*Updated April 2018*

**CURRICULUM VITAE**

**Personal Information**

Name: Sarah D. Linnstaedt, PhD

**Education**

Fellowship: Post-Doctoral Fellow

Duke University

09/2008 – 08/2012

Graduate: PhD

 Georgetown University

 Washington, DC

 08/2003 – 08/2008

College: BS

 Virginia Tech

 Blacksburg, VA

 08/1999 – 05/2003

**Professional Experience**

Assistant Professor

Department of Anesthesiology

Department of Genetics and Molecular Biology

University of North Carolina

Chapel Hill, NC

02/2017 – Present

(joint appointment added)

Assistant Professor

Department of Anesthesiology

University of North Carolina

Chapel Hill, NC

09/2012 – 01/2017

Lecturer

Department of Biology

University of North Carolina

Chapel Hill, NC

01/2011 – 05/2011

Society Memberships:

2016 – Present Society for Biological Psychiatry

2015 – Present Society for Neuroscience

2013 – Present RNA Society

2013 – Present International Association for the Study of Pain

2013 – Present American Society of Anesthesiologists

2012 – Present American Pain Society

**Honors and Awards**

Federal Work Study Supervisor of the Year Award Nominee (being nominated places you in the top 2% of Federal Work Study Supervisors), University of North Carolina at Chapel Hill, NC

2018

Special Recognition from the Basic Science Shared Interest Group of The American Pain Society

American Pain Society Annual Meeting, Palm Springs CA

2015

Top abstract award (out of ~450) from the Pain Genetics Committee

American Pain Society Annual Meeting, Tampa FL

2014

Top Oral Presentation at the Annual Center for AIDS Research Retreat

Duke University

2011

Fellowship Award

Duke University, Durham NC

2009 - 2012

Gertrude Maengwyn-Davies Award for Most Outstanding PhD Thesis

Georgetown University, Washington D.C.

2008

Best Poster Award at the Centers for Infectious Disease Conference

Georgetown University, Washington DC

2005

**Research**

Current Research

University of North Carolina Chapel Hill Mentor: Samuel McLean

Identifying sex-dependent molecular mechanisms of chronic pain and posttraumatic stress development following trauma/stress exposure

2012 – present

Post-doctoral Research

Duke University Mentor: Bryan Cullen

Established the function of Epstein-Barr virus encoded- and associated- microRNAs and discovered microRNA biomarkers of EBV induced lymphoma.

2008 – 2012

Thesis research

Georgetown University Mentor: John Casey

Determined RNA secondary structure and mechanistic requirements for RNA editing in Hepatitis delta virus genotype III

2004 – 2008

Undergraduate research

Virginia Tech Mentor: David Popham

Functional assessment of three stage IV sporulation genes involved in Bacillus subtilis spore cortex synthesis

2001 – 2003

**Teaching Record**

Research Mentorship

Anesthesiology Residents

2017 Anita Matthews, MD, Department of Anesthesiology, University of North Carolina at Chapel Hill, Role: Research advisor for Resident research rotation, Fall 2017

Graduate Students

2017-Preset Yue Pan, PhD candidate, Department of Statistics, University of North Carolina at Chapel Hill. Role: Research mentor

2013-2017 Katrina Kutchko PhD, Department of Biology, University of North Carolina at Chapel Hill, Thesis: From neurons to nucleic acids: spatio-temporal emergent behaviors of complex biological systems. Role: Thesis Committee Member

Medical Students

2016 Suleman Sheikh, First Year Medical Student, West Virginia School of Osteopathic Medicine, Lewisburg, WV

2016 Christine Zhou, First Year Medical Student, Campbell University School of Osteopathic Medicine, Lilington, NC

2015 Karan Koyani, Second Year Medical Student, University of North Carolina at Chapel Hill

2015 Michael Gonzales, First Year Medical Student, University of North Carolina at Chapel Hill

2015 Evan Harmon, First Year Medical Student, University of North Carolina at Chapel Hill

Undergraduate Students

2017-Present Raphael Kim, Sophomore Undergraduate Student, UNC-CH

2017-Present Dongjin Kim, Senior Undergraduate Student, UNC-CH

2017-Present Jameson Blount, awarded a competitive Undergraduate Research Fellowship at The University of North Carolina in 2018, Junior Undergraduate Student, UNC-CH

2016-Present Connie Chen, awarded a competitive Undergraduate Research Fellowship at The University of North Carolina in 2017, Junior Undergraduate Student, UNC-CH

