

INFLAMMATORY BRAIN DISORDERS CONFERENCE 2022

Hosted by Neuroimmune Foundation and accredited in
collaboration with The Wisconsin Medical Society

MAY 20–21, 2022

A live event via webinar



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The **Inflammatory Brain Disorders Conference** features nationally and internationally renowned experts skilled in diagnostic and therapeutic approaches who will present a diverse range of emerging clinical and research challenges, insights, and advances in the field of inflammatory brain disorders.

The intended audience is pediatric and adult physicians. Both generalists as well as specialists will find the conference valuable to their practices. The conference is designed for pediatricians, family physicians, psychiatrists, rheumatologists, immunologists, neurologists, and infectious disease physicians. Though the conference is designed for physicians, physician assistants and nurse practitioners will find the series valuable to their practices as well.

Though all content is geared towards providers, patients and families are welcome to join us. Additional follow up support will be provided through monthly Case-Based Q&A webinars for providers featuring experts in the field.

All registrants will receive a recording of the conference. No refunds will be granted.

Neuroimmune Foundation subscribes to the articles of Title III of the Americans with Disabilities Act of 1990. Should you or anyone accompanying you require special assistance, please notify us by contacting conference@neuroimmune.org or 608-381-0367. Requests should be made as early as possible to allow time to arrange the accommodation.

Neuroimmune Foundation

Advocating on Behalf of Individuals with Neuroimmune Conditions

neuroimmune.org

Friday, May 20, 2022 Agenda

(Times all listed in central time zone)

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MAY 20, 2022 AGENDA

(Times all listed in U.S. central time zone)

9:00 – 10:00 am CT

Maximum of 1.0 AMA PRA Category 1 Credit(s)[™]

Addressing Neuroimmune Diseases Across the Blood Brain Barrier with Monoclonal Antibodies Versus Small Molecules



Lawrence Steinman, MD

Professor of Neurology and Pediatrics, Stanford University School of Medicine
Keynote Speaker

Presentation Synopsis

Dr. Steinman will review the intricate interplay between viral infection and activation of the host immune system, describe how immune cells move to the central nervous system, and settle comfortably in the CNS niche. Once in the CNS niche, he will describe how immune cells damage the brain.

Speaker Biography

Dr. Lawrence Steinman is Professor of Neurology, Neurological Sciences and Pediatrics at Stanford University. He was Chair of the Stanford Program in Immunology from 2001 to 2011. His research focuses on what provokes relapses and remissions in multiple sclerosis (MS), and on the quest for antigen specific therapy in autoimmune disease.

Steinman was senior author on the 1992 *Nature* article that led to the drug Tysabri, approved for MS and Crohn's disease. He is currently applying insights from Tysabri to develop new therapies for neurodegenerative diseases, aimed at blocking macrophages and microglia from eating neurons and axons "in danger."

Dr. Steinman graduated from Dartmouth College, Magna Cum Laude in Physics. His MD is from Harvard Medical School. He was a post-doctoral fellow in chemical immunology fellow at the Weizmann Institute of Science. After neurology residency he remained on the faculty in 1980. He has received numerous honors, including the John M. Dystel Prize in 2004, the Javits Neuroscience Investigator Award from the NINDS twice, the Charcot Prize in MS research, and the Cerami Prize in Translational Medicine. Steinman is a member of the National Academy of Sciences, and the National Academy of Medicine.

Dr. Steinman cofounded several biotech companies, including Neurocrine, Atreca, 180 Life Sciences, 5 Integrin LLC, and Pasithea. He was a Director of Centocor from 1988 until its sale to Johnson and Johnson. He is a Director of BioAtla, an immune-oncology company, co-Executive Chair of 180 Life Sciences, and Executive Chair of Pasithea.



Evidence for PANS as an Inflammatory Brain Disorder

Jenny Frankovich, MD

*Clinical Professor of Pediatrics, Rheumatology, Stanford University School of Medicine
Director of PANS Research Program, Stanford University School of Medicine*

Presentation Synopsis

Dr. Frankovich will cover objective findings that points to PANS/PANDAS as an organic brain disease, discuss the epidemiological studies that have evaluated the links between autoimmunity/inflammation, infection, and OCD, and discuss evidence for autoimmunity and inflammation in PANS/PANDAS and briefly outline management strategies.

Speaker Biography

Dr. Frankovich's primary research and clinical interest is in the intersection between mental health and systemic inflammation. She co-founded the Stanford PANS multidisciplinary clinic and research program. Alongside other collaborators, she is building a large biorepository of patient blood samples and clinical data to share with basic scientists around the world. She collaborates with 10 basic science labs at Stanford to characterize the immunophenotypes of active PANS compared to remission samples and age matched controls. Her ultimate goal is to understand the immunological factors contributing to mental health disturbances and to innovate effective multidisciplinary treatment regimens.

15 minute break



Post-Viral Cognitive and Psychiatric Effects

Robert Yolken, MD

Professor of Neurovirology in Pediatrics, Johns Hopkins University School of Medicine

Presentation Synopsis

It is widely recognized that clinically apparent viral encephalitis is associated with a range of subsequent neuropsychiatric consequences including cognitive impairment. However, recent studies also indicate that inapparent viral infection can also be associated with cognitive impairment. Previous studies from our group have documented that serological evidence of exposure to some common herpesviruses such as Herpes Simplex Virus type 1 (HSV-1) are associated with decreased cognitive functioning in adolescents and young adults and that exposure to other herpesviruses such as Cytomegalovirus (CMV) can be associated with accelerated cognitive decline in the elderly. Furthermore, exposure to SARS2 during the current Covid-19 pandemic has been associated with cognitive decline, psychiatric symptoms, and structural brain changes even in the absence of neuropsychiatric symptoms during acute infection. An improved understanding of the interplay between subclinical viral infections and brain pathways might lead to new methods for the prevention and treatment of the neuropsychiatric consequences of these infections.

Speaker Biography

Dr. Robert H. Yolken is the Theodore and Vada Stanley Distinguished Professor of Neurovirology in the Department of Pediatrics at the Johns Hopkins University School of Medicine. He is also the chair of the Stanley Division of Pediatric Neurovirology, the nation's first pediatric research center designed to investigate links between severe mental illness (including schizophrenia and manic-depressive disorders) and early childhood viral infection.

