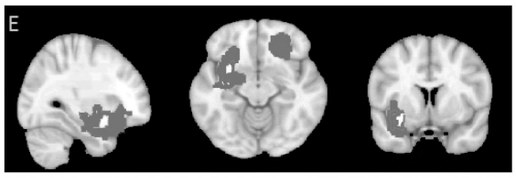

PET scan showing areas of decreased cerebral metabolism in patients with post-treatment Lyme syndrome(Fallon at al)
Thanks to Brian A. Fallon, MD Columbia University Lyme & Tick-Borne Diseases Research Center

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Lyme & Other Tick-Borne Diseases: Science Bridging the Gap

Jointly Provided by:

COLUMBIA UNIVERSITY
College of Physicians and Surgeons

LYME DISEASE ASSOCIATION, INC.

Saturday, Nov. 14 & Sunday, Nov. 15, 2015

Providence-Warwick Crown Plaza
Warwick, Rhode Island

Accreditation Statement 2015 Columbia/LDA CME Lyme Conference

AMA Credit Designation Statement
The College of Physicians and Surgeons designates this live activity for a maximum of 13.25 *AMA PRA Category 1 Credits* ™. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

Accreditation
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 the College of Physicians and Surgeons of Columbia University and the Lyme Disease Association. The College of Physicians and Surgeons of Columbia University is accredited by the ACCME to provide continuing medical education for physicians.

Program Description
An educational, fully CME accredited program on Lyme & other tick-borne diseases for health care providers. This program is designed as a scientific update on the latest research advances on Lyme disease to help clarify the current state-of-the-art and point to new directions in research and clinical care.

Target Audience
The target population is physicians from all specialties, nurses, psychologists, scientists, public health workers. It is also open to the public, and Lyme disease educators generally attend. The geographic area being reached is nationwide. No special background is required for effective participation, although those whose practices contain a high proportion of Lyme disease patients and those whose research concentrates on *Borrelia burgdorferi* will receive the most benefit.

Learning Objectives
Practitioner should be better able to identify the multiple manifestations of Lyme disease. Practitioners should be more open-minded to consider emergence of dormant infection in resurging symptoms. Practitioners should better understand that persistent pain, fatigue, and cognitive problems may be secondary to ongoing immune activation. Awareness that ticks may transmit viruses and not just bacteria. Awareness that new vaccines have been tested in animals and show promise in humans.

GIVE
STEVEN & ALEXANDRA COHEN FOUNDATION

The LDA received educational gift support for this conference from the **Steven & Alexandra Cohen Foundation**

The LDA received a donation for commercial support for this conference from **IGeneX, Inc., CA**

Scholarships Offered
Lyme Disease Association, Inc. (LDA)
is offering scholarships to the conference to eligible medical students, residents, post-doctoral candidates, fellows, veterinarians with equivalent status to the above, and Nurse Practitioner candidates in a doctoral program.

Conference details and registration can be found on the LDA website
www.LymeDiseaseAssociation.org

Lyme & Other Tick-Borne Diseases: Science Bridging the Gap

An educational and networking event featuring prominent speakers on tick-borne diseases

Columbia University & Lyme Disease Association, Inc. Conference Faculty

AGENDA – SATURDAY, NOVEMBER 14, 2015

Registration/Exhibits/Continental Breakfast

Patricia V. Smith, President, Lyme Disease Association, Inc., Conference Planner, Conference Organizing Committee
Welcome, Remarks / Brief Overview of Lyme Spread / Introduction Session Facilitator

Brian A. Fallon, MD, MPH; Conference Director, Conference Organizing Committee

William Robinson, MD, PhD Keynote
Associate Professor, Stanford University, CA
Associate Editor, *Arthritis and Rheumatology* and also *Clinical Immunology*
"Next Generation Diagnostics for Lyme Disease"

Kim Lewis, PhD
University Distinguished Professor,
Director: Antimicrobial Discovery Center, Northeastern University, MA
"*B. Burgdorferi* Persisters and Their Eradication"

Ying Zhang, MD, PhD
Professor Bloomberg School of Public Health, Johns Hopkins University, MD
"Borrelia Persister Drugs: Implications for Improved Treatment"

Morning Discussion Panel

Coffee Break

TBA

Geeta Ramesh, PHD
Primate Center Scientist, Tulane National Primate Research Center, LA
"A Role for Inflammation in the Pathogenesis of Lyme Neuroborreliosis"

