

... Moving TMJ Research into the 21st Century

SEVENTH SCIENTIFIC MEETING  
OF THE TMJ ASSOCIATION

*Genetic, Epigenetic, and Mechanistic Studies  
of Temporomandibular Disorders and Overlapping Pain Conditions*

Federation of American Societies for Experimental Biology (FASEB)  
Bethesda, Maryland  
September 7–9, 2014



This project is supported by Grant Number 1U13DE024691-01  
from the National Institute of Dental and Craniofacial Research

The theme of the seventh scientific meeting builds upon evidence from the six previous meetings demonstrating that Temporomandibular Disorders (TMD) are a complex family of conditions influenced by genetics, sex, environmental and behavioral factors. These mediate the vulnerability of patients to TMD many of whom will manifest other chronic pain conditions beyond their jaw and muscle problems. The seventh meeting focuses on epigenetic and genetic factors in TMD and their overlapping pain conditions. These include chronic headache, endometriosis, fibromyalgia, interstitial cystitis/painful bladder syndrome, irritable bowel syndrome, low back pain, myalgic encephalomyelitis/chronic fatigue syndrome, and vulvodynia.

## The TMJ Association Scientific Advisory Board

*Chairman*

**Allen W. Cowley, Jr., Ph.D.**

Medical College of Wisconsin, Milwaukee, WI

**Kyriacos A. Athanasiou, Ph.D., P.E.**

University of California Davis, Davis, CA

**David B. Burr, Ph.D.**

Indiana University School of Medicine, Indianapolis, IN

**Christine B. Chung, M.D.**

University of California, San Diego, San Diego, CA

**Ronald Dubner, D.D.S., Ph.D.**

University of Maryland Dental School, Baltimore, MD

**Julie Glowacki, Ph.D.**

Harvard School of Dental Medicine, Harvard Medical School, Boston, MA

**Stephen L. Gordon, Ph.D.**

Gordon BioMedical Consulting, LLC, Cary, NC

**Howard J. Jacob, Ph.D.**

Medical College of Wisconsin, Milwaukee, WI

**Jon D. Levine, M.D., Ph.D.**

University of California, San Francisco, San Francisco, CA

**William Maixner, D.D.S., Ph.D.**

University of North Carolina at Chapel Hill, Chapel Hill, NC

**J. Edward Puzas, Ph.D.**

University of Rochester, Rochester, NY

**Anthony Ratcliffe, Ph.D.**

Synthasome, Inc., San Diego, CA

**Christian S. Stohler, D.M.D., Dr. Med. Dent.**

Columbia University College of Dental Medicine, New York, NY

**John T. Watson, Ph.D.**

University of California, San Diego, La Jolla, CA

# Genetic, Epigenetic, and Mechanistic Studies of Temporomandibular Disorders and Overlapping Pain Conditions

Sunday, September 7, 2014

- 3:00 – 3:30 p.m.     **Welcome and remarks**  
Terrie Cowley, President and Co-founder, The TMJ Association, Milwaukee, WI  
Co-founder, Chronic Pain Research Alliance
- Allen W. Cowley, Jr., Ph.D., Program Committee Chairman  
Medical College of Wisconsin, Milwaukee, WI
- National Institutes of Health welcome and remarks**  
Lawrence A. Tabak, D.D.S., Ph.D., Principal Deputy Director, Office of the Director  
National Institutes of Health, Bethesda, MD
- Martha J. Somerman, D.D.S., Ph.D., Director, National Institute of Dental and  
Craniofacial Research, National Institutes of Health, Bethesda, MD
- Josephine P. Briggs, M.D., Director of the National Center for Complementary and  
Alternative Medicine, National Institutes of Health, Bethesda, MD
- Christopher Mullins, Ph.D., Director of Basic Cell Biology Programs, Division of  
Kidney, Urologic and Hematologic Diseases, National Institute of Diabetes and  
Digestive and Kidney Diseases, National Institutes of Health, Bethesda, MD
- Session 1:**     **Epidemiology And Genetic Signatures Of Temporomandibular Disorders,  
Overlapping Conditions, And Chronic Pain**  
Session Co-Chairs: Susan Maier, Ph.D., Deputy Director, Office of Research on  
Women's Health, National Institutes of Health, Bethesda, MD and  
David A. Williams, Ph.D., University of Michigan, Ann Arbor, MI
- 3:30 – 4:00 p.m.     **Epidemiology of temporomandibular joint disorders and related painful  
conditions**  
Gary D. Slade, B.D.Sc., D.D.P.H., Ph.D., University of North Carolina at Chapel Hill  
Chapel Hill, NC
- 4:00 – 4:30 p.m.     **Characterization of individuals with chronic pain: pheontyping approaches  
used in MAPP**  
David A. Williams, Ph.D., University of Michigan, Ann Arbor, MI
- 4:30 – 5:00 p.m.     **Translational research in the genomic era: OPPERA study**  
Luda Diatchenko, M.D., Ph.D., McGill University, Montreal, Quebec, Canada
- 5:00 – 5:30 p.m.     **Mechanisms of chronic pain**  
Joachim Scholz, M.D., Columbia University Medical Center, New York, NY

