

**WINDWARD
ISLANDS
RESEARCH
& EDUCATION
FOUNDATION**



2015 Annual Report



Cover Photo: SGU and WINDREF Executives with Government Ministers, Caribbean-Canada Emerging Leaders' Dialogue (CCELD) Local Organizing Committee members and the twelve CCELD participants following the dialogue session that was held in the WINDREF conference room.



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 calibre 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.

TABLE OF CONTENTS

Director’s 2015 Report.....	6
WINDREF Organization	
Board of Directors (USA/Grenada).....	8
Board of Trustees (United Kingdom).....	8
Scientific Advisory Board.....	8
Administration	
Grenada.....	8
United States.....	8
United Kingdom.....	9
Senior Research Fellows.....	9
Research Fellows.....	9
Research Scientists.....	9
Special Report: Caribbean-Canada Emerging Leaders’ Dialogue (CCELD).....	10
Current Projects	
Elimination of the Neglected Tropical Diseases in the Western Hemisphere with Particular Reference to the Soil Transmitted Helminths.....	11
Characterization of Immune Factors of Severe and Chronic Chikungunya Disease In Grenada, West Indies.....	17
Vaccination Week 2015	19
Community Health Initiatives - Sport for Health, Touch Toes Test, One Health One Medicine.....	20
Grenadian Women’s Perspectives on Screening for Breast and Cervical Cancer: A Collaborative Approach to Prevention.....	21
reachwithin.....	22
Saving Brains: A Community-based Conscious Discipline Program to Reduce Corporal Punishment in the Caribbean.....	25
Grenada School Nutrition Study.....	26
Genetic Correlates of the Addictive Diseases: Cocaine, Alcohol and Marijuana Addiction in Grenada, West Indies.....	30
Caribbean University Interdisciplinary and Integrated Drug Demand Reduction Project.....	31
Caribbean Research Ethics Education Initiative.....	31
Conservation Leaders in the Caribbean (CLiC).....	33
Water Quality Assessment in Clark’s Court Bay Marine Protected Area, Grenada, West Indies.....	36

Caribbean Environmental Research Initiative: International Microbiology Presentations by SGU Students.....	39
United Nations Framework Convention on Climate Change (UNFCCC) St. George’s Regional Collaboration Centre (RCC).....	40
Analysis of Clean Development Mechanism Activities in the Caribbean.....	45
Climate Change Negotiations and Clean Development Mechanism.....	52
Investigation of Disease in Pre-growout Fish in a Commercial Aquaculture Operation in Ecuador.....	53
East Caribbean Bee Research and Extension Center.....	54
Evaluation of Thyroid Function and Establishing Reference Intervals in Endemic Galápagos Giant Tortoises (Chelonoidis spp).....	55
WINDREF External Grants and Funding.....	57
2015 Grant Applications.....	57
Ongoing Externally Funded Projects.....	58
Past Research Projects.....	59
Non-communicable Diseases.....	59
Infectious Diseases.....	61
Unique Projects.....	62
Publications.....	64
Books.....	64
Book Chapters.....	64
Journal Articles.....	64
Abstracts/Presentations at International Conferences.....	68
Oral Presentations.....	68
Poster Presentations.....	69
Reviews of Journals and Boards.....	72
Thesis Defenses.....	72
Graduate Seminars.....	72
WINDREF Organizational Chart.....	74
Contact Information.....	75

Director's Report on WINDREF Activities in 2015

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 2015 a very successful year for WINDREF. Baroness Howells of St. David hosted a joint Board Meeting on Thursday, August 13th in Newcastle, UK. The Board noted the progress that had been made during the year and the upcoming plans for 2015/16.

There were a number of appointments within WINDREF during 2015. Professor Hugh Montgomery, MBBS, BSc, FRCP, MD, FRGS, FRI, FFICM, Professor, University College, London, joined the Scientific Advisory Board. Professor Montgomery is a leading figure in the field of Health and Climate Change and visited Grenada as St. George's University's White Coat Speaker in August 2015. A number of Senior Research Fellows and Research Scientists joined the institute in 2015 and these are listed later in the Annual Report.



Hugh Montgomery new WINDREF Scientific Advisory Board member

CARPHA 60th Annual Health Research Conference at SGU

WINDREF in partnership with St. George's University (SGU), and the Ministry of Health, Grenada partnered together to host the 60th Annual Diamond Jubilee Caribbean Public Health Agency (CARPHA) conference and 14 satellite conferences at SGU's True Blue Campus in June. The region's leading authorities in health research, and the Deans and Directors of most of the regions leading academic and research institutions were in attendance. Addressing 200 delegates at the opening ceremony, the Minister of Health, the Honorable Nickolas Steele, welcomed the largest group of CARPHA delegates to Grenada. Dr. James Hospedales, the Executive Director of CARPHA and a member of WINDREF Scientific Advisory Board also welcomed the delegates to the meeting. The Master of Ceremonies, Dr. George Mitchell, Grenada's Chief Medical Officer, shared his enthusiasm for co-hosting the Conference. "The CARPHA Conference is a partnership which holds great promise for translating research into policy for the benefit of the peoples of the region," he said. A record number of over 178 oral and poster presentations were made during the



CARPHA's Research Advisory Committee Members together with the recipients of the outstanding Research Awards at a reception during the 60th Diamond Jubilee meeting

conference covering the theme of “Violence and Injuries Prevention: an Urgent Public Health and Development Issue.” It was a pleasure to welcome so many of the Region’s prominent health research and education professionals. WINDREF Research Fellows and Scientists presented 18 papers/posters at this conference.

During the year a number of distinguished guests visited WINDREF including HRH, The Princess Royal, Princess Anne and Mr. Andrew Card, the former U.S. White House Chief of Staff.

Dr. Ruth Macklin, PhD, Professor of Bioethics, Division of Research and Training in Education and Bioethics, Albert Einstein College of Medicine, presented the 7th Annual Keith B. Taylor and 15th Annual WINDREF



Her Royal Highness, Princess Anne meets with St. George’s University Chancellor Charles Modica and WINDREF Director Calum Macpherson during a Caribbean-Canada Emerging Leaders’ Dialogue meeting, held in WINDREF



15th Annual WINDREF Lecture by Dr. Ruth Macklin

lecture on Tuesday April 14th at 6:00pm in the Caribbean House Great Hall, True Blue Campus. Her lecture was entitled, “*Ethical Challenges in Confronting Disasters: Some Lessons Learned*”.



Former U.S. White House Chief of Staff, Andrew Card, visits 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 2016.

A handwritten signature in black ink, which reads “Calum Macpherson”.

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. Noel, MPH, FRSPH (Assistant Director)
- Margaret Lambert, MA, (Secretary Treasurer)
- Mary Jeanne Kreek, MD, PharmD (Hon), PhD (Hon)
- Karen Lawson, PhD
- Allen Pensick, PhD
- Ellen Ratner, MEd
- Joseph Feldman, MD
- Lord Soulsby of Swaffham Prior, MRCS, DVSM, MA, CBiol, FIBiol, DSc (Hon), (Past President)

Board of Trustees (United Kingdom)

- Lord Soulsby of Swaffham Prior, MRCS, DVSM, MA, C.Biol., F.I.Biol., DSc (Hon), (Chairman)
- 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
- Sir Kenneth Stuart, MD, DSc
- Richard Summerfield, MB, BChir
- 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
- John J. Ferguson, MBChB, FRCGP
- Malcolm A. Ferguson-Smith, MBChB,

FRCPath

- Edmond Fischer, DSc
- Sir Malcolm Macnaughton, MD, LLD, FRCPG, FRAC
- Calum Macpherson, PhD, DIC
- Anselm Hennis, MBBS, PhD, FRCP, FACP
- Oscar Jordan, GCM, MB, ChB, FRCPE, DCH
- Mary Jeanne Kreek, MD, PharmD (Hon), PhD (Hon)
- Ian McConnell, BVMS, FRSE, F. Med. Sci.
- Hugh Montgomery, MBBS, BSc, FRCP, MD, FRGS, FRI, FFICM
- Baron Peter Piot, MD, PhD, CMG, FRCP
- Neil Poulter, MD, PhD
- Sir Kenneth Stuart, MD, DSc (Hon)
- Melinda S. Sothern, PhD, CEP
- Richard Scribner, MD, MPH
- M. S. Swaminathan, DSc
- John B. Zabriskie, MD
- James Hospedales, MB, BS, MSc

Administration — Grenada

Dr. Randall Waechter continued as Grants Administrator, Mr. Kareem Coomansingh continued as IRB Administrator, Ms. Isha English continued as Assistant Administrator, and Ms. Naomi Alexander continued as Secretary in 2015. Ms. Celia Clyne Edwards provides legal support.

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. Its goal is to enhance the development of WINDREF's research and educational programs. The offices are located in Great River, New York. Ms. Tyeast Shaw 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).

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 Scribner, MD, PhD

Research Fellows

- John Adamski, MD, MSc, MPH
- Muge Akpinar-Elci, MD, MPH
- Zuri Amuleru-Marshall, PhD
- Glennis Andall, PhD
- Charles Avgeris, MD, MSc
- Satesh Bidaisee, DVM, MSPH, MSB, FRSPH, EdD
- Beverly Bonaparte, BSN, PhD
- Grant Burgess, PhD
- Dirk Burkhardt, MD, MSc, PhD
- Reccia Charles, PhD
- Sonia Chehil, MD, FRCPC
- Cheryl Cox Macpherson, PhD
- Andrea Easter-Pilcher, PhD
- Francis Fakoya, MBBS, 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
- Matthias Lorenz, PhD
- Marios Loukas, MD, PhD
- Theresa McCann, MPH, PhD
- Barrymore McBarnette, MD, MPH, MBA
- Craig McCarty, PhD
- Clare Morrall, PhD
- Shamdeo Persaud, MD, MPH
- Roger Radix, MD, MPH, MIB, FRSPH
- Christine Richards, PhD, MPH
- Bonnie Rusk, MSc
- Samina Rutrecht, PhD
- Hugh Sealy, PhD., P.Eng.
- Karen Schioler, PhD
- Shanti Singh, MD, MPH
- Kamilah Thomas-Purcell, PhD, MPH

Research Scientists

Sadiq Al-Tamini, Jonathan Ashcroft, Sumita Asthana, Yitzhack Asulin, Bishara Baddour, Jean-Pierre Barakat, Matthew Beeson, Keith Bensen, Matthew Boles, Karen Brennan, William Brown, Matt Browne, Ella Cameron, Nicholas Caputo, Jessica Clayton, Mmakgomo Coangae, Rae Connolly, Abraham El-Sedfy, Karla Farmer, Daniel Firer, Kristy Fisher, Scott Forman, Brandon Francis, 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, Rakesh Patel, Barry Politi, Sandeep Pulim, Sean Ramsammy, Justin Rebo, Alan Rhoades, Laura Robinson,

Karin Schioler, 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.

Special Report: Caribbean-Canada Emerging Leaders' Dialogue (CCELD)

The Caribbean-Canada Emerging Leaders' Dialogue (CCELD) Grenada Tour was held from 27th September to 1st October 2015 and brought together 12 emerging leaders from the Caribbean and Canada. Her Royal Highness (HRH), The Princess Royal, Princess Anne, President of the CCELD visited Grenada for a second time during the 2015 meetings.



HRH The Princess Royal, Princess Anne meets SGU Chancellor Charles R. Modica and Lisa Modica at the welcome reception at the Spice Island Beach Resort

"The objective is for members to look, listen and learn in the hope that the process will help them to improve the quality of their decision-making when they reach the peaks of their occupations." -HRH The Duke of Edinburgh



HRH The Princess Royal, Princess Anne with members of the CCELD Local Organizing Committee



HRH The Princess Royal, Princess Anne tours WINDREF Institute for the CCELD Dialogue

The CCELD is a not-for-profit organization, established by Canadian and Caribbean alumni of The Duke of Edinburgh Commonwealth Study Conference, that has brought together leaders from diverse backgrounds and occupations to learn from each other and enhance the quality of their leadership and decision-making skills for over 50 years.

The Dialogues are built on the proven model of The Duke of Edinburgh's Commonwealth Study Conferences. The Princess Royal graciously accepted the position of President of the Commonwealth Leadership Development Conferences in June 2011, upon the retirement of HRH The Duke of Edinburgh, who has assumed the role of Patron. In May-June 2011, HRH served as President of the first Caribbean-Canada Emerging Leaders' Dialogue (CCELD 2011). She visited several

groups during their study tours in the Caribbean, including Grenada, and later met with each study group during the Closing session.



HRH The Princess Royal, Princess Anne tours St. George's University with SGU and WINDREF executive members

The demand drivers for success in this new world are clear:

- Broad global thinking
- Collaborative leadership
- The ability to engage and build effective relationships with diverse partners



HRH The Princess Royal, Princess Anne bids farewell to Government Ministers and LOC members

CCELD is tackling this issue head on. The unique two week in-field Dialogue moves emerging leaders out of the classroom and into communities and workplaces, allowing

- Exposure to a range of issues from multiple perspectives
- To see beyond the scope of their regular context in their own organizations and geography
- To collaborate with team mates and make leadership decisions in a real time setting
- To be better, more confident leaders

Current Research Projects

Elimination of the Neglected Tropical Diseases in the Western Hemisphere with Particular Reference to the Soil Transmitted Helminths

This study focuses on the Incidence of Neglected Tropical Diseases with a specific emphasis on the Soil Transmitted Helminths (STH) with the aim to tackle the three main helminthes; *A.lumbricoides*, *T.trichiura* and *N.americanus/A.duodenale*. The study has been part of a national elimination program for Grenada, Carriacou and Petite Martinique. The study protocol was reviewed and approved by the St. George's University Institutional Review Board (IRB) (Project number: 09014) and the Ministry of Health (Grenada) Research Oversight Committee (ROC) and the Ministry of Education (Grenada) ROC. On the advice of our WINDREF statistician thirty eight of the fifty six primary schools in Grenada were selected for inclusion in this study and if a grade/standard was selected all members of that grade/standard were given the opportunity to participate regardless of their class size to adhere to ethical soundness.

The informed consent forms and attitudes, behavior, and practices (ABP) questionnaires were distributed to the 38 schools and

disseminated by the school principals to the parents/guardians. These informed consent forms and ABP questionnaires had already been pilot tested in several schools that were not included in the surveillance part of the study. Informed written consent was obtained from all parents or legal guardians of minors. All participants were free to withdraw from the study at any time during the consultation with no further obligation.

Before a questionnaire was administered or any stool sample was obtained, an informed consent to participate was obtained. A parental or guardian signature at the bottom of the form indicated authorization for a child's participation in the study. One signed consent form was required per participant, such that when multiple children from one house participated in the study, they each had their own consent form. After informed consent was obtained, the participant was officially enrolled in the study and was assigned a participant number. This number was present on all the questionnaires and stool samples that were subsequently collected for that participant. The incidence of STH was ascertained and the possible correlation of these results with the ABP questionnaire was investigated. The positive subjects were treated using albendazole.

Data Collection

A paper copy questionnaire to ascertain the ABP of school students that had been pilot tested on parents and guardians of primary school students from Grade 4 at the South St. George Government School was used for this study. This paper copy questionnaire was to ascertain the socioeconomic status of participants and their potential for current, past and future exposure/infection. The paper copy questionnaire was administered to the

parents or guardians when they signed the informed consent. The questionnaire consisted of twelve questions that were applicable to STH. In addition, a piloted electronic questionnaire was created for the primary school students and it was administered via Turning point and the use of an Automatic Response System (ARS) ("clickers") prior to and after a 10 minute powerpoint presentation that was designed to sensitize the students to STH and their control. The use of the electronic questionnaire pre and post intervention was to test the difference in short term knowledge recall. The post-intervention electronic questionnaire was administered within a year of the initial intervention to test long term knowledge recall. All three questionnaires were pilot tested with people who did not otherwise participate in the survey.

