

1) Personal Information

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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

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| 2022- | Associate Professor with Tenure, Department of Anesthesiology, University of North Carolina at Chapel Hill, NC. Effective date: March 25, 2022. |
| 2019-2022 | Assistant Professor (Tenure Track), Department of Anesthesiology, University of North Carolina at Chapel Hill, NC. (Transitioned to Tenure Track). Effective date: July 1, 2019. |
| 2017- | Member of the Curriculum in Genetics and Molecular Biology, University of North Carolina at Chapel Hill, NC |
| 2012-2019 | 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:

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| 2023 – Present | American college of neuropsychopharmacology |
| 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 |
| 2012 – 2019 | American Pain Society (replaced by USASP) |

4) Honors and Awards

- 2023 NIH HEAL Director's Trailblazer Award from Dr. Rebecca Baker, Director of the National Institutes of Health Helping to End Addiction Long-term Initiative. This was a competitive award that recognizes HEAL-funded researchers in the early to middle stages of their careers who are applying an innovative approach or creativity in their research or are expanding research into addressing the pain and opioid crisis in new directions.
- 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. Garrison-Desany H, Denckla CA, Meyers JL, **Linnstaedt SD**, Koenen KC, ... Harte S, Mclean SA. Post-traumatic stress and future substance use outcomes: leveraging antecedent factors to stratify risk. *Frontiers in Psychiatry*, section Addictive Disorders. Accepted March 8, 2024
2. Zeamer AL, Salive MC, An X, Beaudoin FL, House SL, Stevens JS, ... **Linnstaedt SD**, ... Bucci V, Haran JP. Association between microbiome and the development of adverse posttraumatic neuropsychiatric sequelae after traumatic stress exposure. *Transl Psychiatry*. 2023 Nov 18;13(1):354. PMID: 37980332.
3. Sim J, O'Guin E, Monahan K, Sugimoto C, McLean SA, Albertorio-Saez L, Zhao Y, Laumet S, Dagenais A, Bernard MP, Folger JK, Robinson AJ, **Linnstaedt SD**, Laumet G. Interleukin-10-producing monocytes contribute to sex differences in pain resolution in mice and humans. *bioRxiv*. 2023 Nov 5:2023. PMID: 37961295.
4. Rowland GE, Roeckner A, Ely TD, Lebois LAM, van Rooij SJH, ... **Linnstaedt SD**, ... Stevens JS, Harnett NG. Prior sexual trauma exposure impacts posttraumatic dysfunction and neural circuitry following a recent

