

Curriculum Vitae

September 6, 2023

I. IDENTIFYING DATA

Name	Martin S. Angst, MD
Current Position	Professor of Anesthesiology, Perioperative and Pain Medicine Stanford University School of Medicine
Phone	650 4985109
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II. EDUCATION HISTORY

Colleges and Universities Attended:

1987 MD, University of Berne, Switzerland

Residency and Fellowship Training:

1988-1990 Residency, Internal Medicine, Burgdorf Hospital, Burgdorf, Switzerland

1990-1994 Residency, Anesthesia and Intensive Care Medicine, University Hospital of Berne, Berne, Switzerland

1994-1996 Postdoctoral Fellowship, Clinical Pharmacology, Department of Anesthesiology, Perioperative and Pain Medicine, Stanford University School of Medicine

Board Certification:

1993 European Board, European Academy of Anesthesiology

1993 Swiss Board, Swiss Society of Anesthesiologists

III. EMPLOYMENT

Academic Appointments:

3/1996-10/1998 Clinical Instructor, Anesthesiology, Perioperative and Pain Medicine, Stanford University School of Medicine, Stanford, CA

9/1998-1/2006 Assistant Professor, Anesthesiology, Perioperative and Pain Medicine, Stanford University School of Medicine, Stanford, CA

2/2006-12/2010 Associate Professor, Anesthesiology, Perioperative and Pain Medicine, Stanford University School of Medicine, Stanford, CA

1/2011- Professor, Anesthesiology, Perioperative and Pain Medicine, Stanford University School of Medicine, Stanford, CA

Other Appointments:

- 10/2019-9/2022 Director of Cardiovascular and Thoracic Anesthesia, Department of Anesthesiology, Perioperative and Pain Medicine, Stanford University School of Medicine
- 6/2022- Vice Chair for Strategy and Initiatives, Department of Anesthesiology, Perioperative and Pain Medicine, Stanford University School of Medicine

IV. HONORS AND AWARDS

- 1/1994-1995 Research Fellowship Award, Swiss Society of Anesthesiologists
- 1/1994-1995 Research Fellowship Award, Ciba-Geigy-Jubilaeumsstiftung
- 1/1994-1995 Research Fellowship Award, Janggen-Poehn Stiftung
- 5/1996 Research Award, Department of Anesthesiology, Perioperative and Pain Medicine, Stanford University School of Medicine
- 6/1997 Best Abstract, Analgesia and Headache Section, American Society of Clinical Pharmacology and Therapeutics
- 2001, 5/2007, 5/2008, 5/2009, 5/2010 Research Award, Department of Anesthesiology, Perioperative and Pain Medicine, Stanford University School of Medicine (Mentor)
- 6/2002 Monthly Resident Teaching Award, Department of Anesthesiology, Perioperative and Pain Medicine
- 7/2008 Elected Member, National Panel for Establishing Opioid Research Guidelines
- 6/2011 Stanford Society of Physician Scholars (SSPS) Collaborative Research Award (Mentor), Stanford University School of Medicine
- 6/2012 Best Abstract (Mentor), Society of Obstetric Anesthesia and Perinatology
- 2013 Kosaka Award for Best Abstract in Patient-oriented Research (Mentor), International Anesthesia Research Society
- 5/2013, 2015, 5/2017, 5/2018 Research Award (Mentor), Department of Anesthesiology, Perioperative and Pain Medicine, Stanford University School of Medicine
- 6/2013 Best Abstract of Critical Care, Trauma and Resuscitation Category (Mentor), International Anesthesia Research Society

6/2015	Best New Investigator Poster Award (Mentor), Society of Reproductive Investigations on Immunology and Women's Health
2018	Best of Meeting Abstract Award (Mentor), American Society of Regional Anesthesia
6/2018	Finalist Kosaka Award (Mentor), International Anesthesia Research Society
6/2018	Team Science Leadership Workshop Nomination, Stanford Medicine's Office of Faculty Development and Diversity, Stanford University School of Medicine
6/2019	Best of Meeting Award (Mentor), Society of Cardiovascular Anesthesiologists
6/2019	Best of Meeting Award (Mentor), American Society of Regional Anesthesia
6/2023	Best of Abstracts - Clinical Science (Mentor), American Society of Anesthesiologists

V. BIBLIOGRAPHY

* Co-author, ** Mentee

Peer-Reviewed Publications: (133 total, 1 in press)

1. Saxenhofer H, **Angst M**, Weidmann P, Shaw SG, Ferrier C. Corticosteroid-induced Stimulation of Atrial Natriuretic Peptide in Man. *Acta Endocrinol (Copenh)*. 1988 Jun;118(2):179-186. PMID: 2968749
2. Kahwaji R, Bevan DR, Bikhazi G, Shanks CA, Fragen RJ, Dyck JB, **Angst MS**, Matteo R. Dose-ranging Study in Younger Adult and Elderly Patients of ORG 9487, a new, rapid-onset, short-duration muscle relaxant. *Anesth Analg*. 1997 May;84(5):1011-1018. PMID: 9141923
3. **Angst MS**, Mackey SC, Zupfer GH**, Tataru CD**, Brock-Utne JG. Reduction of propofol injection pain with a double lumen i.v. set. *J Clin Anesth*. 1997 Sep;9(6):462-466. PMID: 9278832
4. **Angst MS**, Dyck JB, Azarnoff DL, Goldblum R, Ho B, Gfroerer T, Linton EA, Glynn BP, Shafer SL. Pharmacokinetics, cortisol release, and hemodynamics after intravenous and subcutaneous injection of human corticotropin-releasing factor in humans. *Clin Pharmacol Ther*. 1998 Nov;64(5):499-510. PMID: 9834042
5. Fisher DM, Kahwaji R, Bevan D, Bikhazi G, Fragen RJ, **Angst MS**, Ornstein E, Matteo RS. Factors Affecting the Pharmacokinetic Characteristics of Rapacuronium. *Anesthesiology*. 1999 Apr;90(4):993-991000. PMID: 10201669
6. **Angst MS**, Brose WG, Dyck JB. The Relationship between the Visual Analog Pain Intensity and Pain Relief Scale Changes during Analgesic Drug Studies in Chronic Pain Patients. *Anesthesiology*. 1999 Jul;91(1):34-41. PMID: 10422926

7. **Angst MS**, Ramaswamy B**, Riley ET, Stanski DR. Lumbar Epidural Morphine in Humans and Supraspinal Analgesia to Experimental Heat Pain. *Anesthesiology*. 2000 Feb;92(2):312-324. PMID: 10691216
8. Claure RE**, Drover DD, Haddow GR, Esquivel CO, **Angst MS**. Orthotopic liver transplantation for carcinoid tumour metastatic to the liver: Anesthetic Management. *Can J Anaesth*. 2000 Apr;47(4):334-337. PMID: 10764178
Case report
9. **Angst MS**, Bührer M, Lötsch J**. Insidious Intoxication after Morphine Treatment in Renal Failure: Delayed Onset of Morphine-6-Glucuronide Action. *Anesthesiology*. 2000 May;92(5):1473-1476. PMID: 10781294
Case report
10. Lötsch J, Tegeder I, **Angst MS**, Geisslinger G. Antinociceptive Effects of Morphine-6-Glucuronide in Homozygous mdr1a P-Glycoprotein Knockout and in Wildtype Mice in the Hotplate Test. *Life Sci*. 2000 May 5;66(24):2393-2403. PMID: 10864101
11. **Angst MS**, Drover DR, Lötsch J, Ramaswamy B*, Naidu S, Wada DR, Stanski DR. Pharmacodynamics of orally administered sustained-release hydromorphone in humans. *Anesthesiology*. 2001 Jan;94(1):63-73. PMID: 11135723
12. Li X, **Angst MS**, Clark JD. A Murine Model of Opioid-induced Hyperalgesia. *Brain Res Mol Brain Res*. 2001 Jan 31;86(1-2):56-62. PMID: 11165371
13. Raj PP, Chado HN, **Angst M**, Heavner J, Dotson R, Brandstater ME, Johnson B, Parris W, Finch P, Shahani B, Dhand U, Mekhail N, Daoud E, Hendler N, Somerville J, Wallace M, Panchal S, Glusman S, Jay GW, Palliyath S, Longton W, Irving G. Painless Electrodiagnostic Current Perception Threshold and Pain Tolerance Threshold Values in CRPS Subjects and Healthy Controls: a multicenter study. *Pain Pract*. 2001 Jan;1(1):53-60. PMID: 17129284
14. Brodsky JB, Malott K, **Angst M**, Fitzmaurice BG, Kee SP, Logan L. The relationship between tracheal width and left bronchial width: Implications for left-sided double-lumen tube selection. *J Cardiothorac Vasc Anesth*. 2001 Apr;15(2):216-217. PMID: 11312482
15. Li X, **Angst MS**, Clark JD. Opioid-induced Hyperalgesia and Incisional Pain. *Anesth Analg*. 2001 Jul;93(1):204-209. PMID: 11429366
16. Drover DR, **Angst MS**, Valle M, Ramaswamy B**, Naidu S, Stanski DR, Verotta D. Input characteristics and bioavailability after administration of immediate and a new extended-release formulation of hydromorphone in healthy volunteers. *Anesthesiology*. 2002 Oct;97(4):827-836. PMID: 12357147
17. Lötsch J**, **Angst MS**. The mu-opioid agonist remifentanil attenuates hyperalgesia evoked by blunt and punctuated stimuli with different potency: A Pharmacological Evaluation of the Freeze Lesion in Humans. *Pain*. 2003 Mar;102(1-2):151-161. PMID: 12620606
18. Smith DL**, **Angst MS**, Brock-Utne JG, DeBattista C. Seizure duration with remifentanil/methohexitral vs. methohexitral alone in middle-aged patients undergoing