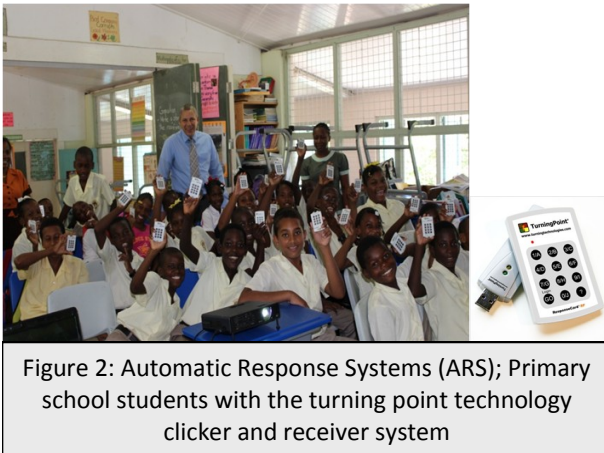
Educational Component - Intervention to inform knowledge

After assessing the ABP and establishing the baseline prevalence we established the knowledge level of the children and subjected them to an intervention to inform knowledge that was assessed using ARS. In addition, the students were sensitized via laminated educational posters that were placed in each of the 56 primary schools throughout Grenada (Figure 1).



Figure 1: One of the STH Control/Elimination program

In each of the primary schools the posters were erected and a poster ambassador was appointed to safeguard the poster. One year later all 56 posters were intact and still on display in their schools. The ARS (seen in Figure 2) allowed for comparative analysis before and after the intervention at the individual, school and country level. This ARS technology has never been used for STH and definitely not in the Caribbean region. This tested the effectiveness of the intervention and was novel. This lent itself to both public health and parasitology in that it sought to intervene at a country level...this had not been done in Grenada before. This intervention medium will provide advantages for middle and low-income countries where resources are at a minimum.



The assessment of the 56 primary school areas to characterize STH was facilitated through the novel use of ARS (Figure 2) as well as field observation. The ARS provided individual and school level data characterizing factors believed to be associated with STH in Small Island Developing States (SIDS) such as Grenada.

The protocol involved in using the ARS was as follows:

1. Schools were randomly selected

2. Classes were randomly selected
3. Sample number in Parishes was proportional to population distribution
4. Class register was obtained (Names and Gender noted)
5. Assignment of Turning point clicker number to individual students to ensure no swapping of clickers (see Figure 2 above)
6. Only students present on the day were surveyed
7. Classes were Grade 4 and/or Grade 5 (to allow for attrition levels)

The five step process used to assess the students' short and long-term knowledge:

1. Eight questions were administered via turning point technology.
2. An educational STH intervention presentation was given to the students.
3. The same eight questions were administered again.
4. The students were assessed for their short term recall knowledge.
5. The same eight questions were administered seven months later without the intervention presentation and the students' long term recall knowledge was assessed.

An example of the ability of using the ARS (Figure 2) to achieve immediate comparative results pre and post the intervention for a question administered during the pilot testing of the study (Table 1).

Comparative Results	Responses			
	Pre Presentation		Post Presentation	
	Percent	Count	Percent	Count
15. Where do people get worms from?				
A.Dogs	15.22%	7	6.67%	3
B.Cats	2.17%	1	2.22%	1
C.Cows	2.17%	1	2.22%	1
D.Chickens	30.43%	14	6.67%	3
E.Other People who have it	50.00%	23	82.22%	37
	100%	46	100%	45

Table 1: Turning Point technology comparative results for questions asked at a primary school pre intervention and post intervention

Results

The attitudes behavior and practice of schoolchildren as relayed by the parents or guardians is displayed in Table 2.

Questions	Response:Proportion (95% Confidence Interval)
Does your child regularly wash his or her hands before eating?	Yes: 66% (63 – 69%) Unsure: 24% (21 – 27%) No: 10% (8 – 12%)
Where does your family get its water supply?	Inside Pipe: 85% (82 – 88%) Standpipe: 14% (11 – 16%) River: 1% (0.6 – 2.3%)
What kind of toilet facility does your household have?	Indoor Toilet: 57% (54 – 61%) Outdoor Latrine: 43% (39 – 46%)
Does your child play around an outdoor latrine area?	Always: 3% (1.3 – 3.5%) Sometimes: 26% (23 – 30%) Never: 71% (68 – 75%)
Does your child wear shoes outdoors?	Always: 40% (37 – 44%) Sometimes: 58% (55 – 62%) Never: 2% (0.8 – 2.6%)
Does the person who prepares food for your family wash vegetables before cooking and fruits before cooking?	Always: 90% (88 – 92%) Sometimes 10% (8 – 12%) Never: 0.1% (0.0 – 0.7%)
Has your child ever had de-worming medication?	Yes: 82% (79 – 84%) No: 18% (16 – 21%)

Table 2: Attitude, Behavior and Practice (ABP) of primary school children as relayed by parents/guardians

The initial stool samples were analysed and the results can be seen in Table 3.

The knowledge intervention was assessed using ARS and the results can be seen in

Parish	Number of students sampled	Positives	Estimated Prevalence %	Not-Greater-Than Confidence Intervals (95%)
Petite Martinique	6	0	0	< 39 %
Carriacou	8	0	0	< 31 %
St. Andrew's	191	3	1.6	< 4 %
St. David's	26	0	0	< 11 %
St. George's	170	0	0	< 2 %
St. John's	43	1	2.3	< 11 %
St. Mark's	31	1	3.2	< 14 %
St. Patrick's	51	2	3.9	< 12 %
Total	526	7	1.3	< 2.5 %

Table 3: Estimated STH Prevalence in Primary school children by Parish

Figure 3, 4 and 5. The initial number of Primary school participants in the ARS STH intervention in March 2013 was 903 students from 38 schools. Of the 903 students from the initial ARS survey, 767 were followed up and 136 participants were lost to follow up. This represented an 85% inclusion on follow up of participants from 7 months previously and a 15% loss to follow up for the ARS STH intervention.

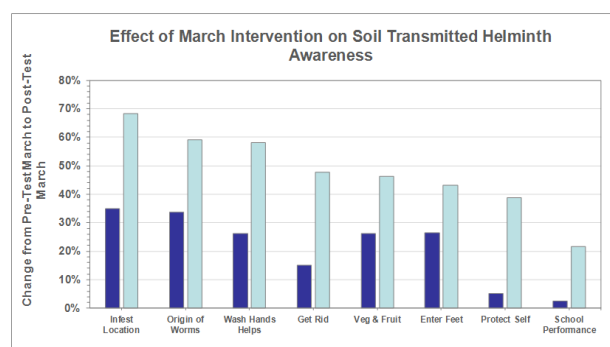


Figure 3: Short – Term Change in STH Awareness March 2014

In Figure 3 there was a positive short-term effect from the educational intervention in STH knowledge for all questions across all 903 students ($p < .001$).

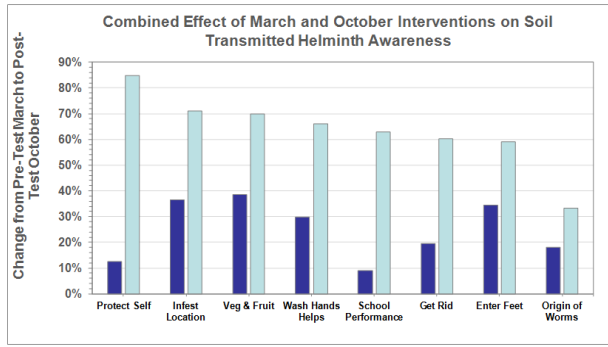


Figure 4: Long – Term Change in STH Awareness March 2014 pre intervention - October 2014

In Figure 4 there was a positive long-term effect from the educational intervention in STH knowledge for all questions across all 767 students ($p < .001$).

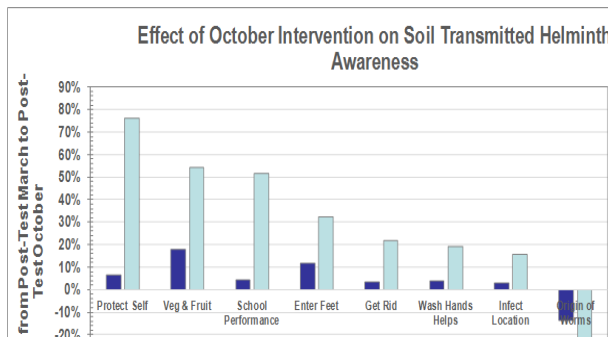


Figure 5: Time Effect on STH Awareness without Reinforcement March 2014 post intervention until October 2014

In Figure 5 the passage of time with no reinforcing intervention showed a decrease in knowledge for only one of the eight questions (Origin of Worms) across all 767 students ($p = 0.011$).

There was no significant statistical difference across schools. In summation, there was no evidence of a location effect; i.e it did not matter where we administered the treatment. The average improvement as a

percent of possible improvement was 52%. This is a significant statistical difference across questions. In summation, the students did better in respect of their factual knowledge after the powerpoint presentation treatment.

The final stool samples were analysed after the interventions and the results can be seen in Table 3.

Parish	Number of students sampled	Positives	Estimated Prevalence %	Not-Greater-Than Confidence Intervals (95%)
Petite Martinique	6	0	0	< 39 %
Carriacou	8	0	0	< 31 %
St. Andrew's	189	0	0	< 2 %
St. David's	23	0	0	< 12 %
St. George's	157	0	0	< 2 %
St. John's	43	0	0	< 7 %
St. Mark's	30	0	0	< 10 %
St. Patrick's	48	0	0	< 6 %

Table 3: Estimated STH Prevalence in primary school children by parish post interventions of treatment and education

Discussion

1) Attitude Behavior and Practice

The questionnaires administered by paper to evaluate the individual level data characterizing STH related outcomes and predictors at both the individual and school level were from 811 participants (parents or guardians). It is hoped that this tool can be generally applied to other tropical countries as a precursor in an effort to more effectively control disease transmission on a wider scale. The practical recommendations such as In-house sanitation facilities can be made. The wearing of shoes outdoors would be another

more practical recommendation that should be enforced to prevent hookworm infection. The fact that the majority of parents or guardians (82 % of those surveyed) are familiar with antihelminthics is a positive from the perspective of compliance when their children are afflicted with STH and need to be treated. There is no requirement for social marketing because the drugs both generic and brand name are known by the community which is different to the challenge that exists with new drugs on the market. Once these responses are taken into account it will enable limited resources to be used more efficiently to combat the problem of infection with STH in SIDS. The evidence is there to assist the policy makers with instituting evidence based policies. It is hoped that through this medium there will be an increase in the appreciation of the public health importance of STH in Grenada.

2) Knowledge (Turning Point technology)

The response by students via ARS was not different across schools. There was a change of factual knowledge by giving the students an educational experience via ARS. There are arguments for giving education in conjunction with chemotherapy on a case by case basis. We can make a conjecture as it relates to eliminating it. It is *prima facie* valid. The overarching argument is that it will help: it is cheap to administer, it is easy to administer and the cost is minimal. At a fundamental level ARS communicated key information: some STH larvae can enter through the skin of the feet and washing hands with soap and water after playing outside reduces the chance of getting STH. It is not possible to state whether it was the chemotherapy or the education or the combination that led to the elimination of the STH from Grenada. However, both were done and here is the

result. It is a positive move because other diseases can be eliminated. In general, persons that had no or limited knowledge are now empowered with knowledge to affect their behavior and make a difference.

3) Sample prevalence (Stool)

Comparing the proportion of positive cases after the intervention (0.0%) with the proportion of positive cases before the intervention (1.3%) using an exact Chi-square test, the results shows that the proportions are statistically different (p -value < .001). This provides strong evidence in support of a reduction in the prevalence of STH within the school children involved in the study. The results also show that if the entire population of Grenadian school children had received the intervention, the proportion of positive cases would not be greater than 0.8% (98% confidence). Using this information we can analyze the three hypotheses; in testing hypothesis 1 we can say that yes, STH were present in primary school children in the parishes of Grenada. In testing hypothesis 2, the prevalence of STH was low enough for it to be feasible to eliminate them within a twelve month period in a small Caribbean island nation such as Grenada. The estimated prevalence among school attending children in Grenada was 1.3%. We can say with 95% confidence that the true prevalence is no greater than 2.5% before treatment and education (intervention). In testing hypothesis 3, the combination of regular education and targeted treatment reduced the estimated prevalence to zero. We can say that the true prevalence is not greater than 0.6% for children receiving the educational and treatment intervention.

In conclusion, this study has provided evidence that a combination program of

education and targeted treatment can be effective in small island developing states for control and/or possible elimination of STH.

The results of this study have been presented as three separate presentations (one oral and two poster presentations) at the Caribbean Public Health Agency (CARPHA) 60th Diamond Jubilee Conference in June 2015 (Figure 6).

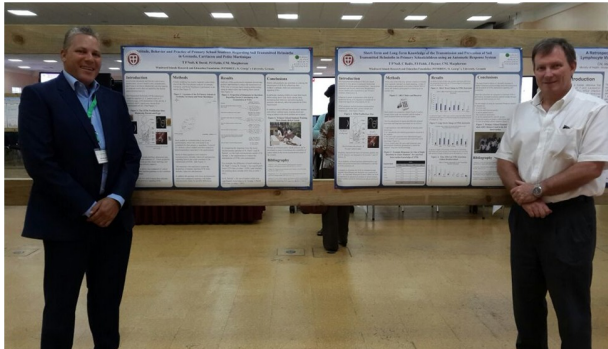


Figure 6: Trevor P. Noël (PhD candidate) with Dr. Calum N. L. Macpherson (Chair, PhD supervisory committee) at the CARPHA 60th Diamond Jubilee Conference in Grenada in June 2015.

These results are currently being written up as part of a PhD dissertation.

Submitted by Trevor Paul Noël

Characterization of Immune Factors of Severe and Chronic Chikungunya Disease in Grenada, West Indies

The 2014 Chikungunya virus outbreak in Grenada caused thousands of suspected cases of disease, with a wide spectrum of symptoms reported. It is estimated that since that time, 90% of the Grenadian population has been infected with CHIKV and tens of thousands continue to suffer joint complaints. CHIKV disease can cause both acute and chronic illness. Initial fever is often followed by severe skeletal and joint pain, arthritis and, more rarely, eye inflammation,

vision loss, neuritis, paralysis, vasculitis, hepatitis and heart disease. Currently, there is no specific therapy and there are no approved CHIKV vaccines.

Objectives

Around fifty percent of those infected with CHIKV suffer joint disease, which can persist for years, but our understanding of the risk factors and mechanisms underlying such chronic disease sequelae are limited. Research is currently ongoing in a collaborative study between WINDREF and Stanford University in the US to address this knowledge gap.

The specific objectives of this project are to:

1. Identify demographic and exposure factors associated with chronic CHIKV disease in Grenada, West Indies.
2. Define human immune responses associated with chronic CHIKV disease.

To date, 175 patients who had their blood tested for CHIKV between July-October 2014, have been contacted for follow up. Participants underwent a physical examination and completed questionnaires on current arthritis/arthralgia symptoms, recent illnesses, and prior medical history (including prior joint disease, trauma, injury, or other comorbidities). In addition, other physical, psychological, social and environmental factors were surveyed, in order that all of these parameters can be assessed in the context of long-term disease sequelae.

