

**Award Numbers:** W81XWH-15-1-0538

**Title:**

“Testing the Model: A Phase 1/11 Randomized Double Blind Placebo Control Trial of Targeted Therapeutics: Liposomal Glutathione and Curcumin.”

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**REPORT DATE:**

October 2017

**TYPE OF REPORT:**

Annual

**PREPARED FOR:**

U.S. Army Medical Research and Materiel Command  
Fort Detrick, Maryland 21702-5012

**DISTRIBUTION STATEMENT:**

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# REPORT DOCUMENTATION PAGE

Form Approved  
OMB No. 0704-0188

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|   |                                 |  |
|---|---------------------------------|--|
| <b>1. REPORT DATE (DD-MM-YYYY)</b><br>October 2017  | <b>2. REPORT TYPE</b><br>Annual | <b>3. DATES COVERED (From - To)</b><br>30Sep2016 - 29Sep2017 |
| <b>4. TITLE AND SUBTITLE</b><br>"Testing the Model: A Phase 1/11 Randomized Double Blind Placebo Control Trial of Targeted Therapeutics: Liposomal Glutathione and Curcumin."   |                                 | <b>5a. CONTRACT NUMBER</b>                                   |
|   |                                 | <b>5b. GRANT NUMBER</b><br>W81XWH-15-1-0538                  |
|   |                                 | <b>5c. PROGRAM ELEMENT NUMBER</b>                            |
| <b>6. AUTHOR(S)</b><br>Richard C. Deth, PhD<br><br>Klimas, Nancy, G.<br><br>Email: rdeth@nova.edu   |                                 | <b>5d. PROJECT NUMBER</b>                                    |
|   |                                 | <b>5e. TASK NUMBER</b>                                       |
|   |                                 | <b>5f. WORK UNIT NUMBER</b>                                  |
| <b>7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)</b><br><br>Nova Southeastern University<br>College of Pharmacy<br>3301 College Avenue<br>Fort Lauderdale, FL 33314<br><br>VA Medical Center, Miami,<br>FL Department of Medicine<br>VA Medical Center 111-I<br>1201 NW 16 <sup>th</sup> Street<br>Miami, FL 33125 |                                 | <b>8. PERFORMING ORGANIZATION REPORT NUMBER</b>              |
| <b>9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)</b><br><br>U.S. Army Medical Research and Materiel Command<br>Fort Detrick, Maryland 21702-5012  |                                 | <b>10. SPONSOR/MONITOR'S ACRONYM(S)</b>                      |
|   |                                 | <b>11. SPONSOR/MONITOR'S REPORT NUMBER(S)</b>                |
| <b>12. DISTRIBUTION / AVAILABILITY STATEMENT</b><br><br>Approved for public release; distribution unlimited   |                                 |  |
| <b>13. SUPPLEMENTARY NOTES</b>  |                                 |  |

**14. ABSTRACT**

We propose to perform a phase I/II study comparing two nutraceuticals and placebo that target mediators identified in our prior dynamic modeling study of Gulf War Illness (GWI). We will repeat the dynamic modeling before treatment and on therapy to assess our modeling and the impact of the interventions on the homeostatic networks we have identified, with an added focus on the glutathione/redox system.

In our prior study "Dynamic Modeling in GWI" we used an exercise stress model (rest, peak VO<sub>2</sub>, and 7 follow-up sampling points) to measure the mediators of relapse in the context of their interactive homeostatic networks. We surveyed the response of genes and blood-borne biomarkers in order to interrogate and map regulation of neuro-endocrine-autonomic-immune function in these subjects as compared to GW era sedentary healthy controls. We applied an integrative systems-based approach rooted in computational biology connecting gene expression and biomarkers to pathways and to symptoms in order to identify potential therapeutic targets as well as optimal strategies for manipulation of these targets. Using this data we have developed a virtual model of the illness, which we have used to identify potential therapeutic targets. The proposed project is directed at the validation of pharmacologic mediation of illness targets for GWI, identified using an integrative systems-based approach to the study of molecular and cellular markers.

**15. SUBJECT TERMS**

GW  
Comprehensive Molecular Profiling

**16. SECURITY CLASSIFICATION OF:**

**a. REPORT**  
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**b. ABSTRACT**  
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**c. THIS PAGE**  
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**17. LIMITATION OF ABSTRACT**

UU

**18. NUMBER OF PAGES**

136

**19a. NAME OF RESPONSIBLE PERSON**

USAMRMC

**19b. TELEPHONE NUMBER** *(include area code)*

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## Introduction

Within months after their return from Operation Desert Storm an alarming number of Gulf War veterans began to report a variety of symptoms, including fatigue, musculoskeletal discomfort, skin rashes, and cognitive dysfunction. During deployment, these troops were subjected to a number of potentially hazardous conditions and multiple hypotheses as to the etiology of Gulf War Illness (GWI) have been considered. The symptoms of (GWI) that are most consistently reported include those which are often reported in Chronic Fatigue Syndrome (CFS). The objective of this study is to improve our understanding of GWI pathogenesis in two ways; by integration across several of the body's regulatory systems of data and knowledge collected from disparate sources, and by mapping of the coordinated interactions between these physiologic systems and the potential for altered "wiring" of these signaling networks in GWI. Using comprehensive molecular profiling, network and control theory the overarching objective of this proposal is to define the precise nature of these irregularities in immune and neuroendocrine signaling as well as the altered activation states of the corresponding cells such that treatment courses can be designed to redirect the system as a whole to normal pattern of coordinated activity.

## Body

As noted above, this project involves a clinical trial that serves as both a proof of concept study, using nutraceuticals that target nfKB, identified in our modeling studies, performing before an after dynamic modeling studies of the study volunteers, and refining our modeling work as a result. It should be noted that we have a number of funded studies that aim to improve the modeling that would lead to clinical trials, and all of the data collected in this study serves as data used by our computational modeling staff to test both the utility of intervening at nfKb (in the case of this study) and to provide an increasingly rich and complex data set to inform the other aspects of their studies.

In this study we have a SOW. It should be noted that the start time of the recruitment was delayed by a prolonged HRPO process submitted on our notice of approval in Sept 2015 after a HRPO pre-review and IRB approval; it was HRPO approved April 2016, thus recruitment began shortly afterwards. We have reset our recruitment projections accordingly, still with the intent to complete this study in the 3 year window without the need for carry over funding. We have doubled our recruitment efforts to achieve numbers. To help with recruitment the CSP #585, "Gulf War Era Cohort and Biorepository (GWECB) group has mailed our flyers to thousands of their previous Gulf War survey participants. We are also looking into ways of possibly increasing payments for enrollment to see if this will help with retaining subjects.

| Statement of Work  | Timeline    | MVAMC | NSU INIM | NSU Phar | NSU Stats |
|--|-------------|-------|----------|----------|-----------|
| 1) <b>Major Task 1:</b> Perform a randomized phase I/II study comparing curcumin BCM-85, 400 mg twice a day to liposomal glutathione 630 mg bid 3 month intervention and assess safety, efficacy and biomarker response to therapy | Months      |       |          |          |           |
| <b>Sub-task 1: Prepare Regulatory Documents and Research Protocol for Study</b>  |             |       |          |          |           |
| Request pre-IND meeting to determine exemption if necessary submit Investigational New Drug  | 1<br>1 TO 4 | NK    | Complete |          |           |
| Refine eligibility criteria, exclusion criteria, screening protocol  | 1 TO 2      | NK    | Complete |          |           |
| Finalize consent form & human subjects protocol  | 2 TO 4      | NK    | Complete |          |           |
| IRB protocol submission MVAMC  | 2 TO 3      | NK    | Complete |          |           |
| IRB protocol submission NSU (with MVAMC revisions if suggested)  | 2 TO 5      | NK    | Complete |          |           |
| Military 2nd level IRB review (ORP/HRPO)   | 4 TO 5      | NK    | Complete |          |           |

|  |        |    |          |    |    |
|--|--------|----|----------|----|----|
| Submit amendments, adverse events and protocol As deviations as needed   | Needed | NK |          |    |    |
| Submit annual IRB report for continuing review   | annual | NK | Complete |    |    |
| <i>Milestone Achieved: Local IRB approval at MVAMC,</i>  | 4      | NK | Complete |    |    |
| <i>Milestone Achieved: HRPO approval for all protocols and local IRB approvals</i>   | 6      | NK | Complete |    |    |
| <b>Sub-task 2: preparation for initiation of clinical trial (staff/space/platform)</b>   |        |    |          |    |    |
| Study Staff definition of duties, cross training   |        |    | Complete |    |    |
| Coordinate with study staff to customize web based assessment platform (REDCap) Complete   | 1 to 3 | NK | MF       | RD | GB |
| Coordinate with study staff and research pharmacy a flow chart for all study steps, web data collection and database requirements Complete | 3 to 5 | NK | MF       | RD | GB |
| Mock run of virtual subject through all time   | 5      | NK |          |    | GB |
| Review platform for HIPAA, permissions, and data retrieval issues Complete   | 5      | NK |          |    | GB |
| <i>Milestone Achieved: Research staff trained</i> Complete   | 1 to 5 | NK |          |    | GB |
| <i>Milestone Achieved: 1st participant consented, 7 to 8M screened and enrolled</i> Complete   |        | NK |          |    |    |
| <i>Milestone Achieved: Study begins</i> Complete   | 7 to 8 | NK |          |    |    |

|   |                    |          |   |  |            |
|---|--------------------|----------|---|--|------------|
| <b>Sub-task 3: Initiation of randomized control clinical trial</b>  |                    |          |   |  |            |
| Recruitment of subjects, screening, informed consent process  | 7 to 30            | NK       | Underway  |  |            |
| Completion of exercise challenge and specimen collection before and after 12 weeks of treatment condition                                   | 10 to 33           | NK       | Underway  |  |            |
| Monitor and report adverse events to IRB, Data monitoring board chair   | 7 to 33            | NK/GD    | Ongoing   |  |            |
| <i>Milestone achieved: Clinical trial underway, meeting recruitment goals:</i>  | 12,24              | NK       | Underway on target for 12 mths. recruitment goal Yr 3 |  |            |
| <i>Milestone achieved: last subject (subject 75) initiates study condition</i>  | 30                 | NK       |   |  |            |
| <i>Milestone achieved last subject completes intervention and final assessment</i>  | 33                 | NK       | Yr 3  |  |            |
| <i>Milestone Achieved: Study begins</i>   | 7 to 8 m           | NK       | Achieved  |  |            |
| <b>Sub-task 4: Biomarkers/lab studies</b>   |                    |          |   |  |            |
| Review established protocols and establish accession, barcoding and sample flow   | 1 to 3 m           |          | MF Complete   |  |            |
| Coordinate with study coordinator and lab staff on scheduling, courier to lab during assessments and exercise challenge                     | 3 to 4             | NK       | MF Complete   |  |            |
| Determine batch assays schedule, data entry plan, work with lab information system for direct data entry to REDCap platform                 | 1 to 6<br>Complete | NK       | MF  |  | GB         |
| Maintain quality control for all assays review with MF weekly   | 7 to 34<br>Ongoing |          |   |  |            |
| Run assays as described in protocol, maintaining quality and timely data entry. Stats core to run monthly data status for all investigators | 7 to 34<br>Ongoing |          |   |  |            |
| <i>Milestone achieved: lab information system platform link to REDCap</i>   | 6                  | Complete | MF  |  | GB         |
| <i>Milestone achieved completion of all assays with data entered into system</i>  | 34                 | Yr 3     | MF  |  | GB         |
| <b>Projected enrollment</b>   |                    |          |   |  |            |
| <b>Enrollment</b><br>MVAMC<br>15 enrolled, 5 completed, 8 terminations, 2 in progress, 4 scheduled for screening                            |                    |          |   |  | Goal<br>75 |

|   |                 |                                  |                                  |    |
|---|-----------------|----------------------------------|----------------------------------|----|
| <b>Major Task 2</b> (Specific Aim 2):<br>Perform dynamic modeling studies before and after 3 months of therapy, repeating the method used previously in order to compare the response to exercise across groups and better quantify the degree of recovery in treated subjects using an exercise challenge and 9 point in time blood and saliva collections over 24 hours with genomic, cytokine, neuropeptide and cell population studies. |                 |                                  |                                  |    |
| <b>Sub-Task 1:</b> Apply previously developed computational modeling to before/after intervention comparisons   | 1 to 36         | Yr 3                             |                                  | GB |
| Adapt computational modeling platform for intervention before/after analyses  | 1 to 12         | complete                         |                                  | GB |
| Perform dynamic modeling utilizing group A/B/C designation for interim analyses   | 24              |                                  |                                  | GB |
| Break blind   | 34              | RP                               |                                  | GB |
| Completion of final analyses  | 36              |                                  |                                  | GB |
| Final publications and translation plan   | 34-36           | Yr 3                             |                                  | GB |
| <i>Milestone achieved: Interim analyses data used in modeling data</i><br><i>Milestone Achieved: Report results computational modeling</i>  | 34-36           |                                  |                                  | GB |
| <b>Specific Aim 3: Assessment of antioxidant and methylation-related metabolic status prior to, during and after acute exercise in GWI subjects before and after antioxidant interventions</b>  | <b>Timeline</b> | <b>Site 1</b><br>(Initiating PI) | <b>Site 2</b><br>(Partnering PI) |    |
| <b>Major Task 1:</b> Measurement of antioxidant and methylation pathway metabolites and vitamin B12 status  | Months          |                                  |                                  |    |
| <b>Subtask 1:</b> Thiol and thioether metabolite assays:<br>HPLC assay of redox and methylation pathway thiols and thioethers in plasma (GSH, GSSG, cysteine, methionine, homocysteine, homocystine, cystathionine, S-adenosylmethionine, S-adenosylhomocysteine)<br>• HPLC assay of redox and methylation pathway thiols and thioethers in HPLC assay of redox and methylation pathway thiols and thioethers in PBMC mitochondria          | 1 to 36m        |                                  | Underway<br>RD                   |    |
| <b>Subtask 2:</b> Measurement of vitamin B12 status:<br>HPLC assay of vitamin B12 (cobalamin) species in PBMCs (cyanocobalamin, glutathionylcobalamin, hydroxocobalamin, methylcobalamin, adenosylcobalamin   | 1 to 36         |                                  | Underway<br>RD                   |    |
| <b>Major Task 2:</b> Evaluation of DNA methylation status   |                 |                                  |                                  |    |
| <b>Subtask 1:</b> Global DNA methylation status:<br>Pyrosequencing-based assay of LINE-1 nuclear DNA methylation status   | 1 to 36         |                                  | Underway<br>RD                   |    |
| <b>Subtask 2:</b> Mitochondrial DNA methylation status:<br>Pyrosequencing-based assay of MT-ATP6 mitochondrial DNA methylation status   | 1 to 36         |                                  | Underway<br>RD                   |    |
| <b>Milestone #1:</b> Co-author manuscript on redox and methylation status in GWI  | 24-36           | NK                               | RD                               |    |



## **Key Research Accomplishments**

We prepared regulatory documents and research protocol and the study has received IRB approval for both the VA and Nova Southeastern University, thus the protocol has been finalized and is now being implemented. Study staff has been hired and trained. We have coordinated with the study staff to customize REDCap (web based assessment platform). Pharmaceuticals liposomal glutathione and curcumin, as well as placebo have been received by the VA Clinical Research pharmacist and are available for dispensing. Recruitment and screening has begun. A total of 15 GWI subjects have been screened and consented and enrolled, 8 have been withdrawn. Five participants have completed the study and two other participants are currently on the study protocol and 4 are scheduled for screening. Thus the randomized clinical trial is underway.

The laboratory measures have been established, studies that are run on fresh samples are being completed per protocol, the biorepository has been established and batch samples will be withdrawn as the accrual of samples progresses. Many of the biomarker studies will be run in batches before and after intervention using the biorepository samples. These will be run as accrual reaches, 25, then 50 then 75 subjects.

Dr Richard Deth is the partnering PI at NSU for the companion project addressing Specific Aim 3. Specific aim 3 involves assessment of antioxidant and methylation-related metabolic status prior to, during and after acute exercise in GWI subjects before and after antioxidant interventions. These measurements will be carried out with batched plasma and PBMC samples following accrual of 25, 50 and 75 subjects. A research technician has been hired whose effort is dedicated to this project. In support of these assays a new HPLC system was purchased by Nova Southeastern University and methods for analysis of antioxidant and methylation pathway metabolites as well as vitamin B12 (cobalamin species) have been developed for the new instrument. Assays for measuring global and mitochondrial DNA methylation status have also been developed and are ready for samples.

## **Reportable Outcomes**

We have doubled our recruitment efforts, in order to meet our numbers. We submitted a more detailed, targeted recruitment plan which was approved by our IRB and is in place at the moment. Blind will be maintained until the completion of the study, at which point we will be able to report on outcomes.

## **Conclusions**

The study has been initiated and recruitment is underway. Samples are being processed for immediate (eg nk cell function, flow cytometry) and batched studies. Our late HRPO approval reset our study accrual baseline, we are therefore adjusting our quarterly accrual figures to complete the study in the 3 year study time frame.

## **References**

No publications specifically from his study at this time, though our computational group is using data from this project in their ongoing work and resultant publications. We will not be publishing the study results until end of year 3.

## CURRICULUM VITAE

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12/1/2011 – present: Chair, Department of Clinical Immunology, COM, Nova Southeastern University, Davie, FL

12/1/2011 – present: Director, NSU Institute for Neuro-Immune Medicine, NSU, Davie FL

3/1/2012 – present; Medical Director, NSU Neuro-Immune Medicine Clinics

12/1/2011 – present: Professor of Medicine, Nova Southeastern University College of Osteopathic Medicine, Davie, FL

12/1/2011- present: Professor Emerita (active), Departments of Medicine, Psychology, Microbiology and Immunology, University of Miami School of Medicine, Miami, FL

1987 - present: Director of AIDS Research, and Co-Director of the AIDS Clinical Research Unit, Miami VA Medical Center

1999 – present: Director, VAMC/NSU CFS/GWI Multidisciplinary Research Center (initiated with NIH Center funding, U01 AI45940)

1985 - present: Co-Director, E.M. Papper Clinical Immunology Laboratory, Miami VA Medical Center and Department of Medicine, University of Miami School of Medicine

2011 – present: Director, GWI and CFS/ME Clinics VA Medical Center, Miami

1/1/2015-12/31/2015: Member of Budget Subcommittee, Miami VA Healthcare System

1/1/2015-12/31/2015: Member of Space Subcommittee, Miami VA Healthcare System

**Past:**

1984 - 2011: Director, VA Allergy and Immunology Clinic

1996 - 2011: Professor of Medicine, University of Miami Miller School of Medicine, Miami, FL (primary)

1997 - 2011: Professor of Psychology, University of Miami College of Arts and Sciences

1999 – 2011: Professor of Microbiology and Immunology, University of Miami Miller School of Medicine

1987 –2011: Director, University of Miami Diagnostic Immunology and Chronic Fatigue Clinics

2001 – 6 month sabbatical, Centers for Disease Control and Prevention, National Center for Infectious Diseases/ Division of Viral and Rickettsial Diseases, Viral Exanthems and Herpesviruses Branch, “Emperic Case Definition of CFS” working group.

1996 – 1998: Director, West Palm Beach VAMC Allergy Clinic

1991 - 1996: Associate Professor of Medicine, University of Miami School of Medicine

1994 - 1999: Associate Professor of Microbiology and Immunology, University of Miami School of Medicine,

1993 - 1997: Associate Professor of Psychology, University of Miami College of Arts and Sciences

1985 - 1991: Instructor and Assistant Professor of Medicine, University of Miami School of Medicine

1984 - National Cancer Institute Research Fellow; Clinical Immunology Lab, Department of Medicine, University of Miami School of Medicine

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Virginia Commonwealth University 9/1972 - 6/1973

University of South Florida, 9/1973 - 6/1976

University of Miami, M.D., 8/1976 - 6/1980

Baylor University Hospitals and Clinics, Medical Internship, 6/1980 – 6/1981

University of Miami Hospitals and Clinics, Medical Residency, 6/1981 – 6/1983

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ABIM Certification in Diagnostic Laboratory Immunology, 1986

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University of Miami Hospital,  
Jackson Memorial Hospital

##### 5b. Publications

###### Books Published:

1. Chronic Fatigue Syndrome, P. Goodnik and N.G. Klimas, eds., American Psychiatric Press, Washington, D.C., 1993.

2. Clinical Management of Chronic Fatigue Syndrome, N. Klimas, MD and R Patarca, MD PhD, eds., The Haworth Medical Press, New York • London ,1995
3. Disability and Chronic Fatigue Syndrome. Clinical, Legal and Patient Perspectives. Klimas, N.G., Patarca, R, eds Haworth Press, Inc., New York • London, 1997

Books currently contracted:

Chronic Fatigue Syndrome: A Patient's Guide Johns Hopkins Press; Nancy Klimas, MD

Invited Book Chapters Published:

1. Fletcher, MA, Barnes Z, Broderick G and **Klimas NG**. Psychoneuroimmunology and natural killer cells: the chromium release whole blood assay. In *Protocols in Psychoneuroimmunology*. Yan, Q, ed., Humana Press, 2012.
2. **Klimas NG** Gulf War Illness, Encyclopedia of Behavioral Medicine, Springer Press 2011
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- Chronic Fatigue Syndrome, P. Goodnik and N.G. Klimas, eds., American Psychiatric Press, Washington, D.C., p95-108, 1993.
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Juried or Refereed Journal Articles:

1. Harvey, J. M., Broderick, G., Bowie, A., Barnes, Z. M., Katz, B. Z., O'Gorman, M. R., Vernon, S. D., Fletcher, M. A., Klimas, N. G., Taylor, R. (2016). Tracking post-infectious fatigue in clinic using routine Lab tests. BMC pediatrics, 16(1), 54. (Peer Reviewed: No)
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5. Daniel L. Hall, Michael H. Antoni, Emily G. Lattie, Devika R. Jutagir, Sara J. Czaja, Dolores Perdomo, Suzanne C. Lechner, Jamie M. Stagl, Laura C. Bouchard, Lisa M. Gudenkauf, Lara Traeger, Mary Ann Fletcher & **Nancy G. Klimas** (2015): Perceived fatigue interference and depressed mood: comparison of chronic fatigue syndrome/Myalgic encephalomyelitis patients with fatigued breast cancer survivors, *Fatigue: Biomedicine, Health & Behavior*, DOI:10.1080/21641846.2015.1039289
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Articles in popular press:

Klimas NG Expert on Chronic Fatigue Syndrome for New York Times November 2009 – present host of the NY Times CFS focus blog.  
 Klimas, NG “Could a Virus be the Cause of Chronic Fatigue Syndrome?” MS Magazine January 2010  
 Klimas, NG. “Wake-Up Call. Hopeful new research shows that chronic fatigue syndrome may have a genetic basis”. Ms. Magazine, summer issue, 2006.