- electroconvulsive therapy. *Acta Anaesthesiol Scand.* 2003 Oct;47(9):1064-1066. PMID: 12969096
19. Ginosar Y**, Riley ET, **Angst MS**. The site of action of epidural fentanyl in humans: the difference between infusion and bolus administration. *Anesth Analg.* 2003 Nov;97(5):1428-1438. PMID: 14570661, <https://doi.org/10.1213/01.ANE.0000081793.60059.10>
 20. Ginosar Y**, Columb MO, Cohen SE, Mirikatani E, Tingle MS, Ratner EF, **Angst MS**, Riley ET. The Site of Action of Epidural Fentanyl Infusions in the Presence of Local Anesthetics: a minimum local analgesic concentration infusion study in nulliparous labor. *Anesth Analg.* 2003 Nov;97(5):1439-1445. PMID: 14570662, <https://doi.org/10.1213/01.ANE.0000081792.84877.A2>
 21. **Angst MS**, Koppert W, Pahl I**, Clark DJ, Schmelz M. Short-term infusion of the mu-opioid agonist remifentanil in humans causes hyperalgesia during withdrawal. *Pain.* 2003 Nov;106(1-2):49-57. PMID: 14581110
 22. Koppert W, **Angst M**, Alsheimer M, Sittl R, Albrecht S, Schüttler J, Schmelz M. Naloxone Provokes Similar Pain Facilitation as Observed after Short-term Infusion of Remifentanil in Humans. *Pain.* 2003 Nov;106(1-2):91-99. PMID: 14581115
 23. Carroll IR**, **Angst MS**, Clark JD. Management of perioperative pain in patients chronically consuming opioids. *Reg Anesth Pain Med.* 2004;29(6):576-591. PMID: 15635517
 24. **Angst MS**, Ramaswamy B**, Davies MF, Maze M. Comparative Analgesic and Mental Effects of Increasing Plasma Concentrations of Dexmedetomidine and Alfentanil in Humans. *Anesthesiology.* 2004 Sep;101(3):744-752. PMID: 15329600
 25. Todd MM, Hindman BJ, Clarke WR, Torner JC, Intraoperative Hypothermia for Aneurysm Surgery Trial (IHAST) Investigators. Mild Intraoperative Hypothermia during Surgery for Intracranial Aneurysm. *N Engl J Med.* 2005 Jan 13;352(2):135-145. PMID: 15647576
 26. Koppert W, Filitz J, Tröster A, Ihmsen H, **Angst M**, Flor H, Schüttler J, Schmelz M. Activation of naloxone-sensitive and -insensitive inhibitory systems in a human pain model. *J Pain.* 2005 Nov;6(11):757-764. PMID: 16275600
 27. Chu LF**, Clark DJ, **Angst MS**. Opioid tolerance and hyperalgesia in chronic pain patients after one month of oral morphine therapy: a preliminary prospective study. *J Pain.* 2006 Jan;7(1):43-48. PMID: 16414554
 28. **Angst MS**, Drover DR. Pharmacology of drugs formulated with DepoFoam: A Sustained Release Drug Delivery System for Parenteral Administration Using Multivesicular Liposome Technology. *Clin Pharmacokinet.* 2006;45(12):1153-1176. PMID: 17112293
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 29. **Angst MS**, Clark JD. Opioid-induced hyperalgesia: A Qualitative Systematic Review. *Anesthesiology.* 2006 Mar;104(3):570-587. PMID: 16508405
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30. Clark JD, Qiao Y, Li X, Shi X, **Angst MS**, Yeomans DC. Blockade of the Complement C5a Receptor Reduces Incisional Allodynia, Edema, and Cytokine Expression. *Anesthesiology*. 2006 Jun;104(6):1274-1282. PMID: 16732100
31. Carvalho B**, **Angst MS**, Fuller AJ, Lin E, Mathusamy AD, Riley ET. Experimental heat pain for detecting pregnancy-induced analgesia in humans. *Anesth Analg*. 2006 Nov;103(5):1283-1287. PMID: 17056970
32. Davis MP, Shaiova LA, **Angst MS**. When Opioids Cause Pain. *J Clin Oncol*. 2007 Oct 1;25(28):4497-4498. PMID: 17906213
Case report
33. Clark JD, Shi X, Li X, Qiao Y, Liang D, **Angst MS**, Yeomans DC. Morphine Reduces Local Cytokine Expression and Neutrophil Infiltration after Incision. *Mol Pain*. 2007 Oct 2;3:28. PMID: 17908329, PMCID: PMC2096620
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35. Liang D, Shi X, Qiao Y, **Angst MS**, Yeomans DC, Clark JD. Chronic morphine administration enhances nociceptive sensitivity and local cytokine production after incision. *Mol Pain*. 2008 Feb 22;4:7. PMID: 18294378, PMCID: PMC2279109, <https://doi.org/10.1186/1744-8069-4-7>
36. Carvalho B**, Clark DJ, **Angst MS**. Local and Systemic Release of Cytokines, Nerve Growth Factor, prostaglandin E2, and substance P in incisional wounds and serum following cesarean delivery. *J Pain*. 2008 Jul;9(7):650-657. PMID: 18394968, <https://doi.org/10.1016/j.jpain.2008.02.004>
37. **Angst MS**, Clark JD, Carvalho B**, Tingle M, Schmelz M, Yeomans DC. Cytokine Profile in Human Skin in Response to Experimental Inflammation, noxious stimulation, and administration of a COX-inhibitor: A Microdialysis Study. *Pain*. 2008 Sep 30;139(1):15-27. PMID: 18396374, <https://doi.org/10.1016/j.pain.2008.02.028>
38. **Angst MS**, Chu LF**, Tingle MS, Shafer SL, Clark JD, Drover DR. No evidence for the development of acute tolerance to analgesic, respiratory depressant and sedative opioid effects in humans. *Pain*. 2009 Mar;142(1-2):17-26. PMID: 19135798, <https://doi.org/10.1016/j.pain.2008.11.001>
39. Pasternak JJ, McGregor DG, Lanier WL, Schroeder DR, Rusy DA, Hindman B, Clarke W, Torner J, Todd MM, IHAST Investigators. Effect of Nitrous Oxide Use on Long-term Neurologic and Neuropsychological Outcome in Patients who Received Temporary Proximal Artery Occlusion during Cerebral Aneurysm Clipping Surgery. *Anesthesiology*. 2009 Mar;110(3):563-573. PMID: 19212259, PMCID: PMC2735401, <https://doi.org/10.1097/ALN.0b013e318197ff81>
40. Todd MM, Hindman BJ, Clarke WR, Torner JC, Weeks JB, Bayman EO, Shi Q, Spofford CM, IHAST Investigators. Perioperative Fever and Outcome in Surgical Patients with

- Aneurysmal Subarachnoid Hemorrhage. Neurosurgery. 2009 May;64(5):897-908; discussion 908. PMID: 19404150, <https://doi.org/10.1227/01.NEU.0000341903.11527.2F>
41. Scuderi GJ, Cuellar JM**, Cuellar VG, Yeomans DC, Carragee EJ, **Angst MS**. Epidural interferon gamma-immunoreactivity: A Biomarker for Lumbar Nerve Root Irritation. Spine (Phila Pa 1976). 2009 Oct 1;34(21):2311-2317. PMID: 19934811, <https://doi.org/10.1097/BRS.0b013e3181af06b6>
 42. Hindman BJ, Bayman EO, Pfisterer WK, Torner JC, Todd MM, IHAST Investigators. No association between intraoperative hypothermia or supplemental protective drug and neurologic outcomes in patients undergoing temporary clipping during cerebral aneurysm surgery: Findings from the Intraoperative Hypothermia for Aneurysm Surgery Trial. Anesthesiology. 2010 Jan;112(1):86-8101. PMID: 19952722, <https://doi.org/10.1097/ALN.0b013e3181c5e28f>
 43. Carvalho B**, Aleshi P, Horstman DJ**, **Angst MS**. Effect of a Preemptive Femoral Nerve Block on Cytokine Release and Hyperalgesia in Experimentally Inflamed Skin of Human Volunteers. Reg Anesth Pain Med. 2010;35(6):514-519. PMID: 20975465, <https://doi.org/10.1097/AAP.0b013e3181faa107>
 44. Oertel BG, Felden L, Tran PV, Bradshaw MH, **Angst MS**, Schmidt H, Johnson S, Greer JJ, Geisslinger G, Varney MA, Lötsch J. Selective antagonism of opioid-induced ventilatory depression by an ampakine molecule in humans without loss of opioid analgesia. Clin Pharmacol Ther. 2010 Feb;87(2):204-211. PMID: 19907420, <https://doi.org/10.1038/clpt.2009.194>
 45. Cuellar JM**, Golish SR, Reuter MW, Cuellar VG, **Angst MS**, Carragee EJ, Yeomans DC, Scuderi GJ. Cytokine evaluation in individuals with low back pain using discographic lavage. Spine J. 2010 Mar;10(3):212-218. PMID: 20207331, <https://doi.org/10.1016/j.spinee.2009.12.007>
 46. Scuderi GJ, Woolf N, Dent K, Golish SR, Cuellar JM**, Cuellar VG, Yeomans DC, Carragee EJ, **Angst MS**, Bowser R, Hanna LS. Identification of a Complex between Fibronectin and Aggrecan G3 Domain in Synovial Fluid of Patients with Painful Meniscal Pathology. Clin Biochem. 2010 Jul;43(10-11):808-814. PMID: 20460120, <https://doi.org/10.1016/j.clinbiochem.2010.04.069>
 47. Nguyen HP, Zaroff JG, Bayman EO, Gelb AW, Todd MM, Hindman BJ, IHAST-MIDS and IHAST Investigators. Perioperative Hypothermia (33 degrees C) Does not Increase the Occurrence of Cardiovascular Events in Patients Undergoing Cerebral Aneurysm Surgery: Findings from the Intraoperative Hypothermia for Aneurysm Surgery Trial. Anesthesiology. 2010 Aug;113(2):327-342. PMID: 20571361, PMCID: PMC2910193, <https://doi.org/10.1097/ALN.0b013e3181dfd4f7>
 48. Chapman CR, Lipschitz DL, **Angst MS**, Chou R, Denisco RC, Donaldson GW, Fine PG, Foley KM, Gallagher RM, Gilson AM, Haddox JD, Horn SD, Inturrisi CE, Jick SS, Lipman AG, Loeser JD, Noble M, Porter L, Rowbotham MC, Schoelles KM, Turk DC, Volinn E, Von Korff MR, Webster LR, Weisner CM. Opioid pharmacotherapy for chronic non-cancer pain in the United States: a research guideline for developing an evidence-base. J Pain. 2010 Sep;11(9):807-829. PMID: 20430701, <https://doi.org/10.1016/j.jpain.2010.02.019>

