



Tisch MS Research Center of New York



Mission:

The Tisch MS Research Center of New York is an independent nonprofit 501(c)(3) organization dedicated to finding the cause of and cure for multiple sclerosis. By conducting groundbreaking medical investigations, Tisch MSRCNY accelerates the pace at which research discoveries translate from lab bench to bedside. The Center aims to discover the cause of MS, elucidate mechanisms of disease progression, develop translational research programs that will lead to new therapies, and investigate regeneration and repair in MS while offering patient access to the best and most advanced treatment possible. The Center's medical research is designed to understand all aspects of MS, including experimentation at the cellular and molecular levels, in order to treat and cure MS. Our stem cell studies are the most exciting of all of our research projects. The Neural Cell Regeneration and Repair study is working to perfect a treatment using the patient's own adult stem cells to regenerate and repair nerve cells and help patients recover lost functions.

Tisch MS Research Center of New York's Priorities, Direction & Investigations for 2020-2021



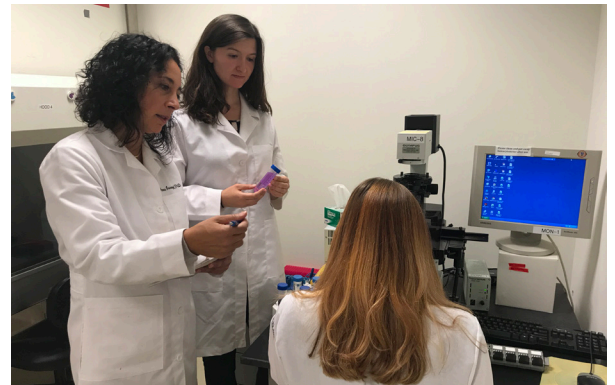
In 2001, our research center led by Dr. Saud A. Sadiq began an initiative to develop a reparative therapy for MS patients with established disability. Following several years of laboratory-based research developing a cell therapy and establishing efficacy in animal-based models of the disease, we were able to get FDA-approval for a Phase I clinical trial. Our Phase I trial was completed in 2017 and the results that were published earlier this year showed

safety and tolerability, as well as encouraging efficacy trends. At Tisch MSRCNY, a commitment was made to invest in this novel treatment with the goal of bringing this therapy into clinical practice. A \$5 million state-of-the-art Regenerative Medicine Laboratory was completed in 2018 to facilitate our landmark three-year Phase II clinical trial to hopefully establish the effectiveness of our stem cell treatment, scheduled to be completed in 2022. Moving forward we have established the following three projects as priorities for the upcoming years.

To better understand and treat coordination and balance difficulties in patients with MS.

In some people with MS, the major reason for disability is a lack of coordination with their limb function. These patients have great difficulty with daily activities, including writing and walking. The area of the brain that is responsible for coordination is a cauliflower-like structure found at the base of the brain called the cerebellum. Unfortunately, this phenomenon

does not respond to currently available medications and physical therapy has limited benefits. Dr. Anna Iacoangeli and her team are creating experimental models of the disease to identify the factors that lead to cerebellar dysfunction. In addition, her team is also investigating if there are unique molecular or protein signatures in the blood or cerebrospinal fluid (CSF) of patients that develop cerebellar disease. We hope that in the next three years we will translate what we learn from our experiments to develop rational therapeutic strategies. Finally, we hope to also initiate clinical trials later this year using novel approaches to better treat patients with balance difficulties.



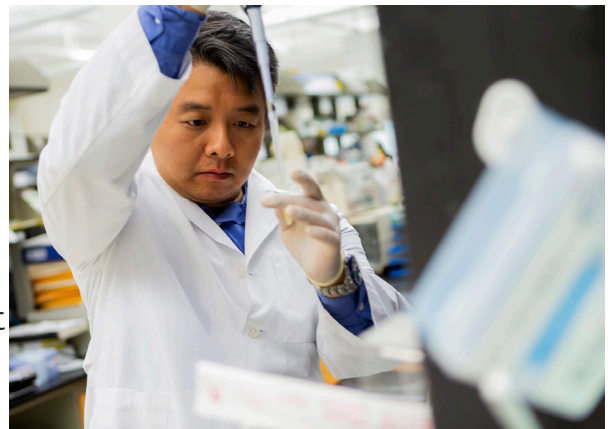
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To create an experimental model of progressive MS that will enable us to better understand and treat patients with secondary progressive MS (SPMS) and primary progressive MS (PPMS). In preliminary work, Dr. Jamie Wong and her research team have made some remarkable progress. Injecting minute quantities of CSF derived from PPMS patients directly into the CSF of the cervical spine of mice results in weakness of the limbs and demyelination. Validation of this work is currently