He and his research colleagues speculate that infectious agents can invade the brain and then lie dormant for years before triggering the onset of schizophrenia or manic-depressive illness in adolescence and young adulthood. Neuropathogenic microorganisms can also affect cognition and behavior through alterations in the immune system of the microbiome. They are investigating as possible microbial triggers Herpesviruses, Influenza viruses, and Coronaviruses, as well as *Toxoplasma gondii* which is a protozoan which can be transmitted to humans by cats and undercooked meat from farm animals. They believe that in the future antiviral, antimicrobial, or anti-inflammatory medications might be developed to treat or prevent schizophrenia in some individuals.

The overall goal of the research laboratory is to develop a training and research program devoted to the elucidation of the role of infection and immunity in the etiology of schizophrenia and bipolar disorders as well as suicide behaviors. Interests also include elucidating the role of perinatal infections in subsequent brain development.

Dr. Yolken received his M.D. from Harvard Medical School and completed a residency at Yale New Haven Hospital. He also trained at the National Institutes of Health before joining the Hopkins faculty in 1979.

He is author or coauthor of more than 500 scientific papers as well as *Beasts of the Earth* and several editions of the *Manual of Clinical Microbiology*.

30 minute break

12:45 – 1:15pm CT

Maximum of 0.5 AMA PRA Category 1 Credit(s)[™]

Chronic Fatigue Syndrome/Myalgic Encephalomyelitis

Jonas Bergquist, MD, PhD

Professor in Analytical Chemistry and Neurochemistry in the Department of Chemistry at Uppsala University, Sweden; Adjunct Professor in Pathology at the University of Utah School of Medicine; Distinguished Professor in Precision Medicine at Binzhou Medical University in Yantai, China



Presentation Synopsis

The presence of autoantibodies in circulation, in peripheral body fluids and tissues but also in central nervous system involved in complex neurological, neurodegenerative, and post-viral neuroinflammatory processes have recently been explored as part of the pathophysiological processes. In this lecture we will look at a few examples including the post-viral consequences of herpes simplex encephalopathies, myalgic encephalomyelitis and post-covid. We will also focus a bit on the similarities and differences between the pathophysiological processes.

Speaker Biography

Professor Dr Jonas Bergquist, MD, PhD, is Full Chair Professor in Analytical Chemistry and Neurochemistry at the Biomedical Centre, Department of Chemistry at Uppsala University, Sweden, Adjunct Professor in Pathology at the Department of Pathology, School of Medicine, University of Utah, USA, and Distinguished Professor in Precision Medicine, Binzhou Medical University, Yantai, China. He is also the director of the clinical collaborative research centre in Uppsala (together with Harvard Medical School, Stanford University, Montreal and Melbourne) with focus on myalgic encephalomyelitis (ME). Professor Bergquist's group is continuously developing general analytical tools for molecular diagnostic screening and discovery of biomarkers of pathological states.

Technologies include all important links: identifying relevant clinical applications, invasive in-situ sampling of complex samples, advanced sample pretreatment, multidimensional liquid-based separation, high resolution mass spectrometry, and multivariate data analysis. Professor Bergquist among other things focus to explore the neuroimmunological involvement in neurodegenerative diseases by using proteomics and metabolomics with a special interest in cerebrospinal fluid and hard-to-reach tissue studies. Professor Bergquist has currently published over 540 papers, with around 11 000–15 000 citations (h-index of 57 in Web of Science and 69 in Google Scholar).

1:15 – 1:45pm CT

Maximum of 0.5 AMA PRA Category 1 Credit(s)[™]

Regulatory T Cells for Immunotherapy of Neurological Autoimmunity



Wanjun Chen, MD

Senior Investigator
Chief, Mucosal Immunology Section
NIDCR, NIH

Presentation Synopsis

Dr. Chen will discuss the development and function of Regulatory T cells (Tregs), opportunities and challenges of immunotherapy for neuroinflammatory and autoimmune diseases, and *in vivo* generation of autoantigen-specific Tregs for therapy of EAE and other autoimmune diseases.

Speaker Biography

Wanjun Chen, M.D. is the Senior Investigator and Chief of Mucosal Immunology Section, NIDCR, NIH. Dr. Chen is internationally recognized by his work focus on TGF- β regulation of immunity and tolerance. Dr. Chen discovered that TGF- β induces Foxp3 in CD4 T cells and converts them into regulatory T cells. He applies the mechanistic knowledge to animal models to understand the pathogenesis of autoimmunity and inflammation, cancer, and infectious disease. In particular, he has developed an immunotherapy by inducing antigen-specific regulatory T cells for the treatment of experimental models of autoimmunity, including the EAE, an animal model of Multiple Sclerosis. His studies aim to lead to the development of potential immunotherapies for relevant human diseases.

15 minute break

2:00 – 2:30pm CT

Maximum of 0.5 AMA PRA Category 1 Credit(s)[™]

Arthritis, Enthesitis, and Development of Autoimmune/Anflammatory Disease in Patients with PANS

(Presented by Dr. Jenny Frankovich, Dr. Meiqian Ma, and Dr. Shreyas Vasanawala)



Shreyas Vasanawala, MD, PhD

Division Chief of Pediatric Radiology, Associate Chair of Radiology
Radiologist-in-Chief for Pediatric Radiology, Stanford University School of Medicine



Meiqian Ma, MD

Clinical Assistant Professor, Pediatrics – Rheumatology
Stanford University School of Medicine

Presentation Synopsis

Drs. Frankovich, Vasanawala, and Ma will present on the increased incidence of enthesitis/arthritis among patients meeting criteria for PANS, the three types of arthritis found in patients with PANS, including clinical features. Participants will learn to recognize that children with PANS have severe psychiatric symptoms and sensory dysregulation which may interfere with normal perception of pain (under or over report of pain and thus prompting clinicians to use objective tools for evaluating arthritis).

Speaker Biography

Dr. Shreyas Vasanawala is the William R. Brody Professor of Pediatric Radiology and Child Health and serves as Radiologist-in-Chief for Stanford Children's Health and Chief of Pediatric Radiology at Stanford University. After completing undergraduate studies in mathematics at the California Institute of Technology, he pursued a medical degree and doctorate in biophysics at Stanford University, where his studies led to a resurgence of signal efficient methods in magnetic resonance imaging. After a surgical internship, a residency in radiology, and a fellowship in pediatric radiology, Dr. Vasanawala joined the faculty at Stanford University. He then focused on building the MRI programs at Lucile Packard Children's Hospital and at Stanford Hospital and Clinics, and building the Division of Body MRI.