Invited Lectures (last 10 years)

Gender differences in Gulf War Illness: VA GWI Research advisory committee, Jan 5 2014

Research advances in ME/CFS Patient conference, NYU, NYC November 15, 2013

Treating Chronic Fatigue Syndrome/ ME and Gulf War Illness, Pri-Med Conference 2012 Miami, FL

Grand Rounds lecture, Endocrine issues in CFS/ME and GWI University of Miami Medical School October 2011

“What’s new? Pathogenesis and Treatment 2011” IACFS/ME 10th International Conference, Ottawa, Canada September 19, 2011

Difficult Case Presentations Chair and panelist, IACFS/ME 10th International Conference, Ottawa, Canada September 19, 2011

Death and Dying, Physician/Patient presentation FIU School of Medicine, March 2011, Miami FL

Immune mechanisms of autoimmune diseases: pathogens, self, and chronic disease. FIU College of Medicine, March 2011

“Gene Expression change in exercise challenge in CFS/ME and GWI”, Opening lecture International Science Symposium On Myalgic Encephalomyelitis/ Chronic Fatigue Syndrome (ME/CFS) BOND UNIVERSITY Queensland, Australia December 3 and 4 2010.

8 lecture tour, New Zealand November 2010: Research advances and clinical management of CFS/ME Nov 19 – 30, 2010, Dunedin College of Medicine, and 7 other sites.

Immunology and Biomarker Discovery in ME/CFS. INVEST in ME Science International Science Symposium London, England June 8 2010

Advances in our Understanding of Chronic Fatigue Syndrome, Pri-Med conference Ft Lauderdale Florida Feb 2010

Treatment based on pathogenesis – advances in our understanding of CFS, Fatigue Sciences Conference Calgary Canada Sept 2009

Keynote address (opening) “Immunology of Fatiguing Disorders” 3<sup>rd</sup> International Conference on Fatigue Science, Okinawa, Japan September 3<sup>rd</sup>, 2008

Keynote Address “Research Advances in CFS and ME” Canadian Conference on Fatigue and Illness, Calgary, Alberta Nov 12, 2008

“Biomarker Discovery in CFS” 8<sup>th</sup> annual TMJ Conference Rockville, MD, May 12, 2008

“Research Advances in CFS/ME” Invited lecture Western Pharmacologic Association Kona, Hawaii Jan 29, 2008

Keynote address: Understanding the interactions of the Immune system and the brain in CFS; International CFS/ME Clinical Conference, Oslo, Norway October 8, 2007

Evidence Based Treatment Approaches in CFS/ME; International CFS/ME Clinical Conference, Oslo, Norway October 8, 2007

Advances in our understanding of the immunology of CFS; Keynote 2<sup>nd</sup>International Conference on ME/CFS Biomedical Research, May 25, 2007 Edinburgh, Scotland.

Diagnosis and Management of CFS, Feb 23, 2007 PRIMCARE conference Ft Lauderdale FL, Research Updates, ME/CFS February, 2007, Madrid and Barcelona, Spain, Universad de Catalonia, series of talks to clinicians and patients “

Presidential Address, "New Directions in CFS/ME Research" IACFS/ME 8<sup>th</sup> annual International Research and Clinical meeting, Ft. Lauderdale, FL January 12, 2007.

The Diagnosis and Management of ME/CFS, a series of 10 talks to professionals and patients, across the country September, 2006, New Zealand

The Immunology and Genomics of Gulf War Illness – August 14, 2006 GWI Research Advisory Council, Washington, DC

Research Methodology in Fatiguing Illnesses Keynote Address Aviano, Italy: 1st International Meeting on Chronic Fatigue Syndrome and Cancer-related Fatigue May 5th 2006

Chronic Fatigue Syndrome: From Genomics to Treatment: Keynote Address, Connecticut ME Association Regional Conference, April 30, 2006 Hartford CT

CFS In the Veteran Population: Best Practices in the Continuum of Care: Management of Infectious Disease Little Rock AR. April 26, 2006

Clinical Management of CFS - PANDORA Conference, West Palm Beach, FL Oct 27, 2005

Research Advances in CFS – Keynote Address , OFFER Regional Conference, Salt Lake City ,Utah 4/16/05

Impact of Research Advances on Clinical Management of CFS – Keynote, OFFER Patient Conference, Salt Lake City, Utah 4/16/05

Research Advances in CFS – Keynote Address , CFIDS Asso Regional Conference, Charlotte, NC Nov 13, 2004

Gene Array Technology in CFS – the C<sup>3</sup> Computational Challenge, Cold Spring Harbor, Oct 2005

Immunomodulatory therapies – a review, South Florida Allergy Journal Club, 11/04

CFS – advancing knowledge impact on management, Keynote, AACFS Intl Clinical Conference, Madison Wisconsin 10/04

CFS Pathogenesis Keynote address, Specialization Course on Fibromyalgia and Chronic Fatigue Syndrome International University of Catalonia Barcelona, Spain May 29, 2004.

Honorary degree awarded.

Management of CFS Keynote Address, PANDORA Providers and Patient Conference, Ft Lauderdale Fl. May 11, 2004

The Diagnosis and Management of CFS NMA 2003 Annual Convention and Scientific Assembly, Philadelphia, August 2003

Immune Methodologic Issues, invited speaker NIH CFS Methodology Workshop June 2003, Bethesda, MD

CFS and Fibromyalgia – Diagnosis and Management NPACE, May 2003 Orlando Fl

CFS: What we know, what we need to know, and how to get there. New Jersey Medical Association, New Brunswick. May 2003

CFS: What we know, what we need to know, and how to get there., Regional Primary Care Conference Salt Lake City May 2003

CFS – Somatic or Physical? A Debate, Intl Behavioral Medicine Asso, Helsinki, Finland August 2002

Instruments and Design of an Empiric Case Definition Study, CDC CFS Case Definition Workshop, Calloway Gardens, May 2002

Diagnosis and Management of CFS, National American Medical Women's Association Conference, San Antonio, TX Jan 2002

Inclusion and Exclusion Criteria, CDC CFS Case Definition Workshop, Calloway Gardens, May 2001

Immunology of Chronic Fatigue Syndrome, State of the Science Meeting, NIH, October 2000

Current Understanding of CFS Pathogenesis, NIH/CFS Research Priorities Series – Autonomic Dysfunction Conference, October 2000; Neuroendocrine Abnormalities, February 2001; Immunology Conference October 2001

Immune Restoration Post Antiretroviral Therapy, Guest lecturer, Hollywood Memorial Hospital; Baptist Hospital; Mercy Hospital; Broward General Hospital; VAMC, Nashville Tennessee; Mobile, Alabama; Key West Florida; Jan – April 2005

Global Impact of HIV on Women, National Organization for Women's Global Women's Health Conference, Washington DC June 2001

Housestaff/Medical Student lectures (given regularly throughout all academic years): Anaphylaxis; Asthma; Immune Modulatory Therapies; Global Impact of HIV; Immune restoration in HIV infection; Hepatitis C; HIV Co-infection; Death and Dying – the Clinician's role; Chronic Fatigue Syndrome; Gulf War Syndrome; Psychoneuroimmunology; Stress and Disease.

Graduate Studies Lectures: Multidisciplinary Clinical Research; Immunology 101; Psychoneuroimmunology and disease; Pathogenesis of HIV/AIDS; Chronic Fatigue Syndrome

Undergraduate Lectures: Careers in clinical research, Death and Dying

### Other Works and Publications

#### Reports

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#### Letters to the Editor

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#### Editorials

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### Abstracts and Presentations at National and International Meetings

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101. **Klimas, NG**, McPherson, S Adherence and Chronic Active Hepatitis C – what we have

learned from HIV, 25<sup>th</sup> Intl behavioral Medicine Society Conference, Brisbane, Australia Nov 2000

102. **Klimas, NG**, speaker. Immunology of CFS, State of the Science Meeting, NIH Workshop, Washington DC October 2000
103. **Klimas, NG**, speaker: Current understanding of the Pathogenesis of CFS –NIH/CFIDS Asso Workshop on Autonomic Dysfunction and CFS, February 2001, Washington DC
104. **Klimas, NG**, speaker: Methodologic Issues Seminar \_ NIH/CFIDS Workshop on Neuroendocrine Dysfunction and CFS, Nov 2001, Washington DC
105. **Klimas, NG**, speaker: Methodologic Issues in the Study of CFS – NIH/CFIDS Association Workshop on Immune Dysfunction and CFS, Feb 2002
106. **Klimas, NG**, speaker: Adherence to Therapy Seminar, 26<sup>th</sup> International Behavioral Medicine Society Conference, Helsinki, Finland, August 2002
107. **Klimas, NG**, debater participant: CFS – physical or somatic disorder? 26<sup>th</sup> International Behavioral Medicine Society Conference, Helsinki, Finland, August 2002
108. **Klimas, NG**, speaker : Methodologic Issues – Immunology of CFS; NIH State of the Science Meeting, Bethesda, MD, May 2003
109. **Klimas NG** and Turgeli, E Assessment Tools in CFS, AACFS Intl Conference Madison Wisconsin, October 2004
110. [Jeffrey Greeson](#), [Maria Llabre](#), [Nancy Klimas](#), [Peter Lawrence](#), [Alex Gonzalez](#), [Pedro Martin](#), [Neil Schneiderman](#), [Barry Hurwitz](#) [Psychological Distress and HIV Disease Progression: Role of Natural Killer Cell Immunity](#); 2005 Annual Meeting of the American Psychosomatic Society, March 2-5, in Vancouver, Canada
111. Elevations of HHV-6 serology are associated with low NK cell Function, **Nancy Klimas**, Mary Ann Fletcher, Kevin Maher. International Conference on HHV6 Infection, Barcelona Spain May1-3, 2006.
112. **Klimas, NG** and Fletcher MA Neuropeptide Y in CFS and GWI, IACFS International Conference, Fort Lauderdale 2007
113. Vera, M, **Klimas, N**, Garcia L., Fletcher MA Isoprinosine in CFS (presentation) IACFS/ME Research Conference Reno Nevada, March 2009
114. Garcia, L, **Klimas N**, Fletcher MA Incidence of sleep disorders in CFS sample. IACFS/ME Research Conference Reno Nevada March 2009.
115. Broderick G, Fletcher MA, Vernon SD, **Klimas N**, 2009, Isolating Characteristic Immune Signals under Challenge in Gulf War Illness. Int Assoc CFS/ME, Reno, NV, March 12-15: Oral session Abstracts/ Latest Research in Immunology, abstract #3.



116. Fletcher MA., Ironson, G, Antoni, M, Hurwitz, **Klimas N.** Neuropeptide Y (NPY) correlates with symptom severity in chronic fatigue syndrome. 9<sup>th</sup> International IACFS/ME Research and Clinical Conference. Reno, NV. March 2009.
117. Fletcher MA, **Klimas NG** and Broderick G. Neuroimmune biomarkers in CFS. From infection to Neurometabolism: a nexus for CFS, a NIH sponsored workshop. Banbury Center, Cold Springs Harbor Laboratory, Long Island, NY. September, 2009 .
118. **Klimas NG**, Fletcher MA and Broderick G. Immunologic biomarkers for CFS/ME. 5th Annual Invest in ME/CFS Conference in London, 24 May 2010.
119. Katz B, Fletcher MA, Smith FA, Taylor R, Vernon SD, Broderick G. 2010. Cytokine Expression as a Potential Prognostic Indicator in Post-infectious Fatigue. Cytokines 2010; 52(1-2): SS11-7, 81.
120. Fletcher MA, **Klimas NG** and Broderick G Biomarkers for Chronic Fatigue Syndrome and Gulf War Illness, International Science Symposium on Myalgic Encephalomyelitis/Chronic Fatigue Syndrome Bond University, Queensland. Australia. 3-4 December 2010.
121. Fletcher MA, **Klimas NG.** Biomarkers in CFS/ME and GWI. IACFS/ME conference. Ottawa, September 22 -25, 2011.

5c. Research (Past 5 years):

Funded:

NIH                    April 2016-March 2018  
 “Male-specific genomic mechanisms of transcriptional regulation of ME/CFS/SEID”  
 Lubov Nathanson, PI, Nova Southeastern University; Role Co-I

NIH                    August 2015-July 2016  
 “Microbial Discovery and Immunity in ME/CFS” Role: PI

DoD                    June 2015-June 2018  
 “Testing the Model: A Phase I/II Randomized Double Blind Placebo Control Trial of Therapeutics: Liposomal Glutathione and Curcumin.” Role: PI

NIH R15              April 2015-March 2018  
 “Genomic Approach to Find Novel Biomarkers and Mechanisms of CFS/ME”  
 Lubov Nathanson, PI, Nova Southeastern University; Role: CO-I

DOD                    June 2015-June 2018  
 “An integrated genomics and cell biology approach to correlate novel GWI indicators of infections and neuro-inflammatory mechanisms with targeted drug therapy”  
 Paula Waziry, PI, Nova Southeastern University; Role- CO-I

VA Merit             July 2014-July 2018

“Gender Differences in GWI and Dynamic Modeling” Role: PI

NIH RO1 August 2014 – July 2018

“Gender Differences in CFS/ME and Dynamic Modeling” Role: Co-PI

DOD September 2013-September 2017

Gulf War Illness Consortium “Understanding GWI: An Integrative Modelling Approach”

Mariana Morris, PI, Nova Southeastern University; Role: Co-PI, Clinical Core PI

DOD September 2014-September 2017

Gulf War Illness Consortium “Brain Immune Interactions as the basis for GWI”,

Kim Sullivan, PI, Boston University; Role CO-I

CDC Contract:

Developing a clinical data base for longitudinal studies in CFS

Role site PI, coinvestigator

Start date May 2012, 5 year contract

Recent:

NIAID RO1 October 2010 – September 2015

"Genetic pathway Analysis in ME/CFS" 450,000/year 4 years with one year extension South Florida Veterans Foundation for Research and Education Role: PI

NIH RO1 2010 – 2015

“Virtual platforms for CBT in CFS/ME” Mike Antoni, PI, University of Miami; Role: Co-PI

NIAID R21 2011- 2015

“Microbial Translocation in ME/CFS” Mary Ann Fletcher, PI, Nova Southeastern University;

Role-CO-PI

NIAID RO1 (2011-2012)

“The role of XMRV in CFS” PI, Ian Lipkin, Columbia University

Role: National Clinical Core Coordinator and Miami site PI 2 year study local budget \$125,000

DOD 6/2009 – 6/2011, no cost extension through June 2013

"The Use of Comprehensive Molecular Profiling with Network and Control Theory to Better Understand GWI and Model Therapeutic Strategies" Award Number W81XWH-09-2-0071, \$500,000 (direct costs total over 3 years) Role: PI

R01AI065723 - 01 12/1/06 – 11/30/11, no cost extension through 11/30/12

Immunologic Mechanisms, Biomarkers and Subsets in CFS

NIAID (PI MA Fletcher)

Goal of this project is to determine the immunologic basis for CFS pathogenesis

Role: Co-PI

CFI (Chronic Fatigue Initiative): A Clinical and Biosample Database to Enable Discovery of

Pathogens and Pathogenic Mechanisms in ME/Chronic Fatigue Syndrome,  
Role: PI Funding approx over 2 years. 2/2011- 2/2013

R21: 12/01/2008 – 12/31/2011 (continuation year)

Neuropeptide Y and dipeptidyl-peptidase IV (CD26) in chronic fatigue syndrome  
NIAAA (PI MA Fletcher)

Goal of this project to determine the relationship of neuropeptide Y and dipeptidyl-peptidase IV  
to natural killer cell cytotoxicity in CFS.

Role: Co-PI, R21AA016635-01

Merit Review 11/05 – 11/10

Longitudinal follow up of GWI and CFS patients

Veterans Administration

Study of immune function and clinical symptoms in patients with Gulf War Illness.

Role: PI

Merit Review 9/06 -8/10

Gene Array Analysis of Gulf War Illness and Chronic Fatigue

Veterans Administration

Gene Array Analysis of Gulf War Illness and Chronic Fatigue Syndrome

Role: PI

Foundation Research grant 03/07 – 03/09

Mechanisms of Cytotoxic Cell Dysfunction in CFS

CFIDS (PI N Klimas)

Study of killer cells in CFS

Role: PI, 15% UM effort

R01MH066697 09/04/03-6/30/08

Psychobiological Processes and Health in HIV/AIDS

NIMH R01 (PI G. Ironson)

This grant examines psychological and biological (CTL, NK, cortisol) predictors of disease  
progression in HIV/AIDS.

Role: Co-I. 5% UM effort

R01 9/30/06-8/31/10

Virtual Cognitive Behavioral Therapy in Chronic Fatigue Syndrome

NIMH (PI M Antoni)

Evaluate CBT utilizing phone and web based interventions

Role: Co-I, 5% UM effort

NIH sponsored Clinical Trial 2000 - 2009

Immune Restoration with IL-2 in HIV infection – the ESPRIT study

Role: Site PI

R01 HL72712 09/30/02-08/31/07

HIV/HCV Co-Infection: HAART and CVD Pathophysiology

NIH/NHLBI (PI Hurwitz)

Role: Co-I

5d. Editorial Responsibilities:

Founding Editor: Journal of Chronic Fatigue Syndrome  
Haworth Press (1992-2001)  
Editorial Board, Journal of Chronic Fatigue Syndrome (2001 – current)  
Ad hoc reviewer, NEJM  
Ad hoc Reviewer, Journal of Clinical Immunology  
Ad hoc Reviewer, JAMA  
Ad hoc Reviewer, Annals of Internal Medicine  
Ad hoc Reviewer, AIDS  
Ad hoc Reviewer, JAIDS  
Ad hoc Reviewer, Psychosomatic Medicine  
Ad hoc reviewer, Brain Behavior and Immunity  
Ad hoc reviewer, PLoS one  
Ad hoc reviewer, Psychoneuroimmunology

5e. Professional and Honorary Organizations:

International Association for CFS/ME (previously AACFS), President 2003-2009  
International Academy of Behavioral Medicine  
Fellow, Academy for Behavioral Medicine Research  
International Association of Psychoneuroimmunology  
American Society for the Advancement of Science;  
Association of Medical Laboratory Immunologists  
Clinical Immunology Society  
Association of Women in Science;  
American Medical Woman's Association  
University of Miami Medical Women  
Florida Medical Association'  
Dade County Medical Association  
Gauze Ceiling Coalition (Miami Dade County Medical Women)

5f. Honors:

2016- World Class Faculty Award recipient by the Greater Fort Lauderdale Alliance  
2015 - NSU Fifth Annual Provost's Research and Scholarship Award  
2013 – IACFS/ME Perpich award for contributions to the field  
2011 – IACFS/ME Nelson Gantz Memorial Award for distinguished clinical service  
2011 - NOW Foundation's second annual Victoria J. Mastrobuono Women's Health Award  
2011 - Distinguished Alumni Award, University of Miami Medical Alumni Association  
2010 - May A Brunson Award for Achievement University of Miami Women's Commission  
2009 – Award named to honor research achievements “Nancy Klimas Research Excellence Award” awarded annually at the IACFS/ME Research Conference  
2004 – Honorary Degree, University of Catalonia, Barcelona Spain.  
1998 - Fellow - Academy for Behavioral Medicine Research

1992 - Iron Arrow (University of Miami Honor Association)  
1985 - American Cancer Society Institutional Research Award  
1984 - National Research Service Award  
1983 - Southern Medical Association Research Award  
1982 - Finalist Beecham Award, Southern Blood Club  
1982 - Finalist Burroughs-Wellcome Young Investigator Award

5g. Other Professional Activities:

Miami VAMC AIDS Clinical and Research Unit Developed and wrote the proposal for the Miami VAMC AIDS Clinical and Research Unit, which was one of 3 selected for funding. The proposal included 3 million dollars in construction funds as well as infrastructure support. This resulted in one of the top VA HIV/AIDS clinical and research programs in the US, which is still in operation. Dr Klimas is Director of AIDS Research and Co-director of the Clinical HIV/AIDS program at the Miami VAMC. 1987 to present

South Florida CFS and GWI Research Center : Initially funded with an NIH center grant (Klimas, PI), and since supported with NIH , VA, DOD, and private foundation grants, the center is a clinical , translational, and basic science center that integrates research across disciplines. Current studies include genomics, immune, neuroendocrine studies , a natural history study, and clinical trials. Dr. Klimas is Center PI and coordinates the research efforts of four research interdisciplinary groups.