underway. These studies should allow our scientists to map the factors that lead to disease progression and also to develop new treatment strategies. The hope is that disease progression can be arrested in SPMS/PPMS patients so that repair strategies, such as our stem cell treatment, can be optimally effective. One approach that is being investigated is to cleanse out the damaging factors in CSF by a process of "pheresis."

Finally, and perhaps most importantly, we need to identify the initial trigger(s) that cause MS. This has been a central goal of the Tisch MS Research Center of New York since its inception. This work has recently been boosted due to a grant from the Emerald Foundation. Jerry Lin and associates have made immense strides in elucidating the CSF antibody response in patients with MS over the past decade. We have studied several thousand single antibody-producing cells (B-cells and plasma cells)



and have tried to determine if they react with a number of myelin targets found in the human brain. We are also investigating the link with the Epstein-Barr virus to establish how the immune system in patients with MS escapes self-tolerance and becomes autoimmune. In some patients, we have found environmental trigger factors and are currently working on animal models to firmly establish these findings. To maximize and accelerate our current trailblazing research, we are currently building a state-of-the-art Experimental Research Center. The new facility will allow us to further develop these experimental models, with the goal of discovering new therapies which can directly impact the lives of patients with MS. Ultimately, all this research is driven by our mission to find the cause of this disease.



"Above all, I think the secret to the success of the Tisch MS Research Center is that there is a real and genuine connection between the patients and the doctor that embodies the very best in medicine... true compassion, dedication, humility and knowing that the doctor is indeed honored and privileged to be a healing servant of the patient."

- Dr. Saud A. Sadiq, Director and Chief Research Scientist
of the Tisch MS Research Center of New York.

Who is Dr. Saud A. Sadiq?

Dr. Sadiq, a native of Kenya, is a board-certified neurologist who completed medical school at the University of Nairobi and residency training in Internal Medicine in Kenya and in England. He then completed a residency in Neurology at the University of Texas, where he was elected to the Alpha Omega Alpha Honor Medical Society. From 1988-91, he trained as a research fellow funded by a Dana Fellowship award and an MDA Fellowship in Neuroimmunology at Columbia University in New York. From 1992-98, he was Assistant Professor of Neurology at the Neurological Institute at Columbia University, where he served as Associate Director of the MS Clinical Program. In 1998, he became Director of the MS Research and Treatment Center at St. Luke's-Roosevelt Hospital in New York. From 2000-2005, he served as Chairman of the Department of Neurology at St. Luke's-Roosevelt, with faculty appointments at Columbia University and Albert Einstein College of Medicine.

His research interests are focused on MS and include investigating the intrathecal oligoclonal B-cell response; exploring the mechanisms of disease progression, biomarker development, and applying stem cell biology to clinical use. Clinically, Dr. Sadiq is an internationally acknowledged expert in MS, receiving numerous awards for his research and clinical activities. He has been an invited guest speaker nationally and internationally at numerous conferences and has more than 100 publications. He is among a select few MS specialists who has a full time clinical practice and is able to combine it with directing a productive laboratory-based research program.

Included in the following Castle Connolly publications and/or partner publications:

America's Top Doctors: 14th Edition, 13th Edition

America's Top Doctors: 2018, 2017, 2016

Top Doctors: New York Metro Area: 18th Edition, 17th Edition, 16th Edition, 15th Edition, 14th Edition

Top Doctors New York Metro Area: 2018, 2017, 2016

New York Magazine: Best Doctors Issue: 2018, 2017, 2016, 2014, 2013, 1999 ([Hall of Fame Issue](#)), 1996



What is the History of Tisch MSRCNY?