2014-Present Matthew Carson, Sophomore Undergraduate Student, UNC-CH

2015-2018 Shan Yu, awarded a competitive Undergraduate Research Fellowship at The University of North Carolina in 2017, current Dental School student at UPenn

2015-2018 Cathleen Rueckeis, awarded a competitive Undergraduate Research Fellowship at The University of North Carolina in 2016, Senior Undergraduate Student, UNC-CH

2014-2017 Lindsey Jung, current Masters student in Biostatistics, Boston College

2013-2017 Kyle Riker, awarded a competitive Undergraduate Research Fellowship at The University of North Carolina in 2015, current MD PhD student, UNC-CH

2015-2016 Alan Wu, current Masters student in Biostatistics, Columbia University

2014-2015 Eunice Yeh, current PhD student in biostatistics, Harvard University

2012-2015 Margaret Walker, awarded a competitive Undergraduate Research Fellowship at The University of North Carolina in 2013, current science teacher, Brooklyn, New York

2012-2014 Kathleen McCarthy, current Research Assistant, Professional Sector

2010-2012 Caitlin Esoda, current Graduate Student, Duke University

2010-2012 Anand Kornepati, current MD PhD student, Texas A&M

Instructional

Medical Student Teaching

2015 Lecturer, “MicroRNA and their role in pain pathogenesis”, Pain Didactic Lecture Series

2014 – 2017 Lecturer, “Critical appraisal of the literature”, Anesthesiology Department Academic Medicine Rotation

2003 – 2008 Teaching Assistant, Medical Microbiology Laboratory Class, Georgetown University

Graduate Student Teaching

2017 GNET703 Curriculum in Genetics and Molecular Biology Student Seminar Series, University of North Carolina at Chapel Hill Department of Genetics

2011 MGM252 Virology and Viral Oncology – Lecturer, “Viral MicroRNAs” Duke University

2006 – 2007 MICB619 Biology and Biochemistry of Viruses – Lecturer, “Hepatitis D Virus”, “Prions”, “Herpes Viruses” Georgetown University

Undergraduate Student Teaching

2011 BIOL 202 Human Genetics – Lecturer, MWF class of 150 students, 9 weeks, UNC Chapel Hill

**Bibliography**

*Published Peer Reviewed Journal Articles*

1. Gilmore ME, Bandyopadhyay D, Dean AM, **Linnstaedt SD**, Popham DL. Production of muramic delta-lactam in Bacillus subtilis spore peptidoglycan. *Journal of Bacteriology* 2004 186(1): 80-9

2. **Linnstaedt SD**, Kasprzak WK, Shapiro BA, Casey JL. The role of a metastable RNA secondary structure in hepatitis delta virus genotype III RNA editing. *RNA* 2006 12(8): 1521-33

3.Vasudevan P, Weaver A, Reichert ED, **Linnstaedt SD**, Popham DL. Spore cortex formation in Bacillus subtilis is regulated by accumulation of peptidoglycan precursors under the control of sigma K. *Molecular Microbiology* 2007 65(6): 1582-94

4. Gandy SZ, **Linnstaedt SD**, Muralidhar S, Cashman KA, Rosenthal LJ, Casey JL. RNA editing of the human herpesvirus 8 kaposin transcript eliminates its transforming activity and is induced during lytic replication. *Journal of Virology* 2007 81(24): 13544-51

5. **Linnstaedt SD**, Kasprzak WK, Shapiro BA, Casey JL. The fraction of RNA that folds into the correct branched structure determines hepatitis delta virus RNA editing levels. *RNA* 2009 15(6): 1177-87

6. **Linnstaedt SD**, Gottwein E, Skalsky R, Luftig M, Cullen B. Virally induced cellular miR-155 plays a key role in B-cell immortalization by EBV. *Journal of Virology* 2010 Nov; 84(22):11670-8

7. Feederle R, **Linnstaedt SD**, Bannert H, Lips H, Bencun M, Cullen BR, Delecluse HJ. A viral microRNA cluster strongly potentiates the transforming properties of a human herpesvirus. *PLoS Pathogens* 2011 Feb; 7(2): e1001294

8. Feederle R, Haar J, Bernhardt K, **Linnstaedt SD**, Bannert H, Lips H, Cullen BR, Delecluse HJ. The Members of an Epstein-Barr Virus MicroRNA Cluster Cooperate To Transform B Lymphocytes. *Journal of Virology* 2011 Oct; 85(19): 9801-10

9. Kim DJ, **Linnstaedt SD**, Palma J, Park JC, Ntrivalas E, Kwak-Kim JY, Gilman-Sachs A, Beaman K, Hastings ML, Martin JN, Duelli DM. Plasma components affect accuracy of circulating cancer-related microRNA quantitation. *Journal of Molecular Diagnostics* 2012 Jan; 14(1): 71-80.

