

# Curriculum Vitae

## 1. Current Position



Timothy Andrew Benke M.D., Ph.D.<sup>BENKE</sup>  
Ponzio Family Endowed Chair in Neurology Research  
Children's Hospital Colorado  
Professor with Tenure  
Dept. of Pediatrics, Neurology, Pharmacology and Otolaryngology  
University of Colorado School of Medicine  
12800 E 19<sup>th</sup> Ave, MS 8102  
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## 2. Education:

Doctor of Medicine  
Baylor College of Medicine, Houston, TX, 1995

Doctor of Philosophy  
Baylor College of Medicine, Houston, TX, 1994  
Department: Neuroscience  
Advisor: Kimon Angelides, Ph.D.  
Research area: Synaptic transmission in the central nervous system.  
Thesis title: Distribution of Conantokin-G sensitive N-methyl-D-aspartate receptors and dendritic sodium channels on neurons: Implications for synaptic amplification and plasticity

Master of Science  
Rice University, Houston, TX, 1989  
Department: Electrical and Computer Engineering  
Advisor: John Clark, Ph.D.  
Research area: Nerve regeneration and mathematical modeling.  
Thesis title: Studies in Nerve Electrophysiology

Bachelor of Science  
Vanderbilt University, Nashville, TN, 1986  
Discipline: Biomedical Engineering and Chemistry (double major), summa cum laude

## Post-Doctoral Research Training:

- Research Assistant, Department of Anatomy, University of Bristol, Bristol, U.K. Project: Post-synaptic mechanisms of long-term potentiation in the rat hippocampus, 1995-1996. Supervisor: Prof. Graham L. Collingridge, Ph.D., F.R.S.

## Post-Doctoral Clinical Training:

- Pediatric Resident, Department of Pediatrics, Baylor College of Medicine, Houston, TX, 1996-1998. Supervisor: Dr. Martin Lorin, M.D.
- Child Neurology Resident, Department of Pediatrics, Division of Child Neurology, Baylor College of Medicine/Texas Children's Hospital, Houston, TX, 1998-2001. Supervisor: Dr. Marvin Fishman, M.D.

## Academic Honors:

- Dean's List; High Honors, Vanderbilt University, Nashville, TN.
- Tau Beta Pi (Engineering Honorary), Senior Chemistry Research Prize, Alpha Lambda Delta and Phi Eta Sigma (freshman honoraries), Vanderbilt University, Nashville, TN.
- Eta Kappa Nu Electrical Engineering Honorary, Rice University, Houston, TX.

- Sigma Xi Thesis Award (Ph.D.), 2<sup>nd</sup> Place, Baylor College of Medicine, Houston, TX, 1994.
- Texas Neurological Society Young Investigator Award, 2<sup>nd</sup> Place, 1999.

## **Leadership Training**

- Center for Creative Leadership, Colorado Springs, CO, 2006
- CCTSI, Co-Mentor Program, 2016

## **3. Academic Appointments:**

- Professor with Tenure, Departments of Pediatrics, Neurology, Pharmacology and Otolaryngology, University of Colorado, School of Medicine Denver, CO, 2019-present.
- Associate Professor, Departments of Pediatrics, Neurology, Pharmacology and Otolaryngology, University of Colorado, School of Medicine Denver, CO, 2012-2019.
- Associate Professor, Departments of Pediatrics, Neurology and Pharmacology, University of Colorado, School of Medicine Denver, CO, 2008-present.
- Assistant Professor, Departments of Pediatrics, Neurology and Pharmacology, University of Colorado, School of Medicine Denver, CO, 2002-2008.
- Child Neurology Section Chief (Interim), Children's Hospital Colorado, Denver, CO, 2006-2008.
- Neuroscience Graduate Training Program, University of Colorado, School of Medicine Denver, CO, member, 2006-present.
- Child Neurology Residency Program Director, University of Colorado, School of Medicine Denver, CO, 2002-2007.
- Assistant Professor, Pediatrics, Division of Child Neurology, Baylor College of Medicine, Houston, TX, 2001-2002.

## **4. Hospital Positions, government, other positions:**

### **Hospital Positions**

- Medical Director, Rett Clinic, Children's Hospital Colorado, 2011-present.
- Attending Physician, Division of Child Neurology, Children's Hospital Colorado, Denver, CO, 2002-present.
- Clinical Director, Child Neurology Clinic, Ben Taub General Hospital, Houston, TX, 2001-2002.
- Attending Physician, Division of Child Neurology, Texas Children's Hospital, Houston, TX, 2001-2002.

### **Consulting/Scientific Advisory Boards**

- AveXis pharmaceuticals, Aug 2017-present
- Marinus pharmaceuticals, Sep 2017-present
- Loulou Foundation, Oct 2017-present.
- International Foundation for CDKL5 research, Nov 2017-present.
- International Rett Syndrome Foundation/RettSyndrome.Org, Jul 2018-present
- Lennox-Gastaut Foundation, Sep 2018-present
- GRIN2B Foundation, Sep 2018-present
- Neuren/Acadia pharmaceuticals, Oct 2018-present
- Takeda pharmaceuticals, Mar 2019-present
- GW pharmaceuticals, Apr 2019-present

## **5. Honors and Recognition**

- American Neurological Association, elected 2011
- Ponzio Family endowed Chair in Neurology Research, 2014
- International Foundation for CDKL5 Research, Star Thrower Award, 2015.
- "Top Provider, Patient-Family Experience Excellence in Patient Care Award" For achieving 90% or higher with 9/10 ratings on Overall Provider Experience, Children's Hospital Colorado, 2016, 2017, 2018, 2019
- Loulou Foundation, Champion of Progress Award, 2019

## **6. Membership in Professional Societies (past/present):**

- Fellow, American Academy of Pediatrics (past)

- Child Neurology Society
- Society for Neuroscience
- Biophysical Society (past)
- American Neurological Association
- American Epilepsy Society
  - Special Interest Group Leader 2015-present
  - Research and Recognition Awards committee, 2017-present

## 7. Service Responsibilities

### University of Colorado School of Medicine (UC-SOM) Service Responsibilities School of Medicine

- Committee on Research Ethics, ad hoc panel member, 2003
- Medical Scientist Training Program, applicant interviewer, 2010-present.
- Dean's Research Advisory Committee, 2012-2015; Chair 2014-2015
- Child Health Research Enterprise Committee, 2017-present