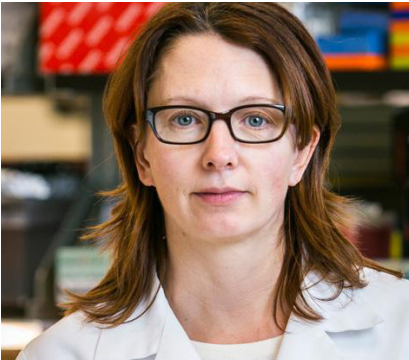
The Tisch Multiple Sclerosis Research Center of New York (Tisch MSRCNY) was formally launched in 2006, but traces its lineage to the MS Center at the Neurological Institute of New York at Columbia University Medical Center, which Saud A. Sadiq, MD, joined in 1992. The research arm consisted of a 320 square foot laboratory directed by Dr. Sadiq and dedicated to finding the cause and cure of multiple sclerosis. Moving to the Department of Neurology at St. Luke's-Roosevelt Hospital in 1998, Dr. Sadiq reformed the center as the MS Research and Treatment Center in 1998, upgrading to a 2000 square foot facility in the process. With increased funding, the research wing more than doubled in size in 2003 and expanded to 10 researchers.

In 2006, Dr. Sadiq left the hospital/university setting and transformed the center into an independent, private, not-for-profit 501(c)(3) research institute, founding the Multiple Sclerosis Research Center of New York (MSRCNY), then and now the largest independent MS center in the world. The research center conducts groundbreaking [investigations into the cause of MS](#), biomarker research aimed at developing precise diagnostic and predictive tools to bring the disease under the control of treating neurologists, and novel [regenerative strategies for repairing the damage](#) done by the disease in patients who are unresponsive to standard treatments. In 2012 with the generous assistance of our benefactors we initiated a further expansion to an area encompassing approximately 80,000 square feet to house the latest in research equipment and technology designed to accelerate the pace of MS research and treatment. The expansion included the installation onsite of two 3-Tesla magnetic resonance scanners to serve our clinical and research needs. The close relationship of the research center and the clinical practice, [International Multiple Sclerosis Management Practice \(IMSMP\)](#), speeds the translation of basic science into clinical practice and helps to test new treatments for MS. Our unity of purpose, and an ease of communication between the clinical and research staff of over 80 individuals creates a unique environment that accelerates the pace of scientific discovery and advancement at minimum cost and with minimal bureaucratic constraints.

It was in recognition of the Center's achievements in MS research and in support of Dr. Sadiq's mission to discover the cause and cure of multiple sclerosis that the Tisch family named the research center in February 2013, formally creating the Tisch MS Research Center of New York. The Tisch MS Research Center of New York is a nonprofit 501(c)(3) organization supported entirely by grants and private philanthropy.

Principal Scientists

Meet the Scientists at Tisch MSRCNY



"As a scientist, having such a close connection with patients and their stories is highly motivating. It also allows us to think outside the box, and focus our research on topics that will really make a difference."

Dr. Violaine K. Harris, PhD, Senior Research Scientist

Dr. Harris joined the laboratory of the Tisch Multiple Sclerosis Research Center of New York in 2004, where she has been developing cell therapy strategies to promote repair and regeneration in multiple sclerosis. Her work has led to the groundbreaking stem cell clinical trial, the first ever to test bone marrow-derived neural progenitors in patients with MS. Through investigating adult stem cells from bone marrow- a source of cells from the same individual (autologous) - known as mesenchymal stem cell-derived neural progenitors (MSC-NPs), Dr. Harris, and her team have discovered that these cells promote repair in areas of demyelination when injected into mouse models of multiple sclerosis. Through the uniquely close partnership between the researchers, clinicians, and patients, this stem cell therapy was tested in twenty MS patients through an FDA approved Phase I clinical trial. Results from the study were remarkable and unprecedented. Patients with both primary and secondary progressive MS experienced improvement in bladder function, vision, and walking speed with no adverse effects. Dr. Harris and her team are actively investigating the mechanisms by which MSC-NPs promote repair and regeneration in MS. Research is focused on the identification of molecules involved in MSC-NP-mediated repair, which have therapeutic potential in future cell therapy strategies.

