Suzanne D Vernon, PhD
BHC Research Director

Publications

Lee J, Wall P, Kimler C, Bateman L, **Vernon SD**. Clinically accessible tools for documenting the impact of orthostatic intolerance on symptoms and function in ME/CFS. WORK: A Journal of Prevention, Assessment & Rehabilitation, (in press).

Palombo T, **Vernon SD**, Roundy S. Development of an Inertial Measurement-Based Assessment of Disease Severity in Chronic Fatigue Syndrome. Proceedings of the 2020 Utah NASA Space Grant Consortium and EPSCOR.

Uhde M, Indart AC, Yu XB, Jang SS, De Giorgio R, Green PHR, Volta U, **Vernon SD**, Alaedini A. Markers of non-coeliac wheat sensitivity in patients with myalgic encephalomyelitis/chronic fatigue syndrome. Gut. 2019 Feb;68(2):377-378. doi: 10.1136/gutjnl-2018-316133. Epub 2018 Mar 17. PubMed PMID: 29550784; PubMed Central PMCID: PMC6352651.

Herrera S, de Vega WC, Ashbrook D, **Vernon SD**, McGowan PO. Genome-epigenome interactions associated with Myalgic Encephalomyelitis/Chronic Fatigue Syndrome. Epigenetics. 2018;13(12):1174- 1190. doi: 10.1080/15592294.2018.1549769. Epub 2018 Dec 5. PubMed PMID: 30516085.

Uhde M, Indart A, Fallon BA, Wormser GP, Marques AR, **Vernon SD**, Alaedini A. C-Reactive Protein Response in Patients With Post-Treatment Lyme Disease Symptoms Versus Those With Myalgic Encephalomyelitis/Chronic Fatigue Syndrome. Clin Infect Dis. 2018 Sep 28;67(8):1309-1310. doi: 10.1093/cid/ciy299. PubMed PMID: 29741589; PubMed Central PMCID: PMC6160605.

de Vega WC, Erdman L, **Vernon SD**, Goldenberg A, McGowan PO. Integration of DNA methylation & health scores identifies subtypes in myalgic encephalomyelitis/chronic fatigue syndrome. Epigenomics. 2018 May;10(5):539-557. doi: 10.2217/epi-2017-0150. Epub 2018 Apr 25. PubMed PMID: 29692205.

Broderick G, Fletcher MA, Gallagher M, Barnes Z, **Vernon SD**, Klimas NG. Exploring the Diagnostic Potential of Immune Biomarker Co-expression in Gulf War Illness. Methods Mol Biol. 2018;1781:101- 120. doi: 10.1007/978-1-4939-7828-1_7. PubMed PMID: 29705845.
Cook DB, Light AR, Light KC, Broderick G, Shields MR, Dougherty RJ, Meyer JD, VanRiper S, Stegner AJ, Ellingson LD, **Vernon SD**. Neural consequences of post-exertion malaise in

Myalgic Encephalomyelitis/Chronic Fatigue Syndrome. Brain Behav Immun. 2017 May;62:87-99. doi: 10.1016/j.bbi.2017.02.009. Epub 2017 Feb 17. PubMed PMID: 28216087.

Murdock KW, Wang XS, Shi Q, Cleeland CS, Fagundes CP, **Vernon SD**. The utility of patient-reported outcome measures among patients with myalgic encephalomyelitis/chronic fatigue syndrome. Qual Life Res. 2017 Apr;26(4):913-921. doi: 10.1007/s11136-016-1406-3. Epub 2016 Sep 6. PubMed PMID: 27600520; PubMed Central PMCID: PMC5336422.

Edwards KA, Terry SF, Gold D, Horn EJ, Schwartz M, Stuart M, **Vernon SD**. Realizing Our Potential in Biobanking: Disease Advocacy Organizations Enliven Translational Research. Biopreserv Biobank. 2016 Aug;14(4):314-8. doi: 10.1089/bio.2015.0053. Epub 2016 Apr 8. PubMed PMID: 27058463; PubMed Central PMCID: PMC4991568.

Contributions to Science

1. **Developed a competitive grant program and recruited more than 70 scientists** (the majority beingnew to this research domain) to respond to two funding opportunities. From 2009 to 2013 awarded ten $100,000 research grants. Five of the awardees have received grants totaling more than $12 million from federal agencies to continue their research. I became a collaborator with several of these awardees and was included as a co-author on publications.

   - Herrera S, de Vega WC, Ashbrook D, **Vernon SD**, McGowan PO. Genome-epigenome interactions associated with Myalgic Encephalomyelitis/Chronic Fatigue Syndrome. Epigenetics. 2018;13(12):1174-1190.

   - de Vega WC, Erdman L, **Vernon SD**, Goldenberg A, McGowan PO. Integration of DNA methylation & health scores identifies subtypes in myalgic encephalomyelitis/chronic fatigue syndrome. Epigenomics. 2018 May;10(5):539-557.