Review article

49. **Angst MS**, Phillips NG**, Dровер DR, Tingle M, Galinkin JL, Christians U, Swan GE, Lazzeroni LC, Clark JD. Opioid Pharmacogenomics Using a Twin Study Paradigm: Methods and Procedures for Determining Familial Aggregation and Heritability. *Twin Res Hum Genet.* 2010 Oct;13(5):412-425. PMID: 20874462, <https://doi.org/10.1375/twin.13.5.412>
50. Nekhendzy V, Lemmens HJ, Tingle M, Nekhendzy M, **Angst MS**. The Analgesic and Antihyperalgesic Effects of Transcranial Electrostimulation with Combined Direct and Alternating Current in Healthy Volunteers. *Anesth Analg.* 2010 Nov;111(5):1301-1307. PMID: 20530614, <https://doi.org/10.1213/ANE.0b013e3181e3697e>
51. Carvalho B**, Clark DJ, Yeomans DC, **Angst MS**. Continuous Subcutaneous Instillation of Bupivacaine Compared to Saline Reduces Interleukin 10 and Increases Substance P in Surgical Wounds after Cesarean Delivery. *Anesth Analg.* 2010 Dec;111(6):1452-1459. PMID: 20861424, <https://doi.org/10.1213/ANE.0b013e3181f579de>
52. Hu Y, Liang D, Li X, Liu HH, Zhang X, Zheng M, Dill D, Shi X, Qiao Y, Yeomans D, Carvalho B, **Angst MS**, Clark JD, Peltz G. The role of interleukin-1 in wound biology. Part I: Murine in Silico and in Vitro Experimental Analysis. *Anesth Analg.* 2010 Dec;111(6):1525-1533. PMID: 20889942, <https://doi.org/10.1213/ANE.0b013e3181f5ef5a>
53. Hu Y, Liang D, Li X, Liu HH, Zhang X, Zheng M, Dill D, Shi X, Qiao Y, Yeomans D, Carvalho B, **Angst MS**, Clark JD, Peltz G. The role of interleukin-1 in wound biology. Part II: In vivo and Human Translational Studies. *Anesth Analg.* 2010 Dec;111(6):1534-1542. PMID: 20889944, <https://doi.org/10.1213/ANE.0b013e3181f691eb>
54. Chu LF**, Dairmont J**, Zamora AK, Young CA, **Angst MS**. The Endogenous Opioid System is Not Involved in Modulation of Opioid-Induced Hyperalgesia. *J Pain.* 2011 Jan;12(1):108-115. PMID: 20864417, <https://doi.org/10.1016/j.jpain.2010.05.006>
55. Tzabazis AZ, Klukinov M, Crottaz-Herbette S, Nemenov MI, **Angst MS**, Yeomans DC. Selective Nociceptor Activation in Volunteers by Infrared Diode Laser. *Mol Pain.* 2011 Mar 22;7:18. PMID: 21426575, PMCID: PMC3070669, <https://doi.org/10.1186/1744-8069-7-18>
56. Ruau D**, Liu LY, Clark JD, **Angst MS**, Butte AJ. Sex differences in reported pain across 11,000 Patients Captured in Electronic Medical Records. *J Pain.* 2012 Mar;13(3):228-234. PMID: 22245360, PMCID: PMC3293998, <https://doi.org/10.1016/j.jpain.2011.11.002>
57. Chu LF**, Cun T, Ngai LK, Kim JE, Zamora AK, Young CA, **Angst MS**, Clark DJ. Modulation of remifentanil-induced postinfusion hyperalgesia by the β -blocker propranolol in humans. *Pain.* 2012 May;153(5):974-981. PMID: 22365565, <https://doi.org/10.1016/j.pain.2012.01.014>
58. Ruau D**, Dudley JT, Chen R, Phillips NG, Swan GE, Lazzeroni LC, Clark JD, Butte AJ, **Angst MS**. Integrative Approach to Pain Genetics Identifies Pain Sensitivity Loci Across Diseases. *PLoS Comput Biol.* 2012;8(6):e1002538. PMID: 22685391, PMCID: PMC3369906, <https://doi.org/10.1371/journal.pcbi.1002538>

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60. **Angst MS**, Phillips NG**, Drover DR, Tingle M, Ray A, Swan GE, Lazzeroni LC, Clark DJ. Pain Sensitivity and Opioid Analgesia: A pharmacogenomic Twin Study. *Pain.* 2012 Jul;153(7):1397-1409. PMID: 22444188, PMCID: PMC3377769, <https://doi.org/10.1016/j.pain.2012.02.022>
61. **Angst MS**, Lazzeroni LC, Phillips NG**, Drover DR, Tingle M, Ray A, Swan GE, Clark JD. Aversive and Reinforcing Opioid Effects: A pharmacogenomic Twin Study. *Anesthesiology.* 2012 Jul;117(1):22-37. PMID: 22713632, PMCID: PMC3428265, <https://doi.org/10.1097/ALN.0b013e31825a2a4e>
62. Chu LF**, D'Arcy N, Brady C, Zamora AK, Young CA, Kim JE, Clemenson AM, **Angst MS**, Clark DJ. Analgesic tolerance without demonstrable opioid-induced hyperalgesia: A Double-blinded, Randomized, placebo-controlled trial of sustained-release morphine for treatment of chronic nonradicular low-back pain. *Pain.* 2012 Aug;153(8):1583-1592. PMID: 22704854, <https://doi.org/10.1016/j.pain.2012.02.028>
63. Oertel BG, Vermehren J, Zimmermann M, Huynh TT, Doehring A, Ferreiros N, Senzel S, Schmitz-Rixen T, Erbe M, Geisslinger G, Harder S, **Angst MS**, Lötsch J. Necessity and risks of arterial blood sampling in healthy volunteer studies. *Clin Pharmacokinet.* 2012 Oct 1;51(10):629-638. PMID: 23018527
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65. Bayman EO, Chaloner KM, Hindman BJ, Todd MM, IHAST Investigators. Bayesian Methods to Determine Performance Differences and to Quantify Variability Among Centers in Multi-center Trials: the IHAST Trial. *BMC Med Res Methodol.* 2013 Jan 16;13:5. PMID: 23324207, PMCID: PMC3599203, <https://doi.org/10.1186/1471-2288-13-5>
66. Pepper A, Li W, Kingery WS, **Angst MS**, Curtin CM, Clark JD. Changes resembling complex regional pain syndrome following surgery and immobilization. *J Pain.* 2013 May;14(5):516-524. PMID: 23453564, PMCID: PMC3644418, <https://doi.org/10.1016/j.jpain.2013.01.004>
67. Ginosar Y**, Riley ET, **Angst MS**. Analgesic and Sympatholytic Effects of Low-dose Intrathecal Clonidine Compared with Bupivacaine: A Dose-response Study in Female Volunteers. *Br J Anaesth.* 2013 Aug;111(2):256-263. PMID: 23533254, <https://doi.org/10.1093/bja/aet027>
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immune signatures. *Sci Transl Med.* 2014 Sep 24;6(255):255ra131. PMID: 25253674, PMCID: PMC4334126, <https://doi.org/10.1126/scitranslmed.3009701>