Canadian Government advisor in the development of the Clinical Case Definition for Chronic Fatigue Syndrome/Myalgic Encephalitis 2001, which is being revised in 2008.

6 month deployment CDC 2001 –, Molecular Epidemiology Program Viral Exanthems and Herpesvirus Branch, Developed the international protocol currently underway to empirically define CFS.

IACFS/ME

Dr. Klimas served as President of the International Association for Chronic Fatigue Syndrome (A national professional organization of investigators and clinicians) from 2005-2007 and was re-elected for another 3-year term in January of 2007. She organized the IACFS conference in Fort Lauderdale in January, 2007, and the conference in Reno Nevada in March 2009. Each of these conferences were attended by 400 patients and 350 professionals, and provided a unique opportunity for patients to meet and talk with leading international researchers and clinicians.

CFSAC: Chronic Fatigue Syndrome Advisory Committee

In 1996, Secretary for Health Donna Shalala chartered a special committee to advise the Department of Health and Human Services (DHHS) on policy regarding chronic fatigue syndrome (CFS), also known as chronic fatigue and immune dysfunction syndrome or CFIDS or Myalgic Encephalomyelopathy (ME). This committee, known as the DHHS Chronic Fatigue Syndrome Coordinating Committee (CFSCC), brought together officials representing various health agencies together with seven appointed members of the public to improve coordination of federal CFS programs. A year 2000 review of federal activities on CFS conducted by the General Accounting Office prompted several changes. Among them was the replacement of the

CFSCC with a standing committee, the CFS Advisory Committee (CFSAC), whose structure more closely matched other DHHS advisory bodies. Secretary Michael Leavitt most recently renewed the charter on August 30, 2006. Nancy Klimas served on this committee from 1997 to 2000. She was reappointed to another three-year term on the committee in 2007, which has been extended to 2011. She chairs the quality of life and education subcommittees.

NSU COM Institute for Neuro-Immune Medicine: A newly conceived program using clinical care templates to help diagnose and manage complex CFS/ME cases while collecting research data and developing the patient base for clinical trials work. Working with a basics science pathogenesis team, a computational biology team and a biomarkers discovery group, the institute merges clinical care with scientific discovery to promote new knowledge that can be applied to clinical care through rapidly employed translational clinical trials.

#### 5h. Consultantships

1987 - 1990 - VA National AIDS Steering Committee

1987 - 1990 - VA National AIDS Research Subcommittee

1987 - 1991 - VA Train the Trainer National AIDS Education Program

1988 - Present - VA National AIDS Prevention and Counseling Training Program

1988 - Present - Special Review Committee, National VA AIDS Prevention and Education

1990 – 2000 - VA National HIV Therapeutics Advisory Committee

1991 - 2000 - Board of Directors, American Association for Chronic Fatigue Syndrome (An international professional organization of investigators and clinicians).

2002 – 2006 - Board of Directors, International Association for Chronic Fatigue Syndrome/ME (An international professional organization of investigators and clinicians).

1992 - Chairperson of the Program Committee for the First International Meeting: Chronic Fatigue Syndrome, held in Albany NY, sponsored by the AACFS, NIH and CDC.

1994 - Local Coordinator and Program Committee member for the Second International Meeting: Chronic Fatigue Syndrome research Conference, held in Ft Lauderdale, October 1994, sponsored by AACFS, NIH, CDC, and Univ. of Miami.

1994 - Chairperson of the Program Committee for the CFS Clinical Conference, held in Ft. Lauderdale, October 1994, sponsored by AACFS.

1991- 1997 Consultant to Center for Special Immunology, Inc., Ft. Lauderdale, FL.

1993 - 2000 - Board of Directors, American Association for Chronic Fatigue Syndrome.

1993- Present Medical Advisory Board, Chronic Fatigue and Immunodeficiency Syndrome

Foundation.

1993- 1998 - Medical Advisory Board, Environmental Health Foundation.

2000 NIH State of the Science CFS Conference planning committee

2001 – present Name Change subcommittee, HHS CFS coordinating Committee

1999-present – CDC CFS Case Definition Revision Committee

2001 Canadian CFS Clinical Case definition expert panel

2001 CDC Expert Advisory Panel – long term outcomes study

2002 – present NIH reviewer and site visitor GCRC applications

2001- present Ad Hoc reviewer, Medical Research Council, United Kingdom.

2003 –present NIH reviewer CFS Special Emphasis Panel

2003 Brighton Collaboration on CFS Case Definition

2003 Elected to the Board of Directors, AACFS, 7 year term

2005 - 2009 President of the International Association for Chronic Fatigue Syndrome – this international organization of investigators and clinicians sponsors international and regional meetings, has developed a peer review journal, and works with government and regional groups to develop curricula and provider education programs.

2007 – 2012 CFSAC HHS Advisory committee to the Secretary of Health and Human Services

2008-2010 Chair HHS CFSAC subcommittee on Education

2010 – 5/2012 Chair, HHS CFSAC subcommittee on Quality of Life and Education

2010 International CFS/ME Case Definition working group,

2011 CFIDS Association of America Scientific Advisory Board

2011 Chronic Fatigue Initiative national coordinator, clinical sites.

2012- present Nova Southeastern University Research Advisory Committee

2011- present Nova Southeastern College of Osteopathic Medicine Research Committee

2013 – Research Advisory Committee for Gulf War Illness, VA Health care Systems

2013 - Institute of Medicine CFS Committee reviewing case definition and name

2013 - NIH Advisory Committee P2P program to develop research priorities in CFS/ME related research

## 5i. TEACHING

### Teaching Award:

Woman Faculty Member of the Year, 1989, UM Medical Women.

May Brunson Award, Woman Faculty Member of the Year, University of Miami 2010 (University of Miami Women's Commission)

### Recent Teaching Responsibilities:

Housestaff, Graduate Program, Medical School and Undergraduate lecturer (see lectures listed above)

General topics:

Clinical Immunology, Medical Laboratory Immunology, HIV Infection, Health and Human Values: Psychoneuroimmunology, Allergy and Immunology, CFS, Gulf War Illness, Stress and Disease.

Internal Medicine, Ward Attending, VA Medical Center (3 months/ year)

Allergy Clinic rotations for medical students, housestaff and Harrington Latin American Scholars.

HIV and Immunology rotations for medical students, housestaff and Harrington Latin American Scholars

Nationally/Internationally consulted in the development of CME course work for clinicians in the diagnosis and treatment of CFS in collaboration with the CDC and CFIDS Association of America

### Dissertation Advising:

Masters and Doctoral Students in University of Miami Psychology program (9 PhD candidates/3 MS candidates over last 5 years)

## 6. SERVICE TO THE UNIVERSITY

### 6a. University of Miami and VAMC Committees:

1. Medical School Admissions Committee, 1984-1987.
2. VA Human Subjects IRB, 1987.
3. Faculty Sponsor, UM Medical Women, 1985 - 2011
4. UMHC Infection Control Committee, 1989 - 1992.
5. VAMC Research Space Committee, 1988 - 1989.
6. VA Research and Education Foundation Board of Directors – 1999- present
7. UM Search Committee - AIDS/HIV senior and junior research faculty 2004-2011



8. Selection Committee – applicants for AAMC Women in Medicine Leadership Program
9. Executive Committee, GCRC 2002 – 2009
10. Executive Committee, Behavioral Medicine Research Center, 1999 - 2011
11. University of Miami Committee on Rank Salary and Conditions of employment 2003-2004
12. VA Research Committee, alternate 2004-present
13. UM Faculty Senate Professional Conduct Panel 2003 – 2011
14. University of Miami Miller School of Medicine Self Study LCME Women and Minority subcommittee 2007- 2009

Nova Southeastern Committees (2012 forward):

1. Nova Southeastern University Research Advisory Committee
2. Nova Southeastern College of Osteopathic Medicine Research Committee

#### 6b. Clinical Responsibilities

1. Director, CFS and GWI Clinical and Research Center, NSU and Miami VAMC
2. Co-director of VA Medical Center AIDS Clinical Unit,
3. HIV/AIDS Primary Care Clinic (Silver Team) – attending Monday clinic, and backing up Wednesday clinic. Daily oversight of 2 ARNP clinics.
4. General Medicine teaching attending, VAMC
5. Director, Miami VAMC Allergy Clinic, Tuesday MD clinic, and oversight of RN clinic and RN and ARNP clinic
6. Medical Director NSU Neuro Immune Clinics, Davie, FL and Kendall FL –training staff and overseeing quality of care in this clinic utilizing the CFS clinical care templates developed and implemented in this demonstration project site.

Consistently ranked “Outstanding” in the annual VAMC and university proficiency reporting, including clinical skills, teaching, productivity and administration.

#### 7. COMMUNITY ACTIVITIES

Health Crisis Network, Co-Founder and Past Chair of the Medical Advisory Committee and Board of Directors. (Currently Co-Cure Foundation, a Miami Dade HIV related community health organization) 1984, 1985-89

Member, National Task Force on Women's Health Issues, NOW (1995-present)

People with AIDS Coalition (PWAC), Board of Directors 1993-95

PWA Housing Coalition, Board of Directors 1993-95

Women's Emergency Network, Board of Directors 1998/99

Bessie Garrett Foundation – Homeless children outreach, Board of Directors 1999 – 2009

National Organization for Women, Health Advisory Board, 1992-2002

PANDORA – advocacy for people with neuro-inflammatory disorders, board of directors 2007 – present

CFIDS Association of America – Scientific Advisory Committee

# RICHARD CARLTON DETH, PhD

## I. Personal Data and Education:

### A. Personal Data:

Home Address:

Work Address:

Nova Southeastern University  
3200 South University Drive  
Fort Lauderdale, Florida 33328-2018

Contact Information:

Telephone

FAX

EMAIL

### B. Education:

1965-1970

Bachelor of Science (Pharmacy)  
S.U.N.Y. at Buffalo

1970-1975

Doctor of Philosophy (Pharmacology)  
University of Miami, School of Medicine

## II. Professional Experience:

### A. Post-Doctoral Training

1975-1976

Catholic University of Leuven (Belgium)

### B. Professional/Administrative Experience

1972-1976

Registered Pharmacist, State of Florida

1976-1981

Assistant Professor of Pharmacology,  
Northeastern University, Boston, MA

1981-1982

Section Leader, Pharmacology

1981-1987

Associate Professor of Pharmacology

1982-1986

Director, Pharmacy Program

1987-Present

Professor of Pharmacology

1990-1992

Chairman, Department of Pharmaceutical Sciences

2013-Present

Research Professor

2014-Present

Florida Atlantic University

Professor of Pharmacology

Nova Southeastern University

## III. Memberships:

Rho Chi, Sigma Xi, Phi Kappa Phi (Honor Societies)

Society for Neuroscience

American Society of Pharmacology and Experimental Therapeutics

Society of Biological Psychiatry

International Society for Autism Research

#### **IV. Current Research Interests:**

1. Role of redox and methylation status in neurodevelopmental disorders.
2. Receptor-dependent regulation of gene expression via epigenetic mechanisms.
3. Involvement of epigenetic mechanisms in drug addiction
4. Role of D<sub>4</sub>-dopamine receptor-mediated phospholipid methylation in psychiatric illnesses.
5. Redox and methylation effects of casein/gluten-derived opiate peptides.

#### **V. Teaching Experience**

Course coordination and lectures in undergraduate and graduate-level pharmacology courses.

Lecture areas have included:

**Undergraduate:** Autonomic Pharmacology, Neuropharmacology, Cardiovascular Pharmacology, G.I. Pharmacology, Autacoids, Diuretics, Anesthetic agents, Diabetes management, G.I. pharmacology, Endocrine pharmacology, Anti-inflammatory drugs.

**Graduate:** Molecular modeling, cardiovascular pharmacology and physiology, neuropharmacology, and receptor pharmacology

**Graduate Student Advisees:**

- Seventeen Ph.D. Thesis Students
- Five M.S. Thesis Students
- Service on numerous thesis committees

#### **VI. Scientific Advisory Board Memberships**

**Current:**

Autism Research Institute

Immunotec Inc.

Focus for Health

**Previous:**

National Autism Association

#### **VII. Grant Support**

**Current:**

1. R001 PI: R. Deth 7/1/2015-6/30/2016 1.0 calendar A2 Milk Corporation \$28,750  
Effects of BCM7 on uptake and transport of essential micronutrients

2. R002 PI: R. Deth 9/30/2014 – 9/29/2018 3.0 calendar Department of Defense \$513,526  
Testing the Model: A Phase I/II Randomized Double Blinded Placebo Control Trial of Targeted Therapeutics: Liposomal Glutathione and Curcumin

3. R003 PIs: K. Sullivan/M. Kregel; Co-PI R. Deth 9/1/2016-8/31/2019 0.5 calendar Department of Defense \$55,657.  
Examination of neuroimaging, cognitive functioning and plasma markers in a longitudinal cohort of Gulf War deployed veterans: The Ft. Devens Cohort

#### **VIII. Publications:**

##### **A. Articles:**

1. Chang, K.J., Deth, R.C., Triggle, D.J.: "Cholinergic antagonism among stereoisomers of a series of substituted 1,3 dioxolanes". J. Med. Chem., 15, 243-249 (1972).

2. Van Breemen, C., Farinas, B.R., Casteels, R., Gerba, P., Wuytack, R., **Deth, R.C.:** "Factors controlling cytoplasmic  $\text{Ca}^{2+}$  concentration". *Phil. Trans. Roy. Soc., Lond.* **B** 265, 57-71 (1973).
3. **Deth, R.C.,** Van Breemen, C.: "Relative contributions of  $\text{Ca}^{2+}$  influx and cellular  $\text{Ca}^{2+}$  release during drug induced activation of the rabbit aorta". *Pflugers Arch.* 348, 13-22 (1974).
4. Van Breemen, C., **Deth, R.C.:** "La and excitation contraction coupling in vascular smooth muscle (pp. 26-31) in "Ionic actions of vascular smooth muscle", edit by E. Betz, Springer-Verlag Berlin (1976).
5. **Deth, R.C.,** Van Breemen, C.: "Agonist-induced release of intracellular  $\text{Ca}^{2+}$  in rabbit aorta". *J. Membrane Biology*, 30, 363-380 (1977).
6. **Deth, R.,** Casteels, R.: "A study of releasable  $\text{Ca}^{2+}$  fractions in smooth muscle cells". *J. General Physiology*, 69, 401-419 (1977).
7. **Deth, R.C.:** "The effect of Lanthanum and reduced temperature on  $\text{Ca}^{2+}$  efflux from the rabbit aorta". *Am. J. Physiol. (Cell Physiology)* **3** (3), C139-C145 (1978).
8. **Deth, R.C.** and Lynch, C.J.: "The binding of  $^3\text{H}$ -ouabain to Na-K ATPase sites in arterial smooth muscle". *Pharmacology* 21, 29-37 (1980).
9. **Deth, R.C.** and Lynch, C.J.: "Mobilization of a common source of smooth muscle  $\text{Ca}^{2+}$  by norepinephrine and methylxanthines". *Am. J. Physiol.* 240, C239-C247 (*Cell Physiology*) (1981).
10. **Deth, R.C.** and Lynch, C.J.: "Inhibition of alpha-receptor-induced  $\text{Ca}^{2+}$  release and  $\text{Ca}^{2+}$  influx by  $\text{Mn}^{2+}$  and  $\text{La}^{3+}$ ". *Eur. Pharmacol.* 71, (1981).
11. Lynch, C.J., **Deth, R.C.** and Steer, M.L.: "Simultaneous loss and reappearance of alpha-adrenergic responses  $^3\text{H}$ -prazosin binding sites in rat liver after irreversible blockage by phenoxybenzamine". *B.B.A.*, 757, 156-163 (1983).
12. Awad, R. and **Deth, R.C.:** "Alpha-adrenergic subtype associated with receptor binding,  $\text{Ca}^{2+}$  release and contractile events in the rabbit aorta". *J. Pharmacol. Exp. Ther.* 227, 60-77 (1983).
13. Lynch, C.J. and **Deth, R.C.:** "Release of a common source of intracellular  $\text{Ca}^{2+}$  by alpha-adrenergic agonists and dinitrophenol in rat liver slices". *Pharmacol.* 28, 74-85 (1984).
14. **Deth, R.C.,** Smart, J.L., Lynch, C.J. and Walsh, R.: "Lack of correlation between  $^3\text{H}$ -ouabain binding and Na-K ATPase inhibition in rat aorta". *Eur. J. Pharmacol.* 99, 45-55 (1984).

15. Lynch, C.J., Guarino, J.J., **Deth, R.C.** and Steer, M.L.: "The effect of sucrose-feeding on alpha-adrenergic response in the rat liver". *Am. J. Physiol.* 246, E344-E349 (1984).
16. Danthuluri, N.R. and **Deth, R.C.**: "Phorbol ester-induced contraction of arterial smooth muscle and inhibition of alpha-adrenergic response". *Biochem. Biophys. Res. Comm.* 125, 1103-1109 (1985).
17. Lynch, C.J., Steer, M.L., Connors, M.R., Schatz, R.A. and **Deth, R.C.**: "Evidence for a decrease in the efficiency of beta-receptor coupling to adenylate cyclase in liver membranes from sucrose fed rats". *Biochem. Pharmacol.* 34, 623-629 (1985)
18. Tumas, J., **Deth, R.C.** and Kloner, R.A.: "Effects of nisoldipine on myocardial infarct size, hemodynamics, and myocardial performance". *J. Cardiovasc. Pharmacol.* 7, 383-391 (1985).
19. Campbell, M.D., Honeyman, T.M. and **Deth, R.C.**: "Correlation between  $^{32}\text{P}$ -labelling of phosphoinositides and agonist-induced contraction and  $\text{Ca}^{2+}$  fluxes in arteries". *Eur. J. Pharmacol.* 116, 129-136 (1985).
20. Danthuluri, N.R., and **Deth, R.C.**: "Acute desensitization to angiotensin II: Evidence for a requirement of agonist-induced diacylglycerol production during tonic contraction of rat aorta". *Eur. J. Pharmacol.* 126, 135-139 (1986).
21. Lynch, C.J., Steer, M.L., Smart, J.L. and **Deth, R.C.**: "Differences in the role of  $\text{Na}^+/\text{K}^+$  ATPase during  $\alpha_1$ -adrenergic events in rat and rabbit aorta". *Pharmacology* 33, 221-34 (1986).
22. Campbell, M.D., Danthuluri, N.R. and **Deth, R.C.**: "Differences in phospholipid incorporation of  $^{32}\text{P}$  relevant to  $\alpha_1$ -receptor coupling events in rat and rabbit aorta". *Biochem. Biophys. Res. Comm.* 141, 1213-1221 (1986).
23. Wick, P.F., Keung, A.C., Bowler, J.J. and **Deth, R.C.**: "Alpha-1 adrenergic coupling events induced by full and partial agonists in rabbit aorta". *J. Pharmacol. Exp. Ther.* 241, 458-464 (1987).
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#### **IX. Monograph:**

**Deth, R.C.** “Molecular Origins of Attention: The Dopamine-Folate Connection”  
Kluwer Academic Publishers (April, 2003)

#### **X. Patents:**

1. “Compositions and methods for diagnosing schizophrenia” Inventor: **Richard C. Deth**; Patent# 5686255; Date of issue: Nov. 11, 1997. Claims restricted to the diagnosis of schizophrenia and related psychiatric disorders with novel laboratory tests involving D4 dopamine receptor-mediated phospholipid methylation.
2. “Compositions and methods for diagnosing schizophrenia” Inventor: **Richard C. Deth**; Patent# 5,738,998; Date of issue: April 14, 1998. Claims restricted to the use of novel assays for the discovery of new therapeutic entities.
3. “Methods and materials for the diagnosis and treatment of schizophrenia and related disorders” Inventor: Northeastern University/**Richard C. Deth**; Patent# 6,080,549; Date of issue: June 27, 2000.

4. “Methods of identifying and determining the effectiveness of therapeutic processes or agents for the treatment of schizophrenia and related disorders” Inventor: Northeastern University/**Richard C. Deth**; Patent# 6,773,892; Date of issue: August 10, 2004.