### Departmental

- Pediatrics
  - Promotions Committee, 2010-present.
  - Search Committees
    - Chair, Search committee for Linda Crnic Down Syndrome Institute Clinic Director (2012)
    - Hematology/Oncology (2015-16)
    - Genetics (2017)
  - IDDRC (Intellectual and Developmental Disabilities Research Center)
    - Member 2008-2012
    - NEXUS Study Review Committee (reviews applications for research access to NEXUS bio-repository of DNA samples) (2008-2016)
    - Animal Behavior Core, Co-Director (2008-9)
    - Executive Committee (2009-2012)
  - CCTSI/Pediatrics/K12 Junior Faculty Training program
    - Mentor, Dr Peter Baker, 2016-present
    - Executive Committee, 2017-present
  - Pediatric Residency program, applicant interviewer, 2003-present.
  - Division of Child Neurology
    - Director of Research, Children's Hospital Colorado/ University of Colorado, School of Medicine Denver, 2008-present.
      - Reports/Hires: 2 Research managers and 10+ study coordinators.
      - Oversight: 100+ clinical trials and projects
      - Neuroscience Content Lead for Children's Hospital Colorado Research Organization (2015-present)
        - Research Executive Steering Committees (2015-present)
        - Strategic Planning Committee (2017)
        - Child Health Research Enterprise (2017)
        - Genomics Workgroup (2017-present)
      - Initiatives:
        - Instituted annual Burn's Night fundraiser, 2013-present
      - Development of clinical research policies and procedures
    - Movement-Genetic-MS (MGM) Team Leader, Children's Hospital Colorado/ University of Colorado, School of Medicine Denver, 2008-2019.
      - Reports: 3 faculty, 2 genetic counselors, 4 RNs, 1 staff assistant
    - Rett Clinic Medical Director/Founder, 2011-present
      - Reports: RN clinic coordinator
      - Directs: 16 faculty/staff providers in Rett Clinic
      - Featured in Children's Hospital Colorado Annual Report, 2012 <http://2012annualreport.childrenscolorado.org/neuroscience.html>
      - International Foundation for CDKL5 Research Center of Excellence
      - RettSyndrome.Org (IRSF) Center of Excellence
    - Clinical Service (Children's Hospital Colorado)

- Outpatient general child neurology: 1-2 half-days/month
- NeuroGenetic Clinic: 1 half-day/month
- Rett Multidisciplinary Clinic: monthly (Additional care/coordination of patients with 14 sub-specialists)
- Attending, Neurology Service: 4-5 weeks/year
- Junior Faculty Mentees (past/present)
  - Tim Bernard, MD
  - Marco Gonzales, PhD
  - Yogi Raol, PhD
  - Audrey Yee, MD
  - Andrew White, MD PhD
  - Kendra Bjoraker, PhD
  - Scott Turner, MSN, FNP
  - Abigail Collins, MD
  - Peter Baker, MD (Section of Genetics and Metabolism)
  - Scott Demarest, MD (NSADA fellow)
  - Andra Dingman, MD (NSADA fellow)
  - Josh Bear, MD (NSADA fellow)
  - Robert Dietz, MD, PhD (Section of Neonatology)
- Section Chief (Interim), Children's Hospital Colorado, Denver, CO, 2006-2008.
  - Academic Recruits:
    - Tim Bernard, MD-Stroke Program (2007)
    - Abbie Collins, MD-Movement Disorders Program (2008)
    - Jennifer Armstrong-Wells, MD-Stroke Program (2008)
    - Susan Koh, MD-Epilepsy Program(2008)
    - Kristen Park, MD-Epilepsy Program (2008)
    - Dan Arndt, MD (2008)
    - Jennifer Flack, RN/NP (2008)
    - Jean Milholland, PA (2008)
    - Scott Turner, RN/NP (2008)
- Division of Child Neurology and Department of Neurology
  - Child Neurology Program Training Director, 2002-2007
    - Trainees graduated:
      - Carter Wray, MD (2009)
      - Ed Jernigan, MD (2009)
      - Lucy Zawadzki, MD (2008)
      - Tim Bernard, MD (2006)
      - Brendan Mull, MD (2005)
  - Child Neurology Residency program applicant interviewer, 2002-present.
- Departments of Pharmacology (T32), Otolaryngology (T32), MSTP, Developmental Psychobiology Research Group (T32) and Neuroscience (T32 & P30) Graduate Training Programs:
  - Core Director (P30), BINC (Behavior and in vivo Neurophysiology Core), 2015-present
  - PhD program applicant interviewer, 2008-present.

### **Community Service:**

- American Epilepsy Society
  - Basic Mechanism, Special Interest Group (SIG) leader 2012-14
  - Neonatal Seizures, Special Interest Group (SIG) leader 2015-17
  - Pediatric Content Committee, 2015-16
  - Epilepsy Research Benchmarks Committee, 2014-16
  - Research and Recognition Awards Committee, 2017-present
- Child Neurology Society
  - Member, Long-Range Planning Committee, 2010-2013
- Board member, Lennox-Gastaut Foundation, 2018-present
- Board member, GRIN2B Foundation, 2018-present
- Medical Advisor, International Rett Syndrome Foundation, 2018-present

- Board member, Rocky Mountain Rett Association (local parent/family/patient support group to support the Rett Clinic at Children's Hospital Colorado), 2008-present
  - Presentations to family via family-centered conferences and facebook live, 2008-present
  - Related media appearances/promotions
    - Fox News Denver, 2012, 2019
    - Channel 4 News, Denver, 2008, 2006
    - Channel 9 News, Denver, 2017, 2018, 2019
- <https://www.9news.com/article/news/local/family-shares-devastating-rett-syndrome-diagnosis/73-543400445>
- Rare Disease Day, Presentation to State Lawmakers, Colorado State Capitol, 2/2016
  - CBS and Fox News coverage
- <http://www.auroratv.org/News/News.html?show=4485#t=38>
- <http://denver.cbslocal.com/2016/02/29/rare-diseases-perisylvian-syndrome-awareness-leap-year-day/>
- Rare Disease Day, Presentation to State Lawmakers, Colorado State Capitol, 2/2018
- Testimony in support of HB-1147 (to permit licensure of Genetic Counselors), Colorado State Capitol, 2/2015.
- Testimony in support of HB-1114 (to permit licensure of Genetic Counselors), Colorado State Capitol, 2/2018.
- Day with a Doctor (mentorship of university students interested in medicine, neurology and pediatrics), 2-6 mentees/year, 2004-present.
- High school senior science project outside mentor, Brandon Skogen, Grand View High School, "An EEG human-computer interface", 2012-2013.
- High school senior science project outside mentor, Jason Cyrus, Grand View High School, "Evoked Potentials", 2013-14.

## 8. Licensure and Board Specializations

### Medical License:

- Texas State Board of Medical Examiners, entered 1998-2009.
- Colorado State Board of Medical Examiners, entered 2002. Active.
- Montana State Board of Medical Examiners, 2009-3/31/2015. Expired.

