

**WINDWARD  
ISLANDS  
RESEARCH  
& EDUCATION  
FOUNDATION**



*2017 Annual Report*



Cover Photo: Three simultaneous hurricanes active on 8 September 2017 – Katia (left), Irma (center), and Jose (right) – the first such occurrence since 2010. While Grenada was spared, the 2017 Atlantic hurricane season was a devastating one for the northern Caribbean. It was the costliest season on record, with an estimated \$296 billion USD in damages. WINDREF supports climate change mitigation and adaptation activities in the Caribbean through its partnership with the United Nations Framework Convention on Climate Change (UNFCCC) Secretariat and the St. George’s Regional Collaboration Center (RCC) located on the SGU campus.



### **Mission Statement**

WINDREF seeks to advance health and sustainable environmental development through multi-disciplinary research and education programs. WINDREF strives for program excellence by promoting collaborative relationships between internationally recognized scholars and regional scientists, and by adhering to the highest ethical and academic standards in the design and conduct of research.

### **Goals**

- To provide a scientific resource centre capable of coordinating international collaborative research of the highest caliber in the areas of medicine, medical and veterinary public health, environmental health, anthropology, sociology, ecology, marine and terrestrial biology, and ethics.
- To provide a first rate academic opportunity to scientists from the Caribbean and around the world through unique research opportunities that enhances the knowledge and welfare of local and international communities.
- To conduct applied scientific research for the benefit of community and health development at the local, national and international levels.
- To share relevant scientific information with local and international communities in the pursuit of evidence-based policies.

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## Director's Report on WINDREF Activities in 2017

2017 saw a further expansion and consolidation of projects conducted by WINDREF. We welcomed Dr. Joseph Childers (figure 1) to the WINDREF Board of Directors. Dr. Childers currently serves as the Provost of St. George's University (SGU) and brings a wealth of experience in Research from his previous positions and in particular as the Dean of the School of Graduate Studies at the University of Riverside, California. During the year, a number of new Research Scientists were appointed to the Research Institute and they are listed in this Annual Report.



(Figure 1) Dr. Joseph Childers, appointed as a Member of the WINDREF Board of Directors

WINDREF lost three of its valuable members in 2017 including our former President, Lord Soulsby of Swaffam Prior (**23<sup>rd</sup> June 1926 – 8<sup>th</sup> May 2017**), who was instrumental in establishing WINDREF's reputation in the United Kingdom (figure 2). His obituary in The UK Times can be found at <https://www.thetimes.co.uk/article/lord-soulsby-of-swaffam-prior-obituary-39mcccc33>. We also lost Sir Kenneth Stuart (**16<sup>th</sup> June 1920 – 11<sup>th</sup> November 2017**) who's obituary in The Times can be found at <https://www.thetimes.co.uk/article/sir-kenneth-stuart-6xkqkskdr>

(figure 2); and Dr. John Zabriskie (1928 – 17<sup>th</sup> August 2017) who served on WINDREF's Scientific Advisory Board (figure 3). Their combined considerable contributions to WINDREF provided much of the guidance for the Foundation in its formative years. All of their obituaries are on the WINDREF website at <http://www.windref.sgu.edu/news/news-archives.html>. We are deeply saddened by their passing and our thoughts are with their family members.



(Figure 2) Lft. to rt. back row: Dean Allen Pensick, Dr. Keith Taylor, Dean Margaret Lambert, Sir Kenneth Stuart, Baroness Howells of St. David, Mr. Trevor Noël Lft. to rt. front row: Lord Soulsby, (Recipient of the 2006 Mike Fisher Memorial Award), Lady Soulsby, Hon. Ann David-Antoine, (Minister of Health), Dr. Eric Ottesen, (7th WINDREF Lecturer), Dean Calum Macpherson



(Figure 3) Dr. John Zabriskie

During the year, Dr. Trevor Noël, Deputy Director of WINDREF, completed his PhD on the elimination of soil transmitted helminths in Grenada (figure 4), and his report is presented in the Annual Report.



(Figure 4) Dr. Trevor Noël

WINDREF's President, Baroness Howells of St. David, hosted our 4<sup>th</sup> Sports for Health dinner at the House of Lords entitled "Global Health: Looking for the Future". This evening was sold out and attended by many members from the House as well as a number of Vice Chancellors and Deans from other academic institutions. One of the many celebrities attending the dinner was Dr. Johnson Beharry, VC who signed an oil painting depicting a Beharry Heliconia which had been presented to the dinner for a silent auction by Meghan Tyrrell (figure 5). The Keynote Speaker at the dinner was Professor David Heymann, MD, PhD, CBE, DTM&H, Professor of Infectious Disease Epidemiology at the London School of Hygiene and Tropical Medicine and the former Chairman of Public Health England, and Assistant Director General of the World Health Organization for Health Security and the Environment. During the dinner, the 16<sup>th</sup> & 17<sup>th</sup> Mike Fisher Memorial Awards were presented to

Professor Sir Gordon Conway and Chancellor Charles R. Modica respectively. The Mike Fisher Memorial Award, awarded annually since 2006, acknowledges the work of the late Mike Fisher who was Vice President of Research at the pharmaceutical company, Merck, whose original research led to the discovery of the drug ivermectin, which has saved 35 million people in developing countries from blindness and disfigurement and provided domestic animals and livestock with healthier lives. In 2015, William C. Campbell who worked in the laboratory at Merck under the direction of Mike Fisher and Satoshi Omura who supplied the samples from Japan, jointly received the 2015 Nobel Prize for Medicine or Physiology for the discovery of ivermectin.



(Figure 5) Dr. Beharry with the painting of the Beharry Heliconia standing next to Dr. Trevor Noël (left), Dr. Cal Macpherson (right) and Dr. Brad Noël.

Professor Sir Gordon Conway pioneered the sustainable agriculture developing integrated pest management programs for the State of Sabah in Malaysia. He joined Imperial College in 1970 setting up the Centre for Environmental Technology. In the 1970s/1980s he worked in Asia and the

Middle East, for the Ford Foundation, World Bank and USAID. He served as Vice-Chancellor of the University of Sussex and Chair of IDS. From 1998-2004 he was President of the Rockefeller Foundation and from 2004- 2009 Chief Scientific Adviser to DFID and President of the Royal Geographical Society. He is the author of *“The Doubly Green Revolution: Food for all in the 21st Century”* and co-authored Science and Innovation for Development. His most recent book is entitled *“One Billion Hungry: Can we Feed the World?”*.

Chancellor Modica, the founder, 40 years ago, of St George’s University, received the award in recognition of his vision in founding and developing St George’s University, which has graduated more than 17,000 doctors, veterinary surgeons and public health professionals. Today these graduates practice their art and science in more than 50 countries, significantly impacting the health and wellbeing of millions of people and animals on all continents. The value of this contribution to mankind cannot be overstated and epitomizes the attributes of the recipients of the Mike Fisher Memorial Award (figure 6).



(Figure 6) Dr. Charles Modica receives the Mike Fisher Memorial Award, presented by Baroness Howells, President of WINDREF and the only Grenadian member in

The 2018 recipient of the Mike Fisher Memorial award was Professor Sarah Cleaveland, BVSC, PHD, FRS, CBE, Professor of Comparative Epidemiology, Institute of Biodiversity, Animal Health and Comparative Medicine, College of Medical, Veterinary and Life Sciences, Glasgow University Scotland, United Kingdom for her innovative work on One Health One Medicine. Professor Cleaveland received the award after her Plenary presentation at the SGU One Health One Medicine Symposium held on October 21<sup>st</sup>/22<sup>nd</sup> (figure 7). Professor Cleaveland has worked extensively amongst the pastoral Masai people in Tanzania and particularly on a number of infectious diseases of people, domestic animals and wildlife. Her work continues to attract large numbers of graduate students to work with her from many parts of the world, and the outcomes of her studies provide important information for policies in infectious disease control.



(Figure 7) Dr. Sarah Cleaveland receives the Mike Fisher Memorial Award. From left to right: Ms. Naomi Alexander, Dr. Antonia MacDonald, Dr. Neil Olson, Dr. Randall Waechter, Dr. Calum Macpherson, Dr. Joseph Childers, Dr. Sonia Nickson, Dr. Satesh Bidaisee, Mr. Kareem Coomansingh, Dr. Sarah Cleaveland, Dr. Guy Palmer, Ms. Isha English, Dr. Trevor Noël, Ms. Yvette Baptiste.



Ms. Regan Schwartz, a Research Scientist with WINDREF, who has spent the last three years working on her dual DVM/MPH degree, presented her work on *Toxocara canis* at the same One Health One Medicine Symposium. Her presentation entitled “Puppies pooping in paradise: parasites & public health” was selected as the best WINDREF Research Scientist presentation and the award was presented to her at an award ceremony in November 2017 (figure 8).



(Figure 8) Regan Schwartz received the WINDREF Research Award, November 23<sup>rd</sup>, 2017; accompanied by Dr. Satesh Bidaisee and Dr. Calum Macpherson.

The longitudinal research projects all continued throughout 2017 and a number of new initiatives were initiated including our first efficacy study conducted in partnership with LifeSeasons. This study will examine over the next few years the effectiveness of a supplement provided to pre-diabetic patients in helping to prevent the progression to diabetes. This program falls under the Caribbean Center for Health Equity (CCHE). Grenada was very fortunate in 2017 to be spared one of the worst hurricane seasons in which 12 of the 26 island nations were affected, some were devastated. A number of relief efforts were made and some donations were contributed to the islands affected. Our

thoughts are with those peoples who were affected during 2017.

Our collaboration with the LaBeaud Laboratory at Stanford University on Chikungunya and Zika viruses continued in 2017 and Dr. Desiree LaBeaud will visit Grenada early in 2018. I had the opportunity to visit the Zika Forest at Entebbe in Uganda in the Summer of 2017 (figure 9) where the virus was first identified in a sentinel Rhesus monkey in 1947 during studies on yellow fever. The forest today spans 25 acres and is surrounded by flower growing operations for shipment of flowers to the European Union. Zika, like other arboviruses, have slowly spread across the world through the movement of its vectors and infected individuals. The last diagnosed case of Zika in Grenada was in October 2016. Like Chikungunya, this virus arrived and spread rapidly through the immunologically naive population and was transmitted for approximately 6 months before the outbreak ended. The long term impact of Chikungunya and Zika formed the basis for our long-term collaborations with many institutions.



(Figure 8) Dr. Calum Macpherson in the Zika Forest

*WINDREF Research Lecture*

The 17th annual WINDREF and 9th annual K.B. Taylor Memorial lecture was delivered by Dr. Kenneth Bridges on 18<sup>th</sup> January 2017 entitled “*Rise of sickle cell disease and novel approaches to its treatment*” (figure 10).



(Figure 10) Dr. Kenneth Bridges, MD, 17<sup>th</sup> Annual WINDREF Lec-

Approximately 300 faculty and students attended the lecture which was received very positively, and a number stayed on to talk to the speaker at the reception afterwards. Dr. Bridges received an MD degree from Harvard Medical School, and subsequently trained in internal medicine and hematology in Boston, at Massachusetts General and Brigham and Women’s Hospitals, respectively. Following medical subspecialty training, Dr. Bridges worked on the biology of cellular iron metabolism for three years at the National Institutes of Health in Bethesda, Maryland. Dr. Bridges returned to Harvard as a member of the Hematology Division at Brigham and Women’s Hospital where he reached the faculty rank of Associate Professor of Medicine. In parallel with his laboratory investigation of iron metabolism, Dr. Bridges maintained active clinical work and established the Joint Center for Sickle Cell and Thalassemic Disorders at Brigham and Women’s Hospital and Massachusetts General

Hospital, emphasizing bench-to-patient translational research. Dr. Bridges published over 70 peer-reviewed articles during his academic career, as well as a number of book chapters. He also co-authored with Dr. Howard Pearson of Yale University a textbook on red cell disorders and anemia. Dr. Bridges left academia to work in biotechnology, initially with Hoffman La Roche followed by 3 years at Amgen where he worked on Aranesp and participated in the launch of Nplate. Dr. Bridges moved to Onyx Pharmaceuticals where he oversaw several trials involving Kyprolis (carfilzomib). Following the Amgen acquisition of Onyx, Dr. Bridges moved to Global Blood Therapeutics in the role of Vice President, working the new treatment for sickle cell disease, GBT440.

*The WINDREF One Health Research Grant Initiative (OHRI)*

The OHRI research projects all continued in 2017 and many were presented at the OHOM Symposium in October. The second tranche of funding to the successful grant recipients was made in December 2017.

On behalf of the members of the Grenada, United Kingdom, and United States Boards of Trustees and Directors, I would like to thank our collaborators and donors for making 2017 a very successful year for WINDREF.

We thank all of our donors for supporting the work of WINDREF over the past year, and look forward to another successful year in 2018.

A handwritten signature in black ink, which appears to read "Calum N.L. Macpherson". The signature is written in a cursive style.

Calum N.L. Macpherson  
Director, WINDREF

## WINDREF Organization

### Board of Directors

- Baroness Howells of St. David's, OBE (President)
- Calum N. L. Macpherson, PhD, DIC, FRSPH (Vice President & Director)
- Trevor P. Noël, PhD, MPH, FRSPH (Deputy Director)
- Margaret Lambert, MA, (Secretary Treasurer)
- Mary Jeanne Kreek, MD, PharmD (Hon), PhD (Hon)
- Karen Lawson, PhD
- Ellen Ratner, MEd
- Joseph Feldman, MD
- Joe Childers, PhD

### Board of Trustees (United Kingdom)

- Baroness Howells of St. David, OBE
- Sir Kenneth Calman, KCB, FRCSE
- Lord Stevens of Kirkwhelpington, KStJ, QPM, DL, FRSA,
- Lord Trees of The Ross, DVM, PhD
- Neil Poulter, MD
- Patrick Orr
- Margaret Lambert, MA (Ex Officio)
- Calum Macpherson, PhD, DIC, FRSPH (Ex Officio)

### Scientific Advisory Board

- Sir Frederick Ballantyne, MD
- John R. David, MD
- Malcolm A. Ferguson-Smith, MBChB, FRCP, FRCPATH
- Edmond Fischer, DSc
- Calum Macpherson, PhD, DIC
- Anselm Hennis, MBBS, PhD, FRCP, FACP
- Mary Jeanne Kreek, MD, PharmD (Hon), PhD (Hon)
- Ian McConnell, BVMS, FRSE, F. Med. Sci.
- Hugh Montgomery, MD
- Baron Peter Piot, MD, PhD, CMG, FRCP

- Neil Poulter, MD, PhD
- Melinda S. Sothern, PhD, CEP
- Richard Scribner, MD, MPH
- Lord Trees of The Ross, DVM, PhD
- James Hospedales, MB, BS, MSc

### Administration — Grenada

Dr. Randall Waechter continued as Grants Administrator, Mr. Kareem Coomansingh continued as Assistant Grants Administrator, Ms. Isha English continued as Assistant Administrator, and Ms. Naomi Alexander and Ms. Yvette Baptiste continued as secretaries. Ms. Celia Clyne Edwards provides legal support. Dr. Paul Fields continued as Biostatistician

### Administration — United States

WINDREF (USA) was established as a 501(c)3 non-profit organization to facilitate coordination of the USA activities and to administer charitable donations from the United States and worldwide. Its goal is to enhance the development of WINDREF's research and educational programs. The offices are located in Great River, New York. Ms. Sarah Cahill provides administrative and logistical support, and Mr. Michael Cahill provides legal support.

### Administration — United Kingdom

WINDREF (UK) was set-up as a charitable trust in Winchester, England in 1999 to promote collaboration between WINDREF scientists and academic centers of research in the United Kingdom and the European community. A Board of Trustees was appointed in 1999 to oversee the activities of WINDREF (UK). The office is located in London. Mr. Patrick Orr provides oversight of the financial operation and charitable status of WINDREF (UK).

### Senior Research Fellows

- Hugh W. Ferguson, BVM&S, PhD, Dipl. ACVP, MRCVS, FRCP
- Paul Fields, PhD
- Paul Garner, MBBS, PhD
- Mary Glenn, PhD
- Duane Gubler, ScD
- Ruth Milner, MSc
- Stephen Morse, PhD
- Leslie Ramsammy, PhD, DSc (Hon)
- Douglas Slater, MD, MPH
- Stanley Weiss, MD
- Melinda Southern, PhD
- Richard Schribner, MD, PhD
- Christine Richards, PhD, MPH
- Bonnie Rusk, MSc
- Hugh Sealy, PhD., P.Eng.
- Karen Schioler, PhD
- Shanti Singh, MD, MPH
- Kamilah Thomas-Purcell, PhD, MPH
- Randall Waechter, BBA, PhD
- Trevor P. Noël, PhD, MPH, FRSPH
- Karen Blackmon, PhD
- Michelle Fernandes, MBBS, DPhil
- Andrew Sobering, PhD

### Research Fellows

- John Adamski, MD, MSc, MPH
- Muge Akpınar-Elci, MD, MPH
- Glennis Andall, PhD
- Jonathan Ashcroft, MD, PhD
- Charles Avgeris, MD, MSc
- Satesh Bidaisee, DVM, MSPH, MSB, FRSPH, EdD
- Grant Burgess, PhD
- Reccia Charles, PhD
- Sonia Chehil, MD, FRCPC
- Cheryl Cox Macpherson, PhD
- Andrea Easter-Pilcher, PhD
- Martin Forde, ScD
- Orazio Giliberti, MD
- Natalie Hendon, PharmD
- Richard Kabuusu, DVM, MPH
- Victoria Kimotho, MPH
- Svetlana Kotelnikova, PhD
- Desiree LaBeaud, MD, MSc
- Barbara Landon, PsyD
- Marios Loukas, MD, PhD
- Theresa McCann, MPH, PhD
- Barrymore McBarnette, MD, MPH, MBA
- Clare Morrall, PhD
- Shamdeo Persaud, MD, MPH
- Roger Radix, MD, MPH, MIB, FRSPH

### Research Scientists

Sadiq Al-Tamini, Sumita Asthana, Yitzhack Asulin, Bishara Baddour, Jean-Pierre Barakat, Matthew Beeson, Matthew Boles, William Brown, Ella Cameron, Nicholas Caputo, Rae Connolly, Abraham El-Sedfy, Karla Farmer, Daniel Firer, Kristy Fisher, Scott Forman, Brandon Francis, Christopher Gibson, Vamsi Guntur, François Hallé, Anthony Junck, Megan Kaminskyj, Sebastian Kreitzschitz, Erik Lacy, Ede Langevine, Richard Lehman, Jason Lowther, Setshidi Makwinja, Paul Mancuso, Baher Maximos, Shanice McKain, John McCormack, David Melamed, Kirk Minkus, Jerry Mitchell, Jessica Morlok, Kevin Neill, Bayela Nfila, Yolanda Ng, Michael Nillas, Steve Nimrod, Andre Panagos, Barry Politi, Sandeep Pulim, Sean Ramsammy, Justin Rebo, Laura Robinson, Corey Schwartz, Sarah Scott, Christopher Skaff, Nadia Solomon, David Steinberg, Derrick Tlhoiwe, Sarah Treter, Nghia Truong, James Tsai, Dan Twyan, Frank Van Natta, Ru-Amir Walker, Juliette Williams, David Winokur, Colleen Wunderlich, Elliot Yung, Regan Schwartz, Nikita Cudjoe.

## Current Research Projects

### The Elimination of the Soil Transmitted Helminths from Grenada and Beyond

The practical lab and field based focus of this elimination program was to examine the prevalence and importance of the STH in Grenada and their potential elimination. The STH study was initiated following ethical approval in 2012. The study had a population-based focus and used a multi-stage randomization approach to proportionally represent the geographic distribution of the study cohort. In January 2012, informed consents were circulated with questionnaires. The questionnaires were used to establish the initial attitude and practices (811 students) from 26 primary schools across the tri-island state of Grenada. Between February and April 2012, the STH baseline prevalence 1.3% (7 of 527) was established in children aged 5- 11 examining fresh stool samples using Zinc Sulphate floatation with centrifugation. The 7 children infected with STH immediately received albendazole. Within a month of the completion of the baseline study, STH sensitization posters were erected at all 56 primary schools.



STH sensitization posters in one of the schools (St. Thomas Aquinas R. C school , Petite Martinique)

The automatic response systems (ARS) were used on 903 schoolchildren to assess their short term (administered after 20 minutes) in March 2014 and of these 767 could be traced to assess their long term (8 months later). There was a positive short-term effect from the educational intervention in STH knowledge for all questions across all 903 students ( $p < .001$ ). The assessment of the long-term recall showed a decrease in knowledge for only one of the eight questions across all 767 students ( $p = 0.011$ ).



Students from Chantimelle RC school St. Patrick with ARS

The STH prevalence post intervention (0.0%) was assessed in October/November 2014 and demonstrated a statistically significant reduction ( $p$ -value  $< .001$ ) using an exact Chi-square test.

A parallel analysis in the Grenada General Hospital Laboratory (GGHL) utilizing their 51,913 records of examining stool samples from all of the country using the formalin ether technique collected annually since 2006 demonstrated a significant decrease in STH from the start of this intervention 0.77% (95% Confidence Interval:0.68 – 0.90) between 2006 – 2012 and 0.25 % (95% Confidence Interval: 0.19 – 0.33) from 2012 – 2017.