   - Cook DB, Light AR, Light KC, Broderick G, Shields MR, Dougherty RJ, Meyer JD, VanRiper S, Stegner AJ, Ellingson LD, **Vernon SD**. Neural consequences of post-exertion malaise in Myalgic Encephalomyelitis/Chronic Fatigue Syndrome. Brain Behav Immun. 2017 May;62:87- 99.

   - de Vega WC, Herrera S, **Vernon SD**, McGowan PO. Epigenetic modifications and glucocorticoid sensitivity in Myalgic Encephalomyelitis/Chronic Fatigue Syndrome (ME/CFS). BMC Med Genomics. 2017 Feb 23;10(1):11.

- Harvey JM, Broderick G, Bowie A, Barnes ZM, Katz BZ, O'Gorman MR, **Vernon SD**, Fletcher MA, Klimas NG, Taylor R. Tracking post-infectious fatigue in clinic using routine Lab tests. BMC Pediatr. 2016 Apr 26;16(1):54.

- Broderick G, Katz BZ, Fernandes H, Fletcher MA, Klimas N, Smith FA, O'Gorman MR, **Vernon SD**, Taylor R. Cytokine expression profiles of immune imbalance in post-mononucleosis chronic fatigue. J Transl Med. 2012 Sep 13;10:191. PMCID: PMC3480896

2. **Established the "Research Institute Without Walls",** a framework for senior scientists to use best research practices, develop and share standard operating procedures, share information and data, collaborate and learn from one another and provide the means for the organization to archive results generated from funding opportunities.

- Uhde M, Indart AC, Yu XB, Jang SS, De Giorgio R, Green PHR, Volta U, **Vernon SD**, Alaedini
- Markers of non-coeliac wheat sensitivity in patients with myalgic encephalomyelitis/chronic fatigue syndrome. Gut. 2018 Mar 17. pii: gutjnl-2018-316133.

- Jason LA, Sunnquist M, Brown A, Evans M, **Vernon SD**, Furst J, Simonis V. Examining case definition criteria for chronic fatigue syndrome and myalgic encephalomyelitis. Fatigue. 2014 Jan 1;2(1):40-56.

- Aslakson E, Szekely S, **Vernon SD**, Bateman L, Baumbach J, Setty Y. Live sequence charts to model medical information. Theor Biol Med Model. 2012 Jun 15;9(1):22. PMCID: PMC3536704

- Broderick G, Kreitz A, Fuite J, Fletcher MA, **Vernon SD**, Klimas N. A pilot study of immune network remodeling under challenge in Gulf War Illness. Brain Behav Immun. 2010 Oct 16.

- Broderick G, Fuite J, Kreitz A, **Vernon SD**, Klimas N, Fletcher MA. Formal Analysis of Cytokine Networks in Chronic Fatigue Syndrome. Brain, Behavior, and Immunity. 2010 May 4.

3. **Created a registry and innovative "on-demand" biobank** to engage the patient community in research. Shortly thereafter secured a 1-year, $100,000 partnership with one of the largest pharmaceutical companies to validate a potential diagnostic marker. This

$100,000 investment was leveraged in more than $5 million of additional research on remaining, stored biological samples.

- Irlbeck DM, **Vernon SD**, McCleary KK, Bateman L, Klimas NG, Lapp CW, Peterson DL, Brown JR, Remlinger KS, Wilfret DA, Gerondelis P. No association found between the detection of either xenotropic murine leukemia virus-related virus or polytropic murine leukemia virus and chronic fatigue syndrome in a blinded, multi-site, prospective study by the establishment and use of the SolveCFS BioBank. BMC Res Notes. 2014 Aug 4;7:461.

- Glynn SA, Busch MP, Dodd RY, Katz LM, Stramer SL, Klein HG, Simmons G, Kleinman SH, Shurin SB; NHLBI Emerging Infectious Disease Task Force convened November 7, 2011. Emerging infectious agents and the nation's blood supply: responding to potential threats in the 21st century. Transfusion. 2013 Feb;53(2):438-54.

- Simmons G, Glynn SA, Komaroff AL, Mikovits JA, Tobler LH, Hackett J Jr, Tang N, Switzer WM, Heneine W, Hewlett IK, Zhao J, Lo SC, Alter HJ, Linnen JM, Gao K, Coffin JM, Kearney MF, Ruscetti FW, Pfost MA, Bethel J, Kleinman S, Holmberg JA, Busch MP; Blood XMRV Scientific Research Working Group (SRWG). Failure to confirm XMRV/MLVs in the blood of patients with chronic fatigue syndrome: a multi-laboratory study. Science. 2011 Nov 11;334(6057):814-7.

- Simmons G, Glynn SA, Holmberg JA, Coffin JM, Hewlett IK, Lo SC, Mikovits JA, Switzer WM, Linnen JM, Busch MP; Blood XMRV Scientific Research Working Group. The Blood Xenotropic Murine Leukemia Virus-Related Virus Scientific Research Working Group: mission, progress, and plans. Transfusion. 2011 Mar;51(3):643-53.