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47. Fragiadakis GK, Gaudilliere B, **Angst MS**, and Nolan GP. Single cell mass cytometry of human peripheral blood reveals an endogenous immune response to surgical trauma. AAI 2013.
48. Gaudilliere B, Fragiadakis GK, **Angst MS**, Nolan GP. Mass Cytometry Reveals an Endogenous Immune Response to Physiological Perturbation in Humans. CYTO 2013.
49. Gaudilliere B, Fragiadakis GK, Nolan GP, **Angst MS**. System-wide Analysis of the Endogenous Immune Response to Surgical Trauma Using Mass Cytometry (CyTOF). IARS 2013.
50. Cuellar JM, Marlen N, Cuellar VG, **Angst MS**, Yeomans DC, Montesano PX. Spinal intervertebral disc cytokines of patients undergoing lumbar anterior discectomy and interbody fusion for degenerative disc disease. Scol Res Soc 2013.
51. Gaudilliere B , Fragiadakis GK, , Tingle M, Silva J, Yeh C, Nolan G, **Angst MS**. Systems Immunology Reveals Massive Expansion of Myeloid Derived Suppressor Cells in Patients Undergoing Surgery. ASA 2013.
52. Samusik N, Gaudilliere B, **Angst MS**, Nolan GP. Fast and accurate mapping of phenotypic space in single-cell data with X-shift. Eur Conf Comp Biol 2014
53. Acupuncture for Inflammatory Pain and Central Sensitization. Phillips N, Hershowitz J, **Angst MS**, Langevin H. IASP 2014.
54. Yeomans DC, **Angst MS**, Frey WH, Jacobs D. Therapeutic Effects of Nasal Oxytocin in Chronic Migraine Patients. Am Headache Soc 2014.
55. Yeomans D, Jacobs D, Mechanic J, J Miller J, Pascual C, Manering N, Frey W, **Angst MS**. Cytokine dependence of the analgesic effect of nasal oxytocin in chronic migraineurs. APS 2014
56. Fragiadakis GK, Gaudillière B, Bruggner RV, **Angst MS**, Nolan GP. Immune capacity for surgical recovery quantified by single-cell mass cytometry. Winter q-bio Meeting 2015.
57. Baca QJ, Gaudilliere B, MD, Nolan GP, **Angst MS**. Immune Signatures of Women with Preterm Birth. SRI 2015.
58. Baca QJ, Nolan GP, **Angst MS**, Gaudilliere B. Immune Signatures of Neonates. SOAP 2015.
59. Gaudilliere B, Fragiadakis G, Ganio E, Tingle M. Nolan GP, **Angst MS**. A Pre-operative Immune “Stress-Test” to Predict Clinical Recovery from Surgery. IARS 2015.
60. Gaudilliere B , Fragiadakis G , Ganio E , Tingle M, Lancero H , Nolan G , **Angst MS**. Preoperative Immune Signatures Correlate with Recovery from Surgical Trauma. AAI 2015.
61. Complex modulation of the immune response to surgery by immune enhancing nutrients. Gaudilliere B, Aghaeepour N, Ganio EA, McNeil L, Tingle M, **Angst MS**. AUA 2016 & IARS 2016.

62. J Baca QJ, Fragiadakis G, Nima Aghaeepour, Carvalho B, **Angst MS**, Gaudilliere B. Maternal blood: a window into the neonatal immune system. SOAP 2016.
63. Tawfik VL, Ganio E, **Angst MS**, Clark JD, Gaudilliere B. Perioperative TLR4 modulation in a mouse model of surgical trauma: A systems-wide analysis by single-cell mass cytometry. AUA 2016 & IARS 2016.
64. Global Plasma Metabolic Profiles in Term and Preterm Birth. Lee-McMullen B; Kevin Contrepois K; **Angst MS**, Gaudilliere B, Quake S, Relman DA; Shaw G; Stevenson DK, Snyder M. ASMS 2017.
65. Ghaemi, S., **Angst, MS.**, Gaudilliere, B., Aghaeepour, N. Multiomics Analysis of the Immunome, Transcriptome, Microbiome, Proteome, and Metabolome in Term Pregnancy. SRI 2018.
66. Aghaeepour N, Ganio E, McIlwain D, Tsai A, Tingle M, Van Gassen S, Gaudilliere D, Baca Q, McNeil L, Okada R, Ghaemi MS, Furman D, Wong R, Wing V, Druzin M, El-Sayed Y, Quaintance C, Gibbs R, Darmstadt G, Shaw G, Stevenson D, Tibshirani R, Nolan G, Lewis D, **Angst MS**, Gaudilliere B. An Immune Clock of Human Pregnancy. RECOMB 2018.
67. Ando, K., Han, X., Ghaemi, S., Tsai, A., Ganio, E., Gaudilliere, D., Culos, T., Shaw, G., Wong, R., Stevenson, D., Carvalho, B., Tingle, M., **Angst, MS.**, Aghaeepor, N., Gaudilliere, B. Mass Cytometry and Proteomic Based Prediction of the Onset of Labor. SOAP 2018.
68. Ganio EA, Choisy B, Gaudillière D, Tsai AS, Han X, Ando K, Tingle M, McNeil L, **Angst MS**, Aghaeepour N, Gaudillière B. Systematic examination of whole blood sample handling procedure for analysis of immune cell function. CYTO 2018.
69. Gaudillière D, Djebali K, Culos T, Tsai AS, Ganio EA, Choi W, Ahmad A, Okada R, Tingle M, **Angst MS**, Aghaeepour N, Gaudillière B. Identifying a Peripheral Immune Signature of Chronic Periodontitis Using Mass Cytometry. CYTO 2018.
70. Han X , Ando K, Ghaemi S, Tsai AS, Ganio EA, Gaudillière D, Culos T, Tanada A, Shaw G, Stevenson D, Carvalho B, Tingle M, **Angst MS**, Aghaeepour N, Gaudillière B. Assessment of Maternal Peripheral Immune System by Mass Cytometry to Predict the Onset of Labor. CYTO 2018.
71. Spatz J, Tsai AS, Gaudillière D, Ganio EA, **Angst MS**, Hughes-Fulford M, Aghaeepour N, Gaudillière B. Immunosuppression in Space: System-level, single-cell human adaptations to microgravity. CYTO 2018.
72. Predictors of postoperative pain in 1,008 spine surgery patients. Baca QJ, Marti F, Gaudilliere B, Aghaeepour N, **Angst MS**. ASRA 2018.
73. Rishel C, **Angst MS**, Sun E. Association between preoperative opioid weaning and postoperative outcomes among chronic opioid users: a retrospective analysis. WARD 2018.
74. Ganio E, Stanley N, Einhaus J, Tsai A, Culos A, Rumer K, Fallahzadeh R, Lindberg-Larsen V, Kehlet H, **Angst MS**, Aghaeepour N, Gaudillière B. Deep Immune Profile of

Preoperative Glucocorticoid Administration in Patients Undergoing Surgery. AUA/IARS 2019, Shock 2019, CYTO 2019.

75. Ghaemi M, Becker M, Culos A, Fallahzadeh R, Hamad GB, Hedou J, Phongpreecha T, Stanley N, Tanada A, Ando K, Baca Q, Ganio E, Gaudilliere D, Han X, Peterson L, Rumer K, Stelzer I, Tsai A, Tsai E, Wong R, Shaw G, Stevenson D, Snyder M, Relman D, Quake S, **Angst MS**, Gaudilliere B, Aghaeepour N. Machine Learning for Integration of Mass Cytometry with the Transcriptome, Microbiome, Proteome, and Metabolome for Prediction of Clinical Outcomes. CYTO 2019.
76. Han, X., Ghaemi, M. S., Ando, K., Peterson, L., Ganio, E. A., Tsai, A. S., Gaudilliere, D., Einhaus, J., Tsai, E. S., Stanley, N. M., Culos, A., Taneda, A. H., Fallahzadeh, R., Wong, R. J., Winn, V. D., Stevenson, D. K., **Angst, MS.**, Aghaeepour, N., Gaudilliere, B. Differential Dynamics of the Maternal Immune System in Healthy Pregnancy and Preeclampsia. SRI 2019, CYTO 2019.
77. Stanley N, Han X, Fallahzadeh R, Ganio E, Becker M, Culos A, Hamad GB, Hedou J, Phongpreecha T, Tanada A, Ando K, Baca Q, Gaudilliere D, Peterson, Rumer K, Stelzer I, Tsai A, Tsai E, **Angst MS**, Gaudilliere B, Aghaeepour N. Multi-view Machine Learning Increases Predictive Power in Clinical Flow and Mass Cytometry Datasets. CYTO 2019
78. Stelzer I, Becker M, Han X, Ganio E, Tsai E, Peterson L, Shaw G, Stevenson DK, **Angst MS**, Aghaeepour N, Gaudillière. Fetal sex influences maternal immune system dynamics over the course of pregnancy. ISIR 2019.
79. Baca QJ, McNeil L, Okada R, Tingle M, Aghaeepour A, Gaudilliere B, **Angst MS**. Lidocaine Infusion during Hip Arthroplasty Modulates the Surgical Immune Response and Decreases Postoperative Pain. ASRA 2019.
80. Feinstein I, Yutsis M, Fischbein MP, Oakes DA, **Angst MS**. Investigating Cognitive Decline after Cardiac Surgery: A Magnetic Resonance Spectroscopy Approach. SCA 2019.
81. Tsai AS, Beneyto MM, Berry K, Ganio EA, Baca QD, Gaudillière D, Han X, Ando K, **Angst MS**, Lansberg MG, Buckwalter MS, Gaudillière B, Aghaeepour N. Systemic Immune Profile of Stroke Recovery. Cyto 2018, Shock 2019.
82. Rishel C, **Angst MS**, Sun E. Association between the Trajectory of Preoperative Opioid Use and Postoperative Opioid Use, Adverse Events, and Economic Outcomes: A Retrospective Analysis. IARS 2019.
83. Tsai ES, Rumer K, Wong KD, Warrington B, Shelton E, Ganio E, Ando K, Tsai AS, Kebebew E, Shelton A, Morris A, Kirilcuk N, Gurland B, Folk-Tolbert M, Shankar K, Kin C, **Angst MS**, Aghaeepour N, Brice G. Immune profiling to predict recovery outcomes after surgery. Shock 2019.
84. Kristen Rumer K, Ganio E, Stanley N, Tsai E, Kin S, Shelton A, Morris A, **Angst MS**, Aghaeepour N, Gaudilliere B. Deep immune profiling of patients with inflammatory bowel disease reveal disordered immune cell frequencies before and in response to major abdominal surgery. Scientific Forum 2020