Year	Tests	<i>Strongyloides stercoralis</i>	<i>Ancylostoma duodenale</i> / <i>Necator americanus</i>	<i>Trichuris trichiurae</i>	<i>Ascaris lumbricoides</i>	Total	Total/1000
2006	3,244	11	7	1	2	21	6.5
2007	3,635	19	13	6	9	47	12.9
2008	4,362	17	9	5	0	31	7.1
2009	4,352	20	16	6	0	42	9.7
2010	4,523	11	15	5	0	31	6.9
2011	4,950	8	13	1	3	25	5.1
2012	4,608	3	4	0	0	7	1.5
2013	4,308	4	5	0	1	10	2.3
2014	4,154	8	0	2	4	14	3.4
2015	4,809	15	1	0	1	17	3.5
2016	4,829	8	1	1	1	11	2.3
2017	4,139	3	0	0	2	5	1.21

Results Grenada General Hospital Soil Transmitted Helminths

The GGHL also demonstrated a significant decrease in prevalence of feco orally transmitted protozoan species 9.83 % (95% Confidence Interval: 9.5 – 10.2) between 2006 – 2012 and 5.92 (95% Confidence Interval: 5.6 – 6.2) from 2012 – 2017.

Year	Test	<i>Endolimax nana</i>	<i>Entamoeba coli</i>	<i>Entamoeba histolytica</i>	<i>Entamoeba hartmanni</i>	<i>Iodamoeba buetschlii</i>	<i>Giardia lamblia</i>	Total	Total/1000
2006	3,244	256	85	75	85	77	11	589	181.6
2007	3,635	119	96	57	52	40	29	393	108.1
2008	4,362	156	145	91	14	23	14	443	101.6
2009	4,352	46	102	47	37	19	11	262	60.2
2010	4,523	85	137	45	83	33	3	386	85.3
2011	4,950	119	72	120	19	44	18	392	79.2
2012	4,608	77	76	54	25	26	3	261	56.6
2013	4,308	118	68	84	24	37	16	347	80.5
2014	4,154	82	62	73	24	18	10	269	64.8
2015	4,809	65	44	59	13	12	7	200	41.6
2016	4,829	87	54	96	10	17	9	273	56.5
2017	4,139	49	33	54	0	8	5	149	36.0

Results Grenada General Hospital Laboratory Protozoan Cyst

These data indicate that the intervention program was successful and strongly suggest that education can play a powerful role in the reduction of a wider spectrum of pathogens than those targeted by the intervention study. It is therefore strongly suggested that control programs against STHs should employ the widest possible interventions available. The long term benefits will determine the

overall impact that this approach could have on the health of children. This control intervention program has been written up as a dissertation as partial fulfillment of a Doctorate awarded to Dr. Trevor Paul Noël in May 2017.

Future considerations in the coming years include the following;

Assistance will be provided to the GGHL to regularize their standard operating procedure for appropriate processing of stool samples.

The STH prevalence will be carefully monitored in partnership with GGHL along with other fecal orally transmitted protozoan species. The appropriate treatment will be provided by WINDREF through our close partnership with the GGHL should this be necessary.

WINDREF has established a Caribbean Centre for Health Equity (CCHE) and one of the centres activities will be the continuous education of susceptible low income populations in Grenada.

Upgrading safe drinking water and sanitation facilities will be one of the areas of continued support by WINDREF. The longitudinal impact of these activities on preventable NTDs will be continuously assessed.

Continued educational campaigns using ARS will be implemented biannually in the Primary and Secondary schools to continuously build on the successes demonstrated in this work. This study will be expanded to examine its effectiveness for the control of other infectious diseases: for example, vector borne diseases. This future study conforms with the request made to WINDREF by the Ministry of Health.

Other novel educational delivery systems will be explored as they are developed. Novel educational delivery systems appear to enhance the messages they impart.



Student participants handwashing at the Tivoli R. C. school in St. Andrew.

*Submitted by Trevor Paul Noël*

### **Zika Virus Infection in Pregnant Women Study**

#### Background

As the global prevalence of ZIKV disease increases, the primary drivers for severe ZIKV disease and maternal to child transmission (MTCT) remain unknown. Brazil reported more than 4,000 cases of microcephaly, compared to the usual rates of 100 to 200 cases per year. While these cases are still being investigated, potential links to ZIKV raises questions about MTCT of Zika virus and the possible long-term medical consequences of congenital Zika disease. In April-November 2016 a large ZIKV outbreak occurred in Grenada. The Grenadian Ministry of Health approximated that about 50% of the population (50,000 people) had been infected with ZIKV virus with approximately 12 cases

of GBS reported (a severe disease manifestation).

#### Study Aims

1. To identify demographic and exposure factors associated with maternal to child transmission (MTCT) of ZIKV - Including prior DENV exposure, viral load and disease manifestations (asymptomatic vs. symptomatic)
2. To define the medical consequences of congenital ZIKV disease
3. To create strong preliminary data and a cohort of ZIKV-exposed children that will enable us to define the spectrum of long-term infant outcomes (separate protocol)

#### Methods

From April 2016 to February 2017 during the ZIKV outbreak in Grenada and Carriacou, our group collected survey data and serum from 185 adults during acute febrile disease (temp  $\geq 38.0^{\circ}\text{C}$  with rash) (**febrile cohort**). 5% of the febrile cohort had severe disease as defined as either Guillain-Barré syndrome (GBS) or hospitalization and 28 were pregnant. We anticipate that half will have had previous DENV exposure. Participants underwent physical examination by a health center nurse or primary care physician, and completed questionnaires on current symptoms and comorbidities. Acutely ill participants had blood drawn for serum collection and analysis. All serum separation was performed on site at SGU/WINDREF labs. The U.S. Navy/TETRACORE tested this entire cohort by standard ZIKV, CHIKV, and DENV PCR and performed DENV and ZIKV serology testing, but were unable to distinguish prior DENV exposure from ZIKV exposure using these traditional methods.

A separate cohort of 313 women pregnant (**pregnancy cohort**) were enrolled during the ZIKV outbreak over two months at all 36 antenatal clinics in Grenada and Carriacou to study MTCT of ZIKV. Blood and urine samples were collected once during pregnancy at enrollment. Upon enrollment pregnant participants underwent physical examination by a health center nurse, and completed questionnaires on current symptoms, comorbidities, mosquito exposures, demographics, prior dengue and chikungunya history, and current ZIKV symptoms. All participants had blood drawn and urine collected for testing and analysis.

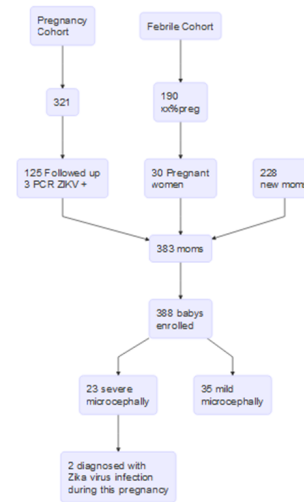


Figure 1: Enrollment

Results (to date)

In the current project, mothers and children were invited to re-enroll in a **mother-child cohort** study (N=388 children, including 5 sets of twins, and 383 mothers; 121 of these mothers participated in the **pregnancy cohort** listed above and 28 of them participated in the **febrile cohort** listed above) to study the gestational impact of ZIKV (Figure 1). At follow-up (one week to one year postpartum), babies had a thorough examination (physical exam and anthropometrics) and mothers completed questionnaires on current symptoms, comorbidities, mosquito exposures, demographics, prior dengue and chikungunya history, and ZIKV symptoms. All mother-child pairs had blood collected for testing and analysis.

Mothers were asked “During your Zika illness, what symptoms did you have?”. Any who answered with at least one symptom were categorized as symptomatic (Figure 2).

4 Mothers of mother child pairs were Zika PCR positive (Figure 2).

n	ZIKV PCR Negative	ZIKV PCR Positive	p-value	Asymptomatic Mom	Symptomatic Mom	p-value
	16	4		2	31	
<b>MOTHERS</b>						
Parish (%)			0.585			0.578
St George's	7 (43.8)	1 (25.0)		2 (100.0)	8 (25.8)	
St Andrew's	3 (18.8)	2 (50.0)		0 (0.0)	7 (22.6)	
St David's	3 (18.8)	0 (0.0)		0 (0.0)	9 (29.0)	
St Patrick's	1 (6.2)	0 (0.0)		0 (0.0)	4 (12.9)	
St John's	2 (12.5)	1 (25.0)		0 (0.0)	3 (9.7)	
Caucasian descent (%)	8 (50.0)	2 (50.0)	1	1 (50.0)	13 (41.9)	1
Have you ever had dengue fever? Yes (%)	3 (18.8)	0 (0)	0.635	0 (0.0)	5 (16.1)	0.499
<b>CHILD</b>						
Weight (Kg) (median [IQR])	7.65 [7.00, 8.92]	9.00 [8.62, 9.25]	0.256	9.00 [8.35, 9.65]	7.70 [7.00, 9.05]	0.326
Length (Cm) (median [IQR])	68.00 [65.50, 72.00]	74.50 [73.25, 75.00]	0.02	65.00 [64.50, 65.50]	68.00 [64.00, 73.50]	0.344
Head Circumference (Cm) (median [IQR])	43.00 [40.00, 43.47]	45.50 [45.00, 46.75]	0.02	43.50 [43.25, 43.75]	43.00 [40.67, 45.00]	0.879
Female infant (%)	8 (50.0)	2 (50.0)	1	1 (50.0)	13 (41.9)	1
APGAR score at 1 minute (median [IQR])	8.00 [7.75, 8.25]	9.00 [8.50, 9.00]	0.193	7.50 [7.25, 7.75]	8.00 [8.00, 9.00]	0.323
APGAR score at 10 minutes (median [IQR])	9.00 [9.00, 9.00]	9.00 [9.00, 9.00]	0.617	9.00 [9.00, 9.00]	9.00 [9.00, 9.00]	0.878
OPV vaccination at birth? (Yes) (%)	0 (0.0)	0 (0.0)	1	0 (0.0)	2 (6.5)	1
Are all vaccinations up to date? Yes (%)	16 (0.0)	4 (0.0)	1	0 (0.0)	1 (3.2)	1
temperature (c)(median [IQR])	36.20 [36.00, 36.50]	36.95 [36.65, 37.25]	0.014	36.10 [36.05, 36.15]	36.50 [36.25, 36.65]	0.138
heart rate (beats/minute) (median [IQR])	120.00 [120.00, 140.00]	135.00 [133.50, 137.00]	0.209	135.00 [127.50, 142.50]	130.00 [120.00, 140.00]	0.787
respiratory rate (median [IQR])	32.00 [28.00, 33.25]	32.00 [31.00, 32.50]	0.884	31.00 [29.50, 32.50]	32.00 [29.00, 35.00]	0.702
Color/skin:						
pink well perfused	16 (100.0)	3 (75.0)	0.2	2 (100.0)	30 (96.8)	1
peripheral cyanosis	16 (100.0)	4 (100.0)	NA	2 (100.0)	31 (100.0)	NA
pallor	16 (100.0)	4 (100.0)	NA	2 (100.0)	31 (100.0)	NA
jaundice	16 (100.0)	4 (100.0)	NA	2 (100.0)	31 (100.0)	NA
rashes/pete	0 (0.0)	1 (25.0)	0.2	0 (0.0)	1 (3.2)	1
chiae	16 (100.0)	4 (100.0)	NA	2 (100.0)	31 (100.0)	NA
mongolian blue spot	16 (100.0)	4 (100.0)	NA	2 (100.0)	31 (100.0)	NA



Cry (%)	Normal	8 (50.0)	2 (50.0)	1	1 (50.0)	12 (38.7)	1
	Feeble						
	don't know	8 (50.0)	2 (50.0)				
Tone (%)	Normal	15 (93.8)	4 (100)	1	0 (0.0)	1 (3.2)	1
	Increased (hypertonia)						
	Decreased (hypotonia)						
	don't know	1 (6.2)	0 (0.0)				
moving limbs (Yes) (%)		16 (100.0)	4 (100.0)	NA	2 (100.0)	31 (100.0)	NA
Anterior fontanelle (%)	Normal	13 (81.2)	4 (100.0)	1	0 (0.0)	5 (16.1)	1
	sunken	3 (18.8)	0 (0.0)				
Sutures (%)	Normal	15 (93.8)	4 (100)	1	0 (0.0)	1 (3.2)	1
	Split	1 (6.2)	0 (0.0)				
	Overriding						
Any facial dysmorphic features? (No) (%)		16 (100.0)	4 (100.0)	NA	2 (100.0)	31 (100.0)	NA
diast lipipalietie (No) (%)		16 (100.0)	4 (100.0)		2 (100.0)	31 (100.0)	NA
Eyes: red-light reflex present bilaterally? (%)	Yes	13 (81.25)	4 (100.0)	NA	2 (100)	26 (83.9)	
	Don't know/can't comment	3 (18.8)	0 (0.0)	1	0 (0.0)	5 (16.1)	1
Capillary refill time (peripheral) (<3 sec.) (%)		16 (100.0)	4 (100.0)		2 (100.0)	31 (100.0)	NA
Heart sounds I + II? (%)	Yes	16	3	0.2	2 (100)	20 (64.5)	
	Don't know	0 (0.0)	1 (25.0)		0 (0.0)	2 (6.5)	1
heart murmurs? (Yes) (%)		0 (0.0)	0 (0.0)	1	0 (0.0)	1 (3.2)	1
Breath sounds clear across both lungs? (Yes) (%)		16 (100.0)	4 (100.0)	NA	2 (100.0)	31 (100.0)	NA
Any breathing noises? (check all that apply)	Stridor	16 (100.0)	4 (100.0)	NA	2 (100.0)	31 (100.0)	NA
	Wheeze	1 (6.2)	0 (0.0)	1	0 (0.0)	2 (6.5)	1
	Crackles	16 (100.0)	4 (100.0)	NA	2 (100.0)	31 (100.0)	NA
	None	15 (93.8)	4 (100.0)	1	2 (100.0)	29 (93.5)	1
	Don't know	16 (100.0)	4 (100.0)	NA	2 (100.0)	31 (100.0)	NA
Signs of increased respiratory effort?	None	16 (100.0)	4 (100.0)	1	2 (100.0)	30 (96.8)	1
	Accessory muscle use	16 (100.0)	4 (100.0)	NA	2 (100.0)	31 (100.0)	NA
	nasal flaring	0 (0.0)	0 (0.0)	1	0 (0.0)	1 (3.2)	1
	Don't know	16 (100.0)	4 (100.0)	NA	2 (100.0)	31 (100.0)	NA
Normal bowel sounds? (Yes) (%)		16 (100.0)	4 (100.0)	NA	2 (100.0)	31 (100.0)	NA
Presence of umbilical hernia? (Yes) (%)	None	13 (81.25)	4 (100.0)	1	0 (0.0)	3 (9.7)	1
	hepatomegaly	3 (18.8)	0 (0.0)	NA	2 (100.0)	31 (100.0)	NA
	splenomegaly			NA	2 (100.0)	31 (100.0)	NA
	Don't know			NA	2 (100.0)	31 (100.0)	NA
Testes descended? (Bilaterally) (yes) (%)		8 (100.0)	2 (100.0)	NA	2 (100.0)	31 (100.0)	NA
patent anus (No) (%)		16 (100.0)	4 (100.0)	NA	1 (100.0)	18 (100.0)	NA
Hip manoeuvres (Ortolani and Barlow) (%)	Yes	3 (18.8)	0 (0.0)	1	2 (100.0)	31 (100.0)	NA
	No	13 (81.25)	4	0 (0.0)	5 (16.1)	1	
Symmetrical creases on hips? (Yes) (%)		16 (100.0)	4 (100.0)	NA	2 (100.0)	31 (100.0)	NA
Femoral pulses felt bilaterally? (Yes) (%)		15 (93.8)	4 (100.0)	1	2 (100.0)	30 (96.8)	1
Any spinal sciosis? (No) (%)		16 (100.0)	4 (100.0)	NA	2 (100.0)	31 (100.0)	NA
Any sacral dimple/hair tuft? (No) (%)		16 (100.0)	4 (100.0)	NA	2 (100.0)	31 (100.0)	NA
Moro reflex (Present) (%)		16 (100.0)	4 (100.0)	NA	2 (100.0)	31 (100.0)	NA
Grasp reflex (Present) (%)		16 (100.0)	4 (100.0)	NA	2 (100.0)	31 (100.0)	NA
Suck reflex (Absent) (%)		1 (6.2)	0 (0.0)	1	0 (0.0)	1 (3.2)	1
Plantar reflex (Present) (%)		16 (100.0)	4 (100.0)	NA	2 (100.0)	31 (100.0)	NA
Galant reflex(Present) (%)		16 (100.0)	4 (100.0)	NA	2 (100.0)	31 (100.0)	NA

Figure 2: Outcomes by Zika PCR and self-reported symptomatic Zika.

We measured the head circumference of each child. According to WHO anthropometric guidelines, adjusting for age and sex, 35 children classified as mildly microcephalic (at least 2 standard deviations below the mean) and 23 as severely microcephalic (at least 3 standard deviations below the mean) (Figure 3). We are confirming these surprising results.

Microcephalic child	level	none	mild	severe	p
n		324	35	23	
MOTHER					
ZIKV pcr positive (%)		7 (5.4)	0 (0.0)	0 (0.0)	1
Have you ever had Zika? (%)					0.133
	no	280 (86.4)	33 (94.3)	18 (78.3)	
	yes	33 (10.2)	1 (2.9)	2 (8.7)	
	NA	11 (3.4)	1 (2.9)	3 (13.0)	
Was this confirmed by a blood test? (YES) (%)		23 (69.7)	0 (0.0)	2 (100.0)	0.37
Have you ever been diagnosed with Zika virus? (%)					0.736
	No	96 (93.2)	8 (100.0)	9 (90.0)	
	Yes	4 (3.9)	0 (0.0)	1 (10.0)	
	NA	3 (2.9)	0 (0.0)	0 (0.0)	
During this pregnancy, have you been diagnosed with Zika virus infection? (%)					0.125
	No	95 (92.2)	7 (87.5)	8 (80.0)	
	Yes	3 (2.9)	0 (0.0)	2 (20.0)	
	NA	5 (4.9)	1 (12.5)	0 (0.0)	
Were you pregnant or did you deliver a baby while you had Zika? (%)					1
	No	2 (6.1)	0 (0.0)	0 (0.0)	
	Yes	30 (90.9)	1 (100.0)	2 (100.0)	
	NA	1 (3.0)	0 (0.0)	0 (0.0)	
Trimester of infection (%)					0.692
	1	5 (16.7)	0 (0.0)	0 (0.0)	
	2	15 (50.0)	0 (0.0)	1 (50.0)	
	3	7 (23.3)	1 (100.0)	1 (50.0)	
	NA	3 (10.0)	0 (0.0)	0 (0.0)	
Child					
Age (months) (median [IQR])		5.50 [3.19, 8.87]	4.96 [1.51, 5.73]	4.27 [2.12, 7.51]	0.022
Female (%)		149 (46.0)	10 (28.6)	8 (34.8)	0.1
Head circumference (cm) (mean (sd))		42.43 (3.28)	37.94 (3.32)	36.68 (2.91)	<0.001
Weight (kg) (median [IQR])		7.50 [6.30, 8.93]	6.00 [4.35, 7.60]	5.50 [4.35, 7.10]	<0.001
Length (cm) (mean (sd))		65.34 (8.30)	59.53 (9.18)	60.61 (8.28)	<0.001

Figure 3: Characteristics by microcephaly

### Next steps:

In order to link patient and child outcomes to Zika virus exposure, sensitive and specific assays are needed; however, diagnosis of acute ZIKV can be problematic. PCR is specific but only identifies viremic individuals, typically during their first week of infection. ZIKV infection can also be demonstrated based on development of anti-ZIKV IgG (seroconversion), as assayed by ELISA. However, serum antibodies to other closely related viruses, including dengue virus, can cross-react with the ZIKV antigen when tested by ELISA, compromising the specificity of the assay. We have developed a novel assay for IgG against different closely-related flaviviruses, including ZIKV and dengue virus, which has higher specificity and reliability distinguishes between acute ZIKV and dengue virus (DENV) infection. We have applied for additional funding to use the optimal test to determine the ZIKV and DENV exposure

status among our well-characterized febrile and pregnant ZIKV cohort samples and then link these accurate test results to patient outcomes. This will also allow us to clarify if ZIKV and DENV co-exposure has a more severe clinical presentation compared to single infection and investigate if asymptomatic ZIKV infection can lead to maternal to child transmission.

We also have applied for funding proposing to examine the range of cognitive deficits in congenital Zika virus (ZIKV) syndrome using a well-characterized human cohort. The goals of this investigation are to better understand the variability in neurodevelopmental outcomes in infants who were exposed to ZIKV *in utero*, to identify co-factors that predict poor neurologic outcomes, and to create a platform for targeted therapies in those poorly affected. While microcephaly is the most severe and obvious neurodevelopmental impact associated with *in utero* ZIKV exposure, evidence suggests a spectrum of developmental impacts from mild to severe. Thus, sensitive measures are needed to determine the true incidence and nature of the impact on child neurocognitive development. We will investigate cognitive outcomes in a well characterized cohort of exposed children in Grenada and then identify risk factors for poor outcome and potential beneficial therapies. The end product will be a sensitive description of the cognitive impact of ZIKV exposure - the *Neurocognitive Zika Syndrome* - in human infants.

#### Conclusions

We have created a strong preliminary dataset and a cohort of ZIKV-exposed children that will enable us to define the spectrum of long-

term infant outcomes. Further, we have applied for funding to use a newly available test to determine the ZIKV and DENV exposure status among this cohort. This will allow us to identify demographic and exposure factors associated with maternal to child transmission (MTCT) of ZIKV - Including prior DENV exposure, viral load and disease manifestations (asymptomatic vs. symptomatic). We also have applied for funding to examine the range of cognitive deficits in congenital Zika virus (ZIKV) syndrome in this cohort to define the medical consequences of congenital ZIKV disease.

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### **Neurodevelopment and Vector-borne Diseases: Building a Research Capacity in the Tropics**

#### Background

Up to 200 million children – mostly in developing nations – are at risk of failing to reach full neurodevelopmental potential. This waste of human capital impacts the ability of the next generation in these nations to solve the challenges that lock individuals, communities, and societies in poverty. The goal is to eliminate extreme inequality and maximize neurodevelopment in all children regardless of where they are born.