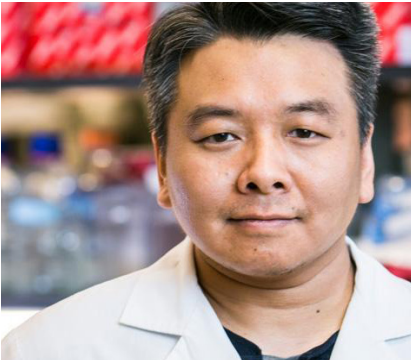
As regenerative therapies are developed and tested in clinical trials, there is a need for biomarkers that can measure neural repair and remyelination in MS. Cerebrospinal fluid (CSF) circulates around the brain and spinal cord and, thus, is ideally suited to measure neural repair. Dr. Harris' research team is investigating the CSF of patients treated with stem cells in order to discover novel biomarkers of repair. Her recent research has also identified other CSF biomarkers of disease activity, including Fetuin-A. Fetuin-A was found to not only detect disease activity but was also a biomarker of clinical response to the drug natalizumab. Her current research is focused on understanding the mechanisms of action of Fetuin-A in MS pathogenesis. In a recent review article, Dr. Harris and Dr. Sadiq discuss the benefit of using CSF biomarkers as a means to understanding the level of disease activity and treatment response in MS patients. Through her expertise in studying biomarkers, Dr. Harris and her team are revealing a better understanding of disease mechanisms that lead directly to personalized treatments for patients.

Dr. Harris has had a longstanding interest in stem cell biology and in understanding the mechanisms of cell signaling and differentiation. She received her PhD in Pharmacology from Georgetown University, and her BA in Biochemistry/Molecular, Cellular, and Developmental Biology from the University of Colorado in Boulder. Her training also included a postdoctoral fellowship at Mount Sinai Medical Center in New York, where she studied mechanisms involved in the maintenance of cancer stem cells.



Principal Scientists

Meet the Scientists at Tisch MSRCNY



"Trying to find the cause [of multiple sclerosis] can only be done in an environment like this."

Jerry Lin, BA, Senior Staff Associate

Jerry Lin has collaborated with Dr. Sadiq since 1996, where he worked as a research assistant at Columbia University Presbyterian Hospital under Dr. Sadiq and Dr. Norman Latov. As a research associate, he helped establish Dr. Sadiq's research program at the MS Research & Treatment Center at Roosevelt Hospital from 1998-2006, and subsequently as a senior staff

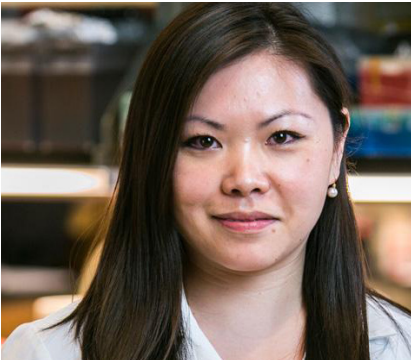
associate at the MSRCNY (now the Tisch MSRCNY) from 2006 to present. His motivation for continual research lies in his strong work ethic and understanding that Dr. Sadiq cultivates a unique and collaborative environment at the Center. Mr. Lin is a graduate of Johns Hopkins University with a BA in Chemistry.

Lin is actively working towards discovering the cause of MS. His research is based on the finding that over 90% of MS patients have oligoclonal bands- antibodies that identify and aid in the removal of foreign antigens such as viruses and bacteria- in the cerebrospinal fluid (CSF). Lin believes that finding the targets of these antibodies may lead us to the cause of the disease. Lin and his team have developed the techniques to successfully isolate clonally expanded and persistent B-cells from the CSF of MS patients. Using recombinant technology, they were able to identify, sequence, and mass produce antibodies from B-cell clones from individual MS patients. Importantly, they have been able to identify a foreign antigen recognized by B-cell clones from an early primary progressive MS patient. Investigation of this common antigen as a possible autoimmune trigger in MS is ongoing. Jerry Lin is also working to establish appropriate risk assessment tools to predict the development of progressive multifocal leukoencephalopathy (PML) in natalizumab-treated MS patients through generating several tools to detect the presence of John Cunningham virus (JCV), the causative agent of PML. His extensive research reflects his enthusiasm and dedication to not only pursuing a cure for multiple sclerosis but to the Center itself.