Tim G. Brooks, MA, MB, BChir, LMSSA, MSc, FRCPath, FRSPH
Clinical Services Director, Rare & Imported Pathogens Laboratory,
Public Health England,UK
"Lyme Borreliosis in England"

Lunch

Richard T. Marconi, PhD Conference Co-Director, Organizing Committee, Saturday Afternoon Facilitator

Hassan M. Minhas, MD, MB, BS
Department of Law and Psychiatry, Yale School of Medicine
"Suicide & Lyme Neuroborreliosis: Case Report"

Klemen Strle, MD
Instructor of Medicine, Harvard Medical School
Assistant in Immunology, Massachusetts General Hospital
"Microbial and Host Factors in Immune Responses in Lyme Disease"

Brian A. Fallon, MD, MPH
Professor of Psychiatry, Columbia University College of Physician & Surgeons
Director, Columbia Lyme and Tick-Borne Diseases Research Center
Director, Center for Study of Neuroinflammatory Disorders & Biobehavioral Med., NYSPI
"PANDAS, PANS, & Lyme"

Midafternoon Discussion Panel

Afternoon Coffee Break

Philip J. Molloy, MD
Assistant Clinical Professor of Medicine,Tufts University School of Medicine MA
Medical Director, IMUGEN Diagnostic Reference Laboratory, NY
Laboratory Director, PMG Laboratories, MA
Staff, Beth Israel Deaconess, Plymouth, MA
"Borrella miyamotoi"

Richard T. Marconi, PhD
Professor in the School of Medicine, Virginia Commonwealth University Medical Center
"Chimeric Linear Epitope Based Vaccines for Lyme Disease & Other Tick-Borne Diseases: Progress Report on The Road to a New Human Vaccine"

Afternoon Discussion Panel

NETWORKING RECEPTION

AGENDA – SUNDAY, NOVEMBER 15, 2015

(Breakfast on you own)

Registration/Exhibits

Steven Schutzer, MD, Sunday Facilitator
Professor of Medicine
New Jersey Medical School, Rutgers University

John N. Aucott, MD
Assistant Professor of Medicine, Johns Hopkins University
Director, Johns Hopkins Rheumatology Lyme Disease Clinical Research Center
"Serum Cytokine and Chemokine Biomarkers for Post-Treatment Lyme Disease"

Edward B. Breitschwerdt, DVM
Professor of Medicine & Infectious Diseases, North Carolina State University College of Veterinary Medicine (NCSU-CVM)
Adjunct Professor of Medicine at Duke University Medical Center
Director, Intracellular Pathogens Research Laboratory, Center for Comparative Medicine & Translational Research, NCSU-VCM
Director Vector Borne Diseases Diagnostic Laboratory
Director, NCSU-CVM Biosafety Level 3 Laboratory "Bartonellosis"

Charles Chiu, MD, PhD
Associate Professor, Laboratory Medicine and Medicine / Infectious Diseases
Director, UCSF-Abbott Viral Diagnostics and Discovery Center
Associate Director, UCSF Clinical Microbiology Laboratory
UCSF School of Medicine
"Genomic Investigations of Lyme Disease"

Erin McGintee, MD
Adult & Pediatric Allergy/Clinical Immunology Practice, Southampton, NY
Southampton Hospital Tick-Borne Disease Resource Center's Medical Advisory Panel
"Alpha-Gal Meat Allergy after Lone Star Tick Bite"

Morning Discussion Panel

Break

Point–Counterpoint: Possibility of Sexual Transmission

Raphael B. Stricker, MD
Medical Director, Union Square Medical Associates, CA
Point & Counterpoint: "Evidence Suggests the Potential for Sexual Transmission"

Sam T. Donta, MD
Infectious Disease Practice (Ret. 5/15)
Consultant, Infectious Diseases, at Falmouth Hospital, MA
Point & Counterpoint:"Evidence Suggests Lyme is Not Sexually Transmissable"

Discussion/Q & A on Sexual Transmission

William V. Padula, OD, DPNAP, FAAO, FNORA
Pennsylvania College of Optometry, adjunct faculty
Rehabilitation Hospital of CT & Gaylord Hospital CT, staff appointments
"Current Research Implications Regarding the Consequences of Tick-Borne Disease on Vision and Visual Processing"

Richard S. Ostfeld, PhD
Senior Scientist, Cary Institute of Ecosystem Studies, NY
Editorial Boards of *Ecology Letters,* and *Vector-borne and Zoonotic Diseases*
"Impact of Climate Change & Loss of Biodiversity on Ticks"

Afternoon Discussion Panel

COLUMBIA UNIVERSITY
College of Physicians and Surgeons

LYME DISEASE ASSOCIATION, INC.