Previous studies have a link between CHIKV (and possible other vector-borne diseases (VBD)) and cognitive functioning in infants. Evidence suggests that perinatal mother to child CHIKV infection is associated with poor neurocognitive outcomes as a result of microcephaly or white matter restriction.

Specifically, 50% of infected newborns showed delayed coordination and language at two years of age. Viral or parasitic infections of the nervous system are among the most avoidable causes that can impact neurodevelopment.

The introduction in December 2013 and the rapid spread of CHIKV throughout all the Caribbean nations as well as the emergence of zika virus (ZIKV) highlights the need to develop a VBD research capacity in the tropics. Furthermore, it is important to confirm and further specify the potential link between infectious VBD, neurodevelopment, and cognitive functioning among children, and to decipher which biological mechanisms underlie this relationship so that pregnant women living in endemic regions can take preventive measures.

#### Aims

1. Build capacity for arboviral and neurodevelopmental research at St. George's University in Grenada
2. Assess the burden of confounding factors to better understand the specific impact of CHIKV on neurodevelopment and inform public health priorities
3. Determine the prevalence of mother to child transmission of CHIKV in Grenadian pregnant mothers.
4. Measure neurodevelopment using the interNDA, a standardized, comprehensive tool, in children at 2 years of age exposed at different trimesters in utero to CHIKV and compare with unexposed children.

#### Methods

Mothers who gave birth during the 2014 CHIKV outbreak and up to 1 year after the

outbreak were recruited. Questionnaire data was collected on the timing and symptoms of their CHIKV infection and pregnancy, delivery and newborn outcomes. Confounding factors such as preterm birth, fetal alcohol spectrum disorders, maternal diet and gestational diabetes, infections, dietary intake, toxic exposure (heavy metals, pesticides) and violence during infancy were also taken into account. Once enrolled, mothers and their offspring were tested for exposure to CHIKV by ELISA (InBios CHIKjj IgG kit). All infants with positive IgG results will be further tested for recent (not in utero) exposure by IgM ELISA (InBios CHIKjj IgM kit).

CHIKV-exposed moms and infants, and time of exposure during pregnancy will be used to divide groups for comparison:

- 1) Children who are IgG and IgM positive will be considered as cases of perinatal mother-to-child infection or as postpartum infections according to the timing or absence of maternal infection;
- 2) Children who are IgG positive, but IgM negative, and whose mother recalls disease during pregnancy will be considered "in utero infections" if maternal infection occurred during the CHIKV outbreak period;
- 3) Children who are IgM and IgG negative and whose mother recalls disease during pregnancy will be considered "in utero exposed";
- 4) children who are IgG negative and whose mother is also IgG negative will be considered unexposed.

We administered the Intergrowth-21st Neurodevelopment Assessment (interNDA) - a holistic assessment of early child development - to examine potential differences in neurodevelopment between

the two-year old infants exposed to CHIKV and those who were not exposed to CHIKV.

Results (to date)

Of 526 mothers tested, 426 (81%) were IgG CHIKV positive and 100 (19%) tested negative. Among 381 children tested, 16 tested positive and 365 negative (Figure 1a).

The infection rates for those exposed in utero compared to not were 4.4% and 3.9% respectively (Figure 1b).

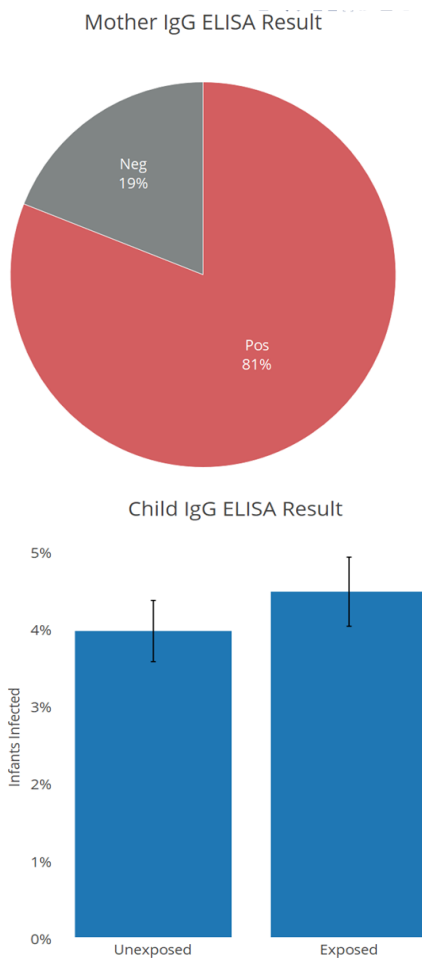


Figure 1 a and b: Mother Anti CHIKV IgG Result and child IgG Result by in utero exposure

Infected mothers had lower education compared to non-infected but were otherwise not significantly different from each other on average (Figure 2).

Factor	Level	Negative	Positive	p
<b>n</b>		100	426	
<b>Race (%)</b>				0.717
	African Descent	85 ( 89.5)	354 (85.9)	
	Indian descent	3 ( 3.2)	19 ( 4.6)	
	Other	7 ( 7.4)	36 ( 8.7)	
	Refused/don't know	0 ( 0.0)	3 ( 0.7)	
<b>Mother age (years) (mean (sd))</b>		30.17 (5.99)	30.14 (6.01)	0.965
<b>Mother's education (%)</b>				0.02
	Primary School	13 ( 13.7)	51 (12.4)	
	Secondary School	45 ( 47.4)	234 (56.8)	
	Bachelor's degree	6 ( 6.3)	40 ( 9.7)	
	Graduate or Professional degree	8 ( 8.4)	9 ( 2.2)	
	Other	23 ( 24.2)	75 (18.2)	
	Refused/Don't know	0 ( 0.0)	3 ( 0.7)	
<b>Mother is married, common-law, or lives with a partner? (%)</b>				0.247
	No	36 ( 37.9)	193 (46.8)	
	Yes	59 ( 62.1)	218 (52.9)	
	Refused/Don't know	0 ( 0.0)	1 ( 0.2)	
<b>Monthly income (%)</b>				0.066
	Under \$1000 EC	13 ( 13.7)	85 (20.6)	
	\$1,001-2,000 EC	22 ( 23.2)	74 (18.0)	
	\$2,001-3000 EC	13 ( 13.7)	78 (18.9)	
	Over \$3000 EC	23 ( 24.2)	60 (14.6)	
	Refused/Don't know	24 ( 25.3)	115 (27.9)	
<b>History of Hypertension (%)</b>				0.606
		8 ( 8.0)	44 (10.3)	
<b>History of Diabetes Mellitus (%)</b>				0.563
		4 ( 4.0)	10 ( 2.3)	
<b>Alcohol during pregnancy</b>				0.25
		10 ( 10.5)	27 ( 6.5)	
<b>Smoking during pregnancy</b>				0.312
	No	95 (100.0)	406 (97.6)	
	Yes	0 ( 0.0)	6 ( 1.4)	
	Refused/Don't know	0 ( 0.0)	4 ( 1.0)	

Figure 2: Demographic characteristics of mothers: IgG Positive versus Negative

526 participants have been recruited to date and we performed a preliminary analysis to identify the effect of CHIKV infection on pregnancy and neonatal outcomes. We classified the cohort into 2 groups by reported history and confirmed exposure to CHIKV by IgG ELISA: those infected with CHIKV during pregnancy and those not infected during pregnancy. Demographic and symptom data, pregnancy and neonatal outcomes were compared. Of the 526 participants, 179 (46%) reported CHIKV during pregnancy and were CHIKV IgG positive. Infection occurred during the first trimester for 65 (36%) of women, second

trimester for 63 (35%) of women and third trimester for 51 (29%) and during delivery for 1 (>1%) woman. The most frequent maternal symptoms reported were, arthralgia (88%), fever (63%), rash (49%), itchiness (44%), headache (38%), muscle pains (35%), and generalized body aches (31%). Significant difference in types of symptoms reported between those infected during pregnancy compared to those who experienced CHIKV infection prior to pregnancy muscle and bone pain, dizziness, loss of appetite, vomiting, and diarrhea (Figure 2). Pregnancy outcomes were similar between the two groups (Figure 3).

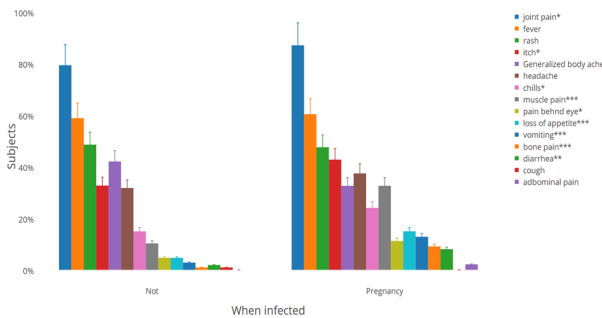


Figure 2: CHIKV symptoms during pregnancy vs. Non-pregnant

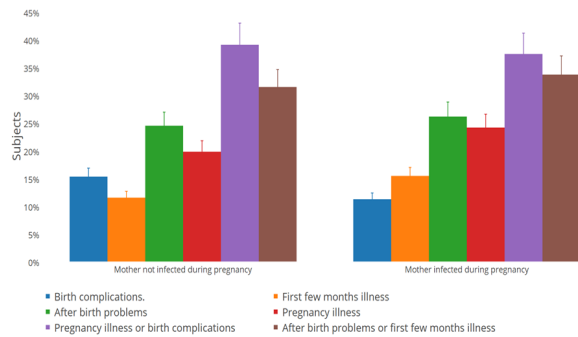


Figure 3: Pregnancy and birth complications table/graph

The preliminary analysis of the InterNDA data revealed that children exposed to CHIKV in utero may have lower mean cognitive scores compared to unexposed children (4.1 vs 3.82,  $p = 0.08$ ) (Figure 4).

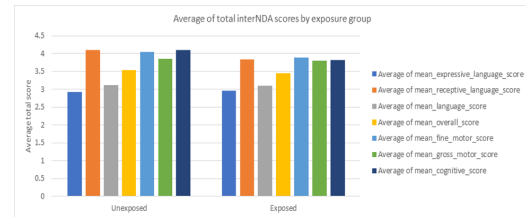


Figure 4: Average interNDA scores unex-

Children exposed to CHIKV versus not were similar in height, weight, age, and gender (Figure 5)

	NOT EXPOSED	EXPOSED TO CHIKV
<b>N</b>	170	179
<b>CHILD HEIGHT (CM) (MEDIAN [IQR])</b>	87.05 [85.11, 89.68]	87.60[85.00, 89.95]
<b>CHILD WEIGHT (KG) (MEDIAN [IQR])</b>	12.10 [11.20, 13.30]	12.40 [11.40, 13.57]
<b>CHILDS AGE (MONTHS) (MEDIAN [IQR])</b>	25.00 [24.00, 25.00]	25.00 [24.00, 25.00]
<b>FEMALE (%)</b>	67 (43.8)	85 (50.3)

Figure 5: Child characteristics exposed versus not

### Capacity Building

The primary goal of this program – to build capacity in arboviral and neurodevelopmental research in a middle-income country – is relevant to the mission of the Fogarty International Center at the NIH. Capacity building has taken place on multiple fronts: (1) Caribbean-based research assistants have been trained in standardized neurodevelopmental assessment using the interNDA; (2) Caribbean-based lab

technicians and research assistants have been trained to carry out ELISA test; (3) Caribbean-based research assistants have been involved in the research process from start to finish: study design, contacting participants, obtaining informed consent, collecting data and biological samples, data basing and cleaning data, processing biological samples, data analysis, results preparation, results presentation, manuscript preparation, and grant applications. The research team has submitted three additional grant applications since the study began: interNDA for child health equity grant through Stanford, an interNDA longer-term follow-up grant of ZIKV-exposed children through the Department of Defense in the USA, and an additional follow-up of ZIKV-exposed infants through USAID. One peer-reviewed journal publication is currently planned, which will examine interNDA results between children exposed to CHIKV and those not exposed to CHIKV and those exposed to CHIKV at different trimesters. Several conference presentations are planned for the upcoming American Society of Tropical Medicine and Health meeting in New Orleans in October 2018. Preliminary results have been presented at an NIH Fogarty meeting. In terms of mentorship, one Stanford undergraduate student (Cameron Nosrat), one Stanford post-doctoral fellow (Amy Krystosik), one Stanford visiting scholar (Priyanka Suresh), and 3 St. Georges University Master of Public Health students (Ashlee Watts, Bianca Punch, Hayley Crandell) are using data from this project in their academic studies.

## Conclusions

This study is still enrolling after the expected enrollment period in attempts to reach the

targeted 1000 mother-child pairs. Several factors have limited enrollment, such as the timing of testing for the infants turning 24 months and the likelihood of parent bringing their infants for assessment (i.e., summer break/Carnival season, rainy season) and inability to contact the mothers due to outdated phone numbers/contact information. However, we are continuing to reach out to nurses at the health clinics, where the mothers attend follow-up appointments with their infants to try and obtain updated contact information and locate them for involvement in the study.

We are successfully building capacity for arboviral and neurodevelopmental research at St. George's University in Grenada by identifying promising, Caribbean based citizens and providing training in assessment, data collection, data management, and processing of samples / lab techniques (i.e., aliquots, tracking samples, ELISA testing), results analysis, scientific writing, and grant applications.

Mother to child transmission of CHIKV in Grenadian pregnant mothers appears to be at least 0.5%.

We have measured neurodevelopment using the interNDA in 381 children at 2 years of age. We find that the mean cognitive scores may be lower in those exposed at different trimesters in utero to CHIKV compared with unexposed children.

The next analysis steps will be to assess the burden of confounding factors to better understand the specific impact of CHIKV on neurodevelopment and inform public health priorities.

*Submitted by Randall Waechter and Angelle Desiree LaBeaud*

### **Community Health Initiatives – Sport for Health, Touch Toes Test, One Health**

The Sports for Health program for 2018 partnered with established health and fitness groups in Grenada. Community participants are increasingly enrolling into local gyms which provided the opportunity to access persons to assess their physical health parameters. Participants were identified as having a mix range of normal to overweight Body Mass Index (BMI) and a consistent family history of diabetes and hypertension. The Sports for Health program will continue to partner with the local gym facilities where community participants are increasingly enrolling towards monitoring their progress over time.

The success of WINDREF's Touch Toe Test in Grenada from 2013-2017 in reducing the number of amputees associated with diabetic complication of peripheral neuropathy was identified by the Organization of Eastern Caribbean States. In 2018, WINDREF partnered with the Caribbean Public Health Agency (CARPHA) and the Ministry of Health in St Lucia to launch a similar program for other Caribbean islands. The Touch Toe Test Health promotion and education campaign together with mobilization of health services to identify peripheral neuropathy as well as advocate for foot care has been successfully expanded to other Caribbean islands with the expectation of similar results in reducing the burden of diabetes and its complications.

In 2018, WINDREF and St. George's University as part of its 40th Anniversary celebrations delivered a year-long Massive Open Online Course (MOOC) on One World, One Health,

One Medicine. The course which included twelve different monthly presentations ranging in topics from human, animal and environmental health engaged a global audience from every continent. The course was offered in partnership with the United States National Board of Public Health Examiners (NBPHE) and included 12 continuing education credits.

*Submitted by Satesh Bidaisee*

### **A Randomized Controlled Trail to Investigate the Effectiveness of a Glucose-stabilizing Dietary Supplement in Individuals Exhibiting Metabolic Syndrome**

WINDREF is conducting a randomized, placebo-controlled, double-blinded clinical trial designed to evaluate the effectiveness of a dietary supplement to stabilize the blood glucose levels of individuals who exhibit characteristics of metabolic syndrome, a condition that often indicates a person is at risk for progression toward becoming diabetic. Since diet is an important factor in a healthy lifestyle for people with metabolic syndrome, the objective of the study is to document scientific evidence the formulation tested can contribute to a person maintaining blood glucose levels within a healthy range less than 6.0 HbA1c.

This study is the first clinical trial conducted in Grenada, and it will be one of the largest, longest and most controlled studies on a dietary supplement targeted to stabilizing a person's blood glucose level.

By the end of the study, 240 participants will have been enrolled with 120 allocated at random to a treatment group and a placebo group for a duration of twelve months. As of

the end of 2017, the 67 participants have been enrolled who have completed the first stage of four three-month stages. Each participant's blood glucose level – as measured by glycated hemoglobin HbA1c – is assessed initially at enrollment and then at the end of each 90-day stage.

A team of three full-time licensed nurses visit the study participants in their homes every 30 days to monitor the participants' compliance with the study protocol, distribute supplements and placebos, measure blood glucose levels, and collect data on the participants' activity, body weight, blood pressure and dietary practices. Activity level is monitored with a personal activity tracker worn by each participant.

Since the data are longitudinal repeated-measures, analyses are conducted using ANCOVA, with preliminary results reported at the end of each stage.

The dietary supplement used by the treatment group is a formulation manufactured by LifeSeasons, Inc., headquartered in the USA, and marketed under the brand name *Glucose Stabili-T*. LifeSeasons provided twelve-months of supplements and placebos for the study participants.

The research was approved by the St. George's University Institutional Review Board, and is being directed by Paul J. Fields, Calum Macpherson, Emmanuel Keku, Trevor Noel, Randall Waechter, and Dolland Noel. George Mitchell, the Chief Medical Officer for the Grenada Ministry of Health, is a research collaborator as well.

*Submitted by Paul Fields*

### **The Effectiveness of Auricular Acupuncture in Reducing Waist Circumference and BMI in Overweight Females**

The research has been undertaken by Felicity Lillingston, who is completing her PhD in Integrative Medicine at the International Quantum University for Integrative Medicine in Hawaii. Study design and data collection was carried out at St. Georges University in Grenada in close partnership with WINDREF, and specifically, advice and support of Dr. Randall Waechter and statistician Dr. Paul Fields.

Clearance was given to carry out the study by the SGU Institutional Review Board (IRB) in January 2017. Data collection ran from August to December 2017. Preliminary findings were presented at the 'One Health One Medicine Symposium' on SGU campus in October 2017.

Obesity and subsequent ill health has reached epidemic proportions in the developed countries in the West, and many developing countries are following the same path. As discussed recently by Professor Fitzroy Henry at the 'One Health One Medicine Symposium' this is also perceived as a serious problem here in the Caribbean where obesity-related ill health leads to high mortality. Weight loss and sustaining a healthy weight has posed a constant challenge to patients and health care providers in the region and globally. According to the literature, dietary advice and lifestyle changes alone have demonstrated limited sustainable impact on patients seeking to achieve a healthy weight. Although trials have been carried out on Auricular Acupuncture (AA) and its role in weight control, research fails to clearly



demonstrate a conclusive impact. Thus, a randomized placebo-controlled trial was carried out using auricular acupuncture as an intervention. Participants attended a single weekly session in WINDREF over a 7-week period, in which the intervention group received auricular acupuncture and the placebo-controlled group received sham acupuncture. The participants were blinded to their group assignment. Each week, waist measurement and weight measurement was taken, and food and mood and activity questionnaires for the week were completed. The participants were explicitly told not to change their dietary habits and exercise regime during the 7-week intervention. The participants were not given any dietary and exercise advice or recommendations. The purpose and hypothesis was to test the effectiveness of auricular acupuncture on waist reduction, weight loss, BMI and mood and that acupuncture would be more effective than placebo.

There were strict criteria for inclusion to avoid any age and gender variables which could affect weight loss and be difficult to factor in when analyzing the results. Females affiliated to SGU, aged between 20-30, with a BMI of 25 or above and with no significant medical history or allergies were recruited. Any prescribed medication was disclosed and any changes in this were to be reported to the researcher. As the selection for the acupuncture or placebo control group was strictly random it was not possible to ensure that both groups had similar weight and girth measurements at the outset.

The Rochon method for calculating the sample sizes was used (James Rochon, "Sample Size Calculations for Two-Group Repeated-Measures Experiments, Biometrics,

v47, Dec 91, 1383-1398). Based on this analysis, 30 participants were randomly recruited in the control and 30 in the intervention groups. The minimum total sample size advised was 54. 60 candidates were accepted for the trial. All 60 candidates completed the trial however 2 sets of data were not included for analysis due to the candidates not continuing with the required strict criteria for inclusion during the trial.

Candidates were asked to fill in a MFQ - mood and feeling questionnaire weekly. This was not only to monitor their mood throughout the study but also to alert the researcher to any student who was depressed and needed help. Protocols were set in place to assist any such student.

All equipment was calibrated prior to the trial. Electronic weighing scales were used to avoid error or data collection bias and were calibrated as correct before use. The waist measure was designed especially for measuring waist circumference with a secure locked in attachment and a button to tighten to the correct size to avoid any error or bias by the person collecting the data. To ensure unbiased readings were taken, these weekly statistics were recorded separately each week on the students MFQ Questionnaires. These were stored to be entered on a spread sheet and analyzed at the end of the trial.

Acupuncture needles were sterile and sealed. In the placebo-control group, a similar plaster (with no needle) was used and was not placed in the correct position on the ear.

The evidence from early findings from this study show that the intervention of auricular acupuncture might be useful in helping subjects achieve a reduction in waist

circumference of up to 9% within 7 weeks.

Current Outcomes (n=58)

		Pre-Post Weight Change	Pre-Post Waist Circumference Change
Acupuncture Intervention	Average	-1.31%	-5.35%
	Minimum	+3.88%	-0.15%
	Maximum	-7.25%	-8.97%
Placebo Control	Average	-0.54%	-0.02%
	Minimum	+2.55%	+5.38%
	Maximum	-5.98%	-7.28%

It was interesting to note that 100 % of intervention group lost waist measurements showing reduced abdominal adiposity whereas the results from the control/placebo group was negligible by comparison. Data analysis is ongoing to determine whether the 5.35% average waist circumference drop in the acupuncture group is significantly more than the placebo control group.

