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Engineering & Scientific Consulting

Emily Friedrich, Ph.D.

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Professional Profile

Dr. Friedrich has broad expertise spanning biomaterials characterization, biomaterial-tissue interactions, pre-clinical and clinical study design, study management, and analysis. She has experience working within plastic and reconstructive surgery, dermatology, and emergency medicine evaluating medical devices ranging from biologically derived scaffolds and skin substitutes for tissue regeneration to medical device performance in austere environments.

Dr. Friedrich earned her Ph.D. at Carnegie Mellon University where her work focused on the synthesis, characterization, and biological transport of anti-inflammatory hyaluronic acid-based biomaterials for applications including burns, wound healing, and atopic dermatitis. To accomplish this, she leveraged techniques across chemistry, biology, and engineering including advanced imaging techniques such as fluorescence correlation spectroscopy (FCS). She then worked at Northwestern University as a postdoctoral fellow in the Division of Plastic Surgery conducting basic and translational research focused on hypertrophic scar biology and treatments. Additionally, at Northwestern she optimized the processing of biologically derived tissue scaffolds for the treatment of volumetric muscle loss and other soft tissue injuries both in collaboration with industry partners and on Department of Defense funded grant programs.

As a Research Instructor at the University of Illinois at Chicago, Dr. Friedrich led biochemistry intensive research to elucidate a novel pathway in pulmonary vascular permeability. As part of a multidisciplinary team, she confirmed the specific route of protein leak in a mouse model of pulmonary edema using transmission electron microscopy (TEM).

Prior to joining Exponent, Dr. Friedrich served as Biomedical Research Program Manager with General Dynamics Information Technology. In this role, she provided high level guidance to a research group composed of military physicians and contracted research support staff. She served as the subject matter expert for preclinical and clinical research evaluating products, procedures, and devices for hemorrhage control and resuscitation in large animal, cadaver, and human subject models.

Academic Credentials & Professional Honors

Ph.D., Biomedical Engineering, Carnegie Mellon University, 2014

M.S., Biomedical Engineering, Carnegie Mellon University, 2011

B.S., Molecular Genetics and Biochemistry, University of Pittsburgh, 2007

Congressionally Directed Medical Research Program Combat Readiness – Rapid Development and Translational Research Award, Naval Medical Center Portsmouth, 2020 – 2022

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Military Health System Research Symposium 2020 Outstanding Research Accomplishment/Team/Military

National Institutes of Health Lung Biology and Pathobiology T32 Training Grant, University of Illinois at Chicago, 2017 – 2019

Teaching Assistant Award, Carnegie Mellon University, 2014

Best Poster Award, McGowan Institute for Regenerative Medicine Second Annual Symposium on Regenerative Rehabilitation, 2012

Licenses and Certifications

Good Clinical Practices (GCP) for Clinical Trials with Investigational Drugs and Biologics

Good Clinical Practices (GCP) in Medical Device Clinical Investigations

Project Management Professional (PMP)

Prior Experience

Biomedical Research Program Manager, General Dynamics IT, 2019-2023

Research Instructor, University of Illinois at Chicago, 2017 – 2019

Postdoctoral Fellow, Northwestern University, 2015-2017

Professional Affiliations

Project Management Institute

Women in Bio (member Philadelphia Chapter)

Publications

Wilson M, Stuart S, Lassiter B, Parker T Jr, Martin C 3rd, Healy R, Treager C, Sulava E, Gower L, Fernandez P, Friedrich E. (2024) Pharmacokinetics of Tranexamic Acid (TXA) Delivered by Expeditious Routes in a Swine Model of Polytrauma and Hemorrhagic Shock. Prehosp Emerg Care. 28(5):680-688. doi: 10.1080/10903127.2024.2342025.

Lopachin T, Treager CD, Sulava EF, Stuart SM, Bohan ML, Boboc M, Fernandez P, Bianchi WD, McGowan AJ, Friedrich EE. (2023) Ultrasound Localization of Resuscitative Endovascular Balloon Occlusion of the Aorta in a Human Cadaver Model. J Spec Oper Med. 23(2):73-77. doi:10.55460/8MDD-BY4I.

