

**Sarah D. Linnstaedt, PhD****1) Personal Information**

Name: Sarah D. Linnstaedt, PhD  
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**2) Education**

<u>Institution and Location</u>	<u>Degree/Program</u>	<u>Year</u>	<u>Degree/Focus</u>
Duke University Durham, NC	Post-doctoral Fellow	2012	RNA biology
Georgetown University Washington, DC	PhD	2008	Microbiology and Immunology
Virginia Tech Blacksburg, VA	BS	2003	Biology
Brooke Pointe High School Stafford, VA	Diploma	1999	

**3) Professional Experience – Employment History**

2019- Assistant Professor (Tenure Track), Department of Anesthesiology, University of North Carolina at Chapel Hill, NC, with joint appointment in the Curriculum in Genetics and Molecular Biology, University of North Carolina at Chapel Hill, Chapel Hill, NC  
(Transitioned to Tenure Track)

2017- Research Assistant Professor, Department of Anesthesiology, University of North Carolina at Chapel Hill, NC, with joint appointment in the Curriculum in Genetics and Molecular Biology, University of North Carolina at Chapel Hill, Chapel Hill, NC  
(Additional appointment in the Curriculum in Genetics and Molecular Biology)

2012- Research Assistant Professor, Department of Anesthesiology, University of North Carolina at Chapel Hill, Chapel Hill, NC

2011 Lecturer, Department of Biology, University of North Carolina at Chapel Hill, Chapel Hill, NC

2003-2008 Research Fellow, Department of Microbiology and Immunology, Duke University, Durham, NC

1999-2003 Teaching Fellow, Department of Microbiology and Immunology, Georgetown University, Washington, D.C.

**Society Memberships:**

2020 – Present USASP (replaced the American Pain Society)  
 2016 – Present Society of 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

#### 4) Honors and Awards

- 2020 Rita Allen Foundation Pain Scholar Award, Rita Allen Foundation. This is a competitive award that funds between two and four proposals each year. Past recipients of the award comprise many leaders in the pain field.
- 2020 Best Poster Award from the UNC School of Medicine Center for Women’s Health Research, University of North Carolina at Chapel Hill, Chapel Hill, NC. This recognition and monetary award was presented to Undergraduate student mentee, Esther Son (role: mentor, senior author)
- 2018 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, Chapel Hill, NC
- 2015 Future Leader in Pain, American Pain Society. This award is highly competitive (<10% success rate) and is awarded to two pain researchers in the US each year. My application entitled, “MicroRNA mechanisms mediating chronic pain development after motor vehicle trauma” earned me this distinction in 2015.
- 2015 Special Recognition (and plaque) from the Basic Science Shared Interest Group of The American Pain Society for excellence in research, American Pain Society Annual Meeting, Palm Springs, CA
- 2014 Top abstract award (out of ~450) from the Pain Genetics Committee American Pain Society Annual Meeting, Tampa, FL
- 2011 Top Oral Presentation at the Annual Center for AIDS Research Retreat, Duke University, Durham, NC
- 2008 Gertrude Maengwyn-Davies Award for Most Outstanding PhD Thesis, Georgetown University, Washington, D.C.
- 2005 Best Poster Award at the Centers for Infectious Disease Conference, Georgetown University, Washington, D.C.

#### 5) Bibliography

##### Refereed Articles

##### *Published Original Research and Review articles*

1. Lobo JJ, Tungate AS, Peak DA, Swor RA, Rathlev NK, Hendry PL, McLean SA, **Linnstaedt SD**. Polygenic risk scoring of a longitudinal trauma cohort to assess genetic overlap and protective factors influencing vulnerability to posttraumatic stress, chronic pain, and depression. *Translational Psychiatry*. 2021 Jun 29; 11(1):359. PMID: 34226500
2. **Linnstaedt SD**, Mauck MC, Son EY, Tungate AS, Pan Y, Rueckeis C, Yu S, Lechner M, Datner E, Cairns BA, D’Anza T, Velilla MA, Pearson C, Shupp JW, Smith DJ, McLean SA. 17 $\beta$ -estradiol levels circulating in the early aftermath of trauma exposure influences chronic posttraumatic pain outcomes: results from women and men enrolled in three longitudinal trauma cohorts. *PAIN*. 2021 Mar 26. PMID: 34028234
3. Cakmak AS, Alday E, Da Poian G, Bahrami Rad A, Metzler TJ, Neylan TC, House SL, Beaudoin FL, An X, Stevens J, Zeng D, **Linnstaedt SD**,... Clifford GD. Classification and prediction of post-trauma outcomes related to PTSD using circadian rhythm changes measured via wrist-worn research watch in a large longitudinal cohort. *IEEE J Biomed Health Inform*. 2021 Jan 22. PMID: 33481725
4. Beaudoin FL, Kessler RC, Hwang I, Lee S, Sampson NA, An X, Stevens JS, Zeng D, Neylan TC, Clifford GD, **Linnstaedt SD**, ... McLean SA. Pain after a motor vehicle crash: The role of socio-demographics, crash characteristics, and peri-traumatic stress symptoms. *European Journal of Pain*. May;25(5):1119-1136. PMID: 33458880