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## V. PUBLICATIONS (BOOKS AND MONOGRAPHS)

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## VII. US PATENTS HELD

1. Bovine Glycoproteins and Use in Diagnosing Infectious Mononucleosis. 4,460,694
2. New Purified Glycoproteins and Their Use in the Diagnosis of Infectious Mononucleosis. 4,525,459

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  241. Klimas NG, Fletcher MA and Broderick G. Immunologic biomarkers for CFS/ME. 5th Annual Invest in ME/CFS Conference in London, 24 May 2010.
  242. Katz B, Fletcher MA, Smith FA, Taylor R, Vernon SD, Broderick G. 2010. Cytokine Expression as a Potential Prognostic Indicator in Post-infectious Fatigue. *Cytokine* 2010; 52(1-2): SS11-7, 81.
  243. Fletcher MA, Klimas NG and Broderick G Biomarkers for Chronic Fatigue Syndrome, International Science Symposium on Myalgic Encephalomyelitis/Chronic Fatigue Syndrome Bond University, Queensland. Australia. 3-4 December 2010.
  244. Fletcher MA. Immunology of CFS/ME. State of Knowledge Workshop. Myalgic Encephalomyelitis/Chronic Fatigue Syndrome Research. NIH. Bethesda, MD. April 7-8, 2011.
  245. Fletcher MA, Klimas NG. Biomarkers in CFS/ME. IACFS/ME conference. Ottawa, September 22 -25, 2011.
  246. Fletcher, MA. Biomarkers in ME/CFS. CFS Advisory Committee. HHS, Washington, DC, October, 2012.
  247. Fletcher, MA. Biomarkers in Gulf War Illness. NOVA Southeastern University. Institute for Neuroimmune Medicine, Ft. Lauderdale, FL, March, 2013.
  248. Kremer H, Ironson G, Kaplan L, Stuetzele R, Baker N, Fletcher MA. Spiritual coping predicts CD4-cell preservation and undetectable viral load over four years. *AIDS Care.* 2015;27 (1):71-9. doi: 10.1080/09540121.2014.952220. Epub 2014 Oct 8. PMID: 25297848
  249. Kremer H, Ironson G, Kaplan L, Stuetzle R, Fletcher MA. Compassionate Love as a Predictor of

- Reduced HIV Disease Progression and Transmission Risk. *Evid Based Complement Alternat Med.* 2013;2013:819021. doi: 10.1155/2013/819021. Epub 2013 Nov 18.
250. Lopez CR, Antoni MH, Pereira D, Seay J, Whitehead N, Potter J, O'Sullivan M, Fletcher MA. Stress Management, Depression and Immune Status in Lower Income Racial/Ethnic Minority Women Co-infected with HIV and HPV. *J Appl Biobehav Res.* 2013 Mar 1;18(1):37-57. Epub 2013 Mar 8. PMID: 23526866
  251. Klimas NG, Broderick G, Fletcher MA. Biomarkers for chronic fatigue. *Brain Behav Immun.* 2012 Nov;26(8):1202-10. doi: 10.1016/j.bbi.2012.06.006. Epub 2012 Jun 23. Review.
  252. Lopez C, Antoni M, Penedo F, Weiss D, Cruess S, Segotas MC, Helder L, Siegel S, Klimas N, Fletcher MA. A pilot study of cognitive behavioral stress management effects on stress, quality of life, and symptoms in persons with chronic fatigue syndrome. *J Psychosom Res.* 2011 Apr;70(4):328-34. doi: 10.1016/j.jpsychores.2010.11.010. Epub 2011 Jan 15.
  253. Ironson G, Stuetzle R, Ironson D, Balbin E, Kremer H, George A, Schneiderman N, Fletcher MA. View of God as benevolent and forgiving or punishing and judgmental predicts HIV disease progression. *J Behav Med.* 2011 Dec;34(6):414-25. doi: 10.1007/s10865-011-9314-z. Epub 2011 Feb 22.

## **IX. FUNDED RESEARCH**

### **Research Support**

NIH 4/6/2016-3/31/2018  
 Proposal Number: 1R21AI124187-01  
 Project Title: "Male-specific genomic mechanisms of transcriptional regulation of ME/CFS/SEID"  
 Principal Investigator: Lubov Nathanson  
 Role: CO-I

DoD 7/1/2015-6/30/2018  
 Proposal Number: W81XWH-15-1-0537  
 Project Title: "Testing the Model: A Phase I/II Randomized Double Blind Placebo Control Trial of Therapeutics: Liposomal Glutathione and Curcumin."  
 Principal Investigator: Nancy Klimas  
 Role: Co-PI

NIH R15 4/15/2015-3/31/2018  
 Proposal Number: 1R15NS087604-01A1  
 Project Title: "Genomic Approach to Find Novel Biomarkers and Mechanisms of CFS/ME"  
 Principal Investigator: Lubov Nathanson  
 Role: Co-I

DOD 7/1/2015-6/30/2018  
 Proposal Number: W81XWH-15-1-0163  
 Project Title: "An integrated genomics and cell biology approach to correlate novel GWI indicators of infections and neuro-inflammatory mechanisms with targeted drug therapy"  
 Principal Investigator: Paula Waziry  
 Role- CO-I

DoD 9/30/2015-9/29/2018  
 Proposal Number: W81XWH-15-1-0582  
 Proposal Name: High Fidelity Design of Multi-Modal Restorative Interventions in Gulf War Illness



Principal Investigator: Gordon Broderick  
Role: Co-I

VA Merit 4/1/2014-3/31/2018  
Proposal Number:  
Project Title: "Gender Differences in GWI and Dynamic Modeling"  
Principal Investigator: Nancy Klimas  
Role: CO-I

NIH RO1 9/1/ 2014 – 7/31 2018  
Proposal Number:  
Project Title: "Gender Differences in CFS/ME and Dynamic Modeling"  
Principal Investigator: Mary Ann Fletcher

Gulf War Illness Research Program 9/30/2013-9/29/2017  
Proposal Number: GW120045, consortium award  
Project Title: "Understanding Gulf War Illness: An Integrative Modeling Approach"  
Principal Investigator: Mariana Morris  
Role: Co-I laboratory studies of immune and genomics in the animal and human subjects, 20% effort

### **Research Support (last 5 years)**

2R56AI065723-06A1 (PI MA Fletcher) 12/15/2006 – 08/31/2014  
Immunologic Mechanisms, Biomarkers and Subsets in CFS/ME  
Goal of this project was to determine the immunologic basis for CFS pathogenesis  
Role: PI 15% effort

2R56AI065723-06A1 (PI MA Fletcher) 12/15/2006 – 08/31/2014  
Immunologic Mechanisms, Biomarkers and Subsets in CFS/ME  
Goal of this project was to determine the immunologic basis for CFS pathogenesis  
Role: PI 15% effort

R21 AI099809-01 (PI MA Fletcher) 08/15/2012 – 08/14/2014  
Microbial Translocation in ME/CFS  
Goal of this project is to determine to relationship of "leaky gut" to symptoms and biomarkers in ME/CFS.  
Role: PI 20% effort

GW093042 DOD (PI G Broderick) 08/01/2010 – 07/30/2013  
Theory-Driven Models for Correcting "Fight or Flight" Imbalance in Gulf War Illness  
A computer-based analysis of the hypothalamic-pituitary-adrenal (HPA) axis, the immune system, and the ability of those systems to ensure survival and then to re-establish homeostasis that existed prior to the "fight or flight" stimulus.  
Role: co-I

NIAMSD 1 R01 AR057853-01A1 (PI NG Klimas) 12/01/2010 – 04/30/2014  
Study of Chronic Fatigue Syndrome using comprehensive molecular profiling with network and control theory

The objective of this study is to improve our understanding of CFS pathogenesis by using broad-scale molecular profiling to create a comprehensive assessment of status in several of the body's regulatory systems  
Role: Co-PI 20% effort

NIH NIMH RO1 (PI Mike Antoni) 2010 -2015  
Virtual platforms for CBT in CFS/ME  
A study of spouse and patient CBT using a virtual platform.  
Role: Co-I, 7% effort

GW080152 DOD (PI N Klimas) 06/2009 – 06/2012  
The Use of Comprehensive Molecular Profiling with Network and Control in GWI  
GWI patients are studied using gene array technology and neuron-endocrine-immunologic profiling pre-post exercise challenge.  
Role: co-PI

R01AI065723-08 (PI MA Fletcher) 10/01/2006 – 09/30/2014  
Immunologic Mechanisms, Biomarkers and Subsets in CFS  
Goal of this project was to determine the immunologic basis for CFS pathogenesis  
Role: PI

R21AA016635 (PI MA Fletcher) 09/30/06 - 05/31/09  
Neuropeptide Y and dipeptidyl-peptidase IV (CD26) in chronic fatigue syndrome  
2R56AI065723-06A1 (PI MA Fletcher) 12/15/2006 – 08/31/2014  
Immunologic Mechanisms, Biomarkers and Subsets in CFS/ME  
Goal of this project was to determine the immunologic basis for CFS pathogenesis  
Role: PI 15% effort

R21 AI099809-01 (PI MA Fletcher) 08/15/2012 – 08/14/2014  
Microbial Translocation in ME/CFS  
Goal of this project is to determine to relationship of “leaky gut” to symptoms and biomarkers in ME/CFS.  
Role: PI 20% effort

GW093042 DOD (PI G Broderick) 08/01/2010 – 07/30/2013  
Theory-Driven Models for Correcting "Fight or Flight" Imbalance in Gulf War Illness  
A computer-based analysis of the hypothalamic-pituitary-adrenal (HPA) axis, the immune system, and the ability of those systems to ensure survival and then to re-establish homeostasis that existed prior to the “fight or flight” stimulus.  
Role: co-I

NIAMSD 1 R01 AR057853-01A1 (PI NG Klimas) 12/01/2010 – 04/30/2014  
Study of Chronic Fatigue Syndrome using comprehensive molecular profiling with network and control theory  
The objective of this study is to improve our understanding of CFS pathogenesis by using broad-scale molecular profiling to create a comprehensive assessment of status in several of the body's regulatory systems  
Role: Co-PI 20% effort

NIH NIMH RO1 (PI Mike Antoni) 2010 -2015  
Virtual platforms for CBT in CFS/ME

A study of spouse and patient CBT using a virtual platform.  
Role: Co-I, 7% effort

Gulf War Illness Research Program 2013-2017  
Proposal Number: GW120045, consortium award  
Project Title: "Understanding Gulf War Illness: An Integrative Modeling Approach"  
Principal Investigator: Mariana Morris  
Role: Co-I laboratory studies of immune and genomics in the animal and human subjects, 20% effort

## **X. PROFESSIONAL SOCIETIES**

American Association of Immunologists; American Society for Microbiology; American Society for the Advancement of Science; Society for Complex Carbohydrates; Association of Women in Science; Society for Experimental Biology and Medicine; Society for Clinical Cytology; Association of Medical Laboratory Immunologists, Steering Committee, 1987; Clinical Immunology Society; PsychoNeuroImmunology Research Society, Scientific Affairs Committee - 1993 1995; American Association of Bioanalysts, Association of Clinical Chemists

## **XI. HONORARY SOCIETIES and HONORS**

Phi Kappa Phi, Alpha Epsilon Delta, Alpha Lambda Delta, Sigma XI, Fellow - Academy for Behavioral Medicine Research

IACFS Award for Outstanding Research in CFS/ME - 2011

## **XII. CONSULTANTSHIPS**

National Cancer Institute (NCI), Tumor Immunology Review Committee 1980 - 1982

NCI - Clinical Cancer Program Project Review Committee Site Visit Participant, 1978 - 1984

National Science Foundation (NSF), Postdoctoral Fellowship Review Committee, 1979 - 1980

NSF Ad Hoc Review, 1979 - 1986

National Institutes of Health (NIH), Immunotechnology Special Review Committee, 1986-87

National Institute of Mental Health (NIMH), Psychoneuroimmunology Training Grants, Site Visitor, 1987 and Special Review Committee, 2004.

National Institute of Drug Abuse (NIDA), Site Visitor, 1988

National Heart, Lung and Blood Institute (NHLBI), Site Visitor, Special Review Committee 1989, 1993, 1998.

National Institute of Allergy and Infectious Diseases (NIAID), Special Review Committee, In vitro methods for AIDS Clinical Trials, 1995

NIAID, Ad Hoc reviewer for AIDS study section, 1991;

NIAID, Special Review Committee for Pediatric AIDS, 1995

NIAID, HIV Vaccine Development Review Committee, 1996, 1997, 1999, 2002 - 2005

NIAID, Special Review Committee for CFAR proposals, 2002, 2003

NIAID, HIV Special Emphasis Panel, 2004

NIH, CFS/FMS/TMD Review Panel, 2007, 2010, 2012

NIAID, Special Review Committee, 2007, 2008, 2010, 2012, 2013

NIH, 2012/08 ZRG1 CB-D (50) - review applications responding to the NIH Common Fund Single Cell Analysis Program [RFA-RM-11-015](#)

HHS, Member Chronic Fatigue Syndrome Advisory Committee

### **XIII. EDITORIAL BOARDS AND REVIEWING**

Clinical Applications in Cytometry; Clinical and Diagnostic Immunology; Journal of Chronic Fatigue Syndrome; Clinical and Applied Immunology Reviews ; Section editor: ASM Manual of Medical Laboratory Immunology, 5th edition. Ad Hoc reviewer, FASEB, Natural Immunity, Annals Internal Medicine, Journal of Immunology, Psychosomatic Medicine, Brain Behavior and Immunity, Journal Infectious Diseases, Journal of Translational Medicine, American Journal of Physiology , PLoS one.

### **XIV. TEACHING**

Specialization: Immunology, Medical Laboratory Immunology, Psychoneuroimmunology

Mentor: Pre-doctoral trainees:

Martin Rosenthal, 2006-2008

Zachary Barnes, 2008-2009

Natalie Hone, 2009

Mentor - Ph.D. candidates:

Karen Caldwell, Ph.D., M.D. 1982 - 1989

George Ann Baron, Ph.D. 1983 - 1987

Brian Esterling, Ph.D. 1989 - 1991

Mentor – Post-doctoral fellows:

Patricia Kozlovskis, Ph.D.1980-1981

Zuhair Latif, Ph.D.1980-1983

Nancy Klimas, M.D.1983-1984

Lisetti Said, M.D.1980-1983

Gerson Silveria, M.D. 1984-1985  
Olga Torres, M.D. 1985-1986  
Fernando Salvato, M.D. 1987-1989  
Roberto Patarca, Ph.D. M.D. 1990-1994  
Kevin Maher, Ph.D., 1993-1994  
Hector Pons, Ph.D., 1994-1995  
Maria Jose Miquez-Burbano, M.D. 1994-1996  
Desh Asthana, Ph.D., 1994 - 1997  
Denise Dixon, Ph.D., 1997 – 1999  
Lina Garcia, M.D., 2007-2009  
Maria Vera, M.D., 2008-2009

Thesis and Dissertation Committees:

Elaine Young 1976-1978  
Stephen Obenauf 1979-1983  
David Charish 1979-1982  
Caroline Petty 1979-1982  
Scott Buessow 1984-1984  
Alicia Sinclair 1984-1985  
Marijane Montgomery 1984-1985  
Gordon Watson 1985-1989  
Peter O'Hearn 1986-1989  
Arthur Laperrier 1987-1988  
H. Lane Bagget 1989-1990  
Sharon August 1990-1991  
Andrea Friedman 1990-1993  
Kathleen Starr 1992-1995  
Susan Lugtendorf 1993-1994  
Teresa Woods 1996-1998  
Deidre Pereira 1996-1998  
Mark Zuckerman 1996-1998  
Frank Penedo 1997- 1999  
Saroch Motivala 1997- 1999  
John Malonovitch 1997- 1999  
Staci Wagner 1998 - 2001  
Kristian Kilbourn 1999 - 2002  
Tammy Enos 1998- 2001  
Steven Burke, 1999-2002  
Connor O'Cleirigh 2000 -2006  
Adam Carrico 2004 – 2007  
Orit Weitzman 2004  
Blake Scalon 2005 – 2007  
Corina Lopez 2009 – 2010  
Emily Lattie 2011 –  
Julia Seay 2011 -

## **XV. SCHOOL AND DEPARTMENTAL COMMITTEES AND OFFICES**

1. Medical School Council, 1976-1978. 2003-09

2. Faculty Senate Council Rep. to Medical School Council, 1979-1982.
3. School of Medicine Rep. to Consultative Committee for the Presidential Search, 1979-1981.
4. Admissions Committee, Ph.D.- M.D. 1974-1977.
5. Department of Medicine Research and Space Committee, 1978-1979.
6. Graduate School Faculty Screening Committee, 1980-1982, Chairperson, 1983
7. School of Medicine Rep. to Consultative Committee for Provost Search, 1982.
8. Scientific Advisory Committee, 1983-1985 (Chairperson); 1993-1996; 2002-07.
9. Appointment, Promotion and Tenure Committee, 1981-1984, 2007-11.
10. Institutional Self-Study, Faculty Review Subcommittee, Chairperson, 1986-1987.
11. Clinical Research Center - Protocol Review Committee, 1990-1992.
12. Center for AIDS Research - Steering Committee, 1989-1994.
13. Clinical Research Center, Executive Committee, 2008 -2009.
14. Scientific Review Committee for DCFAR Developmental Grant Applications. 2007 – 2009.
15. Department of Medicine Appointment , promotion and tenure committee. 2012 -

## **XVI. UNIVERSITY COMMITTEES & OFFICES**

1. Faculty Rep. to Presidential Search and Selection Committee, 1979-1981.
2. Vice-Chairperson, Faculty Senate, 1979-1981.
3. Faculty Senate, 1979-82; 2000-2012.
4. Faculty Senate Council Representative from School of Medicine, 1979-1982.
5. Academic Planning Committee, 1976-1978.
6. Academic Personnel Board, 1979-1981, 1992-1994.
7. Faculty Senate Committee on Committees, 1979-1981.
8. Women's Commission, President, 1984-1986.
9. President's Ad Hoc Committee on Research and Development - Chairperson of Subcommittee on Academic Affairs, 1981-1982.
10. Intercollegiate Athletics Governing Board, 1981-1982.
11. Research Council, 1982-1985.
12. Search Committee for Vice-President for Research and Dean of the Graduate School, 1984-1985
13. Consultative Committee for V.P. for Research & Dean of Grad. School, 1984-1985 (Chair).
14. University Self Study - Committee for Intercollegiate Athletics, 1985-1986.
15. Faculty Senate Committee for Rank, Salary and Conditions of Employment, 1987-1990 (Chair).
16. Faculty Senate Professional Conduct Committee, 1992 -1994 (Chair).
17. Faculty Senate Athletic Committee, 1993 - 1997, Chair, 1993-1994.
18. Faculty Senate Committee on Academic Services, 1997-1999.
19. Faculty Senate Committee on Women and Minorities, 2000-2004 (Chair).
20. Faculty Senate Committee on Institutional Priorities, 2000-2001.
21. Faculty Senate General Welfare Committee, 2004-2012.
22. Faculty Senate Ad Hoc Committee on Academic Freedom, 2008-2009.
23. Faculty Senate Ad Hoc Committee on Evaluation of Sub Deans, 2008-2011.

## **XVII. COMMUNITY ACTIVITIES**

Health Crisis Network, Medical Advisory Committee, 1985

Women and AIDS Workshops, National Organization for Women, State and National Conferences, 1988, 1989, 1990, 1991, 1996, 1997.