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86. Protocol for a multisite prospective biomarker study in adolescent chronic musculoskeletal pain. Simons L, Coghill R, Moayedi M, Stinson J, King C, Lopez-Sola M, **Angst MS**, Gaudilliere B, Aghaeepour N. NIH 2021 HEAL meeting.
87. Becker M, Nassar H, Espinosa CA, Stelzer IA, Feyaerts D, Berson E, Bidoki N, Chang AL, De Francesco D, Fallahzadeh R, Maric I, Mataraso SJ, Phongpreecha T, Ravindra NG, Stanley N, Thuraiappah M, Shaw G, Stevenson DK, **Angst MS**, Gaudilliere B, Aghaeepour N. Next-generation Network Construction Algorithm Reveals Changes in Coordination between Multiomics Biological Pathways during Pregnancy. PAS 2022.
88. Chang AL, Reiss JD, Culos A, Becker M, Mayo JA, Marić I, Fallahzadeh R, Bidoki NH, De Francesco D, Phongpreecha T, Espinosa CA, Xenochristou M, Zhang M, Stanley N, Lee HC, Gaudillière B, **Angst MS**, Stevenson DK, Shaw GM, Sylvester KG, Aghaeepour N. Quantitative assessment of neonatal health using dried blood spot metabolite profiles and deep learning. SRI and PAS 2022.
89. Espinosa CA, Chang AL, Phongpreecha T, Moufarrej MN, Contrepois K, Wong RJ, Quaintance CC, Becker M, Berson E, Bidoki N, De Francesco D, Liu Q, Mataraso S, Ravindra N, Thuraiappah M, Stelzer I, Maric I, Wise PH, Winn VD, Druzin ML, Gibbs RS, Darmstadt GL, Murray JC, Gaudilliere B, Snyder MP, **Angst MS**, Shaw GM, Stevenson DK, Aghaeepour N. Multiomics modeling of preterm birth in low- and middle-income countries. SRI 2022.
90. Feyaerts D, Stelzer IA, Maric I, Hedou J, Diop M, Ganio EA, Han X, Ando K, Aghaeepour N, Hlatky MA, **Angst MS**, Winn VD, Stevenson DK, Romero R, Gaudilliere B, Gomez-Lopez N. Cross-tissue Assessment of Local and Peripheral Immune Determinants of Preeclampsia. PAS 2022.
91. Multiomics Longitudinal Modeling of Preeclamptic Pregnancies Marić I, Contrepois K, Moufarrej M, Stelzer, Feyaerts D, Han H, Tang A, Wong RJ, Darmstadt GL, Winn VD, Shaw GM, Relman DA, Quake SR, **Angst MS**, Snyder MP, Stevenson DK, Brice Gaudilliere G, Aghaeepour N. SRI 2022.
92. Rumer KK, Hedou J, Tsai A, Einhaus J, Verdonk F, Stanley N, Choisy B, Ganio E, Bonham A, Jacobsen D, Warrington B, Gao X, Tingle M, McAllister TN, Fallahzadeh R, Feyaerts D, Stelzer I, Gaudilliere D, Ando K, Shelton A, Morris A, Kebebew E, Aghaeepour N, Kin C, **Angst MS**, Gaudilliere B. Integrated single-cell and plasma proteomic modeling to predict surgical site complications: a prospective cohort study. Ann Surg. 2022 Mar 1;275(3):582-590. PMID: 34954754, PMCID: PMC8816871, <https://doi.org/10.1097/SLA.0000000000005348>
93. Choisy B, Hedou GH, Verdonk F, Gaudilliere D, Tsai AS, Shankar K, Sato M, Einhaus J, Ganio E, Bonham A, Warrington B, Ahmad S, Tingle M, Ando K, Bruckman S, S. **Angst MS**, Kin C, Gaudilliere B. Multimodal, coached telehealth prehabilitation has high

compliance and improves exercise and cognitive capacity prior to surgery: a pilot study. IARS 2022.

94. Verdonk F, Hedou J, Marić I, Bellan G, Einhaus J, Gaudilliere D, Bonham A, **Angst MS**, Gaudilliere B. An Immune Signature of Surgical Site Infections (SSI), a Retrospective Study with a Novel Machine Learning Pipeline for Biomarker Identification. IARS 2023.
95. Verdonk F, Hedou J, Marić I, Bellan G, Einhaus J, Gaudilliere D, Ladant FX, Stelzer I, Feyaerts D, Tsai A, Bonham A, **Angst MS**, Aghaeepour N, Stevenson DK, Tibshirani R, Gaudilliere B. STABL Enables Reliable and Selective Biomarker Discovery in Predictive Modeling of High-dimensional Omics Data. IARS 2023.
96. Verdonk F, Tsai AS, Hedou J, Heifets B, Gaudilliere D, Bellan G, Feyaerts F, Stelzer I, Ganio E, Sato M, Bonham A, Ando A, Aghaeepour N, **Angst MS**, Gaudilliere B. An immune signature of postoperative cognitive dysfunction (POCD). IARS 2022.

Digital Publications: (4 total)

1. Carvalho B**, Clark DJ, Yeomans D, **Angst MS**. Collecting and measuring nociceptive and inflammatory mediators in surgical wounds. *J Vis Exp.* 2008 Oct 29;962. PMID: 19078937, PMCID: PMC3234158, <https://doi.org/10.3791/962>
2. **Angst MS**, Tingle M, Schmelz M, Carvalho B**, Yeomans DC. Human in-vivo bioassay for the tissue-specific measurement of nociceptive and inflammatory mediators. *J Vis Exp.* 2008 Dec 1;1074. PMID: 19229167, PMCID: PMC2762925, <https://doi.org/10.3791/1074>
3. **Angst MS**, Tingle M, Phillips NG**, Carvalho B**. Determining heat and mechanical pain threshold in inflamed skin of human subjects. *J Vis Exp.* 2009 Jan 14;1092. PMID: 19229176, PMCID: PMC2763295, <https://doi.org/10.3791/1092>
4. Carvalho B**, Clark DJ, Yeomans D, **Angst MS**. Collecting and Measuring Wound Exudate Biochemical Mediators in Surgical Wounds. *J Vis Exp.* 2012 Oct 20;50133. PMID: 23117346, PMCID: PMC3490314, <https://doi.org/10.3791/50133>

VI. GRANT FUNDING

Unfunded:

Role:

Current:

9/2018-6/2024	Funder: NIH, R01AG058417-0251 Title: Dietary Modulation of Neuro-inflammation in Age-Related Memory Disorders Role: Site PI (PI: Sloan R.)
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9/2018-6/2024	Funder: NIH, R01AG058417 Title: Dietary Modulation of Neuro-inflammation in Age-Related Memory Disorder Role: Site PI (PI: Sloan R.)
9/2019-7/2024	Funder: NIH, R61NS114926 Title: Signatures of Pain Recovery in Teens (SPRINT) Role: Co-Investigator (PI: Simons L.)
7/2020-6/2024	Funder: NIH, R01NS117340 Title: B Lymphocyte-Mediated Autoimmunity in Pain after Trauma Role: Site PI (PI: Clark D.)
9/2020-6/2025	Funder: NIH, R35GM138353 Title: Machine Learning for Integrative Modeling of the Immune System in Clinical Settings Role: Co-Investigator (PI: Aghaeepour N.)
9/2020-8/2025	Funder: NIH, R21/33AG065744 Title: Building a Platform for Precision Anesthesia for the Geriatric Surgical Patient Role: Co-Investigator (PI: Drover D.)
1/2022-12/2023	Funder: March of Dimes Title: Immune Mechanisms and Proteomic Signatures Predicting and Determining Preterm Birth Role: Co-investigator (project leader) (PI: Stevenson D.)
4/2022-3/2024	Funder: ADRC Stanford and NIH, P30AG066515 Title: Comprehensive Biomarker Analysis of Perioperative Neurocognitive Disorder and its Relationship to Latent Alzheimer's Disease Pathology Role: Mentor (PI: Feinstein I.)
9/2023-8/2025	Funder: Wu Tsai Neurosciences Institute Title: Biological Determinants of Brain Resilience in Cardiac Surgery Role: PI
10/2023-2026	Funder: NIH, R42NS129395 Title: Developing Novel Technologies to Monitor Nociception and Opioid Administration during Surgery and General Anesthesia in order to Minimize Post-operative Opioid Requirements Role: Co-Investigator (PI: Patrick Purdon)

Completed:

