HEATHER HERD GUSTAFSON

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GOAL

To develop an independent research lab that utilizes existing and develops novel technology platforms that target and alter macrophage phenotypes. I aim to do this through the utilization of platforms that: 1. specifically initiate and/or block amylogenic cell death (i.e. pyroptosis and necroptosis) and 2. induce or reverse trained innate immunity.

EDUCATION

2019 **Postdoctoral Fellow**
University of Washington, Seattle, WA and Walter and Eliza Hall Medical Institute, Melbourne, Australia
Concentration: Understanding the role of tumor associated macrophages in the tumor microenvironment

2014 **Ph.D. in Bioengineering**
University of Utah, Salt Lake City, UT, USA
Helmholtz Institut, Saarbruecken, Germany
Dissertation: Macrophage Silica Nanoparticle Interactions: Cellular Uptake and Fate

2008 **B.S.E. in Biomedical Engineering**
Case Western Reserve University, Cleveland, OH
Area of concentration: Macromolecular Engineering
Minor: Chemistry

KEY EXPERIENCES

2019 Assistant Professor, Ben Towne Center for Childhood Cancer Research, Seattle Children's Research Institute, Seattle, WA

2015 Postdoctoral Fellow, Dr. Seth Masters, Dr James Vince, Dr. Suzie Pun, Walter and Eliza Hall Medical Institute, Melbourne Australia and Department of Bioengineering, University of Washington, Seattle

- Development of a new in-vivo screening platform for novel ligand identification specifically within brain metastasis with a focus on macrophage phenotypes
- Development of multiple collaborations including an international collaboration which has resulted in a novel class of peptide therapeutics which alters macrophage phenotype
- Development of a new class of injectable basement membrane polymers that interact directly and specifically with the tumor microenvironment to modulate disease progression
- Prepared and received fellowship/grant funding totaling $150,000
- Mentored 2 graduate students, 1 undergraduate student

2015 Postdoctoral Fellow, Dr. Cyrus Ghajar, Public Health Sciences Division/Human Biology/Translational Research Program, Fred Hutchinson Cancer Research Center, Seattle, WA
Development of a brain perivascular niche co-culture model

2008-2014 Graduate Research Assistant, Dr. Claus-Michael Lehr and Dr. Hamid Ghandehari, Department of Bioengineering, University of Utah, Salt Lake City, UT and Department of Pharmaceutical Research Helmholtz Institute and Saarland University, Saarbruecken, Germany

- Designed and executed original hypothesis-driven research leading to 6 peer-reviewed research publications, one review and one book chapter, numerous conference abstracts/posters and awards
- Mentored 3 graduate and 1 undergraduate students
- Prepared and received fellowship/grant funding totaling $190,000
- Primary authorship of a funded $1.2 million NIH R01

2013, Cold Spring Harbor Short Course Synthetic Biology, Cold Spring Harbor, New York

2005-08, Undergraduate Research Assistant, Department of Biomedical Engineering, Case Western Reserve University, Cleveland, OH

- Senior Projects: "Platelet-Targeted Surface-Modified Amphiphilic Block Co-Polymer Micelles as Targeted Vehicles for Multimodal Imaging of Atherosclerosis", "Development of an In-Vitro Model for Cardiovascular Systems that Allows for Thermodynamic and Optical Modeling, Imaging and Profiling", and "Surface-Modification of Liposomes for Targeted Drug Delivery in treatment of Cardiovascular Diseases"
- Obtained multiple undergraduate research fellowships/awards

2007, Intern, NovelMed Therapeutics, Cleveland, OH

- Development of an Orally Active Small Molecule for the Neutralization of TNF, and IL-1beta in the treatment of Rheumatoid and Osteoarthritis
- Research excellence award