**XVIII Licensure**

1984–Present CLIA certified and licensed as a Clinical Laboratory Director in Florida  
And Diplomate, American Board of Bioanalysis

**CURRICULUM VITAE**  
**Gordon Broderick, Ph.D. P.Eng.**  
(updated December 8, 2016)

**Current Appointment:**

Professor, Dept. of Psychology and Neuroscience  
College of Psychology, Nova Southeastern University,  
Fort Lauderdale, FL, USA

Business Address: Institute for Neuro-immune Medicine,  
Nova Southeastern University,  
University Park Plaza, Suite 3440  
3424 South University Drive  
Fort Lauderdale, FL 33328  
Ph. 780-492-1633 Fx. 780-407-6384  
Email. [gbroderick@nova.edu](mailto:gbroderick@nova.edu)

Citizenship:

**Education and Training:**

|           |   |
|-----------|---|
| 1980-1984 | B.Eng. (Mechanical), McGill University, Montreal, Canada                                    |
| 1988-1989 | M.Eng. (Chemical), McGill University, Montreal, Canada                                      |
| 1991-1994 | Ph.D. (Chemical Eng.), École Polytechnique de Montréal,<br>Montreal, Canada                 |
| 2000-2001 | Post-doctoral fellow (Computer Science), McGill University,<br>Montreal, Canada             |
| 2002-2006 | Post-doctoral research associate (Biochemistry), University of<br>Alberta, Edmonton, Canada |

**Licensure and Certification:**

|              |  |
|--------------|--|
| 1986-present | Ing. (P. Eng.) Ordre des Ingénieurs du Québec (#39881) |
|--------------|--|

**Academic Appointments:**

|                |   |
|----------------|---|
| 2000 – 2001    | Visiting Scientist McGill School of Computer Science / Montreal<br>General Hospital, Montreal, Canada                                 |
| 2002 – 2006    | Project Leader, Institute for Biomolecular Design, University of<br>Alberta, Edmonton, Canada   |
| 2004 – 2005    | Consulting Biostatistician, Alberta Transplant Applied Genomics<br>Centre, University of Alberta, Edmonton, Canada                    |
| 2006 – 2013    | Associate Professor with Tenure – Dept. of Medicine, Faculty of<br>Medicine and Dentistry, University of Alberta, Edmonton,<br>Canada |
| 2010 – Present | Associate Professor (Voluntary) – Dept. of Medicine, Miller<br>School of Medicine, University of Miami, USA                           |
| 2013 – Present | Associate Professor (Voluntary) – Dept. of Medicine, Faculty of<br>Medicine and Dentistry, University of Alberta, Edmonton,<br>Canada |



|                |   |
|----------------|---|
| 2013 – Present | Professor – Center for Psychological Studies, Nova Southeastern University, Fort Lauderdale, FL, USA.                                   |
| 2013 – Present | Professor – College of Pharmacy, Nova Southeastern University, Fort Lauderdale, FL, USA.  |
| 2013 – Present | Director – Clinical Systems Biology Group, Institute for Neuro-immune Medicine, Nova Southeastern University, Fort Lauderdale, FL, USA. |

**Research Appointments:**

|             |  |
|-------------|--|
| 1989 - 1995 | Research Engineer/Project Leader, Noranda Technology Center, Pointe-Claire, Canada |
| 1995 – 1999 | Senior Scientist, Noranda Technology Center, Pointe-Claire, Canada                 |
| 1999 – 2002 | Principal Scientist, Noranda Technology Center, Pointe-Claire, Canada              |

**Awards/Honours:**

|             |   |
|-------------|---|
| 1980 - 1984 | J.B. Lynch Foundation Award (Bachelor)  |
| 1988 - 1989 | R.M. Fowler Memorial Fellowship (Masters)   |
| 1988 - 1989 | Natural Sciences and Engineering Research Council of Canada Award (Masters)                                 |
| 1991 - 1994 | Natural Sciences and Engineering Research Council of Canada Award (Ph.D)                                    |
| 1992 - 1993 | John S. Bates Centennial Fellowship (Ph.D)  |
| 1994        | Dean of Graduate Studies and Research Award for best doctoral thesis, École Polytechnique de Montréal.      |
| 2007-2008   | Teacher of the Year Award (Small Group Case Study), University of Alberta Medical Students Association      |
| 2009-2010   | Discovery Learning Preceptor Excellence Award, University of Alberta Medical Students Association           |
| 2010        | Nightingale Award for Community Service, ME Society of Edmonton   |
| 2010-2011   | Discovery Learning Preceptor Excellence Award, University of Alberta Medical Students Association.          |
| 2011-2012   | Discovery Learning Preceptor Excellence Award, University of Alberta Medical Students Association.          |
| 2012-2013   | Discovery Learning Preceptor Excellence Award (Year 1), University of Alberta Medical Students Association. |
| 2012-2013   | Discovery Learning Preceptor Excellence Award (Year 2), University of Alberta Medical Students Association  |

**Professional Memberships and Administrative Activities:**

**Memberships:**

|              |  |
|--------------|--|
| 1986-present | Member, Ordre des Ingénieurs du Québec (#39881)                            |
| 2010         | Member, International Society for Interferon and Cytokine Research (#2634) |

Grant Review:

|      |   |
|------|---|
| 2006 | The Centre for Complexity Science, Jerusalem, Israel  |
| 2009 | U.S.-Israel Bi-national Science Foundation, Jerusalem, Israel   |
| 2009 | Chief Scientist Office of the Scottish Government Health Directorate, Edinburgh, UK (2 grant proposals)   |
| 2009 | Microsoft Research PhD Scholarship Programme, Microsoft Research, Cambridge, UK (2 proposals)   |
| 2009 | Canadian Institutes of Health Research (CIHR)   |
| 2009 | Natural Sciences and Engineering Research Council of Canada (NSERC)   |
| 2010 | NIH Chronic Fatigue Review Panel, Neurotoxicology and Alcohol (NAL) Study Section, National Institutes of Health, Bethesda, MD (2 proposals).                           |
| 2010 | Health Research Awards, the Health Research Board (HRB) of Ireland, Dublin, Ireland   |
| 2010 | Chief Scientist Office of the Scottish Government Health Directorate, Edinburgh, UK   |
| 2011 | NIH Chronic Fatigue Syndrome Special Emphasis Panel (SEP), National Institutes of Health, Bethesda, MD (4 proposals).   |
| 2011 | Biomedical Innovation in Public-private Research Partnership program, French National Research Agency (ANR), National Institutes of Health, Bethesda, MD (4 proposals). |
| 2011 | RCUK Shared Services Centre for Medical Research Council of the UK (RCUK SSC) Award program, Swindon, Wiltshire, UK (2 proposals).                                      |
| 2011 | CFIDS Association of America, Application for access to CFIDS Bio-bank. Charlotte, NC, US.  |
| 2012 | NIH Chronic Fatigue Syndrome Special Emphasis Panel (SEP), National Institutes of Health, Bethesda, MD (4 proposals).   |

Review of candidates for faculty positions.

|      |  |
|------|--|
| 2006 | Candidate Senior Lecturer; Dept. of Bio-medical Eng., Ben Gurion University, Israel  |
| 2008 | Candidate Senior Lecturer; Faculty of Life Sciences; University of Bar-Ilan, Israel  |
| 2012 | Promotion to full professor; Dr. Timothy Labron, Philosophy and religious Studies, Concordia University, Edmonton, AB, Canada            |
| 2013 | Promotion to full professor; Dr. Mark Van Ness, Health, Exercise, and Sport Sciences Department, University of the Pacific, Stockton, CA |

National and International Advisory Committees, Scientific Societies:

|      |  |
|------|--|
| 2010 | Invited member; International Panel for Canadian Consensus Document on ME/CFS, Vancouver, Canada (*submitting author)                                  |
| 2010 | Invited member; US Veteran's Administration Cooperative Study Committee for Genome-wide Association in Gulf War Illness, Washington DC, USA (CSP #585) |

- 2011 Invited panellist; US National Institutes of Health - Office of Research on Women's Health (ORWH); State of the Knowledge on Myalgic Encephalomyelitis/Chronic Fatigue Syndrome (ME/CFS) Research, Washington DC, USA
- 2011-2016 Invited member; Scientific Advisory Board, Solve ME/CFS Initiative, Charlotte, USA
- 2014 Invited panellist Technical Expert Panel (TEP); US National Institutes of Health - Agency for Healthcare Research and Quality's (AHRQ) Effective Health Care (EHC) Program: Diagnosis and Treatment of Myalgic Encephalomyelitis/Chronic Fatigue Syndrome.
- 2014 Invited panellist; Strategic Advisory Board, Chronic Pain and Fatigue Network, Institute of Musculoskeletal Health and Arthritis (IMHA), Canadian Institutes of Health Research.

**Editorial activities:**

- 2012-2014 Member Editorial Board, *Brain Behavior and Immunity*, Elsevier, Amsterdam, NL (impact factor 5.061)
- 2011- Member Editorial Board, *Systems Biomedicine*, Landes Bioscience, Austin, TX (new journal, Editor-in-chief: Sol Efroni, PhD, Bar Ilan University, Israel)
- 2010- Associate Editor, *BMC Systems Biology*, Biomed Central, London, UK (impact factor 4.064)
- Current Review activities for: *Brain Behavior and Immunity* (\*over 10 manuscripts; impact 5.061), *Journal of Immunology*, *Journal of Infectious Diseases*, *BMC Medical Genomics*, *American Journal of Transplantation*, *Cellular and Molecular Life Sciences*, *Molecular Medicine*, *The Journal of Physical Chemistry*, *PLoS One*, *Transplantation*, *Bioinformatics* (Oxford Press), *BMC Neurology*, *Theoretical Biology and Medical Modeling*, *PLoS Computational Biology*

**Institutional Administrative and Leadership Contributions:**

Organising committees

- 2007 Session Chair - Numerical Techniques for Creating Biological Insights "Omic" Technologies to Phenotype Disease: A Satellite Symposium of the 9th Banff Conference on Allograft Pathology, Edmonton, AB. June 18 -19, 2007
- 2009 Judge's panel; Department of Medicine Research Day Graduate Student Poster Session (6 posters).
- 2015 Panel Member - Symposium: Optimizing Patient Outcomes: The Role of Psychology in Applying A Network Medicine Model. 2015 APA Annual Convention, Toronto, August, 2015

Administrative and Research Committees

|            |   |
|------------|---|
| 2006- 2007 | Head Computational Biology and voting member, Scientific Management Executive Committee, Alberta Transplant Applied Genomics Centre |
| 2007       | Member, Faculty Committee for University Wireless Services  |
| 2007- 2008 | Member, Faculty Committee for Review of the Institute for Biomolecular Design   |
| 2007-2010  | Member, Department of Medicine Research Committee   |
| 2006 -2013 | Member, Division of Pulmonary Medicine  |
| 2013-      | Founding member, Executive Committee, Institute for Neuro-immune Medicine, Nova Southeastern University                             |

Student Examination committees

|      |  |
|------|--|
| 2011 | MED526 PCC Human Sexuality II OSCE Examiner. |
|------|--|

Graduate student academic committees.

|           |   |
|-----------|---|
| 2006-2009 | Member, Ph.D. Committee – Mr. Zhipeng Cai, Dept. of Computer Science, University of Alberta                   |
| 2006-2010 | Member, Ph.D. Committee – Mr. Anmmd Kamruzzaman, School of Public Health, University of Alberta               |
| 2011-     | Supervising Member, Ph.D. Committee – Mr. Saurabh Vashishtha, Dept. of Medicine, University of Alberta        |
| 2013-2014 | Member, Ph.D. Examination Committee – Mr. Homood As Sobeai, College of Pharmacy, Nova Southeastern University |

**Teaching Contributions:**

Postgraduate/graduate Advisees:

|           |   |
|-----------|---|
| 1995-1997 | <u>Mr. Trevor Fenton (M.Sc.)</u><br>Graduate student “Finite element modeling of porous networks of composite materials”<br>Funding: Noranda Technology Centre; NSERC<br>My Role: Private sector co-supervisor; Primary supervisor: Dr. H. Budman (University of Waterloo)    |
| 1995-1997 | <u>Mr. Timothy Knapp (M.Sc.)</u><br>Graduate student “Adaptive geometry neural network based control of chemical processes”<br>Funding: Noranda Technology Centre; NSERC<br>My Role: Private sector co-supervisor; Primary supervisor: Dr. H. Budman (University of Waterloo) |
| 1996-1998 | <u>Mr. Jean Sébastien Bolduc (M.Sc.)</u><br>Graduate student “Cellular-automata based nonlinear adaptive controllers”<br>Funding: Noranda Technology Centre; NSERC<br>My Role: Private sector co-supervisor; Primary supervisor: Dr. D. Thérien (McGill University)           |

- 1996-1998      Ms. Bodhana Ratitch (M.Sc.)  
Graduate student “Continuous function identification with fuzzy cellular automata”  
Funding: Noranda Technology Centre; NSERC  
My Role: Private sector co-supervisor; Primary supervisor: Dr. D. Thérien (McGill University)
- 1997-2000      Mr. Brendan Cote (M.Sc.)  
Graduate student “Applicability of advanced computational networks to the modeling of complex geometry”  
Funding: Noranda Technology Centre  
My Role: Private sector co-supervisor; Primary supervisor: Dr. D. Thérien (McGill University)
- 1997-2001      Ms. Paule Marceau (M.Sc.)  
Graduate student “Modeling the impact of particle size distribution of mechanical properties of wood composites”  
Funding: Noranda Technology Centre  
My Role: Private sector co-supervisor; Primary supervisor: Dr. A. Cloutier (Université Laval)
- 2006-2007      Mr. Eric Carpenter (M.Sc.)  
Research fellow “Bi-stability in repair from injury and rejection of kidney allografts”  
Funding: University of Alberta, Start-up funding  
My Role: Primary Supervisor
- 2007-2010      Dr. J Fuite (Ph.D. 2008)  
Research fellow “Network Theoretical Study of Neuro-immune Deficiency in Chronic Fatigue and Gulf war Illness”  
Funding: CFIDS Association of America  
My Role: Primary Supervisor
- 2010-2011      Dr. Scott Meadows (Ph.D. 1994)  
Research fellow “Integrated Control and Multi-stability of the Fight or Flight Axis”  
Funding: U.S. Department of Defense  
My Role: Primary Supervisor
- 2012-2013      Dr. T. Craddock (Ph.D. 2011)  
Research fellow “Integrated Control and Multi-stability of the Fight or Flight Axis”  
Funding: U.S. Department of Defense  
My Role: Primary Supervisor
- 2011-present      Mr. Saurabh Vashishtha (M.Sc., Ph.D. candidate)  
Ph.D. Graduate student, “Immune Network Dynamics in Complex Stress-mediated Illness”  
Funding: US National Institutes of Health  
My Role: Primary Supervisor

- 2011-2014      Mr. Sadiq Olayinka (M.Sc., M.Eng., Ph.D. candidate)  
Ph.D. Graduate student “The Network Dynamics of gene  
Regulation in Breast Cancer”  
Funding: NA  
My Role: Primary Supervisor
- 2013- present      Ms Gaytri Patel (Psy.D. student, Clinical Psychology, Nova  
Southeastern University)  
Research intern “Gender-specific effects of neuroinflammation  
on human cognition ”  
Funding: US Dept. of Defense.  
My Role: Co-supervisor
- 2013- present      Mr Trevor Barker (Psy.D. student, Clinical Psychology, Nova  
Southeastern University)  
Research intern “Gender-specific effects of neuroinflammation  
on human cognition ”  
Funding: US Dept. of Defense.  
My Role: Co-supervisor
- 2013- present      Mr Tory Toole (Ph.D. student, Clinical Psychology, Nova  
Southeastern University)  
Research intern “Neuroinflammation and pain pathways ”  
Funding: US Dept. of Defense.  
My Role: Co-supervisor
- 2013- present      Ms Alexia Holovatyk (Ph.D. student, Clinical Psychology, Nova  
Southeastern University)  
Research intern “Chronic fatigue, neuroinflammation and their  
effects on human cognition ”  
Funding: US Dept. of Defense.  
My Role: Co-supervisor

Undergraduate Advisees:

- 1995-1996      Mr. Bernhard Handle (senior year metallurgical engineering  
design project)  
Undergraduate research assistant “Hydrometallurgical electro-  
refining of high-purity tellurium”  
Funding: Noranda Technology Centre, Principal  
My Role: Private sector co-supervisor; Primary supervisor Dr. P.  
Paschen, Montan-University, Leoben, Austria
- 2007      Ms. Ann Aspler (M.Sc.) and Ms Carly Bolshin (B.Sc.) (M.D.  
students, class of 2010)  
Undergraduate research assistants “Evidence of Altered  
Neuroendocrine- immune Function in a Population-based Study  
of Chronic Fatigue Syndrome”

- Funding: University of Alberta, start-up funds  
My Role: Primary Supervisor
- 2008-2009 Mr. Michael Gallagher (M.D. student, class of 2010)  
Undergraduate research assistant “Immune Biomarkers in Gulf War Syndrome”  
Funding: CFIDS Association of America, U.S. Dept. of Defense  
My Role: Primary Supervisor
- 2009 Ms. Andrea Kreitz (B.Sc., M.D. student, class of 2011)  
Undergraduate research assistant “Emergent Patterns of Cytokine Expression in Chronic Fatigue Syndrome and Gulf War Illness”  
Funding: CFIDS Association of America; *Recipient of the PANDORA Summer Research Award*  
My Role: Primary Supervisor
- 2009 Ms. Christina Yang (M.Sc., M.D. student, class of 2011)  
Undergraduate research assistant “A Study of Cognitive Deficits in Patients with Chronic Fatigue Syndrome”  
Funding: CFIDS Association of America; *Recipient of the Henry Anton Deutsch Medical Summer Research Award*  
My Role: Primary Supervisor
- 2010-2011 Mr. Scott De Graff (B.Sc., M.D. student, class of 2012)  
Undergraduate research assistant “Models for Cardiovascular Dysregulation in Chronic Fatigue Syndrome”  
Funding: CFIDS Association of America  
My Role: Primary Supervisor
- 2011-2014 Ms. Jeanna Harvey (B.Sc., M.D. student, class of 2014, University of Miami)  
Undergraduate research assistant “Exercise Induced Immune Gene Expression in Gulf War Illness”  
Funding: US Veterans Affairs  
My Role: Co-supervisor
- 2012 Ms. AnneLiese Smylie (B.Sc. Honours, M.D. student, class of 2015)  
Undergraduate research assistant “A Cytokine-based Screening Test for Gulf War Illness”  
Funding: Alberta Innovates Health Solutions (AIHS); *Recipient of an AIHS Summer Studentship Research Award.*  
My Role: Primary Supervisor
- 2012 Mr. Henrique Fernandes (B.Eng. Distinction, M.D. student, class of 2015)  
Undergraduate research assistant “Identifying Common Molecular Traits and Emergent Patient Sub-groups in Chronic Fatigue Syndrome”

Funding: Canadian Institutes for Health Research (CIHR);  
*Recipient of a CIHR Health Professional Student Research Award.*

My Role: Primary Supervisor

- 2013 Mr. Lundy McKibbin (B.Sc. Distinction, M.D. student, class of 2016)  
Undergraduate research assistant “A study of the effects of PTSD co-morbidity on immune signature in Gulf War Illness”  
Funding: US. Dept. of Defense.  
My Role: Primary Supervisor
- 2013 Mr. Simar Singh (M.Sc. Distinction, Stanford University)  
Graduate research assistant “A study of neuro-inflammatory mechanisms in Gulf War Illness”  
Funding: US. Dept. of Defense.  
My Role: Primary Supervisor
- 2013 Ms. Alanna Bowie (B.Sc. Distinction, M.D. student, class of 2016)  
Undergraduate research assistant “Prognostic Clinical Markers for Early Detection Chronic Sequela from Infectious Mononucleosis”  
Funding: Alberta Innovates Health Solutions (AIHS); *Recipient of an AIHS Summer Studentship Research Award.*  
My Role: Primary Supervisor
- 2013 Ms. Melissa Hwang (B.Sc. Distinction, M.D. student, class of 2016)  
Undergraduate research assistant “Mechanisms of Immune-endocrine Interaction in Episodic Exacerbation of Chronic Fatigue Syndrome”  
Funding: Faculty of Medicine and Dentistry; *Recipient of the David and Beatrice Reidford Research Scholarship.*  
My Role: Primary Supervisor
- 2013-2014 Mr. Mark Rice (Computer Science student, class of 2014)  
Undergraduate research assistant “Large-scale Circuit Models of Physiological Regulation”  
Funding: US Dept. of Defense  
My Role: Primary Supervisor
- 2013-2014 Mr. Ryan del Rosario (Computer Science student, class of 2014)  
Undergraduate research assistant “Large-scale Circuit Models of Physiological Regulation”  
Funding: US Dept. of Defense  
My Role: Primary Supervisor
- 2013-2014 Mr. Patrick Gourdet (Computer Science student, class of 2014)  
Undergraduate research assistant “Large-scale Circuit Models of Physiological Regulation”



Funding: US Dept. of Defense  
My Role: Primary Supervisor

- 2013 Ms. Lindsey Russell (B.Sc. Honours (cell biology), M.D. student, class of 2016)  
Undergraduate research assistant “Gulf War Illness; a comprehensive model incorporating insults to cardiac, neurological and immune function”  
Funding: Alberta Innovates Health Solutions (AIHS); *Recipient of an AIHS Summer Studentship Research Award.*  
My Role: Primary Supervisor
- 2013-2014 Mr Samuel Thomas (B.Sc. student, Behavioral Neuroscience, class of 2015, Nova Southeastern University)  
Research intern “Neuroinflammatory cascades in the brain ”  
Funding: US Dept. of Defense.  
My Role: Co-supervisor
- 2014 Mr Shane Hills (B.Sc. Physics, Queen’s University 2012)  
Research intern “Mapping Neurological Response to Exercise Challenge in Gulf War Illness”  
Funding: CFIDS Association of America/ Univ. of Wisconsin.  
My Role: Supervisor

Classroom Instruction (undergraduate):

- 2007 DMED 512 - Infection, Immunity and Inflammation, Small Group Facilitator, University of Alberta, Edmonton, AB  
Overall effectiveness rating: 9.2/10.0
- DMED 514 – Cardiovascular, Pulmonary and Renal Systems, Small Group Facilitator, University of Alberta, Edmonton, AB:  
Renal Block; Overall effectiveness rating 9.4/10.0  
Pulmonary Block; Overall effectiveness rating 10.0/10.0
- 2008 MED516 /DDS510 Patient-centred Care I, Small Group Facilitator, University of Alberta, Edmonton, AB  
Overall effectiveness rating: Not transmitted
- MED526 /DDS520 Patient-centred Care II, Small Group Facilitator, University of Alberta, Edmonton, AB  
Overall effectiveness rating: Not transmitted
- MED521 /DDS506 – Gastroenterology and Nutrition, Small Group Facilitator, University of Alberta, Edmonton, AB  
Overall effectiveness rating: 9.8/10.0
- DMED 514 – Cardiovascular, Pulmonary and Renal Systems, Small Group Facilitator, University of Alberta, Edmonton, AB:  
Renal Block; Overall effectiveness rating 9.4/10.0

Pulmonary Block; Overall effectiveness rating 9.1/10.0  
Cardiology Block; Overall effectiveness rating 9.4/10.0.