These are preliminary findings however it's seems pertinent to conclude that by using auricular acupuncture together with adding in extra advice on lifestyles and dietary changes (which was not given during the study) would possibly improve the outcome further.

*Submitted by Felicity Lillingston*

**Perspectives on the Uptake of Breast and Cervical Cancer Screening in the English Speaking Windward Islands: A Collaborative Approach**

Background

In July 2015, the proposal entitled, 'Perspectives on the uptake of breast and cervical cancer screening in the English Speaking Windward Islands: A collaborative

approach' was approved for funding through the Caribbean Public Health Agency (CARPHA) and the National Cancer Institute (NCI) in the United States. The proposal was one of six funded under the request for proposals. The study is funded for two years, 2016 -2017, in the amount of US\$50,000.00. This study has multiple data collection locations in the English-speaking Windward Islands including Grenada, St. Lucia, St. Vincent and the Grenadines and Dominica. The study aims are: 1) To identify cultural factors that influence participation in breast and cervical cancer screening among women living in the English speaking Windward Islands and 2) To determine the clinical and social services that are available that enhance or support the quality of life for breast and cervical cancer patients in each of the 4 English speaking Windward Islands from the perspective of the gatekeepers who provide care for patients.

Status of the Study

Implementation of the project began in January 2016. To achieve the aims of the study focus group discussions were held for women and in-depth interviews for health practitioners involved in providing services for breast and cervical cancer patients. Initially the researchers obtained IRB approval and appointed a country liaison in each of the participating countries. Using online forums, meetings were held and contractual agreements signed with liaisons. Training sessions were also conducted via this method. Furthermore, liaisons were required to complete the National Institutes of Health (NIH) training for researchers and submit their certificates. Additionally, transcriptionist -s were identified by the liaisons for each country and contractual agreements entered

into using the same method as was used for the liaisons. To ensure that the research protocol was being adhered to, site visits were conducted in each island at the start of data collection.

Phase one of the project was completed in 2016. This comprised of 3 focus group discussions and 5-7 key informant interviews in each of the countries. Submission of all attendance records, demographic forms, audio files as well as transcripts for all focus groups and interviews completed as specified in the contract. Country liaisons and transcriptionists have also received payments based upon the agreed upon payment schedule. Currently, final reports are being completed for submission.

As of December 2017, data collection for Phase two is complete. All final reports from the country liaisons were completed and submitted. Data from individual interviews have been coded and analyzed. An article entitled '**Gatekeepers' Perceptions of the Quality and Availability of Services for Breast and Cervical Cancer Patients in the English-speaking Windward Islands: An Exploratory Investigation**', the results of the individual interviews, were published in the high impact journal *Cancer Causes and Control*.

Data analysis of the focus group portion of Phase 2 is underway and is expected to be completed by February 2018.

#### Progress to Date

Number of participants: 128

We have collected data in each of the 4 countries (Dominica, Grenada, St. Lucia, St.

Vincent & the Grenadines. We completed 22 individual interviews with oncology professionals and conducted 9 focus groups that included 106 local women in each country.

#### Publications

Thomas-Purcell, K.B., Tarver, W.L., Richards, C., Primus-Joseph, M. (2017). Gatekeepers' Perceptions of the Quality and Availability of Services for Breast and Cervical Cancer Patients in the English-speaking Windward Islands: An Exploratory Investigation. *Cancer Causes and Control*.

#### Conference Presentations

SGU Research Day Poster Presentation- November 2017; African Caribbean Cancer Consortium Annual Meeting- October 2017; Caribbean Public Health Association Annual Conference- June 2018.

Summary of findings of focus group discussions

In progress.

#### Security and Maintenance of Confidentiality

All data from this study has no personal or identifying information attached. The PI requested a waiver of signed consent to protect participant confidentiality. All data is kept electronically on a password protected computer and a backup file is being kept in a password protected cloud storage program. Any identifying information used for recruitment is kept separate from the data and will be destroyed once the study findings are written up.

## Next Steps

Two manuscripts will be authored based on the focus group data and submitted to peer-reviewed journals.

Two mini papers will be authored and submitted to the 2018 CARPHA annual conference.

Phase 3 of the project will begin in January 2018. This will involve completion of the final report, submissions to research conferences, and small group presentations/discussions with the Ministries of Health in each of the participating Windward Islands.

The study findings will be used in each of the four participating Caribbean Islands to inform the development of culturally appropriate programs that encourage the uptake of screening and preventative health behaviors. Furthermore, recommendations will be provided to the Ministries of Health of each island for strengthening the screening system and the treatment and support services. The ultimate goal is to reduce morbidity and mortality from the breast and cervical cancers.

*Submitted by Kamilah B. Thomas-Purcell, Christine Richards, & Marva Joseph*

## Reachwithin

2017 launched the opening of the reachwithin drop-in centre, located on Old Fort Road in St. George's. The drop in centre, for adolescents transitioning out of residential care and those connected to the street, is a safe haven to receive information, job-training, life skills and opportunities for healing connections.

reachwithin staff member, Mr. Troy Clarke who has a background in social work and has worked with marginalized adolescent populations in New York City, very quickly established a caseload of clients in need of support for meeting short-term and long-term needs. The current individual case load is 9 adolescents who receive counselling, advocacy and training. Mr. Clarke is also conducting in-take sessions in preparation to launch life skills and job-training workshops with capacity for 25 participants per session. Mr. Clarke's work uses a child rights approach where-by the relationships that the youth have developed with the streets or in residential care and the strategies for survival are seen as a strength. At the reachwithin drop-in centre, each individual is valued. reachwithin staff meet clients wherever they are and help them to take the next step towards a goal.

reachwithin has expanded therapeutic outreach programs to include babies and toddlers. To ensure we are following best practice guidelines set forth by the United Nations Convention on the Rights of the Child, reachwithin has adapted programming to include the youngest residents in our yoga, drumming and mindfulness programs. Ms. Shirley, a staff member of the BelAir Home co-facilitates the sessions along with reachwithin's Program Coordinator, Mr. Jerry Bascombe. The sessions not only support developmental milestones and rhythmic self-regulation but also promote nurturing interactions between caregivers and children. This year, 7 children ranging from birth to four years of age have received over 50 hours of therapeutic programming through this initiative. The classes also welcome infants who come into the home on an emergency short-term basis and who are in need of

positive, soothing connections.



reachwithin continues to offer yoga, drumming and mindfulness sessions at the Bel Air Home, The Queen Elizabeth Home, Dorothy Hopkins and Father Mallaghan's Home. 86 residents aged five to eighteen years and young adults with disabilities participate in bi-weekly classes. The classes are led by reachwithin's Program Coordinator Mr. Jerry Bascombe and Program assistant Mr. Dennis Mason. reachwithin also mentors several older youth in leading the sessions for younger children. Once residents begin to trust the group rhythm of drumming, individuals often express themselves through dance or song in the centre of the circle. This year, reachwithin's intern, Liam Stewart, developed a train-the trainer project to incorporate mindfulness breathing exercises and singing lessons into these sessions.



Training and educating caregivers in understanding the behaviours of children who have experienced abuse and neglect is paramount to the work of reachwithin. Aside from ongoing training sessions at residential care homes, reachwithin now offers one-day retreats for caregivers and staff working in four residential homes in Grenada. reachwithin believes staff caregivers provide the most consistent relationship for children who have experienced abuse or abandonment and it is highly important to replenish resources in

order to prevent burnout.

According to reachwithin's scientific advisor, Dr. Richard Honigman, "parents/caregivers have a certain amount of inner reserve. Stress, health issues, any number of factors can drain this supply. In order to offer optimal support to children or be open to handling challenging situations with patience, it is important to replenish these resources."

The caregiver retreats include gentle yoga, drumming, journaling, walking meditation and team- building exercises. 19 caregivers and 1 manager participated in the 2017 retreat program that runs on a quarterly basis. reachwithin would like to thank La Luna Hotel for donating a beautiful space and nourishing lunch for the first caregiver retreat.

reachwithin volunteer Mr. Jim Stewart and Program Coach, Mrs. Lorna Douglas have also been developing curriculum for *My Spiritual Life* Program. The program is designed for caregivers working in residential care homes and allows them to explore faith in the context of their work with vulnerable children. The program offers an opportunity for caregivers to share experiences and draw upon faith based practices for support and rejuvenation. This year Mrs. Douglas trained 26 caregivers and staff across 4 residential care homes.



reachwithin in conjunction with St. George's University hosted a 3-day specialty training for the SGU School of Nursing and invited guests from the Child Protection Authority and GrenCase Caregiver Programme (formerly Grenada Roving Caregiver Programme) in the growing field of Infant Mental Health. Infant mental health recognizes the importance of and attempts to enhance early infant caregiver relationships towards the goal of providing infants and caregivers with the means to establish healthy relationships, as there is a growing body of scientific research and literature demonstrating that the roots of

many adult diseases have their beginnings in early childhood adversities. Early life adverse circumstances and environmental stressors such as poverty, domestic violence, substance abuse, the death or incarceration of a parent can all contribute to ill health when not mediated by safe and responsible culturally respectful caregiving relationships.

Dr. Alexandra Harrison, a noted child psychiatrist led the course. Dr. Harrison in addition to being a core faculty member of the University of Massachusetts Boston Infant Mental Health Post-Graduate Certificate Program is a Training and Supervising Analyst in Adult and Child Psychiatry at the Boston Psychoanalytic Institute, an Assistant Professor Part Time in Psychiatry at Harvard Medical School and co-founder of a non-profit Supporting Child Caregivers dedicated to furthering her efforts to disseminate knowledge about the importance of early relationships in the life and health of infants and their caregivers.



The lecture material was organized around the tasks of the parent: To Protect, to nurture, and to enjoy, and also included demonstration of the "Newborn Behavioural

Observation" tool used to build healthy relationships between the newborn infant and its parents.

On October 27, 2018, reachwithin collaborated with the Child Protection Agency (CPA) to launch the All Against Child Abuse campaign in Grenada. As part of the partnership, reachwithin co-designed public health materials for the march and procured a child friendly mascot to promote the message, "It's safe to tell." Over 80 people marched through the streets of St. George's. reachwithin will continue to work with the Child Protection Agency as the initiative spreads to other parishes.



reachwithin rounded out the year by launching the "reachwithin Project" campaign. This fundraising initiative includes the purchase and renovation of a property that will become Grenada's first Emergency Shelter and Training Centre for Best Practice in Public Health. According to a UNICEF study, child abuse is a growing epidemic in the Caribbean, region and both immediate and long-term responses are needed to bring about change.



### Grenadian Staff

Name	Position	Dates acted
Jerry	Program	2011 - Present
Bascombe	Coordinator	
Lorna Douglas	Program Coach	2009 - Present
Troy Clarke	Program Coordinator	2016 - Present

The reachwithin Project Includes:

- respite for children in emergency situations of abuse or neglect
- scientifically based programs for self-regulation and re-patterning of traumatic experiences
- community trainings for children and adults in child abuse awareness and prevention agricultural and
- vocational training programs
- training opportunities for SGU nursing, medical, psychology and public health students to develop best practice initiatives in response to this growing epidemic

reachwithin would like to thank local business, Steel Magnate LTD for kicking off the fundraising.

### Our People

#### Board members/Trustees

Name	Position	Dates acted
Karen Lawson	Board Chair	2008- Present
Kathleen	Board	2008-Present
Kinsella	Treasurer	
Aram	Board	2015 - Present
Moezenia	Member	

### Consultants

Name	Position	Dates acted
Lauren Brownstein	Grant Writer	Project Based
Wendy Bertucci	Communications	Project Based
Rosy Evans	Program Development	Project Based
Mackenzie Lawson	Development Director	June 2014 - Present
Ben Macintyre	Graphic Design	Project Based
Yc Shao	Bookkeeping	Project Based
Liam Stewart	Intern	Oct 017 - Present

### Volunteers

Name	Position	Dates acted
Katia Lawson	Social Media	Sept. 2016 - Present





## Help Us Create Change

### Volunteer Your Time

reachwithin is currently recruiting long-term volunteers living in Grenada to mentor a vulnerable child or youth.

### Join the 2018 NYC Marathon Team

Running a marathon can be an inspiring and life changing event. The effort, the struggle and the thrill of achieving a goal, mirror the experiences of so many children who have faced adversity in their life. Please consider this challenge and run in honour of a vulnerable child. Space is extremely limited. Sign-up today for automatic entry into the New York City Marathon.

### Make a Donation

Together we can create change. Please visit [www.reachwithin.org](http://www.reachwithin.org) to find out how you can invest today.

*Submitted by Karen Lawson*

### **Saving Brains Grenada: A Community-based Conscious Discipline Program to Reduce Corporal Punishment in the Caribbean**

The Saving Brains Grenada initial pilot project came to an end in the Fall of 2016, and a final report has been submitted to the funding agency, Grand Challenges Canada. The purpose of the project was to disseminate a 'Conscious Discipline Meme' in which

corporal punishment is seen as counterproductive, and more positive alternatives that focus on parent-child attachment and skillful child raising practices are vitally important. To accomplish this, we implemented a train-the-trainer model, teaching Conscious Discipline Paraprofessionals (CDPPs) who traveled to communities to meet weekly with parents and their children--to model Conscious Discipline, foster positive attachment, and impart new skills. These CDPPs were supported by a mobile resource unit that also traveled to the communities to provide further training and resources and provide high national visibility for the project. The impact and results from the program are encouraging:

- Over the course of the 2-year project, 105 Ministry of Social Development Roving Caregivers received Conscious Discipline training and were certified as Paraprofessionals. Each trainee spent an average of 12.5 days in workshops and travelled throughout Grenada visiting families with children from birth to age three, providing stimulation and Conscious Discipline techniques.
- At the completion of the study, 66 of these Paraprofessionals were still in the field delivering the service to moms and their young infants. Each session was one hour in length.
- Paraprofessionals made over 2,000 home visits in 60 Grenadian communities during the 2-year project.
- Over the course of the 2 year project, 843 caregivers and their infants received at least some in-home visits from the Paraprofessionals, and more than 400 received the minimum target number of visits (10).
- A Conscious Discipline Mobile Resource

Unit, staffed by project manager Ms. Stephanie Holmes, was established and visited communities throughout Grenada over the course of the project to provide classes in Conscious Discipline and to support the Roving Caregivers.



The Saving Brains Grenada Mobile Resource Unit

- 100% of parents/caregivers who visited the Saving Brains bus said they would recommend bus visits for other parents/caregivers with small children!
- Parents in the intervention group showed more stable attitudes toward corporal punishment from pre-intervention to post-intervention than parents in the control group whose attitudes deteriorated over the 2 years of the study, suggesting that the training and modeled attitudes influenced parents' views of corporal punishment.
- The majority (71.6%) of the intervention group parents who were tested (n=131) provided positive responses when asked about what they would do in different daily scenarios encountered with their toddler, suggesting that the parents took up the model attitudes.
- We noted that the mean age for the intervention group (27.9 months) was higher than the mean age for the control group (26.4 months). Consequently, we included age as a covariate in modeling the cognitive responses of the toddlers. Considering only the toddlers whose parents had received more than 10 Conscious Discipline training sessions, and accounting for the difference in ages between the intervention and control groups, we found that toddlers in the intervention group scored higher on the Intergrowth 21<sup>st</sup> Neurodevelopmental Assessment total cognitive score (Mean Score = 42.9) than toddlers in the control group (Mean Score = 39.1). The difference in scores was significantly different from zero (t = 2.236, p = .027). Using Cohen's d, we determined that the effect size was small-medium (d = .435; 95% CI: .049 to .821). Therefore, the results indicate evidence of higher total cognitive
- The Mobile Resource Unit supported Paraprofessionals when they went into the community, and acted as a "mobile billboard", advertising the project to the Grenadian public.
- The Mobile resource Unit visited 50 Grenadian communities every two months during the 2-year project.
- 340 of the 843 infants in the project were randomly-selected for outcomes assessment: 168 in the intervention and 172 in the waitlist control.
- Significantly more Grenadians reported hearing about "Saving Brains Grenada?" after the study was completed (16.2%) than at the beginning of the study (13.4%), )  $\chi^2=3.79, p=.052$  (n=999).
- 40.4% of respondents reported in the affirmative to the question: "Have you seen this bus in Grenada?" (n=1,126).
- The mean rating for "overall experience at the bus" was 4.4 (0= extremely bad; 5=extremely good) (n=80).

achievement by the intervention group.

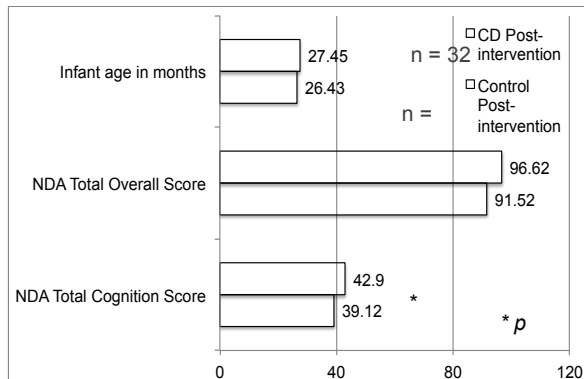


Figure 1: Neurodevelopment (NDA) scores for waitlist control vs. intervention group



Families visit the Saving Brains Grenada Mobile Resource Unit

Submitted by Barbara Landon and Randall Waechter

The project team is now seeking further funding to scale the project up from late 2017 onward. This scale-up will include the expansion of the CD-based in-home visits to more communities in Grenada, expanding the CD training to daycare workers, opening a CD-based best-practice demonstration elementary school in Grenada, inviting interested individuals and government representatives from Grenada and throughout the Region to visit the CD best practice school, and encourage other schools in Grenada to train educators in CD techniques.



Saving Brains Grenada Project Manager, Ms. Stephanie Holmes, interacts with a Grenadian girl while teaching Conscious Discipline to parents and caregivers

### Genetic Correlates of the Addictive Diseases: Cocaine, Alcohol and Marijuana Addiction in Grenada, West Indies

In Grenada, blood samples are taken from normal volunteers, drug-free former cocaine users, drug-free former marijuana users, drug-free former alcohol users, or current drug and alcohol users. To assess their levels and types of addiction, a standard scale – developed by the Kreek Lab – is used for each patient, called the KMSK scale. The KMSK scale is a brief survey that is 90-100% effective in screening for alcohol, marijuana, cocaine and heroin addiction. This scale is used for all patients studied in the Kreek Lab. The patients are also asked about their family origin, as this information may play a role in further genetic studies done by the Kreek Lab.

To date, 55 case participants have completed the full KMSK questionnaires and blood draws in Grenada. Our control participant’s selection is ongoing and we have completed 93 control samples. The samples and KMSK and family origin questionnaires that are administered

are sent to Rockefeller University (New York) where they are analyzed.

In the past, our research nurses have included Nestar Edwards (Chief Nursing Officer for Grenada), Beverly Mends, Kathleen Collier, and Nurse Idis Mark-George. Recent talks have been held to include nurses from the St. George's University School of Nursing and the Ministry of Health (Grenada). These nurses have been entrusted with the process of receiving a signed informed consent form and drawing the blood and administering the Family Origin Questionnaire and the KMSK scale to the participants.

The Kreek Lab collaborates with WINDREF in Grenada in an effort to gain a better understanding of the biology of addictive diseases, particularly the genetic basis of addiction. Grenada provides a unique study sample as heroin and other such opiates have yet to enter the country. In most countries, opiate and cocaine addiction is rampant and sometimes may go hand in hand. Thus, the Grenada study acts as a control for any heroin-cocaine addiction comorbidity observed in previous genetic studies of addicts.



Dr. Mary Jeanne Kreek, Head of the Kreek Laboratory, Rockefeller University, New York.



From L to R: Dave Alexander - Drug Czar, Drug Control Office; Trevor Noël, Mary Jeanne Kreek - Rockefeller University; Elizabeth Japal - Assistant Drug Control Officer

Whole blood samples taken from subjects in Grenada are shipped to the Kreek Lab at Rockefeller University for DNA isolation. The DNA is further analyzed by lab members who look for any polymorphisms – variations in DNA – that may occur in specific regions of the DNA: mu and kappa opioid receptor genes being two of the many.

Projects of a similar nature are being run in several other areas of the world, including Stockholm, Lund, and Uppsala in Sweden, Oslo in Norway, Tel Aviv in Israel, Las Vegas in Nevada, Oakland in California and New York City in New York, USA.

Trevor Noel is the WINDREF representative on the Grenada Drug Intervention Network (GREN DIN). GREN DIN celebrated its fourteenth anniversary in December and we continue to work closely with Drug Avoidance Officers from the Ministry of Education. Both WINDREF and Rockefeller University have been collaborating with the Drug Avoidance office on this project for twelve years.

*Submitted by Trevor P. Noël*

**Caribbean University Interdisciplinary and Integrated Drug Demand Reduction Project**

including the Drug Rehabilitation sectors of Grenada and Saint Lucia.

This project is designed as the first phase of one of several approaches for responding to the region's need for an inter-disciplinary and comprehensive approach to the illicit drug use problem.

The project utilizes a qualitative design where focus group discussion sessions consisting of 6 - 8 participants are or will be conducted in each country. Focus groups will be conducted until data saturation is reached.

In this proposal, the focus is on the community outreach activities by building capacity within Grenada and St. Vincent while drawing on the considerable academic expertise at SGU to evaluate the impact and effectiveness of the treatment programmes and interventions carried out in Grenada and St. Vincent.

The subject population for this research consists of key community members / stakeholders, drug users and family members of drug users. There are three (3) groups of key stakeholders: persons who use substance and seek treatment; family members of persons who use substances; persons involved in the treatment and care of those who use substances for the Grenada arm of the study and only one (persons who use substance and seek treatment) for the Saint Vincent and Saint Lucia arms.