1/1995-12/1996	Funder: Organon Inc. Title: ORG-9487 - A New Rapid Onset Muscle Relaxant Role: Co-Investigator (PI: Dyck B.)
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1/1996-1/1996	Funder: Neurobiological Technologies Inc. Title: Pharmacokinetics of Corticotropin-Releasing Factor in Man Role: PI
1/1996-12/1997	Funder: Abbott Inc. Title: Analgesic Action of Dexmedetomidine in Humans Role: PI
1/1997-12/2001	Funder: Knoll Pharmaceutical Company Title: Pharmacokinetics and Pharmacodynamics of Slow Release Hydromorphone in Humans Role: PI
1/2000-1/2001	Funder: Department of Anesthesia, Stanford University School of Medicine Title: Experimental Model of Acute Opioid Tolerance and Withdrawal in Man Role: PI
1/2000-1/2001	Funder: Cellergy Pharmaceuticals Inc. Title: Pharmacokinetics of Anogesic in Patients with Anal Fissure Role: Co-Investigator (PI: Drover D.)
1/2001-1/2002	Funder: Physiometrix Inc. Title: Data Collection Study for PSA 4000 with Hypnos Software Upgrade Role: Co-Investigator (PI: Drover D.)
1/2001-1/2002	Funder: Department of Anesthesia, Stanford University School of Medicine Title: Gender and Rate Differences in Acute Tolerance and Withdrawal to the Analgesic, Sedative, and Respiratory Depressant Effects of Opioids Role: PI
7/2002-6/2004	Funder: Foundation for Anesthesia Education and Research Title: Differential Rate for the Development of Acute Tolerance to Opioid-induced Analgesia, Respiratory Depression and Sedation Role: PI
7/2003-6/2004	Funder: Foundation for Anesthesia Education and Research Title: Opiate-induced Tolerance and Hyperalgesia in Pain Patients Role: Mentor (PI: Chu L.)
1/2004-1/2005	Funder: Department of Anesthesia, Stanford University School of Medicine Title: Human Biomarkers of Inflammation and Nociception: Validation of an In-vivo Model Role: PI
7/2004-6/2009	Funder: NIH, K23 Title: Opiate-induced Tolerance and Hyperalgesia in Pain Patients Role: Mentor (PI: Chu L.)
1/2005-1/2006	Funder: Department of Anesthesia, Stanford University School of Medicine Title: Effect of Nicotine on Inflammatory and Nociceptive Biomarkers in a

	Sunburn Model of Hyperalgesia in Healthy Volunteers Role: PI
1/2005-1/2007	Funder: Department of Anesthesia, Stanford University School of Medicine Title: Effects of Trans-cranial Electro-stimulation on Pain Perception, Cognition and Mood in Human Volunteers Role: Mentor (PI: Nekhendzy V.)
1/2005-1/2007	Funder: Organon Pharmaceuticals Inc. Title: A Multi-center, Randomized, Assessor-blinded, Phase II, Parallel Dose-finding Trial to Assess the Efficacy and Safety of Org 25969 Role: Co-Investigator (PI: NA)
1/2006-1/2008	Funder: Organon Pharmaceuticals Inc. Title: A Multi-center, Randomized, Phase III Trial Assessing the PK/PD of Org 25969 in Subjects of Various Ages Role: Co-Investigator (PI: NA)
7/2006-6/2008	Funder: NIH, K12 Title: Chronic Persistent Pain Following Cesarean Delivery: The Role of Wound Cytokines Role: Mentor (PI: Carvalho B.)
1/2007-1/2008	Funder: I-Flow Corporation Title: Continuous Administration of Bupivacaine and Ketamine to Surgical Wounds via the Follow-on Pain Buster System: Analgesic, Anti-hyperalgesia and Anti-inflammatory Effects Role: PI
6/2007-7/2008	Funder: Department of Anesthesia, Stanford University School of Medicine Title: Pilot-Study - Heritability of Opioid Analgesia Role: PI
7/2007-6/2008	Funder: DARPA, W911NF0710462
7/2008-6/2011	Title: Feedback Regulated Drug Delivery System Based on Polymer Hydrogels and Vesicles Role: Consortium Principal Investigator
1/2008-6/2009	Funder: Scientific Imaginetics Inc. Title: Analgesic and Anti-inflammatory Effects of Electromagnetic Therapy in Humans Role: PI
6/2008-6/2010	Funder: NIH, 1R43DA026228 Title: Naso-cerebral Administration of Peptides for Temporo-mandibular Joint Pain Role: Consultant (PI: Trigemina Inc.)
7/2008-6/2010	Funder: Stanford Institute for Immunity, Transplantation and Infection Title: A Systems Biology Approach for Discovery of Biomarkers for

	Inflammatory Pain Role: PI
7/2008-6/2012	Funder: NIH, R01DA023063 Title: Opioid Efficacy - A Twin-study Role: PI
7/2009-6/2010	Funder: NIH, R43DA027259 Title: Intranasal Nociceptin for the Treatment of Migraine and Head Pain Role: Consultant (PI: Trigemina Inc.)
7/2012-6/2017	Funder: Department of Anesthesia, Stanford University School of Medicine Title: Mass cytometry - A Systems-based Approach for Studying Immune Health in Surgery and Anesthesia Role: PI
1/2013-12/2015	Funder: March of Dimes Title: Characterizing Immune Signatures in Preterm Labor with Single Cell Mass Cytometry Role: Co-investigator (project leader) (PI: Stevenson D.)
7/2013-6/2014	Funder: NIH, T32GM089626 Title: Systems Analysis of the Human Immune Response to Surgical Trauma Role: Mentor (PI: Gaudilliere B)
7/2013-6/2016	Funder: Stanford University School of Medicine, BioX Graduate Fellowship Title: Systems-analysis of the Human Immune Response to Surgery Role: Mentor (PI: Fragiadakis GK)
7/2013-6/2017	Funder: NIH, K23HD07097201 Title: Postpartum Hemorrhage and Anemia: Epidemiologic and Cost-Effectiveness Analyses Role: Mentor (PI: Buttwick A.)
1/2014-12/2016	Funder: Bill and Melinda Gates Foundation Title: Use of Molecular Features in Peripheral Blood to Understand Relationships between Microbiome and Host in the Setting of Preterm Birth Role: Co-Investigator (PI: Stevenson D)
7/2014-6/2018	Funder: Stanford Neuroscience Institute Title: The Stroke Collaborative Action Network: Redefining Stroke Recovery Role: Co-Investigator (PI: Buckwalter M.)
7/2014-6/2018	Funder: NIH, K23GM111657 Title: Role of Myeloid-derived Suppressor Cells in the Immune Response to Surgery Role: Mentor (PI: Gaudilliere B.)
1/2016-1/2017	Funder: SomaLogic Inc. Title: Aptamer Technology to Infer Gestational Age in the Plasma Proteome Role: PI

7/2016-6/2017	Funder: HPI Hasso Plattner Institute Title: Human Technology Teamwork: Enabling Clinicians to Focus on Complex Design Thinking Tasks through Advances in IT Systems Engineering: Tools to Improve Human-centered Communication between Patients and Providers Role: Co-Investigator (PI: Berte N.)
7/2016-6/2017	Funder: Robert Butler Columbia Aging Center Title: Plasticity in Recovery from Surgery - The Effects of Exercise Prehabilitation on Cognitive and Functional Recovery after Shoulder Replacement Surgery in Older Adults Role: Co-Investigator (PI: Sloan R.)
7/2016-6/2019	Funder: NIH, T32GM089626 Title: The Effects of Lidocaine on Pain Trajectories and Immune Responses after Hip Arthroplasty Role: Primary Mentor (PI: Bacca Q)
1/2017-1/2018	Funder: Prematurity Research Center Stanford University School of Medicine Title: A Proteomic Signature of Preeclampsia Role: PI
7/2017-6/2018	Funder: Lukas Center Grant, Stanford University Title: Cognitive Decline after Cardiac Surgery: A Multimodal Magnetic Resonance Spectroscopy Approach Role: Co-Investigator (PI: Feinstein I.)
9/2017-8/2018	Funder: SPARK Translational Research Program Stanford University Title: Cocoa Flavanols for Modulating the Immune Response to Surgery and Accelerate Recovery Role: PI
1/2018-12/2020	Funder: Bill and Melinda Gates Foundation Title: Maternal and Fetal Markers for New Biology and Maternal/Fetal/Newborn Birth Risk Role: Co-investigator (project leader) (PI: Stevenson D.)
7/2018-6/2020	Funder: NIH, R21DE027728 Title: Identifying a Systemic Immune Signature of Periodontal Disease with Mass Cytometry Role: Co-Investigator (PI: Gaudilliere B.)
7/2018-6/2020	Funder: American Heart Association Title: A Systems-based Mass Cytometry Approach to Study the Post-cardiac Arrest Immune Response Role: Co-Investigator (PI: Hirsch K.)
7/2018-6/2022	Funder: NIH, R01HL139844 Title: Preeclampsia to Cardiovascular Disease - Life Course Analysis of

	Biomarkers and Risks Role: Co-Investigator (PI: Hlatky M.)
3/2019-7/2022	Funder: Alkahest Inc. Title: A Randomized, Placebo-controlled Pilot Study to Evaluate the Effect of GRF6019 on Intracellular Signaling Cascades in Blood Leukocytes and Post-surgery Recovery of Participants Undergoing Primary Hip or Knee Arthroplasty Role: PI
7/2019-6/2020	Funder: ITI Center for Systems Immunology and the Bill and Melinda Gates Foundation Title: Machine Learning for Integrated Multiomics Analysis of Preeclampsia Role: Co-Investigator (PI: Aghaeepour N.)
7/2019-6/2020	Funder: ITI Center for Systems Immunology and the Bill and Melinda Gates Foundation Title: Identifying a Predictive Immune Signatures of Preeclampsia Role: Co-Investigator (PI: Gaudilliere B.)
7/2019-6/2020	Funder: Stanford Maternal and Child Health Research Institute Title: Maternal Life Stress, Prenatal Inflammation, and the Developmental Origins of Child Temperament Role: Co-Investigator (PI: Gotlib J.)
10/2019-9/2021	Funder: SCA/IARS Mid-Career Research Grant Title: Enhanced Recovery after Cardiac Surgery with Erector Spinae Plane Catheters: A Prospective, Randomized, Placebo Controlled Trial Role: Co-Investigator (PI: Brodt J.)
7/2020-6/2021	Funder: FIDL Award Department of Anesthesiology Stanford University Title: Oxidative Stress and Surgical Outcomes Role: Co-Investigator (PI: Clark D.)
7/2020-6/2021	Funder: RISE Stanford COVID-19 Crisis Response Program Title: Using Micro-geographic Variability to Address Modifiable Factors Associated with COVID-19 Transmissibility, Hospitalization, and Death Role: Co-Investigator (PI: Staudenmayer K.)
10/2021-6/2023	Funder: Bill and Melinda Gates Foundation Title: Discovery Hubs and Network-Adjuvants Role: Co-Investigator (PI: Davis M.)