- traumatic event in the AURORA study. *Biol Psychiatry Glob Open Sci*. 2023 Feb 16;3(4):705-715. PMID: 37881578
5. Florea R, **Linnstaedt SD**, Geranton SM. Editorial: Mechanisms underlying the interactions between stress and pain. *Front Pain Res*. 2023 Sep 11;4:1285257. PMID: 37766818.
 6. Webb KE, Ely TD, Rowland GE, Lebois LAM, van Rooij SJH, Bruce SE, ... **Linnstaedt SD**, ... Ressler KJ, Harnett NG. Neighborhood disadvantage and neural correlates of threat and reward processing in survivors of recent trauma. *JAMA Network Open*. 2023 Sep 5;6(9):e2334483. PMID: 37721751.
 7. Hinojosa CA, Liew A, An X, Stevens JS, ...**Linnstaedt SD**, ... Fani N. (in press). Associations of alcohol and cannabis use with change in posttraumatic stress disorder and depression symptoms over time in recently trauma-exposed individuals. *Psychological Medicine*. 2023 Jun 13:1-12. PMID: 37309917.
 8. Nievergelt CM, Maihofer AX, Atkinson EG, Chen CY, ... **Linnstaedt SD**, ...Ressler KJ, Koenen KC. Discovery of 95 PTSD loci provides insight into genetic architecture and neurobiology of trauma and stress-related disorders. medRxiv. 2023 Sep 2:2023.08.31.23294915.
 9. Branham EM, McLean SA, Deliwala IH, Mauck MC, Zhao Y, McKibben LA, Lee A, Spencer AB, Zannas A, Lechner M, Danza T, Velilla MA, Hendry PL, Pearson C, Peak DA, Jones J, Rathlev NK, **Linnstaedt SD**. CpG methylation levels in HPA axis genes predict chronic pain outcomes following trauma exposure. *Journal of Pain*. 2023 Mar 10:S1526-5900. PMID: 36906051. *****This article was selected as the Featured Article in the July 2023 volume of The Journal of Pain.**
 10. Zannas AS, **Linnstaedt SD**, An X, Stevens JS, Rubinow DR, Binder EB, Kessler RC, Koenen KC, Ressler KJ, McLean SA. Epigenetic Aging and PTSD Outcomes in the Immediate Aftermath of Trauma. *Psychological Medicine*. 2023 Mar 23:1-10. PMID: 36951141.
 11. Wong SA, Lebois LAM, Ely TD, van Rooij SJH, Bruce SE, Murty VP, Jovanovic T, House SL, Beaudoin FL, An X, Zeng D, Neylan TC, Clifford GD, **Linnstaedt SD**, Germine LT, Bollen KA, Rauch SL, Haran JP, Storrow AB, Lewandowski C, Musey PI, Hendry PL, Sheikh S, Jones CW, Punches BE, Kurz MC, Swor RA, Hudak LA, Pascual JL, Seamon MJ, Pearson C, Peak DA, Merchant RC, Domeier RM, Rathlev NK, O'Neil BJ, Sergot P, Sanchez LD, Miller MW, Pietrzak RH, Joormann J, Barch DM, Pizzagalli DA, Harte SE, Elliott JM, Kessler RC, Koenen KC, McLean SA, Ressler KJ, Stevens JS, Harnett NG. Internal capsule microstructure mediates the relationship between childhood maltreatment and PTSD following adulthood trauma exposure. *Molecular Psychiatry*. 2023 Mar 17. PMID: 36932158.
 12. Harnett NG, Fani N, Carter S, Sanchez LD, Rowland GE, Davie WM, Guzman C, Lebois LAM, Ely TD, van Rooij SJH, Seligowski AV, Winters S, Grasser LR, Musey PI, Seamon MJ, House SL, Beaudoin FL, An X, Zeng D, Neylan TC, Clifford GD, **Linnstaedt SD**, Germine LT, Bollen KA, Rauch SL, Haran JP, Storrow AB, Lewandowski C, Hendry PL, Sheikh S, Jones CW, Punches BE, Swor RA, Hudak LA, Pascual JL, Harris E, Chang AM, Pearson C, Peak DA, Merchant RC, Domeier RM, Rathlev NK, Bruce SE, Miller MW, Pietrzak RH, Joorman J, Barch DM, Pizzagalli DA, Harte SE, Elliott JM, Kessler RC, Koenen KC, McLean SA, Jovanovic T, Stevens JS, Ressler KJ. Structural inequities contribute to racial/ethnic differences in neurophysiological tone, but not threat reactivity, after trauma exposure. *Molecular Psychiatry*. 2023 Feb 1. PMID 36725899.
 13. Straus LD, An X, Ji Y, McLean SA, Neylan TC, AURORA Study Group, Cakmak AS, Richards A, Clifford GD, Liu M, Zeng D, House SL, Beaudoin FL, Stevens JS, **Linnstaedt SD**, ..., Koenen KC. Utility of wrist-wearable data for assessing pain, sleep, and anxiety outcomes after traumatic stress exposure. *JAMA Psychiatry*. 2023 Jan 11:e224533. PMID: 36630119.
 14. Punches BE, Stolz U, Freiermuth CE, Ancona RM, McLean SA, ... **Linnstaedt SD**, ... Ressler KJ, Koenen KC, Lyons MS. Predicting at-risk opioid use three months after ED visit for trauma: Results from the AURORA Study. *PLOS ONE*. 2022 Sep 23; 17(9):e0273378. PMID 36149896.
 15. Jones WC, An X, Ji Y, Liu M, Zeng D, House SL, Beaudoin FL, Stevens JS, Neylan TC, Clifford GD, Jovanovic J, **Linnstaedt SD**, ..., Kessler RC, McLean SA. Derivation and validation of a brief ED-based prediction tool for posttraumatic stress after motor vehicle collision. *Annals of Emergency Medicine*. 2022 Oct 31:S0196-0644(22)00585-6 PMID: 36328855.