5. Elliott JM, Rueckeis CA, Pan Y, Parrish TB, Walton DM, **Linnstaedt SD**. microRNA let-7i-5p mediates the relationship between muscle fat infiltration and neck pain disability following motor vehicle collision: a preliminary study. *Scientific Reports*. 2021 Feb 4;11(1):3140. PMID: 33542428
6. Harnett NG, van Rooij SJH, Ely TD, ... **Linnstaedt SD**, ... Koenen KC, Mclean SA, Ressler KJ, Stevens JS. Prognostic neuroimaging biomarkers of trauma-related psychopathology: resting-state fMRI shortly after trauma predicts future PTSD and depression symptoms in the AURORA study. *Neuropsychopharmacology* 2021 Jun;46(7). PMID: 33479509
7. Khoury S, Wang QP, Parisien M, Gris P, Bortsov A, **Linnstaedt SD**, McLean SA, Tungate A, Sofer T, Lee J, Louie T, Redline S, Kaunisto M, Kalso E, Munter HM, Nackley A, Slade G, Smith S, Zaykin D, Fillingim R, Ohrbach R, Greenspan J, Maixner W, Neely G, Diatchenko L. Multi-ethnic GWAS and meta-analysis of sleep quality identify MPP6 as a novel gene that functions in sleep center neurons. *Sleep*. Mar 12;44(3). PMID: 33034629
8. Neylan TC, Kessler RC, Ressler KJ, Clifford GD, Beaudoin FL, An X, Stevens JS, Zeng D, **Linnstaedt SD**, Germine LT, ... McLean SA. Prior sleep problems and adverse post-traumatic neuropsychiatric sequelae of motor vehicle collision in the AURORA study. *Sleep*. 2021 Mar 12;44(3). PMID: 32975289
9. Joorman J, McLean SA, Beaudoin FL, An X, Stevens JS, Zeng D, Neylan TC, Clifford GD, **Linnstaedt SD**, Germine LT, ... Ressler K, Kessler R. Socio-demographic and trauma-related predictors of threshold depression within eight weeks of motor vehicle collision in the AURORA study. *Psychological Medicine*. 2020 Oct 29:1-14. PMID: 33118917
10. Kessler RC, Ressler KJ, House SL, Beaudoin FL, An X, Stevens JS, Zeng D, Neylan TC, **Linnstaedt SD**, Germine LT, ..., McLean SA. Socio-demographic and trauma-related predictors of PTSD within eight weeks of a motor vehicle collision in the AURORA study. *Molecular Psychiatry*. 2020 Oct 19:10.1038/s41380-020-00911-3. PMID: 33077855
11. **Linnstaedt SD**, Rueckeis CA, Riker KD, Pan Y, Wu A, Yu S, Wanstrath B, Gonzalez M, Harmon E, Green P, Chen C, King T, Lewandowski C, Hendry PL, Pearson C, Kurz MC, Datner E, Velilla MA, Domeier R, Liberzon I, Mogil JS, Levine J, McLean SA. microRNA-19b predicts widespread pain and posttraumatic stress symptom risk in a sex-dependent manner following trauma exposure. *PAIN*, 2020 Jan;161(1):47-60. PMID: 31569141
12. **Linnstaedt SD**, Zannas AS, McLean SA, Koenen KC, Ressler KJ. Literature review and methodological considerations for understanding circulating risk biomarkers following trauma exposure. *Molecular Psychiatry*, 2020 Sep;25(9):1986-1999. PMID: 31863020
13. Mauck MC, **Linnstaedt SD**, Bortsov A, Kurz MC, Hendry PL, Lewandowski C, Velilla MA, Datner E, Pearson C, Domeier R, Fillingim RB, Beaudoin FL, Ting J, McLean SA. Vitamin D insufficiency increases risk of chronic pain among African Americans experiencing motor vehicle collision. *PAIN*, Feb;161(2):274-280. PMID: 31651575
14. Nievergelt CM,... **Linnstaedt SD**,... Koenen KC. International meta-analysis of PTSD genome-wide association studies identifies sex- and ancestry-specific genetic risk loci. *Nat Commun*. 2019 Oct 8;10(1):4558 PMID: 31594949
15. McLean SA, Ressler KJ, Koenen KC, Neylan TC, Germine L, Jovanovic T, Clifford GD, Zeng D, An X, **Linnstaedt SD**, Beaudoin FL, ... and Kessler RC. The AURORA Study: A Longitudinal, Multimodal Library of Brain Biology and Function after Traumatic Stress Exposure. *Molecular Psychiatry* 2020 Feb;25(2):283-296. PMID: 31745239
16. Stone D, Bogaardt H, **Linnstaedt SD**, Martin-Harris B, Smith AC, Walton DM, Ward E, Elliott JM. Whiplash-Associated Dysphagia: Considerations of Potential Incidence and Mechanisms. *Dysphagia*. 2020 Jun;35(3):403-413. PMID: 31377863
17. Yu S\*, Chen C\*, Pan Y, Kurz MC, Datner E, Hendry PL, Velilla MA, Lewandowski C, Pearson 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. *Am J Med Genet B Neuropsychiatr Genet*. 2019 Sep;180(6):415-427 (\*co-first authors) PMID: 30537437