4. **Conceived of and successfully implemented a computational challenge** to integrated disparate phenotype, physiological and genomic data from a 2-day in-hospital study. Selected 25 international scientists and clinicians to voluntarily participate on one of five teams over the six-month challenge period. Within six months, 15 peer-reviewed papers were published in a dedicated issue of Pharmacogenomics (below is the article I wrote introducing the challenge and the 15 papers). The CDC Director issued a national press release lauding this innovative approach and outcome.

- **Vernon SD**, Reeves WC. The challenge of integrating disparate high-content data: epidemiological, clinical and laboratory data collected during an in-hospital study of chronic fatigue syndrome. Pharmacogenomics. 2006 Apr;7(3):345-54.

5. **Shortly after the completion of the sequence of the human genome in 2001** my laboratory team was the first to integrate population-based epidemiological studies with cutting-edge genomic technologies to identify novel pathogens and objective disease markers.

- Ben-Zvi A, **Vernon SD**, Broderick G. Model-based therapeutic correction of hypothalamic pituitary adrenal axis dysfunction. PLoS Comput Biol. 2009 Jan;5(1):e1000273. PMCID:
- PMC2613527

- Fuite J, **Vernon SD**, Broderick G. Neuroendocrine and immune network re-modeling in chronic fatigue syndrome: An exploratory analysis. Genomics. 2008 Dec;92(6):393-9.

- Bolshin C, Aspler AL, **Vernon SD**, Broderick G. Evidence of inflammatory immune signaling in chronic fatigue syndrome. Behav Brain Funct. 2008 Sep 26;4:44.

- Presson A, Sobel E, Papp J, Whistler T, Rajeevan MS, Reeves WC, **Vernon SD**, Horvath S. A systems genetic analysis implicates FOXN1 in chronic fatigue syndrome. BMC Syst Biol. 2008 Nov 6;2(1):95.

Complete List of Published Work in Google Scholar and MyBibliography:

https://scholar.google.com/citations?user=qKhxi2wAAAAJ&hl=en

https://www.ncbi.nlm.nih.gov/sites/myncbi/1B1NuktJ86uQj/bibliography/48942313/public/?sort=date&direction=ascending

Research Support

ACTIVE
1 R01 AI121920 02 (Unutmaz) 06/01/2016 05/31/2021 0
0.8% calendar NIH/NIAID $250,000
Decoding Immunological perturbations during Chronic Fatigue Syndrome

The goal of this project is to develop a detailed functional and genetic immunological framework that can be used to decode the mechanisms of Myalgic Encephalomyelitis and Chronic Fatigue Syndrome (ME/CFS) and to develop robust, quantitative immune biomarker sets for predicting disease susceptibility, stratifying patients and guiding treatment strategies.

ACTIVE
1 U54 NS105539 (Unutmaz) 09/30/2017 09/30/2022
0.65% calendar NIH/NINDS $1,500,000

Topological Mapping of Immune, Microbiota, Metabolomic and Clinical Phenotypes to Reveal ME/CFS Disease Mechanisms

The aims of this project are: 1) Develop a comprehensive and prospective database of immune, metabolomics and microbiome profiles of ME/CFS patients (Clinical Research Project); 2) Establish a platform for mechanistic discoveries on role of ME/CFS microbiota and immune response (Basic Research Project); 3) Rapidly implement recruitment of the ME/CFS prospective clinical cohort (Clinical Core); and 4) Coordinate an integrative, multidisciplinary group in ME/CFS research (Admin Core).

Completed Research Support

1R43AI145696-01 (Daugherty)
04/01/2019 – 09/30/2019 $35,000 NIH/NIAID $224,975

Serum Antibody Biomarkers of Myalgic Encephalomyelitis/Chronic Fatigue Syndrome

The objective of this project is to identify a panel of distinct antibody epitopes that can be used to identify cases of ME/CFS using a blood test.

1R21AI121996-01 Contact PI / Project Leader: Armin Alaedini, NIH/NIAID

Title: Intestinal immune response in Myalgic Encephalomyelitis/chronic fatigue syndrome
Award period/amount: 1/15/2016-12/31/2017, 6% effort ($7,000)
Award goal(s): To map the antigenic specificity of the immune response to gluten and assess the relationship between the immune response to gluten and specific markers of microbial translocation and systemic inflammation in ME/CFS.

Dr. Ralph & Marian Falk Medical Research Trust Catalyst Award Program.

Award recipient:	Suzanne D. Vernon, PhD, Principal Investigator
Award institution:	Solve ME/CFS Initiative
Award title:	Delineating ME/CFS Heterogeneity using the DNA Methylome Award
Period/Amount:	12/1/2014-11/30/2015, $499,913
Award goal(s):	To collect phenotype information and blood samples from 150 ME/CFS patients and 150 healthy volunteers for epigenetic analysis and to storing blood components in the SolveCFS BioBank for further research.