16. Maihofer A, Engchuan W, Huguet G, Klein M, MacDonald J, ... **Linnstaedt SD**, ..., Nievergelt C. Rare copy number variation in posttraumatic stress disorder. *Molecular Psychiatry*. 2022 Sep 21. PMID: 36131047.
17. Lebois LAM, Harnett NG, van Rooij SJH, Ely TD, ... **Linnstaedt SD**, ..., Stevens JS, Ressler KJ. Persistent dissociation and its neural correlates in predicting outcomes after trauma exposure. *Am J Psychiatry*. 2022 Sep; 179(9):661-672. PMID: 35730162.
18. Short NA, vanRooij SJH, Murty VP, Stevens JS, An X, ...**Linnstaedt SD**, ...Koenen KC, Jovanovic T. Anxiety sensitivity as a transdiagnostic risk factor for trajectories of adverse posttraumatic neuropsychiatric sequelae in the AURORA study. *J Psychiatr Res*. 2022 Sep 27; 156: 45-54. PMID: 36242943.
19. Harnett NG, Finegold KE, Lebois LAM, van Rooij SJH, Ely TD, Murty VP, Jovanovic T, Bruce SE, House SL, Beaudoin FL, An X, Zeng D, Neylan TC, Clifford GD, **Linnstaedt SD**, ..., Ressler KJ, Stevens JS. Structural covariance of the ventral visual stream predicts posttraumatic intrusion and nightmare symptoms: a multivariate data fusion analysis. *Translational Psychiatry*. 2022 Aug 8; 12(1):321. PMID: 35941117.
20. Tanriverdi B, GregoryDF, Olino TM, Ely TD, Harnett NG, van Rooij SJH, Lebois LAM, Seligowski AV, Jovanovic T, Ressler KJ, House SL, Beaudoin FL, An X, Neylan TC, Clifford GD, **Linnstaedt SD**, ..., Stevens JS, Murty VP. Hippocampal threat reactivity interacts with physiological arousal to predict PTSD symptoms. *Journal of Neuroscience*, 2022 Jul 25;42(34):6593-604. PMID: 35879096.
21. Kim R, Lin T, Pang G, Liu Y, Tungate AS, Hendry PL, Kurz MC, Peak DA, Jones J, Rathlev NK, Swor RA, Domeier R, Velilla MA, Lewandowski C, Datner E, Pearson C, Lee D, Mitchell PM, McLean SA, **Linnstaedt SD**. Derivation and validation of risk prediction for posttraumatic stress symptoms following trauma exposure. *Psychological Medicine*. 2022 Jul 1:1-10. PMID: 35775366.
22. 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. *Scientific Reports*. 2022 Apr 20;12(1):6511. PMID:35444168.
23. 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. *Psychoneuroendocrinology*. 2022 Jul;141:105729. PMID: 35413575.
24. Wanstrath BJ, McLean SA, Zhao Y, Mickelson J, Bauder M, Hausch F, **Linnstaedt SD**. Duration of reduction in stress-induced hyperalgesia via FKBP51 inhibition depends on timing of administration after traumatic stress exposure. *Journal of Pain*. 2022 Jul;23(7):1256-1267. PMID:35296422.
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26. Stevens JS, Harnett NG, Lebois L, van Rooij S, Ely TD, Roeckner A, Vincent N, Beaudoin FL, An X, Zeng D, Neylan TC, Clifford GD, **Linnstaedt SD**,... Ressler KJ. Brain-based biotypes of psychiatric vulnerability in the acute aftermath of trauma. *The American Journal of Psychiatry*, 2021 Nov;178(11):1037-1049. PMID 34645277.
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31. 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. Development and Validation of a Model to Predict Posttraumatic Stress Disorder and Major Depression After a Motor Vehicle Collision *JAMA Psychiatry*. 2021 Sep 1:e212427. PMID: 34468741.
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36. **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 β -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.
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39. 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.
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68. 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.
69. **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.

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73. 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.

Original Research articles under review

1. Son E, Gaither R, Lobo J, Zhao Y, McKibben LA, Arora R, Albertorio-Sáez L, Mickelson J, Wanstrath BJ, Bhatia S, Stevens JS, Jovanovic T, Koenen K, Kessler R, Ressler K, Beaudoin FL, McLean SA, **Linnstaedt SD**. Data from humans and animals suggesting that 17 β -estradiol is a promising preventative therapeutic for the reduction of chronic posttraumatic pain in women. In review, *PAIN*.

Original Research articles in preparation

1. McKibben LA, Géranton SM, Zhao Y, Mickelson J, Florea R, Branham E, Kuhl-Chimera S, Deliwala I, Iyer M, Pan Y, Hausch F, McLean SA, **Linnstaedt SD**. RNA expression changes over time and across tissues in rats following the single prolonged stress model of traumatic stress exposure. *In preparation*.
2. McKibben LA, Géranton SM, Zhao Y, Mickelson J, Florea R, Branham E, Iyer M, Hausch F, McLean SA, **Linnstaedt SD**. Cross-species validation and mechanistic insights into FKBP51 as a promising therapeutic target for posttraumatic chronic pain. *In preparation*.
3. Albertorio-Saez L, Layne M, Zhao Y, **Linnstaedt SD**. Peritraumatic circulating CRP levels are associated with improved pain recovery in men vs women following traumatic stress exposure. *In preparation*.