VII. PATENTS

1/2012-	Methods and compositions for treating aging-associated conditions, US14/562,401
1/2012-	Methods for the treatment of headaches by administration of oxytocin, US 8,202,838

- 1/2012- Methods for the treatment of headaches by administration of oxytocin, US 8,198,240
- 1/2012- Methods for treatment of headaches by administration of oxytocin, US 8,252,745
- 1/2012- Therapy procedure for drug delivery for trigeminal pain, US 8,258,096
- 1/2013- Methods for the treatment of headaches by administration of oxytocin, US 8,501,691
- 1/2013- Methods for the treatment of pain, US 8,551,949
- 1/2016- Methods for the treatment of pain, US 9,238,053
- 1/2018- Compositions and methods of prognosis and classification for preeclampsia, US62/767,957
- 1/2020- Composition and methods of predicting time to onset of labor, US63/066,701
- 1/2021- Systems and methods to generate a surgical risk score and uses thereof, US63/162,912

VIII. EDITORIAL SERVICE

Editorial Positions:

- | | |
|-----------|---|
| 2007-2010 | Associate Editor, Anesthesia & Analgesia |
| 2010-2012 | Editor, Anesthesia & Analgesia |
| 2010-2019 | Associate Editor, European Journal of Pain |
| 2012-2014 | Section Editor, Pain and Analgesic Mechanisms, Anesthesia & Analgesia |

IX. SERVICE AS GRANT REVIEWER

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| 1/2001-12/2006 | NA, Research Grants Council of Hong Kong, China |
| 1/2006 | Ad hoc Reviewer, NIH, NAIDA |
| 1/2009 | ZRG1 SBIB-V Challenge Grant Panel, NIH, NINDS |
| 1/2011 | Somatosensory and Chemosensory Systems Study Section, NIH |
| 1/2017 | Special emphasis panel NCCIH - Phased Innovation Award for Mechanistic Studies to Optimize Mind Body Interventions in NCCIH High Priority Research Topics, NIH |
| 1/2019 | Special Emphasis Panel ZRG1 IFCN-L HEAL Initiative, NIH |
| 1/2021 | Neurological Sciences and Disorders A Study Section, NIH, NINDS |

X. UNIVERSITY ADMINISTRATIVE SERVICE

7/2000-6/2006	Admissions Panel Medical School, Stanford University School of Medicine
1/2009-6/2012	Member of Stanford Hospital Committee for Establishing ICU CNS Pharmacotherapy Guidelines, Stanford Medicine
1/2011-12/2011	Search Committee Member: Chief of Multi-Specialty Division, Department of Anesthesiology, Perioperative and Pain Medicine, Stanford University School of Medicine
1/2011-12/2011	Search Committee Member: Research Faculty, Stanford Neuroscience Institute, Stanford University School of Medicine
1/2012-12/2012	Search Committee Member: Clinician Scientist, Critical Care Division, Department of Anesthesiology, Perioperative and Pain Medicine, Stanford University School of Medicine
1/2013-12/2013	Search Committee Member: Clinician Scientist in Clinical Pharmacology, Department of Anesthesiology, Perioperative and Pain Medicine, Stanford University School of Medicine
1/2014-12/2014	Search Committee Chair: Clinician Scientist in Pain Medicine, Department of Anesthesiology, Perioperative and Pain Medicine, Stanford University School of Medicine
1/2014-12/2014	Search Committee Member: Senior Scientist, Department of Anesthesiology, Perioperative and Pain Medicine, Stanford University School of Medicine
1/2015-12/2015	Search Committee Member: Head Bio-banking and Population-based Genetic Research, Department of Medicine, Stanford University School of Medicine
6/2015-5/2021	Appointment and Promotion Committee, Stanford University School of Medicine
1/2016-12/2016	Member High Value Care Team for Spine Surgery, Stanford Medicine
1/2016-12/2020	Stanford Biobank Working Group Member, Representative for the Department of Anesthesiology, Perioperative and Pain Medicine, Stanford University School of Medicine
1/2017-12/2018	Search Committee Chair: Division Chief Cardiovascular and Thoracic Anesthesia, Department of Anesthesiology, Perioperative and Pain Medicine, , Stanford University School of Medicine
1/2018-12/2021	Search Committee Member, UML Faculty Search, Department of Surgery, Stanford University School of Medicine
1/2019-	Finance Committee Member, Department of Anesthesiology, Perioperative and Pain Medicine, Stanford University School of Medicine
1/2019-	Governance Committee Member, Department of Anesthesiology, Perioperative and Pain Medicine, Stanford University School of Medicine

10/2019-9/2022	CVH Operations Leadership Group Member, Stanford Cardiovascular Health Service Line
1/2020-12/2021	Multi-Organ Transplantation Quality Project Member, Stanford University School of Medicine
1/2021-	MCL Search Committee Member, Department of Anesthesiology, Perioperative and Pain Medicine, Stanford University School of Medicine
1/2022-	Data Science Initiative Committee Member, Department of Anesthesiology, Perioperative and Pain Medicine, Stanford University School of Medicine
10/2022-	Co-chair Data Governance Committee, Department of Anesthesiology, Perioperative and Pain Medicine, Stanford University School of Medicine
10/2022-	Executive Committee Member, Department of Anesthesiology, Perioperative and Pain Medicine, Stanford University School of Medicine
11/2022-	Search Committee Chair: Anesthesia Division Chief of Critical Care Medicine, Department of Anesthesiology, Perioperative and Pain Medicine, Stanford University School of Medicine

XI. SERVICE TO PROFESSIONAL ORGANIZATIONS

1/1995-12/2014	International Association for the Study of Pain, Member
1/1995-12/2014	American Pain Society, Member
1/1995-	California Society of Anesthesiologists, Member
1/1995-	American Society of Anesthesiologists, Member
1/1996-	International Anesthesia Research Society, Member
1/1997-12/2000	American Society for Clinical Pharmacology and Therapeutics, Member
1/2009-	Association of University Anesthesiologists, Member (elected)
1/2015-12/2022	Shock Society, Member
1/2015-12/2022	American Association of Immunologists, Member

XII. INVITED PRESENTATIONS (64 PRESENTATIONS)

Grand Rounds: (9 presentations)

1/2011	“Opioid Pharmacogenomics in a Twin-Study Paradigm”, Laboratory of the Biology of Addictive Diseases, Rockefeller University New York
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- 1/2014 "Clinical Recovery from Surgery Strongly Correlates with Single-Cell Immune Signatures, CCR UCSF
San Francisco
- 1/2014 "Immunity in the Context of Surgery and Anesthesia", Department of Anesthesiology, Pain and Perioperative Medicine
Stanford
- 1/2015 "Immune Signatures of Clinical Recovery from Surgical Trauma: Mass Cytometry to Comprehensively Survey the Entire Immune System with Single-cell Resolution at the Bedside", Rigshospitalet, Copenhagen University Copenhagen, Denmark
- 1/2015 "Single-cell Analysis of the Peripheral Immune System in Patients with a History of Term and Preterm labor", Department of Pediatrics
Stanford
- 1/2016 "Immune Correlates of Delayed Surgical Recovery", Department of Anesthesia, Washington University
St. Louise
- 1/2017 "Immune Correlates of Surgical Recovery, Grand Round DeGroote Institute, McMaster University
Hamilton, Canada
- 9/2022 "Anesthetic Management of Aneurysms and Vascular Malformations", Grand Round Stony Brook Medicine
Stony Brook
- 9/2022 "Biological Determinants of Postoperative Recovery", Grand Round Stony Brook Medicine
Stony Brook

Local Meetings: (8 presentations)

- 6/2002 "Opioid-induced Hyperalgesia", Brain Research Institute
Stanford
- 9/2003 "Do Painkillers Cause Pain?", Department of Psychiatry and Behavioral Sciences
Stanford
- 1/2015 "Implementing Mass Cytometry at the Bedside: Single-cell Immune Signatures of Clinical Recovery from Surgical Trauma", Stroke Collaborative Action Network
Stanford
- 1/2017 "A Proteomic Clock of Pregnancy", Stanford Prematurity Research Center
Stanford