Hafer, A., Verga, J., Sulava, E., Friedrich, E., Sheldon, D., Boboc, M., Bohan, M., Norris, E., Gaspary, M., & Stuart, S. (2023). The evaluation of Hemoblast Bellows for arterial hemorrhage control in a swine model of vascular injury. Trauma, 0(0). doi:10.1177/14604086231152670

Stuart, S. M., Treager, C. D., Lopachin, T. R., Moss, P. I., & Friedrich, E. E. (2022). Persistence of procoagulable thromboelastography results in hospitalized COVID-19 patients despite clinical improvement. Eur Rev Med Pharmacol Sci, 26(9), 3399-3405. doi:10.26355/eurrev_202205_28761

Stuart, S. M., Bohan, M. L., & Friedrich, E. E. (2022). Speed, Skill Retention, and End User Perceptions of iTClamp Application by Navy Corpsmen on a Manikin Model of Femoral Hemorrhage. Mil Med.

doi:10.1093/milmed/usac355

Stuart, S. M., Bohan, M. L., McLean, J. B., Walchak, A. C., & Friedrich, E. E. (2022). iTClamp-Mediated Wound Closure Speeds Control of Arterial Hemorrhage With or Without Additional Hemostatic Agents. J Spec Oper Med, 22(4), 87-92. doi:10.55460/tpmg-0mqu

Getz, C. W., Stuart, S. M., Barbour, B. M., Verga, J. M., Roszko, P. J. D., & Friedrich, E. E. (2022). Cric in the Dark: Surgical Cricothyrotomy in Low Light Tactical Environments. J Spec Oper Med, 22(4), 50-54. doi:10.55460/8dr3-b0rh

Treager, C., Lopachin, T., Mandichak, S., Kinney, B., Bohan, M., Boboc, M., Go, C., Friedrich, E., & Stuart, S. (2021). A comparison of efficacy, efficiency, and durability in novel tourniquet designs. J Trauma Acute Care Surg, 91(2S Suppl 2), S139-S145. doi:10.1097/TA.0000000000003216

Zhao, J., Jia, S., Xie, P., Friedrich, E., Galiano, R. D., Qi, S., Mao, R., Mustoe, T. A., & Hong, S. J. (2020). Knockdown of sodium channel Na(x) reduces dermatitis symptoms in rabbit skin. Lab Invest, 100(5), 751-761. doi:10.1038/s41374-020-0371-1

Jones, J. H., Friedrich, E., Hong, Z., Minshall, R. D., & Malik, A. B. (2020). PV1 in Caveolae Controls Lung Endothelial Permeability. Am J Respir Cell Mol Biol, 63(4), 531-539. doi:10.1165/rcmb.2020-0102OC

Friedrich, E. E., Hong, Z., Xiong, S., Zhong, M., Di, A., Rehman, J., Komarova, Y. A., & Malik, A. B. (2019). Endothelial cell Piezo1 mediates pressure-induced lung vascular hyperpermeability via disruption of adherens junctions. Proc Natl Acad Sci U S A, 116(26), 12980-12985. doi:10.1073/pnas.1902165116

Friedrich, E. E., Lanier, S. T., Niknam-Bienia, S., Arenas, G. A., Rajendran, D., Wertheim, J. A., & Galiano, R. D. (2018). Residual sodium dodecyl sulfate in decellularized muscle matrices leads to fibroblast activation in vitro and foreign body response in vivo. J Tissue Eng Regen Med, 12(3), e1704-e1715. doi:10.1002/term.2604

Friedrich, E. E., & Washburn, N. R. (2017). Transport patterns of anti-TNF-alpha in burn wounds: Therapeutic implications of hyaluronic acid conjugation. Biomaterials, 114, 10-22. doi:10.1016/j.biomaterials.2016.11.003

Friedrich EE, Niknam-Bienia S, Xie P, Jia SX, Hong SJ, Mustoe TA, Galiano RD. (2017) Thermal injury model in the rabbit ear with quantifiable burn progression and hypertrophic scar. Wound Repair Regen. 25(2):327-337. doi: 10.1111/wrr.12518.

Zhao, J., Zhong, A., Friedrich, E. E., Jia, S., Xie, P., Galiano, R. D., Mustoe, T. A., & Hong, S. J. (2017). S100A12 Induced in the Epidermis by Reduced Hydration Activates Dermal Fibroblasts and Causes Dermal Fibrosis. J Invest Dermatol, 137(3), 650-659. doi:10.1016/j.jid.2016.10.040

Ramadan, M. H., Sansone, N. J., Pendergast, L. M., Friedrich, E. E., & Washburn, N. R. (2016). Non-fouling hyaluronic acid coatings for improved sandwich ELISA measurements in plasma. Analytical Methods, 8(6), 1222-1228. doi:10.1039/C5AY03092G

Korkmaz, E., Friedrich, E. E., Ramadan, M. H., Erdos, G., Mathers, A. R., Ozdoganlar, O. B., Washburn, N. R., & Falo, L. D., Jr. (2016). Tip-Loaded Dissolvable Microneedle Arrays Effectively Deliver Polymer-Conjugated Antibody Inhibitors of Tumor-Necrosis-Factor-Alpha Into Human Skin. J Pharm Sci, 105(11), 3453-3457. doi:10.1016/j.xphs.2016.07.008