Published Abstracts – poster presentations

1. McLean SA, McKibben LA, Géranton SM, Florea R, Zhao Y, Mickelson J, Albertorio-Saez L, Hausch F, **Linnstaedt SD**. Molecular insights into FKBP51-mediated chronic posttraumatic pain development using the single prolonged stress model in rats and mice. *American College of Neuropsychopharmacology scientific meeting*. Accepted for poster presentation. Tampa, FL, December 2023.
2. Pang G, Kim R, Lin T, Liu Y, Hendry PL, Kurz MC, Peak DA, Jones J, Rathlev NK, Swor RA, Robert Domeier R, Velilla MA, Lewandowski C, Datner E, Pearson C, Lee D, Mitchell PM, McLean SA, **Linnstaedt SD**. Derivation and validation of risk prediction for posttraumatic chronic pain. *The US Association for the Study of Pain annual scientific meeting*. Durham, NC, April 2023.
3. Arora R, McLean SA, Son E, Lobo J, Zhao Y, Albertorio-Saez L, Wanstrath BJ, Benavides S, Gaither R, Mickelson J, Beaudoin F, **Linnstaedt SD**. Data from humans and animals implicating 17 β -estradiol as a promising therapeutic strategy for the prevention of chronic posttraumatic musculoskeletal pain. *The US Association for the Study of Pain annual scientific meeting*. Durham, NC, April 2023.
4. Sim J, Monahan K, Sugimoto C, McLean SA, Albertorio-Saez L, Zhao Y, O'Guin E, Dagenais A, Inyang K, Bernard M, Folger JK, Robison A.J., **Linnstaedt SD**, Laumet G. Peripheral Interleukin-10-producing Monocytes Contribute to Sex Differences in Pain Resolution in Mice and Humans. *The US Association for the Study of Pain annual scientific meeting*. Durham, NC, April 2023.
5. **Linnstaedt SD**, Albertorio-Saez L, Yao X, Zhao Y, Bhatia S, Son E, Kessler R, Koenen K, Ressler KJ, McLean SA. Blood-based biological sample collection and processing in the AURORA study. Poster presentation at the *2023 Society for Biological Psychiatry Meeting*, San Diego, CA. April 2023
6. McKibben LA, An X, Li Q, Lin T, Burnham L, Ressler KJ, Koenen K, Kessler RC, **Linnstaedt SD**, McLean SA. Derivation and Validation of a Brief Emergency Department-Based Prediction Tool for Persistent Severe