18. **Linnstaedt SD**, Pan Y, Mauck MC, Sullivan J, Zhou CY, Jung L, Rueckeis CA, Blount JD, Carson MS, Tungate AS, Kurz MC, Hendry PL, Lewandowski C, D'Anza T, Datner E, Bell K, Lechner M, Shupp JW, Cairns BA, McLean SA. Evaluation of the association between genetic variants in circadian rhythm genes and posttraumatic stress symptoms identifies a potential functional allele in the transcription factor *TEF*. *Front Psychiatry*. 2018 Nov 15;9:597 PMID: 30498461
19. **Linnstaedt SD**, Riker KD, Rueckeis CA, Kutchko KM, Lackey L, McCarthy KR, Tsai Y, Parker JS, Kurz MC, 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 Sep 26;38(39):8407-8420. PMID: 30150364 \*\*\*See below for press/media coverage associated with this manuscript.
20. 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 PMID: 29371004
21. **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. PMID: 27805929
22. **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). PMID: 27601501
23. **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. PMID: 27690835
24. **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. PMID: 26447706
25. **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. PMID: 26498117
26. **Linnstaedt SD**, Hu JunMei, Bortsov AV, Soward AC, Swor R, Jones J, Lee D, Peak D, Domeier R, Rathlev N, Hendry P, McLean SA.  $\mu$ -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. PMID: 25842347
27. 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. PMID: 25422152
28. Skalsky RL, Kang D, **Linnstaedt SD**, Cullen BR. Evolutionary conservation of Primate Lymphocryptovirus microRNA targets. *Journal of Virology* 2014 Feb; 88(3): 1617-35. PMID: 24257599
29. 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 May;87(10):5437-46. PMID: 23468485

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31. 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. PMID: 22496226
32. 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. PMID: 22154918
33. 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. PMID: 21752900
34. 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. PMID: 21379335
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36. Chen R, **Linnstaedt SD**, Casey JL. RNA editing and its control in hepatitis delta virus replication. *Viruses* 2010 Jan; 2(1): 131-46. PMID: 21994604
37. **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. PMID: 19383766
38. 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. PMID: 17913828
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40. **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. PMID: 16790843
41. 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. PMID: 14679227

#### *Manuscripts in Submission*

1. Wanstrath BJ, Bauder M, Hausch F, McLean SA, **Linnstaedt SD**. Duration of reduction in stress-induced hyperalgesia via FKBP51 inhibition depends on timing of administration after traumatic stress exposure. *In review, Journal of Neuroscience*.
2. Ziobrowski HN, Kennedy CJ, Ustun B, House SL, Beaudoin FL, An X, Stevens JS, Zeng D, Neylan TC, Clifford GD, Jovanovic T, **Linnstaedt SD**, ... Kessler RC. Predicting posttraumatic stress disorder and major depression three months after a motor vehicle collision: results from the AURORA study. *In review, JAMA Psychiatry*.
3. Harnett NG, van Rooij SJH, Ely TD, ... **Linnstaedt SD**, ... Koenen KC, Mclean SA, Ressler KJ, Stevens JS. Thalamic volume and fear extinction interact to predict acute posttraumatic stress severity. *In review, Journal of Psychiatric Research*.
4. Beaudoin FL, An X, Basu A, Ji Y, Liu M, Kessler RC, Dougherty RF, Zeng D, Bollen KA, House SL, Stevens JS, Neylan TC, Clifford GD, Jovanovic T, **Linnstaedt SD**, ... McLean SA. Use of serial smartphone-based assessments to characterize diverse neuropsychiatric symptom trajectories in a large trauma survivor cohort. *In review, American Journal of Psychiatry*.