Faculty Presentation Summaries

William Robinson, MD, PhD — "Next Generation Diagnostics for Lyme Disease"
We are developing multiplex assays for the early and accurate diagnosis of *B. burgdorferi* infection, and for characterizing inflammatory responses in post-treatment Lyme disease syndrome (PTLDS). We are also sequencing B and T cell repertoires in acute *B. burgdorferi* infection and PTLDS, to elucidate the targets of the immune responses in these conditions. Our results from these studies will be presented.

Kim Lewis, PhD — "*B. Burgdorferi* Persisters and Their Eradication"
We examined the ability of *B. burgdorferi* to form persisters. Killing of growing cultures of *B. burgdorferi* with antibiotics used to treat the disease was distinctly biphasic, with a small subpopulation of surviving cells. Upon regrowth, these cells formed a new subpopulation of antibiotic-tolerant cells, indicating that these are persisters rather than resistant mutants. The level of persisters increased sharply as the culture transitioned from exponential to stationary phase. Combinations of antibiotics did not improve killing. Daptomycin, a membrane-active bactericidal antibiotic, killed stationary phase cells, but not persisters. Mitomycin C, an anti-cancer agent that forms adducts with DNA, killed persisters and eradicated both growing and stationary cultures of *B. burgdorferi*. Finally, we examined the ability of pulse-dosing an antibiotic to eliminate persisters. After addition of ceftriaxone, the antibiotic was washed away, surviving persisters were allowed to resuscitate, and antibiotic was added again. Four pulse-doses of ceftriaxone killed persisters, eradicating all live bacteria in the culture.

Ying Zhang, MD, PhD — "Borrelia Persister Drugs: Implications for Improved Treatment"
The problem of persistence in Lyme disease and the problem of current Lyme antibiotics will be discussed. New drug candidates from FDA drug library and NCI compound libraries that have activity against Borrelia persisters will be presented. The effect of drug combinations to more effectively eradicate Borrelia persisters will be presented. Our data indicate three drug combinations are more effective at eradicating the more resistant form of Borrelia persisters, i.e. microcolonies, than single drugs and two drug combinations in vitro. The implications of these findings for more effective treatment of Lyme disease will be discussed.

Geeta Ramesh, PhD — "A Role for Inflammation in the Pathogenesis of Lyme Neuroborreliosis"
In humans, Lyme neuroborreliosis may present most commonly as meningitis, cranial neuritis, and/or acute radiculoneuritis. Our central hypothesis is that *Borrelia burgdorferi* induces inflammatory mediators in glial and neuronal cells, and contributes to immune activation. This inflammatory context potentiates glial and neuronal damage and dysfunction. A causal role for inflammation in the pathogenesis of Lyme neuroborreliosis was assessed by evaluating inflammatory changes in the central nervous system, spinal nerves, and dorsal root ganglia, in rhesus macaques that were inoculated intrathecally with live *B. burgdorferi* and treated with one of two anti-inflammatory drugs, dexamethasone or meloxicam, or left untreated. The results of these evaluations will be presented.

Tim G. Brooks, MA, MB, BChir, LMSSA, MSc, FRCPath, FRSPH — "Lyme Borreliosis in England"
The incidence of Lyme Disease in the UK is lower than in Europe or the eastern US, but is slowly rising with around 1200 laboratory confirmed cases a year and much larger proportion who treated empirically by family doctors. The disease is present all over the country, and can be found in parks on the outskirts of cities as well as urban gardens, but most transmission occurs in well publicised areas of southern England and Scotland, Roughly 60% of cases are caused by *Borrelia garinii*, 30% by *B. afzelii* and less than 10%by *B. burgdorferisenso stricto.* Neurological disease is relatively common as *B. garinii,* and to a lesser extent, *B. afzelii*, have a strong neurotropism, and may be the primary presentation in up to 30% of cases without any history of a rash. Public Health England provide diagnostic testing services and a clinical advice line, and are working with the University of Liverpool to develop improved diagnostic tests, including the use of more sensitive PCR techniques and proteomics. Treatment regimens follow established best practice, and difficult cases are usually referred to infectious disease specialists or neurologists. The main patient advocacy group is Lyme Disease Action, who provide some excellent literature and a support line for patients based on the available evidence.