- Pain after Motor Vehicle Collision Trauma Using Data from the AURORA Study. Poster presentation at the *2023 Society for Biological Psychiatry Meeting*, San Diego, CA. April 2023
7. McKibben LA, Zhao Y, Mickelson J, Burnham L, Lin T, Wang TW, Lee S, Shih YI, Harnett N, van Rooij S, Stevens J, Jovanovic T, Koenen K, Kessler RC, Ressler KJ, McLean SA, **Linnstaedt SD**. Early life adversity increases risk for posttraumatic chronic pain via enduring hippocampal changes: preliminary evidence from the AURORA cohort and a reverse-translated rodent model. Poster presentation at the *2023 Society for Biological Psychiatry Meeting*. San Diego, CA. April 2023
 8. McKibben LA, McLean SA, Zhao Y, Geranton S, Florea R, Wanstrath B, Kuhl-Chimera S, Deliwala I, Hausch F, **Linnstaedt SD**. RNA expression signatures of the physiological response to traumatic stress exposure in rats reveals insight into *Fkbp5*-mediated posttraumatic chronic pain development. *Poster presentation at the 4th Annual National Institutes of Health HEAL Initiative Investigator Meeting*, Bethesda MD. February 2023.
 9. Stevens JS, **Linnstaedt SD**, Michopoulos V, Seligowski AV, Harnett NG, Lebois LAM, van Rooij SJH, Murty V, Mclean SA, Jovanovic T, Ressler KJ. Estradiol influences on threat neurocircuitry in trauma-exposed women and men. Poster presentation at the 2022 Conference of the *International Society for Traumatic Stress Studies*. Atlanta, GA. November 2022.
 10. McDermott TJ, Webber TK, Noble NC, Merker JB, Hinrichs R, Davie W, Wiltshire C, Ressler KJ, **Linnstaedt SD**, McLean SA, Jovanovic T, Seligowski AV. Estradiol is associated with greater sympathetic activity in trauma-exposed women. Poster presentation at the 2022 Conference of the *International Society for Traumatic Stress Studies*. Atlanta, GA. November 2022.
 11. McKibben LA, Mickelson J, Kuhl-Chimera S, Wanstrath B, McLean SA, **Linnstaedt SD**. microRNA-19 influences posttraumatic chronic pain development via sex-dependent regulation of sleep/circadian rhythm and innate immune pathways: results of a preliminary analysis in humans and animals. Poster presentation at the 2022 Bi-Annual Meeting of the *International Association for the Study of Pain*, Toronto, Canada, September 2022.
 12. McKibben LA, Zhao Y, Mickelson J, Wang T, Lee S, Shih I, Stevens J, McLean SA, and **Linnstaedt SD**. Early life adversity increases risk for posttraumatic chronic pain via enduring hippocampal changes: preliminary evidence from the AURORA cohort and a reverse-translated rodent model. Poster presentation at the 2022 Bi-Annual Meeting of the *International Association for the Study of Pain*, Toronto, Canada, September 2022.
 13. Wanstrath BJ, Deliwala IH, Mickelson J, McLean SA, Zhao Y, Bauder M, Hausch F, **Linnstaedt SD**. Duration of reduction in enduring stress-induced hyperalgesia via FK506-binding protein 51 inhibition depends on timing of administration relative to traumatic stress exposure. Poster presentation at the 2022 Conference of the *US Association for the Study of Pain*. Cincinnati, OH. May 2022.
 14. Branham EM, Deliwala IH, Mauck MC, Zhao Y, Lee A, Zannas A, McKibben LA, Spencer AB, Cairns BA, Lechner M, Danza T, Kurz MC, Velilla MA, Hendry PL, Pearson C, Datner E, Peak DA, Jones J, Rathlev NK, Lewandowski C, McLean SA, **Linnstaedt SD**. DNA methylation levels in hypothalamic-pituitary-adrenal axis genes predict chronic pain outcomes following trauma exposure. Poster presentation at the 2022 Conference of the *US Association for the Study of Pain*. Cincinnati, OH. May 2022.
 15. Kim R, McKibben LA, Lin T, Pang G, Liu Y, Tungate AS, Hendry PL, Kurz MC, Peak DA, Jones J, Rathlev NK, Swor RA, Domeier R, Velilla MA, Lewandowski C, Datner E, Pearson C, Lee D, Mitchell PM, McLean SA, **Linnstaedt SD**. Risk prediction for posttraumatic stress symptoms following trauma exposure. Poster presentation at the 2022 *Society for Biological Psychiatry Meeting*, New Orleans, LA. April 2022.
 16. Polanco K, Li Q, An X, Beaudoin F, Zeng D, Stevens J, **Linnstaedt SD**, Jovanovic T, Neylan T, Clifford GD, Ressler K, Koenen K, Kessler R, McLean SA, for the AURORA Study Group. Anxiety sensitivity is a leading risk factor of severe or widespread pain three months after motor vehicle collision. Poster presentation at the 2022 *Society for Biological Psychiatry Meeting*, New Orleans, LA. April 2022.
 17. Lobo JJ, Ayoub L, Moayedi M, **Linnstaedt SD**. Hippocampal volume, FKBP5 genetic risk alleles, and childhood trauma interact to increase vulnerability to chronic multisite musculoskeletal pain. Poster presentation at the 2022 *Society for Biological Psychiatry Meeting*, New Orleans, LA. April 2022.

18. Son E, Lobo J, Zhao Y, Arora R, Albertorio L, Stevens J, Jovanovic T, Koenen K, Kessler R, Ressler K, McLean SA, **Linnstaedt SD**. MicroRNA-Mediated Protective Effects of Peritraumatic 17β -Estradiol on Posttraumatic Chronic Pain in Women. Poster presentation at the 2022 *Society for Biological Psychiatry Meeting*, New Orleans, LA. April 2022.
19. Hernandez H, Rawls A, Wang Y, Zhang X, Chen J, Pan Y, Dang H, Slade G, **Linnstaedt SD**, Parisien M, Diatchenko L, Nackley A. Tissue-specific regulation of miR-374a-5p and its mRNA targets associated with pain in humans and mice. Submitted for presentation at *Society for Neuroscience*, Chicago, IL October 2021.
20. Ayoub LJ, Lobo JJ, **Linnstaedt SD**, Moayed M. Hippocampal volume, FKBP5 genetic vulnerability, and childhood trauma compound risk for chronic multisite pain in the UK Biobank cohort. Submitted for presentation at *Society for Neuroscience*, Chicago, IL October 2021.
21. 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 17β -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.
22. 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.
23. 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.
24. 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.
25. 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.
26. 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.
27. Williams JH, Pan Y, Blount J, Datner E, Hendry PL, Lewandowski C, Pearson C, McLean SA, **Linnstaedt SD**. 17β -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.
28. Blount J, Pan Y, Mauck MC, Datner E, Kurz MC, Hendry PL, Lewandowski C, Pearson C, McLean SA, **Linnstaedt SD**. 17β -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.
29. 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.
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. *Poster Presentation* at the 2018 International Association for the Study of Pain, Boston MA, September 2018.