### Medical Board Specialization (U.S.):

- American Board of Pediatrics, 2001-2008.
- American Board of Psychiatry and Neurology, special certification in Child Neurology, Passed 2002, Re-certification passed 2013.

## 9. Inventions, intellectual property and patents held or pending.

## 10. Review and Referee Work

### Scientific Review:

- Neuropharmacology, Editorial Board 2011-2013
- Epilepsy Currents, Editorial Board 2012-2015
- Journal of Neuroscience
- Neurology
- JAMA Neurology
- Neurobiology of Disease
- Journal of Neurophysiology
- Proceedings of the Royal Society, Philosophical Transactions B
- Epilepsia,
- Epilepsy Research
- Journal of Neuroscience Methods
- Glia
- Brain Pathology
- Biological Cybernetics
- Brain Research
- Trends in Neuroscience
- Journal of Physiology
- Neuroscience

- Scientific Reports
- eNeuro
- Methods and Findings in Experimental and Clinical Pharmacology

#### **Grant Review:**

- Wellcome Trust (ad hoc)
- Epilepsy Foundation (ad hoc)
- Human Frontiers Science Program (ad hoc)
- Dr Hadwen Trust for Humane Research (ad hoc)
- FDA, Orphan Products Development Program: 2010-2014
- NIH/NINDS, Epilepsy Eureka, 2011 (ad hoc)
- NIH/NINDS, F03A, Neurodevelopment, Synaptic Plasticity and Neurodegeneration Fellowship Panel, 2012-present (ad hoc)
- Epilepsy Research UK, 2014
- NIH-NICHD/NINDS SEP, 2013-present (ad hoc)
- NIH-SBIR, 2015-present (ad hoc)
- NIH-NINDS DBD, 2018-present (ad hoc)
- Cure Foundation, (ad hoc) 2011-present
- Colorado Clinical Translational Science Institute
  - Child and Maternal Health: 2008-present
  - K12: 2011-present
  - Novel Clinical and Translational Methods: 2011-present
- Boetcher Foundation 2017
- Loulou Foundation 2017-present
- LGS Foundation 2018-present

#### **11. Invited Lectures**

##### *Local*

1. “Modulation of a glutamate receptor conductance by synaptic plasticity”, Dept. of Pediatrics, Section of Child Neurology, UCHSC, Denver, CO, May 2001.
2. “S(e)izing up glutamate receptors”, Neuroscience Program, UCHSC, Denver, CO, December 2005.
3. “Perils, Problems and Pitfalls: Modeling Human Disease with Rodent Models and Our Experiences with a Model of Early Life Seizures in Rats” IDDRC symposium, UCHSC, Denver, CO, June 2011.
4. “Early-life seizures: acute and chronic effects on synaptic physiology”, MCHB Keynote Speaker, University of Colorado/School of Medicine, Mar 2017.
5. “Rett and Rett-related disorders research update”, Rett Family Conference, Children’s Hospital Colorado, Oct 2017.
6. “Rett and Rett-related disorders”, Christopher Ward Neuroscience Nursing Conference, Children’s Hospital Colorado, Feb 2018.
7. “Development of a CDD Severity Assessment in the IFCR Centers of Excellence”, IFCR Family conference, Denver, June 2018.
8. “Rett and Rett-related disorders research update”, Rett Family Conference, Children’s Hospital Colorado, Sep 2018.

##### *National*

1. “Mechanisms of developmental synaptic plasticity” (symposia with El-Husseini, A., Collingridge, G.L. and Taira, T.), Winter Conference on Brain Research, Copper Mountain, CO, January 2004.
2. “S(e)izing up glutamate receptors”, Dept of Neuroscience, MUSC, Charleston, SC, October 2006.

3. "Neonatal Seizures and Consequences", Department of Neuroscience, University of California-Irvine, Irvine, CA, October, 2008.
4. "Do neonatal seizures per se cause brain damage? New insights from mutations of potassium channels", AES Investigators workshop, Boston, MA, Dec 2009.
5. "Basic Neuroscience: cognitive deficits after early life seizures", Special interest group meeting, AES, Boston, MA, Dec 2009.
6. "Translocation of FMRP and PP2A underlie enhancement of mLTD in adult rats following early life seizures", American Neurological Association, Annual Meeting, Epilepsy Special Interest Group Presentation and Poster, Sept, 2011.
7. "Translocation of FMRP and PP2A underlie enhancement of mLTD in adult rats following early life seizures", Colorado State University, Fort Collins, CO, Oct, 2011.
8. "First-line treatment of Neonatal seizures: Evidence from basic science", American Epilepsy Society, Special Interest Group lecture, San Diego, Dec 2012.
9. "Altered behavior and plasticity after early life seizures: Molecular mechanisms", University of Chicago, May, 2013.
10. "Altered behavior and plasticity after early life seizures: Molecular mechanisms", Yale University School of Medicine, May, 2013.
11. "Altered behavior and plasticity after early life seizures: Molecular mechanisms", OCNS Symposium, University of Oklahoma School of Medicine, September, 2013.
12. "Intractable epilepsy in Rett and CDKL5 syndromes", IRSF/IFCR Family Conference, Washington, DC, June 2014.
13. "Are seizure medicines so bad?", American Epilepsy Society, Pediatric State of the Art Symposium, Dec, 2014, Seattle, WA.
14. "Early-life seizures cause latent synaptic changes in FMRP-mediated signaling, altered plasticity and an autistic phenotype", Pathways of Neurodevelopmental Disorders, Keystone Symposia, March 2015, Tahoe City, CA
15. "Neonatal seizures: a menagerie of models-A tour of animal models of neonatal seizures", Special Interest Group Coordinator, AES, Philadelphia, PA, Dec, 2015.
16. "The role of fragile X mental retardation protein in epilepsy, ion channels and behavioral comorbidities", Panel speaker, AES, Philadelphia, PA, Dec, 2015.
17. "Neurocognitive effects of Early Life Seizures", Panel Chair and Speaker, Winter Conference on Brain Research, Jan, 2016.
18. "Early-life seizures: acute and chronic effects on synaptic physiology and behavior", Seattle Children's Hospital Research Institute, February 2016.
19. "Updates, progress and priorities from CDKL5 Centers of Excellence", 3<sup>rd</sup> International CDKL5 Research Symposium, Chicago, IL, June 2016.
20. "Neurophysiological correlates and biomarkers: Rett syndrome, MECP2 duplications and Rett-related disorders Consortium", 14<sup>th</sup> Rett Syndrome Research Symposium, Chicago, IL, June 2016.
21. "Epilepsy Management: Treatments, Emergencies, SUDEP", IRSF/IFCR Family Conference, Chicago, IL, June 2016.
22. "Neonatal seizures: Genetic causes of neonatal epileptic encephalopathies", Special Interest Group Coordinator, AES, Houston, TX, Dec, 2016.
23. "Acute and chronic effects of early-life seizures on hippocampal synaptic physiology", Neurology and Neurosciences Seminar Series, University of Illinois Apr 2017.
24. "Multidisciplinary approach to CDKL5 syndrome", Grand Rounds, University of Illinois, Apr 2017.
25. "Acute and chronic effects of early-life seizures on hippocampal synaptic physiology", University of Alabama, May, 2017.