The project goals will be achieved through research geared toward assessing the needs for best treatment and aimed at reducing drug demand; evaluation of the economic cost for drug demand reduction; training workshops on drug demand reduction for community outreach personnel and evaluation of the effectiveness of the training. Additional goals include: developing treatment policies, standards, protocols; and, using best practices that foster prevention, timely identification, and management of the drug use problem by health providers.

The study is ongoing. To date Grenada focus group sessions have been completed. Sessions were held at the Mt. Gay facility where groups of persons who used substances, family members and health care providers were interviewed. The data is currently being transcribed for analysis in 2018.

The aim of the needs assessment phase of the project is to describe the nature of drug treatment and obstacles or barriers encountered in seeking care for substance use with the aim of recommending strategies to the Drug Rehabilitation Sector that inform policy which will aid in the development of programs and interventions to address the needs of the communities in Grenada, Saint Lucia and St. Vincent. This project has the support of a coalition of organizations,

The St. Vincent round of focus groups started in November 2016 and will continue into January 2018. Following completion of the sessions in St. Vincent the data will be added to the software for comparison with the Grenada data.

Saint Lucia is the third country from which data would be collected. The IRB process is still ongoing and it is hoped that this would be resolved to enable data collection in February/ March 2018.

Submitted by Shelley Rodrigo

**Caribbean Research Ethics Education Initiative (CREEi)**

The Caribbean Research Ethics Education Initiative (CREEi), funded by the NIH Fogarty International Center Grant Number R25 TW007085, is completing training of its 3<sup>rd</sup> cohort. CREEi aims to build research ethics capacity in the Caribbean and Latin America through centers in Grenada (SGU) and Mexico (Universidad de Autonoma). To do so, it trains professionals through online learning, preceded by a rigorous and demanding intensive on-site proseminar course hosted by Bioethics at SGU and WINDREF, and concluded by a similar onsite capstone course in the same location. Trainees who complete all courses receive a diploma, and those who complete the proseminar and 2 online courses receive a certificate. Those who excel and are motivated to do so may use their course work to apply for advanced standing in the Master's degree program in bioethics at Clarkson University, and apply for a CREEi scholarship.

In the English-speaking arm, only trainees from Caribbean countries classified as low or middle income by the World Bank may be enrolled in CREEi. Trainees from Grenada, Jamaica, St Vincent, St Lucia, Antigua, Belize, Guyana, Surinam and, in Cohort 1, Trinidad and Tobago have been accepted. Accomplishments to date are as follows.

**Cohort 1**

Of 12 trainees enrolled, 11 completed the diploma on time while 1 took a leave of absence and completed with Cohort 2. Full scholarships for the Masters degree program were awarded to 3 of the 12; 1 of them has completed and 2 are projected to complete in

2018. Additionally, 2 enrolled in the Masters degree program at their own expense (1 successfully completed it and the other will start in 2018). Additionally, an alumnus of Cohort 1 was awarded and completed a highly competitive ethics fellowship at the NIH Bioethics Center.

**Cohort 2**

Of 10 trainees enrolled, 7 completed on time and 1 will complete with Cohort 3, 1 withdrew early on, and 1 was dismissed for academic dishonesty. Scholarships for the Masters program were awarded to 3 who are expected to complete on time in 2018.

**Cohort 3**

Of 11 enrolled, 10 hope to complete on time despite facing competing personal and professional commitments that challenge members of Cohort 3. These led 1 to request a leave after successfully completing the Certificate. If the grant is renewed to continue CREEi beyond 2018, then that trainee will complete with the next Cohort.

Individual alumni have significant accomplishments since completing CREEi. Among others, these include peer reviewed publications, conference presentations, PAHO consultancies, invitations to train IRB members, and more.

*Submitted by Cheryl Macpherson*

**United Nations Framework Convention on Climate Change (UNFCCC) St. George's Regional Collaboration Centre (RCC)**

The St. George's Regional Collaboration Centre (RCC), a collaboration between the United Nations Framework Convention on Climate Change (UNFCCC) secretariat,

WINDREF, and the Department of Public Health and Preventive Medicine (DPHPM) at St. George's University (SGU) entered its 4<sup>th</sup> year of operation in 2017. The Centre is dedicated to promoting climate action in the sixteen independent Caribbean states. This year, the RCC progressed the actions from previous years, supporting CDM projects in the region, the development of standardized baselines, and supporting work on Nationally Appropriate Mitigation Actions (NAMAs) under the leadership of Vintura Silva who was appointed to coordinate activities in the Latin America and Caribbean regions. New initiatives supported by the RCC in 2017 included support for Nationally Determined Contributions (NDCs) in the Caribbean - including the use of carbon pricing Instruments; building capacity for Measuring, Reporting and Verification (MRV); and energy and renewable energy projects and technology throughout the Caribbean as key mitigation objectives as the RCC supports implementation of the Paris Climate Change Agreement.

*Submitted by Vintura Silva and Hugh Sealy*

### **Carbon Pricing in the Caribbean**

A Nationally Determined Contribution (NDC) is a country's voluntary climate change mitigation target over the next 5 to 10 years. Most NDCs for the Caribbean region express an interest in using collaborative market (international and domestic) approaches to meet their mitigation targets. In preparation for the implementation of the commitments in NDCs as well as to arrive at a Caribbean position on the Article 6 discussions under the Paris Agreement, Caribbean countries requested the UNFCCC Regional Collaboration Center (RCC) in St George's

(RCC) to help create awareness on the topic of carbon pricing and options under the article 6 of the Paris agreement.

In 2015, the Caribbean Community Climate Change Center (CCCCC) announced the potential for regional approaches to addressing climate change mitigation including through use of regional carbon markets. Trinidad in its intended Nationally Determined Contributions (iNDC) referred to the use of the carbon market in development by the Energy Chamber of Trinidad & Tobago (ECTT). This initiative "The Caribbean Carbon Pricing Initiative (CCPI)" (<http://energy.now.tt/blog/the-caribbean-carbon-pricing-initiative-ccpi>) has expressed interest to create a regional carbon market.

With the support from the collaborative Instruments for ambitious climate action (CI-ACA) initiative RCC St George's started to identify how to advance these discussions. CI-ACA is an initiative by UNFCCC together with the RCC host partners, supported by governments of Germany, Norway, Sweden and Switzerland.

To begin to validate the requirements of the countries, an informal consultation on establishing a regional initiative to support Caribbean countries in implementing collaborative climate actions, including through a possible regional carbon market, was held on the margins of the Bonn Climate Change Conference in May 2017, under the leadership of the CCCCC in collaboration with the RCC. The key message from this meeting was the need of the Caribbean countries to understand options available to them, knowledge of developments in the international arena and the negotiation process on the topic of carbon pricing and

collaborative actions. To meet this need, the RCC, in consultation with CCCCC, Carbon Finance Solutions (CFS) – a consortium of consultants working on the CCPI, Climate Markets and Investment Association (CMIA), together with the support of the Swedish Energy Agency (SEA), OECS secretariat, CARICOM secretariat, the World Bank and the International Emissions Trading Association (IETA) developed a work programme to address the request of the countries. Initially, the partners conducted a survey with all CARICOM member countries both in written and oral form, with follow-ups to identify the needs of the countries in terms of capacity building on carbon pricing. Secondly, to create awareness on Carbon pricing, a Webinar was organized, lead by CMIA, on 14 September 2017. The webinar covered the themes of introduction to carbon pricing, options available to countries and background on existing international initiatives. On the 2<sup>nd</sup> and 3<sup>rd</sup> of October, RCC St George’s, together with other partners, organized a regional dialogue to assist Caribbean countries in the development of carbon pricing approaches for implementing their Nationally Determined Contributions (NDC) under the Paris Agreement. The event was held at the Radisson Grenada Beach Resort, Grenada, West Indies, in conjunction with the event “Developing a regional proposal for a programme to support the implementation of the energy aspects in NDCs in the Caribbean” and climate focal points were jointly invited to both the events. Opening the dialogue Dr. Randall Waechter, Associate Director of Research for SGU and Research Grants Coordinator at the Windward Islands Research and Education Foundation (WINDREF) stated: “This event provides the opportunity for Caribbean Community and Common Market (CARICOM) member states to meet and

discuss how to access regional and international support for implementation of their Nationally Determined Contributions (NDCs) and other commitments under the Paris Agreement”. “However, despite progress, we are cognizant of the challenges we face as small islands. Due to our small size and small populations the socio-economic stability of small states is being severely compromised by climate change,” said Dr. Hugh Sealy, Professor in the Environmental and Occupational Health Track in SGU’s Department of Public Health and Preventive Medicine and co-facilitator of international discussions of Article 6 of the Paris Agreement.



Participants at the Caribbean regional dialogue on carbon pricing instruments in Grenada, October 2-3, 2017

The objective of this two-day event was to continue the momentum and further the dialogue around a carbon market/instrument in the Caribbean region with various state and non-state stakeholders. The objectives of the dialogue were to:

- Raise awareness in the region with regards to the use and benefits of market instruments;
- Gain a better understanding of current initiatives supporting development of market instruments in the Caribbean;



- Exchange views on how the elements of a potential regional approach should be designed to address regional needs that are in line with individual national plans;
- Collect ideas regarding countries' expectations and planned levels of engagement;
- Increase the number of countries and high-level stakeholders that are involved in discussions on market instruments;
- Develop a general understanding of how market instrument(s) could operate.

The event was also supported by ParlAmericas, California Air Resource Board. The partners also organized follow up meetings in Trinidad and Tobago (during the CCCCC and GCCA+ international conference on Climate change for the Caribbean on 9-12 October) and Mexico City at the Latin America and Caribbean Carbon Forum (18-20 October) to further impart knowledge on the topic to prepare countries for discussions under Article 6 of the Paris agreement and possible early action. At the invitation of Dr. Jennifer Simons, Speaker of the National Assembly of the Republic of Suriname, who was present at the meeting in Grenada, RCC St George's together with UNFCCC presented on the topic of carbon pricing and opportunities of carbon markets to parliamentarians at a specially organized national assembly session in Suriname on 25 October 2018.



Vintura Silva presenting to the National Assembly of the Republic of Suriname October 25, 2017

To summarize the developments CCCCC together with RCC St George's conducted a follow up event on Caribbean Carbon Pricing Dialogue at COP 23 on 10 November 2017. Below is a summary of key points from this series of discussions:

- To take a concrete decision on the way forward the political decision makers need to be made aware of and be informed on different options;
- Region has some appetite for the carbon pricing approaches, but there are large differences in the preparedness of different countries in the region to initiate action;
- Although the technical officers present at awareness trainings gained a general understanding on the topic of carbon pricing and options available, they need further support and knowledge to conduct analysis on the options that will work and are favorable in national/regional contexts;
- The best way to address this gap is a need for a national/ regional level study to analyze what instruments can work best in the regional/ national context and present options to work on;
- Importance of these solutions to be in line with the economic development goals and needs (while at the same time meeting NDCs) was highlighted as an important aspect;
- Also, it was noted that the long-term benefits must be understood and highlighted as part of this study. The study will always have to framed in terms of jobs and growth and finance how the region will benefit;
- In terms of whether a regional/sub regional or country level approach is preferred, the participants pointed that there is a huge difference in terms of

emissions in the region taking Trinidad as an example compared with the smaller east Caribbean countries. However, given the size of economies and mitigation potential in the countries there was consensus on investigating a regional level approach to be favorable to achieve sizable emission reductions, economically.

Based on an analysis of country readiness, CI-ACA supported investigating ways to advance the topic of Carbon pricing in Dominican Republic and Jamaica as an initial step. In collaboration with the National Council for Climate Change and Clean Development Mechanism in the Dominican Republic the first national consultation on the topic of Carbon Pricing took place on 4 December 2017, with participation of over 40 individuals.



Invited speaker Dr. Juan Carlos Arredondo Brun, ministry of Environment Mexico, sharing experience from Mexico on setting price on carbon at the first national consultation on Carbon Pricing for Dominican Republic, 4 December 2017

Some of the conclusions of the workshop were the identification of the priority sectors: energy, transport and agriculture, waste and agriculture. Likewise, the country's experience was shared in the establishment of a tax on high-capacity motor vehicles and incentives to the Renewable Energy Law, among others. It was noted that it is important to verify the

environment to reduce the risks of price fluctuations that discourage investments. Establish robust rules, indicators of operation and impacts that point towards the achievement of strategic objectives. Experiences of participation in Market Mechanisms were shared, such as in the Clean Development Mechanism, the challenge of price fluctuations, and difficulties in accessing the mechanism for some sectors. Participants agreed to conduct a study to identify what carbon pricing instruments can be considered within the national context.



Vintura Silva Presenting at the ZACK 2017 Forum “Access to finance for implementations of policies and measures for implementation of Nationally Determined Contributions” Santo Domingo, Dominican republic 5-6 December, 2017

Summary of this consultation was presented and discussed with a larger section of the private sector at ZACK 2017 forum on “Access to finance for implementations of policies and measures for implementation of Nationally Determined Contributions” organized together with GIZ in Santo Domingo, Dominican republic.

*Submitted by Vintura Silva and Hugh Sealy*

### Development of Standardized Baselines for the Caribbean Electricity Sector

To facilitate renewables and energy efficiency projects through the Clean Development Mechanism (CDM) and through Nationally Appropriate Mitigation Actions (NAMAs), UNFCCC together with the Regional Collaboration Centre St George's (RCC St George's) and UNDP hosted a series of training workshops on the development of standardized baselines for the power sector. UNFCCC colleagues were joined by Vintura Silva and Nigel Edwards from the RCC St George's, who coordinated the organization of the workshops.

The workshops were held during 23-31 October across three Caribbean countries - Guyana, Suriname, and Saint Lucia. The purpose of these workshops was to increase capacity in the area, develop baselines and collect and process data.



Participants at the Training workshop in Guyana 23-24 October 2017

The Caribbean power sector is heavily dependent on imported fossil fuel; therefore, the introduction of renewables would result in significant emission reductions. Besides achieving sustainable development (SD)

objectives of the countries, the transition to renewables through carbon/climate finance would also require a robust and credible MRV (measuring, reporting & verifying) system to report mitigation outcomes objectively and transparently for the region. Standardized baselines as a benchmark established for the power sector provide critical information for the assessment of the greenhouse gas (GHG) mitigation of renewable energy and energy efficiency activities implemented in the region/countries.

The workshops aimed to facilitate capacity development domestically in the 3 targeted countries through the delivery of hands-on technical training for Designated National Authorities (DNAs) and relevant entities to further cement their understanding of the procedure and methodological approaches of standardized baselines for the power sector using real case data. The participants learned how the data collected for the standardized baselines are also relevant to their national GHG emissions inventory and the preparation of national communications.



Practical sessions during the training workshop in Suriname to calculate the Grid Emission Factors 26-27 October 2017

Upon request, participants were introduced to the RETScreen® tool to demonstrate the

application of the standardized baseline in the broader context of climate change mitigation and climate finance. Also, introductions were made to the “Transformational Change Assessment” of projects developed by The Initiative for Climate Action Transparency (ICAT).

Participants expressed their appreciation of having received this technical training and concluded that other sectors within each of their own countries could also benefit from developing standardized baselines (e.g., the waste sector). The workshops in the three countries successfully achieved their objectives and helped to progress the standardized baseline development to the advanced stage for the countries. We look forward to seeing more standardized baselines coming from the Caribbean!



Participants at the Training workshop in St Lucia 30-31 October 2017

The RCC St. George’s team continue to work on Grid Emission Factor Calculations for Trinidad and Tobago, Antigua and Barbuda, Haiti, St Vincent and Grenadines, Jamaica, St Kitts and Nevis, as well as renewal of Grid Emission Factor Standardized Baseline for

Belize & Waste sector Standardized Baseline for Dominican Republic. For Belize and St Vincent and Grenadines, development of transport sector baseline was also initiated with the JCCCCP project.

*Submitted by Vintura Silva and Hugh Sealy*

### **Conservation Leadership in the Caribbean**

Dr. Andrea Easter-Pilcher is one of six international collaborators on a 2014 United States Fish and Wildlife Service (USFWS) grant (\$125,000) which supports a groundbreaking conservation leadership training and capacity-building program in the Caribbean and Latin America. The overarching vision for Conservation Leadership in the Caribbean (CLiC) is “healthy, functional marine and terrestrial Caribbean ecosystems enabling ecologically and economically sustainable development to meet both human and wildlife needs.” The mission is to facilitate the careers of young conservation professionals by teaching them the skills to launch, develop, and implement successful conservation campaigns, while connecting them with existing leaders in the field. The primary goal of CLiC is to establish an enduring Caribbean leadership-training program that facilitates a “coalition of forces” conservation network of regional governmental agencies, non-governmental organizations and universities dedicated to securing the future of wildlife resources across the wider Caribbean. CLiC candidates (fellows) must be Caribbean or Latin American residents and have completed their bachelor’s degree in a related field. Since the team’s initial grant award of \$125,000, they have received three additional grant extensions from the USFWS (\$30,000 in 2015, \$68,000 in 2016 and \$99,237 in 2017). The team has also received a small grant of

\$2,500 from the Helen Johnston Family Foundation in support of the CLiC fellows. “This program directly addresses the critical need for a new generation of wildlife and conservation leaders throughout the Caribbean and Latin America who, as today’s young leaders, do not have adequate access to opportunities to experience and practice conservation in areas such as development, communications or grassroots activities,” said Kelvin Alie, CLiC Board of Directors member and Executive Vice President at the International Fund for Animal Welfare (IFAW).

The CLiC strategy provides the fellows with valuable experience in international collaboration and networking. The fellows emerging from the CLiC program will be capable of initiating and managing new conservation initiatives within their home countries and across international boundaries. In addition to three training sessions to be held over an 18-month period, fellows are working in teams to design, implement and evaluate selected projects in biodiversity conservation for sustainable development in the Caribbean. They have access to qualified training experts who are guiding them on this journey and who are providing one-on-one mentoring, networking opportunities and career development.

The inaugural 2015-2016 class was comprised of 20 fellows, from 14 countries across the wider Caribbean. Each fellow was an emerging leader in his/her field and a conservation practitioner committed to the conservation of biodiversity at the national and community levels. They hailed from diverse backgrounds including government, international NGOs, local conservation organizations and universities. Three of the CLiC fellows were graduates of the marine, wildlife and

conservation biology program in the Department of Biology, Ecology and Conservation (BEC) in the School of Arts and Sciences (SAS) at St. George’s University (SGU).



A main objective of the inaugural CLiC program was successfully completed in October 2016 when, with outstanding deliveries of their team projects before an audience of some 50 people who were present in-person and online, the 17 graduating CLiC fellows from 12 countries - the first cohort (2015-2016) - made for a fitting end to what is now being hailed as a unique conservation leadership program in the wider Caribbean. After an 18-month training and mentorship journey led by the voluntary Board of 6 Directors, fellows accounted for this investment in building their leadership capacity to a diverse mix inclusive of the principal donor USFWS, existing and potential partners, and their peers. The event in the form of a “brown bag” was hosted by the USFWS with the center of focus being the CLiC project presentations. These projects were broad in range, addressing conservation of hawksbill sea turtles and parrotfish; management of invasive lionfish populations; restoration of mangrove forests and reducing the trafficking of wildlife species – with

achievable biodiversity targets identified through the open standards process.

An important take-away was that these projects (being team-selected) have fostered a sense of ownership among the fellows, with great expectations far beyond the 18-month implementation period. Critical success factors include the 5-year planning cycle and the elements of sustainability built into each project (community involvement, linkage to home institutions, individual interests and partnerships), which are expected to promote continued implementation. One of the fellows speaking (at the brown bag in Washington D.C.) of the impact of his team's project on a local community, endorsed CLiC simply by stating - "Small initiatives do work".

As the first cohort came to a successful end, the Board of Directors went into planning mode for the second cohort and selected 20 new CLiC fellows in February of 2017 (from a pool of 60 applicants) from across the wider Caribbean region. Fellows in the second cohort hail from 12 different countries including: Trinidad and Tobago, Grenada, St. Vincent and the Grenadines, Jamaica, Anguilla, Venezuela, Nicaragua, Haiti, Colombia, Dominica, Suriname, and Belize. Two of the CLiC fellows in this second cohort are graduates of the marine, wildlife and conservation biology program in BEC in the SAS at SGU.



CLiC Cohort 2

The first training session for the new cohort of CLiC fellows was held in May of 2017 on the SGU campus. Since that initial workshop, the fellows have been developing and implementing their projects which include: development of a co-management plan to improve sanitation of the coral reef ecosystem in Grand Anse Bay, Grenada; Blue and Gold macaw conservation in Trinidad, West Indies; coral reef restoration on San Andres Island, Columbia; conservation of Hawksbill sea turtles in Grenada and Trinidad; mangrove forest protection in Guyana and Haiti. During a virtual training session held at the end of October (2017), the CLiC fellows presented project updates to the CLiC Board of Directors and to their team advisors.

Project partners for CLiC include the USFWS, International Fund for Animal Welfare (IFAW), SGU and the Windward Islands Research and Education Foundation (WINDREF). The CLiC leadership-training program is currently based at SGU. Dr. Easter-Pilcher sits on the Board of Directors.

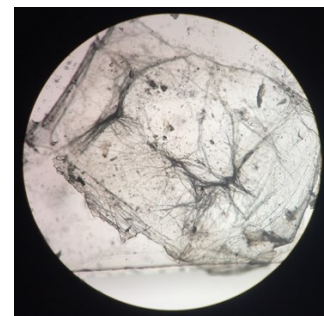
*Submitted by Andrea Easter-Pilcher*

### **The Occurrence of Microplastic in the Intestinal Tract of Commercially Exploited Fish from Grenada**

The team of Dr. Clare Morrall from the Department of Biology, Ecology and Conservation at St. George's University, Michelle Taylor, a current student in the Department of Biology, Ecology and Conservation in the School of Arts and Sciences, supported by other undergraduate research assistants have continued research that started in May 2016 supported by the Caribbean Node of the Global Partnership on Marine Litter.