31. 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.
32. **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.
33. 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.
34. **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.
35. **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.
36. **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.
37. **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.
38. **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
39. 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
40. **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
41. 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
42. **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
43. **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
44. **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
 45. **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
 46. **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
 47. **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
 48. **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
 49. **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.
 50. **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.
 51. **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, January 2010.
 52. **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.
 53. **Linnstaedt SD**, Casey J. HDV RNA editing, deconstructed. *Poster presentation*, Centers for Infectious Diseases Conference, Georgetown University, Washington DC, 2005.
 54. **Linnstaedt SD**, Casey J. The split personality of Hepatitis delta virus. *Poster presentation*. Student Research Days, Georgetown University, 2004.
 55. 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**, Katy Vincent (University of Oxford), Dayna Loyd Averitt (Texas Woman's University). Beyond reproduction, evidence for multiple roles of sex steroids in the context of pain. Selected workshop presentation at the 2018 International Association for the Study of Pain (IASP) Meeting in Amsterdam Netherlands, August 2024.
2. **Linnstaedt SD**. Molecular insights into chronic posttraumatic pain development with a focus on novel drug target identification. Duke University School of Medicine, Department of Anesthesiology, Durham NC. Planned: April 27, 2024.
3. **Linnstaedt SD**. Towards new therapeutic strategies for the prevention of chronic posttraumatic pain. Emory University School of Medicine, Department of Psychiatry and Behavioral Sciences, Atlanta GA. December 12, 2023.
4. **Linnstaedt SD**. FKBP51 as a promising therapeutic target for posttraumatic chronic pain: insights from humans and animals. Invited research presentation at the annual international FKBP51 meeting. Max Planck Institute of Psychiatry in Munich, Germany. March 16, 2023.
5. **Linnstaedt SD**. Promising therapeutic strategies for the prevention of chronic posttraumatic pain: insights from translational studies in humans and rats. USASP annual meeting, Symposium speaker. Cincinnati, OH. May 20, 2022
6. **Linnstaedt SD**. FKBP51 antagonism to prevent posttraumatic persistent hyperalgesia. 51TaValP meeting. Virtual meeting hosted by investigators at the University of Darmstadt, Darmstadt Germany. April 25, 2022.
7. **Linnstaedt SD**. FKBP51 as a promising therapeutic target for the prevention of chronic posttraumatic pain. 3rd Annual National Institutes of Health HEAL Initiative Investigator Meeting. Symposium speaker. April 12, 2022
8. **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
9. **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.
10. **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
11. **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.
12. **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.
13. **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.
14. **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.
15. **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.
16. **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.

17. **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.
18. **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 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.
19. **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.
20. **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.
21. **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.
22. **Linnstaedt SD**, Casey J. RNA structural dynamics and RNA editing in Hepatitis delta virus genotype III. Research presentation at the American Society for Virology, 24th annual meeting, Penn State University, State College PA, May 2005.

Regional/Local

23. **Linnstaedt SD**. Science of Stress and Prior Life Trauma on Chronic Pain Outcomes following Injury. Invited research presentation at the Pain Society of the Carolinas 2022 Annual Meeting and Scientific Sessions, Asheville North Carolina, September 23, 2022.
24. **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.
25. **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.
26. **Linnstaedt SD**, Mauck MC, McLean SA. Translational biology of chronic pain development. Research presentation, Anesthesiology Grand Rounds, UNC-CH Medical School, March 6, 2019.
27. **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.
28. **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.
29. **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.
30. **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.
31. **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.

32. **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

- 2023 The Journal of Pain selected our manuscript “CpG methylation levels in HPA axis genes predict chronic pain outcomes following trauma exposure” as the Featured Article in their July 2023 volume of articles.
- 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

- 2023-Present Henri M. Garrison-Desany, PhD MSPH. Harvard T.H. Chan School of Public Health. Research focus: Predicting mental health symptoms after trauma: leveraging genetic and epigenetic markers for machine learning methods. Role: Co-research mentor.
- 2021-Present Lauren A. McKibben, PhD., Behavioral Neuroscience. Received a competitive T32 through the Trauma Research Fellowship Program, Department of Surgery, University of North Carolina at Chapel Hill. Research focus: “Neurobiological correlates of chronic post-traumatic pain in individuals with a history of early life adversity”. Role: Primary research mentor.