- 5:30 – 6:00 p.m.      **Travel awardee poster presentations**
- Association between INADL genetic variant and the subgroup with high risk for TMD in the OPPERA study**  
Shad B. Smith, Ph.D., University of North Carolina at Chapel Hill, Chapel Hill, NC
- Case-control analysis in resting and evoked inflammatory profiles**  
Christopher D. King, Ph.D., University of Florida, Gainesville, FL
- 6:00 – 7:00 p.m.      **Dinner and poster sessions**
- 7:00 – 7:45 p.m.      **Comorbid chronic pain advocates round table**  
Round Table Chair: Terrie Cowley, President and Co-founder  
The TMJ Association, Milwaukee, WI, Co-founder, Chronic Pain Research Alliance
- Temporomandibular Disorders**  
Terrie Cowley, President and Co-founder, The TMJ Association, Milwaukee, WI  
Co-founder, Chronic Pain Research Alliance
- Interstitial Cystitis/Painful Bladder Syndrome**  
Lee Bryan Claassen, CAE, Executive Director, Interstitial Cystitis Association  
McLean, VA.
- Fibromyalgia**  
Janet F. Chambers, President, National Fibromyalgia & Chronic Pain Association  
Logan, UT
- Myalgic Encephalomyelitis/Chronic Fatigue Syndrome**  
Suzanne D. Vernon, Ph.D., Scientific Director, Solve ME/CFS Initiative  
Los Angeles, CA  
Co-founder, Chronic Pain Research Alliance
- Vulvodynia**  
Christin L. Veasley, Co-founder, Chronic Pain Research Alliance  
North Kingstown, RI
- 7:45 – 8:15 p.m.      **Discussion and recommendations**

**Monday, September 8, 2014**

- 8:00 – 8:30 a.m.      **Welcome and remarks**  
Martin Frank, Ph.D., Executive Director, American Physiological Society  
Bethesda, MD
- National Institutes of Health welcome and remarks**  
Story C. Landis, Ph.D., Director, National Institute of Neurological Disorders and  
Stroke, National Institutes of Health, Bethesda, MD
- Susan Maier, Ph.D., Deputy Director, Office of Research on Women's Health  
National Institutes of Health, Bethesda, MD

- Session 2: Mechanisms Of Chronic Pain - Basic And Clinical Studies**  
Session Co-Chairs: John Kusiak, Ph.D., Director, Molecular and Cellular Neuroscience Program, National Institute of Dental and Craniofacial Research, National Institutes of Health, Bethesda, MD and Anne Louise Oaklander, M.D., Ph.D., Massachusetts General Hospital, Harvard Medical School, Boston, MA
- 8:30 – 9:00 a.m. **Study of chronic orofacial pain with preclinical models**  
Jianguo Gu, M.B., Ph.D., University of Cincinnati College of Medicine  
Cincinnati, OH
- 9:00 – 9:30 a.m. **Modeling TMJD pain in the laboratory mouse: role of TRP ion channels**  
Wolfgang Liedtke, M.D., Ph.D., Duke University Medical Center, Durham, NC
- 9:30 – 10:00 a.m. **The neurobiology of oral cancer pain**  
Brian Lee Schmidt, D.D.S., M.D., Ph.D., New York University College of Dentistry  
New York, NY
- 10:00 – 10:15 a.m. **Break**
- 10:15 – 10:45 a.m. **Functional interactions between glutamate receptors and TRPV1 in trigeminal sensory neurons**  
Jin Y. Ro, Ph.D., University of Maryland School of Dentistry, Baltimore, MD
- 10:45 – 11:15 a.m. **Small-fiber polyneuropathy (SFPN), a common underlying diagnosis in syndromes involving unexplained chronic pain and multi-system symptoms**  
Anne Louise Oaklander, M.D., Ph.D., Massachusetts General Hospital,  
Harvard Medical School, Boston, MA
- 11:15 – 11:45 a.m. **Travel awardee poster presentations**
- Confocal microscopy reveals nerve fiber similarities in fibromyalgia and patients with dry eyes with a normal ophthalmic exam**  
Daniel E. Harper, Ph.D., University of Michigan, Ann Arbor, MI
- TRPV4-mediated trigeminal pain: behavior assessments and mechanisms**  
Yong Chen, Ph.D., Duke University, Durham, NC
- 11:45 – 12:15 p.m. **Discussions and recommendations**
- 12:15 – 1:15 p.m. **Lunch and poster sessions**