Our research protocol has remained unchanged as we have expanded the range of species investigated. The invasive Lionfish is the most recent species to be examined and 15 Lionfish are currently being analyzed. All Lionfish samples examined to date have contained microplastics and a piece of coloured microplastic film was recently found in the stomach of a Lionfish.

Research from this microplastic project was presented at the 2017 St. George's University Research Day and Ms. Michelle Taylor was awarded for the Best Oral Presentation by a Student in the School of Arts and Sciences. Abstracts based on this research have been accepted for presentation at the Sixth International Marine Debris Conference in San Diego, California in March 2018. Dr. Clare Morrall and her Research Assistant, undergraduate student Ms. Michelle Taylor will present in San Diego. A further abstract of our microplastics research has been accepted to the World Academy of Science, Engineering and Technology's 20<sup>th</sup> International Conference on Marine Pollution and Management as an oral presentation to be held in Paris in August 2018.



Samples of microplastics found in fish

Following on from this research investigating microplastics in fish in Grenada, Michelle Taylor has been awarded funding from the Association of Marine Laboratories of the Caribbean to support an additional microplastics research project focused on marine sponges which started in November 2017. Alongside investigating microplastics in sponges and in anticipation of further funding from the Caribbean Node of the Global Partnership on Marine Litter a range of marine invertebrates are currently being tested with our protocol.

*Submitted by Michelle Taylor and Clare Morrall*

### **Climate Resilient Eastern Caribbean Marine Managed Areas Network (ECMMAN) Project**

The ECMMAN' Project came to an end in October 2017. The overall project was funded by the German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB) through The Nature Conservancy (TNC) and implemented in collaboration with four partner organizations (OECS Commission; UNEP/

SPAWRAC acting through the Caribbean Marine Protected Areas Managers (CaMPAM) Network; Caribbean Network of Fisherfolk Organizations (CNFO) acting through the Caribbean Regional Fisheries Mechanism (CRFM) Secretariat; and PCI Media Impact). The project started in the last quarter of 2013 and was implemented in six Eastern Caribbean countries i.e. St. Kitts and Nevis, Antigua and Barbuda, Dominica, Saint Lucia, St. Vincent and the Grenadines and Grenada.

and coordinated all project activities.



GMPA Team at Fisherman's Birthday Celebration in Gouyave, 2016

The ECMMAN project had four specific objectives:

1. Declaring new MMAs and strengthen existing MMAs;
2. Build strong constituencies for sustainable livelihoods and ocean use in all six countries;
3. Improve and update an Eastern Caribbean Decision Support System (ECDSS) that provides accessible decision-making tools and incorporates current ecological, socio-economic, and climate change data; and
4. Institute sustainability mechanisms to support the MMA network, including regional political commitments and actions, collaboration mechanisms on marine and coastal resources, and sustainable financing.

In Grenada, the Fisheries Division, Ministry of Agriculture, Lands, Forestry, Fisheries & the Environment was designated as the National Implementing Entity (NIE) for the ECMMAN project.

The contract for the In-Country Project Coordinator (IPC) – Ms. Ezra Campbell – was made possible through the Windward Island Research and Education Foundation (WINDREF). As IPC, Ms. Campbell managed

Highlights of project accomplishments over the past 4 years include:

1. MMA strengthening Small Grants Project (ECMMAN-SGP)

The Grenada ECMMAN-SGP focused on the Molinière-Beauséjour Marine Protected Area (MBMPA). A significant proportion of the activities were geared towards enhancing the communication and education components of the MPA program in order to strengthen effective MPA management and governance. Two key accomplishments under this component included support for the GMPA Annual Summer Camp Program and establishment of the GMPA Junior Rangers Program.

2. Livelihoods Support Fund (ECMMAN-LSF)

Through the OECS Livelihood Support Fund (LSF) and support from the Fisheries Division, two livelihood projects were developed to equip the fishers displaced by the designation of the MBMPA to support the undertaking of livelihood activities and micro-enterprises that would impact positively on the Molinière-



Beauséjour Marine Protected Areas.



Recipient of the LSF Support Fund - Arrendell Antoine and his Son

volunteers were trained in SocMon protocol and another eight were trained as enumerators. The SocMon training and study was done through the University of the West Indies, Centre for Resource Management and Environmental Studies (UWI-CERMES).



MPA Summer Camp Group, 2015

3. Establishment of at least one New MMAs

One of the biggest accomplishments of this project is the declaration of the Grand Anse Marine Protected Area (GAMPA) in April, 2017. This is now Grenada's largest MPA (~1,965 ha (19.7 km<sup>2</sup>)) with 6 management zones (mega-yacht anchoring, anchoring, power craft exclusion, pleasure craft anchoring, traditional beach seine fishing, and swimming). Grand Anse was identified due to the high level of uses in the area, the possibility of conflicts between users, and the environmental impacts that these uses can cause to the fragile marine ecosystems in the area.

5. This is Who We Are Campaign

The 'This is Who We Are' Campaign was a regional campaign developed in collaboration with PCI Media Impact. In Grenada, the concept was created to facilitate environmental communication through innovative mediums such as high impact videos, environmental theater productions, radio programs, fun fairs, mascots, and photography and art competitions, among others. The campaign culminated in November 2015 with an award ceremony held in Dominica. At that ceremony Grenada received the award for first place among the participating islands.

4. Ecological and Socioeconomic Monitoring

Through the project four (4) members of the GMPA -- Alwyn Gatt, Denzel Adams, Akeem Clement & Olando Harvey were certified in various components of the Atlantic Gulf Rapid Reef Assessment (AGRR) protocol. Additionally, a Socio-Economic Monitoring (SocMon) assessment was conducted in adjacent communities of the Grand Anse Marine Protected Area (GAMPA). Ten (10)



GMPA Junior Rangers during PADI Certification

6. ECMMAN CNFO Fisher’s Exchange - Belize

Two fishermen from Grenada participated in a regional exchange program with other fishermen from the Eastern Caribbean. The fishermen from Grenada Mr. Arrendell Antione from the Molinière-Beauséjour MPA and Mr. Dwayne Lewis from the Grand Anse MPA had the opportunity to network with fishermen from the wider Caribbean Region and learn about the opportunities and challenges that fishers experience within their respective MPAs.

Due to the successes of this project, there is a strong foundation for the improved management of marine and coastal resources in Grenada and Eastern Caribbean countries – this has large implications for the sustenance of these economies.

*Submitted by Ezra Campbell, ECMMAN In-country Project Coordinator*

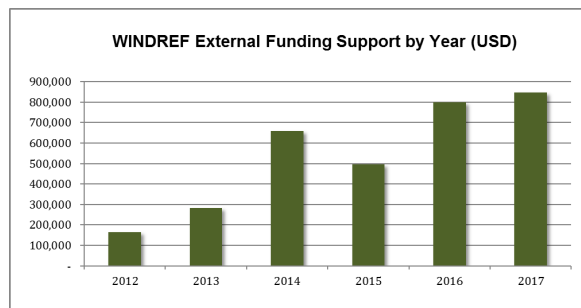
**External Grants and Funding**

We thank all of the donors who have made WINDREF’s work possible in 2017:

- Bartholomew J. Lawson Foundation
- Benevity
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- Ellen Ratner and Cholene Espinoza
- Fogarty International Centre – National Institutes of Health (NIH)
- General Secretariat of the Organization of American States (OAS) – Executive Secretariat of the Inter-American Drug Abuse Control Commission (ES/CICAD) – Secretariat for Multidimensional Security

Gulf and Caribbean Fisheries Institute (GCFI)

- International Fund for Animal Welfare (IFAW)
- LifeSeasons
- The Nature Conservancy (TNC)
- Nova Southeastern University
- Pan-American Health Organization (PAHO)
- Stanford University
- St. George’s University, for ongoing support, including the Small Research Grant Initiative
- United Nations Framework Convention on Climate Change (UNFCCC) Secretariat
- United States Fish and Wildlife Service (USFWS)



**2017 Grant Applications**

Nineteen grant applications were submitted to external funding agencies in 2017. The total potential value of these grant applications was \$14,506,026 USD – a 13.6% increase over the total potential value of grant applications in 2016. To date, 7 of these applications were successful, 9 were not successful, and decisions on the other 3 are outstanding. The grant applications are listed below (green: funded, red: not funded, black: waiting to hear back).

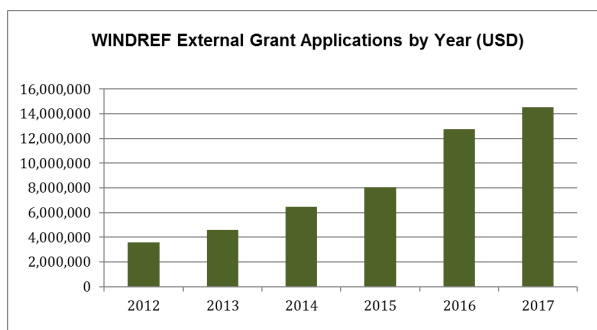
- Gallo, Macpherson, Mathur, Mercer, McSweeney, & Kottlil: A Pilot Study to

- define the Epidemiology, Test, Link and Treat HCV patients in the Caribbean. *Gilead Pharmaceutical.*
- Waechter, Landon, Fernandes, & Blackmon. Rescuing Neurodevelopment in Zika-exposed Children. *NIH Institute of Child Health and Human Development.*
  - Blackmon, Waechter, Fernandes, Landon, & Noël. Predictive Biomarkers of Adverse Neuropsychological Outcomes in Zika Exposed Children. *NIH Institute of Allergy and Infectious Diseases.*
  - Paradis & Waechter. Comparison of Public Human Resources Practice across the OECs Region. *Global Affairs Canada.*
  - Macpherson. Development of a Caribbean Center for Health Equity. *St George's University.*
  - Macpherson, Fields, Noël, Keku, Noël & Waechter. The Effectiveness of Life Seasons' DiabetX in Reducing HbA1c among Grenadians with Metabolic Syndrome. *LifeSeasons.*
  - Scribner, Sothorn, Radix, Noël, & Waechter. Grenada Adolescent Nutrition Cohort Study. *National Institutes of Health.*
  - Sutton & Morrall. Humanitarian OpenStreetMap. *HOT Microgrant.*
  - Glasgow & Forde. Knowledge, Attitudes, and Practices Regarding Rabies in Grenada: A Cross Sectional Study. *Pan American Health Organization*
  - Easter-Pilcher. Conservation Leadership in the Caribbean - International Fund for Animal Welfare & US Fish & Wildlife Service.
  - Macpherson, Noël, Waechter, & Fields. Dengue Surveillance in a Caribbean Traveller's Population. *Janssen.*
  - Waechter & Landon. Saving Brains Grenada. *Grenlec.*
  - Macpherson. Monitoring Hepatitis C in Grenada. *Gilead.*
  - LaBeaud & Macpherson. The Spectrum of Zika Disease in Grenada. *Stanford University.*
  - Cox Macpherson, Childers, Philpott, Waechter, Sealy, & Macpherson. Designing a Process of Democratic Deliberation to Explore the Value of Carbon Neutral Policies in Caribbean Institutions and Nations - *Greenwall Foundation.*
  - Gillenwater, Cage, Sealy, Waechter, Edwards, & UNFCC RCC St. George's. Caribbean Cooperative Monitoring, Reporting, and Verification Hub (CCMRVH) International Climate Initiative. *German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB)*
  - Landon & Waechter. Saving Brains Grenada Scale-up. *UNICEF.*
  - Kehn-Hall, LaBeaud, Dumas, Narayanan, Waechter, Noël, Blackmon, Fernandes, Landon, & Macpherson. Interdisciplinary Dissection of Cognitive Zika Syndrome: Epidemiological, Behavioral, and Proteomic Approaches Provide Direction for Prognosis and Prevention. *US Department of Defense, Defense Health Program.*
  - Sealy, Forde, Edwards, & Waechter. Hosting the Global Water Partnership Caribbean Office at St. George's University. *Global Water Partnership.*
- The final research grant count for 2016 is as follows: Fourteen applications with a total value of \$12,764,988 were submitted, of which 5 were successful. This represents a 36% success rate. Of the 60 grant applications submitted between January 2012 and December 2016, 25 were successful. This represents a 42% success rate over this 5-year

period. The value of grant applications and external funding received by year is outlined in the charts.

Despite strong global competition for external grants, we continue to achieve an impressive hit rate of successful grants to applications. More SGU faculty and WINDREF fellows are learning about the grant writing process and submitting grants to external funders.

WINDREF also continued in the role of grant funder in 2017, through the One Health Research Initiative (OHRI). Under this program, seven grantees were funded up to \$128,000 USD for up to three years.



### Ongoing externally funded projects

There were 20 ongoing funded projects in 2017 with a total multi-year value of \$3.37 million USD:

- Noël, T. (2009-2014). Neglected Tropical Diseases (NTDs) and Rheumatic Fever in Grenada: a project to prevent/eliminate helminthic and rheumatic fever infections among children (5-15 years of age). *Bartholomew J. Lawson Foundation*. \$41,903.
- Noël, T. (2010- ) Genetic Correlates of the Addictive Diseases: Cocaine, Alcohol and Marijuana Addiction - Grenada, WI, *Dr. Mary-Jeanne Kreek, Kreek Laboratory, Rockefeller University*. \$60,000.
- Macpherson, C., Noël, T. & Bidaisee, S. (2011- ). Sport for Health. *House of Lords Fundraiser and Ratner Family Fund*. \$66,021.
- Lawson, K. & Tyrrell, M. (2013-). reachwithin. *Bartholomew J. Lawson Foundation*. \$256,434.
- Sealy, H. (2013- ). UNFCCC Clean Development Mechanism (CDM) Caribbean Regional Collaborating Centre (RCC) at St. George's University. *UNFCCC Secretariat Clean Development Mechanisms Programme*. \$105,179.
- Ratner, E. & Macpherson, C. (2013- ). Outreach Activities in South Sudan. *Multiple Donors*. \$238,278.
- Rodrigo, S. (2013-2015). Drug Demand Reduction: A Caribbean University Interdisciplinary and Integrated Proposal. *Executive Secretariat of the Inter-American Drug Abuse Control Commission (ES/CICAD)*. \$40,000.
- Morrall, C., Waechter, R., & Campbell, E. (2014- ). In-country Project Coordinator for the Eastern Caribbean Marine Managed Areas Network (ECMMAN) Project. *The Nature Conservancy*. \$68,109.
- Cox Macpherson, C., Philpott, S. & Hall, R. (2014-2019). Caribbean Research Ethics Education Initiative (CREEi). *Fogarty International Center – National Institutes of Health*. \$1,100,000
- Easter-Pilcher, A., et al. (2014- ). Conservation Leadership in the Caribbean (CLiC). *U.S. Fish and Wildlife Service, Division of International Affairs, via the International Fund for Animal Welfare (IFAW)*. \$325,205.
- Sealy, H. (2015- ). Intended Nationally Determined Contributions (INDC) Consultancy to the UNFCCC St. George's Regional Collaborating Centre. *United*

*Nations Framework Convention on Climate Change Secretariat. \$143,217*

- Sealy, H. (2017- ). Green Climate Action (GCA) Program. *United Nations Framework Convention on Climate Change Secretariat. \$10,000.*
- Richards, C., & Thomas-Purcell, K. (2015- ). Perspectives on the Uptake of Breast, Cervical, and Prostate Cancer Screening in the English Speaking Windward Islands. *Caribbean Public Health Agency (CARPHA). \$50,000.*
- Clunes, M., Macpherson, C. C. (2016- ). Palliative Care Association of Grenada. *Iota Epsilon Alpha Organization. \$5,952.*
- Morrall, C. (2016- ). The Occurrence of Micro-plastic in the Intestinal Tract of Commercially Exploited Fish in from Grenada. *Gulf & Caribbean Fisheries Institute. \$8,085.*
- Waechter, R., LaBeaud, D., Landon, B., & Noël, T. (2016-18). Neurodevelopment and Vector-borne Diseases: Building Research Capacity in the Tropics. *National Institutes of Health - Fogarty International Center. \$298,938.*
- Macpherson, C. (2016-19). One Health Research Initiative. \$450,000.
- Macpherson, C., Fields, P., Noël, D., Keku, E., Noël, T., & Waechter, R. (2017-18). The Effectiveness of Life Seasons' Diabet-X in reducing HbA1c among Grenadians with Metabolic Syndrome. *LifeSeasons. \$100,000.*
- Glasgow, L. & Forde, M. (2017). Knowledge, Attitudes, and Practices Regarding Rabies in Grenada: A Cross Sectional Study. *Pan-American Health Organization/Government of Grenada. \$10,007.*
- LaBeaud, D. & Macpherson, C. (2017). The Spectrum of Zika Disease in Grenada. *Stanford University. \$13,601.*

**Past Research Projects**

**Non-communicable Diseases**

- Angiotensin converting enzyme and angiotensinogen gene polymorphisms in the Grenadian population: relation to hypertension
- Development of a decision rule for screening Obstructive Sleep Apnea and its epidemiologic relevance to the people of Grenada
- Prevalence and associated risk factors of hypertension in a sample population of native Caribbean's in Grenada, West Indies
- Assessing the prevalence of diabetic complications by examining type I and type II adult diabetics for signs of retinopathy, neuropathy, nephropathy and dermatological changes associated with poor glucose control within the native Caribbean population of Grenada
- Hypertension management and control in two Caribbean countries
- Assessment of the effectiveness of broad-spectrum treatment to children with protozoan and nemathelminthic parasitic infections on diarrhea and school attendance
- The effects of iron-deficiency anemia on cognition and behavior in infants
- Diurnal variation of urinary endothelin-I and blood pressure: related hypertension
- Alcohol consumption in Grenada
- The incidence and mortality of cancer in Grenada over the ten year period: 1990-1999
- The prevalence of abnormal haemoglobin traits in Grenadian secondary school adolescents
- Knowledge, attitudes, beliefs and practices of sickle cell anemia in Grenadian primary and secondary school children
- Decompression sickness among the

- indigenous fishing population in Grenada: Assessing the burden of disease
- WINDREF / SGU Hurricane Relief
  - Spice Research Program
  - Sulfate-reducing bacteria in oxidized freshwater of tropical mangroves
  - Novel antibiotics from tropical marine environments: drug development in Grenada
  - Study of the mutacin C-7A
  - Gram-negative bacteria isolated from aquatic environments of Grenada (61.4°W, 12.0°N), West Indies
  - Identification of bacteria producing antibiotics isolated from deep marine biofilms of Grenada
  - SGU Environmental Testing Unit (ETU)
  - Post-hurricane water surveillance in problematic areas of Grenada
  - Evaluation of the relocation potential for villagers residing in Queen Elizabeth National Park, Uganda
  - Study of the calls of the spotted hyena at feeding
  - Survey on the attitude of villagers in Queen Elizabeth National Park, Uganda towards the threat of lions, leopards and hyenas
  - Epidemiology of human injuries resulting from wildlife in ten villages within Queen Elizabeth National Park, Uganda
  - Rural Ugandan village perspective on lion, leopard and hyena conservation
  - Epidemiology of human injuries by wildlife in six villages within Queen Elizabeth National Park, Uganda
  - Prevalence of *Campylobacter fetus* subspecies *venerealis* and other microorganisms in the reproductive tracts of cattle from the southern region of Santo Domingo, Dominican Republic
  - Antimicrobial properties of skin secretions from *Eleutherodactylus johnstonei* on bacteriological isolates
  - Examination and analysis of prostate cancer in Grenada
  - A Church-based intervention to improve hypertension prevention and control among women in Grenada
  - Occupational Health Problems among Nutmeg Factories Workers, SGU Small Research Grant Initiative
  - Sport for Health Programme
  - Grenada School Nutrition Study: Evidence to Inform Policy
  - Genetic Correlates of the Addictive Diseases: Cocaine, Alcohol and Marijuana Addiction - Grenada
  - Promoting Resilience Among Medical Students: A Comparison of Mindfulness, Yoga, and Exercise
- Infectious Diseases**
- The Spectrum of Zika Disease in Grenada. *Stanford University*. \$34,992.
  - Zika Surveillance in the Southern Caribbean and Reference Lab Support. *Naval Medical Research Center*. \$80,000.
  - Investigation of the prevalence of SIV in the mona monkey (*Cercopithecus mona*) in Grenada
  - Seroprevalence of HIV-I and HIV-II in pregnant women in Grenada, W.I. – their knowledge of AIDS and their exposure hazards to the virus
  - A cross sectional study of the current status of *Schistosoma mansoni* in St. Lucia by field surveys and supplementary data collection
  - Identification and characterization of hantaviruses among the mammal population of Grenada
  - HIV/AIDS health education and evaluation program in Grenada
  - The seroprevalence of *Toxoplasma gondii* in a population of pregnant women and