5. Sterina E, Michopoulos V, **Linnstaedt SD**, Neylan TC, Clifford GD, Ethun KF, Lori A, Wingo AP, Rothbaum BO, Ressler KJ, Stevens JS. Time of trauma prospectively affects PTSD symptom severity: the impact of circadian rhythms and cortisol. *In review, Neuropsychopharmacology*.
6. Lobo JJ, Ayoub LJ, Moayed M, **Linnstaedt SD**. Hippocampal brain volume and FKBP5 genetic risk interact to influence chronic musculoskeletal pain: analysis of 36,822 UKBB participants. *In preparation, Nature Communications*.
7. Kim R, Pang G, Lin T, Tungate A, Liu Yufeng, McLean SA, **Linnstaedt SD**. Derivation and validation of emergency department based risk prediction for posttraumatic stress symptoms six months following traumatic stress exposure. *In preparation, American Journal of Psychiatry*.

#### *Published Abstracts*

1. Son E, Tungate AS, Mauck MC, Pan Y, Witkemper KD, Kurz MC, Hendry PL, Pearson C, Lewandowski C, Datner E, Cairns BA, McLean SA, **Linnstaedt SD**. Peritraumatic Circulating 17 $\beta$ -Estradiol As a Resiliency Factor for Chronic Pain Outcomes in Women Following Trauma. *Poster presentation* at the 2020 Society for Biological Psychiatry Meeting, New York, NY May 2020.
2. Lobo JJ, Tungate AS, Peak DA, Swor RA, Rathlev NK, Hendry PL, McLean SA, **Linnstaedt SD**. Examination of genetic overlap in vulnerability to posttraumatic chronic pain, stress, and depression symptoms following motor vehicle collision using polygenic risk score analyses. *Poster presentation* at the 2020 Society for Biological Psychiatry Meeting, New York, NY May 2020.
3. Wanstrath BJ, Pazhayam NM, Bauder M, Hausch F, McLean SA, **Linnstaedt SD**. Timing of FKBP51 inhibition following stress exposure influences the duration of reduction in enduring stress-induced hyperalgesia. *Poster presentation* at the 2020 Society for Biological Psychiatry Meeting, New York, NY May 2020.
4. Kim R, Pan Y, Kurz MC, Hendry PL, Pearson C, Lewandowski C, Datner E, Liu Y, McLean SA, **Linnstaedt SD**. Prediction of co-morbid chronic pain and posttraumatic stress: results of a pilot analysis of clinical and microRNA data from a longitudinal cohort of African American trauma survivors. *Poster presentation* at the 2020 Society for Biological Psychiatry Meeting, New York, NY May 2020.
5. Barton C, Mauck MC, **Linnstaedt SD**, Kurz MC, Hendry PL, Pearson C, O'Neil B, Lewandowski C, Datner E, Liberzon I, Domeier R, McLean SA. Immune profile in the immediate aftermath of MVC and its prediction of APNS. *Poster presentation* at the 2020 Society for Biological Psychiatry Meeting, New York, NY May 2020.
6. An X, Ressler KJ, Koenen K, **Linnstaedt SD**, Kessler RC, Zeng D, Mclean SA. Methods of the Aurora Study: A Large-scale, In-depth Study Of The Development Of Chronic Pain And Other Neuropsychiatric Sequelae After Traumatic Stress Exposure. *Poster presentation* at the 2019 American Society of Anesthesiology. Orlando, FL, October 2019.
7. Williams JH, Pan Y, Blount J, Datner E, Hendry PL, Lewandowski C, Pearson C, McLean SA, **Linnstaedt SD**. 17 $\beta$  -estradiol predicts chronic musculoskeletal pain development following trauma exposure and influences the expression of pain-associated genes. *Poster presentation* at the 2019 American Society of Anesthesiology. Orlando, FL, October 2019.
8. Blount J, Pan Y, Mauck MC, Datner E, Kurz MC, Hendry PL, Lewandowski C, Pearson C, McLean SA, **Linnstaedt SD**. 17 $\beta$ -estradiol as a predictor and potential mediator of chronic musculoskeletal pain development in women following trauma exposure. *Poster presentation* at the 2019 American Pain Society Meeting in Milwaukee WI, April 2019.
9. 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. *Poster presentation* at the 2018 American Society of Anesthesiologists Meeting in San Francisco, CA, October 2018.
10. **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. *Poster Presentation* at the 2018 International Association for the Study of Pain, Boston MA, September 2018.