- Session 3: Genetic And Epigenetic Basis Of TMJ Disorders And Related Chronic Overlapping Conditions**  
 Session Co-Chairs: Emily Harris, Ph.D., M.P.H., Chief, Translational Genomics Research Branch, Division of Extramural Research Director, National Institute of Dental and Craniofacial Research, National Institutes of Health, Bethesda, MD and Keji Zhao, Ph.D., National Heart, Lung, and Blood Institute, National Institutes of Health, Bethesda, MD
- 1:15 – 1:45 p.m. **A cellular mechanism of interactions between pain and depression**  
 Jianren Mao, M.D., Ph.D., Massachusetts General Hospital, Harvard Medical School, Boston, MA
- 1:45 – 2:15 p.m. **Combined genetic polymorphisms and environmental factors in the etiology of a chronic TMJD murine model**  
 Karin N. Westlund High, Ph.D., University of Kentucky, Lexington, KY
- 2:15 – 2:45 p.m. **Roles of COMT, NPY and GCH1 in acute and chronic pain/stress response**  
 David Goldman, M.D., National Institute on Alcohol Abuse and Alcoholism, National Institutes of Health, Bethesda, MD
- 2:45 – 3:15 p.m. **Molecular correlates of localized versus co-occurring chronic pain conditions**  
 Andrea G. Nackley, Ph.D., University of North Carolina at Chapel Hill, Chapel Hill, NC
- 3:15 – 3:30 p.m. **Break**
- 3:30 – 4:00 p.m. **The epigenetic signature of chronic pain in the mouse brain**  
 Maral Tajerian, M.Sc., Ph.D., Stanford University, Palo Alto, CA
- 4:00 – 4:30 p.m. **Epigenetic regulation of gene expression and cellular differentiation**  
 Keji Zhao, Ph.D., National Heart, Lung, and Blood Institute, National Institutes of Health, Bethesda, MD
- 4:30 – 5:00 p.m. **Integrating epigenetic data into molecular casual networks**  
 Jun Zhu, Ph.D., Icahn School of Medicine at Mount Sinai, New York, NY
- 5:00 – 5:15 p.m. **Travel awardee poster presentation**
- Associations between ACTN3 and OPPERA pain-related genes in malocclusion**  
 James Sciote, D.D.S, M.S., Ph.D., Temple University, Philadelphia, PA
- 5:15 – 5:45 p.m. **Discussion and recommendations**
- 6:30 p.m. **Dinner - A look back at TMJA advocacy and it's impact on scientific research, Bethesda Marriott, 5151 Pooks Hill Road, Bethesda, MD**  
 Manuel Bonilla, M.S., Chief Advocacy Officer, American Society of Anesthesiologists Washington, DC, Peter Reinecke, President, Reinecke Strategic Solutions, Inc., Arlington, VA, and Diana Zuckerman, Ph.D., President, National Center for Health Research, Cancer Prevention and Treatment Fund, Washington, DC