The impact of chronic joint disease on activities of daily living is assessed using the internationally validated Arthritis Impact Measurement Scale (AIMS). Blood samples

drawn from participants will also be analysed using Luminex array technology. A broad 30-plex cytokine panel will determine the immune profile of the samples. The findings will then be correlated with clinical and symptomology data and also with the AIMS scores from chronic versus recovered patients. We expect that this investigation will yield comprehensive data regarding CHIKV-specific immune responses and will enable confirmation of key immune signatures important in protection from or promotion of chronic disease.

Subject recruitment and data and sample collection for this project is currently ongoing. However, preliminary analysis of the data demonstrates that joint pains were overwhelmingly the most common symptom of acute CHIKV disease, reported in 92% of cases (Figure 1). Moreover, 56% of patients reported experiencing joint pains since and / or currently, more than a year after their illness with CHIKV (Figure 2).

Acute Symptoms Reported

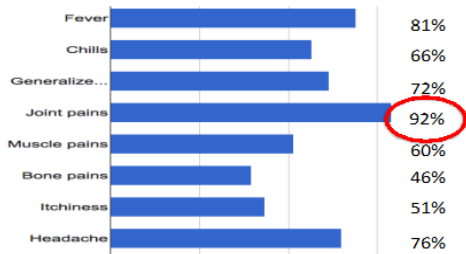


Figure 1: Reported acute symptoms of CHIKV

As the global prevalence of CHIKV disease increases, it is imperative that the immunological mechanisms behind chronic disease sequelae and recovery are elucidated, in order to optimize risk control

Have you had joint pains since?

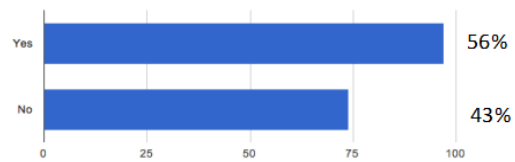


Figure 2: Proportion of patients reporting long-term joint sequelae after CHIKV disease.

and therapeutics, and ultimately inform vaccine development.



The research team (L to R): Trevor Noël, Natalie Hendon, Jason Lowther, Idis Mark-George, Claire

In addition, this research is concentrating specialized knowledge, skills and expertise in a location that has so recently been affected by CHIKV and also provides a rare and unique opportunity to study the dynamics and epidemiology of this emerging arbovirus in a human population. This will yield important data of great relevance globally as this virus and its vectors continue to spread.

Submitted by CHIK V Collaborative team, (WINDREF, St. George's University, Ministry of Health Grenada and Stanford University)

Vaccination Week 2015

A report on Immunizations in the Parish of St. Patrick's (winners of the WINDREF Challenge Trophy for the district with the highest vaccination coverage presented during the observance of Vaccination Week, 2015)

The St. Patrick's Health District provides health care services to a population of over 22,000 people through six health facilities: Tivoli Medical Station, Hermitage Medical station, Mt. Rich Medical Station, River Sallee Medical Station, Sauteurs Health Centre and Union Medical Station. One of the most important components of this service is its Maternal and Child Health Program's Expanded Program on Immunization (EPI). WINDREF supported the EPI in 2015 by providing refrigerators to store vaccines.

The district health team collaborates to achieve 100% vaccination coverage for its target population of live births each year. In 2013 the district had total estimated live births of 229, which served as the target population for vaccination in the primary series of three (3) doses, against Diphtheria, Pertussis, Tetanus, Hepatitis b, Haemophilus influenzae Type b and Poliomyelitis in 2014. This means every child in the target population should have three doses of the above vaccines by six months of age, beginning at six weeks to eight weeks of age.

The MMR vaccines are also important and are administered to children at one (1) year and a second dose at 18 months. An estimated target population of 248 one year olds were given this vaccine.

The vaccines available at the health facilities are free of cost. They include the following; Diphtheria, Pertussis, Tetanus (DPT),

Poliomyelitis (IPV/OPV), Hepatitis b (HepB), Haemophilus influenzae Type b (Hib), Measles Mumps Rubella (MMR), Influenza and Rabies vaccine.

Vaccine	Tivoli	Hermitage	Mt. Rich	River Sallee	Sauteurs	Union	Total
3 rd dose DPT, Hib, HepB (6 wks to 6 mths)	T=60 V=59	T=35 V=31	T=22 V=25	T=31 V=33	T=40 V=49	T=42 V=42	T= 229 V=239 104.3%
3 rd IPV (6 wks to 6 mths)	T=60 V= 58	T=35 V= 28	T=22 V= 25	T=31 V= 31	T=40 V=47	T=42 V= 36	T=229 V=225 98.25%
MMR 1 st dose (at 1 yr)	T=67 V=65	T=36 V=34	T=20 V=20	T=32 V=35	T=41 V=38	T=49 V=39	T=248 V=231 93.14%
MMR 2 nd dose (at 18 mths)	T=44 V=52	T=21 V=23	T=20 V=17	T=32 V=32	T=44 V=43	T=33 V=29	T=196 V= 196 100%
1 st DPT booster (at 18 mths)	T= 44 V=44	T= 21 V=23	T= 20 V=16	T= 32 V=32	T= 44 V=44	T= 33 V=32	T=196 V=191 97.44%
1 st IPV booster (at 18 mths)	T=44 V=46	T=21 V=18	T=20 V=13	T=32 V=27	T=44 V=36	T=33 V=30	T=196 V=170 86.73%

Breakdown of the Vaccines Given in 2015
 T = Target Population (children zero to one year)
 V = Vaccinated Population (children zero to one year)



(L to R, front): Dr. George Mitchell (Grenada Chief Medical Officer), Ms. Tessa Stroude (PAHO representative), Dr. Calum Macpherson (WINDREF), Hon. Nickolas Steele (Grenada Minister of Health), Mr. Trevor Noël (WINDREF) and Ms. Lydia Francis (Chief Community Health Nurse) with community nursing division staff of all districts.

Submitted by Trevor Paul Noël

Community Health Initiatives: Sport for Health, Touch Toes Test, One Health One Medicine

WINDREF's Sports for Health program entered into its fifth year of community-based exercise to mitigate the effects of chronic diseases in Grenada. By the end of 2015, over 1,500 participants have engaged the program and received the benefits of assessed reduction in Body Mass Index (BMI) and Waist to Hip Circumference (WHC), which serves to reduce the risk of heart diseases, diabetes, cancers and other chronic conditions. In 2015, the program also assessed community members who did not engage the program in an effort to understand any barriers towards their participation and inform practices to reduce and/or remove identified barriers. The lack of participation among males was a primary observation with 97% of participants being females. The enquiry among males inferred that they did not perceive the Sports for Health program to be of benefit. Further exploration revealed that males did not favor engaging in activities whether medical examinations or conversations about their health. The Sports for Health program therefore assumed an educational component for males in the various communities to promote their knowledge of chronic diseases, inform effective attitudes towards the benefits of exercise and inculcate positive perceptions about the Sports for Health program. The program will monitor the impact of the intervention among males by observing for any changes in the proportional participation in 2016.

The Touch Toe Test (TTT) campaign continued in 2015 as part of a longitudinal initiative to promote basic screening for loss of sensation in toes (peripheral neuropathy)

among persons in Grenada especially those affected with Diabetes Mellitus. With each year, the TTT campaign, which centers around the observation of World Diabetes Day in November of each year, identifies more persons with peripheral neuropathy. Persons once identified and confirmed with peripheral neuropathy are enrolled into management clinics as well as followed up to prevent the adverse outcomes of limb amputations. Assessments from the medical records for Grenada demonstrated a reduction in the number of amputations associated with peripheral neuropathy while there was an increase in the number of persons identified and managed for peripheral neuropathy since the TTT campaign started in 2012. The awareness and implementation of the TTT campaign has therefore been evaluated as effective towards reducing the burdens of Diabetes Mellitus and its complications of limb

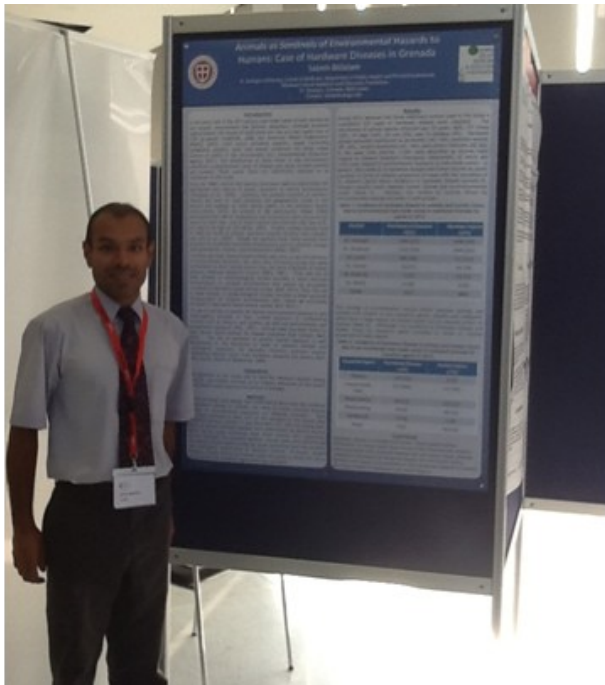


Graduate Students Demonstrating the Touch Toe Test

amputations. Through home screening practices and increased awareness, the TTT will continue to be maintained in 2016 with a focus on identifying further strategies promoting its use and effectiveness in the Grenadian community.

WINDREF's One Health, One Medicine initiative for 2015 focused on the theme of the International One Health Congress, which

was Ecosystem Health. Understanding the interdependency of Humans, Animals and the Environment, WINDREF studied Hardware Diseases (animal injuries from contact with foreign objects) as sentinels for environmental contaminants for human health. The study recorded cases of hardware disease, its distribution and contaminant's type in Grenada and compared with injuries sustained by humans from medical records. The study identified similar objects found in the environment to serve as the hazards for both human and animals. Construction nails,



Dr. Satesh Bidaisee presents a poster at the International One Health Congress, Amsterdam, 2015

loose wiring and metal sheets were the reported main environmental contaminants, which both humans and animals were in contact with. This study was presented at the 3rd International One Health Congress in Amsterdam in 2015.

Submitted by Satesh Bidaisee

Grenadian Women's Perspectives on Screening for Breast and Cervical Cancer: A Collaborative Approach to Prevention

On 1st July 2014, Dr. Christine Richards from the Department of Public Health and Preventive Medicine collaborated with Dr. Kamilah Thomas-Purcell, Assistant Professor from Nova Southeastern University (NSU), College of Osteopathic Medicine in Fort Lauderdale Florida and researchers from the NSU Office of Research and Innovation to secure a grant from Franklin Kenyon and Frances Kenyon Agneski Trust Endowed Cancer Research Award for US\$8,862.00. Nova Southeastern University College of Osteopathic Medicine was the beneficiary of the proceeds of a trust left by the late Franklin Kenyon and Frances Kenyon Agneski. They designated that funds generated by the trust must be used solely to support research efforts in areas related to cancer. These projects must have an emphasis on primary care.

Drs. Richards and Thomas-Purcell received funding to support a study entitled



Research team members (L to R): Oge (MPH student), Dr. Christine Richards, Winta Ghidei (MPH student) and Dr. Thomas-Purcell in the Parish of St. Patrick's actively recruiting participants for the study

'Grenadian women's perspectives on screening for breast and cervical cancer: A collaborative approach to prevention'. The researchers conducted formative research to identify the behavioral determinants of Grenadian women that facilitate receiving breast and cervical cancer screening. Ultimately the researchers plan to use the results of the study to inform a social marketing campaign to encourage breast and cervical cancer screening.

To achieve the research aims, a community based participatory research strategy was used in which a number of local organizations were invited to participate in the planning and implementation phases of the project. Participants included the Ministry of Health, the Grenada Cancer Society, the Pink Ribbon Society, the Grenada Public Health Association and the St George's University. Grenadian women from each of the seven parishes participated in focus group discussions during August and September 2014. During these discussions information was obtained from women on their knowledge of breast and cervical cancer, barriers and facilitators to cancer screening, current sources of cancer information, and

preferred channels of information. The results of this research study are under review for publication in the *Global Journal of Health Education and Promotion* and an abstract will be submitted to the 2016 Caribbean Public Health Association (CARPHA) Annual Meeting.

In July 2015 Drs. Thomas-Purcell and Richards received notice that their proposal to extend this study to Dominica, St. Lucia, and St. Vincent and the Grenadines was approved for funding through CARPHA and the National Cancer Institute in the United States. This proposal entitled 'Perspectives on the uptake of breast and cervical cancer screening in the English Speaking Windward Islands: A collaborative approach' was one of six funded under the funding announcement. The study is funded for two years in the amount of US\$50,000 and will begin data collection in January 2016. This aim of this study is 1) To identify cultural factors that influence the uptake of breast and cervical cancer screening among women living in the Windward Islands and 2) determine the quality of services for breast and cervical cancer patients in the Windward Islands from the perspective of the gatekeepers who provide care for patients. Liaisons in each county will assist with the coordination of the research. Marva-Primus Joseph, MPH, RN a graduate of the Department of Public Health and Preventive Medicine will serve as the lead project coordinator for the study.

Submitted by Christine Richards

reachwithin

reachwithin's mission is to improve the health and well-being of Grenada's most vulnerable youth. In recent years, **reachwithin** has focused its programming on benefiting formerly maltreated children



Team member, Marva Primus Joseph (R) explaining the study to a community member in the Parish of St. Mark's

currently living in residential care facilities across Grenada. This is done through a multi-dimensional approach that aims to improve internal (i.e. coping skills) and external (i.e. quality of care) resources for children.

reachwithin has held numerous meetings with the Grenada Ministry of Social Development and the Ambassador of Humanitarian Affairs for the Diaspora, both in Grenada and NY, with the express goal of supporting their efforts to help Grenada's vulnerable children. CPA has engaged **reachwithin** for input into the UNICEF report pertaining to child protection. We have engaged in these activities so that we might add content to the development of policy pertaining to children's rights.

In 2015 **reachwithin** focused on 3 key areas: 1) caregiver education and capacity building; 2) youth services; and 3) support activities and special fundraising initiatives.

1) Caregiver Education

reachwithin provides the following care homes with support: Queen Elizabeth Home, Belair Home, Dorothy Hopkins Home and P.A.M. Father Mallaghan's Home For Boys closed its doors mid 2015 and its former residents now reside south of the island, at the Richmond Hill Home for Boys. **reachwithin** is working with CPA to regain access to the youth at this location, so they can continue to benefit from our programs.

Caregiver coaching services are still being made available with the help of Ms. Lorna Douglas, who branched out from her role as head coach at Belair to also offer guidance at Queen Elizabeth Home. At the end of 2015 Ms. Douglas will have spent over 96 hours

working at these two sites. Ms. Carla St. Louis, a local counselor, temporarily joined the **reachwithin** team in February, and provided 58 hours of psychotherapeutic services for high-risk youth living at QEH. Ms. St. Louis has also worked closely with the care home staff to help address any behavioral problems at the home.