11. 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. *Poster Presentation* at the 2018 International Association for the Study of Pain, Boston MA, September 2018.
12. **Linnstaedt SD**, Pan Y, Borde A, Mathew A, Kim D, Kim R, 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.
13. 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.
14. **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.
15. **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.
16. **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.
17. **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.
18. **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
19. 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
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. 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
22. **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

23. **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
24. **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
25. **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
26. **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
27. **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
28. **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
29. **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 14<sup>th</sup> biennial Conference of The International Association for Research on Epstein-Barr Virus and Associated Diseases, Birmingham UK, September 2010.
30. **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*, 12<sup>th</sup> International Conference on Malignancies in AIDS and Other Acquired Immunodeficiencies, NIH, Bethesda MD, April 2010.
31. **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.
32. **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.
33. **Linnstaedt SD**, Casey J. HDV RNA editing, deconstructed. *Poster presentation*, Centers for Infectious Diseases Conference, Georgetown University, Washington DC, 2005.
34. **Linnstaedt SD**, Casey J. The split personality of Hepatitis delta virus. *Poster presentation*. Student Research Days, Georgetown University, 2004.
35. 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.

#### Invited/Professional Talks



*International/National*

1. **Linnstaedt SD.** FKBP51 antagonism to prevent chronic pain. Translational Pain Research Consortium of the Gulf Coast Consortia and the Texas Pain Research consortium. This is a virtual symposium attended by 200-250 scientists each month. March 19, 2021
2. **Linnstaedt SD.** Sex and stress specific molecular mechanisms of chronic pain development following traumatic stress exposure. Invited research presentation to the Neural & Behavioral Sciences Department, Penn State College of Medicine, Hershey PA, February 27, 2020.
3. **Linnstaedt SD.** Predictors and mediators of posttraumatic chronic pain development. Invited research presentation given to the Stanford Department of Anesthesiology, Palo Alto CA, January 23, 2019
4. **Linnstaedt SD** (moderator), Price T (UT-Dallas), Geranton S (UCL). Sex differences in chronic pain: mechanistic insights from humans and animals. Workshop presentation at the 2018 International Association for the Study of Pain (IASP) Meeting in Boston, MA, September 2018.
5. **Linnstaedt SD.** microRNAs as stress and sex dependent mediators of posttraumatic chronic pain. Invited research presentation given to the OHSU Department of Physiology & Pharmacology, Portland OR, January 25, 2018.
6. **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. Selected research presentation at the 2017 Annual Society for Biological Psychiatry Meeting, San Diego CA, May 2017.
7. **Linnstaedt SD** (moderator), McLean SA (UNC-CH), Levine J (UCSF). Stress-Induced Persistent Pain: Mechanistic Insights from Humans and Animals. Symposium presentation at the 2016 Annual Meeting of the American Pain Society, Austin TX, May 2016.
8. **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. Invited research presentation given to the Departments of Anesthesia and Psychology, McGill University, Montreal Canada, February 16, 2016.
9. **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, San Diego, CA, October 24-28, 2015.
10. **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.
11. **Linnstaedt SD,** Walker MG, Parker JS, Sons RL, Velilla MA, Pearson C, O'Neil BJ, Zimny 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 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.
12. **Linnstaedt SD,** Casey J. Specific nucleotides within the HDV genotype III editing structure determine RNA folding dynamics and editing efficiency. Research presentation at the Annual meeting on the Molecular Biology of Hepatitis B viruses, Rome Italy, July 2007.
13. **Linnstaedt SD,** Casey J. RNA editing in hepatitis delta virus genotype III is controlled by RNA structural dynamics and substrate quality. Research presentation at the RNA society meeting, Seattle WA, July 2006.
14. **Linnstaedt SD,** Casey J. RNA secondary structural dynamics regulate Hepatitis delta virus editing levels. Research presentation at the RNA meeting group of the National Institutes of Health, Bethesda MD, April 2006.

