, Fluidigm EP1 system for 48x48 and 96x96 chip genotyping system, ABI 7000, 7300, and 7900ht Real time PCR units, 4 ABI Veriti thermocyclers (2 in 96-well format, 2 in 384-well format), Biotek plate reader/spectrophotometer, Nanodrop 2000, Bioruptor, Bioanalyzer, Qubit fluorimeter, Nautilus LIMS system, Sorvall centrifuge, microcentrifuges, autoclave, -70 freezers, refrigerators, freezers, balances and water baths.

In addition to providing genotyping and DNA methylation characterization services to collaborators, the Molecular Genetics Lab stores DNA samples for more than 80 projects spanning most major forms of psychopathology and behaviors such as obesity and sleep. Although the samples are proprietary to the respective PIs, we work collaboratively with investigators to provide training opportunities for fellows and trainees within the Division to gain experience analyzing real data relevant to their phenotypic interests.

### **Vascular Research Labs, Ocean State Research Institute**

The Vascular Research Lab (VRL) has the following equipment available to this project. All equipment listed below, except where noted, are located in the Research Building #35 or Animal facility building #9 at Providence VA Medical Center.

**Animal Physiology:** Two Teague TE-10 rodent cigarette smoking machines; Lung edema assessments: Rodent surgery suite with necessary instruments; Kf (lung vascular permeability assessment): Grass force and pressure transducers with isolated lung water bath; four Harvard Apparatus rodent ventilators; Gilson mini-perfusion pump; pressure transducers; force transducers; Grass polygraph Model 78D, Grass amplifiers Model CP122; Grass PolyView data acquisition analysis system; Rodent surgery suite with necessary instruments; Lung function mechanics: two FlexiVent, SCIREQ Inc., interfaced with a computer and analysis software; Rodent echocardiograms: Visualsonics Vevo 2100 ultrasound imaging system; 24 MHz small animal transducer; MMode, B-Mode, PW Doppler and tissue Doppler capabilities interfaced with analysis software, Vevo imaging station (Bench-mounted adjustable rail system) with rat and mouse handling table; dedicated ATL 3000 ultrasound machine with CL-10-5 probe for rodent echocardiograms; Arterial ring studies: Radnoti tissue bath setups; Rodent hypoxia chamber: three Biospherix A-Chambers each interfaced with ProOx gas sensors; Exercise Physiology: 2 rodent Accupacer Treadmill Omnitech Electronics Inc. ; three Isoflurane Vaporizers, Moor Laser Doppler Imaging System. Millar-AD Instruments High fidelity PV catheters and MVPS/Powerlab Data acquisition, Radnoti rodent langendorff setup for heart isolation, two circulating heating water baths, one heating waterbath, two fume hoods, one BSL2+ laminar flow hood. Three workstation computers for data acquisition

**Mitochondrial Function Assay:** Seahorse XFe96 Extracellular Flux Analyzer simultaneously assesses the two major energy producing pathways of the cell – mitochondrial respiration and glycolysis - in a microplate, in

real-time. The XFe96 Analyzer determines in vitro oxygen consumption rate (OCR), and extracellular acidification rate (ECAR).

**Tissue Culture:** Four Baker SG 400 biological safety hoods; four Precision double chamber, water-jacketed incubators; two Applied Biophysics Electrical Cell Impedance Sensing (ECIS) equipment: Model 100 includes HP Vectra computer and ECIS ZØ with Dell Latitude E5430 laptop; Biospherix two incubator chambers with glove box hypoxic system, Miltenyi GentleMACS tissue dissociator; two liquid N<sub>2</sub> storage system; autoclave, BioRad TC automated cell counter.

**Microscopes:** Nikon TE 2000U inverted fluorescence microscope interfaced with Hamamatsu ORCA285 digital camera and solvent incubator (live imaging); Nikon Eclipse E400 fluorescence microscope interfaced with a DS-Ri1 Digital Color Camera and DS-Qi1 Monochrome Camera with NIS Elements Basic Research Software Package and Workstation; Nikon Ni-Upright Research Microscope for Fluorescence Imaging interfaced with ZYLA 4.2 monochromatic camera and 5 fluorescence cubes with NIS Elements BR ML software. EZeiss Axiovert phase microscope; Nikon TMS inverted microscope interfaced with CCD video camera and Sony thermal paper printer; one Aperio CS bright-field 5 slide scanner with two workstations and Aperio bright-field imaging analysis software; one Aperio FL fluorescence 5 slide scanner with Indica Labs fluorescence imaging analysis software and a Miltenyi MACSQuant Analyzer 7 flow cytometer.

**Cellular Electrophysiology:** Axon Amplifier 200B, Digidata 1440A, pClamp 10, Vibration isolation table with faraday cage, Nikon inverted fluorescence microscope, hydraulic micromanipulator, low-pass filter, vWR low flow pump, Cell Microsystems perfusion system, Sutter P-100 microelectrode puller.

**Centrifuges:** Sorvall Lynx 4000 refrigerated high speed centrifuge; Sorvall RC5C Plus refrigerated high speed centrifuge; Beckman Optima L-70 ultracentrifuge;; one Eppendorf 5804R refrigerated tabletop centrifuge; two Sorvall ST16R refrigerated tabletop centrifuge; two Shandon Cytospin3 centrifuges, and three tabletop microfuges.

**Spectrophotometers:** Bio-Tek Synergy 2 fluorescence microplate reader, Bio-Tek Cytation 5 monochromatic fluorescence microplate reader and plate washer, BioRad Smart Spec plus spectrophotometer, one Nanodrop.

**Molecular Biology Devices:** Ultra-Lum gel documentation system, two Hybaid hybridization oven, UV cross-linker, BIO-RAD pressure transblotter, agarose gel electrophoresis equipment, BIO-RAD gel dryer, Savant Speedvac, BIO-RAD SDS-PAGE apparatus, CBS 2-dimensional electrophoresis apparatus and SDS-PAGE electrophoresis apparatus, Hunter Thin Layer Electrophoresis System HTLE-7000, GE Imagequant 350 gel imaging station, AMAXA Nucleofactor II electroporation system, Applied Biosystems Step One Plus Real-time PCR, Applied Biosystems Veriti Thermocycler, LiCor Odyssey CLx Near Infrared Imager, RNA/DNA hood

**Miscellaneous:** Buchi RotoVapor, five platform shakers, four microplate shaker, six refrigerators, five -20°C freezers, seven -80°C freezers, Agfa CP1000 x-ray tabletop processor, heating and cooling water baths and heat blocks, Mettler and Sartorius balances, industrial dishwasher, Bullet Blender Storm 24, Thermofisher CryoStar NX50 cryostat, Sonic Vibra-Cell sonicator. two workstation computers for data processing

**Radioisotopes:** Beckman LS 6500 liquid scintillation counter.