July 2nd, 2015 marked the launch of **reachwithin's** second annual **Children and Caregivers: The importance of their Relationships** conference held at St. George's University. Over 50 attendees were invited to come together to share knowledge and to provide practical application to further their understanding of the importance of early social-emotional development in the overall health and well being of a child. Keynote speakers included **Dr. Stephen Porges**, Professor, Department of Psychiatry University of North Carolina, Chapel Hill; **Dr. John Hornstein**; **Dr. C. Sue Carter**, Director Kinsey Institute, Rudy Professor of Biology, Indiana University, **Dr. Hazel DaBreo**, psychotherapist, Executive Director Sweet Water Foundation Grenada; **Dr. Carla St. Louis**, Early Childhood Education Officer, Grenada Ministry of Education; **Aditi Subramaniam**, LHMC, CEIS, R-DMT, Boston Children's Hospital, Brazelton Institute, Boston; and **Gaylen Plant**, M.Ed, CEIS, Boston Children's Hospital, Brazelton Institute, Boston.

2) Youth Services

The Yoga program continues to make impacts under the tutelage of our Program Coordinator, Mr. Jerry Bascombe. In 2015, Mr. Bascombe will have delivered 109 Youth Yoga Classes and 101 group drumming classes spread across 4 homes.

reachwithin, in collaboration with local musician Monteith Drayton, now helps to support a drumming program at Belair, QEH and at P.A.M. Our program coordinator, Jerry Bascombe, provides transportation and plays the drums alongside Mr. Drayton, who leads the group as head drumming instructor. Together, Mr. Drayton and Mr. Bascombe offer interactive group drumming circles, which have been praised by the homes for their positive impact on the youth's pro-social behaviors. In 2016, in collaboration with the Child Protection Authority of Grenada, reachwithin hopes to bring the drumming program to the residents of Richmond Hill Home for Boys, so that they too can benefit from this program.

3) Special Fundraising Activities

#ARunforGrenada

On November 1st, 2015, reachwithin held its first #ARunForGrenada fundraising campaign, which was hugely successful. Running alongside the team up the West Coast of the island was Canadian actor, Brandon McLaren, from the hit show 'Graceland'. His public lending of support helped draw attention to the cause and made it possible



Supporters meet early in the morning on Sunday 1st November for the Run for Grenada Marathon

for reachwithin to surpass its \$20,000 USD fundraising goal on Indiegogo.com. Funds from the 2015 #ARunForGrenada campaign will now help in the creation of a Transitional Living Program in 2016, for youth who have aged out of care yet are still in need of help. Yoga awareness day

To help spread awareness about the benefits of yoga and to encourage its widespread adoption in the community, **reachwithin** held its first-ever Community Yoga Awareness Day, May 30th at the Fountain of Youth Yoga Studio in Grand Anse. Members of the local community were invited to attend to sample



Participants at the Community Yoga Awareness Day – 30th May 2015

several free yoga classes, held by talented local instructors. Twenty people turned out for the event and information was disseminated about our programs and the plethora of benefits yoga provides

participants.

reachwithin Staff Members

- Ms. Meghan Tyrrell, involved in program management, logistic arrangement, and budget handling
- Mr. Jerry Bascombe, program coordinator and a yoga teacher, involved in handling the Youth Program by providing ongoing support to caregivers in the home;
- Ms. Christine George communications and PR specialist
- Ms. Lorna Douglas, an expert in youth development through her work at NEWLO, a vocational training school, who also coaches caregivers in several homes
- Dennis Mason, program support.

Submitted by Meghan Tyrrell

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

Now in its second year, the Grenada Saving Brains project is in full swing. Drs. Randall Waechter and Barbara Landon secured a two-year \$270,000 CDN grant to maximize neurodevelopment by training parents and caregivers in Conscious Discipline, an evidence-based caregiver education curriculum aimed at self-regulation through attachment and enrichment activities. The Grand Challenges Canada Saving Brains Initiative is devoted to funding innovative intervention research in order to enhance neurodevelopment in developing regions. Over 40 projects have been funded worldwide. The Grenada project, which got underway on 1st October 2014, has accomplished the following to date:

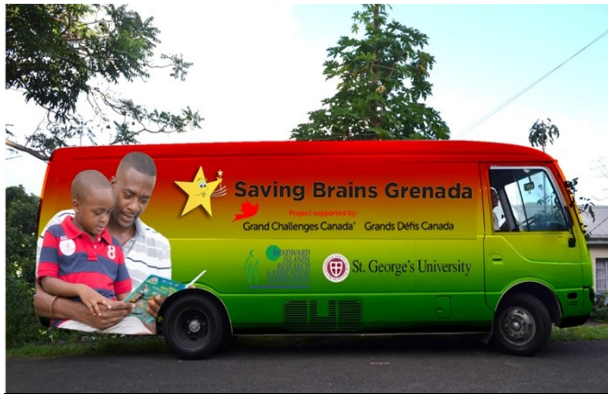
- Trained 132 of the Ministry of Social Development's Roving Caregivers to be Conscious Discipline Paraprofessionals.



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

These caregivers travel throughout Grenada visiting families with children from birth to age three, providing stimulation and Conscious Discipline techniques.

- Hosted Dr. Becky Bailey, award-winning author of the Conscious Discipline curriculum, and her associate Ms. Mindy Becker, an early childhood teacher. In addition to providing supplemental training for the Paraprofessionals, Dr. Bailey also provided a one-day workshop for the Grenadian community, and gave a Grand Rounds on neurodevelopment entitled, "What the World Needs Now is More Peek-a-boo." She also appeared on local radio and television.
- Established a Conscious Discipline Mobile Resource Unit, staffed by project manager Ms. Stephanie Holmes. The Mobile Resource Unit was a previous St. George's University bus that has been refurbished to travel around Grenada providing classes in Conscious Discipline and supporting the Roving Caregivers. The bus has been on the road since May 2015.
- Hired and trained 8 research assistants, who are currently collecting data on



The Saving Brains Grenada Mobile Resource Unit

intervention and wait-list control families. Dr. Michelle Fernandes, a research fellow at Oxford University, came to Grenada in May to train the RAs in the Intergrowth-21st Neurodevelopmental Assessment, an internationally standardized early



Families visit the Saving Brains Grenada Mobile Resource Unit

childhood assessment tool. In addition to the InterNDA, a number of other outcome measures are being administered to assess family functioning in Grenada. All data is collected electronically via tablets and cellular data service.

- The two co-PIs have attended international Grand Challenges annual meetings, and are beginning to forge partnerships regionally. The goal is to scale up the project in 2017.

Submitted by Barbara Landon Landon and Randall Waechter

Grenada School Nutrition Study

The Grenada School Nutrition Study (GSNS) adopts the Global Burden of Disease (GBD) approach to the quantification of disease risk, which projects that non-communicable diseases (NCDs) will represent the greatest disease burden in low- and middle-income countries (LMIC) by 2030 (Murray & Lopez 1997; Mathers & Loncar 2006). There is significant evidence to indicate that the onset of NCDs, including cardiovascular disease, diabetes, and cancer, is due to a limited number of modifiable factors in the environment that are associated with obesogenic diets, lack of physical activity, and tobacco use (WHO 2005; Strong, Mathers et al., 2006). The GSNS is organized to identify these factors among Grenadian adolescents who have yet to adopt the obesogenic lifestyle.

An expansive literature on the modifiable environmental factors associated with overweight and obesity exists for high-income countries. In addition, numerous interventions have targeted school and physical activity environments, taxes, food marketing, and other aspects of the physical environment (e.g., walkability). Despite these efforts, researchers in high-income countries have watched the epidemic of obesity unfold over the past three decades, not only in the US, but also across the globe. Consequently, the identification of the “drivers” of the epidemic remains contentious (Swinburn, Sacks et al., 2011; Blair, Archer et al., 2013;

Luke & Cooper, 2013). Identifying the drivers of the epidemic involves the isolation of factors responsible for upsetting the balance in the energy intake/energy expenditure equation over the past four decades. On the energy intake side, the global food system that provides a Westernized diet of cheap, palatable, energy dense foods is implicated (Swinburn, Sacks et al., 2011; Popkin, Adair et al., 2012; Luke & Cooper, 2013). On the expenditure side the transition to sedentary occupations with low energy expenditure are implicated (Franco, Ordunez et al., 2007; Church, Thomas et al., 2011). The inability to arrive at a consensus is attributed to the lack of research with designs sufficient to link local obesogenic environments - created by the societal drivers - with individual obesity related behaviors (Wang & Beydoun, 2007; Popkin, 2009; Bleich, Ku et al., 2011). The GSNS is a three year study funded by the International Development Research Centre (IDRC), which seeks to address these limitations by studying a cohort of Grenadian adolescents who have not yet experienced the high rates of obesity observed in high income countries in order to identify potential drivers of the obesity epidemic.

As a low-middle income country, the adoption of obesogenic lifestyles in Grenada is in its early stages for adolescents. There is a window of opportunity to intervene in the trajectory of the country's youth, to prevent lifelong obesity and the diseases associated with it. The GSNS takes advantage of this window of opportunity and attempts to identify the environmental factors in the school and local environment, driving the epidemiologic transition to high rates of obesity in Grenada, a trend which a recent study has already noted in Grenadian adults, especially women. Positive findings from the

study could have a significant impact on the drivers of the obesity epidemic not only in Grenada but globally. The specific objectives of the study include the following:

- Objective 1: Conduct structured interviews to inform surveys (i.e., cultural appropriateness) of the local environment, perceived to be associated with obesogenic lifestyles among adolescents and their parents.
- Objective 2: Conduct a secondary school based assessment of 1,000 first-year, secondary students (aged 11-14) nested within Grenada's 23 secondary schools. The assessments involved direct measurement of height, weight and waist circumference. Accelerometry was also used to directly assess physical activity.
- Objective 3: Conduct neighborhood and school assessments of the 23 secondary schools to characterize the food and physical activity environments in terms of accessibility of healthful and unhealthful food items, and each schools' food and physical education policy. This effort was facilitated through the development of a Geographic Information System (GIS). A Principal Survey was used to assess schools' food and physical education policy.
- Objective 4: Conduct multilevel analyses to identify modifiable contextual environments associated with overweight and obesity related behaviors and outcomes. The analysis is designed to identify the individual and school level factors associated with overweight and obesity in the student population.
- Objective 5: Disseminate the study results to policymakers, academics, students, and their parents with the intent of influencing policy that will change the

environmental contexts associated with an obesogenic lifestyle. The dissemination efforts will be designed to support evidence-based policy to reduce obesity in middle and low-income countries including the countries of the CARICOM region.

As of December 2015, the GSNS has come to a close, with the successful implementation of all five objectives. The GSNS team is now in the process of disseminating the results of the study, including at the Caribbean Public Health Agency's (CARPHA) 60th Health Research Conference, which was held on the St. George's University campus in Grenada in June 2015. The following abstracts were submitted to that conference:

Abstract 1: Overweight and Obesity among Grenadian Adolescents

The analysis documents the low rates of overweight and obesity among Grenadian adolescents. Overall Grenadian adolescents had low rates of overweight (17.6%) and obesity (7.6%) compared with US counterparts. Grenadian girls had nearly twice the rates of overweight compared to Grenadian boys (i.e., 22.7% versus 12.2%) but similar rates of obesity (i.e., 8.2% versus 6.8%). These findings confirm that fact that Grenadian adolescents have not yet undergone the epidemiologic transition associated with the adoption of the obesogenic lifestyles associated with the obesity epidemic.

Abstract 2: Differential Exposure to Social Determinants of Obesity among Rural and Urban Grenadian Adolescent

The analysis characterizes the variation in exposure to social determinants of obesity among Grenadian adolescents in rural and

urban schools. Significant differences between rural and urban students were noted for car access (40.7% versus 53.3%), computer access (61.6% versus 73.5%), and snacking after school (83.6% versus 90.5%) respectively. Rural students' school environment had a lower mean density of snack shops (1.53 versus 3.39 shops/square km) and mean fast food outlet density (0 versus 1.17 outlets/square km) compared with urban students' school environment. These findings suggest that Grenadian adolescents attending rural schools will have delayed adoption of obesogenic lifestyles and lower rates of overweight and obesity.

Abstract 3: Individual and School-level Influences on Moderate and Vigorous Physical Activity (MVPA) in Grenada Adolescents

The analysis attempted to identify school level factors that predicted overweight and obesity risk among GSNS students in multilevel analyses. No school-level policy variables related to physical education were



Some members of the Grenada School Nutrition Study (GSNS) team presenting results at the Caribbean Public Health Agency (CARPHA) health research conference in Grenada, 25-27 June 2015

significantly related to student MVPA. Waist circumference was the only variable that significantly predicted MVPA in both boys ($p=0.03$) and girls ($p=0.005$). In girls,

overweight/obesity was significantly associated with decreased MVPA ($p=0.004$). The early research findings have raised further questions among the GSNS research team, regional and international obesity and social determinants of health researchers, and local, regional, and international policymakers. Specifically, the finding of low rates of overweight and obesity among young Grenadian adolescents compared to: (1) Grenadian adults; (2) Adolescents in more developed countries in the Caribbean (e.g., Barbados, Trinidad & Tobago, Turks & Caicos); (3) Age-matched adolescents in the US; (4) US adults suggests that Grenada is undergoing an epidemiologic transition originating in the adults and moving to the children and young adolescents. Thus, understanding the factors associated with this epidemiologic transition is critical for Grenada and may have international implications for addressing the obesity epidemic. Policymakers will require this information to create awareness among the population as to the factors that are driving the obesity epidemic. Changes in awareness are critical to support policy changes around the obesity environment, thereby reducing the risk of overweight and obesity.

The GSNS research team proposes the following next steps to advance the overall objective of decreasing the probability of the adoption of an obesogenic lifestyle among adolescents in Grenada and the Caribbean region (given that other islands are grappling with the same challenge as per personal communication with regional researchers and policymakers at the CARPHA conference):

1. Further research to identify the specific factors involved in the epidemiologic transition that is occurring among young Grenadian adolescents.
2. To accomplish the above, the GSNS research team believes that the existing cohort of first-year secondary student participants should be followed through the last year of secondary school, when they turn age 18.
3. During this 5-year transition, all of the measures and variables included in the GSNS should be repeated: Anthropometric measurements, food frequency questionnaire, accelerometry, dietary assessment, evaluation of the residential, transportation, and school environment, and social determinants of obesity (e.g., processed food availability, sugar-sweetened food availability).
4. Furthermore, blood samples should be drawn from a subset of the youth, to account for genetic and metabolic factors that may change during the epidemiologic transition.

These methodologies will allow the research team to track the factors associated with transition to obesity among those students who become overweight/obese as they approach adulthood, versus those who do not. Critically, this research extension will allow for the testing of several competing mechanisms/models of obesity transition, which are currently being examined by obesity researchers worldwide:

1. Whether the driver of the epidemiologic transition is the relative contribution of energy intake or energy expenditure;
2. Whether environmental factors in childhood impact gene expression for obesity, which is expressed as the adolescent transitions to adulthood (e.g., the Barker Hypothesis)
3. The relative contribution of individual versus environmental determinants in the transition to overweight and obesity

Lastly, the GSNS research team believes that it is critical to build public awareness around obesity-related policy initiatives to support sustainable development goals. In order to change policy, public education and awareness campaigns and school programs are needed to inform the public of research findings and statistics of the obesity epidemic. These awareness campaigns support grass roots efforts that ultimately support policy change at the political level. The research team is now examining how such a public education and awareness campaign could be rolled out in Grenada. The Ministers of Health and Education are fully supportive and any initiative that could raise awareness among the populace – especially children and adolescents – and potentially reduce the risk of overweight and obesity, and the associated chronic diseases, in the future.