10. Forte E, Salinas R, Chang C, Zhou T, **Linnstaedt SD**, Gottwein E, Jacobs C, Jima D, Li QJ, Dave SS, Luftig MA. The Epstein-Barr virus induced tumor suppressor miR-34a is growth promoting in EBV-infected B cells. *Journal of Virology* 2012 Jun; 86, No. 12 6889-98.

11. Ballina LE, Ulirsch JC, Soward AC, Rossi C, Rotolo S, **Linnstaedt SD**, Heafner T, Foley KA, Batts J, Collette R, Holbrook D, Zelman S, McLean SA. μ-Opioid receptor gene A118G polymorphism predicts pain recovery after sexual assault. *Journal of Pain* 2013 Feb; 14(2): 165-71.

12. Wahl A, **Linnstaedt SD**, Esoda C, Krisko JF, Martinez-Torres F, Delecluse HJ, Cullen BR, Garcia JV. A Cluster of Virus-encoded microRNAs Accelerates Acute Systemic Epstein-Barr Virus Infection but does not Significantly Enhance Virus-induced Oncogenesis In Vivo. *Journal of Virology* 2013 Mar 6.

13. Skalsky RL, Kang D, **Linnstaedt SD**, Cullen BR. Evolutionary conservation of Primate Lymphocryptovirus microRNA targets. Journal of Virology 2014 Feb; 88(3): 1617-35.

14. Musey PI, **Linnstaedt SD**, Platts-Mills TF, Miner JR, Bortsov AV, Safdar B, Bijur P, Rosenau A, Tsze DS, Chang AK, Dorai S, Engel K, Feldman JA, Fusaro AM, Lee DC, Rosenberg M, Keefe FJ, Peak DA, Nam CS, Patel R, Fillingim RB, McLean SA. Gender Differences in Acute and Chronic Pain in the Emergency Department: Results of the 2014 Society for Academic Emergency Medicine Consensus Conference Pain Section. *Acad Emerg Med* 2014 Dec; 21(12):1421-30.

15. **Linnstaedt SD**, Hu JunMei, Bortsov AV, Soward AC, Swor R, Jones J, Lee D, Peak D, Domeier R, Rathlev N, Hendry P, McLean SA. µ-Opioid Receptor Gene A118 G Variants and Persistent Pain Symptoms Among Men and Women Experiencing Motor Vehicle Collision. *Journal of Pain* 2015 Jul;16(7):637-44.

16. **Linnstaedt SD**, Walker MG, Parker J, Yeh E, Sons RL, Zimny E, Lewandowski C, Hendry PL, Damiron K, Pearson C, Velilla MA, O’Neil BJ, Jones J, Swor R, Domeier R, Hammond S, McLean SA. microRNA circulating in the early aftermath of motor vehicle collision predict persistent pain development and suggest a role for microRNA in sex specific pain differences. *Molecular Pain*. 2015 Oct 24; 11:66*.*

17. **Linnstaedt SD**, Bortsov AV, Soward AC, Swor R, Peak D, Jones J, Rathlev N, Lee DC, Domeier R, Hendry P, McLean SA. *CRHBP* polymorphisms predict chronic pain development following motor vehicle collision. *Pain.* 2016 Jan; 157(1):273-9.

18. **Linnstaedt SD**, Riker KD, Walker MG, Nyland JE, Zimny E, Lewandowski C, Hendry PL, Damiron K, Pearson C, Velilla MA, Jones J, Swor RA, Domeier R, McLean SA. microRNA-320a predicts chronic axial and widespread pain development following motor vehicle collision in a stress-dependent manner. *J Orthop Sports Phys Ther.* 2016;46(10):911-919, B1-B3.

19. **Linnstaedt SD**, Hu JunMei, Liu AY, Soward AC, Bollen KA, Wang HE, Hendry PL, Zimny E, Lewandowski C, Velilla MA, Damiron K, Pearson C, Domeier R, Kaushik S, Feldman J, Rosenberg M,Jones J, Swor R, Rathlev N, McLean SA. Methodology of the AA CRASH Prospective Observational Study Evaluating the Incidence and Pathogenesis of Chronic Pain and Adverse Psychological Outcomes in African Americans following Motor Vehicle Collision. *BMJ Open*. 2016 Sep 6;6(9).