He leads a multidisciplinary research group focused on developing fast and quantitative pediatric medical imaging methods. The group's efforts include development of new medical imaging hardware, new pediatric-friendly image acquisition methods, novel image reconstruction approaches and unique strategies to image analysis. These endeavors have led to the first routine clinical translational deployment of high density pediatric specific MRI receiver coils, the first routine clinical use of innovative compressive sensing and deep learning medical image reconstruction methods, and the routine ability to obtain high resolution pediatric images with reduced anesthesia. Together, these efforts, and those of other pediatric radiology faculty, have contributed to Lucile Packard Children's Hospital at Stanford becoming a leading pediatric MRI program internationally. With over 150 peer-reviewed publications and 25 patents, he has developed a deep collaborative network within Stanford and beyond.

Dr. Ma is an Assistant Clinical Professor in the Department of Pediatrics, Division of Allergy, Immunology Rheumatology (AIR) at Stanford University/Lucile Packard Children's Hospital (LPCH). She completed her medical training at the Medical College of Wisconsin. She then went to Cohen Children's Medical Center/Northwell Health to complete her training in pediatrics and pediatric rheumatology. Her research in fellowship focused on the validation of the 2019 European League Against Rheumatism/American College of Rheumatology Criteria Compared to the 1997 American College of Rheumatology Criteria and the 2012 Systemic Lupus International Collaborating Clinics Criteria in Pediatric Systemic Lupus Erythematosus. She joined the Stanford PANS Program in July 2020.

2:30 – 3:15pm CT

Maximum of 0.75 AMA PRA Category 1 Credit(s)[™]

GAD65 Neurological Autoimmunity

Sean Pittock, MD

*Director, Center for Multiple Sclerosis and Autoimmune Neurology, Mayo Clinic
Neuroimmunology Research Laboratory, Mayo Clinic*



Presentation Synopsis

In 1956, Moersch and Woltman identified a syndrome they termed stiff-man (now termed person) syndrome (SPS). In 1988, Solimena and colleagues recognized that SMS was an autoimmune disorder associated with antibodies to glutamic acid decarboxylase-65 (GAD65). Antibodies targeting GAD65 are a biomarker of type 1 diabetes mellitus (T1DM), but at low titers they lack clinical specificity for autoimmune neurological disease. In contrast, high-titer GAD65 antibodies, over 1000-fold higher than the upper limit of normal, confer high clinical specificity for GAD65

neurological autoimmunity. SPS was determined to be a prototypical presentation of GAD65 neurological autoimmunity, however it is now recognized that nearly half of patients lack an SPS phenotype. SPS, cerebellar ataxia, epilepsy, and limbic encephalitis may all occur in isolation, and these are considered the primary disease manifestations of GAD65-neurological autoimmunity. Many patients have overlapping phenotypes with multifocal manifestations that also can include cognitive impairment, brainstem dysfunction and myelopathy. Psychiatric symptoms especially anxiety is common. SPS is the most immunotherapy-responsive presentation, while epilepsy is least immunotherapy-responsive. Complete response to immunotherapy is rare.

Speaker Biography

Dr. Sean Pittock is Professor of Neurology, Director of the Neuroimmunology Laboratory and the Center for MS and Autoimmune Neurology at the Mayo Clinic. His expertise is in the laboratory and clinic-based diagnosis and management of immune mediated neurological disorders. In 2006, he set up the Autoimmune Neurology Clinic at the Mayo Clinic, the first dedicated Clinic of its type in the USA. This Clinic provides a multidisciplinary approach to the evaluation and treatment of patients with a broad range of autoimmune neurological disorders. He is the co-founder of the Autoimmune Neurology Section at the American Academy neurology and currently serves as its chair. His research is translational and is focused on 1) the identification of novel biomarkers of autoimmune neurological diseases. His group discovered antibodies targeting AQP4, GFAP, MAP1B-IgG, KELCH11, NIF, PDE10 and CRMP5; 2) the clinical application of laboratory-based tests in diagnosis and outcome prediction for patients with autoimmune and paraneoplastic neurological disorders; 3) optimizing the clinical management of autoimmune and paraneoplastic neurological disorders. He has published 325 peer reviewed papers. The Neuroimmunology Laboratory tests sera and CSF from approximately 200,000 patients for comprehensive neural antibody profiles (CAP and New York State certified) pertinent to encephalopathy, epilepsy, myasthenia gravis and CNS inflammatory demyelinating disorders including neuromyelitis optica. His recent work has focused on Phase 3 immunotherapy trials for patients with autoimmune epilepsies and CNS demyelinating disorders (targets include LGI1 and AQP4). This unique translational practice extending the laboratory's serologic findings directly to the bedside has allowed the creation of diagnostic decision trees which will optimize triaging of such patients for further phenotype analysis and biomarker discovery.

3:15 – 3:45 pm CT

Maximum of 0.5 AMA PRA Category 1 Credit(s)[™]

Neuromodulation for Psychiatric Disorders



Sameer Sheth, MD, PhD

Associate Professor of Neurosurgery, Psychiatry & Behavioral Sciences, and Neuroscience, Baylor College of Medicine; Cullen Foundation Endowed Chair, Baylor College of Medicine

Presentation Synopsis

Dr. Sheth will review the history and development of neurosurgery for psychiatric disorders, focusing on neuromodulation therapies like DBS. In particular, he will discuss DBS for severe, treatment resistant depression and will cover the current state of this therapy and future directions of research.

Speaker Biography

Dr. Sameer Sheth is currently Associate Professor, Cullen Foundation Endowed Chair, Vice-Chair of Research, and McNair Scholar in the Department of Neurosurgery, Baylor College of Medicine, Houston, TX. He also holds joint appointments in the Department of Neuroscience and Department of Psychiatry & Behavioral Sciences at Baylor, and is an Adjunct Associate Professor in the Department of Electrical and Computer Engineering at Rice University. Dr. Sheth received his bachelor's degree in Physics and Astronomy at Harvard University summa cum laude before earning his MD and PhD from the University of California Los Angeles.

Dr. Sheth completed his residency and a fellowship in stereotactic and functional neurosurgery at the Massachusetts General Hospital and Harvard Medical School. Clinically, Dr. Sheth specializes in stereotactic/functional neurosurgery, including the surgical treatment of movement disorders, epilepsy, and psychiatric disorders. He employs a combination of stereotactic and traditional open surgical techniques, including deep brain stimulation (DBS), neuromodulation, laser ablation, radiosurgery, and microsurgery.