Korkmaz, E., Friedrich, E. E., Ramadan, M. H., Erdos, G., Mathers, A. R., Burak Ozdoganlar, O., Washburn, N. R., & Falo, L. D., Jr. (2015). Therapeutic intradermal delivery of tumor necrosis factor-alpha antibodies using tip-loaded dissolvable microneedle arrays. Acta Biomater, 24, 96-105. doi:10.1016/j.actbio.2015.05.036

Friedrich, E. E., Azofiefa, A., Fisch, E., & Washburn, N. R. (2015). Local delivery of antitumor necrosis factor-alpha through conjugation to hyaluronic acid: dosing strategies and early healing effects in a rat burn model. J Burn Care Res, 36(2), e90-e101. doi:10.1097/BCR.0000000000000140

Friedrich, E. E., Sun, L. T., Natesan, S., Zamora, D. O., Christy, R. J., & Washburn, N. R. (2014). Effects of hyaluronic acid conjugation on anti-TNF-alpha inhibition of inflammation in burns. J Biomed Mater Res A, 102(5), 1527-1536. doi:10.1002/jbm.a.34829

Washburn, N. R., Prata, J. E., Friedrich, E. E., Ramadan, M. H., Elder, A. N., & Sun, L. T. (2013). Polymer-conjugated inhibitors of tumor necrosis factor-alpha for local control of inflammation. Biomatter, 3(3). doi:10.4161/biom.25597

Sun, L. T., Friedrich, E., Heuslein, J. L., Pferdehirt, R. E., Dangelo, N. M., Natesan, S., Christy, R. J., & Washburn, N. R. (2012). Reduction of burn progression with topical delivery of (antitumor necrosis factor-alpha)-hyaluronic acid conjugates. Wound Repair Regen, 20(4), 563-572. doi:10.1111/j.1524-475X.2012.00813.x

Lou, H., Montoya, S. E., Alerte, T. N., Wang, J., Wu, J., Peng, X., Hong, C. S., Friedrich, E. E., Mader, S. A., Pedersen, C. J., Marcus, B. S., McCormack, A. L., Di Monte, D. A., Daubner, S. C., & Perez, R. G. (2010). Serine 129 phosphorylation reduces the ability of alpha-synuclein to regulate tyrosine hydroxylase and protein phosphatase 2A in vitro and in vivo. J Biol Chem, 285(23), 17648-17661. doi:10.1074/jbc.M110.100867

Alerte, T. N., Akinfolarin, A. A., Friedrich, E. E., Mader, S. A., Hong, C. S., & Perez, R. G. (2008). Alpha-synuclein aggregation alters tyrosine hydroxylase phosphorylation and immunoreactivity: lessons from viral transduction of knockout mice. Neurosci Lett, 435(1), 24-29. doi:10.1016/j.neulet.2008.02.014

Presentations

Friedrich EE, Hong Z, Xiong S, Zhong M, Rehman J, Komarova YA, Malik AB. Endothelial Cell Expressed Piezo1 Regulates Pressure-Induced Lung Vascular Permeability. Oral presentation selected from abstracts at the Vascular Cell Biology Gordon Research Conference, Ventura, California, January 20-25, 2019.

Friedrich EE, Niknam-Bienia S,Lanier ST, Arenas G, Hong SJ, Wertheim J, Mustoe TA, Galiano RD. Complete Removal of SDS Necessary for Biologically Derived Scaffold Integration in Muscle Wound Repair. Oral presentation selected from abstracts at the 29th Annual Wound Healing Society Meeting, San Diego, California, April 5-9, 2017.

Friedrich EE, Sun LT, Washburn NR, Natesan S, Zamora DO, Christy RJ. Improving Burn Outcomes with (Anti-TNF-alpha)-Polysaccharide. Poster presented at the 2012 All Hands AFIRM meeting, St. Pete Beach, Florida, Feb 14, 2012.

Friedrich EE, Wehmeyer JL, Natesan S, Christy RJ. Development of Supercritical CO2-Treated Human Amniotic Membrane Combined with Adipose Derived Stem Cells. Poster preview and poster presented at the McGowan Institute for Regenerative Medicine Second Annual Symposium on Regenerative Rehabilitation, Pittsburgh, Pennsylvania, Nov 13-14, 2012.

Azis M, Bagla N, Costa J, Desai K, Friedrich E, Heshmati M, Li C. Redesigning the Lift Chair. Poster presented during the National Science Foundation site visit to Quality of Life Technology Center, Pittsburgh, Pennsylvania, April 12, 2011

Peer Reviews

Journal of Tissue Engineering and Regenerative Medicine

Military Medicine