20. **Linnstaedt SD**, Walker MG, Riker KD, Nyland JE, Hu JM, Rossi C, Swor RA, Jones JS, Diatchenko L, Bortsov AV, Peak DA, McLean SA. Genetic variant rs3750625 in the 3’UTR of ADRA2A affects stress dependent acute pain severity after trauma and alters a microRNA-34a regulatory site. *Pain*. 2017 Feb;158(2):230-239

21. Madsen TE, McLean SA, Zhai W, **Linnstaedt SD**, Kurz MC, Swor RA, Hendry PL; Peak DA, Lewandowski C, Pearson C, O’Neil B, Datner E, Lee D, Beaudoin F. Gender Differences in Pain Experience and Treatment after Motor Vehicle Collisions in the CRASH Study. *Journal of* *Clinical Therapeutics, special issue on* *Women’s Health and Gender Medicine*. 2018. Feb;40(2):204-213.e2

22. **Linnstaedt SD**, Riker KD, Kutchko KM, Lackey L, McCarthy KR, Tsai Y, Parker JS, Kurz M, Hendry PL, Lewandowski C, Velilla MA, Datner E, Pearson C, Domeier R, Kaushik S, Laederach A, McLean SA. A functional riboSNitch in the 3'UTR of *FKBP5* alters microRNA-320a binding efficiency and mediates vulnerability to chronic posttraumatic pain. *Journal of Neuroscience*. 2018 In Review.

23. **Linnstaedt SD**, Riker KD, Rueckeis CA, Wu A, Yu S, Gonzalez M, Harmon E, Green P, Chen C, King T, Tsai YH, Parker J, Lewandowski C, Hendry PL, Pearson C, Kurz MC, Damiron K, Velilla MA, Domeier R, Liberzon I, Mogil JS, Levine J, McLean SA. microRNA-19b acts as a sex-dependent regulatory hub for posttraumatic stress and widespread pain development following trauma exposure. *Biological Psychiatry*. 2018 In Review.

24. Yu S, Chen C, Pan Y, Kurz MC, Pearson C, Hendry PL, Lewandowski C, Domeier R, McLean SA, **Linnstaedt SD**. Genes known to escape X chromosome inactivation predict co-morbid chronic musculoskeletal pain and posttraumatic stress symptom development in women following trauma exposure. *Neuropsychiatric Genetics.* Special Issue on Sex differences in neuropsychiatric disorders. 2018 In Review.

*Manuscript in Preparation*

25. **Linnstaedt SD**, Jung L, Blount J, Zhou CY, Carson MS, Mauck MC, Kurz MC, Hendry PL, Lewandowski C, Velilla MA, Datner E, Pearson C, Domeier R, Kaushik S, McLean SA. Genetic variants in the circadian rhythm pathway predict PTS symptoms following trauma exposure. *Frontiers in Psychiatry*. Manuscript in preparation for a Special Issue on Molecular Mechanisms in Stress and Trauma Related Disorders.

**Conference Presentations**

1. Weaver A, **Linnstaedt SD**, Reichert E, Manfredi M, Street J, Dean A, Meader-Parton J, Popham D. Spore Peptidoglycan synthesis in Bacillus subtilis *spoIV* and *spoV* mutant strains. *Poster presentation*, American Society for Microbiology, Washington DC, 2003.

2. **Linnstaedt SD**, Casey J. The split personality of Hepatitis delta virus. *Poster presentation*. Student Research Days, Georgetown University, 2004.

3. **Linnstaedt SD**, Casey J. HDV RNA editing, deconstructed.*Poster presentation*, Centers for Infectious Diseases Conference, Georgetown University, Washington DC, 2005.

4. **Linnstaedt SD**, Casey J. RNA structural dynamics and RNA editing in Hepatitis delta virus genotype III.*Oral presentation*, American Society for Virology, 24th annual meeting, Penn State University, Pennsylvania, 2005.

5. **Linnstaedt SD**, Casey J. RNA secondary structural dynamics regulate Hepatitis delta virus editing levels*Oral presentation*, National Institutes of Health, Bethesda MD, RNA club, 2006.

6. **Linnstaedt SD**, Casey J. RNA editing in hepatitis delta virus genotype III is controlled by RNA structural dynamics and substrate quality. *Oral presentation*, RNA society meeting, Seattle Washington, 2006.