Graduate Students

- 2023-Present Alice Woolard, PhD candidate, Department of Bioinformatics and Computational Biology (BCB), University of North Carolina at Chapel Hill. Role: Primary thesis research mentor. Thesis topic: Molecular mechanisms driving increased chronic pain in women trauma survivors.
- 2021-Present Erica Branham, PhD candidate, Department of Genetics and Molecular Biology (GMB), University of North Carolina at Chapel Hill. Role: Primary thesis research mentor. Thesis topic: Epigenetic mechanisms responsible for the relationship between traumatic stress exposure and posttraumatic chronic pain development. Erica is a T32 fellow through the UNC GMB program.

- 2021-Present Rachel Gaither, PhD candidate, Department of Epidemiology, Brown University School of Public Health. Role: Thesis Committee Member. Thesis topic: Epidemiology of chronic pain development in women versus men following traumatic stress 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 Kutcho 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 Mathew, MD, Department of Anesthesiology, University of North Carolina at Chapel Hill, Role: Research advisor for Resident research rotation, Fall 2017

Medical Students

- 2022 Jarred Lobo, First Year Medical Student, University of North Carolina at Chapel Hill
- 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 Gonzalez, 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

- 2022-Present Miranda Layne, Senior Undergraduate Student, UNC-CH
- 2021-Present Simran Bhatia, Senior Undergraduate Student, UNC-CH
- 2020-2023 Sophia Kuhl-Chimera, Senior Undergraduate Student, UNC-CH
- 2019-2023 Tina Lin, currently a Patient Recruitment Assistant at the Institute for Medical Research, Senior Honors Thesis: Derivation and validation of a set of miRNA predictors of month-3 moderate-severe pain following trauma exposure using the AURORA cohort. Published one manuscript, second author (PMID: 35775366)
- 2019-2023 Ishani Deliwala, Senior 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- β -estradiol and STX prevent chronic pain after traumatic stress exposure" (Role: primary mentor). Published one manuscript, middle author (PMID: 36906051)
- 2018-2023 Rhea Arora, currently a medical student, University of Mississippi Medical Center, Class of 2028.
- 2018-2022 YeEun (Esther) Son, currently a medical student at Northwestern University. Awarded a competitive research poster award from the UNC School of Medicine Center for Women's Health Research, University of North Carolina at Chapel Hill, Chapel Hill, NC. Published one manuscript, third author (PMID: 34028234)
- 2018-2021 Gehao (Leo) Pang, Undergraduate Student, UNC-CH, awarded a competitive Undergraduate Research Fellowship that provided 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). Published one manuscript, third author (PMID: 35775366)

- 2018-2021 Jarred Lobo, currently a medical student, UNC-CH, 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). Published two first author manuscripts (PMID: 35444168, PMID: 34226500).
- 2017-2019 Raphael Kim, currently a Graduate student, Harvard University. Published one manuscript, first author (PMID: 35775366)
- 2017-2019 Jameson Blount, currently a PhD student, Duke University, 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). Published one manuscript, middle author (PMID: 30498461)
- 2016-2019 Constance “Connie” Chen, currently a Medical student at the University of Miami Miller School of Medicine, awarded a competitive Undergraduate Research Fellowship that provided 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) Published one manuscript, third author (PMID: 30537437).
- 2014-2019 Matthew Carson, currently an associate manager, data science at THREAD. Published one manuscript, middle author (PMID: 30498461)
- 2017-2018 Dongjin Kim, subsequently received a graduate degree in Statistics and Mathematics, UNC-CH
- 2015-2018 Shan Yu, currently attending dental school, U Penn, 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- β -estradiol regulation predict chronic musculoskeletal pain in women experiencing motor vehicle collision” (Role: primary mentor). Published three manuscripts, one first author (PMID: 30537437, 34028234, 31569141)
- 2015-2018 Cathleen Rueckeis, currently a medical resident with Full Circle Health in Boise Idaho. 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). Published five manuscripts, two second author (PMID: 30498461, 34028234, 33542428, 31569141, 30150364)
- 2014-2017 Lindsey Jung, currently a Senior Statistician II at AstraZeneca. Published one manuscript, middle author (PMID: 30498461)
- 2013-2017 Kyle Riker, currently an MD PhD student, UNC-CH, 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). Published five manuscripts, two second author (PMID: 27690835, 27805929, 31569141, 30150364)
- 2015-2016 Alan Wu, currently a Research Biostatistician III for Weill Cornell Medicine. Published one manuscript, middle author (PMID: 31569141)
- 2014-2015 Eunice Yeh, currently a senior biostatistician for Rho. Published one manuscript, middle author (PMID: 26498117)
- 2012-2015 Margaret Walker, currently a software engineer with The Orchard. 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). Published three manuscripts, two second author (PMID: 26498117, 27690835, 27805929)