AWARDS

2018	MIT and Johns Hopkins University Rising Star in Biomedical Engineering Workshop
2018	University of Washington Postdoctoral Mentoring Award
2017-2018	Whitaker International Scholar
2017	Gordon Research Seminar Travel Award
2015-2018	Cardiovascular Training Grant Senior Fellow: University of Washington
2016	WPI Future Faculty Fellow Training Workshop
2011-2014	Department of Defense Breast Cancer Research Program Predoctoral Fellow
2014	Drug Delivery Euro Ph.D. from the Helmholtz Institut, Saarbruecken, Germany
2013	Helmholtz Association of German Research Centers, Paper of the Month
2011	NanoDDS Poster Award, Nanomedicine and Drug Delivery Symposium, Salt Lake City, Utah
2011	Whitaker International Fellow
2011	German Academic Exchange Service Fellow
2010	First Place Student Poster Award, Mountain West Biomedical Engineering Research Conference, Salt Lake City, Utah
2008	Campus Wide Undergraduate Leadership/Service Award, Case
2004-2008	Horn Hays Case Western Reserve University Scholar
2006-2008	Junior/Senior Case Western Reserve University Scholar
2007	NovelMed Therapeutics Inc, Exemplarily Scientist Award
2007	SOURCE Undergraduate Research Award, Case Western
2004-2008	Deans High Honors

EXISTING AND PRIOR SUPPORT

1. Whitaker Foundation **Gustafson (PI)** 12/01/2017-01/01/2019
Whitaker International Scholar: Development of a novel pyropotic compound for anti-tumor therapy

2. Cardiovascular Training Program Schwartz (PI) 09/01/15- 1/15/19
University of Washington

3. DOD BC100947 **Herd (PI)** 07/01/11 – 07/01/14
Department of Defense Predoctoral Fellowship in Breast Cancer: Multifunctional Silica Nanoparticles for Assessment of the Role of Tumor-Associated Macrophages in Breast Adenocarcinoma

4. Institute for International Education **Herd (PI)** 01/01/11-07/01/11
Whitaker International Fellow: The Assessment of Silica Nanoparticle Physiochemical Characteristics on Cellular Uptake and Intracellular Fate

5. German Academic Exchange Fellowship **Herd (PI)** *Declined.*
The Assessment of Silica Nanoparticle Physiochemical Characteristics on Cellular Uptake and Intracellular Fate

6. Source Undergraduate Research **Herd (PI)** 05/15/07-09/15/07
Surface-Modification of Liposomes for Targeted Drug Delivery in treatment of Cardiovascular Diseases.

SELECTED INVITED TALKS

H. Gustafson, R.J. Lamm, D. Sellers, N. White, S.H. Pun**.** Fibrin Stabilization by a Targeted, Synthetic Polymer Modulates the Brain Metastatic Niche. BMES Atlanta, GA. October 2018.

H. Gustafson. Two sides of the same coin: *in vivo* phenotype modulation of macrophages via novel biomaterials. Invited Seminar University of Minnesota Department of Bioengineering. March 2018.

H. Gustafson, R.J. Lamm, D. Sellers, N. White, S.H. Pun. A fibrin-stabilizing polymer aids in brain metastatic outgrowth through macrophage recruitment and reactive gliosis. Podium. Biomaterials Gordon Research Seminar. July 2017.

H.Herd, N. Daum, H. Ghandehari, CM Lehr. Phagocytic Nanoparticle Response is Phenotypically Dependent. Podium. NanoUtah. Oct 2013

H.Herd, N. Daum, H. Ghandehari, CM Lehr. Cellular Nanoparticle Surface Orientation Facilitates Modes of Uptake. NanoDDS. 10 min lightening talk. Salt Lake City, UT, Oct 2011

H.Herd, N. Daum, H. Ghandehari, CM Lehr. Translocation and Uptake of Geometrically Defined Silica Nanoparticles across Primary Alveolar Macrophages and Epithelial Cells. 5 min short talk. Nanomedicine Summer School European Union. Germany, June 2011

TEACHING

Summer 2018 Design and implementation of a novel biology course for juniors/seniors in Biology, University of Washington

Summer 2016/2017 Discussion Group Leader Biomedical Research Integrity Program – 4.6 out of 5

Spring 2016 Guest Lecture for Failure in Medicine Course, University of Washington- Not reviewed