26. "Acute and chronic effects of early-life seizures on hippocampal synaptic physiology", invited speaker, 40<sup>th</sup> Anniversary MD/PhD symposium, Baylor College of Medicine, Sep 2017.
27. "CDKL5 Deficiency syndrome", Invited speaker, Takeda Research Forum, Boston, MA, Nov 2017.
28. "CDKL5 syndrome: Towards a clinical severity scale", Invited speaker, session leader, CDKL5 Forum, Boston, MA, Nov 2017
29. "Neonatal seizures: seizure detection", Special Interest Group Coordinator, AES, Washington, DC, Dec, 2017.
30. "Rett and Rett-related disorders: Multidisciplinary Approach", Child Neurology Grand Rounds, New York University Hospital, Jan 2018.
31. "Neurophysiological Correlates and Biomarkers: Rett Syndrome, *MECP2* Duplications, and Rett-Related Disorders Consortium", Rett-Syndrome Research Trust Symposium, Boston, MA, May 2018.
32. "GRIN Variant Patient Registry (GVPR)", CFERV annual conference, Atlanta, GA, Sept 2019.
33. "CDKL5 Deficiency Disorder (CDD): Overview for PFDD FDA", Patient focused drug development for US FDA, Bethesda, MD, October, 2019.
34. "Severity Assessments in Developmental and Epileptic Encephalopathies", Investigators Workshop, American Epilepsy Society, December, 2019.

### *International*

1. "Impact of early-life seizures on plasticity and behavior", MRC Centre for Synaptic Plasticity, University of Bristol, Bristol, UK, May 2004.
2. "CDKL5 syndrome: clinical issues in research", CDKL5 Forum, London, UK, October, 2015.
3. "Early-life seizures: acute and chronic effects on synaptic physiology and behavior", MRC Centre, Laboratory of Molecular Biology, Cambridge, UK, Aug 2016.
4. "Clinical Assessments of Common and Uncommon Phenotypes in CDKL5 Syndrome", International CDKL5 meeting, Invited speaker and session leader, Rome, Italy, June, 2017
5. "Modulation of hippocampal mGlu-LTD by L-type calcium channels: mechanisms and chronic alteration by early life seizures", Invited speaker, 9<sup>th</sup> International Conference on metabotropic glutamate receptors, Taormina, IT, Oct 2017.
6. "Development of a CDD Severity Assessment in the IFCR Centers of Excellence", CDKL5 Forum, London, UK, Oct 2018.
7. "Development of a CDD Severity Assessment in the IFCR Centers of Excellence", presented along with patient examinations at a) IRCCS Fondazione Stella Maris, Pisa, IT, b) University of Bologna, Di Neuropsichiatria Infantile Su Casi Clinici Complessi, Bologna, IT and c) Policlinico Gemelli, Catholic University, Rome, IT, Nov 2018.
8. "An approach to developmental encephalopathies associated with early-life seizures", Invited speaker, University of Toronto/Sick Kids Research Institute, Toronto, CA, May 2019.
9. "Development of a CDD Severity Assessment in the IFCR Centers of Excellence", CDKL5 Alliance, Edinburgh, UK, June 2019.
10. "Development of a CDD Severity Assessment in the IFCR Centers of Excellence/Standards of Care", CDKL5 Asia, ICRN, Tokyo, Japan, September 2019.

## **12. Teaching Record:**

### **UC-SOM**

- PHCL 7614: Membrane Biophysics. Graduate level class for Neuroscience Program, Physiology and Pharmacology graduate students covering the physical basis of excitable



- membranes. Course Director. I taught all lectures in this 12 week, 2 hour credit course, 2003-2006.
- PHCL 7605: Ethics in Research. I led a discussion group of (8-12) students that met weekly for 6 weeks. 2006-2013.
  - NSC 7600: Cellular and Molecular Neuroscience. I provide one lecture on brain-slice electrophysiological techniques. 2012-present.
  - Clinical training in child neurology of pediatric, adult neurology and child neurology residents during ward rotations at Children's Hospital Colorado.
  - Lectures in related child neurology topics to residents and graduate students in pharmacology, pediatrics, genetics, development, neurology, psychiatry and neurosurgery.
    - The Pediatric Neurological exam: January 2007, 2008
    - Pediatric Stroke: March 2007
    - Pediatric Neurogenetic disorders: April 2007
    - Genetics of CNS malformations: 2003-2016
    - Genetics of Intellectual Disability: 2010-2016
    - Anticonvulsants: 2007-present (Molecules to Medicine Course for MSTP program)
    - Neonatal Seizures: Nov 2009, 2010, 2011, 2012 (Pharmacology Intro Course)
    - Neurology Grand Rounds
      - Neurometabolic disorders, November 2004
      - Jumpy legs and a review of membrane biophysics, Sept 2006
      - Neonatal Seizures, January 2008
      - A teenager with encephalitis associated with NMDA receptor antibodies, Dec 2008
      - Pontocerebellar Hypoplasia, Jan 2010
      - Chronic translocation of FMRP and enhanced mGluR-LTD after early life seizures, July 2011
      - Early-life seizures cause latent synaptic changes in FMRP-mediated signaling, altered synaptic plasticity and an autistic phenotype, August 2014
  - Graduate student advisor and PhD thesis committee member
    - Chris Dulla, Neuroscience program (PhD-2004)
    - Christina Rapp, Neuroscience program (PhD-2005)
    - Audrey Brumback, Neuroscience program (PhD-2007)
    - Susan Goebel, Neuroscience program (PhD-2007)
    - Eric Horne, Pharmacology (PhD-2007)
    - Holly Hudson-Robertson, Pharmacology (PhD-2008)
    - Tianna Hicklin, Neuroscience (PhD-2009)
    - Anna Nelson, Pharmacology (PhD-2009)
    - Matt Pink, Neuroscience, (PhD-2010)
    - Julie Milder, Neuroscience (PhD-2010)
    - Sruthi Pandipati, Neuroscience, (PhD-2010)
    - Rinaldo Disouza, Neuroscience, (PhD-2011)
    - Heather O'Leary, Neuroscience, (PhD-2012)
    - Jonah Scott-McKean, Neuroscience, (PhD-2012)
    - Jeffrey Taylor Juergens, Physiology, (PhD-2013)
    - Shane Rowley, Neuroscience, (PhD 2014)
    - Kelsey Barcomb, Pharmacology, (PhD 2015)
    - Ajay Thomas, Neuroscience, (PhD 2015)
    - Jennifer Pearson, Neuroscience, (PhD 2016)
    - Brooke Sinnen, Pharmacology (PhD 2018)
    - Dayton Goodell, Pharmacology (PhD 2017)
    - Alicia Purkey, Neuroscience
    - Veronica Fregoso, CDB (PhD 2019)
    - Aaron Bowen, MSTP/Neuroscience (PhD 2017)
    - Alex Ferber, MSTP/Neuroscience (PhD 2017)
    - Ashley Bourke, Pharmacology
    - Sarah Cook, Pharmacology
  - PhD Thesis supervisor
    - Brandon Cornejo, Pharmacology, MD/PhD graduate, 2006
      - Current: Psychiatrist, Clinical Investigator, Kaiser Permanente, Center for Health Research, Portland, OR