Substitute Teaching as Discovery Learning (DL) small group  
facilitator in:

DMED 512 - Infection, Immunity and Inflammation

DMED 513 – Endocrinology and Metabolism

2009

DMED 512 - Infection, Immunity and Inflammation, Small  
Group Facilitator, University of Alberta, Edmonton, AB

Overall effectiveness rating: 9.4/10.0

MED522 Reproductive Medicine and Urology, Small Group  
Facilitator, University of Alberta, Edmonton, AB

Overall effectiveness rating: 10.0/10.0

MED526/DDS520 Patient-centred Care, Small Group Facilitator,  
University of Alberta, Edmonton, AB

Overall effectiveness rating: Not transmitted

DMED 514 – MED524 Neurosciences and Organs of Special  
Senses (A), Small Group Facilitator, University of Alberta,  
Edmonton, AB

Overall effectiveness rating: 10.0/10.0

DMED 514 – MED524 Neurosciences and Organs of Special  
Senses (B), Small Group Facilitator, University of Alberta,  
Edmonton, AB

Overall effectiveness rating: Not transmitted

MED515 Community Health, Small Group Facilitator, University  
of Alberta, Edmonton, AB

Overall effectiveness rating: 9.8/10.0

MED526/DDS520 Patient-centred Care II, Small Group  
Facilitator, University of Alberta, Edmonton, AB

Overall effectiveness rating: 8.0/10.0

2010

DMED 512 - Infection, Immunity and Inflammation, Small  
Group Facilitator, University of Alberta, Edmonton, AB

Overall effectiveness rating: 10.0/10.0

MED522 Reproductive Medicine and Urology, Small Group  
Facilitator, University of Alberta, Edmonton, AB

Overall effectiveness rating: 9.8/10.0

MED526 Patient-centred Care, Small Group Facilitator,  
University of Alberta, Edmonton, AB (\*\* 2 groups in parallel)

Overall effectiveness rating: 10.0/10.0

DMED 514 – Cardiovascular, Pulmonary and Renal Systems  
(Cardiovascular block), Small Group Facilitator, University of  
Alberta, Edmonton, AB

Overall effectiveness rating: 9.8/10.0

MED524 Neurosciences and Organs of Special Senses (A), Small  
Group Facilitator, University of Alberta, Edmonton, AB

Overall effectiveness rating: 9.4/10.0

MED526/DDS520 Patient-centred Care, Small Group Facilitator,  
University of Alberta, Edmonton, AB

Overall effectiveness rating: (no score provided)

2011

DMED 512 - Infection, Immunity and Inflammation, Small  
Group Facilitator, University of Alberta, Edmonton, AB

Overall effectiveness rating: 10.0/10.0

MED522 Reproductive Medicine and Urology, Small Group  
Facilitator, University of Alberta, Edmonton, AB

Overall effectiveness rating: 10.0/10.0

MED526 Patient-centred Care, Small Group Facilitator,  
University of Alberta, Edmonton, AB (\*\* 2 groups in parallel)

Overall effectiveness rating: 10.0/10.0

2012

DMED 512 - Infection, Immunity and Inflammation, Small  
Group Facilitator, University of Alberta, Edmonton, AB

Overall effectiveness rating: 10.0/10.0

MED522 Reproductive Medicine and Urology, Small Group  
Facilitator, University of Alberta, Edmonton, AB

Overall effectiveness rating: 9.89/10.0

MED516 Patient-centred Care, Small Group Facilitator,  
University of Alberta, Edmonton, AB

(2 sessions: Medical Ethics, Patient Advocacy)

Overall effectiveness rating: Ongoing

MED 523/DDS 523 - Musculoskeletal System, Small Group  
Facilitator, University of Alberta, Edmonton, AB

Overall effectiveness rating: Ongoing

Classroom Instruction (graduate):

1995

MTH 6301 Statistical Design and Analysis of Experiments  
Dept. Appl. Mathematics and Industrial Engineering,  
École Polytechnique de Montréal, Montreal, Canada.

2013

MED 573 An Introduction to Clinical Systems Biology  
Dept. of Medicine, Faculty of Medicine and Dentistry  
University of Alberta, Edmonton, Canada.

**Research Grants:**

Currently Active Grants:

- 01/2013-01/2017 U.S. Department of Defense  
Title: "GW120045 -Understanding Gulf War Illness: An Integrative Modeling Approach."  
Role: Co-PI. - Director Computational Core  
Total Budget: CAN\$:
- 04/2014-03/2018 U.S. Department of Veterans Affairs  
Title: "VA/ CSR&D Award for Research on GWI - Women vs. Men with GWI: Differences in Computational Models and Therapeutic Target."  
Role: Co-PI. - Director Computational Core  
Total Budget:
- 04/2014-04/2016 Nova Southeastern University President's Award  
Title: "Investigating the mTBI neuroinflammatory response to develop novel diagnostics"  
Role: Co-Inv.  
Total Budget:
- 06/2014-03/2017 U.S. Department of Defense  
Title: "GW130053 - Epigenetic Mediation of Endocrine and Immune Response in an Animal Model of Gulf War Illness"  
Role: Co-PI. - Director Computational Core  
Total Budget:
- 08/2014-07/2018 U.S. National Institutes of Health (NIH)  
Title: "Gender Differences in ME/CFS (R01)"  
Role: Co-PI - Director Computational Core  
Total Budget: CAN\$:
- 10/2014-09/2018 U.S. Department of Veterans Affairs  
Title: "VA/ CSR&D Award for Research on GWI - A Translational Medicine Approach to Gulf War Illness: From Cells to Therapy."  
Role: Co-PI. - Director Computational Core  
Total Budget: CAN\$:
- 7/2015-06/2018 U.S. Department of Defense  
Title: "GW140142 - High Fidelity Design of Multi-modal Restorative Interventions in Gulf War Illness"  
Role: PI.  
Total Budget:

- 7/2015-06/2018 U.S. Department of Defense  
Title: "GW140153P1 - Testing the Model: A Phase I/II Randomized Double Blind Placebo Control Trial of Therapeutics: Liposomal Glutathione and Curcumin"  
Role: Co-Inv.  
Total Budget:
- 9/2016-9/2019 U.S. Department of Defense  
Title: "GW - Improving Diagnostics and Treatments for GWI Females by Accounting for the Effects of PTSD"  
Role: Co-Inv.  
Total Budget:
- 9/2016-9/2019 U.S. Department of Defense  
Title: "GW140153P1 - Disentangling the Effects of PTSD from GWI for Improved Diagnostics and Treatments"  
Role: Co-Inv.  
Total Budget:
- Completed Grants:
- 07/2006-06/2009 University of Alberta, Faculty of Medicine and Dentistry (Start-up Grant N031000099)  
Title: "Mechanistic analysis of microarray signatures in transplant rejection"  
Role: Principal Investigator  
Total Budget: CAN\$:
- 07/2006-12/2007 Genome Canada  
Title: "Transplant Transcriptome Project"  
Role: Co-investigator  
Total Budget: CAN\$:
- 01/2008-01/2010 U.S. National Institutes of Health (NIH)  
Title: "A Prospective Study of CFS in Adolescents"  
Role: Consultant  
Total Budget: CAN\$:
- 03/2009-02/2011 CFIDS Association of America  
Title: "Molecular Patterns of Persistent Immune Activation in a Post-infectious Adolescent Cohort"  
Role: Principal Investigator  
Total Budget: CAN\$:
- 06/2009-08/2009 University of Alberta, Faculty of Medicine and Dentistry  
Henry Anton Deutsch Medical Summer Research Award in support of summer studentships for Ms. Christina Yang  
Role: Principal Investigator  
Total Budget: CAN\$:

- 07/2009-06/2012\* U.S. Department of Defense  
Title: "The Use of Comprehensive Molecular Profiling with Network and Control Theory to Better Understand GWI and Model Therapeutic Strategies"  
Role: Co-PI  
Total Budget: CAN\$: 164,000 sub-award  
\* Extended 1 year wo additional funding
- 05/2009-04/2014 Alberta Heritage Foundation for Medical Research  
Title: "Etiology of Inflammatory Bowel Disease: Gene, Microbe, and Environment Interactions"  
Role: Co-investigator  
Total Budget: CAN\$: (1.0 FTE Research Associate)
- 05/2009-04/2013 Patient Alliance for Neuroendocrine-immune Disorders  
Organization for Research and Advocacy (PANDORA)  
Research Award in Support of summer studentships in Broderick laboratory  
Title: "Biomarkers for Gulf War Illness"  
Role: Principal Investigator/ Program Director  
Total Budget: CAN\$:
- 07/2011-06/2012 U.S. Department of Defense  
Title: "Gulf War Illness Research Program Consortium Development Award"  
Role: Co-Inv. - Director Computational Core  
Total Budget: CAN\$:
- 09/2010-08/2013 U.S. Department of Defense  
Title: "Theory-driven Models for Correcting "Fight or Flight" Imbalance in Gulf War Illness."  
Role: Principal Investigator  
Total Budget: CAN\$:
- 10/2010-09/2014 U.S. National Institutes of Health (NIH)  
Title: "Study of Chronic Fatigue Syndrome using comprehensive molecular profiling with network and control theory (R01)"  
Role: Co-PI  
Total Budget: CAN\$:
- 06/2012-07/2013 CFIDS Association of America  
Title: "Post-exertion malaise in CFS: A systems biology approach to understanding brain, inflammation and behavior interactions"  
Role: Co-Investigator  
Total Budget: CAN\$:
- 08/2012-07/2014 U.S. National Institutes of Health (NIH)

Title: "Microbial Translocation in Chronic Fatigue Syndrome (R21)"

Role: Co-PI

Total Budget: CAN\$:

**Publications:**

Peer-Reviewed Original Research (trainees directly supervised by me are underlined):

1. Broderick G, Valade JL, Paris J. High Yield Sulphite Pulping Based on a Plackett-Burman Design. Pulp and Paper Canada, 1993; **94(9)**: T248-251.
2. Broderick G, Paris, J, Valade JL. A Composite Representation of Pulp Quality. Chemometrics and Intelligent Laboratory Systems, 1995; **29(1)**: 19-28.
3. Broderick G, Paris J, Valade JL. Factors Affecting the Optimal Performance of a High-Yield Pulping Operation. Canadian Journal of Chemical Engineering, 1995; **73(3)**: 391-399.
4. Broderick G, Paris J, Valade JL, Wood J. Applying Latent Vector Analysis to Pulp Characterization. Paperi ja Puu, 1995; **77(6-7)**: 410-418.
5. Broderick G, Paris J, Valade JL. Fibre Development in Chemimechanical Pulp Refining, Tappi Journal, 1996; **79(4)**: 193-201.
6. Broderick G, Paris J, Valade JL. The Impact of High-yield Pulping Pretreatment Conditions on Spent Liquor Toxicity and Oxygen Demand. Paperi ja Puu, 1996; **78(1-2)**: 43-50.
7. Broderick G, Paris J, Valade JL, Wood J. Linking the Fibre Characteristics and Handsheet Properties of a High-Yield Pulp. Tappi Journal, 1996; **79(1)**: 161- 169.
8. Tessier P, Broderick G. Industrial Implementation of Motor Load and Freeness Control of Chemimechanical Pulp Refiners. Tappi Journal, 1997; **80(12)**: 135-142.
9. Handle B, Broderick G, Paschen P. A Statistical Response Surface Study of the Tellurium Electrowinning Process. Hydrometallurgy, 1997; **(46)**: 105-120.
10. Broderick G, Lanouette R, Valade JL. Optimizing Refiner Operation with Statistical Modelling. Canadian Journal of Chemical Engineering, 1997; **75(1)**: 79-87.
11. Broderick G, Cacchione E, Heroux Y. The Importance of Distribution Statistics in the Characterisation of Chip Quality. Tappi Journal, 1998; **81(2)**: 131-142.
12. Broderick G, Handle B, Paschen P. Strategies for Optimal Operation of the Tellurium Electrowinning Process. Metallurgical and Materials Transactions B, 1999; **30B(1)**: 5-13.
13. Tessier P, Broderick G, Desrochers C. Chip Size Distribution for an Ultra-high-yield Sulfite Process. Tappi Journal, 2000; **83(4)**: 76.
14. Knapp T, Budman H, Broderick G. Adaptive Control of a CSTR with a Neural Network Model. Journal of Process Control, 2001; **11**: 53-68.

15. Tessier P, Broderick G, Plouffe P. Competitive Analysis of North-American Newsprint Producers Using Composite Statistical Indicators of Product and Process Performance. *Tappi Journal*, 2001; **84(3)**: 81.
16. Tessier P, Broderick G, Plouffe P. Competitive Analysis of North-American Newsprint Producers Using Composite Statistical Indicators of Product and Process Performance. *Pulp & Paper Canada*, 2002; **103(5)**: T140-143.
17. Fenton TE, Budman HM, Pritzker MD, Bernard E, Broderick G. Modeling and Simulation of Oriented Strandboard Pressing. *Ind Eng Chem Res*, 2003; **42(21)**: 5229 – 5238.

*Life science works*

18. Broderick G, Ru'aini M, Chan E, Ellison MJ. A Life-like Virtual Cell Membrane Using Discrete Automata. *Invited Paper*, *In Silico Biology*, 2004; **5**: 0016.
19. Lopez-Campistrous A, Semchuk P, Burke L, Palmer-Stone T, Brox SJ, Broderick G, Bottorff D, Weiner JH, Ellison MJ. Localization, Annotation & Comparison of the Escherichia coli K-12 Proteome under Two States of Growth. *Mol Cell Proteomics*, 2005 May 19; 10.1074/mcp.D500006-MCP200.
20. Broderick G, Craddock RC, Whistler T, Taylor R, Klimas N, Unger ER. Identifying illness parameters in fatigue syndromes using classical projection methods. *Pharmacogenomics*, 2006; **7(3)**: 407-419.
21. Whistler T, Craddock RC, Taylor R, Broderick G, Klimas N, Unger ER. Gene expression correlates of fatigue. *Pharmacogenomics*, 2006; **7(3)**: 395-405.
22. Craddock RC, Taylor R, Broderick G, Whistler T, Klimas N, Unger ER. Exploration of statistical dependence between illness parameters using the Entropy Correlation Coefficient. *Pharmacogenomics*, 2006; **7(3)**: 421-428.
23. Mueller TF, Einecke G, Reeve J, Sis B, Mengel M, Jhangri G, Bunnag S, Cruz, J, Wishart D, Meng C, Broderick G, Kaplan B, Halloran PF. Microarray analysis of rejection in human kidney transplants using pathogenesis-based transcripts sets. *Am J Transplant*, 2007; **7(12)**: 2712-2722.
24. Famulski KS, Broderick G, Einecke G, Hayl K, Cruz J, Sis B, Mengel M Halloran PF. Transcriptome analysis reveals heterogeneity in the injury response of kidney transplants. *Am J Transplant*, 2007; **7**: 1–13.
25. Einecke G, Broderick G, Sis B, Halloran PF. Early loss of renal transcripts in kidney allografts: relationship to morphologic changes and alloimmune effector mechanisms. *Am J Transplant*, 2007; **7(5)**: 1121–1130.
26. Ben-Zvi A, Vernon SD, Broderick G. Model-based Therapeutic Correction of Hypothalamic Pituitary Adrenal Axis Dysfunction. *PLoS Comput Biol*, 2008; **5(1)**: e1000273. doi:10.1371/journal.pcbi.1000273.



27. Aspler AL, Bolshin C, Vernon SD, Broderick G. Evidence of Inflammatory Immune Signaling in Chronic Fatigue Syndrome: A Pilot Study of Gene Expression in Peripheral Blood. *Behav Brain Funct*, 2008 Sep 26; **4(1)**: 44. doi:10.1186/1744-9081-4-44. [18 citations, May, 2011]
28. Fuite J, Vernon SD, Broderick G. Neuroendocrine and Immune Network Re-modeling in Chronic Fatigue Syndrome: An Exploratory Analysis. *Invited submission*, *Genomics* 2008; **92(6)**: 393-399. doi:10.1016/j.ygeno.2008.08.008 (issue cover).
29. Zhao J, Ridgway D, Broderick G, Kovalenko A, Ellison M. Extraction of elementary rate constants from global network analysis of E. coli central metabolism. *BMC Systems Biology*, 2008; **2**: 41, doi:10.1186/1752-0509-2-41.
30. Ridgway D, Broderick G, Ru'aini M, Winter P, Lopez-Campistrous A, Ellison MJ. Coarse-grained molecular simulation of diffusion and reaction kinetics in a crowded virtual cytoplasm. *Biophys J*, 2008 May 15; **94(10)**: 3748-59.
31. Broderick G, Fuite J, Kreitz A, Vernon SD, Klimas N, Fletcher MA. Formal Analysis of Cytokine Networks in Chronic Fatigue Syndrome. *Brain Behav Immun*, 2010 Oct; **24(7)**: 1209-17.
32. Fletcher MA, Zeng XR, Maher K, Levis S, Barry H, Antoni M, Broderick G, Klimas NG. Biomarkers in chronic fatigue syndrome: Evaluation of natural killer cell function and dipeptyl peptidase IV. *PLoS ONE*, 25 May, 2010; 10.1371/journal.pone.0010817.
33. Nakamura T, Schwander SK, Donnelly R, Ortega F, Togo F, Broderick G, Yamamoto Y, Cherniack NS, Rapoport D, Natelson BH. Cytokines across the night in chronic fatigue syndrome with and without Fibromyalgia. *Clin Vaccine Immunol*. 2010 Apr; **17(4)**: 582-7.
34. Fletcher MA, Rosenthal M, Antoni M, Ironson G, Zeng XR, Barnes Z, Harvey JM, Hurwitz B, Levis S, Broderick G, Klimas NG. Plasma neuropeptide Y: a biomarker for symptom severity in chronic fatigue syndrome. *Behav Brain Funct*, 2010 Dec 29; **6(1)**: 76.
35. Folcik VA, Broderick G, Mohan S, Block B, Ekbote C, Doolittle J, Khoury M, Davis L, Marsh CB. Using an agent-based model to analyze the dynamic communication network of the immune response. *Theor Biol Med Model*, 2011 Jan 19; **8**:1.
36. 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*. 2011 Feb; **25(2)**: 302-13.
37. Carruthers BM, van de Sande MI, De Meirleir KL, Klimas NG, Broderick G et al. Myalgic encephalomyelitis: International Consensus Criteria. *J Intern Med*. 2011 Oct; **270(4)**: 327-38.
38. Broderick G, Katz BZ, Fernandes H, Fletcher MA, Klimas NG, Smith FA, O'Gorman MRG, Vernon SD, Taylor R. Cytokine Expression Profiles of Immune Imbalance in Post-mononucleosis Chronic Fatigue. *J Transl Med*. 2012, **10**: 191.
39. Broderick G, Ben-Hamo R, Vashishtha S, Efroni S, Nathanson L, Barnes Z, Fletcher MA, Klimas NG. Altered Immune Pathway Activity under Exercise Challenge in Gulf War Illness: An Exploratory Analysis. *Brain Behav Immun*. 2013, **28**: 159-169.

40. Smylie AL, Broderick G, Fernandes H, Razdan S, Barnes Z, Collado F, Sol C, Fletcher MA, Klimas NG. A Comparison of Sex-specific Immune Signatures in Gulf War Illness and Chronic Fatigue Syndrome. BMC Immunol 2013, **14**:29.
41. Fritsch P, Craddock TJ, del Rosario RM, Rice MA, Smylie A, Folcik VA, de Vries G, Fletcher MA, Klimas NG, Broderick G. Succumbing to the laws of attraction: Exploring the sometimes pathogenic versatility of discrete immune logic. Sys Biomed 2013, **1(3)**:1.
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43. Vashishtha S, Broderick G, Craddock TJA, Fletcher MA, Klimas NG. Inferring Broad Regulatory Biology from Time Course Data: Have We Reached an Upper Bound under Constraints Typical of In Vivo Studies? PLoS ONE 2015, **10(5)**: e0127364.
44. Craddock TJA, Harvey JM, Nathanson L, Barnes ZM, Klimas NG, Fletcher MA, Broderick G. Using gene expression signatures to identify novel treatment strategies in gulf war illness. BMC BMC Med Genomics. 2015 Jul 9; **8(1)**: 36.
45. Craddock TJA, del Rosario R, Rice M, Zysman J, Fletcher MA, Klimas NG, Broderick G. Achieving Remission in Gulf War Illness: A Simulation-Based Approach to Treatment Design. PLoS ONE 2015 **10(7)**: e0132774.
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47. Rice M, del Rosario R, Craddock TJA, Barnes ZM, Klimas NG, Fletcher MA, Zysman J, Broderick G. Gulf War Illness: is There Lasting Damage to Endocrine-immune Circuitry? Sys Biomed 2016, **2(4)**: 80-89.
48. Harvey JM, Bowie A, Katz BZ, O’Gorman MRG, Taylor R, Fletcher MA, Klimas NG, Broderick G. Tracking Post-infectious Fatigue in Clinic using Routine Clinical Lab Tests. BMC Pediatrics 2016, **16**:54.
49. Barker TT, Barker GP, Russo SA, Rice MA Jr., Jeffrey MG, Broderick G, Craddock TJA. Do Lingering Effects of Multiple Concussions Exist? A Case Matched Design. PLoS ONE, 2016. [Under Review](#).
50. Nierenberg B, Cooper S, Feuer SJ, Broderick G. Applying Network Medicine to Chronic Illness: A Model for Integrating Psychology into Routine Care. Amer Psych, 2015. [Under review](#).
51. Toole JT, Rice MA Jr., Craddock TJA, Nierenberg B, Klimas NG, Fletcher MA, Zysman J, Morris M, Broderick G. Breaking away: the role of homeostatic drive in perpetuating depression. Clin Psychol Sci 2016, [Under review](#).