Fall 2013 Guest Lectures for Nanomedicine Course, University of Utah – Not reviewed

Spring 2013 Co-instructor for Biomaterials (a core graduate course) – Review 4.2 out of 5
Gave lectures, wrote and graded homework and test questions, assigned readings, assisted in mock NIH proposals and study sections

Fall 2012 TA for Nanotechnology: Opportunities for Advanced Drug Delivery – Not reviewed
Gave lectures, grade assessments

Spring 2012 TA for Biocompatibility – Review 4.8 out of 5
Gave lectures, wrote and graded homework and test questions

Summer 2005 Supplemental Instructor General Chemistry, Case Western Reserve and Northwestern Universities
Graded homework/assignments, ran review sessions

MENTORING

Meilyn Sylvestre (2017-2019), Graduate student, supervising dissertation project

William Liu (2016-2017), Undergraduate student, *NASA SURP Scholar*

Christopher Saxby (2016), Graduate student, supervised rotation project

Kristopher Bartlett (2011-2014), Undergraduate student, supervised senior project which was resulted in inclusion on a final publication

Wiebke Gerlach (2014), First year graduate student, supervised rotation project

Julian Kessler (2013), First year graduate student, supervised rotation project

Colin Campbell (2012), First year graduate student, supervised rotation project

SERVICE

2019	NIH NCI Cancer Systems Biology and Microbiome Innovation Workshop
2019-present	Member, Brotman Baty Institute
2019-present	Member, Seattle Cancer Consortium and Translational Tumor Program
2017-present	Puget Sound Macrophage Working Group
2015-present	Pacific Science Center: Science Communication and Outreach Fellowship
2016-2019	University of Washington Biomedical Research Integrity Program Discussion Leader
2018-2019	Fulbright Interview Committee University of Washington
2018-2019	ABET Accreditation Committee University of Washington
2017-2019	Science Teaching Experience Project (STEP) for Postdocs
2016-2017	Engineering Immunology Journal Club

2015-2017	University of Washington Postdoc Association
2014-2016	Co-Chair and Founder, Tumor Microenvironment Postdoc Seminar Series
2015-2017	Future Faculty Fellows Program, University of Washington
2014-2015	Student Postdoc Advisory Council Fred Hutch: McDougal Mentoring and Student Travel Award Committees
2008-2014	NanoUtah, A public outreach program to teach nanotechnology
2011-2014	Retention, Tenure and Promotion Committee, University of Utah Dept. of Bioengineering
2013	Intern, State of Utah Governor's Science Advisory Panel
2008- 2011	Chair, Nano Institute of Utah Student Advisory Committee
2008- 2009	Social Committee Chair, Graduate Student Association Dept. of Bioengineering
2006-2008	President and Vice President, Case Engineers Council (Governing Student Engineering Body on Case Western Reserve University Campus)
2006-2007	Public Relations and Local Project Coordinator, Engineers Without Borders Case Student Chapter
2005-present	Vice President and Public Relations, Delta Gamma Social Fraternity
2004-2008	Tour Guide, Undergraduate Admissions Case Western Reserve University
2006-2008	Monster CORP Diversity Leaders Program (one of 2,000 out of 30,000 applicants)

EDUCATIONAL EXPERIENCES

2018	MIT and JHU Rising Star in Biomedical Engineering Workshop
2016/2017	Early Faculty Grant Writing Course, University of Washington
2016	WPI Future Faculty Fellow Training Workshop
2013	Cold Spring Harbor Short Course Participant