Dr. Sheth's research focuses on cognitive neurophysiology, often using opportunities derived from his clinical work. He studies higher order human cognitive processes, including decision-making and emotional regulation, using intracranial electrophysiological recordings and advanced imaging techniques. His lab also strives to improve neuromodulatory treatments for neurological and psychiatric disorders, including depression and dementias, using innovative surgical techniques.

15 minute break

4:00 – 4:30 pm CT

Maximum of 0.5 AMA PRA Category 1 Credit(s)[™]

Inflammation in the Development and Treatment of Depression



Charles Raison, MD

Professor of Psychiatry, University of Wisconsin

Presentation Synopsis

Dr. Raison will discuss how increased inflammation is associated with a unique type of major depressive disorder, how to utilize inflammatory biomarkers to help guide psychopharmacologic treatment decisions, and how to identify which patients are likely to benefit from and which are likely to be harmed by treatment with anti-inflammatory agents.

Speaker Biography

Charles Raison, MD, is the Mary Sue and Mike Shannon Distinguished Chair for Healthy Minds, Children & Families and Professor, Human Development and Family Studies, School of Human Ecology, and Professor, Department of Psychiatry, School of Medicine and Public Health, University of Wisconsin-Madison, and the Director of Clinical and Translational Research for Usona Institute. Web of Science named him one of the world's most influential researchers, with nearly 11,000 citations in the decade preceding 2019 and 137 publications.

Prior to his appointment in the School of Human Ecology, he was Professor in the Department of Psychiatry, College of Medicine, and the Barry and Janet Lang Professor of Integrative Mental Health at the Norton School of Family and Consumer Sciences, College of Agriculture and Life Sciences, University of Arizona. Dr. Raison serves as the founding Director of the Center for Compassion Studies in the College of Social and Behavioral Sciences at the University of Arizona. Dr. Raison is internationally recognized for his studies examining novel mechanisms involved in the development and treatment of major depression and other stress-related emotional and physical conditions, as well as for his work examining the physical and behavioral effects of compassion training. The recipient of several teaching awards, Dr. Raison has received research funding from the National Institute of Mental Health, National Center for Complementary and Alternative Medicine, and the Centers for Disease Control and Prevention. Dr. Raison has received a NARSAD Independent Investigator Award and has received the Raymond Pearl Memorial Award from the Human Biology Association "in recognition of his contributions to our understanding of evolutionary biocultural origins of mental health and illness."

In addition to his academic activities, Dr. Raison is the mental health expert for CNN.com.



Autoimmune and Infectious Encephalitis

Michael Wilson, MD

*Distinguished Professor of Neurology at University of California, San Francisco (UCSF)
Neurologist, UCSF Weill Institute for Neurosciences, Department of Neurology*

Presentation Synopsis

Dr. Wilson will review the tools for differentiating between infectious and autoimmune causes of encephalitis and what they do to identify autoantibody targets in patients with autoimmune encephalitis.

Speaker Biography

Michael Wilson, MD is a Debbie and Andy Rachleff Distinguished Professor of Neurology and an Associate Professor in the UCSF Department of Neurology and Weill Institute of Neurosciences. He is a neurologist specializing in infectious and autoimmune diseases of the central nervous system. He sees patients with autoimmune diseases like multiple sclerosis as well as patients with a wide array of infectious diseases that impact the nervous system like HIV, neurocysticercosis, neurosyphilis, viral encephalitis and fungal infections like coccidiomycosis (valley fever). His laboratory uses metagenomic and immune repertoire sequencing techniques as well as phage display technologies to enhance understanding of the causes and immunopathogenesis of multiple sclerosis as well as autoimmune and infectious causes of meningoencephalitis.



Impact of the Gut Microbiome on Neuroinflammation in Mouse Models

Sarkis Mazmanian, PhD

*Luis B. and Nelly Soux Professor of Microbiology, Caltech
Investigator, Heritage Medical Research Institute*

Presentation Synopsis

The gut microbiome has been associated with effects on the brain. We have recently shown that engineering bacteria to selectively produce microbial metabolites in the gut of mice led to changes in brain activity, functional and structural connectivity in brain regions linked to emotional behavior, as well as gene expression signatures of altered oligodendrocyte function. Indeed, production of gut-derived molecules by the microbiome is associated with increased proportions of immature oligodendrocytes in mice and, accordingly, decreased myelination of neuronal axons in the brain. Furthermore, mice exposed to 4EPS display anxiety-like behaviors, reduced social activity and decreased vocalization. Thus, molecules from the gut microbiome can impact complex behaviors.

Speaker Biography

Sarkis K Mazmanian, PhD, is the Luis & Nelly Soux Professor of Microbiology in the Division of Biology & Biological Engineering at the California Institute of Technology (Caltech). He is a Phi Beta Kappa graduate from the University of California, Los Angeles, where Dr. Mazmanian also received his doctoral training in microbiology and immunology studying the mechanism by which Gram-positive pathogens anchor surface protein adhesins during bacterial infection. He was a Helen Hay

Whitney Post-doctoral Fellow at Harvard Medical School where he studied how symbiotic bacteria promote healthy maturation of the immune system. He was promoted to assistant professor at Harvard Medical School in 2006, and later that year moved to Caltech to start his independent laboratory. Dr. Mazmanian has won numerous awards including a Searle Scholar, Young Investigator of the Year at Harvard Medical School, Damon Runyon Innovation Award, was named by Discover Magazine as one of the “Best Brains in Science under 40” and recently received the MacArthur Foundation “Genius” award. His laboratory currently focuses on the study of beneficial bacterial molecules from the human gut microbiome as novel therapies for immunologic and neurologic disorders. This research has led to identification of novel drug candidates being developed for Inflammatory Bowel Disease, Autism Spectrum Disorder, and Parkinson’s disease. He is a founder of three biotech companies and serves on the Scientific Advisory Board of over a dozen companies, academic centers and not-for-profit foundations. Most importantly, Dr. Mazmanian has trained numerous students and fellows who have gone on to successful independent careers in academia, industry, and medicine.

MAY 21, 2022 AGENDA

(Times all listed in U.S. central time zone)

9:00 – 9:45am CT

Maximum of 0.75 AMA PRA Category 1 Credit(s)[™]

Use of Antibiotics in Infection Associated Neuropsychiatric Syndromes Including PANS



Mark Pasternack, MD

*Chief of Pediatric Infectious Disease, Massachusetts General Hospital
Associate Professor of Pediatrics, Massachusetts General Hospital, Harvard*

Presentation Synopsis

Dr. Pasternack will review the evolution in understanding the role of group A streptococci as a trigger for postinfectious neurobehavioral disorders, address the diversity of group A streptococci as a possible explanation to the challenge of “Why PANDAS? Why now?” and review the natural history of PANDAS and PANS and the challenges inherent in their diagnoses and management.