Principal Scientists

Meet the Scientists at Tisch MSRCNY



"The close proximity to the clinic is the most unique aspect of the Center. I have never seen any other research center where researchers have such a regular interaction with the clinicians and easy access to the patient samples."

Dr. Jamie Wong, PhD, Research Scientist

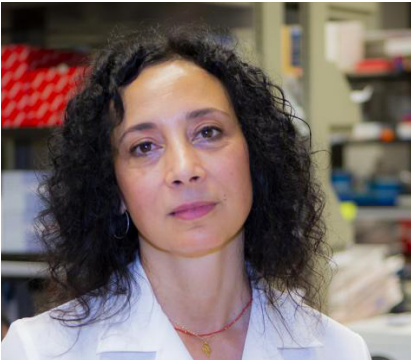
Dr. Wong joined the Tisch MSRCNY research laboratory in May 2015, after completing her postdoctoral training at Icahn School of Medicine at Mount Sinai. Her primary research interests have focused on repair and regeneration mechanisms underlying CNS trauma and neurological disorders. As a postdoctoral fellow, she studied epigenetic mechanisms regulating axon regeneration and glial response after spinal cord injury. Additionally, Dr. Wong studied the effects of manipulating BMP signaling on stroke pathophysiology.

Dr. Wong received her Ph.D. in Biological Sciences in 2011 and B.S. in Neurobiology in 2004 from the Neurobiology and Behavior Department at University of California, Irvine. Her thesis work focused on evaluating the impact of plasticity-promoting drugs and motor training on locomotor recovery following spinal cord injury.

Dr. Wong's research at Tisch MSRCNY is directed towards understanding mechanisms of neurodegeneration and astrogliosis in primary progressive multiple sclerosis.

Principal Scientists

Meet the Scientists at Tisch MSRCNY



"The close collaboration between scientists and clinicians has been the primary motivation for joining the Tisch MSRCNY. The daily interaction with patients is a constant reminder that our ultimate goal is translating scientific discoveries into novel therapeutic interventions that will prevent MS progression."

Dr. Anna Iacoangeli, PhD, Assistant Research Scientist

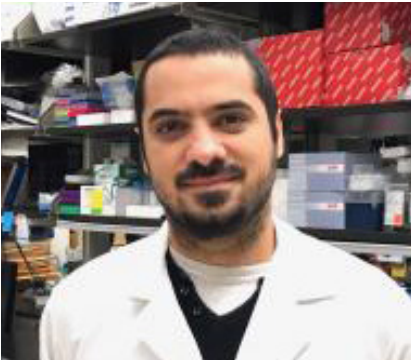
Dr. Iacoangeli joined the Tisch MS Research Center scientific team in March 2017. Prior to her appointment at the Center, she served as a Research Assistant Professor at SUNY Downstate Medical Center in Brooklyn. Dr. Iacoangeli's research interests have focused on understanding the molecular functions of a subtype of regulatory non-coding RNAs (ncRNAs) in neuronal processes and mechanisms. She recently published that dysregulation of these RNAs at synapses resulted in cognitive impairment. In her clinical research at SUNY Downstate, Dr. Iacoangeli identified a novel RNA-based biomarker for invasive breast cancer diagnosis and prognosis.

At the Tisch MS Research Center, Dr. Iacoangeli's research emphasis is on investigating how regulatory ncRNAs contribute to the biochemical and cellular mechanisms leading to multiple sclerosis (MS) onset and progression. With state-of-the-art approaches, Dr. Iacoangeli aims to establish relevant ncRNAs as therapeutic candidates for the treatment of MS. Furthermore, Dr. Iacoangeli is studying cerebellar dysfunction in MS. Clinical cerebellar manifestations experienced by MS patients, consisting of tremor, motor coordination deficits, and slurred speech, result in a significant impairment. Dr. Iacoangeli is currently developing a mouse model to study cerebellar disorders in MS. Understanding the underlying causes of cerebellar dysfunction will translate into effective and tailored treatment strategies for MS patients.

Dr. Iacoangeli received her Ph.D. in Applied Genetics and her Master in Biological Sciences from the Department of Genetics and Molecular Biology "Charles Darwin", at the Sapienza University of Rome, Italy.