PUBLICATIONS

1. **Gustafson H.H.**, Mildenhall, A., Brumatti G., Feltham R., Lalaoui N., Petrie E., De Nardo D., Balka K, Orozco S., Oberst A., Silke J, Murphy J, Pun S, Vince J, Masters S. A candidate therapeutic necroptotic peptide. In review.
2. **Gustafson H.H.**, Olshefsky, A., Sellers, D.L., Sylvestre, M., Pun S.H. Current state of in vivo panning technologies: designing specificity and affinity into the future of drug targeting. **Adv Drug Deliv Rev**. 2018 Jun 28.
3. Yen, A., Cheng, Y., Sylvestre, M., **Gustafson, H.H**., Puri, S., and Pun, S.H. (2018) Serum nuclease susceptibility of mRNA cargo in condensed polyplexes. **Mol Pharm.** 2018 Jun 4;15(6):2268-2276.
4. Ngambenjawong, C.*, Sylvestre, M.*(co-first authors), **Gustafson, H.H**., Pineda, J.M., and Pun, S.H. (2018) Reversibly-switchable, pH-dependent peptide ligand binding via 3,5-diiodotyrosine substitutions. **ACS Chem Biol.** 2018 Apr 20;13(4):995-1002.
5. Butterfield GL*, Lajoie MJ* (co-first authors), **Gustafson HH**, Sellers DL, Nattermann U, Ellis D, Bale JB, Ke S, Lenz GH, Yehdego A, Ravichandran R, Pun SH, King NP, Baker D. Evolution of a designed protein assembly encapsulating its own RNA genome. **Nature,** 2017 Dec 21;552(7685):415-420.
6. Ngambenjawong C*, **Gustafson HH* (Co-first Author)**, Sylvestre M, Pun SH. A Facile Cyclization Method Improves Peptide Serum Stability and Confers Intrinsic Fluorescence. **Chembiochem**, 2017; 18(24):2395-2398.
7. Ngambenjawong C, **Gustafson HH**, Pun SH. Progress in Tumor Associated Macrophage (TAM)-Targeted Therapeutics. **Adv Drug Deliv Rev**, 2016; 6(9):1403-1414
8. Ngambenjawong, C., **Gustafson, H.H.**, Pineda, J. M., Kacherovsky, N. A., Cieslewicz, M., & Pun, S. H. (2016). Serum Stability and Affinity Optimization of an M2 Macrophage-Targeting Peptide (M2pep). **Theranostics**, *6*(9), 1403.
9. **Gustafson-Herd H,** Holt D, Grainger D, Ghandehari H. Nanoparticle Uptake: The Phagocyte Problem. **Nano today**. August 2015; 10(4): 487-510.
10. **Herd H**, Bartlett K, Gustafson J, McGill L, Ghandehari H. Macrophage Silica Nanoparticle Response is Phenotypically Dependent. **Biomaterials**, Jun 2015; 53: 574-582.
11. **Herd H**, Daum N, Jones A, Lehr CM, Ghandehari H. Cellular Nanoparticle Surface Orientation Facilitates Modes of Uptake. **ACS Nano**, 2013 Mar 26;7(3):1961-73.

12. **Herd H.L.**, Ghandehari H. Synthetic and Toxicological Characteristics of Silica Nanomaterials for Imaging and Drug Delivery Applications. In: **Nanobiomaterials Handbook***,* CRC Press, Balaji Sitharaman (ed), 2011
13. **Herd HL**, Malugin A, Ghandehari H, Silica nanoconstruct toleration threshold in vitro. **J Control Release** 2011 Jul 15;153(1):40-8.
14. Greish K, Thiagarajan G, **Herd H**, Price R, Bauer H, Hubbard D, Burckle A, Sadekar S, Yu T, Anwar A, Ray A, Ghandehari H, Size and surface charge significantly influence the toxicity of silica and dendritic nanomaterials. **Nanotoxicology** 2011 Jul 28; 1-11.
15. Malugin A., **Herd H.**, Ghandehari H. Differential Toxicity of Anionic Silica Nanoparticles towards Phagocytic and Epithelial Cells. Journal of Nanoparticle Research, 2011 13(10): 5381-5396.
16. Moos PJ, Honeggar M, Malugin A, **Herd H**, Thiagarajan G, Ghandehari H. Transcriptional responses of human aortic endothelial cells to potential biomedical nanomaterial platforms. **Mol. Pharmaceutics**, 2013, 10 (8), pp 3242–3252

PEER REVIEW

Biomaterials
ACS Biomaterials Science
Advance Drug Delivery Reviews
NanoToday
Molecular Pharmaceutics