Speaker Biography

Mark Pasternack, MD, specializes in Pediatric Service, Infectious Disease Unit, and Chief, Pediatric Infectious Disease Unit, at Massachusetts General Hospital. Educated at Harvard Medical School, Dr. Pasternack completed his residency and clinical infectious disease fellowship at Massachusetts General Hospital and a research fellowship at the Center for Cancer Research, Massachusetts Institute of Technology. Author of numerous papers and articles for prestigious medical journals, Dr. Pasternack is an officer of the Massachusetts Infectious Diseases Society and a member of the Pediatric Infectious Disease Society as well as the Infectious Diseases Society of America. His broad clinical interests include Infectious Disease and Pediatric Infectious Disease. Dr. Pasternack has provided clinical care to PANS/PANDAS patients for over a decade and has participated in the PANS/PANDAS Research Consortium to develop clinical guidelines for the management of these patients.

Clinical and Biological Heterogeneity in An Adult Patient Cohort with Psychiatric Symptoms Enriched for Suspected Immunological Involvement



Janet Cunningham, MD

Associate Professor in the Department of Neuroscience, Associate Professor in Experimental Psychiatry, Psychiatrist, Uppsala University, Sweden

Presentation Synopsis

This talk will discuss the establishment of the Uppsala Immunopsychiatry Clinic which started as a pilot project in 2015 and has now been implemented into standard care. Illustrative cases and the high rates of CNS pathology but also heterogeneity in the data from the first 127 patients will be presented.

Speaker Biography

Janet Cunningham is an Associate Professor in Experimental Psychiatry at Uppsala University, is also affiliated to the Dept. of Neurosciences at Karolinska Institute and a board-certified specialist in Clinical Psychiatry at Uppsala University Hospital. She has an unusual background for a psychiatrist. She completed a BSc in Immunology and Microbiology with Honors at McGill University, Canada and thereafter a preclinical PhD and postdoc in Uppsala, Sweden, where she applied molecular techniques to further characterize and subgroup rare serotonin producing endocrine tumors. Prof. Cunningham shifted her focus to Psychiatry after several coinciding experiences profoundly shifted my perception of psychiatric disease and awoke my curiosity for the biological mechanisms. Prof. Cunningham leads the Immunopsychiatry team in Uppsala which aims to develop tools to differentiate adaptive from maladaptive immunological responses in treatment-resistant patients with severe psychiatric symptoms in order to identify patients for whom immunomodulation therapy will be beneficial. The hypothesis is that different types of maladaptive immunological responses include immunodeficiencies, vulnerability such as difficulty in mobilizing anti-inflammatory processes needed for inflammation resolution and autoimmunity. To ensure relevance for clinical psychiatry, research is tightly integrated with patient care at Uppsala University Hospital. Cross-sectional and longitudinal data and samples are continuously collected from daily practice and clinical trials. The strategy is to use and compare knowledge gained by in-depth analysis of individual cases and large-scale analysis of markers related to the immune system in broad patient cohorts to identify markers with variation within the patient group with potential relevance for diagnosis and clinical prognosis. The research questions have the potential to directly impact clinical practice in psychiatry. Prof. Cunningham coordinator for a professional network The Swedish Immunopsychiatry Alliance, she is a member of the Research Network, European College of Neuropsychopharmacology (ECNP) Immuno-NeuroPsychiatry work-group and is a member the Scientific and Medical Advisory Board for The European Immunopsychiatric Association (EXPAND).

15 minute break

The Immunology Underlying Autoantibody Associated CNS Diseases



Sarosh Irani, FRCP, DPhil, FEAN

Professor, University of Oxford

Head of Autoimmune Neurology Group, University of Oxford

Presentation Synopsis

Dr. Irani will discuss the clinical features and emerging immunobiology underlying autoantibody-mediated CNS disease syndromes with a focus on LGI1, CASPR2 and NMDAR-antibody encephalitis and their antigen-specific B cell populations.

Speaker Biography

Dr. Sarosh Irani is a consultant neurologist and clinician-scientist with clinical and laboratory experiences in the field of autoantibody mediated diseases of the nervous system, in particular the central nervous system. He cares for patients with these disorders and leads a research group to learn more about the origins and treatments of these diseases. He has studied the antigenic targets of autoantibodies in patients with encephalitis and epilepsies. In particular, his research has focused on LGI1, CASPR2 and the NMDA-receptor. In addition, he has been involved with projects examining autoantibodies against the GABAA-receptor, glycine receptors and aquaporin-4.

He has looked after >200 patients with these disorders and characterized their clinical responses to therapies. These findings have generated, often distinctive, clinical features which correlate well with a high likelihood of an immunotherapy-responsive condition. They have also identified novel clinical descriptions of patients with cognitive, movement and seizure disorders, in particular faciobrachial dystonic seizures – a novel autoimmune epilepsy syndrome which often responds better to immunotherapies than conventional anti-epileptic drugs.

He leads a research group combining ~15 talented clinicians, clinician-scientists and basic scientists with the aim of better understanding the causes and potential treatments of this condition. In particular, they study the role of B cell subsets in propagating autoantibody responses and the effects of antibodies in the brain. They are funded by the Wellcome Trust, Medical Research Council, British Medical Association, Association of British Neurologists and industry partners."

The Neuropathology of Autoimmune Encephalitis and PANS and Development of Specialized Brain Banks for these Disorders



Brent T. Harris, MD, PhD, FCAP

Associate Professor of Pathology and Neurology, Director of Neuropathology, Director, Georgetown Brain Bank at Georgetown University Hospital; Director, Histopathology and Tissue Shared Resource, MedStar Health/Georgetown University Medical Center

Presentation Synopsis

Dr. Harris will describe the different types of neuroimmune related diseases that have been studied by neuropathological methods and what is seen on brain biopsies or post-mortem examination and discuss 21st century brain banking techniques.

Speaker Biography

Dr. Harris is a tenured faculty member of Georgetown University with dual appointments in Neurology and Pathology. As a neuropathologist and physician-scientist Dr. Harris has clinical, research, and teaching interests in neurological and oncological diseases. He has active collaborations and research programs in his own lab in the areas of neurodegeneration and CNS neoplasia. His primary interest is in understanding how mechanisms of neuroinflammation and glial-neuronal communication influence the pathophysiology of neurological diseases. In addition to investigating disease processes, he also seeks to uncover targets for pharmacological intervention.