15. **Linnstaedt SD**, Casey J. RNA structural dynamics and RNA editing in Hepatitis delta virus genotype III. Research presentation at the American Society for Virology, 24<sup>th</sup> annual meeting, Penn State University, State College PA, May 2005.

#### *Regional/Local*

16. **Linnstaedt SD**. Molecular risk predictors of chronic pain following traumatic stress: path to preventative interventions. Invited research presentation at the Pain Society of the Carolinas 2020 Annual Meeting and Scientific Sessions, Asheville North Carolina, September 18, 2020 \*Due to COVID-19, this conference was conducted virtually and my talk was live recorded and uploaded to the meeting website.
17. **Linnstaedt SD**. Towards the identification of novel therapies to treat chronic pain following trauma using translational animal models of stress induced hyperalgesia. Research presentation at the Institute for Trauma Recovery, University of North Carolina at Chapel Hill, January 31, 2020.
18. **Linnstaedt SD**, Mauck MC, McLean SA. Translational biology of chronic pain development. Research presentation, Anesthesiology Grand Rounds, UNC-CH Medical School, March 6, 2019.
19. **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.
20. **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.
21. **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.
22. **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.
23. **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.
24. **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.

#### Media Coverage

##### *Print/Web*

- 2019 Pain Research Forum article published May 6, 2019 “A Search for Blood Biomarkers of Pain”, interviewed about the utility of blood biomarkers and to comment on a recently published piece by Niculescu et al.
- 2019 Nature article by science writer Amber Dance published March 27, 2019 “Why the sexes don’t feel pain the same way”, interviewed about recent findings regarding RNA expression differences in X chromosome gene transcripts driving chronic pain in women following trauma exposure: Nature
- 2019 Wall Street Journal article published February 7, 2019 “A New Prognosis for Pain Care”, Interviewed about recent findings regarding genetics of pain development: WSJ
- 2018 NIH Director Francis Collins’ Blog article published September 4, 2018. Coverage related to FKBP5 paper published in the Journal of Neuroscience: NIH Director's Blog
- 2018 The Conversation article published August 27, 2018 “Chronic pain after trauma may depend on what stress gene variation you carry”, invited to write a public interest news piece related to FKBP5 paper published in the Journal of Neuroscience: The Conversation
- 2017 Pain Research Forum article published February 28, 2017 “Young Investigator Spotlight”, Interviewed about research for an international forum for pain researchers: PRF Interview

- 2016 [PainMedicineNews](#) article published March 28, 2016 “MicroRNA in blood may predict post-trauma pain, press for a study showing a microRNA signature that predicts chronic pain development following motor vehicle collision trauma: [PainMedicineNews](#)”
- 2012 [News and Views in Epigenomics](#) article published in 2012 (4(1), 9–12) “A step forward in miRNA diagnostics: new and improved protocols for miRNA measurement”, highlighting a publications describing an improved protocol for measuring miRNA as a diagnostic marker: [Epigenomics](#)”

## 6) Teaching Activities

### Research Mentorship

#### *Postdoctoral Scholars*

2021-Present Lauren A. McKibben, PhD., Behavioral Neuroscience. Dissertation: “Genome-Wide miRNA Regulation of Stress Susceptibility Across the Brain in a Rodent Model of Early Life Stress”

#### *Graduate Students*

- 2021-Present Erica Branham, PhD candidate, Genetics and Molecular Biology (GMB), University of North Carolina at Chapel Hill. Role: Primary research mentor (Erica is currently supported by a T32 fellowship through the UNC GMB program to perform studies focused on how adversity influences epigenetic mechanisms leading to chronic pain development following trauma exposure)
- 2019-2021 Raphael Kim, Masters candidate, Department of Mathematics and Computational Biology, University of North Carolina at Chapel Hill. Role: Research mentor
- 2017-2020 Yue Pan, PhD candidate, Department of Statistics, University of North Carolina at Chapel Hill. Role: Primary 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

#### *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

#### *Medical Students*

- 2020 Anjana Kumar, Fourth Year Medical Student, University of North Carolina at Chapel Hill
- 2018 Sara Feldman, Fourth Year Medical Student, University of North Carolina at Chapel Hill
- 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, Lillington, 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*