2012-2014 Kathleen McCarthy, currently a principal analytical development specialist at Regeneron Pharmaceuticals. Published one manuscript, middle author (PMID: 30150364)

2010-2012 Caitlin Esoda, completed her PhD in Molecular Genetics and Microbiology at Duke University

2010-2012 Anand Kornepati, current MD PhD student, UT Health San Antonio Graduate School of Biomedical Sciences

Instructional

Resident Teaching

2014-Present Academic Medicine Rotation lecture, “Critical appraisal of the literature”, Department of Anesthesiology, University of North Carolina at Chapel Hill, Chapel Hill, NC.

2021 Resident Journal Club, Debate style format, 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: Developing a small molecule antagonist to FKBP51 to prevent and treat pain

Grant Type (or Number): R61NS138233

Grant Amount: \$1,421,122

Funding Agency: NIH/NINDS

Grant Period: 2024-2026

Grant Status: PENDING

Principal Investigator: Sarah Linnstaedt (20% effort)

Current

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

Grant Type (or Number): R01AR081454

Grant Amount: \$2,359,935

Funding Agency: NIH/NIAMS

Grant Period: 2024-2029

Grant Status: AWARDED

Principal Investigator: Sarah Linnstaedt (20% effort)

TITLE: Repurposing estrogen-containing emergency contraceptives for the prevention of chronic pain following sexual assault

Grant Type (or Number): US Based Clinical Repurposing Trials to Address Diversity, Equity and Inclusion
Grant Amount: \$85,000
Funding Agency: Cures Within Reach
Grant Period: 2023-2025
Grant Status: AWARDED
Principal Investigator: Sarah Linnstaedt (0% effort)

TITLE: Exploring the relationship between neurosteroids and chronic pain in military veterans

Grant Type (or Number): Intergovernmental Personnel Act
Grant Amount: \$240,000
Funding Agency: Duke/Durham Department of Veterans Association
Grant Period: 2022-2024
Grant Status: AWARDED
Principal Investigator: Sarah Linnstaedt (60% effort)

TITLE: Discovering DIagnostics, SubtypEs, and NaTurAl history of traumatic brain iNjury (TBI) vs. non-TBI Recovery to Gain MiLitary advantage (DISENTANGLE)

Grant Type (or Number): W81XWH22C0122
Grant Amount: \$8,000,000
Funding Agency: Congressionally Directed Medical Research Programs, US Army Medical Research & Development Command
Grant Period: 2022-2027
Grant Status: AWARDED
Principal Investigator: Samuel McLean
Role: Co-I (10% effort)

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: 2020-2024
Grant Status: AWARDED
Principal Investigator: Sarah Linnstaedt (0% effort)

Completed

TITLE: Diversity Supplement to FKBP51 antagonism to prevent chronic pain: optimizing efficacy & evaluating safety and mechanisms R01NS118563

Grant Type (or Number): R01NS118563- 01A1S1

Grant Amount: \$59,081
Funding Agency: NIH/NINDS
Grant Period: 2022-2023
Grant Status: COMPLETED
Principal Investigator: Sarah Linnstaedt (0% effort)
Funded Individual: Liz Albertorio-Saez

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: 2018-2022
Grant Status: COMPLETED
Principal Investigator: Sarah Linnstaedt (0% 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: 2016-2022
Grant Status: COMPLETED
Principal Investigator: Samuel McLean
Role: Co-I (5% 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: COMPLETED
Principal Investigator: Sarah Linnstaedt (75% effort)

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 β -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

International Committees

- 2021- Guest editor, Frontiers in Pain Research- Topic on stress and pain.
2021- Guest editor, Frontiers in Pain Research- Topic on gene regulation/miRNA.

National Committees

- 2024 Reviewer for the Neurobiology of Pain and Itch Study Section, 2024/05 NPI meeting. Meeting date: February 20&21, 2024
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

- 2022 Reviewer for Summer Undergraduate Research Fellowship awards. Assigned sixteen grants to review for priority funding.
2017- Co-Vice Chair for the Departmental Research Committee, UNC Department of Anesthesiology
2018, 2019 Poster session judge for UNC Women in Science Annual Symposium, Chapel Hill, NC
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: 2020-2023)

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