12:15 – 12:45pm CT

Maximum of 0.5 AMA PRA Category 1 Credit(s)[™]



Low C4B Gene Copy in Children with PANS

Agnieszka Kalinowski, MD

Clinical Instructor, Psychiatry and Behavioral Sciences, Stanford University

Presentation Synopsis

Dr. Kalinowski will present the results from the first analysis of experimentally determined C4 gene copy number variation in a cohort of 225 PANS/PANDAS patients compared to 248 controls. Fewer C4B genes are found in PANS/PANDAS patients compared to controls which is more pronounced in males. Relationships to known C4 gene variation associations will be discussed.

Speaker Biography

Dr. Agnes Kalinowski is a physician-scientist conducting translational research in schizophrenia as an Advanced Fellow in Mental Health Research at the Palo Alto VA and Department of Psychiatry and diagnosing and treating patients with schizophrenia in the INSPIRE Early Psychosis Clinic. The overarching theme of her work is understanding the initiating and perpetuating factors that result in abnormal pathology in individuals with schizophrenia. She uses a combination of clinical samples and molecular studies in model systems.

30 minute break

1:15 – 1:45pm CT

Maximum of 0.5 AMA PRA Category 1 Credit(s)[™]



Neuropsychiatric Illness Associated with Lyme and Tick-Borne Illness

Shannon Delaney, MD

*Neuropsychiatrist, Assistant Professor of Psychiatry, Columbia University Medical Center
Director, Child and Adolescent Evaluation, Lyme & Tick-borne Disease Research Center*

Presentation Synopsis

Dr. Delaney's presentation will discuss an overview of the epidemic of Lyme disease and basics regarding EM rashes and diagnostic testing, discuss literature reviewing persistent symptoms after Lyme disease, provide case vignettes highlighting neuropsychiatric symptoms after Lyme Disease, and review other tickborne illnesses such as *Borrelia miyamotoi*.

Speaker Biography

Dr. Delaney is a neuropsychiatrist at Columbia University Irving Medical Center who is co-director with Dr. Fallon of the Cohen Center for Health and Recovery from Lyme and Tickborne Diseases.

She completed her NIH-sponsored research fellowship at Columbia University in 2017. Her clinical research has focused on immune and infectious contributions to psychiatric disease, especially psychosis in children and young adults. She specializes in seeing children and adults with complex neuropsychiatric presentations, especially those with suspected Lyme disease or other tickborne diseases, as well as those with Pediatric Acute onset Neuropsychiatric Syndrome (PANS).

1:45 – 2:30pm CT

Maximum of 0.75 AMA PRA Category 1 Credit(s)[™]



Autoimmune Phenotypes in Psychiatric Disorders

Emily Severance, PhD

Assistant Professor of Pediatrics, Johns Hopkins University School of Medicine

Presentation Synopsis

Psychiatric researchers are looking beyond the central nervous system (CNS) for novel ways that the body's peripheral cellular and molecular pathways might be harnessed into effective treatments of brain disorders. The gastrointestinal tract and its resident microbiome serves as a critical hub regulating self and non-self interactions, which when dysregulated can generate pathological autoimmunity peripherally and in the brain. Within a framework of the gut-brain axis, Dr. Severance will review the role of inflammation, infectious agents, food antigens, gut dysbioses, endothelial barrier instabilities and autoantibody propagation on CNS pathologies such as neurotransmitter receptor hypofunction and complement pathway-mediated synaptic pruning. Dr. Severance will talk about the current major findings propelling the field forward and the future of translating this research to clinical application and treatments.

Speaker Biography

Dr. Emily G. Severance is an assistant professor of pediatrics at the Johns Hopkins University School of Medicine. She is a member of the Stanley Division of Developmental Neurovirology research team and has served with the Scott-Gentle Foundation of The Brain and Behavior Research Foundation and the Johns Hopkins Silvio O. Conte Center for Schizophrenia Research. As part of her ongoing research program, Dr. Severance focuses on the major gateway of the immune system, the gastrointestinal mucosa, where inflammation, food hypersensitivities, barrier defects and immune dysregulation can cause downstream brain dysfunction in people with psychiatric disorders. She is also involved in research studies of COVID-19 and the roles of other viral, bacterial and fungal pathogens in mental illness.

Dr. Severance earned her B.S. from the University of Maryland and her Ph.D. from the University of South Florida.

2:30 – 3:00pm CT

Maximum of 0.5 AMA PRA Category 1 Credit(s)[™]



PANS Cases: Through the Eyes of a Pediatrician

Cheri Standing, MD

Pediatrician, Greater Regional Health

Presentation Synopsis

Dr. Standing will present case reviews from patients she has treated at Greater Regional Health in Creston, Iowa. The PANS Clinic is in a nonacademic, clinical setting. Cases are chosen to portray a general pediatrician's perspective relating to recognizing and treating post-infectious neuropsychiatric presentations in children.

Speaker Biography

Dr. Standing is a pediatrician at Greater Regional Health in Creston Iowa. She completed a pediatric residency at Strong Memorial Hospital and fellowships in pediatric emergency medicine at Nationwide Children's Hospital and more recently Andrew Weil's integrative medicine fellowship program. She practices general pediatrics, pediatric emergency medicine and has a designated interdisciplinary PANS clinic. Dr. Severance earned her B.S. from the University of Maryland and her Ph.D. from the University of South Florida.

15 minute break

3:15 – 3:45 pm CT

Maximum of 0.5 AMA PRA Category 1 Credit(s)[™]

A New Look: Autoantibodies Against the Dopamine Receptors Define PANDAS and Sydenham Chorea



Chandra Menendez, PhD

Postdoctoral Research Fellow, Microbiology & Immunology, Madeleine Cunningham Laboratory, University of Oklahoma Health Sciences Center

Presentation Synopsis

Basal ganglia encephalitis (BGE) is poorly understood and is associated with infection-related neurologic and neuropsychiatric sequelae. We provide understanding of BGE on a new level, and identify two immune subtypes of BGE as Sydenham Chorea (SC) and pediatric autoimmune neuropsychiatric disorders associated with group A streptococcal infections (PANDAS). In our study, neuropsychiatric syndromes were associated with autoantibodies that activated the dopamine D1 receptor (D1R) and choreatic movement disorders were associated with the dopamine D2 receptor (D2R). We describe a novel mechanism for behavioral dysfunction in neuropsychiatric disturbances in BGE where autoantibodies target D1R, lead to dopaminergic signaling abnormalities, and drug-like enhancement of signaling mediated by dopamine. Our findings shed a new perspective on distinguishing BGE subtypes and offer insight into alternative therapies.