- Elizabeth Stubblefield, Pharmacology, PhD graduate, 2008.
  - Current: Post-doctoral associate Janelia Research Campus, Ashburn, VA.
- Allison Gehrke, Computer Science (co-mentor), PhD graduate, 2015
  - Current: Product development, Intel, Davis, CA.
- Post-doctoral fellows/associates/Research Assistant Professors
  - Paul Bernard, PhD, 2008-2018
    - Current: Assistant Professor, University of PEI, Charlottetown, PEI, Canada
  - Elizabeth Stubblefield, 2009-2010
    - Current: Post-doctoral fellow (Gidon Felsen, PhD), University of Colorado School of Medicine, Denver, CO and Visiting Postdoctoral Associate, Janelia Research Campus, Ashburn, VA
  - Heather O'Leary-Caballes, 2012-2019

### 13. Grant Support

#### Research Interests

- Impact of early-life seizures on hippocampal physiology and related behavior
- Synaptic signaling mechanisms that underlie intellectual disability and autism
- Common genetics and signaling pathways of epilepsy, intellectual disability and autism
- Pharmacology, gating and modeling of glutamate receptors
- Mathematical modeling of neuronal signaling
- Natural history and interventions in rare genetic disorders associated with epilepsy and intellectual disability (Developmental Encephalopathies: Rett, CDKL5, Rett-related, GRIN disorders, FOXP1, Down syndrome and Infantile Spasms).

#### Interventional Clinical Trials:

1. Role of Memantine on cognition in young adults with Down Syndrome. Role: co-PI. Status: completed. Sponsor: Forrest Pharmaceuticals.
2. A Safety Study of NNZ-2566 in Pediatric Rett Syndrome. Role: Site PI. Status: completed. Sponsor: Neuren Pharmaceuticals.
3. Functional and clinical evaluations of glutamate receptor mutations in epileptic encephalopathies. Role: Site PI. Status: recruiting. Sponsor: CURE/GRIN2B.
4. A Double-blind, Randomized, Placebo-controlled Trial of Adjunctive Ganaxolone Treatment in Children and Young Adults with Cyclindependent Kinase-like 5 (CDKL5) Deficiency Disorder (CDD) Followed by Long-term Open-label Treatment. Role: Site Co-PI. Status: recruiting. Sponsor: Marinus.
5. A Randomized, Double-Blind, Placebo-Controlled, Cross-Over Study to Assess the Safety, Tolerability, and Efficacy of Oral Ketamine in Patients with Rett Syndrome. Role: Site PI. Status: recruiting. Sponsor: RSRT.
6. Open-Label Study in patients with CDKL5 deficiency disorder. Role: site Co-PI, Status: recruiting. Sponsor: Ovid/Takeda.
7. A RANDOMIZED, DOUBLE-BLIND, PLACEBO-CONTROLLED, TRIAL TO INVESTIGATE THE EFFICACY AND SAFETY OF CANNABIDIOL ORAL SOLUTION (GWP42003-P, CBD-OS) IN PATIENTS WITH RETT SYNDROME. Role Site PI. Status: start-up. Sponsor: GW/Premier.
8. Lavendar and Lilac: Phase 3 trial of trofinetide in Rett Syndrome. Role: site PI, master-rater. Status: recruiting. Sponsor: Acadia/Neuren/Precision.

#### Fellowships, grants and other support:

##### Active:

1. R21 NS101288 (Benke) 09/01/2017 - 08/30/2019 (NCE)

Exploratory determination of the role of L-type calcium channels in mediating abnormal plasticity and behavior after early life seizures

Role: PI. The goal of this project is to determine the mechanistic role of L-type calcium channels in neurocognitive disorders associated with early-life seizures.

0.6 calendar \$189,880

2. Questcor (Pharma) Active.

PI: Tim Benke, MD, PhD

Whole-exome sequencing and ACTH responsiveness in infantile spasms.

Role: PI. The goals of this project are to determine 1) the effectiveness of whole-exome sequencing in determining causation of infantile spasms and 2) determine pharmacogenomic profiles of patients treated with ACTH for this disorder.

0.06 calendar, \$247,948 (total)

3. Rocky Mountain Rett Association

PI: Tim Benke, MD, PhD 11/01/2011-present

Role: Rett Clinic director. Part of this funding is to join established clinical networks for advancing the treatment of patients with Rett syndrome.

0.06 calendar, \$50,000

4. K12 NS089417

Co-PI: Tim Benke, MD, PhD

07/01/2015-06/30/2020

NIH/NINDS

Colorado Neurological Sciences Academic Development Award (NSADA)

The Colorado Neurosciences Academic Development Award (NSADA K12) program based at the University of Colorado Anschutz Medical Campus (UCAMC) and Children's Hospital Colorado (CHC) will leverage the combined resources of our large, active neuroscience research community, an outstanding university infrastructure for training in clinical-translational research and one of the best children's hospitals in the country to provide exceptional basic-translational pediatric neuroscience research training for the next generation of academic pediatric neurology leaders. (MPI with Brooks-Kayal, non-funded mentorship and leadership effort)

5. U54 HD061222 (PI-Percy) 09/30/2003-07/31/2019 (NCE)

Rare Disease CRC for New Therapies and New Diagnostics

Role: Site PI. Rare Disease multisite initiative to provide natural history studies leading to possible therapies for Rett syndrome, MECP2 Duplication Disorder, and Rett-related Disorders Natural History.