52. Lattie EG, Broderick G, Fletcher MA, Klimas NG, Antoni M. Symptom and Cytokine Modeling in Adult Women with Myalgic Encephalomyelitis/Chronic Fatigue Syndrome. *Brain Behav Immun* 2016, [Under review](#).
53. Cook DB, Light A, Light K, Broderick G, Shields MR, Dougherty RJ, Meyer JD, VanRiper S, Stegner AJ, Ellingson LD, Vernon SD. Functional Neural Consequences of Post-Exertion Malaise in ME/CFS. *TBD* 2016. [In preparation](#).
54. O'Callaghan JP, Kelly KA, Locker AR, Michalovicz L, Vrana KE, Broderick G, Sullivan K, Miller DB. The ALDH1L1 Bac-TRAP mouse as a tool to assess astrocyte specific transcriptome responses to neurotoxicity. *TBD* 2016. [In preparation](#)
55. Craddock TJA, Russell L Harvey JM, Singh SJ, Rice MA Jr., del Rosario RM, Klimas NG, Fletcher MA, Broderick G. Fire in the Head: Exploring the Role of Homeostatic Drive in the Perpetuation of Neuroinflammation and Brain Disorders. *PLoS One*. [In preparation](#)
56. Vashishtha S, Barnes ZM, Harvey J, Zeng XR, Collado F, Craddock TJA, Klimas NG, Fletcher MA, Broderick G. Subversion of immune communication during exercise in GWI. *Sci Rep*. [In preparation](#)
57. Vashishtha S, Russell G, O'Callaghan J, Miller DB, Fletcher MA, Klimas NG, Morris M, Broderick G. Tracking immune network response to stress and exposure across the blood-brain barrier. *J Neurochem* 2015. [In preparation](#)
58. Shinn E, Broderick G, Harris B, Fellman B, Urbauer D, Moulder S, Paterson D, Archer J, Hernandez L, Johnson A, Symmans WF. Time-dependent patterns of discontinuation from oral endocrine therapy in non-metastatic ER+ breast cancer patients. *TBD*. [In preparation](#).
59. Vashishtha S, Harvey J, Barnes ZM, Zeng XR, Craddock TJA, Klimas NG, Fletcher MA, Broderick G. Hot-wiring the immune communication networks in ME/CFS. *Brain Behavior and Immunity*. [In preparation](#).
60. Vashishtha S, Harvey J, Barnes ZM, Zeng XR, Klimas NG, Fletcher MA, Broderick G. Fatigue severity and cellular dynamics of immune response in ME/CFS. *TBD* [In preparation](#).
61. Barnes ZM, Broderick G, Vashishtha S, Russell L, Harvey JM, Klimas NG, Fletcher MA. Sex-hormone mediation of immune function as a driver of ME/CFS severity. *Brain Behavior and Immunity*. [In preparation](#).

Invited Reviews and Editorials:

62. Broderick G, Rubin E. The Realistic Modelling of Biological Systems: A Workshop Synopsis. *ComplexUs*, 2006; **3**: 217–230.
63. Ridgway D, Broderick G, Ellison MJ. Accommodating space, time and randomness in network simulation. Invited paper. *Curr Opin Biotechnol*, 2006; **17**: 1-6.
64. Broderick G, Fuite J, Kreitz A, Vernon SD, Klimas N, Fletcher MA. Circadian rhythms in cytokine secretion in chronic fatigue syndrome. *Brain Behav Immun*. 2010 Jun 19; **24**(7): 1219.

65. Broderick G. Observations on Rituximab's Early Success. Research 1<sup>st</sup>, The CFIDS Association of America. <http://www.research1st.com/2011/10/21/broderick/>
66. Klimas NG, Broderick G, Fletcher MA. Biomarkers for chronic fatigue. *Brain Behav Immun.* 2012; **26(8)**: 1202-10.
67. Broderick G, corresponding author with International Consensus Panel. Response to 'A controversial consensus'; By the International Consensus Panel. *J Intern Med.* 2012 Feb; **271(2)**: 213-7.
68. Broderick G. A moving target: taking aim at the regulatory dynamics of illness. *Brain Behav Immun.* 2012 Oct; **26(7)**: 1045-6
69. Broderick G, Craddock JA. Systems Biology of Complex Symptom Profiles: Capturing Interactivity across Behavior, Brain and Immune Regulation. *Brain Behav Immun.* 2013 Mar; **29**:1-8.

Book Chapters:

1. Broderick G, Fletcher MA, Gallgher M, Barnes Z, Vernon SD, Klimas NG. Exploring the Diagnostic Potential of Immune Biomarker Coexpression in Gulf War Illness. In: Yan Q. (Ed.), *Psychoneuroimmunology: Methods and Protocols (Methods in Molecular Biology)*, Springer, New York, NY, 2012, Part II, Chap. 8: 145-164.
2. Fletcher MA, Barnes Z, Broderick G, Klimas NG. Psychoneuroimmunology and Natural Killer Cells: The Chromium Release Whole Blood Assay. In: Yan Q. (Ed.), *Psychoneuroimmunology: Methods and Protocols (Methods in Molecular Biology)*, Springer, New York, NY, 2012, Part III, Chap. 16: 313-324.

Abstracts/ Proceedings:

Broderick G, Valade JL, Paris J. Identifying Dominant Process Factors in High Yield Sulphite Pulping Using a Plackett-Burman Design. Proc.41st Canadian Chemical Engineering Conf., Vancouver, Oct. 6-9, 1991: 19-5.  
Presented: Oral Podium Presentation.

Broderick G, Paris J, Valade JL. The Impact of Processing Conditions on Spent Sulphite Liquor Toxicity. Proc.43rd Canadian Chemical Engineering Conf., Ottawa, Ont., Oct. 3-6, 1993: 206.  
Presented: Oral Podium Presentation.

Broderick G, Tessier P. On-line Fibre Quality Sensors: What They Should Measure and Why. Pulp Expert User Seminar, Pulp Expert Oy, Montreal, September 30, 1996.  
Presented: Oral Podium Presentation.

Broderick G. PLS and Latent Vector Modelling: A Decision Support Tool. Technical Session, CPPA Process Control Committee, Vancouver, September 23, 1996.  
Presented: Oral Podium Presentation.

Tessier P, Broderick G, Desrochers C, Bussiere S. Motor Load and Freeness Control of Chemimechanical Pulp Refining: Industrial Results. European Control Conference, Brussels, Belgium, July 1-4, 1997.

Presented: Oral Podium Presentation.

Bolduc JS, Broderick G, Therien. From stability to tracking: Robustness of cellular automata based controllers. Proc. ICIPS '97, 1997 IEEE International Conference on Intelligent Processing Systems. Beijing, China, Oct. 28-31, 1997, vol. 1: 619 - 624.

Presented: Oral Podium Presentation.

Tessier P, Broderick G. Example Applications of Multivariate Statistical Analysis in the Pulp and Paper Industry. Proc. PAPTAC Conf., Montreal, January 31-Feb 4, 2000.

Presented: Oral Podium Presentation.

Graff S, Broderick G, Tessier P, Leger R. Predictive Models of Effluent Treatment at Fraser Paper in Edmundston. Proc. Tappi 2000 Environmental Conf., Denver, CO, May 7-10, 2000.

Presented: Oral Podium Presentation.

Pudlas M, Broderick G, Tessier P. Assessing Competitive Position Using Multivariate Statistical Analysis of Pulp Quality. Proc. PACWEST Conference 2000, Pulp and Paper Technical Assoc. of Canada, Jasper, A.B., June 1-4, 2000.

Presented: Oral Podium Presentation.

### *Life science works*

Ellison MJ, Broderick, G, Ru'aini M, Bottorff D, Weiner J. A massively Parallel Arithmetic Approach to Whole-cell Modelling in 4-D. First Int. E.coli. Alliance (IECA) Conference on Systems Biology, Tsuroka, Japan, June 23-25, 2003. Program and Abstracts: 24.

Presented: Oral Podium Presentation.

Broderick G, Ru'aini M, Ellison MJ. A Parallel Particle-based Approach to Whole-cell Modelling. Int. E.coli. Alliance (IECA) Conference on Systems Biology, Banff, Alberta, Canada, June 18-22, 2004; Program and Abstracts: 13.

Presented: Oral Podium Presentation

Lopez-Campistrous A, Semchuk P, Burke L, Palmer-Stone T, Garen G, Brox S, Broderick G, Bottorff D, Locke T, Weiner J. Localisation and Annotation of the Escherichia coli K-12 Proteome in the Presence and Absence of Amino Acids. Int. E.coli. Alliance (IECA) Conference on Systems Biology, Banff, Alberta, Canada, June 18-22, 2004.

Presented: Oral Podium Presentation.

Douglas DN, Lewis J, Broderick G, Bond D, Kneteman NM. Transcriptional profiling of HCV infection and treatment with interferon alpha in the chimeric mouse model for HCV infection. Proc. 3rd Int Dominique Dormont Conference: Viral Escape to Therapy in Chronic Infections, Ancienne Faculté de Médecine et de Pharmacie - Place de la Victoire, Bordeaux, France, Dec.7-9, 2006. Abstract O15: 38.

Presented: Oral Podium Presentation

Einecke G, Reeve J, Sis B, Broderick G, Halloran PF. The Alloimmune Response Induces Allospecific Changes of the Transcriptome within 24 Hours in Mouse Kidney Transplants. American Society of Nephrology, Renal Week 2006, San Diego, CA, Nov. 14-19, 2006.

Presented: Poster Presentation.

Broderick G, Einecke G, Famulski KS, Halloran PF. Dysregulation of Epithelial Repair Dynamics in Rejecting Mouse Kidney Transplants. American Society of Nephrology, Renal Week 2007, San Francisco, CA, October 31- November 5, 2007.  
Presented: Poster Presentation.

Broderick, G. Delayering the Data: Revealing Rejection in Human Kidney Transplants by isolating Gene Set Co-expression. Using the "Omic" technologies to Phenotype Disease: A Satellite Symposium of the 9th Banff Conference on Allograft Pathology. Edmonton, AB, June 18-19, 2007.  
Presented: Oral Podium Presentation

Broderick G, Einecke G, Mueller TF, Sis B, Halloran PF. Delayering the Data: Revealing Rejection in Human Kidney Transplants by Isolating Gene Set Co-Expression Patterns. American Transplant Congress, San Francisco, USA, May 5-9, 2007. Abstract 484: 273-274.  
Presented: Oral Podium Presentation

Einecke G, Broderick G, Sis B, Halloran PF. Early Loss of Renal Transcripts in Kidney Allografts: Epithelial Response to Injury and the Relationship to Morphologic Changes. American Transplant Congress, San Francisco, USA, May 5-9, 2007. Abstract 683: 325.  
Presented: Oral Podium Presentation

Broderick G, Schaefer C, Einecke G, Halloran PF. Identifying Changes in Gene Regulatory Motifs in Rejection of Human Kidney Transplants. Systems Biology: Global Regulation of Gene Expression, Cold Spring Harbor Laboratory, Long Island, N.Y., March 29 - April 1, 2007. Abstract 35.  
Presented: Poster Presentation.

Fuite J, Vernon SD, Broderick G. Neuro-endocrine and Immune Network Re-modeling in Chronic Fatigue Syndrome: An Exploratory Analysis. 7th Int. Conf. for the Critical Assessment of Microarray Data Analysis (CAMDA), Valencia, Spain, December 13-14, 2007. Abstract 32.  
Presented: Oral Podium Presentation.

Fuite J, Vernon SD, Broderick G. 2008. Understanding chronic fatigue using comparative cross-scale analysis of information networks. Systems Biology: Global Regulation of Gene Expression, Cold Spring Harbor Laboratory, Long Island, NY, March 27-30, 2008. Abstract 47.  
Presented: Poster Presentation.

Fuite J, Vernon SD, Broderick G. Re-modelling of neuroendocrine-immune interaction in Chronic Fatigue Syndrome. Department of Medicine Research Day, University of Alberta, Edmonton AB, May 29, 2008. Abstract 67.  
Presented: Poster Presentation.

Yang C, Vernon SD, Broderick G. Cognitive Performance in a Population-based Cohort of CFS Patients. 95th Annual Clinical Congress, American College of Surgeons, Chicago, IL, Oct. 11-15, 2009.  
Presented: Poster Presentation

Mueller T, Chen S, Broderick G, Luyckx V. Prediction Of The Ideal Post-Transplant Kidney Function For Living And Deceased Donor Organs. 2009 Organ Donation Congress, Berlin, Germany, Oct. 4-7, 2009; Abstract #88.  
Presented: Oral Podium Presentation.

Yang C, Vernon SD, Broderick G. Cognitive Performance in a Population-based Cohort of CFS Patients. 42nd Annual Summer Students Research Day, Faculty of Medicine and Dentistry, University of Alberta, Oct. 17, 2009. Poster 154.

Presented: Poster Presentation

Benz-Zvi A, Lee JM, Broderick G. An MPC-based Approach to Robust Control of a Hypothalamic-Pituitary-Adrenal Axis Model. 6<sup>th</sup> IFAC Symposium on Robust Control Design, Haifa, Israel, June 16-18, 2009: paper TuM1.1.

Presented: Oral Podium Presentation.

Broderick G, Fletcher MA, Vernon SD, Klimas N. Isolating Characteristic Immune Signals under Challenge in Gulf War Illness. Latest Research in Immunology, Int Assoc CFS/ME, Reno, NV, March 12-15, 2009. Abstract #3.

Presented: Oral Podium Presentation.

Broderick G, Fuite J, Fletcher MA, Vernon SD, Klimas N. Remodeling of Lymphocyte-cytokine networks in Gulf War Illness under Challenge. Latest Research in Immunology, Int Assoc CFS/ME, Reno, NV, March 12-15, 2009. Poster Abstract #1.

Presented: Poster Presentation.

Katz B, Fletcher MA, Taylor R, Vernon SD, Broderick G. Cytokine Expression as a Potential Prognostic Indicator in Post-infectious Fatigue. Special Symposium 11, Cytokines and Infectious Diseases, Joint Meeting of the International Cytokine Society (ICS) and International Society for Interferon and Cytokine Research (ISICR), Chicago, IL, Oct. 3-7, 2010. Abstract #1682.

Presented: Oral Podium Presentation.

Fletcher MA, Broderick G, Klimas N. Biomarkers for CFS/ME. International Science Symposium on ME/CFS. Bond University, Queensland, Australia. Dec. 3-4, 2010: 3-9.

Presented: Oral Podium Presentation.

Klimas N, Fletcher MA, Broderick G. A Systems Biology Approach to ME/CFS. International Science Symposium on ME/CFS. Bond University, Queensland, Australia. Dec. 3-4, 2010: 1.

Presented: Oral Podium Presentation.

Broderick G, Ben Hamo R, Efroni S, Katz BZ, O’Gorman MRG, Nathanson L, Fletcher MA, Vernon SD, Taylor R. Linking Lymphocyte Metabolites with Clinical Course in Post-Infectious Fatigue. 10th Int IACFS/ME Conf for Physicians and Healthcare Professionals, Ottawa, ON, September 22-25, 2011.

Presented: Oral Podium Presentation.

Broderick G, Ben Hamo R, Efroni S, Nathanson L, Fletcher MA, Vernon SD, Klimas N. Preferential Pathway Activation in Gulf War Veterans with Unexplained Neuroendocrine-immune Imbalances. 10th Int IACFS/ME Conf for Physicians and Healthcare Professionals, Ottawa, ON, September 22-25, 2011: Session #9, paper 77.

Presented: Poster Presentation.

Vashishtha S, Barnes ZM, Broderick G, Zeng XR, Klimas NG, Fletcher MA. Lymphocyte population dynamics in Gulf War Illness during exercise challenge: a network analysis. ICCS 2013, the 28th International Clinical Cytometry Meeting, Fort Lauderdale, FL, October 11-15, 2013: Poster session II, poster #18.

Presented: Poster Presentation.

Harvey JM, Barnes ZM, Plitnik T, Broderick G, Zeng XR, Klimas NG, Fletcher MA. Mixed lymphocyte response to exogenous IL-15 in Gulf War Illness and Myalgic Encephalomyelitis/Chronic Fatigue Syndrome. ICCS 2013, the 28th International Clinical Cytometry Meeting, Fort Lauderdale, FL, October 11-15, 2013: Poster session II, poster #20.

Presented: Poster Presentation.

Vashishtha S, Harvey JM, Barnes ZM, Zeng XR, Klimas NG, Fletcher MA, Broderick G. Hot-wiring the immune communication network in ME/CFS. IACFS/ME 11th Biennial Int. Research and Clinical Conference: Translating Science into Clinical Care. San Francisco, CA, March 20-23, 2014. Poster session.

Presented: Poster Presentation.

DeGraff S, Russell L, Medow M, Stewart J, Klimas NG, Broderick G. A Model-based Exploration of Cardiovascular Deficiency in Chronic Fatigue Patients with Orthostatic Intolerance. IACFS/ME 11th Biennial Int. Research and Clinical Conference: Translating Science into Clinical Care. San Francisco, CA, March 20-23, 2014. Poster session.

Presented: Poster Presentation.

Craddock TJA, Fritsch P, Rice MA Jr., del Rosario RM, Miller DB, Fletcher MA, Klimas NG, Broderick G. Succumbing to the Laws of Attraction: Gender Differences in Homeostatic Drive and the Perpetuation of Chronic Illness. IACFS/ME 11th Biennial Int. Research and Clinical Conference: Translating Science into Clinical Care. San Francisco, CA, March 20-23, 2014. Poster session.

Presented: Poster Presentation.

Fritsch P, Craddock TJA, del Rosario RM, Rice Jr MA, Smylie AL, Folcik VA, Fletcher MA, Klimas NG, de Vries G, Broderick G. Getting Down to Detail: Exploring the Sometimes Pathogenic Versatility of Discrete Immune Logic. IACFS/ME 11th Biennial Int. Research and Clinical Conference: Translating Science into Clinical Care. San Francisco, CA, March 20-23, 2014. Poster session.

Presented: Poster Presentation.

Fernandes H, Harvey JM, Barnes ZM, Smylie AL, Jo YS, Razdan S, Collado F, Sol C, Balbin EG, Klimas NG, Fletcher MA, Broderick G. Chasing a Shifting Immune Baseline in Women with Chronic Fatigue Syndrome. IACFS/ME 11th Biennial Int. Research and Clinical Conference: Translating Science into Clinical Care. San Francisco, CA, March 20-23, 2014. Poster session.

Presented: Poster Presentation.

Harvey JM, Hwang M, Vashishtha S, Barnes ZM, Klimas NG, Fletcher MA, Broderick G. Sex-hormone mediation of immune function as a driver of ME/CFS severity. IACFS/ME 11th Biennial Int. Research and Clinical Conference: Translating Science into Clinical Care. San Francisco, CA, March 20-23, 2014. Poster session.

Presented: Poster Presentation.

Vashishtha S, Harvey JM, Barnes ZM, Zeng XR, Klimas NG, Fletcher MA, Broderick G. Fatigue severity and cellular dynamics of immune response in ME/CFS. IACFS/ME 11th Biennial Int. Research and Clinical Conference: Translating Science into Clinical Care. San Francisco, CA, March 20-23, 2014. Poster session.

Presented: Poster Presentation.



Bowie A, Harvey JM, Katz BZ, Smith FA, O’Gorman MRG, Taylor R, Fletcher MA, Klimas NG, Broderick G. Tracking Post-infectious Fatigue in Clinic using Routine Clinical Lab Tests. IACFS/ME 11th Biennial Int. Research and Clinical Conference: Translating Science into Clinical Care. *Session: Advances in Pediatric ME/CFS Research - Part I*. San Francisco, CA, March 23, 2014.

Presented: Oral Podium Presentation.

Craddock TJA, Harvey JM, Singh SJ, Rice MA Jr., del Rosario RM, Klimas NG, Fletcher MA, Broderick G. Fire in the Head: Exploring the Role of Homeostatic Drive in the Perpetuation of Neuroinflammation and Brain Disorders. Miami 2014 Winter Symposium: The Molecular Basis of Brain Disorders, Miami, FL, January 26-29, 2014. Poster session 2.

Presented: Poster Presentation.

Patel G, Barker T, Craddock TJA, Fletcher MA, Klimas NG, Broderick G, Morris M. A Pilot Analysis of the Effect of Past Traumatic Events on the Neuroendocrine-Immune system and Behavior in Male Subjects with Gulf War Illness. Anxiety and Depression Conference 2015, Miami, Florida, April 9-12, 2015

Presented: Poster Presentation.

Toole JT, Craddock TJA, Rice, MA Jr., Broderick G, Klimas NG, Fletcher MA, Morris M. Exploring the Role of Homeostatic Drive in the Perpetuation of Depression and Anxiety Disorders. Anxiety and Depression Conference 2015, Miami, Florida, April 9-12, 2015

Presented: Poster Presentation.

Barker T, Russo S, Patel G, Broderick G, Craddock TJA. The Effect of Concussion History and Gender on Symptoms of Depression and Anxiety. Anxiety and Depression Conference 2015, Miami, Florida, April 9-12, 2015

Presented: Poster Presentation.

Patel G, Barker T, Craddock TJA, Fletcher MA, Klimas NG, Broderick G, Morris M. Past Traumatic Events’ Effect on Neuroendocrine-Immune System and Well-Being in Veterans With GWI. 2015 American Psychological Association Conference, *Session 2117 Part I - Military*, Toronto, Ontario, Canada, August 6-9, 2015. Poster M-3.

Presented: Poster Presentation.