Submitted by Dr. Roger Radix and the Grenada School Nutrition Team

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

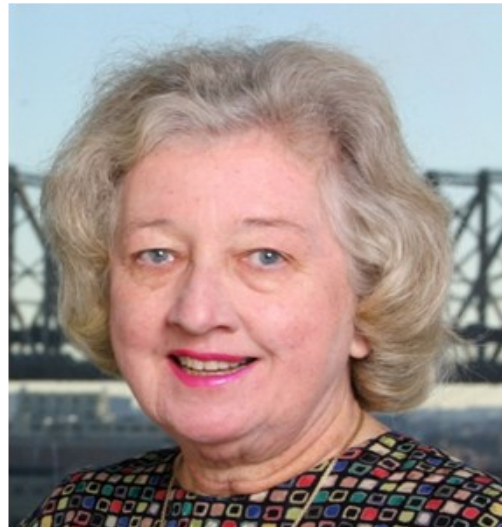
In Grenada, blood samples are taken from normal volunteers, drug-free former cocaine users, drug-free former marijuana users, drug-free former alcohol users, or current drug and alcohol users. To assess their levels and types of addiction, a standard scale – developed by the Kreek Lab – is used for each 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 53 case participants have completed the full KMSK questionnaires and blood draws in Grenada. Our control participant's selection is ongoing and we have completed 92 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.



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

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



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

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.

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 twelfth 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 Paul Noël

Caribbean University Interdisciplinary and Integrated Drug Demand Reduction Project

Progress continues on the Drug Demand Reduction Project. Over the past year, the link with the Grenada Drug Intervention Network (GREN DIN) was strengthened so that we can optimize our collaborative efforts on community outreach drug prevention programs, especially among young people. The involvement of Dr. Shelly Rodrigo from the SGU Masters of Public Health (MPH) program as Co-Principal Investigator has led to the involvement of MPH graduate students in various aspects of the training, research and evaluation of project activities.

Caribbean Research Ethics Education Initiative

Awarded in 2014, the grant is now in its second of five years. The first Cohort of Trainees will complete the one-year Diploma program in May 2016. The Call for Applications for the second cohort has been circulated, and when selected, those Trainees will begin the program in May 2016.

The curriculum is designed specifically to

address issues in the Caribbean basin. It is delivered in English in Grenada at SGU, and in Spanish in Mexico at UAQ (see WINDREF Annual Report 2014 for more details).

At WINDREF and SGU, Co-PI Cheryl Macpherson has facilitated i) planning and advisory committee meetings; ii) partnerships with CARPHA, BSEC, PAHO, and others to advance CREEi's goals and educational mission; iii) hosting the onsite course that began the training for Cohort 1. She is circulating the Call for Applicants for Cohort 2 and is finalizing plans for their selection and introductory course in May 2016.

CREEi Curriculum Development: Planning and Advisory Committees (Nov 13-19, 2014)

Participants

- Advisory Board Members: Liz Heitman, Marty Strossberg, Donald Simeon, and Grace Sirju-Charran
- UGC: Sean Philpott-Jones, Phylise Banner, Tammy Curtis
- Spanish Cohort: Robert Hall, Hilda Romero Zepeda, Jose Salvador Arrellano Rodriguez, Angelina Rodriguez Torres, Miryam Izebel Moreno Pacheco
- English Cohort: Cheryl Macpherson, Derrick Aarons, Maira DuPlessis

Accomplishments

- Presented overview of CREEi structure and goals
- Explored approaches to online education
- Introduced the online platform (joule) used for CREEi
- Brainstormed curricular needs relevant to Caribbean priorities and culture
- Agreed to implement the Goals, Skills, Areas of Impact, and Key Topics bulleted below

Goals

1. To provide a culturally relevant knowledge base and skill set in research ethics to trainees from LMICs in the Caribbean Basin.
2. To prepare trainees and local faculty to act as research ethics educators in their home countries and institutions.
3. To prepare trainees to facilitate institutional change with regard to ethical practices in research.
4. To develop centers of excellence in bioethics and research ethics at SGU and UAQ.
5. To develop and sustain a research ethics network in the Caribbean.

Skills

1. Critical Thinking
2. Interdisciplinarity
3. Vigilance/Surveillance
4. Case Analysis
5. Protocol Review
6. Mediation & Facilitation
7. Oral and Written Communication
8. Mentoring

Areas of impact

1. Clinical/Biomedical
2. Scientific/Technological
3. Environmental
4. Social



CREEi trainees with trainers at WINDREF – April 2015

5. Political

Key Topics

1. History of Research Ethics
2. Theoretical Ethics
3. Practical Ethics and Frameworks
4. Scientific Integrity/Responsible Conduct of Research (RCR)
5. Introductory Overview of Human Subjects Research, Animal Research, and Public Health Research (use case studies to emphasize how each of these address each of the five key areas of impact)

CREEi Regional Partnerships

In addition to capacity building for research ethics in the Caribbean through its training program, CREEi aims to promote dialog about research ethics, provide tools and motivation for critical thinking, and encourage bioethics approaches to other professional endeavors in medicine and research. To this end, the 5 partnerships outlined below were developed and/or strengthened by CREEi's English-speaking arm.

1. BSEC - At its Annual Forum, the Bioethics Society of the English-speaking Caribbean (BSEC) routinely conducts workshops on topics requested by the host institution and/or country. These frequently address some aspect of research ethics. Participants at the 2014 and 2015 Fora and workshops were targeted for CREEi recruitment.
2. CARPHA - After joining CREEi as a faculty member, Derrick Aarons was employed by the Caribbean Public Health Agency (CARPHA) as its ethicist charged with developing CARPHA's IRB. His position helped to publicize CREEi and its aims in the region, recruit qualified applicants,

and initiate the formation of a regional research ethics network involving CREEi Fellows and alumni and others.

3. PAHO - PAHO determined that there was a regional need for an English language webinar series on research ethics, and invited BSEC and CREEi affiliates Macpherson, Aarons, and Charran, with Carla Saenz of PAHO, to develop and present the series. This ran and was archived in March and April 2015 with attendance at about 30 persons each session. Participants were introduced to CREEi during some of these webinars.
4. SGU School of Veterinary Medicine - In April 2015, colleagues from SGU's SVM approached Macpherson, Philpott-Jones, and Macklin about collaborating on development of a Fogarty grant proposal for regional capacity building in Vector Borne Disease (VBD) modeled on CREEi's structure for onsite and online education across the English-speaking Caribbean. We supported this effort by sharing information. Cheryl Macpherson worked with SVM colleagues to draft the Responsible Conduct of Research component of the VBD proposal.
5. Social Networking - We established a CREEi Facebook page and aim to build its activity and profile in coming years.

Submitted by Cheryl Cox Macpherson

Conservation Leaders in the Caribbean (CLiC)

Conservation Leadership in the Caribbean (CLiC) is a groundbreaking leadership training and capacity-building program focused on meeting both human and wildlife needs by

protecting healthy, functional marine and terrestrial Caribbean ecosystems and enabling economically sustainable development. This unique program facilitates effective regional networking to achieve sustainable conservation targets while promoting team building skills, professionalism and task-oriented collaboration strategies. One of the goals of the CLiC program is to establish a sustainable Caribbean conservation leadership-training program that will be based in the Caribbean. The investment made will pay dividends for marine and terrestrial conservation across the Caribbean and Latin America by strengthening professional conservation capacity of emerging leaders. Successful graduates of the program are expected to take up leadership roles in their home countries as well as hold their own in the international conservation arena.

“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 (BoD) member and Wildlife Trade Manager at IFAW.

Project partners for CLiC include the United States Fish and Wildlife Service Division of International Conservation’s Wildlife Without Borders (USFWS), International Fund for Animal Welfare (IFAW), St. George’s University (SGU) and WINDREF. The CLiC leadership-training program will be based at SGU. Dr. Easter-Pilcher, a faculty member in the Department of Biology, Ecology and

Conservation in the School of Arts and Sciences (SAS) at SGU sits on the CLiC BoD as one of three academic advisors. Additional BoD members are Ms. Nadra Nathai-Gyan (CLiC program director), Dr. Heather Eves, Dr. Leo Douglas, Mr. Kelvin Alie and Ms. Michelle Benham.

The inaugural 2015-2106 class is comprised of 20 fellows, (selected from a pool of applicants) from 14 countries across the wider Caribbean. Each fellow is an emerging leader in his/her field and a conservation



practitioner committed to the conservation of biodiversity at the national and community levels. They hail from diverse backgrounds including government, international NGOs, local conservation organizations and universities. Three of the CLiC fellows are graduates of the marine, wildlife and conservation biology program in the Department of Biology, Ecology and Conservation in the School of Arts and Sciences (SAS) at SGU.

In addition to three training sessions to be held over a two-year 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 first training workshop was held on the SGU campus in Grenada on June 4, 2015 and was followed by a ten-day short course on the Open Standards for the Practice of Conservation. The first two workshop sessions dealt with orientation and the context for the program; while the remaining sessions covered skills building, team building and leadership skills. This was the first in-person meeting with the selected fellows and all six members of the BoD were in attendance. Resource personnel from WINDREF (Dr. Randall Waechter), Grenada Fund for Conservation (Mr. Tyrone Buckmire) and the Department of Forestry, Grenada (Mr. Anthony Jeremiah) provided their expertise to complement the training provided by the BoD. The venue for the workshop was the Caribbean House Great Hall on the SGU campus. At the completion of this first workshop, the fellows had formed project teams and had a general concept of what their projects would focus on. Their projects were further developed, to the draft management planning stage, during a 10-day training course on Conservation Planning and Adaptive Management that started immediately after the conclusion of the workshop. The specific workshop topics included the following:

- State of Conservation in the Caribbean
- Professional Capacity Building in the Caribbean
- Effective Team-Building
- Conflict Analysis and Constructive Conflict Management
- Conceptualizing an Effective Conservation Project
- Emerging Technologies for Meeting

Conservation Outcomes

- Making an Impact – Experiences from an International NGO
- Key Skills for Implementing Biodiversity Conservation in the Caribbean
- Communicating Conservation
- Emerging Technologies for Meeting Conservation Outcomes
- Making Impact – Experiences from an International NGO
- The Role/Pathways of Funding and Fundraising for Conservation
- Proposal/Grant Writing
- Community Engagement, Stakeholder Participation, Networking & Partnerships
- Conservation Success Stories in the Caribbean

This initial face-to-face workshop in June was followed by a 1-day virtual training workshop in October to kick off Module 2 of the program. The virtual 1-day training workshop placed emphasis on the projects that had had 6 weeks of implementation time since final proposals were submitted at the end of August 2015. Teams presented updates using PowerPoint presentations with ample time for questions and answers. Enriching the training was a stellar presentation by Mr. David Shaw from the Department of Business in SAS at SGU on negotiation and communications. Fellows also engaged in discussions centered on improving communications and group dynamics led by Board Member, Michelle Benham.

Day 2 of our Module 2 Training (virtual also) will be held in February 2016. In the meantime fellows continue to implement their team projects (Invasive Lionfish Management in Columbia, Mangrove Restoration in Nicaragua, Hawksbill Turtle Conservation in Grenada & Anguilla, Wildlife Trafficking in Bahamas and



Trinidad, and Parrotfish Overfishing in Jamaica) across the Caribbean, gaining leadership skills and contributing in efforts to support biodiversity conservation.

In addition to the original USFWS funds of \$126,871 secured by the CLiC BoD, an additional \$30,000 in funding has been secured by the BoD from the USFWS to support project teams and meet program objectives. These funds will provide additional support for the five projects that CLiC teams are implementing in the region as well as support the engagement of supervisors for the CLiC fellows and the production of a short informational video.

In December of 2015, Dr. Andrea Easter-Pilcher secured an additional \$2,500 for the project teams through the Helen Johnston Family Foundation.

Submitted by Andrea Easter-Pilcher

Water Quality Assessment in Clark's Court Bay Marine Protected Area, Grenada, West Indies

Sustainable management of natural marine ecosystems in Eastern Caribbean countries is challenging as a result of overfishing, unregulated domestic and industrial waste discharge, deforestation and destruction of mangroves to make way for development, and lack of sufficiently trained professionals in the monitoring of protected areas. Aware of the importance of the natural environment to national development and human health and wellbeing, the Government of Grenada is committed to conserve at least 25% of its terrestrial and near shore marine area by 2020. An important mechanism for achieving this goal is the establishment of Marine Protected Areas (MPA). The Woburn Clark's Court Bay Marine Protected Area (WCCBMPA), located in Woburn, St. George's is one of three established MPAs in Grenada. Key stakeholder groups, including land and marine management professionals, have hypothesized a negative impact of an upstream rum distillery on water quality within the WCCBMPA and other downstream terrestrial ecosystems. A major mangrove ecosystem is found within the geographic area of the WCCBMPA. This site however, might be currently stressed from natural and anthropogenic hazards, compromising its productivity and contribution to healthy ecosystem functioning. In 2015, a collaborative project to examine water quality in WCCBMPA was begun with team members Dr. Svetlana Kotelnikova and Ms. Makeda Matthew in the Department of Microbiology and Immunology and Environmental Testing Unit at St. George's University (SGU), Ms. Karla Farmer, Mr. Jerry Enoe and Dr. Randall Waechter at WINDREF, Dr. Hugh Sealy in the Department of Public Health and Preventive Medicine at SGU, and Dr. Clare Morrall in the Department of Marine Biology at SGU. The project was supported by the Nature

Conservancy with Funding from the World Bank, and implemented in close collaboration with Grenada Fisheries, the Woburn Fishery Association, and the WCCBMPA Community Organization. SGU provided laboratory space and equipment, which is utilized by the Environmental Testing Unit at the University. The water quality analysis was designed to establish baseline conditions across dry and rainy seasons in Grenada, and therefore provided the framework to evaluate the effectiveness of conservation interventions within and adjacent to the WCCBMPA. Over 20 chemical, physical and biological parameters, including most probable numbers of viable heterotrophic bacteria and fecal coliforms, Dissolved Oxygen - DO, pH, salinity, Total Dissolved Solids - TDS, alkalinity, hardness, turbidity, conductivity, temperature, concentrations of nitrates, nitrites, ammonium, phosphate, sulfide, copper, iron, and Biological Oxygen Demand – BOD₅, and their variability were quantified

from February to November of 2015. Additionally, the WCCBMPA watershed was mapped and point and non-point sources of pollution assessed.

The methodological, temporal and spatial variations of the twenty physicochemical and biological parameters have been documented and evaluated in accordance with the sensitivity of the approach and the magnitudes of concentrations observed in the environments studied. The quality of water in WCCBMPA was evaluated by comparing the detected levels of pollutants to the limits of the USA Environmental Protection Agency and to the normal levels earlier observed in the control coastal seawaters of Grenada by the environmental testing unit at SGU. Using the pairwise correlation analysis among different parameters over three periods of six weeks, the team assessed the relationships among the levels of each parameter quantified and therefore the informative value of each parameter was evaluated. The most informative and least expensive indicators of water quality for the health risks of humans and animal life and the control of levels of

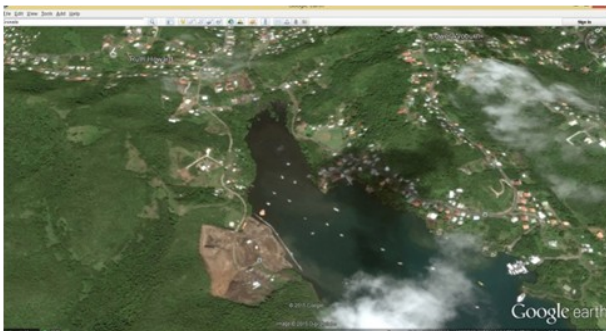


Figure 1. Land and Mangrove degradation observed since 2004 and visualized by Google Earth on 30 October 2014

in and around the WCCBMPA for the first time. Five selected sites including the waterway upstream and downstream of discharge point from the Clark's Court Rum Distillery, the mangrove swamp outlet, the beach and the coral reef water sites in WCCBMPA were subjected to weekly monitoring for 18 weeks during the period



Figure 2. Laboratory and field based training of Woburn Bay community members performed by Ms. Makeda Matthew, BS in Marine Biology, and Ms. Karla Farmer, MSc in Microbiology, at the Environmental Testing Unit Laboratory at St. George's University in February, September and

eutrophication were identified and recommended for long-term monitoring, including viable coliform counts, TDS, Alkalinity, Turbidity, pH, Temperature, and concentrations of copper and iron. Grenadian undergraduate and graduate candidates, government officials, WCCBMPA activists, and Woburn Bay community members were trained to perform the water sample collection and analysis in the future. The water testing methodologies were shared with the trained individuals.