1.8 calendar, \$55,921

6. GRIN2B (PI-Benke) 11/01/2019-5/31/2020

Functional and Clinical Evaluation of NMDA Receptor Mutations in Epileptic Encephalopathy

Role: PI. Functional and clinical evaluations of glutamate receptor mutations in epileptic encephalopathies. This is a rolling foundation-funded grant from GRIN2B foundation. This is a multi-site effort to determine the phenotypic characteristics of subjects with GRIN mutations and epileptic encephalopathy.

0.06 calendar, \$60,953

7. Children's Hospital Foundation 4/1/2014-indefinite

Ponzio Family Endowed Chair in Neurology Research (Benke)

Funds to support chair-holder's research programs.

0.06 calendar, \$100,000

8. R01 NS081248 (Bayer)

04/01/2017-03/30/2021

NIH/NINDS

CaMKII autophosphorylation in opposing directions of synaptic plasticity.

PI: Ulli Bayer, PhD

Role: Col, provide electrophysiological expertise to read-outs of plasticity.

0.06 calendar, \$250,000

**Pending:**

1. R21

04/01/2020-03/31/2022

NIH/NINDS (Priority score 13)

Role of CDKL5 kinase activity in modulating synaptic plasticity

Role: PI. The goal of this project is to characterize potential specific CDKL5 kinase inhibitors in order to determine their role in synaptic plasticity. Comparisons are made to CDKL5-knock out rodents to determine the role of the acute kinase function in this model of pediatric epileptic encephalopathy.

0.06 calendar, \$175,000

**Prior/completed funding:**

CURE (PI-Traynelis)

08/01/2016-12/31/2019

Functional and Clinical Evaluation of NMDA Receptor Mutations in Epileptic Encephalopathy

Role: Site PI. Establish treatment guidelines and database for retrospective study of treatment outcomes in patients with alterations in GRINs.

0.06 calendar, \$35,757

Rett Syndrome Research Trust (Percy)

09/01/2016-08/31/2019

Outcome Measures and Biomarkers Development for Rett Syndrome: Multi-site development of standardized assessments for use in clinical trials

Role: Site PI. The goal of this project is to establish novel biomarkers for the assessment of treatment outcomes in patients with Rett syndrome.

0.06 calendar, \$89,401

UPenn Orphan Disease program (Marsh/Benke)

01/01/2017 - 12/31/2019

5212 Extension Study: AEP/VEP/EEG in CDKL5 deficiency syndrome Role: co-PI. The goal of this project is to determine electrophysiologic biomarkers in CDKL5 deficiency syndrome.

0.03 calendar, \$15,112

1U10NS077277 (Vollmer)

09/30/2011-08/31/2018

NIH/NINDS

PI: Tim Vollmer, MD

Role: Co-I.

Rocky Mountain Network for Neuroscience Clinical Studies (RMNNCS)

The goal of this NeuroNext grant is to support the local infrastructure necessary for multisite clinical trials in neurological disorders.

1.2 calendar, \$200,000

UPenn Orphan Disease program (Benke)

05/01/2017 - 10/30/2018 (NCE)

Mechanisms and treatment of paradoxical hyperexcitability in CDKL5 deficiency syndrome. Role: PI. The goal of this project is to determine the mechanisms and possible treatment of CDKL5 deficiency syndrome.

1.2 calendar, \$150,000

R01 NS076577

PI: Tim Benke, MD, PhD

9/01/2011-08/31/2016

NIH/NINDS

Molecular mechanisms linking early life seizures, autism and intellectual disability

Role: PI. The goal of this project is to characterize the signalling mechanisms involved in the permanent alterations of hippocampal excitatory transmission, mGluR-LTD and in vivo behavior alterations following early life seizures. 20% effort funded.

International CDKL5 Foundation

PI: Tim Benke, MD, PhD

04/01/2013-2014

Role: International CDKL5 Foundation Center of Excellence, clinic director. We are the founding/initial site to establish a clinical research network of sites for advancing the treatment of patients with CDKL5 syndrome; clinic runs concurrently with Rett clinic. 3% effort funded.

Autism Treatment Network

PI: Ann Reynolds, MD

2009-2014

Role: Consultant Neurologist to local Autism Treatment Network (ATN) site. 2% effort funded. The ATN is a multi-site, collaborative, clinical network designed to advance the diagnosis and treatment of autism.

R01 NS40701

PI: Mark Dell'Acqua, Ph.D.

08/01/2001-07/30/2013

NIH/NINDS

Regulation of AKAP79 Postsynaptic Membrane Targeting

Role: Co-Investigator. The goals of this project are to further characterize the mechanism and regulation of AKAP79/150 targeting to the postsynaptic membrane of excitatory synapses in hippocampal neurons with an emphasis on early, rapid regulation of AMPA receptors during induction phases of hippocampal synaptic plasticity. 10% effort

Children's Hospital Colorado Research Institute

PI: Tim Benke, MD, PhD

05/01/2010-04/30/2011

Impact of Early life Seizures on Glutamate Receptors and Synaptic Function

Role: PI. The goal of this project was to characterize the mechanisms involved in the impairment of synaptic plasticity by a single seizure in early life, with an emphasis on investigating the properties of glutamate receptors.

Epilepsy Foundation Pediatric Partnership for Epilepsy Research (190295)

PI: Tim Benke, MD, PhD

1/01/2011-12/31/2011

Impact of Early life Seizures on Glutamate Receptors

Role: PI. The goal of this project was to characterize the mechanisms involved in the early alterations of glutamate receptors and cell signalling by a single seizure in early life. 10% effort.

NIH RO1 NS052644

PI: Ulli Bayer, PhD

1/30/07-11/30/11

NIH/NINDS

CaMKII activation and translocation in neuronal function

Role: Co-investigator: I assisted with electrophysiological characterization of effects of CamKII activation on glutamate receptors in cultured, transfected hippocampal neurons. 2.5% effort, unfunded.

W81XWH-10-1-0380

PI: Audrey Yee, MD

6/1/2010 – 5/31/2011

DOD

Epilepsy and the Wnt Signaling Pathway.

Role: Consultant. The major goal of this project was to determine how wnt pathway signalling affects epileptogenic signalling in the hippocampus. 3% effort.

CCTSI (Colorado Clinical Translational Sciences Institute)

PI: Dr Alberto Costa

6/01/2009-5/31/2011

Clinical Trial: Role of Memantine on cognition in young adults with Down Syndrome.