Speaker Biography

Dr. Chandra Menendez is a Postdoctoral Fellow in the Department of Microbiology and Immunology at the University of Oklahoma Health Sciences Center in Dr. Madeleine Cunningham's Laboratory. Her primary research focus is to understand the autoimmune pathophysiology of neuropsychiatric disorders. Her neuroimmunology and infectious disease background provide a unique angle aimed at investigating the relationship between neural inflammation-mediated autoimmunity and cognitive and/or behavioral disorders in children. She is currently exploring cross-reactive humoral responses and their biological impact in neuropsychiatric disorders including Sydenham Chorea and Pediatric Autoimmune Neuropsychiatric Disorders Associated with Streptococcal Infections (PANDAS).

Dr. Menendez aspires to continue the legacy of Dr. Cunningham's impressive contribution to science, commitment to mentorship, and her pioneering work in autoimmune-related mechanisms in infectious disease.



Use of TMS in OCD

Sandeep Vaishnavi, MD, PhD

Neuropsychiatrist, Faculty, Duke Institute of Brain Sciences

Adjunct Associate, Department of Medicine, Duke University School of Medicine

Presentation Synopsis

Transcranial Magnetic Stimulation (TMS) is a neuromodulatory technology that works by stimulating or inhibiting circuits in the brain. OCD is currently thought of as a circuit disorder, with dysfunction with the CSTC (cortico-striate-thalamic-cortical) circuit. In fact, TMS is now FDA-cleared for adults with OCD due to effects on the CSTC circuit. Given that one of the tenets of neuropsychiatry is that circuit dysfunction, no matter what the cause, can be modulated and improve underlying symptoms, the use of TMS in children with autoimmune-induced OCD is an emerging possibility.

Speaker Biography

Sandeep Vaishnavi, MD, PhD is the Medical Director of the MindPath Care Centers Clinical Trials Institute and the Medical Director of the MindPath Care Centers Interventional Psychiatry/Brain Stimulation Program. The interventional psychiatry/brain stimulation program at MindPath currently encompasses 7 TMS (transcranial magnetic stimulation) machines in 6 locations, along with intranasal esketamine treatment. He was selected in 2021 to be on the Education Committee of the Clinical TMS Society, and he has presented his research on TMS at the American Neuropsychiatric Association and Clinical TMS annual meetings.

In his role in clinical trials, he and his team have been awarded significant federal grant funding. His current research is funded by the U.S. Department of Defense and the National Institutes of Health, as well as the pharmaceutical industry. He has regularly published in the fields of brain stimulation, resilience research, and traumatic brain injury.

His book, *The Traumatized Brain: A Family Guide to Understanding Mood, Memory, and Behavior after Brain Injury*, has been as high as #3 nationally in the Amazon rankings of best sellers in neuroscience. He has been invited by the Johns Hopkins University Press to write a new edition of the book (for publication in 2021). Additionally, he has written 5 book chapters and 53 peer-reviewed scientific papers and research conference abstracts. One of his papers was awarded the 2018 Dorfman Journal Paper Award for Original Research Report by the Academy of Psychosomatic Medicine. He has been referenced in 18 magazines and newspapers, and he has additionally been interviewed for 19 tv shows, radio shows, magazines, or podcasts. He is a faculty member of the Duke Institute for Brain Sciences, and he is an Adjunct Associate in the Department of Medicine at Duke University.

He is certified in Behavioral Neurology & Neuropsychiatry by the United Council for Neurologic Subspecialties. He is also certified in Psychiatry by the American Board of Psychiatry and Neurology. His education includes a fellowship at Johns Hopkins and a residency at Duke University. He has worked as a neuropsychiatrist at the Preston Robert Tisch Brain Tumor Center at Duke University and the Alexian Brothers Neurosciences Institute, now known as the Amita Health Neurosciences Institute (in Chicago). While at Duke, he has received the Clinical Service Award twice. He started at MindPath as the founder of the Neuropsychiatric Clinic before founding the brain stimulation and clinical trials programs.

15 minute break



PTSD in Caregivers of Children with PANS

Margo Thienemann, MD

*Clinical Professor of Psychiatry, Stanford University School of Medicine
Director, Stanford PANS Clinic*

Presentation Synopsis

Without parents to seek, secure and coordinate medical care, children with neuroimmune disorders would not get appropriate treatment, but also risk getting ineffective, inappropriate treatment. We will discuss the caregiving burden parents carry and isolation parents report. Some parents have become clinically anxious and depressed. Hoping to address isolation, anxiety, depression, and reactions to situations parents have described as traumatic, we have piloted, studied, and bootstrapped group psychotherapy protocols for parents. We will present our post-group findings, lessons learned, and our future directions for helping parents: critical parts of ill children's care.

Speaker Biography

Dr. Margo Thienemann is a clinical professor of psychiatry and behavioral sciences at Stanford. She co-directs Lucile Packard's PANS clinic, the first in the country exclusively devoted to PANS. She developed an interest in PANS after directing the Obsessive-Compulsive Disorder Clinic at Stanford in the Division of Child and Adolescent Psychiatry. Dr. Thienemann has enjoyed, over the course of her career, watching the field of psychiatry search more and more into the biological underpinnings of mental health disorders in hopes that we can address their causes, in addition to their symptoms.



T cells and Neurodegeneration

Naresha Saligrama, PhD

*Assistant Professor of Neurology, Washington University in St. Louis
Andrew M. and Jane M. Bursky Center for Human Immunology & Immunotherapy Programs*

Presentation Synopsis

Experimental autoimmune encephalomyelitis (EAE) is a model for multiple sclerosis (MS). We show that EAE induction generates successive waves of clonally expanded CD4, CD8 and $\gamma\delta$ T cells in the blood and central nervous system, like gluten-challenge studies of patients with coeliac disease (CeD). We also find major expansions of CD8 T cells in patients with MS. In EAE, we find that most expanded CD4 T cells are specific for the myelin peptide MOG35-55. By contrast, surrogate peptides derived from a yeast peptide major histocompatibility complex library of some of the clonally expanded CD8 T cells inhibit disease by suppressing the proliferation of MOG-specific CD4 T cells suggesting that the induction of autoreactive CD4 T cells triggers an opposing mobilization of regulatory CD8 T cells. In addition, we find that CD8 T cells expressing inhibitory killer cell immunoglobulin-like receptors (KIRs) are the human equivalent of Ly49+CD8 regulatory T cells in mice and are increased in the blood and inflamed tissues of patients with several autoimmune diseases. Moreover, these CD8 T cells efficiently eliminated pathogenic gliadin specific CD4 T cells from CeD patients' leukocytes in vitro. We also find elevated levels of KIR+CD8 T cells in COVID-19 patients, which correlated with disease severity and vasculitis. Selective deletion of Ly49+CD8 T cells in virus-infected mice led to autoimmunity post infection. Overall, our results indicate that in both species, these regulatory CD8 T cells act uniquely to regulate pathogenic T cells in autoimmune and infectious diseases.