7. **Linnstaedt SD**, Casey J. Specific nucleotides within the HDV genotype III editing structure determine RNA folding dynamics and editing efficiency. *Oral presentation*, Annual meeting on the Molecular Biology of Hepatitis B viruses, Rome Italy, 2007.

8. **Linnstaedt SD**, Gottwein E, Luftig M, Cullen B. Epstein-Barr virus (EBV) encoded miR-BHRF1-1 and cellular miR-155 are important for the growth of EBV transformed B cells. *Poster presentation*, CFAR annual retreat, Durham North Carolina, 2009.

9. **Linnstaedt SD**, Gottwein E, Luftig M, Cullen B. Epstein-Barr virus (EBV) encoded miR-BHRF1-1 and cellular miR-155 are important for the growth of EBV transformed B cells. *Poster presentation*, Keystone Symposia on RNA silencing: Mechanism, Biology and Application.

10. **Linnstaedt SD**, Gottwein E, Luftig M, Cullen B. Epstein-Barr virus (EBV) encoded miR-BHRF1-1 and cellular miR-155 are important for the growth of EBV transformed B cells. *Poster presentation*, 12th International Conference on Malignancies in AIDS and Other Acquired Immunodeficiencies, NIH, Bethesda MD, April 2010.

11. **Linnstaedt SD**, Gottwein E, Luftig M, Cullen B. Virally induced cellular miR-155 plays a key role in B cell immortalization by EBV. *Poster presentation*, The 14th biennial Conference of The International Association for Research on Epstein-Barr Virus and Associated Diseases, Birmingham UK, September 2010.

12. **Linnstaedt SD**, Bortsov A, Swor R, Jones J, Lee D, Peak D, Domeier R, Rathlev N, Hendry P, McLean S.  Among women with substantial pertraumatic distress after minor motor vehicle collision (MVC), the presence of one or more G alleles at OPRM1 A118G is protective against developing persistent moderate or severe pain.  *Poster presentation* at the Annual Meeting of the American Pain Society, New Orleans, LA, May 2013

13. **Linnstaedt SD**, Bortsov AV, Walker MG, Swor RA, Jones JS, Lee DC, Peak DA, Domeier RM, Rathlev NK, McLean SA.A genetic variant in ADRA2A predicts extent of acute pain after motor vehicle collision. *Poster presentation* at the 2013 American Society of Anesthesiologists Annual Meeting, October 12-16, San Francisco, CA

14. **Linnstaedt SD**, Walker MG, Bortsov AV, Sons RL, Swor RA, Jones JS, Lee DC, Peak DA, Domeier RM, Rathlev NK, Hammond SM, McLean SA. A genetic variant in ADRA2A is associated with acute pain severity and is a determinant of miR-34a binding efficiency. *Poster presentation* at the 2014 RNA silencing Keystone Meeting, January 31 – Feb 5, Seattle, WA

15. **Linnstaedt SD**, Walker MG, Bortsov AV, Swor RA, Jones JS, Lee DC, Peak DA, Domeier RM, Rathlev NK, McLean SA. The ADRA2A genetic variant rs3750635 influences extent and severity of acute pain after motor vehicle collision and may do so by regulating microRNA function. *Poster presentation* at the 2014 Annual Meeting of the American Pain Society, Tampa FL, May 2014

16. **Linnstaedt SD**, Walker MG, Parker JS, Sons RL, Velilla MA, Pearson C, O’Neil BJ, Zinny E, Lewandowski CL, Damiron K, Hendry PL, Barnes S, Rosenber M, Hammond SM, McLean SA. Circulating microRNA evaluated in the early aftermath of motor vehicle collision predict widespread pain development in African Americans and provide potential pathogenic insights: results of a preliminary analysis. *Poster presentation* and *Selected for Oral presentation* at the 2014 Annual Meeting of the American Pain Society, Tampa FL, May 2014

17. **Linnstaedt SD**, McCarthy KR, Riker KD, Kutchko KM, Laederach A, McLean SA. A genetic variant in the glucocorticoid receptor co-chaperone FKBP5, associated with chronic pain vulnerability, changes RNA structure and alters binding by miR-320a. *Poster presentation* at the 2014 Bi-Annual Meeting of the International Association for the Study of Pain, Buenos Aires, Argentina, October 2014