Hassan M. Minhas, MD, MB, BS — "Suicide & Lyme Neuroborreliosis: Case Report"
This is a case report on a patient who presented with drastic and non-treatment responsive psychiatric symptoms. On investigation, the patient was found to have Lyme neuroborreliosis, and his psychiatric symptoms improved with intravenous antibiotic treatment.

Klemen Strle, MD — "Microbial and Host Factors in Immune Responses in Lyme Disease"
Because *Borrelia burgdorferi* spirochetes do not produce any known toxins, the clinical manifestations of the disease are thought to result from the host immune response to infection. This presentation will summarize our findings on the inflammatory immune responses in patients with early or late manifestations of Lyme disease. Moreover, we will discuss the role of a particularly virulent *B. burgdorferi* strain and a polymorphism in the host immune gene that lead to greater inflammatory immune response, more symptomatic early infection and greater susceptibility for developing antibiotic-refractory Lyme arthritis. Thus, specific microbial and host factors may set the stage for the type of immune responses that are associated with more severe clinical manifestations of Lyme disease, including the possibility for post-Lyme syndromes.

Brian A. Fallon, MD, MPH — "PANDAS, PANS, & Lyme"
Dr. Fallon will address the latest developments in post-infectious neuropsychiatric disorders, focusing in particular on disorders occurring after strep in children (PANDAS) and disorders occurring after other microbial (e.g, B.burgdorferi) infectious triggers (PANS). Controversial aspects of these illnesses will be addressed, as will various treatment approaches. Finally, new findings will be presented from a joint study with Dr. Madeleine Cunningham of 200 individuals with a history of Lyme disease (various stages) who were assessed using the Cunningham Panel of anti-neuronal antibodies and the Cam Kinase Assay.

Philip J. Molloy, MD — "Borrella miyamotoi"
Borrelia miyamotoi is an important emerging tick-borne pathogen, transmitted to humans by deer ticks. The first known case in North America occurred in 2012, and it is increasingly being recognized in the northeastern United States. Dr. Molloy and colleagues have recently published (Annals Int Med July 23, 2015) a case series describing 51 patients with acute Borrelia miyamotoi infection; he personally evaluated and managed 13 of these patients, and was involved with the development of laboratory tests for this agent. His presentation will summarize its current epidemiology, and the clinical and laboratory findings in these patients.

Richard T. Marconi, PhD
"Chimeric Linear Epitope Based Vaccines for Lyme Disease & Other Tick-Borne Diseases: Progress Report on The Road to a New Human Vaccine"
My laboratory has developed a new vaccine technology that is being applied in the design and construction of a novel human Lyme disease vaccine. The technology centers around the use of linear, protective epitope based-chimeric proteins that we refer to as chimeritopes. The efficacy of our chimeritope technology has been established in animal models. Progress toward the development of a human vaccine for Lyme disease will be discussed.

John N. Aucott, MD — "Serum Cytokine and Chemokine Biomarkers for Post-Treatment Lyme Disease"
Serum cytokine and chemokine biomarkers have been shown to be elevated in acute Lyme disease. Levels of most cytokines and chemokine fall to normal values after initial antibiotic treatment of early Lyme disease. However, persistent elevation of these biomarkers may provide evidence of ongoing host inflammation after standard antibiotic therapy. These biomarkers of ongoing inflammation may prove to be useful in monitoring response to therapy and identifying those at risk of chronic symptoms who may require more extensive treatment.

Edward B. Breitschwerdt, DVM — "Bartonellosis"
Bartonellosis, caused by an expanding number of recently discovered *Bartonella* species, is a zoonotic infectious disease of worldwide distribution. Over 30 *Bartonella* species, of which 17 have been associated with an expanding spectrum of animal and human diseases, are transmitted by arthropod vectors, including fleas, lice, mites, sand flies and ticks. Advances in diagnostic techniques have facilitated documentation of chronic bloodstream infections with *Bartonella* species in healthy and sick animals, and in immunocompetent and immunocompromised human patients. This lecture will emphasize the medical importance of *Bartonella* species as a cause of disease in animals and human patients and the benefits of using a One Health approach to this emerging infectious disease.