- 2020-Present Sophia Kuhl-Chimera, Freshman Undergraduate Student, UNC-CH
- 2020-Present Kaila Hamm, Junior Undergraduate Student, UNC-CH
- 2019-Present Tina Lin, Sophomore Undergraduate Student, UNC-CH
- 2019-Present Aaron Lee, Sophomore Undergraduate Student, UNC-CH
- 2019-Present Ishani Deliwala, Sophomore Undergraduate Student, UNC-CH, awarded a competitive Undergraduate Research Fellowship that provides funding for a summer to perform research at

- The University of North Carolina. 2021 Awardee, funded proposal entitled: “Determining whether 17- $\beta$ -estradiol and STX prevent chronic pain after traumatic stress exposure” (Role: primary mentor)
- 2018-Present YeEun (Esther) Son, Junior Undergraduate Student, UNC-CH
- 2018-Present Gehao (Leo) Pang, Junior Undergraduate Student, UNC-CH, awarded a competitive Undergraduate Research Fellowship that provides funding for a summer to perform research at The University of North Carolina. 2020 Awardee, funded proposal entitled: “Tissue specificity and timing of post-stress expression of the chronic pain-associated protein FKBP51” (Role: primary mentor)
- 2018-Present Jarred Lobo, awarded a competitive Undergraduate Research Fellowship that provides funding for a summer to perform research at The University of North Carolina. 2019 Awardee, funded proposal entitled: “Determining genetic risk for posttraumatic chronic pain and related neuropsychiatric disorders using polygenic risk scores” (Role: primary mentor)
- 2017-2019 Raphael Kim, currently a Graduate student, UNC-CH
- 2017-2019 Jameson Blount, awarded a competitive Undergraduate Research Fellowship that provides funding for a summer to perform research at The University of North Carolina. 2018 Awardee, funded proposal entitled: “Examination of key circadian rhythm genes and transcripts as predictors of chronic pain development following trauma exposure” (Role: primary mentor)
- 2016-2019 Connie Chen, awarded a competitive Undergraduate Research Fellowship that provides funding for a summer to perform research at The University of North Carolina. 2017 Awardee, funded proposal entitled: “Exploration of a key mechanism causing chronic pain and PTSD in women following trauma exposure” (Role: primary mentor)
- 2014-2019 Matthew Carson, current student in Master’s in Public Policy, UNC-CH
- 2017-2018 Dongjin Kim, Graduate in Statistics and Mathematics, UNC-CH
- 2015-2018 Shan Yu, awarded a competitive Undergraduate Research Fellowship that provides funding for a summer to perform research at The University of North Carolina. 2017 Awardee, funded proposal entitled: “Altered microRNA expression due to 17- $\beta$ -estradiol regulation predict chronic musculoskeletal pain in women experiencing motor vehicle collision” (Role: primary mentor)
- 2015-2018 Cathleen Rueckeis, awarded a competitive Undergraduate Research Fellowship that provides funding for a summer to perform research at The University of North Carolina. 2016 Awardee, funded proposal entitled: “microRNA-19b is a Potential Mediator of Adverse Posttraumatic Sequelae Following Motor Vehicle Collision” (Role: primary mentor)
- 2014-2017 Lindsey Jung, current Masters student in Biostatistics, Boston College
- 2013-2017 Kyle Riker, awarded a competitive Undergraduate Research Fellowship that provides funding for a summer to perform research at The University of North Carolina. 2015 Awardee, funded proposal entitled: “The development of widespread pain after stress exposure is potentially regulated by microRNA 320a” (Role: primary mentor)
- 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 that provides funding for a summer to perform research at The University of North Carolina. 2013 Awardee, funded proposal entitled: “The interaction between mir-34a and adrenergic alpha-2A as a mechanistic explanation for post-traumatic pain variability” (Role: primary mentor)
- 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

#### *Resident Teaching*

- 2021 Resident Journal Club, Debate style format, Department of Anesthesiology, University of North Carolina at Chapel Hill, Chapel Hill, NC
- 2014-Present Academic Medicine Rotation lecture, “Critical appraisal of the literature”, Department of Anesthesiology, University of North Carolina at Chapel Hill, Chapel Hill, NC.