18. **Linnstaedt SD**, Riker KD, Nyland JE, Zimny E, Lewandowski C, Hendry PL, Damiron K, Pearson C, Velilla MA, Jones J, Swor R, Domeier R, McLean SA. microRNA 320a is a potential mediator of chronic widespread hyperalgesia development after stress exposure. *Poster presentation* at the 2015 Annual Meeting of the American Pain Society, Palm Springs CA, May 2015

19. Bortsov AV, **Linnstaedt SD**, Velilla MA, Damiron K, Pearson C, Jones JS, Hendry PL, Kurz MC, McLean SA. Vitamin D deficiency is associated with worse overall pain outcomes over time among African Americans experiencing motor vehicle collision. *Poster presentation* at the 2015 Annual Meeting of the American Pain Society, Palm Springs CA, May 2015

20. **Linnstaedt SD**, Wu A, Green P, Levine J, Riker K, Rueckeis C, Yu, S,Zimny E, Lewandowski C, Hendry PL, Damiron K, Pearson C, Velilla MA, Jones J, Swor R, Domeier R, McLean SA. Sex-dependent expression of microRNA -19b predicts chronic widespread pain and posttraumatic stress disorder development following trauma exposure. *Poster presentation* at the 2016 Annual Meeting of the American Pain Society, Austin TX, May 2016

21. McLean SA, Wu A, Gonzalez M, Harmon E, Zimny E, Lewandowski C, Hendry PL, Damiron K, Pearson C, Velilla MA, Swor R, Domeier R, **Linnstaedt SD**. The influence of microRNA on chronic pain development after motor vehicle collision may be sex-dependent. *Poster presentation* at the 2016 Bi-Annual Meeting of the International Association for the Study of Pain, Yokohama, Japan, September 2016

22. **Linnstaedt SD**, Harmon E, Riker KD, Nyland JE, McLean SA. Common genetic variations in ADRA2A that influence stress-induced analgesia might be mediated by microRNA-34a. *Poster Presentation* at the 2016 Annual American Society for Anesthesiologists Meeting, Chicago IL, October 2016

23. **Linnstaedt SD**, Yu S, Chen C, Kurz M, Pearson C, Hendry PL, Lewandowski C, Domeier R, Damiron K, McLean SA. Expression levels of *XIST* RNA predict PTSD and chronic pain outcomes in women experiencing motor vehicle collision. *Poster Presentation* at the 2017 Annual Society for Biological Psychiatry Meeting, San Diego, May 2017.

24. **Linnstaedt SD**, Jung LS, Zhou CY, Mauck MC, Kurz M, Zimny E, Pearson C, Hendry PL, McLean SA. Genetic variants in the circadian rhythm pathway predict PTSD symptoms following trauma exposure. *Poster Presentation* at the 2017 Annual Society for Biological Psychiatry Meeting, San Diego, May 2017.

25. **Linnstaedt SD**, Rueckeis CA, Riker KD, Yu S, Chen C, King T, Lewandowski C, Hendry PL, Pearson C, Kurz M, Damiron K, Domeier R, Liberzon I, McLean SA. microRNA -19b acts as a sex-dependent regulatory hub for PTSD and chronic widespread pain development following trauma exposure. *Poster Presentation* at the 2017 Annual Society for Biological Psychiatry Meeting, San Diego, May 2017.

26. **Linnstaedt SD**, Riker KD, Kurz M, Pearson C, Hendry PL, Lewandowski C, Zimny E, Velilla MA, Damiron K, McLean SA. miRNA-320a regulation of *FKBP5* mediates chronic posttraumatic pain vulnerability in an allele-specific manner. *Poster Presentation* at the 2017 Annual American Society for Anesthesiologists Meeting, Boston MA, October 2017.

27. Yu S, Pan Y, Datner E, Kurz MC, Hendry PL, Lewandowski C, Pearson C, Domeier R, McLean SA, **Linnstaedt SD**. *OPRM1* gene expression differentially predicts posttraumatic chronic pain in women and men. *Poster Presentation* at the 2018 American Pain Society Meeting, Anaheim CA, March 2018.

28. **Linnstaedt SD**, Pan Y, Borde A, Mathew A, Kurz M, Hendry PL, Pearson C, Vililla MA, Lewandowski C, Datner E, Domeier R, Liberzon I, McLean SA. Sex differences in incidence and predictors of depression and posttraumatic stress symptoms among African Americans experiencing motor vehicle collision. *Poster Presentation* at the 2018 Society for Biological Psychiatry Meeting, New York, NY, May 2018.