- cats in Grenada, West Indies
- The efficiency of diagnosing women of *Toxoplasma gondii* using PCR techniques in comparison with ELISA
- Dengue virus in Grenada: seroprevalence and associated risk factors
- A current appraisal of dengue virus in Grenada – serotype analysis and vector assessment
- A site receptivity study determining the threat of reintroduction of malaria into Grenada through the study of Anopheline spp. mosquito vectors
- Chlamydial infection among STD clinic attenders in Grenada
- Fever in Grenada
- Mosquitoes and tourism in Grenada
- Effectiveness of a formula feeding/weaning intervention program in preventing transmission of HTLV-1 from seropositive mothers to newborns in Grenada
- A multi-center longitudinal research study of the behavioral significance of the prevalence of HIV-1 infection in pregnant women and their babies on the islands of Grenada and St. Vincent
- A multi-center longitudinal research study of the ethical analysis of informed consent of the prevalence of HIV-1 infection in pregnant women and their babies on the islands of Grenada and St. Vincent
- Determining the role of IL-15 in mediating function of viral-specific CD8+ T cells in the myelopathogenesis of HTLV-1: symptomatic versus asymptomatic patients
- Intestinal protozoan infections in 6-12 year old children in Grenada
- Intestinal helminth infections in 6-12 year old children in Grenada
- The prevalence of intestinal parasites in school children in rural Guyana
- The prevalence of filariasis and its effects on children aged 8-14 in the central corentyne region of rural Guyana
- The prevalence of streptococcal infection in school children aged 5 – 15 years in Grenada, Carriacou and Petit Martinique
- Studies examining the elimination of lymphatic filariasis as a public health problem in Guyana
- Seroprevalence of heartworm infection in dogs in Grenada
- Dengue in Grenada
- Assessing the potential risk factors of dengue and dengue hemorrhagic fever in the tri-island state of Grenada, Carriacou and Petit Martinique
- A comparative study to find out if there is an association between sexual practices and knowledge in adult populations of Botswana and Grenada with the prevalence of HIV/AIDS
- HIV/AIDS in rural Botswana differentiating between informing and educating
- Evaluating the level of perceived fear and desensitization towards HIV/AIDS in Botswana
- Rheumatic Fever in Grenada
- Streptococcal program in St. Vincent
- Isolating T cells from Rheumatic Fever positive blood: immunofluorescent assay of T lymphocytes via fluorescently labeled monoclonal antibodies
- Possible genetic predisposition to Rheumatic Fever: demonstrating the inheritance fashion of non-HLA B lymphocyte alloantigen D8/17, a marker for Rheumatic Fever
- ELISA antibody titres against group A streptococcal M protein moiety and cell wall N-Acetyl-D-Glucosamine in Grenadian Rheumatic Fever patients
- Evaluating the effectiveness of educational methods in the prevention of Rheumatic

- Fever and knowledge, awareness and practices
- Prevalence of intestinal helminth infections in rural Grenadian school children
- Cystic echinococcosis in Morocco and Uganda
- Elimination of Lymphatic Filariasis in Guyana Program
- Neglected Tropical Diseases and Rheumatic Fever in Grenada: A project to prevent/eliminate helminthic and rheumatic fever infections among children (5-15 years of age)
- Ferguson, H. (2011-2014). Investigation of Disease in Pre-growout Fish in a Commercial Aquaculture Operation in Ecuador. Produmar, S. A.
- Heath, C., LaBeaud, D., Macpherson, C., & Noël, T. (2016). Characterization of Immune Factors of Chronic Chikungunya Disease. American Society for Tropical Medicine & Hygiene Robert E. Shope International Fellowship.
- associated autonomic failure
- Stimulation of angiotensin 4 in cardiac fibroblasts activates matrix metalloproteinases through MAP kinases pathways: A model for astrocytes
- REM sleep and memory
- End of life care in Grenada
- Novel antibiotics from tropical marine environments
- Genetic correlates of the addictive diseases: cocaine, alcohol, and marijuana addiction– Grenada
- An investigation of pediatric botanical medicine for acute respiratory infections
- Efficacy of phage therapy using an in vitro biofilm wound model system
- Degradation of 7 keto cholesterol by Xenohydrolases
- Ecological survival properties of pelagic and benthic indicator microorganisms from the St. John’s river outflow in Grenada
- The public health importance of dogs, Grand Anse, Grenada
- Greater occipital nerve zones for treatment of occipital neuralgia

### Unique Projects

- Characterization of five amphibians inhabiting Grenada and subsequent isolation and antimicrobial assay of potential antibiotics derived from their skin
- Mona monkey studies in West Africa
- Investigation of medicinal plants in Grenada
- Use of medicinal plants in Grenada
- Medicinal drugs from the sea: what do Grenada’s waters have to offer?
- Beekeeping in Grenada: effects of the mite *Varroa jacobsoni* and its control
- Effects of Grenadian medicinal plants on endemic microbial causes of diarrhoeal diseases
- The neurobiological basis of hypoglycemia-
- Photovoltaic power generation program
- Review of current biomedical waste management practices in the Organization of Eastern Caribbean States (OECS) Countries
- Microbial diversity in the iron-oxidizing biofilms of soda springs in Grenada
- Circadian cycle of iron-oxidation in warm soda springs in St. Andrew’s, Grenada, West Indies
- Do the microorganisms in the soda spring water derive energy from the oxidation of manganese?
- Novel marine bacteria and their antagonistic properties against medically relevant biofilms
- Physiological characterization of novel marine bacterial species isolated off



- Grenada
- Characterization of marine sponge-associated bacteria and cytotoxic activity of sponge extracts towards human cancer cells
  - Examining HIV/AIDS provider stigma: assessing regional concerns in the islands of the Eastern Caribbean
  - Knowledge, attitudes and practice survey for women (baseline survey)
  - Caribbean EcoHealth Programme: public and environmental health interactions in food and water-borne illnesses (CEHP)
  - Persistent Organic Pollutants
  - Implementing Renewable Energy and Preventing Land Degradation: An Intervention in the Nutmeg Industry in Grenada
  - Effects of prenatal ethanol exposure on the role of matrix-metalloproteinase mediated neural crest cells in an avian model
  - Assessing Medical Students' Behavior, Perception, and Knowledge of UV Exposure and Sunscreen Application in the Caribbean (Grenada)
  - Basic Life Support Knowledge and Skill Retention in Pre-Clinical Undergraduate Medical Students
  - Student Satisfaction, Comfort and Self-confidence in a Simulation Lab Practice Session
  - Reducing marine Litter in the Wider Caribbean: Developing and Implementing Best Waste Management Practices
  - Ethical Issues and Challenges in Global Population Health Research Partnerships
  - Disaster Management in Grenada: Northumbria University Student Research
  - Baseline Coral Reef Monitoring Program for Sandy Island Oyster Bed Marine Protected Area Mooring Buoy Installation Project
  - Genome annotation in microorganisms and metagenomic libraries as a part of an undergraduate curriculum
  - Molecular identification of marine *Vibrio* isolated in Grenada
  - Occurrence of Antibiotic-resistant Fecal Indicators in Coastal waters of Southern Grenada
  - Investigation of disease in pre-growout fish in a commercial aquaculture operation in Ecuador
  - Revitalizing the Nutmeg Industry in Grenada.
  - Drug Demand Reduction: A Caribbean University Interdisciplinary and Integrated Proposal.
  - The Bioethics of Health and Climate Change in the Caribbean
  - Reach Institute for Children at SGU
  - Outreach Activities in South Sudan
  - UNFCCC Clean Development Mechanism (CDM) Caribbean Regional Collaborating Centre (RCC) at St. George's University.
  - Student Fellow Stipend Agreement - American Humane Association (A. Werners) \$4,000
  - Forde, M., Tomsons, S., Gomez, A. & Morrison, K. (2014). Ethical Issues and Challenges in Global Population Health Research Partnerships. International Development Research Centre. \$15,000.
  - Sealy, H., Solis-Garcia, K. & Waechter, R. (2014). Capacity Building on Carbon Accounting and Clean Technologies Internship for Renewable Energy Post Graduate Students. GIZ Renewable Energies and Energy Efficiency in the Caribbean (REETA). \$5,500.
  - Thomas-Purcell, K. & Richards, C. (2014-2015). Grenadian Women's Perspectives on Screening for Breast and Cervical Cancer. Nova Southeastern University –

Ken-yon Award

- Ferguson, H. (2011-2014). Investigation of Disease in Pre-growout Fish in a Commercial Aquaculture Operation in Ecuador. Produmar, S. A.
- Gibson, K. (2015). Student Chapter Student Associate AVMA Faculty Advisor Program. American Veterinary Medical Association.
- Kotelnikova, S., Morrall, C., Sealy, H., & Waechter, R. (2015-16). Woburn Clarke's Court Bay Water Quality Improvement Demonstration Site Concept. The Nature Conservancy.
- Morrall, C., Waechter, R., Campbell, E., & Nimrod, S. (2014- ). In-country Project Coordinator for the Eastern Caribbean marine Managed Areas Network (ECMMAN) Project. The Nature Conservancy.
- Noël, T. (2016). Inter-American Institute for Cooperation on Agriculture.
- Radix, R. (2012-2015). Grenada School Nutrition Study. International Development Research Centre.
- Waechter, R. & Landon, B. (2014-2016). A Community-based Conscious Discipline Program to Reduce Corporal Punishment in the Caribbean. Grand Challenges Canada – Saving Brains Program.
- Waechter, R., Mitchell, D. & Aire, T. (2014-2015). Restoration and Community Co-Management of Mangroves (RECCOMM) in the Northern Telescope Coastal Area. GIZ Integrated Climate Change Adaptation Strategies (ICCAS) Grenadaps.
- Zap, A. & Rush, M. (2015). Thyroid Hormone Concentrations in Galapagos Giant Tortoises. Morris Animal Foundation - Veterinary Students Scholar Program.

**Publications**

**Books (1)**

Bidaisee, S. (2017). *Global Health Topics*. Lambert Academic Publishing. ISBN: 978-3330-05902-3

**Book Chapters (2)**

Forde, M. S., Forde, S., Keens-Douglas, A., & Mukuria, A. (2017). Provision of tuberculosis services in public facilities to HIV/AIDS infected clients in the Eastern Caribbean, Chapter 31, *Public Health Yearbook 2016*, Editors: Joav Merrick, M.D. (Medical Director, Health Services, Division for Intellectual and Developmental Disabilities, Ministry of Social Affairs and Social Services, Jerusalem, Israel), ISBN: 978-1-53610-947-4.

Goel, V., & Waechter, R. (2017). Inductive & Deductive Reasoning: Integrating Insights from Philosophy, Psychology, & Neuroscience. In L. J. Ball & V. Thompson (Eds.), *The Routledge International Handbook of Thinking and Reasoning*. (pp. 218-247). New York: Routledge.

**Journal Articles (111)**

Akpinar-Elci, M., Bidaisee, S., Nguyen, M. T., & Elci, O. C. (2017). Occupational exposure and respiratory health problems among nutmeg production workers in Grenada, the Caribbean. *International Journal of Occupational and Environmental Health*, 1 –5. <https://doi.org/10.1080/10773525.2017.1280948>

Akpinar-Elci, M., Nguyen, M., Randall, M., Bidaisee, S., Elci, O., Olayinka, O., & Guzman, J. R. (2017). Assessment of

- current occupational safety and health regulations and legislation in the Caribbean. *Revista Panamericana De Salud Publica = Pan American Journal of Public Health*, 41, e26.
- Alonso, F., Graham, R., Rustagi, T., Drazin, D., Loukas, M., Oskouian, R. J., ... Tubbs, R. S. (2017). The Subcostal Nerve During Lateral Approaches to the Lumbar Spine: An Anatomical Study with Relevance for Injury Avoidance and Postoperative Complications Such as Abdominal Wall Hernia. *World Neurosurgery*, 104, 669–673. <https://doi.org/10.1016/j.wneu.2017.05.055>
- Alonso, F., Kassem, M. W., Iwanaga, J., Oskouian, R. J., Loukas, M., Demerdash, A., & Tubbs, R. S. (2017). Anterior Inferior Cerebellar Arteries Juxtaposed with the Internal Acoustic Meatus and Their Relationship to the Cranial Nerve VII/VIII Complex. *Cureus*, 9(8), e1570. <https://doi.org/10.7759/cureus.1570>
- Amaral-Zettler, L. A., Dragone, N. B., Schell, J., Slikas, B., Murphy, L. G., Morrall, C. E., & Zettler, E. R. (2017). Comparative mitochondrial and chloroplast genomics of a genetically distinct form of *Sargassum* contributing to recent “Golden Tides” in the Western Atlantic. *Ecology and Evolution*, 7(2), 516–525. <https://doi.org/10.1002/ece3.2630>
- Amaral-Zettler, L.A., Dragone, N.B., Schell, J, Slikas, B, Murphy, L.G, Morrall,C.E, and Zettler, E.R (2017). Comparative Mitochondrial and Chloroplast Genomics of a Genetically Distinct Form of *Sargassum* Contributing to Recent ‘Golden Tides’ in the Western Atlantic. *Ecology and Evolution* 7, no. 2 (January 2017): 516–25.
- Asher, E., & Bidaisee, S. (2017). Can Infections Cause Alzheimers Disease? *Clin Res Trials*, 3(2), 1-4
- Bidaisee, S., & Dookeeram, D. (2017). Aviation and Alcohol: Assessment of Aeronautical Decision Making among Caribbean Pilots. *Int Public Health J*, 9(1):91-97
- Bilal, M., Edwards, B., Loukas, M., Oskouian, R. J., & Tubbs, R. S. (2017). Johann Gaspar Spurzheim: A Life Dedicated to Phrenology. *Cureus*, 9(5), e1295. <https://doi.org/10.7759/cureus.1295>
- Bilal, M., Voin, V., Topale, N., Iwanaga, J., Loukas, M., & Tubbs, R. S. (2017). The Clinical anatomy of the physical examination of the abdomen: A comprehensive review. *Clinical Anatomy (New York, N.Y.)*, 30(3), 352–356. <https://doi.org/10.1002/ca.22832>
- Bowen, G., Gonzales, J., Iwanaga, J., Fisahn, C., Loukas, M., Oskouian, R. J., & Tubbs, R. S. (2017). Leonardo da Vinci (1452-1519) and his depictions of the human spine. *Child’s Nervous System: ChNS: Official Journal of the International Society for Pediatric Neurosurgery*. 33, no. 12 (2017): 2067–70. <https://doi.org/10.1007/s00381-017-3354-9>
- Chun, I. K. H., Ojumah, N., Loukas, M., Oskouian, R. J., & Tubbs, R. S. (2017). Martin Heinrich Rathke (1793-1860) and his pouch and cyst. *Child’s Nervous System: ChNS: Official Journal of the International Society for Pediatric Neurosurgery*. <https://doi.org/10.1007/s00381-017-3482-2>
- Collin, P. G., D’Antoni, A. V., Loukas, M., Oskouian, R. J., & Tubbs, R. S. (2017). Hip fractures in the elderly-: A Clinical Anatomy Review. *Clinical Anatomy (New York, N.Y.)*, 30(1), 89–97. <https://doi.org/10.1002/ca.22779>
- Collin, P. G., Oskouian, R. J., Loukas, M., D’Antoni, A. V., & Shane Tubbs, R. (2017). Five common clinical presentations in the elderly: An anatomical review. *Clinical*

- Anatomy (New York, N.Y.), 30(2), 168–174. <https://doi.org/10.1002/ca.22771>
- Cooper, S., & Bidaisee, S. (2017). Evaluation of Risks and Factors linked to Precocious Puberty. *J Translational Diagn Technol.* 2 (1), 27-29.
- Cox, M. A., Davis, M., Voin, V., Shoja, M., Oskouian, R. J., Loukas, M., & Tubbs, R. S. (2017). Pineal Gland Agenesis: Review and Case Illustration. *Cureus*, 9(6), e1314. <https://doi.org/10.7759/cureus.1314>
- Davis, M, Loukas, M, and Tubbs, R.S (2017). “Jean Cruveilhier and His Contributions to Understanding Childhood Hydrocephalus, Chiari II Malformation, and Spina Bifida.” *Child’s Nervous System: ChNS: Official Journal of the International Society for Pediatric Neurosurgery*, October 24, 2017.
- Del Pozo, J., Mishra, N., Kabuusu, R., Cheetham-Brow, S., Eldar, A., Bacharach, E., Lipkin, WI and Ferguson, HW. (2017). Syncytial hepatitis of tilapia (*Oreochromis niloticus* L.) is associated with orthomyxovirus-like virions. *Veterinary Pathology* 54:164-170.
- Del-Pozo, J., Mishra, N., Kabuusu, R., Cheetham, S., Eldar, A., Bacharach, E., ... Ferguson, H. W. (2017). Syncytial Hepatitis of Tilapia ( *Oreochromis niloticus* L.) is Associated With Orthomyxovirus-Like Virions in Hepatocytes. *Veterinary Pathology*, 54(1), 164–170. <https://doi.org/10.1177/0300985816658100>
- Di Cicco, E., Ferguson, H. W., Schulze, A. D., Kaukinen, K. H., Li, S., Vanderstichel, R., ... Miller, K. M. (2017). Heart and skeletal muscle inflammation (HSMI) disease diagnosed on a British Columbia salmon farm through a longitudinal farm study. *PloS One*, 12(2), e0171471. <https://doi.org/10.1371/journal.pone.0171471>
- Dookeeram, D., Bidaisee, S., Paul, J. F., Nunes, P., Robertson, P., Maharaj, V. R., & Sammy, I. (2017). Polypharmacy and potential drug-drug interactions in emergency department patients in the Caribbean. *International Journal of Clinical Pharmacy.* 39, no. 5 (October 2017): 1119–27. <https://doi.org/10.1007/s11096-017-0520-9>
- Edwards, B., Wang, J. M., Iwanaga, J., Luviano, J., Loukas, M., Oskouian, R. J., & Tubbs, R. S. (2017). Hiding Within the Cracks: Case Report of Rare Sutural Bone Found at the Nasion. *Cureus*, 9(6), e1333. <https://doi.org/10.7759/cureus.1333>
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- Forde, M. S., Martin, F., Mitchell, G., & Bidaisee, S. (2017). Public health response and lessons learned from the 2014 chikungunya epidemic in Grenada. *Revista Panamericana De Salud Publica = Pan American Journal of Public Health*, 41, e57.
- Fries, F. N., Hendrix, P., Brinker, T. J., Loukas, M., & Tubbs, R. S. (2017). Otto Mennicke (1876-) and the first description of skull base anomalies causing cerebellar tonsillar ectopia: one of the first mentions of the Chiari I malformation. *Child’s Nervous System: ChNS: Official Journal of the International Society for Pediatric Neurosurgery*, 33(5), 825–827. <https://doi.org/10.1007/s00381-017-3395-0>

- Ghudasara, A., Delisio M., & Bidaisee S. (2017). Knowledge, Attitudes, and Perceptions on Genetically Modified Organisms: Case for Sterile Mosquito Release Against Zika in Grenada. *Journal of Epidemiological Research*, (3)1, 57-60
- Gilloteaux, J, Subramanian, K, Solomon, N (2017). Peripheral neuropathy and leptin receptor defect: Demyelination of the sciatic nerve of the obese Zucker rat. *Ultrastructural pathology*; 41(1): 90-2.
- Glasgow, L., Forde, M., Fletcher, S., & Keku, E. (2017). Compliance with the World Organization for Animal Health guidelines for poultry production in Grenada. *World's Poultry Science Journal*, 73(3), 515-526
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### WINDREF Grantees Journal Articles (11)

Amadi, V. A., Matthew-Belmar, V., Subbarao, C., Kashoma, I., Rajashekara, G., Sharma, R., ... Stone, D. (2017). *Campylobacter* Species Isolated from Pigs in Grenada Exhibited Novel Clones: Genotypes and Antimicrobial Resistance Profiles of Sequence Types. *Foodborne Pathogens and Disease*, 14(7), 419–425. <https://doi.org/10.1089/fpd.2016.2229>

Amadi, VA., Hariharan, H., Arya G., Matthew-Belmar, V., Nicholas-Thomas, R., Pinckney, R., Sharma, R., Johnson R., (2017). Serovars and antimicrobial resistance of non-typhoidal *Salmonella* isolated from non-diarrhoeic dogs in Grenada, West Indies. *Veterinary Medicine and Science*, DOI:10.1002/vms3.84.

Brown MC, Chikweto A , Tiwari KP., DeAllie C, Bhaiyat MI and Sharma RN (2017). Prevalence of canine heartworm disease in stray dogs of Grenada, West Indies, *Open Journal of Veterinary Medicine*, Vol 7: 168-174. 2017

Chikweto, A., Sharma, R. N., Tiwari, K. P., Verma, S. K., Calero-Bernal, R., Jiang, T., ... Dubey, J. P. (2017). Isolation and RFLP Genotyping of *Toxoplasma gondii* in Free-Range Chickens (*Gallus domesticus*) in Grenada, West Indies, Revealed Widespread and Dominance of Clonal Type III Parasites. *The Journal of Parasitology*, 103(1), 52–55. <https://doi.org/10.1645/15-945>

O'Connell K., Tiwari K., Chikweto A., Bhaiyat M.I., Sharma R. N (2017). Epidemiological study of rabies (from 2001 to 2016) in Grenada, West Indies. *Veterinary Medicine -Open Journal*. 2(2): 45-50. doi:

10.17140/VMOJ-2-115, 2017.

Sharma R, Tiwari K, Birmingham K, Armstrong E, Montanez A, Guy R, DeAllie C. (2017) *Cysticercus fasciolaris* in brown rats (*Rattus norvegicus*) in Grenada, West Indies. *Journal of Parasitology Research*, Volume 2017 (2017), Article ID 1723406, 4 pages.

Sharma, R. N., Dufayet, R., Mauftras, T., Connell, K. O., & Tiwari, K. (2017). Seroprevalence of antibodies to astrovirus in chickens in Grenada, West Indies. *Veterinary World*, 10(6), 636–639. <https://doi.org/10.14202/vetworld.2017.636-639>

Sharma, R.N, Tiwari K., Samantha W., McKayla D., Cassandra Tang Wing, DeAllie C. (2017). Detection of antibodies against bovine respiratory syncytial virus in ruminants of Grenada, West Indies. *Journal of Animal Research* 7 (2): 1-4, 2017.