Toole JT, Craddock TJA, Rice, MA Jr., Broderick G, Klimas NG, Fletcher MA, Morris M. Homeostatic Drive and the Perpetuation of Depression and Anxiety. 2015 American Psychological Association Conference, *Session 1179: Behavioral Neuroscience and Comparative Psychology*, Toronto, Ontario, Canada, August 6-9, 2015. Poster A-8

Presented: Poster Presentation.

Barker T, Russo S, Patel G, Broderick G, Craddock TJA. Examination of Concussion History and Gender’s Effect on Symptoms of Depression and Anxiety. 2015 American Psychological Association Conference, *Session 4058 Part II - Clinical Neuropsychology*, Toronto, Ontario, Canada, August 6-9, 2015. Poster Q-7.

Presented: Poster Presentation.

Broderick G, Toole JT. Recent Findings in Network Medicine: Implications for Psychology. 2015 American Psychological Association Conference, *Session on Optimizing Patient Outcome - The*

*Role of Psychology in Applying A Network Medicine Model*, Toronto, Ontario, Canada, August 6-9, 2015.

Presented: Oral Podium Presentation.

Broderick G. Integration and Context in Complex Illness: A Biobehavioral Systems Approach. 2015 American Psychological Association Conference, *Session 1300: Biobehavioral Assessment and Intervention for Complex Medical Illness*, Toronto, Ontario, Canada, August 6-9, 2015.

Presented: Oral Podium Presentation.

Barnes ZM, Eugene G, Urban J, Nathanson L, Waziry P, Harvey JM, Craddock TJA, Broderick G, Klimas NG, Fletcher MA. Markers of microbial translocation in myalgic encephalomyelitis / chronic fatigue syndrome. Miami Winter Symposia 2016, Miami, FL, Jan. 24-27, 2016; Abstr. MIAM2016\_0263.

Presented: Poster Presentation.

Govindan R, Barnes ZM, Jo Y, McKean R, Harvey JM, Craddock, TJ, Klimas NG, Broderick G, Fletcher MA. Seeking a quantitative method to determine HHV-6 IgG antibody levels using qualitative ELISA. Miami Winter Symposia 2016, Miami, FL, Jan. 24-27, 2016; Poster P185.

Presented: Poster Presentation

Jeffrey MG, Nathanson L, Barnes ZM, Fletcher MA, Klimas NG, Broderick G, Craddock TJA. Gene expression modules in chronic fatigue syndrome: Interactions of the inflammatory and immune system. Miami Winter Symposia 2016, Miami, FL, Jan. 24-27, 2016; Poster P126

Presented: Poster Presentation.

Broderick G, Holovatyk A, Vashishtha S, Toole JT, Nierenberg BP. Reconciling Discrepancies in the Obesity Literature. American Psychological Association 2016 convention, *Session 16588: Applying Network Medicine: Reconciling Discrepancies in the Obesity and Chronic Pain Literature*, Denver, CO, Aug. 4-7.

Presented: Oral Podium Presentation

Holovatyk A, Broderick G, Nierenberg B. Hope: A Discriminating Variable Among Control, Overweight, and Obese Groups. American Psychological Association 2016 convention, Denver, CO, Aug. 4-7, 2016; Poster XX

Presented: Poster Presentation

Vashishtha S, Russell L, Michalovicz L, Kelley KA, Vrana JA, Locker AR, Barnes ZM, Craddock TJA, Fletcher MA, Klimas NG, Miller D, O'Callaghan J, Morris M, Broderick G. Stress Potentiation of the Brain's Immune Response to Neurotoxic Exposure in the Field: An Animal Model. Int Soc for Traumatic Stress Studies (ISTSS)/ Canadian Inst for Military Veteran's Health Research (CIMVHR) Meeting, *Traumatic Stress Research: Enabling Bedside Implementation*, Toronto, Canada, May 9-10, 2016. (poster board #3)

Presented: Poster Presentation

Toole JT, Rice MA jr., Nierenberg B, Craddock TJA, Fletcher MA, Klimas NG, Zysman J, Morris M, Broderick G. Increasing Resilience to Traumatic Events: Simulating the Protective Role of Well-Being. Int Soc for Traumatic Stress Studies (ISTSS)/ Canadian Inst for Military Veteran's Health Research (CIMVHR) Meeting, *Traumatic Stress Research: Enabling Bedside Implementation*, Toronto, Canada, May 9-10, 2016.

Presented: Poster Presentation

Michalovicz LT, Kelly KA, Locker AR, Vrana JA, Broderick G, Miller DB, O'Callaghan JP. Using novel ALDH1L1 bacTRAP technology to evaluate the astrocyte-specific responses to Gulf War Illness-related exposures. Society for Neuroscience: Neuroscience 2016. San Diego, CA, Nov 12-16.

Presented: Poster Presentation

Kelly KA, Locker AR, Michalovicz LT, Vrana JA, Vashishtha S, Broderick G, Miller DB, O'Callaghan JP. A mouse model of Gulf War Illness reveals a primed neuroinflammatory response to subsequent systemic inflammatory challenge. Society for Neuroscience: Neuroscience 2016. San Diego, CA, Nov 12-16.

Presented: Poster Presentation

Russell L, Broderick G, Harvey JM, Barnes ZM, Collado F, Balbin E, Klimas NG, Fletcher MA. Exploring the role of sex hormones in driving symptom severity in ME/CFS. 2016 Canadian Society of Internal Medicine (CSIM) Annual Meeting. Montreal, QC, Oct. 27.

Presented: Poster Presentation.

Cournoyer J, ... Broderick G, ... The Use of the Respiratory Exchange Ratio in Assessing the Metabolic Efficiency of Patients with ME/CFS and GWI. IACFS/ME12th International IACFS/ME Research and Clinical Conference: Emerging Science and Clinical Care. Fort Lauderdale, FL, October 27-30, 2016.

Presented: Poster Presentation

Russell L, Broderick G, Harvey JM, Barnes ZM, Collado F, Balbin E, Klimas NG, Fletcher MA. Exploring the Role of Sex Hormones in Driving Symptom Severity in ME/CFS. IACFS/ME12th International IACFS/ME Research and Clinical Conference: Emerging Science and Clinical Care. Fort Lauderdale, FL, October 27-30, 2016.

Presented: Oral Podium Presentation

Kelly K, Michalovicz L, Broderick G, Morris M, Klimas NG, Miller D, O'Callaghan J. Resetting homeostasis in Gulf War Illness, a computational biology hypothesis tested in a translational mouse model. Society of Toxicology 56th Annual Meeting, Baltimore, MD, March 12–16, 2017.

### **Invited International Scientific Presentations.**

Broderick G. A Parallel Particle-based Approach to Whole-cell Modelling. Invited Speaker, Banbury Centre Conference on Integrating Disparate Data to Simulate Lymphocyte Function, Cold Spring Harbor Laboratory, Long Island, N.Y., Sept. 19-22, 2004; Closed session.

Broderick G. CFS: From Constructs to Mechanisms", Invited Speaker, CDC Computational Challenge, Banbury Centre Workshop, From Markers to Models: Integrating Data to Make Sense of Biologic Systems, Cold Spring Harbor Laboratory, Long Island, N.Y., Sept. 18-21, 2005; Closed session.

Broderick G. The Virtual Cell Model: Exploring Emergent Behaviour in Nature's Inherent Integration Milieu, Invited Speaker, Realistic Modelling of Biological Systems: A First International Workshop, Weizmann Inst. of Science, Rehovot, Israel, May 2-4, 2005.

Broderick G. Integrating a Model Biological Membrane and Virtual Cytoplasm. Invited Speaker, Realistic Modelling of Biological Systems: A First International Workshop, Weizmann Inst. of Science, Rehovot, Israel, May 2-4, 2005.

Broderick G. Building a Large-scale Functional Model of a Biological Membrane. Invited Speaker, Faculty Talk, Center for Complexity Science, Weizmann Inst. of Science, Rehovot, Israel, May 1, 2005.

Broderick G. Composite Features of Fatigue. Invited Speaker, Computational Challenge, US Centers for Disease Control and Prevention (CDC), Atlanta, GA, March 15, 2006.

Broderick G, Ben-Zvi A, Aslakson E, Klimas N, Vernon SD. An MPC-guided Approach for the Regulation of Cortisol in a Hypothalamic-pituitary-adrenal Axis Model. Centers for Disease Control and Prevention (CDC), Atlanta, Georgia, Aug. 29, 2007.

Broderick G, Bolshin C, Aspler AL. Evidence of Lymphocyte Imbalance in Wichita Study of CFS sufferers. US Centers for Disease Control and Prevention (CDC), Atlanta, GA, August 27, 2007.

Klimas N, Fletcher MA, Broderick G. Gulf War Syndrome: A Systems Biology Approach. **Keynote address**, Acad. Behavioral Medicine Ann. Meeting, Lake Louise, AB, June 14-16, 2008.

Vernon SD, Fuite J, Broderick G. Genetic Variation and Altered Immune Activity in Chronic Fatigue Syndrome. 6<sup>th</sup> Int Conf HHV-6 Foundation, Int Symp on Viruses in Chronic Fatigue Syndrome and Post-viral fatigue, Baltimore, MD, June 22-23, 2008.

Vernon SD, Fuite J, Broderick G. Neuroendocrine and Immune Network Re-modeling in Chronic Fatigue Syndrome. Integrative Neural Immune Interest Group (INIIG) Lecture Series, National Institute of Mental Health, Bethesda, MD, March 4, 2008.

Broderick G. Agent-based Models in Medicine: the Promise and the Challenges. **Keynote** speaker. SwarmFest 2008, Northwestern University Feinberg School of Medicine, Chicago IL, May 12-13, 2008.

Broderick G. Subtle Immune Signatures in Chronic Fatigue Syndrome and Gulf War Illness. From Infection to Neurometabolism: A Nexus for CFS. The Banbury Centre, Cold Spring Harbor Laboratory, Long Island, NY, Sept. 13-16, 2009; Closed session.

Broderick G, Klimas N. Immune Network Dysfunction in Gulf War Illness. Research Advisory Committee, U.S. Department of Veterans Affairs, Boston, MA, June 29-30, 2009.

Broderick G. Chronic Fatiguing Illnesses: Immune Signatures and Beyond. Research Roundtable Guest Speaker. The CFIDS Association of America, Chicago, IL, May 3, 2009.

Broderick, G. Molecular Profiling of Post-infectious fatigue. Expanding Research: Building on your Investment. CFIDS Association Outreach Webinar, Oct. 5, 2010.

Broderick, G. Networked Regulatory Systems in Complex Illness. Developmental Center for AIDS Research. University of Miami, Miami, FL, February 16, 2010.

Broderick, G. A Systems Biology Approach to Understanding Homeostasis Reset - the CFS/GWI Experience. John P. Hussman Institute for Human Genomics, University of Miami, Miami, FL, February 16, 2010.

Broderick, G. Shifting Immune Conversations: A Systems Biology Approach to Gulf War Illness and CFS/ME. US Veterans Affairs, Miami Veterans Affairs Medical Center, Miami, FL, March 26, 2011.

Broderick, G. Immune System Dynamics in CFS/ME. State of Knowledge Workshop on Myalgic Encephalomyelitis/Chronic Fatigue Syndrome (ME/CFS) Research. US National Institutes of Health (NIH), Bethesda, MD, April 7-8, 2011.

Broderick, G. From Cytokines to Cells to Gene Expression: An Integrative Approach to the Study of Gulf War illness. Research Advisory Committee, U.S. Department of Veterans Affairs, Washington, DC, June 27-28, 2011.

Broderick, G. A System Biology Perspective of CFS. Meeting of the Scientific Advisory Board of the CFIDS Association of America, The Banbury Centre, Cold Spring Harbor Laboratory, Long Island, NY, Sept. 26-27, 2011; Closed session.

Broderick, G. Circuit Analysis for Intervention Design. Meeting of the Scientific Advisory Board of the CFIDS Association of America, The Banbury Centre, Cold Spring Harbor Laboratory, Long Island, NY, Sept. 30-Oct. 3, 2012; Closed session.

Broderick G, Fletcher MA. Introducing the new GWI Consortium. Inaugural Patient Conference, Institute for Neuro Immune Medicine, Nova Southeastern University, Fort Lauderdale, FL., January 26, 2013.

Barnes Z, Fletcher, MA, Broderick G, Klimas NG. The Use of Multiplex Cytokine Analysis in Complex Multisystem Disorders. Invited speaker, Closed meeting, Quansys Biosciences, Logan, Utah, March 10, 2013.

Klimas NG, Fletcher MA, Broderick G. A Translational Medicine Approach to ME/CFS Using Computational Modeling for Selecting Subgroups and Therapeutic Targets: A P01 Outline. Reverse site visit to Dr. Timothy A. Gondré-Lewis, Ph.D., Program Officer/COR Immunoregulation Section, Basic Immunology Branch Division of Allergy, Immunology, and Transplantation. US National Institute of Allergy and Infectious Diseases (NIAID), Bethesda, MD, Feb. 13, 2013

Broderick G, Using Systems Thinking to Capture Interactivity and Complexity. Meeting on Mechanisms of Accelerated Aging in Cancer Survivors. US National Cancer Institute (NCI), Rockville, MD, Sept. 25-27, 2013.

Broderick G, Craddock TJA, Identifying therapeutic strategies in Gulf War Illness with systems biology. Meeting of GWI Research Advisory Committee, U.S. Department of Veterans Affairs, Washington, DC, January 7-8, 2014.

Broderick G., Klimas NG: Briefing on research in translation medicine on Gulf War Illness to the staff of **Senator Bernard "Bernie" Sanders** from Vermont, Washington, DC, January 8, 2014.

Broderick G, Mapping the immune connectome to treat disease: Simulating virtual interventions. Invited Guest Lecture, US Centers for Disease Control and Prevention (CDC), National Institute for Occupational Safety and Health (NIOSH), Morgantown, WV, February 25, 2015.

Broderick G, Navigating the Networked Biology of Complex Chronic Illness. Invited Guest Lecture. Rochester General Hospital Research Institute, Rochester, NY, July 20, 2016.

### **Invited National/Regional/Local Presentations**

Broderick G, Ru'aini M, Winters P, Chan E, Ellison MJ. Towards a Life-like Virtual Cell Using Discrete Automata. Departmental Seminars in Chemical and Materials Engineering, University of Alberta, Edmonton, Alberta, Canada, December 2, 2004.

Broderick G. The Virtual Cytoplasm: Exploring Complex Intra-cellular Kinetics. Department of Mathematical & Statistical Sciences, University of Alberta, Edmonton, Alberta, Canada, Feb. 27, 2006.

Broderick G, Schaefer CF, Einecke G, Halloran PF. Identifying Changes in Gene Regulatory Motifs in Rejection of Human Kidney Transplants, Department of Biochemistry, University of Alberta, Edmonton, Alberta, Canada, Jan. 25, 2008.

Broderick G. Discovery Learning: A Preceptor's Impressions. Academic Half-day, Geriatric Division, Glenrose Rehabilitation Hospital, Edmonton, AB, June 16, 2009.

Broderick G. CFS/ME Lifting the Veil on a Complex Illness. Guest Speaker, M.E. Awareness Day, M.E. Society of Edmonton, Edmonton, AB, May 11, 2009.

Broderick G. Shifting Immune Conversations in Complex Chronic Illness: An Information Network Perspective. Dept. of Epidemiology and Community Health, University of Ottawa, Dec. 6, 2010.

Broderick G. CFS/ME Out of the Shadows. Guest Speaker, M.E. Awareness Day, M.E. Society of Edmonton, Edmonton, AB, May 12, 2010.

Broderick G., ME/ CFS: Identifiable, Treatable, Fundable. Invited report to the **Chief Medical Officer**, Alberta Health Services, Edmonton, AB, May 10, 2013.

Broderick G. ME/ CFS: Identifiable, Treatable, Fundable. Invited Speaker, **Members of Canadian Parliament and Senate**, Parliament Hill, Ottawa, ON, May 7, 2013.

Broderick G. ME/ CFS: Identifiable, Treatable, Fundable - A Cross-border Perspective. Invited Speaker, **Public Health Agency of Canada, Canadian Institutes of Health Research**, PHAC Offices, Ottawa, ON, May 12, 2014.

Broderick G. Simulating the systems biology of immune therapy. Guest faculty seminar, Department of Cell and Systems Biology, University of Toronto Scarborough, Scarborough, ON, April 30, 2015.

Broderick G. ME/ CFS: A Path Forward. Invited Speaker, **Members of Canadian Parliament and Senate**, Parliament Hill, Ottawa, ON, May 12, 2016.

## **Patents.**

Broderick G, Lanouette R, Valade JL, 1995. Optimal Energy Refining Method for the Mechanical Treatment of Wood Fibres. Canadian patent 2,150,647 (November 30, 95), U.S. patent 5,540,392 (July 30, 1996).

Ellison MJ, Broderick G, Ru'aini M, Bottorff D, Wishart D, 2004. System and Method for Simulating Living Cell Processes. Patent Cooperation Treaty PCT/CA2004/000369 (May 5, 2004), U.S. provisional patent appl. #60/453,257 (March 10, 2003).

Broderick G, Ru'aini M, Ellison MJ, 2004. System and Method for Simulating Biological Cell Membrane Processes. Patent Cooperation Treaty PCT/CA2005/000795 (May 25, 2005), U.S. provisional patent appl. #60/575,089 (May 28, 2004).

Fletcher MA, Broderick G, Klimas NG, 2013. Dysregulation of Cytokines in Gulf War Illness and Myalgic Encephalomyelitis/Chronic Fatigue Syndrome (ME/CFS). U.S. provisional patent appl. #61890297 (October 13, 2013). International Patent Cooperation Treaty (PCT) Publication Number WO 2015/054701 A2 (Filed October 14, 2014; published April 16, 2015).

## **Media Coverage.**

Interview with scientific visualisation results used by Hapgood F. A Microbe Enters the Matrix: How model bacteria will transform biology. Wired Magazine. Issue 11.09 | September 2003.

Interviewed and quoted by Constans A. Pharma companies turn to computer simulations to complement experimentation and trial design. Regarding massively parallel computer model of whole cell molecular mechanics - Project CyberCell. Desktop Drug Discovery. The Scientist 2004, 18(4): 33. (<http://www.the-scientist.com/article/display/14482/#ixzz1K5sjuFJU>)

Press release announcing award of CFIDS Association grant to PI Broderick for the study of post-infectious fatigue. Picked up by 75 news outlets including Reuters, AOL Money News, Forbes, the Los Angeles Times and Houston Chronicle among others. December 3, 2008.

Interview with Mr. Kirk Fernandes, Medical Unit Producer, The Dr. Oz Show, as part of background research for segment on XMRV and viral triggers of chronic fatigue syndrome. November 2, 2009. (Aired December 3, 2009).

Interviewed and quoted by Zdeb C, Waking up to the reality of chronic fatigue. Describing his new study of EBV-induced metabolic and immune dysfunction. Canwest News Service, Published: Saturday, April 18, 2009 in Edmonton Journal and affiliated CanWest newspapers.

Correspondence regarding research into post-infectious fatigue with Diane R. Bean, Senior Coordinator, International Programs Division, Office of Policy and Public Affairs, Bureau of Consular Affairs, U.S. Department of State. February 5, 2009.

Press release by Public Library of Science (PLOS), via EurekAlert! Newswire, a service of AAAS. Reported by several subscribing news outlets such as the Washington Post: Tweaking Hormones Might Ease Chronic Stress. January 27, 2009.

Interviewed live on the air as invited guest on Peter Brown show RadioActive CBC Radio, regarding his new US award to study of post-infectious fatigue syndrome, CBC Studios, Edmonton, January 8, 2009.

Interview with Amy Dockser Marcus (Pulitzer Prize 2005, Beat Reporting), Wall Street Journal, January 13, 2011, regarding the latest discoveries in chronic fatigue research and the promise of a systems biology approach to diagnosis and treatment.

Interview with Ryan Prior (writer/ film-maker USA Today), ME/CFS documentary “The Blue Ribbon”, October 25, 2013, regarding the new Institute for Neuro-immune Medicine and the Clinical Systems Biology group in energizing discovery in chronic fatigue research.

Interview with Nicole Grether, Field Producer for **Al Jazeera America**, December 9, 2013, ‘Chronic fatigue syndrome activists launch 'uprising' from their beds’, aired on America Tonight news show, January 3, 2014, regarding the new Institute for Neuro-immune Medicine and related to the documentary ‘Canary in a Coal Mine’ by Jennifer Brea.

Broderick lab featured in International Innovations magazine, Research Media EU, Feb. 2014: 78-81.

Interview with Rob Wijbenga, Chair to the ME/cvs Vereniging, Netherlands. ME/CFS outreach project “Science to Patients”, subsidized by the Dutch Ministry of Health, October TBD, 2014, regarding the new Institute for Neuro-immune Medicine and the Clinical Systems Biology group in energizing discovery in chronic fatigue research.

Broderick lab and Institute for Neuro-immune Medicine profiled in feature-length documentary by Coqui Pictures/ Electric Puzzle Productions entitled “The Forgotten Plague: M.E. and the Future of Medicine”. Directed and Produced by Ryan Prior and Nicole deCastillo. Premiered at the Chinese Theater in Hollywood, California, Oct. 26, 2015.

Broderick lab featured at eMerge Americas, an innovation event connecting revolutionary startups, cutting-edge ideas, and global industry leaders & investors across North America, Europe, and Latin America. “Complex Illness and the Human Computer“, May 1-5, 2015.