29. Chen C, Yu S, Pan Y, Kurz MC, Pearson C, Hendry PL, Lewandowski C, Domeier R, McLean SA, **Linnstaedt SD**. Genes known to escape X chromosome inactivation predict comorbid musculoskeletal pain and posttraumatic stress symptom development in women following trauma exposure. Accepted for *Poster Presentation* at the 2018 International Association for the Study of Pain, Boston MA, September 2018.

30. **Linnstaedt SD,** Pan Y, Kurz MC, Pearson C, Hendry PL, Lewandowski C, Domeier R, McLean SA. Sex-dependent risk factors of persistent axial pain development following motor vehicle collision trauma: results of a preliminary analysis. Accepted for *Poster Presentation* at the 2018 International Association for the Study of Pain, Boston MA, September 2018.

31. Mathew A, Yu S, Pan Y, Kurz MC, Hendry PL, Pearson C, Domeier R, **Linnstaedt SD**, McLean SA. Sex-dependent expression of opioid receptor gene mRNA predicts the development of chronic musculoskeletal pain following motor vehicle collision trauma. Submitted for presentation at the 2018 American Society of Anesthesiologists Meeting in San Francisco, CA, October 2018.

**Invited/Professional Talks**

1. **Linnstaedt SD**, Gottwein E, Luftig M, Cullen B. Virally induced cellular miR-155 plays a key role in B cell immortalization by EBV. Research presentation at the MGM department Annual Retreat, Duke University, Durham NC, September 2010.

2. **Linnstaedt SD**, Kornepati A, Esoda C, Skalsky R, Cullen B. miR-155 targeting of c-FOS mRNA plays a role in preventing apoptosis in EBV induced lymphomas. Research presentation at the Center for AIDS Research Annual Retreat, Duke University, Durham NC, September 2011.

3. **Linnstaedt SD**, Walker MG, Parker JS, Sons RL, Velilla MA, Pearson C, O’Neil BJ, Zinny E, Lewandowski CL, Damiron K, Hendry PL, Barnes S, Rosenber M, Hammond SM, McLean SA. Circulating microRNA evaluated in the early aftermath of motor vehicle collision predict widespread pain development in African Americans and provide potential pathogenic insights: results of a preliminary analysis. Research presentation at the 2014 Annual Meeting of the American Pain Society, Tampa FL, May 2014. \*Awarded the Junior Investigator Poster Award from the Genetics and Pain Shared Interest Group of the American Pain Society.

4. **Linnstaedt SD**, Bortsov AV, McLean SA. Understanding molecular mechanisms of chronic pain development following stressful/ traumatic events. Research presentation, Anesthesiology Grand Rounds, UNC-CH Medical School, June 25, 2014.

5. **Linnstaedt SD**. MicroRNA mechanisms mediating persistent pain development after motor vehicle trauma. Invited research presentation given to the Center for Pain Research and Innovation in the UNC School of Dentistry, Chapel Hill North Carolina, December 4, 2015.

6. **Linnstaedt SD**. MicroRNAs and Their Role in Pain Pathogenesis. Review of the research field for the Pain Didactic Series, Department of Anesthesiology, UNC-CH Medical School, February 10, 2015.

7. **Linnstaedt SD**. MicroRNA mechanisms mediating persistent pain development after motor vehicle trauma. Research presentation at the Basic Science SIG Meeting at the 2015 Annual Meeting of the American Pain Society, Palm Springs CA, May 2015.

8. **Linnstaedt SD**, Yeh E, Walker MG, Sons RL, Zimny E, Pearson C, Velilla MA, Jones J, Swor R, Domeier R, McLean SA. MicroRNA in whole blood as predictors of severe axial pain development following motor vehicle collision trauma. Research presentation at the 2015 American Society of Anesthesiologists Annual Meeting, October 24-28, San Diego, CA.

9. **Linnstaedt SD**. A genetic variant in the glucocorticoid receptor co-chaperone FKBP5, associated with chronic pain vulnerability, changes RNA secondary structure and alters binding by miR-320a. Research presentation given to the Departments of Anesthesia and Psychology, McGill University, Montreal Canada, February 16, 2016.

10. **Linnstaedt SD** (moderator), McLean SA (UNC-CH), Levine J (UCSF). Stress-Induced Persistent Pain: Mechanistic Insights from Humans and Animals. Symposium selected for presentation at the 2016 Annual Meeting of the American Pain Society, Austin TX, May 2016.