Heavy metals followed by the deforestation and partial loss of the filtering function. This resulted in the development of acidification and partial anoxia in the water column and production of sulfide and ammonium in the sediments of the Woburn Bay. However this process may be reversed if the periodic discharge of organic and copper-rich vinasse is significantly reduced or ceases. Anthropogenic pollution with sewage and gray water runoff from yacht latrines, domestic and business septic tanks, cattle manure and finally organic discharge due to the deforestation of the mangrove, resulted in an increased numbers of the most probable numbers of Fecal Coliform (FC) *E.coli* bacteria in the Bay. The alarming levels of the fecal indicators were detected in 100% of sampling occasions in all tested sites both in the water way and the Bay, except for the Benji Bay reef area, which was polluted at frequency ranging from 50 to 100%. The health status of the WCCBMPA has been documented and identified to be at the initial stage of eutrophication due to observed decreased pH values and dissolved oxygen contents in the water column and production of sulfide and ammonification in the sediment. This corresponded to the extensive sedimentation observed in the WCCBMPA. Apart from the water quality assessment performed for the first time in the region, it is hoped that a collaborative effort between SGU, the environmental testing unit, WINDREF, and the WCCBMPA and Woburn Bay community members will lead to the improved quality of water and air in the area of Woburn Bay. The project resulted in the development of standard methods and the establishment of protocols for future sustainable monitoring of the water quality, and a potential demonstration site for similar water quality improvement projects throughout the Caribbean region.

Healthy mangroves usually act as natural biological filters that facilitate degradation of pollutants before they reach the coastal water. The tidal waves bring the sulfate-rich seawater into the mangrove biological community, which normally facilitates complete mineralization of the organic pollutions. Following the temporal and special variation dynamics of the water bio- and chemo-indicators, the sources of the pollutions were tracked. Using the quantitative indicators, we identified the potential type of land degradation within the Woburn Mangrove ecosystem. The river watershed, following the discharge from Clark's Court Rum distillery and mangrove runoff, were identified as the major sources of organic pollution in the WCCBMPA in accordance with the gradient and correlation analysis of such parameters as Biochemical Oxygen Demand (BOD₅) and most probable viable numbers of heterotrophic bacteria. The Smelly River waterway and the mangrove of Clarks Court Bay were shown to be subjected to periodic pollution with discharge, which is rich in acidic and anoxic organics, copper, and iron. The overload of the biological community in the mangrove sediments with the vinasse resulted in the increased sediment temperature and intoxication of the mangroves with sulfides, organic acids and

Submitted by Svetlana Kotelnikova, Makeda Matthew, and Karla Farmer

Caribbean Environmental Research Initiative: International Microbiology Presentations by SGU Students

A collaborative effort between the Department of Microbiology and Immunology in the School of Medicine (SOM) and the Program in Marine and Conservation Biology in the School of Arts and Sciences (SAS) at St. George's University (SGU), called the "Microbiology Selective", provided Medical and Biology students with the opportunity to participate in scholarly activity and research in 2015, supervised by Mr. Ravindra Naraine and Dr. Svetlana Kotelnikova.

Ms. Sutasinee Nithisoontorn, in collaboration with other premedical and biology students, performed her investigations while attending a genetics course (BIOL 320) during the Spring 2014. In this course, the students manually identified new enzymatic functions for hypothetical genes with similarities to



Figure 1a: Ms. Nithisoontorn next to our poster.
Figure 1b: Ms. Nithisoontorn presenting our research to two interested members from BAGECO conference.

protein/coding genes within the Genome of extremophilic acidophilic archaeum *Ferroplasma acidarmanus* fer 1. The students completed the analysis of 79 proteins coding for transposases and integrases. Summary of

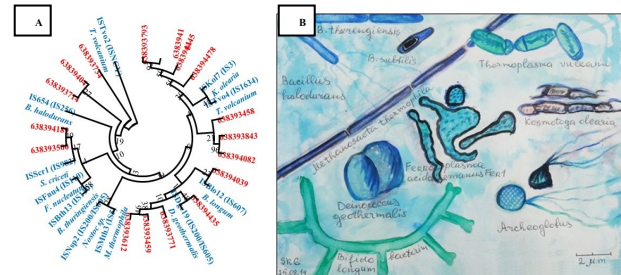


Figure 2a: Phylogeny of 17 fer1 transposases based on the Whelan and Goldman model and bootstrap of 1000.
Figure 2b: Evolutionary hosts of transposases detected in *F. acidarmanus* fer 1, © S. Kotelnikova.

the transposases and IS element identified in both *F. acidarmanus* and the orthologous hosts were presented as a part section dealing with Adaptation and the role of Horizontal Gene Transfer in Prokaryotes during the 13th Symposium on BACTERIAL GENETICS and ECOLOGY (BAGECO) in Milano, Italy.

The team identified 15 ortholog hosts with genes coding for transposases and integrases. Remarkably, *F. acidarmanus* shared these genes with both *Archaea* and *Bacteria*, which were capable of survival at low pH or high temperature such as *Lactococcus lactis*, *Sulfolobus solfataricus*, *Archaeoglobus fulgidus*, *Thermoplasma acidophilum*, *T. volcanium* and *Bifidobacterium longum*, as well as the spore producing *Bacillus* species including *B. thuringiensis*, *B. halodurans*, *B. cereus*, *B. subtilis* (Figure 2a and 2b).

Phylogenetic and sequence-similarity analysis demonstrated evolution of the studied IS families (Fig.2a) as sharing common ancestry with primarily non-related microorganisms. A new model of the horizontal gene transfer of the IS families and transposases dominating in *F. acidarmanus* was produced (Fig.2b). Based on the analysis of 71 transposases, we identified ~12 families of IS elements in *F. acidarmanus*, which indicated incredible potential for mutagenesis and horizontal gene

transfer. Most of the transposases were shared between *T. volcanium* and *F. acidarmanus* and belonged to IS200 and ISNCY families. Another medical candidate,

indicate that the proteins facilitating the drug resistance may be of survival advantage in the environment.

Submitted by Svetlana Kotelnikova

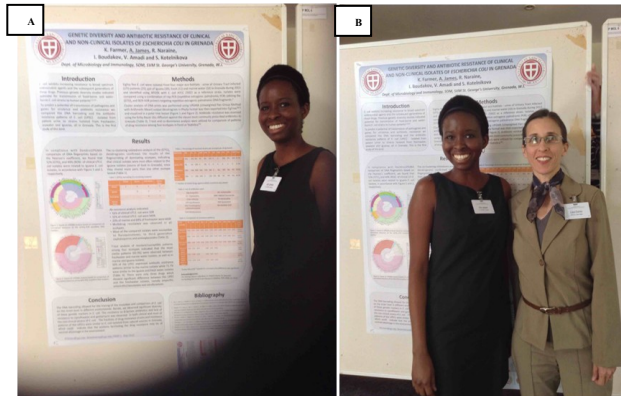


Figure 3a: Ms. Abi James, term 5 SOM candidate next to her research poster.
Figure 3b: Ms. James presenting our research to a visitor of BAGECO conference.

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

The centre is a collaboration between the Sustainable Development Mechanism (SDM) programme of 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). The centre supports Caribbean stakeholders to tap the potential of the Clean Development Mechanism (CDM) of the Kyoto Protocol.

Ms. Abi James, performed her research during premedical term 3.1 in Genomics during Spring 2013 and during Fall 2014 as a part of Microbiology Research Selective SCSK 445 in collaboration with a research group working on antibiotic resistance in Grenada under supervision of Dr. Kotelnikova. Abi decided to present the groups results at the International symposium on the environmental dimension of antibiotic resistance, which took place in Wernigerode, Germany between 17 - 21 May 2015.

Since starting operations in July 2013, RCC St. George's has been assisting governments and the private sector in the Caribbean region in climate change mitigation and adaptation activities. The centre has focused its work on the 16 independent Caribbean countries and has actively engaged with all of them. In 2015 RCC experienced a change in the team with Vintura Silva joining the Centre to head the team. Alexandre Gellert Paris and Nigel Edwards continued their role as technical officers through the year.

DNA barcoding allowed for the tracing of the evolution and comparison of *E. coli* on the strain level in different environments. We observed significant diversity of these genetic markers in *E. coli*. The resistance to β -lactam antibiotics and lack of resistance to ciprofloxacin and gentamycin was observed in both clinical and most of the non-clinical strains of *E. coli*. The fractions of drug resistance strains and resistance patterns of the UPECs were similar to *E. coli* isolated from natural sources in Grenada, which could

The activities of the RCC St George's in 2015 are summarized below.

1. Capacity Building

RCC St. George's hosted four interns during the year:

- (i) MSc. renewable energy student from the University of West Indies (UWI). Internship work on the grid emission factor (GEF) standardized baseline for Trinidad and Tobago;
- (ii) PhD student from Reading University, working on models used by electricity utilities to affect their expansion planning, with particular interest in the challenges faced by utilities operating island grids and their planned expansions;
- (iii) Industrial trainee from Grenadian Solar Energy Technology Research Institute (GSETRI) on renewable energy projects; and
- (iv) MSc. student from Cologne University of Applied Sciences. Supported the direct communication with the CDM project developers and coordinating/managing entities (CMEs) in the Caribbean and the development of training programme.
- During 2015, RCC St George's staff members attended and presented at a number of conferences and workshops:
- Solis, K. (2015). Caribbean Energy Security Initiative (CESI). Washington DC, United States
- Solis, K. (2015). *UN Carbon Market Mechanisms: Business opportunities for the Caribbean*. Department of Business and Management. St. George's University. Grenada
- Paris, A.G. (2015). Caribbean Clean Energy Technology Symposium (CCETS). United States Virgin Islands
- Silva, V. and Paris, A.G. (2015). *Role of CDM in Carbon Markets*, Workshop "Developing Carbon Markets in Trinidad and Tobago: Perspectives on New Market Mechanisms" Claxton Bay, Trinidad and Tobago
- Paris, A.G. (2015). *Result-Based Carbon Financing for Renewable Energy Projects on Islands*. IRENA Martinique Conference on Island Energy Transitions: Pathways for Accelerated Uptake of Renewables. Martinique, France
- Silva, V. (2015). *NAMAs in the context of iNDCs*, Workshop for Jamaica Renewable Energy NAMA. Kingston, Jamaica
- Silva, V. and Paris A.G. (2015). Latin America and the Caribbean Regional Workshop on Carbon Finance and Latin American and Caribbean Carbon Forum (LACCF). Santiago, Chile
- Sealy, H. (2015) *Potential benefits from using and integrating international crediting mechanisms into the iNDCs from Caribbean countries*, Caribbean Regional Workshop, WINDREF, Grenada
- Edwards, N. (2015) *Grid emission factors and introduction to CDM*. Energy for Sustainable Development in the Caribbean Buildings (ESD Project) Regional Coordinating Committee Meeting. Saint Vincent and the Grenadines
- Silva, V. (2015). *INDCs, International Crediting Mechanisms and Support from RCC St. George's for Caribbean countries*. Caribbean Regional Workshop on INDCs. Santo Domingo, Dominican Republic
- Serra, L. (2015) *Implementation of the iNDCs*

and the role of private sector. National workshop on iNDCs, Nassau , Bahamas

Sealy, H. (2015) *Review of iNDCs submitted from SIDS and a discussion on potential benefits from integrating international crediting mechanisms into the iNDCs from SIDS*. LEDES LAC webinar

Silva, V. (2015). *Renewable Energy in Caribbean: The role of Industrial and Commercial sector* (Panelist) Caribbean Renewable Energy Forum (CREF). Miami, United States

Paris, A.G. (2015). Regional Platform for Latin America and the Caribbean (LEDES LAC) Workshop and Low-Emission Development Strategies Global Partnership (LEDES GP)



Mr. Vintura Silva in panel discussion on C&I role in RE & EE at Caribbean Renewable Energy Forum (CREF)

Annual Event. Punta Cana, Dominican Republic

Silva, V (2015). *Carbon Markets: Opportunities it present in the IT sector*. Department of Business and Management. St. George’s University. Grenada

Paris, A.G. (2015). *Standardized Baselines for the Cement Sector*. Forum ZACK (Zement-

Abfall-Co-Processing-Klima). Santo Domingo, Dominican Republic
2. Workshops Organized

RCC St George’s together with WINDREF organized a workshop entitled “Opportunities for Clean Technologies under the Carbon



Participants to the Workshop on Opportunities for Clean Technologies Under the Carbon Market held at St. George’s University

Market”. The workshop had over 30 participants, including the CMEs of Caribbean PoAs and aimed to motivate and promote business opportunities under the carbon market, to share experiences among the CMEs, and to improve the operation and development of PoAs. Presentations were delivered by the RCC staff, the DSI, the Norwegian government, GIZ, Inter-American Development Bank (IDB), South Pole Group, Micro Energy Credit, and Professors from St. George’s University.

RCC St. George’s organized the Caribbean Regional Workshop on Intended Nationally Determined Contributions (iNDCs), which focused on integration of market mechanisms in iNDCs. This workshop was attended by representatives from Grenada, Belize, Haiti, Suriname, Antigua & Barbuda, St Lucia, St Vincent and the Grenadines, Dominican Republic and Trinidad & Tobago.



Participants to the Caribbean Regional Workshop on Intended Nationally Determined Contributions (INDCs) held at St. George's University

A follow up Webinar on the same topic with a focus towards next steps in INDCs was held together with LEDS LAC initiative on 07 October 2015 with over 200 participants.

3. Intended Nationally Determined Contributions

In December this year the world leaders agreed on a landmark agreement on climate change in Paris. All countries were invited to present their climate change plans, or intended nationally determined contributions (INDCs), to the Paris Agreement under the UNFCCC. 186 countries have submitted their INDCs so far. The INDCs were the basis for the Paris Agreement and they represent a decisive step in the challenging path towards an orderly transition to a global society aligned with the boundaries of the climate system.

In 2015, WINDREF with the support of RCC St. George's provided direct support to the development of INDCs in the Caribbean upon request of governments.

In the case of Grenada, the center provided greenhouse gas (GHG) emissions estimates for

four key sectors: electricity, forestry, waste and transport (based on the standardized baseline work), NREL developed scenarios for different policy options, which served as the basis for Grenada's INDC. The partnership between RCC St. George's and NREL was successful and both institutions collaborated also to support the INDC of Jamaica. RCC St. George's partnered with Climate Analytics for the support of the INDC in Belize with GHG emission scenarios.

Additional support included inputs on the draft documents for Antigua and Barbuda, Barbados, Belize, St. Vincent and the Grenadines and St. Kitts and Nevis. Moreover, WINDREF's specialized consultant was responsible for the organization of a workshop on INDC in the Bahamas.