1/2018	"A Proteomic Signature of Preeclampsia", Stanford Prematurity Research Center Stanford
1/2018	"Cocoa Flavanols for Modulating the Surgical Immune Response and Accelerating Clinical Recovery" SPARK Stanford
1/2019	"Cocoa Flavanols for Modulating the Surgical Immune Response and Accelerating Clinical Recovery - Final Results", SPARK Stanford
7/2019	"Cocoa Flavanols for Modulating the Surgical Immune Response and Accelerating Clinical Recovery – Final Results", SPARK Stanford

National and Regional Meetings: (35 presentations)

3/1997	"Quantification of Opioid Analgesia with a New Experimental Pain Model in Man", Analgesiology and Headache Section, Annual Meeting of the American Society of Clinical Pharmacology and Therapeutics San Diego
6/1997	"Quantitative Sensory Testing: What is Abnormal and what are Clinical Standards?", Workshop on Quantitative Sensory Testing, Massachusetts General Hospital Boston
4/2000	"Total Intravenous Anesthesia in Cardiac Surgery", Annual Meeting of the Society of Cardiovascular Anesthesiologists Orlando
6/2000	"The Pharmacodynamics of Oral Sustained Release Hydromorphone", Investigator Meeting Knoll Pharmaceutical Company Orlando
5/2003	"Human Studies on Acute Opioid Tolerance", American Society of Regional Anesthesia and Pain Medicine San Diego
3/2004	"Opioid-induced Hyperalgesia in Humans", UCSF Pain Interest Group San Francisco
5/2004	"Acute Opioid Tolerance: No Evidence in Models of Acute Experimental Pain?", Association of University Anesthesiologists Sacramento

- 10/2004 "Opioid-induced Hyperalgesia: What Does It Mean for Pain Treatment?", American Society of Anesthesiology
New Orleans
- 4/2006 "Electrical Experimental Pain Models in Humans. International Experimental Pain Model", Advisory Board to Eli Lilly and Company
Indianapolis
- 5/2006 "Opioid-induced Hyperalgesia", Forum at the Center for Health Care Evaluation, Department of Veteran Affairs
Menlo Park
- 8/2006 "Opioid-induced Hyperalgesia. Symposium Interface between Pain and Opioids", American Academy of Addiction Society
St. Pete Beach
- 3/2008 "Opioid-induced Hyperalgesia, a Newly Recognized Side Effect of Opioid Therapy?", Department of Physiology and Pharmacology, Oregon Health & Science University
Portland
- 3/2008 "Pharmacokinetic Considerations for the Rational Use of Opioids", Department of Physiology and Pharmacology, Oregon Health & Science University
Portland
- 8/2008 "From Mice to Men: Translational Experimental Protocol to Study Nociception and Inflammation in Tissue Injury", Stanford Scientific Conference of Immunology and the Institute of Immunity, Transplantation and Infection
Asilomar
- 8/2008 "Towards a Definitive Evidence Base for Opioid Management of Chronic Non-cancer Pain: Clinical Assessment of Opioid-induced Hyperalgesia:", National Panel at the Pain Research Center of the University of Utah
Salt Lake City
- 10/2008 "Update on Opioid Safety and Tolerability: Current Concepts to Minimize Side Effects and Risks", Annual Meeting of the American Society of Anesthesiology
Orlando
- 5/2009 "The Relevance of Descending Inhibition to Understanding and Treatment of Neuropathic Pain: Experimental Assessment of Descending Inhibition in Normal Humans and those with Neuropathic Pain", Annual Meeting of the American Pain Society
San Diego
- 10/2009 "The Heritability of Opioid Effects – Preliminary Results of a Twin Study", Annual Meeting of the American Society of Anesthesiology
New Orleans

- 10/2009 "Update on Opioid Safety and Tolerability: Current Concepts to Minimize Side Effects and Risks", Annual Meeting of the American Society of Anesthesiology
New Orleans
- 10/2010 "Update on Opioid Safety and Tolerability: Current Concepts to Minimize Side Effects and Risks", Annual Meeting of the American Society of Anesthesiology
San Diego
- 1/2011 "All about Opioids: Opioid-induced Hyperalgesia", American Academy of Pain Medicine
Washington DC
- 1/2012 "Opioid-induced Hyperalgesia: Clinical Presentation and Implication", World Institute of Pain
Miami, FL
- 1/2013 "TIVA - Implications on Pain Management", Mylan Roundtable
Trenton
- 1/2013 "The Role of Pharmacologic Challenge in Patient Phenotyping for Phase 2 and 3 Trials", IMMPACT
Washington DC
- 1/2015 "Single-Cell Immune Signatures Predict Clinical Recovery after Surgery", UCSF/Stanford Anesthesia Research Retreat
Millbrae
- 1/2015 "The Resolution of Pain after Surgery and Trauma - New Concepts Bring New Opportunities: Immunologic Aspects of Recovery from Surgery", American Society of Anesthesiology
New Orleans
- 1/2016 "New Thoughts on Predicting and Preventing Chronic Pain after Surgery: An Immune Biomarker for Slow Recovery and How to Modify Risk in Slow Recovery", International Anesthesia Research Society
San Francisco
- 1/2018 "Deep Multiomic Profiling in Clinical Studies", UCSF/Stanford Research Retreat
Millbrae
- 1/2018 "Emerging Tools and Approaches in Biomarker Discovery and Development", Panel Chair NIH Workshop
Washington DC
- 1/2018 "Multiomic and Computational Approaches to Biomarker Discovery: Mass Cytometry and Data Integration", NIH Workshop
Washington DC

- 1/2019 "Persistent Postsurgical Pain - Pathophysiology and Preventive Strategies: Perioperative Inflammation and Immune Response", American Society of Anesthesiology
Orlando
- 1/2019 "Shifting Gears – Biological Hall Marks of Surgical Recovery", Shock Society
San Diego
- 1/2019 "Signals to Begin Labor – Inflammation and PTL, March of Dimes
Washington DC
- 5/2019 "Shifting Gears – Biological Hall Marks of Surgical Recovery", Shock Society
San Diego
- 2/2023 "Modulating the Inflammatory Response to Surgery", Alkahest
SanCarlos

International Meetings: (12 presentations)

- 8/1997 "The Measurement of Pain in Clinical Pharmacology", 41st Symposium in Anesthesiology
Lucerne, Switzerland
- 11/2001 "Computer Controlled Infusions: A Useful Tool for Analgesic Drug Trials", Institute of Physiology, University of Nuernberg-Erlangen
Erlangen, Germany
- 11/2001 "Opioid-induced Hyperalgesia", Institute of Physiology, University of Nuernberg-Erlangen
Erlangen, Germany
- 8/2002 "Apparent Acute Analgesic Opioid Tolerance: A Reflection of Opioid-induced Hyperalgesia", Department of Anesthesia, Hospital of Lucerne
Lucerne, Switzerland
- 5/2008 "Altered Sensitivity to Opioids – Hyperalgesia and Tolerance", Annual Meeting of the European Society of Anesthesiology
Copenhagen, Denmark
- 5/2008 "Pain Assessment in Experimental Medicine", Annual Meeting of the European Society of Anesthesiology
Copenhagen, Denmark
- 5/2009 "Difficult Airway Workshop: Flexible Fiberoptic Bronchoscopy", Annual Meeting of JAEPE
Recife, Brazil
- 4/2010 "Surrogate Markers of Opioid-induced Hyperalgesia in Humans: Are they Valid and where Do We Stand?" Spring Pain Conference
Grand Cayman Island

1/2016	“Cellular and Proteomic Signatures of Term/preterm Birth”, March of Dimes Montreal, Canada
1/2019	“Immune Signatures for Risk Profiling of Surgical Patients”, Intensive Care Symposium Schwyz, Switzerland
1/2019	“Intraoperative Opioids: Postoperative Consequences, Opioid-free Anesthesia, and Nociception-Index Guided Anesthesia”, International Anesthesia Research Society Montreal, Canada
1/2021	“Symposium on Immune Health in Surgery and Critical Care – Challenges and Novel Opportunities (organizer and moderator)”, International Anesthesia Research Society Online (due to COVID-19)

XIII. TRAINEES

Graduate students:

Victor Wang, FAER Medical Student Fellow Award, 6/2009-8/2009

Jeremy Harris, Medical Scholar Fellowship Award, 6/2010-2010

Gabi Fragiadakis, BioX Graduate Fellow Award, 7/2012-6/2014

Postdoctoral scholars:

Bhamini Rhamaswamy, MD, 7/1997-7/1998

Yehuda Ginosar, MD, 9/1999-8/2001

Larry F. Chu, MD, FAER Award, NIH K23 Award, 8/2003-7/2004

Jason M. Cuellar, PhD, Medical Student, Stanford Scholar Fellowship Award, 9/2005-8/2007

Brendan Carvalho, MD, BIRCWH Scholar, NIH K12 Award, 9/2006-8/2008

David Ruau, PhD, 9/2009-8/2012

Alexander Butwick, MD, NIH K-23 Award, 9/2013-8/2017

Quentin Barca, MD, PhD, FARM fellow, NIH T32 Award, 9/2013-8/2019

Brice Gaudilliere, MD, PhD, FARM fellow, NIH T-32 Award, NIH K-23 Award, 9/2014-8/2018

Igor Feinstein, MD, PhD, FARM fellow, ADRC/NIA Award, 9/2015-

Chris Rishel, MD, FARM Fellow, NIH T32 Award, 9/2017-8/2019

Karen Hirsch, MD, AHA Award, 9/2019-8/2020

Jessica Brodt, MD, SCA/IARS Award, 9/2019-8/2021