11. **Linnstaedt SD**, Mauck MC, McNaull P. Genetic and molecular mechanisms mediating stress-induced persistent pain development. Research presentation, Anesthesiology Grand Rounds, UNC-CH Medical School, September 7, 2016.

12. **Linnstaedt SD**, Riker KD, Kutchko KM, Lackey L, Kurz M, Lewandowski C, Pearson C, Hendry PL, Laederach A, McLean SA. *FKBP5* variant rs3800373 alters *FKBP5* RNA secondary structure and prevents stress-induced microRNA-320a downregulation of *FKBP5*, resulting in glucocorticoid resistance and increased vulnerability to chronic posttraumatic pain. Research presentation at the 2017 Annual Society for Biological Psychiatry Meeting, San Diego, May 2017.

13. **Linnstaedt SD**. microRNAs as stress and sex dependent mediators of posttraumatic chronic pain. Research presentation given to the OHSU Department of Physiology & Pharmacology, Portland Oregon, January 25, 2018.

14. **Linnstaedt SD** (moderator), Price T (UT-Dallas), Geranton S (UCL). Sex differences in chronic pain: mechanistic insights from humans and animals. Topical Workshop selected for presentation at the 2018 International Association for the Study of Pain (IASP) Meeting in Boston, MA, September 2018.

**Grants and Funding**

TITLE:  Key molecular mechanisms of chronic pain vulnerability in women experiencing MVC

Grant Type (or Number):        KAR071504

Grant Amount: $502,434

Funding Agency:                    NIAMS

Grant Period:                          2018-2022

Grant Status:                          AWARDED

Principal Investigator:           Sarah Linnstaedt

TITLE:  microRNA expression signatures as biomarkers of posttraumatic stress

Grant Type (or Number):        Foundation

Grant Amount: $25,000

Funding Agency:                    Fox Foundation

Grant Period:                          2018-2019

Grant Status:                          AWARDED

Principal Investigator:           Sarah Linnstaedt

TITLE: Longitudinal Assessment of Post-traumatic Syndromes

Grant Type (or Number): 1U01MH110925

Total Grant Amount: $21,007,052

Funding Agency: NIH/NIMH

Grant Period: 2016-2021

Grant Status: AWARDED

Principal Investigator: Samuel McLean

Role: Co-I (5% effort)

TITLE:  Supplement to "Influence of PTSD Symptoms on Chronic Pain Development after Sexual Assault”

Grant Type (or Number):        Foundation

Grant Amount: $179,560

Funding Agency:                    Mayday Fund

Grant Period:                          2014-2019

Grant Status:                          AWARDED

Principal Investigators:           Sarah Linnstaedt and Samuel McLean

TITLE: Assessing stress induced hyperalgesia in rats using analgesia and thermal plantar meters

Grant Type (or Number): Research Infrastructure Grant

Total Grant Amount: $7,996

Funding Agency: UNC School of Medicine Office of Research

Grant Period: 2017

Grant Status: COMPLETED

Principal Investigator: Sarah Linnstaedt

TITLE:  MicroRNA mechanisms mediating chronic pain development after motor vehicle trauma

Grant Type (or Number):        Future Leaders in Pain Grant

Grant Amount: $20,000

Funding Agency:                    The American Pain Society

Grant Period:                          2015-2016

Grant Status:                          COMPLETED

Principal Investigator:           Sarah Linnstaedt

TITLE: microRNA as mediators of chronic pain development following Motor Vehicle Collision

Grant Type (or Number): IBM Junior Faculty Development Award

Grant Amount: $7,500

Funding Agency: University of North Carolina, Chapel Hill

Grant Period: 2014-2015

Grant Status: COMPLETED

Principal Investigator: Sarah Linnstaedt

TITLE: Defining the role of virally -encoded and virally -induced microRNAs in B-cell immortalization by EBV

Grant Type (or Number): T32 AI007392-23

Funding Agency: NIAID Interdisciplinary Research Training Program in AIDS

Grant Period: 2009-2012

Grant Status: COMPLETED

Principal Investigators: Charles Hicks

Role: Fellowship Awardee

**Professional Service**

Poster Session Judge for UNC Women in Science Annual Symposium

Chapel Hill, NC

2018

Vice Chair for the Departmental Research Committee

Department of Anesthesiology

2017-present

Career Mentor at NC School of Science and Mathematics

Durham, NC

2011

Judge at NC Science Fair

Raleigh, NC

2010