*Medical Student Teaching*

- 2016-Present Course Director and student mentor, ANES403/403b Anesthesiology Research, University of North Carolina at Chapel Hill
- 2015 Lecturer, “MicroRNA and their role in pain pathogenesis”, Pain Didactic Lecture Series
- 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

**7) Grants**

*Pending*

TITLE: Sex-dependent microRNA-mediated pathways to chronic musculoskeletal pain following trauma

Grant Type (or Number): R01AR078391  
 Grant Amount: \$3,304,867  
 Funding Agency: NIH/NIAMS  
 Grant Period: 2021-2026  
 Grant Status: PENDING  
 Principal Investigator: Sarah Linnstaedt (25% effort)

TITLE: Predicting PTSD using multi-omic epigenomic profiling via single cell sequencing analysis of human peripheral blood mononuclear cells

Grant Type (or Number): R01NIMH  
 Grant Amount: \$224,269 (subcontract amount)  
 Funding Agency: NIH/NIMH  
 Grant Period: 2021-2026  
 Grant Status: PENDING  
 Principal Investigator: Guia Guiffanti, McLean Hospital, Harvard Medical School  
 Role: Co-I (10% effort)

*Current*

TITLE: FKBP51 antagonism to prevent chronic pain: optimizing efficacy & evaluating safety and mechanisms

Grant Type (or Number): R01NS118563  
 Grant Amount: \$3,317,472  
 Funding Agency: NIH/NINDS  
 Grant Period: 2020-2025  
 Grant Status: AWARDED  
 Principal Investigator: Sarah Linnstaedt (20% effort)

TITLE: FKBP51 inhibition to prevent chronic pain following traumatic stress

Grant Type (or Number): Rita Allen Award in Pain  
Grant Amount: \$150,000  
Funding Agency: Rita Allen Foundation  
Grant Period: 2020-2023  
Grant Status: AWARDED  
Principal Investigator: Sarah Linnstaedt (0% effort)

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

Grant Type (or Number): K01AR071504  
Grant Amount: \$502,434  
Funding Agency: NIH/NIAMS  
Grant Period: 2018-2022  
Grant Status: AWARDED  
Principal Investigator: Sarah Linnstaedt (75% effort)

TITLE: Longitudinal Assessment of Post-traumatic Syndromes

Grant Type (or Number): U01MH110925  
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: microRNA expression signatures as biomarkers of posttraumatic stress

Grant Type (or Number): Fox Foundation  
Grant Amount: \$25,000  
Funding Agency: Fox Companies  
Grant Period: 2018-2021  
Grant Status: AWARDED  
Principal Investigator: Sarah Linnstaedt (0% effort)

*Completed*

TITLE: Tissue specificity and timing of post-stress expression of the chronic pain-associated protein FKBP51

Grant Type (or Number): Pilot projects in UNC biomedical research cores  
Grant Amount: \$7,049  
Funding Agency: UNC School of Medicine  
Grant Period: 2020-2021  
Grant Status: COMPLETED  
Principal Investigator: Sarah Linnstaedt (0% effort)

TITLE: Measurement of circulating protein analytes in multiplex from human and animal biological samples

Grant Type (or Number): Research Infrastructure Grant  
Total Grant Amount: \$21,524  
Funding Agency: UNC School of Medicine Office of Research  
Grant Period: 2019  
Grant Status: COMPLETED  
Principal Investigator: Sarah Linnstaedt (0% 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: COMPLETED  
Principal Investigators: Sarah Linnstaedt and Samuel McLean

TITLE: Assessing 17 $\beta$ -estradiol levels in women and men following trauma exposure  
Grant Type (or Number): Research Infrastructure Grant  
Total Grant Amount: \$7,289  
Funding Agency: UNC School of Medicine Office of Research  
Grant Period: 2018  
Grant Status: COMPLETED  
Principal Investigator: Sarah Linnstaedt (0% effort)

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 (0% effort)

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 (0% effort)

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 (0% effort)

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 (75% effort)

## **8) Professional Service**

## Committees

### *National Committees*

2015-2018 Reviewer for Future Leaders in Pain Grant offered through the American Pain Society. Assigned between 3 and 5 grant proposals to review each year. Review process and committee meeting are organized/run similarly to NIH grant reviews.

### *Local Committees*

2018, 2019 Poster session judge for UNC Women in Science Annual Symposium, Chapel Hill, NC  
2017- Co-Vice Chair for the Departmental Research Committee, UNC Department of Anesthesiology  
2016 Ad hoc grant reviewer, Gillings Innovation Labs Grant, UNC School of Public Health.  
2016 Resident research project grant reviewer, UNC Department of Anesthesiology  
2011 Career mentor at North Carolina School of Science and Mathematics, Durham, NC  
2010 Research project judge for North Carolina Regional Science Fair (for High School students), Raleigh, NC

### Journal Reviewer (last three years only)

Molecular Psychiatry, Translational Psychiatry, Biological Psychiatry, PAIN, RNA, Journal of Pain, Molecular Pain