The RCC St. George's will keep on assisting the Caribbean governments and the private sector in the application of methodologies and tools for carbon accounting and MRV systems needed to translate mitigation outcomes into carbon assets. RCC St. George's plans to continue activities that could enhance INDC implementation in the Caribbean together with its partners, including an on-line platform for collaboration.

4. Partnerships

RCC St George's identified key stakeholders in the Caribbean with regards to climate change mitigation. RCC St George's has forged several partnerships during 2015 working together in regional activities with institutions such as United States National Renewable Energy Laboratory (NREL), Caribbean Community Climate Change Centre, Climate Analytics, GIZ, CARICOM, IRENA, LEDS, CDKN, UNEP and IDB. RCC St George's plans to expand the number

of partnerships in the region, and to formalize some of those partnerships for the implementation of specific projects.

5. CDM Project Support

The centre provided direct technical support to several CDM project activities and programmes in the region at different stages of the CDM cycle (prior consideration, validation, registration, verification, and issuance).

RCC St George's is also supporting the matchmaking between CDM projects and investors. For example, the World Bank's Pilot Auction Facility for Methane and Climate

projects. During the year 10 funding opportunities in total was shared with the PPs. RCC St George's pro-actively contacted all the CDM projects and PoAs in the Caribbean to understand the status of the projects and the support needed. Through in-depth discussions we were able to build good rapport with the project participants and gathered valuable insights. The result of this exercise was summarized in a report titled "Analysis of CDM Activities in the Caribbean" with conclusions on actions to further support CDM distribution in the region.

It was also a landmark year as RCC was able to more than double its cumulative impact on the CDM pipeline.



Mr. Alexandre Gellert Paris visits the Bionersis CDM project at La Duquesa landfill, Dominican Republic

6. Standardized Baseline Support

The standardized baselines (SBLs) allow a baseline to be calculated only once for an entire class of projects or industry sector, as opposed to being calculated separately for each CDM project. SBL can potentially reduce transaction costs, enhance transparency, objectivity and predictability, and facilitate access to the CDM, particularly with regard to underrepresented project types and regions. SBL are intended to scale up the abatement of greenhouse gas (GHG) emissions, while ensuring environmental integrity. In some cases, such standardized baselines are of interest to countries and stakeholders for their use in nationally appropriate mitigation actions (NAMAs) and measurement, reporting and verification (MRV) activities.

Change Mitigation (PAF) is an opportunity for CDM projects in landfills in the region. Also, the Norwegian Carbon Procurement Facility (NorCaP) is still activity in the finance of CDM

In 2015, RCC St George's supported the development and submission of several SBLs in the region. These included the SBL for grid emission factor (GEF) of Antigua and Barbuda, Dominican Republic, Grenada, St Vincent and

the Grenadines, Haiti, and Trinidad and Tobago. The GEF for Dominican Republic has been approved by the CDM Executive Board.

The SBLs for the waste sector of Antigua and Barbuda, Belize, Dominican Republic and Grenada supported by RCC St George's were approved by the CDM Executive Board. These SBLs render automatic additionality for CDM projects as in these countries there are no regulations requiring the use or capture (flaring and/or generating heat/electricity) of landfill gas and use or capture of landfill gas is not a practice in these countries. During 2015, RCC provided support to the government of Jamaica for development of waste sector SBL

RCC St George's also initiated the support to the SBL for the cement sector in the Dominican Republic and also expanding the calculation of Emission factor for off-grid power generation. Steps were taken with respective government focal points to also initiate calculation of the Grid Emission Factors for Jamaica, St Lucia, Guyana and St Vincent and St Kitts.

7. NAMA Support

The Centre supported work of 5 new NAMAs and a programme for implementation of NAMAs in the Caribbean with UNDP-Barbados. This includes Renewable Energy; Re-forestation and Cement sector NAMAs in Antigua & Barbuda, Dominican Republic, Jamaica. The support was principally in the use of CDM tools as MRV systems for the NAMAs.

Submitted by Vintura Silva and Alexandre Gellert Paris

Analysis of Clean Development Mechanism Activities in the Caribbean

Introduction

The Regional Collaboration Centre (RCC) St. George's provides support for Clean Development Mechanism (CDM) project activities and programmes of activity within the Caribbean Region. The 16 countries supported by RCC St. George's have a total of 79 CDM projects and programmes at different stages of the CDM cycle. The RCC St. George's team's aim is to establish contact and create a solid relationship with project participants (PPs) and coordinating/managing entities (CMEs) of CDM projects or programmes in the Caribbean. The main objective was to understand the major barriers and requirements, in order to provide solutions to issues faced and the necessary support to progress through the CDM cycle. Undertaken activities had specific objectives:

- (i) Follow up on the status of implementation of the projects;
- (ii) Update the project's contact information;
- (iii) Understand the barriers that might be impeding the projects from moving towards registration with the CDM and/or issuance of CERs and providing solutions including suggestions for policy or methodology reforms;
- (iv) Offer the services provided by RCC St George's and support the projects directly;
- (v) Provide useful information regarding Sustainable Development co-Benefits Tool (SD tool), the voluntary cancellation platform, and the "Climate Neutral Now" campaign; and
- (vi) Inform the stakeholders on carbon market and funding opportunities, including matchmaking the funds, technical support, and eligible projects

Methodology

In 2015, the RCC St George's team developed a survey and applied a questionnaire to the contacted project participants (PPs) and coordinating/managing entities (CMEs) of CDM projects or programmes in the Caribbean. This activity intended to investigate the pipeline of CDM projects from the UNFCCC secretariat database and other sources. The PDD/ PoA-DD, the MoC, or prior consideration letters provided the initial contact information, such as telephone numbers and e-mail addresses. The RCC St George's team encountered difficulties in

CDM Status	Questionnaire responded		
	No	Yes	% Response
Pending Publication	0	1	100%
Prior Consideration	16	24	60%
Registered	5	20	80%
Validation Public	1	1	50%
Validation Terminated	5	6	54.5%
Total	27	52	65.8%

contacting some PPs and CMEs, due to outdated contact details or because the information on file was related to prior consideration from before 2012 for projects that were no longer proceeding. Out of the 79 CDM projects and programmes, 65.8% responded to the questionnaire (Table 1).

CDM activities status assessment

The country distribution of the CDM activities within Caribbean countries is in Table 2. The Dominican Republic leads the number of projects summing up 63.3% of total projects in the region, followed by Jamaica (7.6%), Haiti (6.3%), Cuba (3.8%) and Belize (2.5%). Minor representation is found in other countries,

such as Bahamas, Guyana, Suriname, and Trinidad and Tobago. It is noted that 11.4% of

Host Country	CDM Activity			
	PA	PoA	Prior	*CPAs of Multi-country PoA
Antigua & Barbuda	-	-	-	5
Bahamas	1	-	-	5
Barbados	-	-	-	6
Belize	1	-	1	4
Cuba	3	-	-	3
Dominica	-	-	-	3
Dominican Republic	23	2	25	4
Grenada	-	-	-	6
Guyana	1	-	-	2
Haiti	-	2	3	4
Jamaica	3	0	3	5
St. Kitts & Nevis	-	-	-	3
St. Lucia	-	-	-	5
Suriname	-	-	1	2
St. Vincent & Grenadines	-	-	-	3
Trinidad & Tobago	-	1	-	3
Multi-country*	-	2	7	-
Total	32	7	40	-

the projects constitute Programmes of Activity with CPAs in multiple countries, embracing all 16 listed countries, supported by the RCC St. George's. RCC St. George's classified the 79 projects according to the UNEP/DTU Pipeline database of CDM projects as shown in Figure 1.

UNFCCC online data base for CDM project activities: <https://cdm.unfccc.int/Projects/projsearch.html>

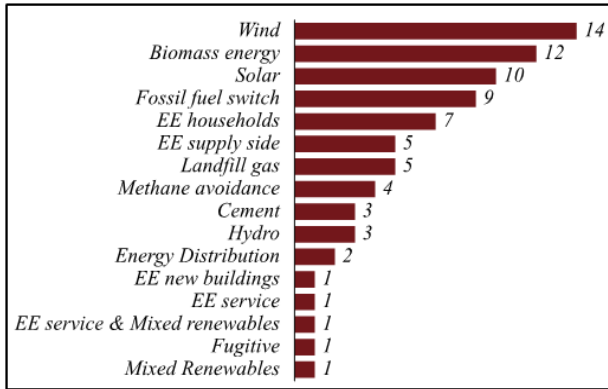


Table 2. CDM activities distribution in the Caribbean region

Figure 1: RCC CDM type of CDM projects and programmes in the Caribbean region

The type of technology is not evenly distributed in the region. For instance, there is a broader diversification of projects within the Dominican Republic, although wind and solar projects are predominant. Cook stoves are more common in Haiti, landfill gas flaring projects are only found in Cuba, Bahamas, Belize, and the Dominican Republic. More variation of project type was developed in multi-country PoAs, which provided an advantage to small-scale projects, such as energy efficiency, energy distribution and biomass energy.

Registered CDM Project Activities and PoAs

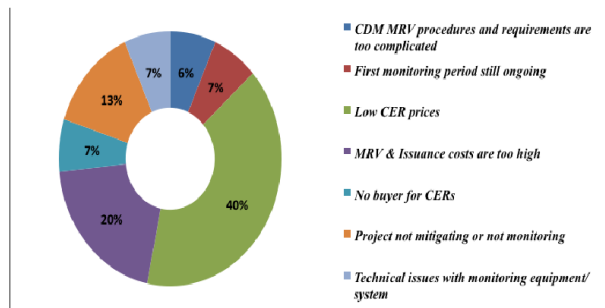
In the Caribbean, there are 21 Project Activities and four Programmes of Activity currently registered within the CDM pipeline. The survey received responses from 17 PAs and three PoAs, totaling 20 registered projects, from which nine are still active in the CDM. However, 11 demonstrated a loss of interest to continue with CDM activities. Additionally, nine projects are “Inactive (on hold)” due to several reasons, such as costs related to CDM procedures and requirements,

low CER prices, technical barriers and the political situation of the host country.

The survey received no response from five registered projects, due to out-dated contact information, or no availability of a responsible person in charge of the projects in the organization contacted.

Requested issuance of CER

Only four registered projects have requested issuance of CERs in the Caribbean region. Cuba hosts two registered projects, which had issued CERs. The other two projects are in Jamaica and in the Dominican Republic. Although the issuance had taken place in the previous years, projects are now inactive (on hold), due a political situation, equipment damaged (pipelines) and also low CER prices.



The main reason why the registered projects have not yet issued their CERs can be found in Figure 2. The low prices of CERs and the high costs imposed on measurement, reporting and verification (MRV) and issuance appeared to be the main drivers, which led to registered projects not pursuing the issuance process.

Figure 2. Reasons why projects have not yet issued CERs in the Caribbean Region.

Activities at Validation Stage

A total of 11 projects were found in Validation Terminated status. The RCC St. George’s team obtained a response from six projects. The situation described by interviewed PPs shows that some projects are Inactive (dead or non-

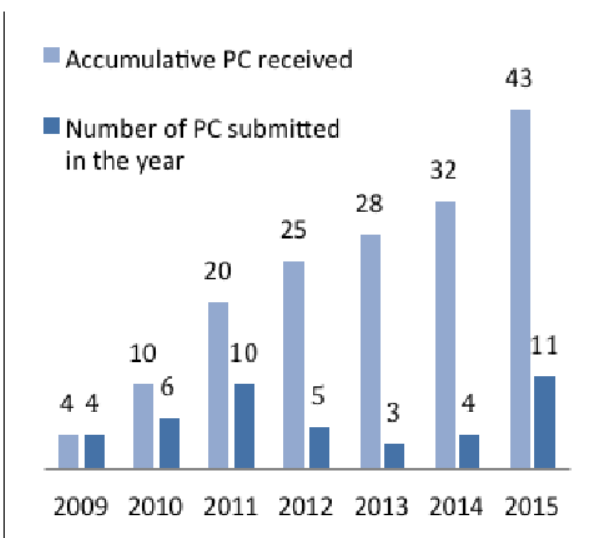
existent) with respect to the CDM. In other cases, the PP decided not to pursue the CDM status any longer due to a problem with a deviation of methodology and the CDM aspect was abandoned, or the CDM methodology was no longer valid. Five projects were difficult to contact due to out-dated telephone numbers and e-mail addresses.

Activities at Prior Consideration Stage

There are currently 40 projects at the prior consideration (PC) stage and three new prior consideration letters submitted and awaiting publication. Previously to 2012, a total of 20 PC letters were submitted. In 2012 there was a decline in PC letters submissions, as a result of CERs reduced demand and the market situation, which lowered CER prices and diminished the intention of pursuing the CDM. After the establishment of the RCC St. George's in 2013 there was an increase of 19 new PC letters, from which 11 were submitted during 2015. The graph, at Figure 3, illustrates PC letters currently available in the CDM pipeline. The RCC St. George's provided support to the three new PCs, which are "Sustainable Business Models for Rural Electrification and Energy Access" to be

implemented in Guyana; the second is the update of "Green Haiti Kit Sanitaire & Ecologique" in Haiti. And the third is "Solar Head of State Executive Residence Installations", a PoA prior consideration for Antigua and Barbuda and St. Lucia.

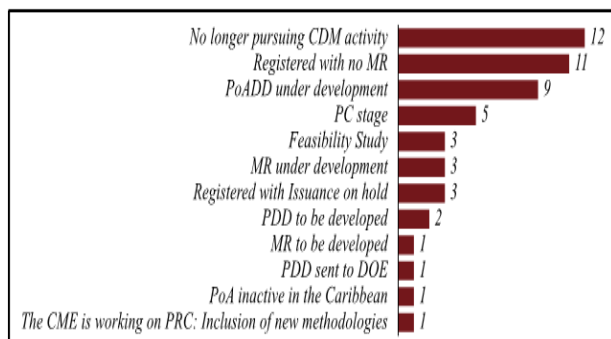
Figure 3. Prior consideration letters in the Caribbean from 2009 to 2015.



It should be noted that more than half (50.6%) of all the CDM projects and PoAs in the Caribbean are at the PC stage. 16 PC were considered to be active in CDM and were proactively contacted. RCC St. George's supported 13 projects to move from lead to PC letter stage and or supported the updating of notification of progress of prior considerations submitted more than two years ago. The majority of the projects have not yet moved to implementation. However, four PCs started the physical implementation of the projects and demonstrated interest in moving towards registration. One example is the "Caribbean Hotel Energy Efficiency and Renewable Energy Action - Advanced Programme (CHENACT-AP)" in Barbados. Seven PCs were difficult to contact. Nine PC were considered Inactive (dead or non-existent) since the PC letters were submitted before 2012, and no response was received when contacted.

CDM activity current status

The list of the CDM status in 2015 by country is in Table 3. With regard to the regional distribution of projects and the possibility to follow up on the CDM, it can be said that all the countries have the likelihood to continue with CDM. Especially, if the Multi-country PoAs and prior considerations, which includes all 16 countries in the Caribbean region are taken into account. Nevertheless, there are



inactive CDM projects found mainly in the Dominican Republic, Jamaica and Suriname. No PoA was found inactive. The current CDM activity status of the 52 project respondents is in Figure 4.

Figure 4. Current CDM activity status.