Role: co-PI and mentor to Jonah Scott-McKean, PhD student. 1% effort

K02 NS056090

PI: Tim Benke, MD, PhD

05/01/2007-04/30/2010

NIH/NINDS

Impact of early life seizures on glutamate receptors

Role: PI. The goal of this project was to characterize the mechanisms involved in the impairment of synaptic plasticity by a single seizure in early life, with an emphasis on investigating the properties of glutamate receptors. 75% effort

NIH RO1 DC0082797

PI: Katie Rennie, PhD

5/1/2007-4/20/2011

NIH/NIDCD

Neurotransmission at the vestibular calyx synapse

Role: Co-investigator: I assisted with electrophysiological analyses and mathematical modelling of neurotransmission at the calyx synapse in the vestibular periphery. 5% effort

K08 NS041267-05

PI: Tim Benke, MD, PhD

09/06/2001-08/31/2006

NIH/NINDS

Impact of Early-Life Seizures on Synaptic Plasticity

Role: PI. The goal of this project was to characterize the mechanisms involved in the impairment of synaptic plasticity by a single seizure in early life, with an emphasis on investigating the properties of glutamate receptors. 75% effort

R01 AA014021

PI: Paula Hoffman, Ph.D.

02/01/2005-01/31/2010

NIH-NIAAA

Regulation of NMDA Receptor Localization by Chronic Ethanol Exposure

Role: Co-Investigator. The focus was on mechanisms of adaptation in synaptic localization of NMDA receptors in response to chronic ethanol exposure. 2.5% effort

American Hearing Research Foundation

PI: Katie Rennie, Ph.D.

2004-2005

Ionic mechanisms underlying neuronal firing in vestibular calyx afferents

Role: Co-investigator. 5% effort.

F32 NS09894 National Research Service Award

PI: Tim Benke MD, PhD

1995-1996

NIH/NINDS

Pharmacological dendritic glutamate changes in LTP.

University of Bristol, Department of Anatomy.

National Institutes of Health Pre-Doctoral Fellowship, Baylor College of Medicine, Houston, TX, 1986-88.

Dr. Hadwen Trust for Humane Research, University of Bristol, Department of Anatomy, 1996-1997.

Achievement Rewards for College Scientists (ARCS) Scholar, Baylor College of Medicine, Houston, TX, 1988-1995.

W.M. Keck Foundation Equipment Grant, Baylor College of Medicine, Houston, TX, 1992.

Human Frontiers of Science Program sponsored Research Externship in laboratory of Graham Collingridge, Ph.D., Department of Pharmacology, University of Bristol, United Kingdom, 1989-1991.

National Science Foundation Travel Award, Rice University, Houston, TX, 1988.

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### Peer Reviewed Publications:

1. Wilson, O.B., Clark, J.W., Ganapathy, N., Benke, T.A. Signal processing methods for inverse problems in electrophysiology, *Twenty-second Asilomar Conference on Signals, Systems and Computers*, Chen, R.R., Ed., Vol. 2, pp. 938-944, 1988.
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5. Bresink, I., Benke, T.A., Collett, V.J., Seal, A.J., Parsons, C.G., Henley, J.M. and Collingridge, G.L., Effects of memantine on recombinant rat NMDA receptors expressed in HEK 293 cells, *British Journal of Pharmacology*, 119, 195-204, 1996.
6. Benke, T.A., Luthi, A., Isaac, J.T.R. and Collingridge, G.L., Modulation of AMPA receptor unitary conductance by synaptic activity, *Nature*, 393, 793-797, 1998.
7. Isaac, J.T.R., Luthi, A., Palmer, M.J., Anderson, W.W., Benke, T.A., Collingridge, G.L., An investigation of the expression mechanism of LTP of AMPA receptor-mediated synaptic

transmission at hippocampal CA1 synapses using failures analysis and dendritic recordings, *Neuropharmacology*, 37, 1399-1410, 1998.

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9. Benke, T.A., Luthi, A., Palmer, M.J., Wikstrom, M., Anderson, W.W., Isaac, J.T.R., Collingridge, G.L., Mathematical modeling of non-stationary fluctuation analysis for studying channel properties of synaptic AMPA receptors, *Journal of Physiology*, 537.2, 407-420, 2001.

10. Luthi, A., Wikstrom, M.A., Palmer, M.J., Matthews, P., Benke, T.A., Isaac, J.T.R., Collingridge, G.L., Bi-directional modulation of AMPA receptor unitary conductance by synaptic activity *BMC Neuroscience* 5, 44, 2004.

11. Lyle, P., Benke, T., Forno, E., Branum, J., Parker, S. Evaluation of encephalitis in the toddler: what part of negative don't you understand? *Curr Opin Pediatr.* 16, 567-70, 2004.

12. Benke, T. A., Swann, J. The tetanus toxin model of chronic epilepsy, *Adv Exp Med Biol* 548:226-238, 2004.

13. Rennie, K. J., Streeter, M. A., Benke T. A. and Moritz, A. T. Modeling channel properties in vestibular calyx terminals. *Biomed. Sci. Instrum.* 41:358-363, 2005.

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18. Hall, DA, Parsons, J, and Benke, TA Paroxysmal nonkinesigenic dyskinesia and celiac disease, *Movement Disorders* 22: 708-710, 2007.

19. Jones, J, Stubblefield, EA, Benke, TA and Staley, KJ Desynchronization of glutamate release prolongs synchronous CA3 network activity, *J Neurophysiol* 97:3812-18, 2007.

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23. Oskarsson, B., Zawadkzi, L., Benke, T.A. and Quan D. Neuromuscular hyperexcitability associated with muscle acetylcholine antibodies in a child, *Journal of Child Neurology* 24(1):90-2, 2009

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Scheper, G.C., Megalencephalic leukoencephalopathy with cysts without *MLC1* defect: 2 phenotypes, *Annals of Neurology*, 67:834-7, 2010.

27. Stubblefield, E.A. and Benke, T.A., Distinct AMPA-type glutamatergic synapses in developing rat CA1 hippocampus, *J Neurophysiol*, 104:1899-912, 2010.

28. Wray, C.D. and Benke, T.A., Effect of price increase of adrenocorticotrophic hormone on treatment practices of infantile spasms, *Pediatr Neurol* 43(3):163-6, 2010.

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30. Meredith, FL, Benke, TA, and Rennie, KJ. Hyperpolarization-activated current ( $I_h$ ) in vestibular calyx terminals: characterization and role in shaping postsynaptic events, *JARO*, 13(6): 745-758, 2012.

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33. Benke, T, O brother, wherefore are thou? Calcium-permeable AMPA receptors make an appearance in adult status epilepticus, *Epilepsy Curr*, 13:32-4, 2012 (review).

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\*35. Bernard, P.B., Castano, A. M., O'Leary, H., Simpson, K. Browning, M.D. and Benke, T.A., Phosphorylation of FMRP and alterations of FMRP complex underlie enhanced mLTD in adult rats triggered by early life seizures, *Neurobiology of Disease*, 59:1-17, 2013.