Tiwari K., Bhaiyat M.I., Dufayet, R, Mauftras, T, DeAllie C., Chikweto A., Sharma RN (2017). Expression pattern of tumor markers in canine hemangiopericytoma. *Indian Journal of Veterinary Pathology*, 41(2) : 84-88.

Vogler TM, Kumthekar M, K Tiwari, DeAllie C, Sharma RN (2017). Current Status of *M. hyopneumoniae* in Pigs in Grenada, West Indies. *Open Journal of Veterinary Medicine*, 7 : 77-84, 2017.

Werners, A. H. (2017). Treatment of endotoxaemia and septicaemia in the equine patient. *Journal of Veterinary Pharmacology and Therapeutics*, 40(1), 1–15. <https://doi.org/10.1111/jvp.12329>

### Abstracts/Presentations at International Conferences (38)

Bartholomew, N., Farmer-Diaz, K., Lin, A , Barranco, J., Matthew, M.1and

- Kotelnikova, S. (2017) Assessment of coastal water quality in Woburn Bay, Grenada West Indies, 12.0°N, 61.6°W. FEMS 2017, the 7-th Congress of European Microbiologists in Valencia, 9-14 of July 2017
- Bidaisee, S (2017). Aviation and Alcohol: An Assessment of Aeromedical Decision Making among Caribbean Pilots. WADDEM Congress on Disaster and Emergency Medicine. Toronto, Canada, April 25-28, 2017
- Bidaisee, S (2017). Public Health American Public Health Association Annual Meeting and Expo, Atlanta, USA, November 4 - 8, 2017
- Brenciaglia, M., Noel, T.P., Fields, P., Bidaisee, S., Nelson, W., Venkateswaran, N., Yearwood, K., Mapp-Alexander, V., Bahadoo, A., Mitchell, G., Myers, T., Macpherson, C.N.L (2017). Aedes Aegypti transmitted arboviral outbreaks in Grenada 2001–2016 – quo vardis? Caribbean Public Health Agency 62nd Annual Health Research Conference, April 27th – 29th, 2017, Guyana.
- Campbell, E., A.L. Easter-Pilcher, N. Koper. (2017). Status and distribution of the diurnal raptors on the island of Grenada: Grenada Hook-billed Kite (*Chondrohierax uncinatus mirus*) and Antillean Broad-winged Hawk (*Buteo platypterus antillarum*). BirdsCaribbean 21st Regional Meeting. Cuba, West Indies. 13-17 July 2017
- Charles, R (2017). Academy of International Business, Southeast USA Chapter Annual Meeting: Navigating (Anti) Globalism, USA, October 26 - 29, 2017
- Desai, A., Sharma, B., Alhassan, A., Ganta, R., Gibson, K., Wilkerson M (2017). Validation of a Luminex xMAP MultiFLEX Vector-borne Panel for Canine Blood-Derived Pathogens in Grenada. Poster presentation, Boehringer Ingelheim NIH symposium, August 3-5, 2017. Bethesda, Maryland
- Easter-Pilcher, A.L. (2017). Experiential, immersion learning: An intimate look at one class at a time scheduling. Pacific Sociological Association 88th Annual Meeting/Conference. Portland, OR. April 6 - 9 2017
- Ekin, U, Wong J, Bidaisee S, Dookeeram D (2017). Are we poisoning our older patients? The unrecognized risk of polypharmacy and drug-drug interactions in older Emergency Department attenders in Trinidad and Tobago. 9th Asian Conference on Emergency Medicine, Turkey, November 22-25, 2017
- Farmer-Diaz K, Bartholomew, N, Matthew M, Wei-Chin Lin A, Barranco J, Konjkavfard N and Kotelnikova S (2017). Potential Health Risks Associated with Bathing in A Tropical Bay in Grenada, West Indies. The 15th Conference of the International Society of Travel Medicine, Barcelona, Spain from 14-18 May 2017. A-876-0002-00301
- Forde M, (2017). Determining the safety of rainwater harvesting systems in the Caribbean, Inter-American Network of Academies of Science (IANAS) Water Symposium, Carlton University, Ottawa, Canada, August 16, 2017.
- Ghudasara, A., Deliso, M., Bidaisee, S., Macpherson, C.N.L (2017). Knowledge, Attitudes, and Perceptions on Genetically Modified Organisms: Case for Sterile Mosquito Release Against Zika in Grenada. Caribbean Public Health Agency 62nd Annual Health Research Conference, April 27th – 29th, 2017, Guyana.
- Glasgow L, Forde M, Brow d, Mahoney C, Fletcher-Lartey C, Rodrigo S (2017). Antibiotics use by poultry farmers in

- Grenada, 62nd ANNUAL CARPHA HEALTH RESEARCH CONFERENCE, April 27 – 29, 2017, West Indian Medical Journal, Supplement, Vol. 66 (Suppl 1) 1 – 65, ISSN 0043-3144 WIMJAD.
- Glasgow L, Forde M, Fletcher S, & Keku E (2017). Compliance with the World Organization for Animal Health Guidelines in Poultry Production in Grenada, The National Environmental Health Association Annual Education Conference, Grand Rapids, Michigan, July 10-13, 2017.
- Grossman E, Forde M, Ridel G, Sisterson D, Doervitch S, Rodriguez-Guzman J, Perez E, Jean M, Lofthouse-Saulka A (2017). Climate Change and Public Health in the Caribbean: Building Capacity and Collaboration, APHA 2017 Annual Meeting & Expo (Nov. 4 - Nov. 8), Atlanta.
- Hattaway, L., Fitzpatrick, D., Hsueh, A., Kushnir, A., Ramos-Nino, M., Cheetham, C (2017). PCR-based bloodmeal analysis of *Aedes aegypti* and *Culex quinquefasciatus* mosquitoes in St. George Parish, Grenada. Oral presentation.
- Johnson, R., Nickalson, P., Armbruster, L., Sommers, F., Junghood, J., Marancik, D., Gadberry, B., Colt, J (2017). Addition of a red macroalgae to alternative plant based feeds for juvenile sablefish *Anoplopoma fimbria*. Oral Presentation, Aquaculture America, February 19-22, 2017. Las Vegas, NV.
- Kabuusu, R (2017). Pathobiology 6th International Scientific Meeting on Sustainable Livelihoods and health in Africa, Uganda, June 29 - 30, 2017
- Kachani, M, Zeyhle E, Solomon N, Romig T, Kern P, Macpherson CNL (2017). The natural history of cystic echinococcosis in untreated and albendazole-treated patients.. 27th Congress of the World Association of Echinococcosis, Algiers, Algeria, 4-7 October 2017.
- Kachani, Malika, Eberhard Zeyhle, Nadia Solomon, Thomas Romig, Peter Kern, Calum N. L. Macpherson (2017) The natural history of cystic echinococcosis in untreated and albendazole-treated patients [plenary session]. 27th Congress of the World Association of Echinococcosis, Algiers, Algeria, 4-7 October 2017.
- Macpherson, C.N.L. (2017). “Vector Borne Diseases in the Caribbean: Successes, Opportunities and Threats” AMSA Convention, October 22, 2017, Grenada.
- Macpherson, C.N.L. (2017). The Role of Ultrasound in the Epidemiology of Parasitic Disease. WHO Short Course on Abdominal Ultrasound in Infectious Diseases, May 15th - 18th, 2017, Pavia, Italy.
- Macpherson, C.N.L., (2017). “One Health and the Neglected Tropical Diseases.” Tamasek Polytechnic, October, 2017. Singapore.
- Macpherson, C.N.L., (2017). “One Health: Lessons from the past and future directions.” Konkuk University, October 2017, Seoul, South Korea.
- Macpherson, C.N.L., Kabuusu R., Lambert, M. (2017). International graduate educational partnerships to enhance health in Africa. The 6th International Scientific Conference On Sustainable Livelihoods And Health In Africa, June 29th – 30th 2017, Kampala, Uganda
- Macpherson, CNL., Kabuusu, RM., Lambert M (2017). International graduate educational partnerships to enhance health in Africa. Oral presentation, 6th International scientific Conference on regional universities Mediated Partnerships for Enhancing Livelihoods and Health in Africa June 27- 30, 2017
- Mansoor Y, Landon B, Chigurupati N, Main O

- (2017). Medical Student Empathy at SGU. American Society for Bioethics & Humanities 19th Annual Conference. Kansas City, Missouri.
- McCann, T, Chan VKT, Chang DR, Breslin AW, Miller JV, Carr MT, Sheth JS, Dabrowiecki AM, Tom W (2017). Cardiopulmonary Resuscitation: Analysis of Chest Compressions in Second Year Medical Students. Poster presentation at the 62nd CARPHA Health Research Conference, Guyana, April 27 - 29, 2017
- McLaughlin, PA., Bettke, JA., Tam, JW., Luke, JD., Leeds, J., Bliska, JB., Butler, BP., van der Velden, AWM (2017). Contribution of inflammatory monocytes to the pathogenesis of Salmonella-induced colitis. Oral presentation, International Congress of Mucosal Immunology, 2017, Washington DC.
- Miccio, MM., Schwarz, A., Turitto E., Bruhl-Day, R., Fields, P., Kalchofner Guerrero, KS (2017). Comparison of methadone and morphine on regurgitation, gastroesophageal reflux and postoperative analgesia in dogs undergoing ovariohysterectomy. Oral presentation, AVA Autumn Meeting, November 2017, Berlin, Germany.
- Philpott-Jones, S, Macpherson, CC, Zepeda, HR (2017). Building Research Ethics Capacity in the Low- and Middle-Income Countries of the Caribbean Basin. ASBH, Kansas City, MO. Oct 2017
- Reese, J and Solomon, N (2017). Giving cultural context to HIV care: Identifying barriers to care in our local [global] community.. As part of the Trilateral Health Summit, An End to HIV: A Global Health Perspective. Elmhurst Global Health Institute, NYC Health and Hospitals/Elmhurst, New York, USA, 1 December 2017.
- Roach, A, Macpherson, C (2017).What constitutes research benefits in international research conducted in LMICs? Oxford Global Health and International Bioethics Conference (Ethox). Keble College, Oxford. July 2017.
- Solomon, N, Fields,, PJ, Macpherson, CNL (2017). The importance of training clinicians on the World Health Organization standardized classification of cystic echinococcosis.. American Society for Microbiology ASM Microbe 2017, New Orleans, Louisiana, USA, 1-5 June 2017.
- Suresh, P., Krystosik, A., Cudjoe, N., Murray, T., Isaac, R., Mitchell, G., Noël, T., Landon, B., Waechter, R., & LaBeaud, D. (2017). Chikungunya Infection during Gestation: Impact on Pregnancy and Neonatal Outcomes. Presented at the 66th Annual Meeting of the American Society for Tropical Medicine and Hygiene: Baltimore, Maryland, USA.
- Waechter, R. & LaBeaud, D. (2017). Neurodevelopment and vector-borne diseases: Building research capacity in the tropics. National Institutes of Health - Fogarty International Center Global Brain Network Meeting: Bethesda, Maryland.
- Waechter, R., Vinuela, M-L., Silva, V., Edwards, O., Previti, V., & Sealy, H. (2017). A Review of the St. George's Regional Collaboration Center Activities. Presented at the United Nations Convention on Climate Change 18th Clean Development Mechanism Designated National Authority Global Forum: Bonn, Germany.

**WINDREF Grantee Abstracts/Presentations at International Conferences (4)**

Amadi, VA., Matthew-Belmar, V., Cheetham, S., Sharma, R., Hariharan, H.,(2017). Gram negative bacteria associated with the

- gastrointestinal tracts of bats and antimicrobial susceptibility profiles of *Escherichia coli* and *Klebsiella pneumoniae*. Poster presentation, New Zealand Microbiology Society Annual (NZMS) conference, November 20th - 23rd, 2017. Auckland, New Zealand.
- Amadi, VA., Matthew-Belmar, V., Subbarao, C., Kashoma, I., Rajashekara, G., Sharma, R., Hariharan, H., Stone, D., (2017). Molecular typing of *Campylobacter* species isolated from pigs in Grenada and antimicrobial resistance profiles of sequence types. Poster presentation, New Zealand Microbiology Society Annual (NZMS) conference, November 20th - 23rd, 2017. Auckland, New Zealand.
- Chikweto A, C. De Allie, K. Tiwari, R. Sharma, M. Bhaiyat (2017). Congenital anomalies in domestic animals in Grenada, West Indies: A retrospective study of 18 cases (2001-2016). Poster presentation, ACVP & ASVCP Concurrent Annual Meeting, November 4-8, 2017, Vancouver Convention Centre, Vancouver, British Columbia, Canada.
- Nisar, M., Amadi, V., Hariharan, H., Sharma R., and Nagaraja, KV (2017). Molecular epidemiology of *Campylobacter upsaliensis* isolated from dogs in Grenada. Oral Presentation at Conference of research workers in animal diseases (CRWAD) 2017; The 98th annual conference December 3-5, 2017, Chicago, Illinois, USA.
- Toxoplasma gondii Infection on Human Behavior” February 23rd 2017
- Marco Brenciaglia (MSc Student): “Clinical and Serological Observations from a Case Series Study during the Asian-lineage Zika Virus Outbreak in Grenada during 2016” February 24th 2017
- Trevor Paul Noël (PhD Candidate): “Elimination of the Neglected Tropical Diseases in the Western Hemisphere with Particular Reference to the Soil Transmitted Helminths” April 13th 2017
- Nicole Taurisano (MSc Student): “*Streptococcus phocae* infections in marine mammals: A retrospective analysis of post-mortem cases from 2007-2012” October 16th 2017

### Graduate Seminars (27)

### Thesis Defenses (5)

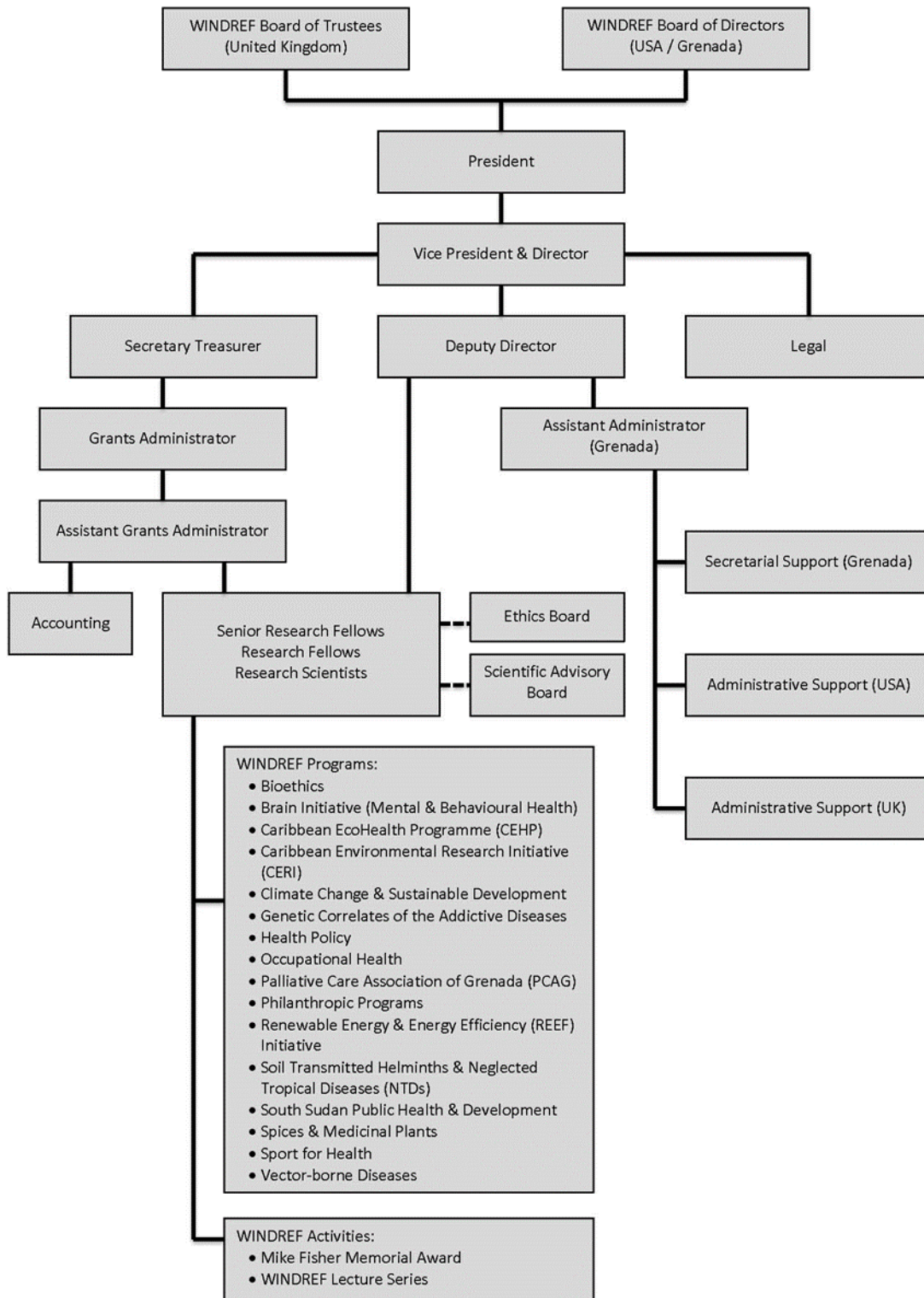
- Jason Lowther (MSc Student): “Chikungunya in Grenada: A study of risk factors for developing chronic arthralgia” February 8th 2017
- Kristy Fisher (MSc Student): “The Influence of Kenneth Bridges (Global Blood Therapeutics, Inc): “Novel Treatments for Sickle Cell disease” January 18th 2017
- Clifton Maxwell (SGU Alumnus 2016): “Permaculture Design: A Sustainable Transformation at SGU” January 25th 2017
- Ellen Ratner: “Loving What You Do!” January 27th 2017
- Satesh Bidaisee: “Statistical Justification of Sample Size for Animal Use” February 1st 2017
- Dianne Ford (Northumbria University): “Can we eat to live longer?” February 10th 2017
- Tamara Hockley (MSc Student): “Preliminary Dental survey of Donkeys in Grenada and Carriacou” March 1st 2017
- Musso Munyeme (University of Zambia): “Classical zoonoses at the interface of wildlife/livestock/humans: the cases of anthrax and zoonotic tuberculosis” March 15th 2017
- John Fardell (MPH Student): “Fardell Farms: Health from farm to table” March 17th



- 2017
- Ramsey Saunders: "The Psychophysics and Neurophysiology of Color Vision" April 7th 2017
- Jennifer Peterson and Lindsay Peterson (SVM Students): "The Expression of Multidrug Resistance Proteins in Transmissible Venereal Tumours and the Effects of Vincristine" April 12th 2017
- Victor A. Amadi: "Salmonella, Campylobacter, Escherichia coli, spirochetes (Helicobacter, Brachyspira), Giardia and Cryptosporidium in the feces of dogs in Grenada, and drug resistance among Salmonella, Campylobacter, and Escherichia coli species" April 19th 2017
- Amber Lee (MSc Student): "DNA detection of the bacterial pathogens diarrheagenic Escherichia coli, Salmonella enterica serovars, Campylobacter and Neorickettsia spp. in Grenadian bats" April 21st 2017
- Joachim Cohen, Kenneth Chambaere, Nicholas Jennings (Vrije Universiteit Brussel): "Public Health perspective of palliative and end-of-life care. International studies on end-of-life decisions and bio-ethics in end-of-life decisions. State of affairs of palliative and end-of-life care in Trinidad & Tobago" April 24th 2017
- Bhumika Sharma (PhD Student): "Development of a multiplex bead assay using specific oligonucleotides and peptides for Ehrlichia and Anaplasma spp. in Grenada, West Indies" April 28th 2017
- Inga Karasek (MSc Student): "Practical and affordable tick control in horses in Grenada, W.I." May 3rd 2017
- Daniel Swale (Louisiana State University): "Pharmaceuticals to Insecticides: Building a bridge between mammalian and insect toxicology for the enhancement of the vector control 'tool box'" May 8th 2017
- Marcy Kanuka (MSc Student): "Molecular Screening of Zika, Dengue, and Chikungunya Viruses in Bats from Grenada, West Indies" May 15th 2017
- Hee-Myung Park, Minhee Kang, Woongbin Noh (Konkuk University): "Introduction to College of Veterinary Medicine, Konkuk University; basic, preventive and clinical medicine" August 18th 2017
- Christopher Gibson (MSc Student): "Clinical Observations in Kenya: A Medical Student's Perspective on Tropical Medicine in East Africa" August 23rd 2017
- Amar Kureishi: "Singapore to St. George's: A personal perspective on global development" October 4th 2017
- Kimberly Pham (SOM Student): "Medical Humanities: Narrative Medicine" October 4th 2017
- Patrick McLaughlin (Post-Doctoral Scholars Program): "Contribution of inflammatory monocytes to the pathogenesis of Salmonella-induced colitis" October 23rd 2017
- Nikisha Bartholomew (MSc Student): "Identification and characterization of micro-organisms utilizing Dictyota sp. and Ulva sp. as a source of carbon" November 6th 2017
- Alfred Chikweto (PhD Student): "Isolation and genotyping of Toxoplasma gondii in small ruminants, pigs and backyard chickens from Grenada, West Indies" November 17th 2017
- Christopher Gibson (MSc Student): "A Proposed Model for Zika Virus Persistence in Human Immune Cells" November 24th 2017
- Mahesh Shriram Deokar (PhD Student): "Gross anatomical, histological, immunohistochemical and ultrastructural study of the testis and epididymis of the mongoose (Herpestes auropectatus) in Grenada" November 28th 2017

Benjamin Turner (PhD Student): “The Nasopalatine Canal: A Radiographic Analysis Using Cone-Beam Computed Tomography (CBCT), Cephalometrics, and Three Dimensional Scanning Technology”  
December 11th 2017

**WINDREF Organizational Chart**



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