Speaker Biography

Dr. Saligrama is an Assistant Professor in the Departments of Neurology and Pathology and Immunology at Washington University School of Medicine in St. Louis. He is also a member of The Bursky Center for Human Immunology and Immunotherapy Programs, The Hope Center for Neurological Disorders, The Siteman Cancer Center, and The Knight Alzheimer's Disease Research Center. Dr. Saligrama is a recipient of National Multiple Sclerosis Society career transition award, Carol and Gene Ludwig and Edward Jr. Mallinckrodt New Investigator Awards. Primary focus of his laboratory is to understand the adaptive immune responses in human neuroinflammatory and neurodegenerative conditions. His laboratory uses yeast display, single cell immune receptor sequencing and high dimensional multiparameter flow cytometry to interrogate immune responses in various human neurological conditions and in clinical trial settings.

5:30pm CT

Closing

Activity Director

- Anna Conkey
Executive Director and Founder, Neuroimmune Foundation

Planning Committee Member

- Amy Malik, MD

Hosts/Moderators

- Anna Conkey
Executive Director and Founder, Neuroimmune Foundation
- Lawrence Steinman, MD
Professor of Neurology and Pediatrics, Stanford University School of Medicine
- Eyal Muscal, MD
Section Chief, Pediatric Rheumatology, Baylor College of Medicine

Dr. Lawrence Steinman is Professor of Neurology, Neurological Sciences and Pediatrics at Stanford University. He was Chair of the Stanford Program in Immunology from 2001 to 2011. His research focuses on what provokes relapses and remissions in multiple sclerosis (MS), and on the quest for antigen specific therapy in autoimmune disease.

Steinman was senior author on the 1992 Nature article that led to the drug Tysabri, approved for MS and Crohn's disease. He is currently applying insights from Tysabri to develop new therapies for neurodegenerative diseases, aimed at blocking macrophages and microglia from eating neurons and axons "in danger."

Dr. Steinman graduated from Dartmouth College, Magna Cum Laude in Physics. His MD is from Harvard Medical School. He was a post-doctoral fellow in chemical immunology at the Weizmann Institute of Science. After neurology residency he remained on the faculty in 1980. He has received numerous honors, including the John M. Dystel Prize in 2004, the Javits Neuroscience Investigator Award from the NINDS twice, the Charcot Prize in MS research, and the Cerami Prize in Translational Medicine. Steinman is a member of the National Academy of Sciences, and the National Academy of Medicine.

Dr. Steinman cofounded several biotech companies, including Neurocrine, Atreca, 180 Life Sciences, 5 Integrin LLC, and Pasithea. He was a Director of Centocor from 1988 until its sale to Johnson and Johnson. He is a Director of BioAtla, an immune-oncology company, co-Executive Chair of 180 Life Sciences, and Executive Chair of Pasithea.

Dr. Eyal Muscal is a pediatric rheumatologist with a MS Degree in Clinical Research whose activities include patient care, fellowship education, quality improvement, and clinical research. His research, quality improvement, and clinical interests include neurologic manifestations of systemic autoimmune disorders (primarily autoimmune encephalitis, NPSLE, APS, and CNS vasculitis), systemic vasculitides, and patient-powered research in rare diseases. He is the Childhood Arthritis and Rheumatology Research Alliance (CARRA) registry PI and co-director of the CARRA autoimmune encephalitis work group.

An increased portion of his clinical effort is spent on standardizing and enhancing care of children with inflammatory brain disorders. As part of this effort, he obtained additional training in advanced QI. During the COVID-19 pandemic he has been one of my section's champions on the pathophysiology and treatment of MIS-C. This has included providing educational sessions at his institution and also to international audiences. He has coordinated evidence-based guidelines for MIS-C at our institution and has insured timely, rational, and multi-disciplinary MIS-C care in both general floor and critical care areas. He is also the rheumatology lead for a joint cardiology-rheumatology clinic that follows MIS-C patients after hospital discharge. He is well suited to support institutional efforts regarding COVID-19 and MIS-C care and specifically the Artificial Intelligence COVID-19 Risk Assessment for Kids (AICORE-kids) program.

We are very grateful to the sponsors of this event who provided generous educational support including:

- University of Wisconsin
- Unity Point Health
- Quartz
- Meriter

Learning and Outcome Objectives

- Learn how to effectively treat inflammatory brain conditions as well as the circumstances in which each treatment is appropriate.
- Learn the clinical work up required to accurately diagnose immune mediated causes of neurologic and psychiatric deteriorations.
- Recognize that neuropsychiatric sequelae can result from infections, autoimmune, and inflammatory conditions.
- Accurately diagnose various inflammatory brain conditions.
- Describe appropriate treatments for patients with inflammatory brain conditions.
- Identify the various immune and inflammatory markers that can present in patients with inflammatory brain conditions.
- Report the cognitive and psychiatric effects seen in some patients following COVID-19.

Accreditation /Credit Designation Statement

This activity has been planned and implemented in accordance with the accreditation requirements and policies of the Accreditation Council for Continuing Medical Education (ACCME) through the joint providership of Wisconsin Medical Society and Neuroimmune Foundation. The Wisconsin Medical Society is accredited by the ACCME to provide continuing medical education for physicians.

The Wisconsin Medical Society designates this live activity for a maximum of 14.5 *AMA PRA Category 1 Credit(s)*[™]. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

Conflict of Interest Disclosure Statement

All Faculty, CME Planning Committee Members, and the CME Office Reviewers have disclosed that they do not have any relevant financial relationships with commercial interests that could constitute a conflict of interest concerning this CME activity.



neuroimmune.org

Neuroimmune Foundation is a 501(c)(3) non-profit organization dedicated to dramatically accelerating physician education of PANS, PANDAS, and encephalitis; significantly improving outcomes for individuals impacted by these disorders; providing meaningful support to families during their darkest days; and catalyzing research at an unprecedented pace.