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37. Benke, T.A., What the dentate gyrus and the millennial in your basement have in common. *Epilepsy Curr*. 2014 May;14(3):152-4 (review).

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39. Bernard, P.B. and Benke, T.A., Early life seizures: evidence for chronic deficits linked to autism and intellectual disability across species and models, *Experimental Neurology*, 2014, (invited review).

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41. Bernard, P.B., Castano, A. M., Beitzel, C.B., Carlson, V.B. and Benke, T.A., Behavioral changes following a single episode of early life seizures support the latent development of an autistic phenotype, *Epilepsy and Behavior*, 44:78-85, 2015.

42. Stafstrom C.E. and Benke T.A. Autism and Epilepsy: Exploring the Relationship Using Experimental Models. *Epilepsy Currents*, 15(4):206-10, 2015.

43. Benke T.A., Getting in Touch with what Drives Your Inner Funky: Sources of CA1 Gamma Oscillations. *Epilepsy Currents*, 15(5):271-3, 2015.

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45. Barcomb K., Hell J.W., Benke T.A., Bayer K.U. The CaMKII/GluN2B Protein Interaction Maintains Synaptic Strength. *The Journal of Biological Chemistry*, 291(31):16082-9, 2016.



46. Goodell, D., Benke, T., A., Bayer, K.U. Developmental restoration of LTP deficits in heterozygous CaMKII $\alpha$  KO mice, *Journal of Neurophysiology*, 116:2140-51, 2016.
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50. Hector RD, Kalscheuer VM, Hennig F, Leonard H, Downs J, Clarke A, Benke TA, Armstrong J, Pineda M, Bailey MES, Cobb SR *CDKL5* variants: improving our understanding of a rare neurological disorder, *Neurology: Genetics* Dec 15;3(6):e200 ,2017.
51. Benke TA and Traynelis SF, AMPA-type glutamate receptor conductance changes and plasticity: still a lot of noise, *Neurochemical Research*, 2019 Mar;44(3):539-548. PMID: 2947644
52. Daniels D, Knupp K, Benke TA, Wolter-Warmerdam K, Moran M and Hickey F. Infantile Spasms in Children with Down Syndrome: Identification and Treatment Response. *Glob Pediatr Health.* 2019 Jan 9;6:2333794X18821939. doi: 10.1177/2333794X18821939. eCollection 2019. PMID: 30671494
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57. Demarest ST, Olson HE, Moss M, Pestana-Knight E, Zhang X, Parikh S, Swanson LC, Riley KD, Bazin GA, Juarez-Colunga E, Benke TA *CDKL5* Deficiency Disorder: Relationship between genotype, epilepsy, cortical visual impairment and development. 2019 60(8):1733-1742. PMID:31313283

\* Recognized by Faculty of 1000

**Complete List of Published Work in MyBibliography:**

<http://www.ncbi.nlm.nih.gov/sites/myncbi/timothy.benke.1/bibliography/41141240/public?sort=date&direction=ascending>

### **In preparation:**

1. Bernard, PB, Castano, AM, Hell, J, Buonarati, OR and Benke, TA, Early life seizures chronically disrupt L-type voltage gated calcium channel regulation of mGluR mediated long term depression via interactions with protein phosphatase 2a, 2019.
2. Demarest SD, et al and Benke TA, Whole-exome sequencing in patients with infantile spasms, 2019.
3. O'Leary H, Castano A, Pantlin L, Vanderlinden L, Saba LM and Benke TA, Transcriptome analysis of hippocampal CA1 in the kainic acid rat model of early life seizures using RNA sequencing. Submitted to Epilepsy Research, 2019.
4. Cary Fu, Dallas Armstrong, Eric D. Marsh, David N. Lieberman, Kathleen J. Motil, Rochelle Witt, Shannon Standridge, Paige Nues, Jane Lane, Tristen Dinkel, Monica Coenraads, Jana von Hehn, Mary Jones, Katie Hale, Bernhard Suter, Daniel G. Glaze, Jeffrey L. Neul, Alan Percy, Tim A. Benke, Health supervision for children, adolescents, and adults with Rett Syndrome. Submitted to Pediatrics, 2019

### **Book Chapters:**

1. Benke, T.A., Bresink, I., Collett, V.J., Doherty, A.J., Henley, J.M., and Collingridge, G.L., "Post-translational mechanisms which could underlie the postsynaptic expression of LTP and LTD", Ch. 5, **Cortical Plasticity**, Fazeli, M.S. and Collingridge, G.L., eds., BIOS Publishers, Oxford, U.K., 1996.
2. Moe, PG and Benke, TA "Neurologic and neuromuscular disorders" in **Current Pediatric Diagnosis & Treatment, 17<sup>th</sup> edition**, Hay, WW, Levin, MJ, Sondheimer, JM and Deterding, RR, eds., Lange Publishers, New York, 2005.
3. Moe, PG, Bernard T and Benke, TA "Neurologic and neuromuscular disorders" in **Current Pediatric Diagnosis & Treatment, 18<sup>th</sup> edition**, Hay, WW, Levin, MJ, Sondheimer, JM and Deterding, RR, eds., Lange Publishers, New York, 2007.
4. Benke, T.A., Anticonvulsants, in **Encyclopedia of Neuroscience**, Binder, M.D.; Hirokawa, N.; Windhorst, U.; Hirsch, M.C. (Eds.), 2008.
5. Benke, T.A. and Brooks-Kayal, A. "Experimental models of seizures and mechanisms of epileptogenesis", in **Wyllie's The Treatment of Epilepsy: Principles & Practice, 5<sup>th</sup> edition**, 2010.
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### **Selected Abstracts:**

1. Benke, T.A., Clark, J.W., Wisoff, P.J., Schneider, S., Balasubramanian, C., Hawkins, H.K., Perling, L., Shehab, A., Laurent, J. "Electrophysiological and Histological studies of laser and suture anastomosis in rat sciatic nerves", Eleventh annual international conference of the IEEE Engineering in Medicine and Biology Society, November, 1989.
2. Benke, T.A., Angelides, K.J. "Distribution of NMDA receptors on hippocampal neurons", Society for Neuroscience, November, 1990.
3. Randall, A.D., Benke, T.A., Angelides, K.J., Schofield, J.G., Collingridge, G.L. "A demonstration of NMDA receptor-mediated synaptic and single-channel currents from patch-clamped neurons in rat hippocampal slices", *Journal of Physiology* 425, 18P, 1990.

4. Benke, T.A., Angelides, K.J. "Distribution of NMDA receptors on hippocampal neurons", Society for Neuroscience, December 1992.
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