Charles Chiu, MD, PhD — "Genomic Investigations of Lyme Disease"
Lyme disease, the most common tick-borne illness in the United States, is an acute febrile illness caused by the bacterium *Borrelia burgdorferi*, and up to 20% of infected patients may exhibit lingering symptoms despite appropriate treatment with antibiotics, a condition known as post-treatment Lyme disease syndrome (PTLDS). Current diagnostics for Lyme disease and other tick-borne illnesses in the acute setting are inadequate due to the low sensitivity of direct *Borrelia* detection in the blood, the "window period" between acute infection and the appearance of detectable antibodies, and the lack of comprehensive testing to identify all vector-borne infectious agents. To address these challenges, we are harnessing genomics to develop new assays for diagnosis of Lyme disease and Lyme-like illnesses. These include a microarray-based platform called the ArthroChip, a metagenomics deep sequencing platform, and a Lyme disease gene expression panel obtained by transcriptome profiling of patients. Our findings also include the discovery of a persistent and distinct gene expression signature in Lyme disease and the uncovering of multiple, previously undescribed pathways and genes that may play key roles in the progression of Lyme-infected patients to PTLDS.

Erin McGintee, MD
Board certified in Allergy and Immunology, Dr. McGintee will discuss from a clinical perspective the Alpha-gal meat allergy which may be triggered by the bite of the *Amblyomma americanum*, lone star tick.

Ralph B. Stricker, MD — Point & Counterpoint: "Evidence Suggests the Potential for Sexual Transmission"
Recent reports indicate that more than 300,000 cases of Lyme disease are diagnosed yearly in the USA. Preliminary clinical, epidemiological and immunological studies in animals and humans suggest that infection with the Lyme spirochete *Borrelia burgdorferi* could be transmitted via intimate contact without a tick vector. Culture, immunohistochemical and molecular studies of semen and vaginal secretions from Lyme disease patients have demonstrated live *Borrelia* spirochetes in these secretions. The presence of viable *Borrelia* spirochetes in genital secretions suggests that Lyme disease could be transmitted by intimate contact from person to person.

Sam T. Donta, MD — Point & Counterpoint: "Evidence Suggests Lyme is Not Sexually Transmissable"
Based on analyses of epidemiological and clinical data, it is most unlikely that Lyme disease can be sexually transmitted. This opinion is reinforced as well by known transmission data from other vector-borne and human to human infectious diseases. Specific information will be provided during the presentation.

William V. Padula, OD, DPNAP, FAAO, FNORA
"Current Research Implications Regarding the Consequences of Tick-Borne Disease on Vision and Visual Processing"
This is the second phase of a research study to evaluate the effect on Visual Evoked Potential (VEP) following treating subjects with chronic tick borne disease in the Experimental Group compared to a Control Group with base in prisms and bi-nasal occlusion. Phase I of the study documented that subjects with tick borne disease demonstrated a statistically significant negative deflection in the N-75 amplitude. Phase II of this study documents that when base in prisms and bi-nasal occlusion were introduced to subjects in the Experimental and Control Groups, subjects in the Experimental Group demonstrated a statistically significant reduction in the negative deflection of the N-75 and there was no difference in the Control Group. The importance of this research is to document that the negative deflection of the N-75 is indicative of a spatial visual processing dysfunction. A spatial visual processing dysfunction often causes symptoms of eyestrain, headaches, spatial disorientation, light sensitivity and blur. The Phase II of the research demonstrates that base in prisms and bi-nasal occlusion are effective to improve visual processing resulting in a reduction of symptoms and improved visual function.

Richard S. Ostfeldt, PhD — "Impact of Climate Change & Loss of Biodiversity on Ticks"
Blacklegged ticks transmit the agents of Lyme disease, human babesiosis, and granulocytic anaplasmosis throughout large parts of eastern and central North America. Ticks hatch uninfected and must acquire these pathogens from reservoir hosts during their larval blood meal in order to become dangerous to humans when they feed as nymphs. Field and lab studies demonstrate that white-footed mice, eastern chipmunks, and short-tailed shrews are the hosts most efficient at transmitting all three pathogens to larval ticks. The common source of infection – small mammals – for all three pathogens has critical implications for understanding and managing human risk of exposure. Biodiversity loss increases risk by increasing the abundance and impact of these small mammals. In addition, risk of human exposure can be predicted based on the local abundance of predators such as foxes and coyotes, and also based on whether oak trees have recently produced a bumper crop of acorns.