Principal Scientists

Meet the Scientists at Tisch MSRCNY



"As a researcher, the close proximity to the patients and clinicians, is highly motivating and brings a concrete objective in our studies of therapeutic approaches for multiple sclerosis."

Dr. Nicolas Daviaud, Research Associate

Dr. Daviaud joined the Tisch MS Research Center of New York in January 2019, after completing his postdoctoral training at the Icahn School of Medicine at Mount Sinai. As a postdoctoral fellow, he studied the use of cerebral organoids as a new human model of preterm hypoxic injury, as

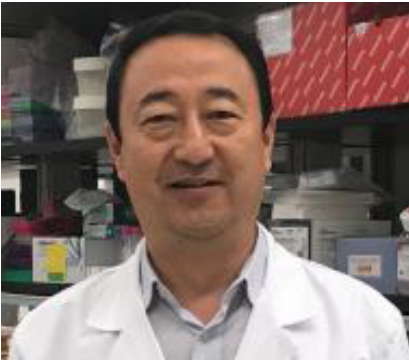
well as the engraftment of transplanted human cerebral organoids in mouse cortex for neural repair in cases of brain injury or neurodegeneration.

Dr. Daviaud received his PhD in Neuroscience and his Master's Degree in Science Technology and Health Engineering at the University of Angers, France. His thesis work focused on the development and characterization of pharmacologically active microcarriers conveying stem cells for the treatment of neurodegenerative disorders.

Dr. Daviaud's research at Tisch MSRCNY is directed towards using cerebral organoids as a model of multiple sclerosis and as a new platform to study therapeutic approaches and analyze mechanisms involved in repair/regeneration of brain cells.

Principal Scientists

Meet the Scientists at Tisch MSRCNY



"I truly feel our Center is a big, warm family. Everyone works hard to investigate the cause of and cure for MS. Most importantly, we have an inspiring leader and collaborator in our Chief Research Scientist, Dr. Saud A. Sadiq."

Dr. Qijiang Yan, Research Scientist

Dr. Yan began working in our research laboratory in 2005. After some recent work in China, Dr. Yan rejoined Tisch MSRCNY in 2019 as a Research Scientist. His research focuses on providing pathological expertise to our

scientists. Almost all of our investigations involve the use of brain and spinal cord specimens. These tissues are obtained from patients with multiple sclerosis who have generously and selflessly donated their bodies for medical research. Such samples are difficult to obtain and at Tisch MSRCNY, we are fortunate to have well-preserved tissue specimens. Dr. Yan's work has involved extensive cataloging of various sections of normal and MS affected brain, as well as categorizing MS lesions into "active" and "inactive." In addition, the Center has spinal cord sections from the cervical and thoracic spine at different levels. The availability of these specimens is especially critical to our work. Based on his past experience with pathological specimens, staining, and categorization pathology, Dr. Yan collaborates with other researchers on their projects in finding the cause of MS and to elucidate a better understanding of progressive disease.

Dr. Qijiang Yan received his PhD in Neurobiology from Sun Yat-sen University of Medical Sciences in Guangzhou, China and an MS in Anatomy from China Xinjiang Medical University.

Principal Scientists

Meet the Scientists at Tisch MSRCNY



"Because of its closeness to clinical patients and its multidisciplinary research approach, the Tisch MS Research Center offers the ideal environment for the better understanding and treatment of MS."

Dr. Roberto Alfonso, Research Associate

Dr. Alfonso joined the Tisch Multiple Sclerosis Research Center of New York in January 2020 after completing his postdoctoral training at the Laboratory of Viral Diseases in the National Institutes of Health (NIH) in Bethesda, MD. At the NIH, Dr. Alfonso's research focused on the regulation of Herpes virus

gene expression during lytic and latency phases and the discovery of new host-virus interactions. These studies led to a better understanding of the mechanisms involved in the transcription of viral genes and the identification of new antiviral targets.

Dr. Alfonso performed his Ph.D. at the National Center for Biotechnology in Madrid, Spain, where he studied the role of epigenetic host factors in the replication and pathogenesis of influenza virus. At Tisch MSRCNY, Dr. Alfonso's research is directed towards understanding the role of environmental factors for the development of MS and the contribution of the immune system to pathogenesis.