Tuesday, September 9, 2014

- 8:30 – 8:45 a.m.      **National Institutes of Health welcome and remarks**  
Patricia A. Grady, Ph.D., R.N., F.A.A.N., Director, National Institute of Nursing Research, National Institutes of Health, Bethesda, MD
- Session 4:            Functional Genomics Of Pain In Analgesic Drug Development And Therapeutics**  
Session Co-Chairs: Jason Wan, Ph.D., Program Director, Mineralized Tissue Physiology Program Integrative Biology and Infectious Diseases Branch, Division of Extramural Research, National Institute of Dental and Craniofacial Research, Bethesda, National Institutes of Health, MD and Roy C. Levitt, M.D., University of Miami Miller School of Medicine, Miami, FL
- 8:45 – 9:15 a.m.      **Pain in the network of genetic and epigenetic control**  
Jörn Lötsch, M.D., Goethe – University, Frankfurt am Main, Germany
- 9:15 – 9:45 a.m.      **Targeted genome and epigenome editing using engineered TALE and CRISPR/Cas9 technologies**  
Charles A. Gersbach, Ph.D., Duke University, Durham, NC
- 9:45 – 10:15 a.m.    **Imaging orofacial pain in mice**  
Xinzhong Dong, Ph.D., Johns Hopkins University School of Medicine, Baltimore, MD
- 10:15 – 10:30 a.m.    **Break**
- 10:30 – 11:00 a.m.    **Carbonic anhydrase-8 gene therapy inhibits the ITPR1-cytosolic free calcium pathway producing analgesia and anti-hyperalgesia**  
Roy C. Levitt, M.D., University of Miami Miller School of Medicine, Miami, FL
- 11:00 – 11:30 a.m.    **Preclinical and translational studies of fenobam, an mGlu5 NAM, for the treatment of pain**  
Robert W. Gereau, Ph.D., Washington University School of Medicine, St. Louis, MO
- 11:30 – 11:45 a.m.    **Travel awardee poster presentation**  
  
**Repetitive transcranial magnetic stimulation (rTMS) of the primary motor cortex for treating facial neuropathic pain - preliminary results of a randomized, sham-controlled, cross-over study**  
Roi Treister, Ph.D., Massachusetts General Hospital & Harvard Medical School, Boston, MA
- 11:45 – 12:15 p.m.    **Discussion and recommendations**
- 12:15 – 1:15 p.m.     **Lunch and poster sessions**
- 1:15 – 2:15 p.m.      **Consolidation of meeting recommendations and closing remarks**  
Drs. Allen W. Cowley, Jr. and John W. Kusiak

“I have been suffering from TMJ symptoms for two years. It has greatly affected my quality of life. It is a constant struggle dealing with pain. I feel alone in this, like I am suffering in silence.  
Nobody knows...” – *Stephanie*

“I am a Fibromyalgia patient with TMJ. I have been suffering with this for years and am very glad to hear about your upcoming conference concerning the overlapping of these conditions. FM and TMJ have been especially traumatic for me as my career was being a bassoonist with The Houston Grand Opera. I have had to retire and am on disability due to these conditions. Please continue to explore the relationships of these diseases to offer some hope to those of us who are so ill.  
Thank you.” – *Marilyn*

“I have just gone through nearly ten years of problems that as of yesterday appear to be mostly related to TMJ. I have had neck, upper back, shoulder, elbow, wrist and hand pain for some years and in the past two years developed severe migraines. For the past eight years I have experienced gradually increasing chronic fatigue symptoms. I was seen by over 20 VA doctors (as a service-connected, disabled veteran) and about five dentists and no one had any idea what was wrong. My wife decided I was just a malingerer and divorced me, leaving me with very little income, and I was forced to move in with my mid-70-year-old parents.” – *Ken*

“I had an illness that took three years to diagnose, and in that three years I was in constant pain in the abdominal area. Because of this I was clenching my teeth in order to overcome pain so I could sleep as pain was there all the time. I then had my wisdom teeth removed and 4 surgeries in order to find the reason for my abdominal pain. It was discovered that I had endometriosis around the Pouch of Douglas, which meant that the abdominal region was inflamed all the time. It took one additional surgery to remove the endometriosis. During this time I started getting terrible headaches, sinus problems, popping in the jaw, pain over the eyes, a swollen and throbbing mouth, dizziness (severe), pain around the neck, shoulders and back which would lead to the front, like a heart attack-type pain. I was having trouble swallowing, chewing and basically standing up straight. When I stood up it felt like I was going to pass out. Eventually I was diagnosed with TMJ.” – *Katrina*

**The TMJ Association is a national, nonprofit organization whose mission is to improve the quality of health care and lives of everyone affected by Temporomandibular Disorders**