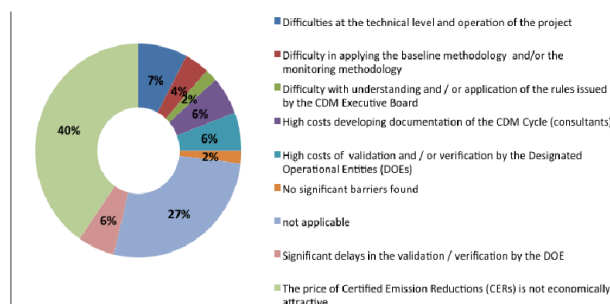
It is possible to infer from the chart, which represents answers from 52 projects, that there are 21 projects with some CDM activity. From PoAs, there are 9 developing the PoADD, and one has not yet included a CPA in the Caribbean. Five projects are stagnated in the PC stage not yet moving to the next step in the CDM cycle. 12 projects are no longer pursuing any CDM activity due to project inactivity, or the project has been operational without any CDM activity according to the PPs decision. According to this survey, 25 interviewed projects are not sure how long the current status of the CDM activity is going to continue. For instance, how long they will keep in the PC stage, in the feasibility study, or how long the project will remain without MRV or without CER issuance. 13 projects are with the MRV, PDD and/or PoADD under development, or doing the feasibility study, and other PC stage projects are willing to complete the activities and move on within 6, 12 or up to 18 months. 14 projects are willing to remain in the current CDM status up to 24 months or for an undetermined period, such as the case of registered projects with

Country	Projects with possibility to follow up on CDM			CDM inactive project	
	PA	PoA	Prior	PA	Prior
Bahamas	1	0	0	0	0
Belize	1	0	1	0	0
Cuba	3	0	0	0	0
Dominican Republic	16	2	13	7	12
Guyana	1	0	0	0	0
Haiti	0	2	3	0	0
Jamaica	2	0	2	1	1
Multi-country	0	2	7	0	0
Suriname	0	0	0	0	1
Trinidad and Tobago	0	1	0	0	0
Total	24	7	26	8	14

issuance on hold or with no MRV.

Table 4: CDM status update by country in the Caribbean region

Note: Multi-country category includes the 16 countries which RCC provides support. These countries are detailed in Table 2



Barriers within the CDM Cycle

The main barriers PPs and CMEs face to continue with the CDM cycle or impeding them to move forward in other CDM cycle stages are found in Figure 5.

Figure 5. Barriers to continuation of the CDM cycle in the Caribbean region.

Barriers such as difficulties with the rules and procedures and costs related to the CDM cycle stages, such as documentation, base line methodology, DOE validation, and operation of the projects sum all together 31% of the responses, as represented in the chart. There is a considerable portion of not applicable responses (27%), related to projects that didn't wish to conclude the implementation or are inactive (dead or non-existent) or are still stuck at the initial PC stage. It is noted that the price of CERs is a strong hindrance not only for project physical implementation but also to continue within the CDM cycle, summing up 40% of the responses. It can be said that the lower demand and the crash of CERs market prices had a negative impact in the development and continuity of projects and programmes in the Caribbean region. In spite of the unattractive CER prices, 57.7% of respondents expressed an interest in continuing with the CDM cycle, 15.4% don't know whether to continue and 26.9% are considering moving to other mechanisms and other voluntary types of markets.

Conclusion and Recommendations

The RCC St. George's direct contact through this survey has enhanced the centre's relationship with PPs and CMEs of CDM projects or programmes in the Caribbean region. The RCC St. George's was able to identify the main barriers CDM projects and

programmes have been facing. Some of the PPs or CMEs responded proactively wishing to move on within the CDM cycle. However, a lot of work still needs to be done, in order to increase the number of CDM projects and programmes moving forward through the CDM project cycle in the region.

The majority of the projects in the region interested in applying for CDM are in the energy sector. Due to the sizes of economies and population/ land availability, as well as nature of small to medium scale enterprises (sometimes individual entrepreneurs) available to invest in the projects, the majority of the projects in the Caribbean are disaggregated small and micro scale projects. Most of the projects are linked to generation of renewable energy and to a smaller extent in energy efficiency.

A significant percentage of the CDM projects is in the larger islands with relatively more diverse economies and industries like the Dominican Republic, Jamaica, and Cuba. However, it should be noted that energy independence, especially the transition to RE to reduce the dependence on fuel imports, is of critical importance to the majority of the smaller islands as much as the larger islands.

1. Access to finance

The major barrier to the implementation and operation of projects in the Caribbean is the access to capital. The current low CER prices do not make the projects economically attractive.

For some of the more advanced projects, especially in the renewable energy generation sector (mainly limited to larger projects), it is observed that due to the main revenue from sale of the energy, most of these projects have continued once they made the

commitment to start the projects, even in the absence of revenue from the CERs. Other types of projects that were not in advanced stages (mostly smaller scale projects), are struggling to start the projects due to the inability to secure sufficient finance without the CER revenue they had estimated before the collapse in the price of CERs.

At present there is little focus on any of the funding opportunities available linked to the CDM that facilitate small RE projects in the Caribbean. The major concern with most of the PPs is availability of upfront capital and a lack of buyers with a reasonable price for the Investors are discouraged to even apply for the CDM loan scheme. If the RCC St. George's is to further promote CDM projects in the Caribbean, especially within the smaller islands, it may need to determine how priority can be given to accessing finance for small scale projects in the small islands especially in the RE sector.

2. Capacity Building

It was observed that the majority of the interviewed PPs and CMEs were interested in receiving more information about the technical and procedural aspects of the CDM. Therefore further communication with the PPs and CMEs is needed to provide the necessary technical and procedural support, for the documents, for the identification of the required CDM entities, buyers, and funding opportunities, for the SD-tool, and for the dissemination of the Climate Neutral Now campaign.

3. Policy

A) Programmatic approaches: Some of the currently desegregated small projects could be developed as PoAs. One of the best examples for this is the CHENACT PoA in development. However, it is sometimes

difficult to bring together multiple private sector project developers (sometimes potential competitors) to form a partnership. It is important to understand that transaction costs however will remain relatively high as the project activities (CPA) in each country will be of a small scale so activities for obtaining LoAs inclusions and sampling costs will still remain high. Hence it may be important to look at the policy level at how there can be more simplification made to POA rules to cater to the smaller SIDs.

- B) Other policy considerations will be on:
- (i) Preferential access to financial support for CDM projects in SIDS with small RE projects,
 - (ii) Considerations for country like the Bahamas which does not qualify for some of the available capacity building support because of its GDP status
 - (iii) Simplification of validation verification sampling approaches for smaller islands
 - (iv) Considerations for regional level projects/ linking of CDM PoAs and NAMAs
 - (v) More flexibility on project validation with regards to LoA as some of the DNAs have entirely new staff or have never issued LoAs and are not familiar with the LoA process
 - (vi) Many of the PPs who had submitted the CDM Prior Consideration forms were not familiar with the two year validity period of the Prior Considerations and hence it may be helpful to see how there can be some flexibility provided in this aspect

Finally, it is important to highlight that the Caribbean region is still underrepresented within the CDM. Faced with a new climate regime based on the Paris Agreement, it is important to maintain and enhance the

relationship with the existing and potential CDM projects and programmes in the region. It is foreseeable that a higher level of capacity building will be required to prepare all stakeholders for the new sustainable development mechanism (Article 6 of the Paris Agreement), which can use the CDM legacy as a basis for future mitigation projects and programmes.

References

UNFCCC (2015). Clean Development Mechanism (CDM). United Nations Framework on Climate Change Available at: <http://cdm.unfccc.int>.

UNFCCC (2015). Adoption of the Paris Agreement. Proposal by the President. Available at: <http://unfccc.int/resource/docs/2015/cop21/eng/l09r01.pdf>

Submitted by Juliana Gellert Paris, Vintura Silva, Alexandre Gellert Paris, and Hugh Sealy

Climate Change Negotiations and Clean Development Mechanism



The Eiffel Tower during the climate change negotiations in Paris – December 2015

Dr. Hugh Sealy, Professor in the Department of Public Health and Preventive Medicine and

a WINDREF Research Fellow, is a Lead Negotiator for the Alliance of Small Island States, and was in Paris at the COP21 talks in December 2015. This is a summary of the negotiations, from his perspective:

"We did it!" The members of the Alliance of Small Island States (AOSIS), a grouping of 44 countries most vulnerable to Climate Change, sang the chorus to Bob Marley's "Three Little Birds" - "*Singing don't worry about a thing, cuz every little thing is going be alright*" in jubilation as we came together for our last meeting before leaving Paris. We shouted, we cried, we sang. What a sense of elation and relief. We had achieved our primary goals:

- A clear reference to limiting warming to 1.5 degrees and a stated objective of net zero emissions in the second half of this century,
- Recognition of loss and damage as distinct



Dr. Hugh Sealy, back row, second from left, listens to the outcomes of climate change negotiations with other delegates at COP-21 in Paris, December 2015

from adaptation, with its own institutional mechanism and funding

- Re-acknowledgment of the special circumstances of small island developing states (SIDS)
- Strengthening of our action pre-2020

Paris was a success, but by itself, the new Agreement with over 187 Nationally Determined Contributions (NDCs) will not save our islands. The NDCs, when aggregated, still

countries in the world have taken on commitments to monitor and report on their progress towards meeting their NDCs, with a review every 5 years. Paris sends a clear signal to politicians and businesses around the world: The days of fossil fuels are numbered, switch your investments to clean energy.



The Grenada delegation at COP-21 negotiations in Paris, December 2015. Front row, L to R: Ms. Martina Duncan, Senator Winston Garraway, Dr. Dessima Williams. Back row, L to R: Mr. Trevor Thompson, Ms. Roxie Hutchison, Mr. Leon Charles, Dr. Hugh Sealy,

The implementation of this ambitious agreement is our next challenge. Timely provision of the promised means of implementation (finance, technology development and transfer, and capacity building) will be crucial. To have any chance of achieving the 1.5 degree Celcius target, countries around the world will need to work much faster over the next 5 years to decarbonise our economies. Within AOSIS, I have primary responsibility for enhancing pre-2020 action globally. Therefore, my work as a lead negotiator is far from over. I would like to express my sincere gratitude to the Department of Public Health and Preventive Medicine and to St. George's University for allowing me to play a small role in our efforts to save our islands.

Submitted by Hugh Sealy

Investigation of Disease in Pre-growout Fish in a Commercial Aquaculture Operation in Ecuador

Our research into an ongoing outbreak of “syncytial hepatitis” in tilapia (SHT) in Ecuador is nearing an end, with Dr Richard Kabuus contributing to the investigation as part of his PhD programme. With the help of a collaborative arrangement between Dr. Ian Lipkin’s viral discovery group at Columbia University, New York, and several organizations in Israel, we have now identified a novel orthomyxovirus as the likely cause of the disease, and these findings have been written up and recently submitted for publication in *Veterinary Pathology* (“Syncytial hepatitis of tilapia *Oreochromis niloticus* L. is associated with orthomyxovirus-like virions”):

Abstract. Using transmission electron microscopy (TEM), reverse transcriptase PCR (RT-PCR) and *in-situ* hybridization (ISH), the presented work expands on the pathological findings of the earlier report on “syncytial hepatitis” in tilapia (SHT). TEM confirmed the presence of an orthomyxovirus-like virus within diseased hepatocytes, but not within endothelium. This was supported by observing intraendosomal, 60-100nm round virions with a trilaminar capsid containing up to 7 electron dense aggregates, enveloped and filamentous virions, clathrin coated vesicles filled with virions, and nuclear ultrastructural changes typical of orthomyxoviral replication. Patterns atypical for orthomyxovirus included the formation of syncytia and the presence of virions within perinuclear cisternae (suspected to be the Golgi apparatus). The ultrastructural morphology of the virions was similar to that previously reported for Tilapia Lake Virus (TiLV). This led us to test for genetic homology using RT-PCR and *in situ* hybridization comparing

clinically sick with clinically normal fish and negative controls. Both techniques yielded positive results: The results of RT-PCR showed that high levels of viral signal correlated positively with clinical disease, and ISH showed labelled viral product mostly in the nucleus of liver and epithelium of gastro-intestinal tract from clinically sick fish. Taken together, these findings strongly suggest that a virus is causally associated with SHT, that this virus is ultrastructurally consistent with an orthomyxovirus, and that it presents with some genetic homology with TiLV.

SHT has recently broken out in Colombia, in larger fish, and we are helping with that diagnostic investigation. This has allowed us to expand our knowledge on this disease, and to compare it with the outbreak in the Sea of Galilee in Israel. Opportunities for collaboration (and funding opportunities) with colleagues in the Veterinary School in Bogota, and the Colombian Ministry of Fisheries are being explored.

Submitted by Hugh Ferguson

East Caribbean Bee Research and Extension Center (ECBREC)

WINDREF continues to collaborate with faculty from the School of Veterinary Medicine on the East Caribbean Bee Research and Extension Centre (ECBREC) at St. George's University (SGU). The mission of the ECBREC is to improve the health and productivity of bees in Grenada and the Caribbean region by focusing research on livestock sustainability, native bees, honeybee husbandry, ecology, behavior, and conservation. The results of the ECBREC research programs are and will continue to be communicated to the public and private sector groups via targeted and multi-faceted ex-

tension efforts, thereby enhancing the sustainability of agriculture, beekeeping and native pollinators. The ECBREC provides scientific knowledge and expertise to the wider Caribbean community and is dedicated to developing knowledge in agriculture research and extension services as well as in human and natural resources. Finally, students and those in the agriculture sector can receive mentoring, training, and instruction in many areas related to honey bee and native pollinator research, thus ensuring a future generation of educators, researchers, conservationists and more. This is critical to the sustainability of the program and bee research in the wider Caribbean.

There are a number of bee research centers around the globe, including OIE Reference Labs in France and Germany, one associated with the USDA in the United States, one in South Korea, two major centers in Canada (University of Guelph and the University of Alberta), and one in Argentina. As such, Grenada presents as an ideal location for a bee research centre given its strategic geographic location and those areas needed for the development of Bee research, the importance of sustainable agriculture in the East Caribbean, and the importance of cultivating environmental stability through the study and evaluation of bees and apiculture within the Africa, Caribbean and Pacific (ACP) regions. Currently, no apiculture centers exists in the tropics. Further, few existing centers prioritize academic development, but instead focus on interpretation of research and evaluation of diagnostic materials. The vision for the ECBREC is unique in that not only will it be located in a region that provides a virgin tropical environment, but it will also endeavor to develop academic programs. As such, the ECBREC will serve as a regional center for the study of entomology

allowed for analysis of over thirty parameters within hours of sample collection. Remaining blood samples were centrifuged, separated and frozen for secondary analysis of thyroid hormone concentrations. Hematological, parasitic and endocrine analysis are currently underway at reference laboratories in the United States and Ecuador. A second trip is planned (March 2016) to collect additional samples for analysis of seasonal variations.

endemic Galapagos tortoises, and provides a basis for comparison for Galapagos tortoises around the world. This project is generously supported by Abaxis, Inc, the Morris Animal Foundation, St. George's University, WINDREF, the University of Georgia and the Eastern Texas Herpetological Society.



Adrien Zap and Jefferys Malagas take carapace measurements of a tortoise on San Cristobal island



SGU Veterinary student and recipient of the Morris Animal Foundation Veterinary Student Scholar Award, Adrien Zap, performs a physical examination of a tortoise on San Cristobal island



The research team takes a blood sample from a Galápagos Giant Tortoise



Dr. Isabelle Desprez performs an Abaxis i-STAT test on a tortoise on Isabela island

Data analysis was performed using Software R to obtain descriptive statistics, distribution, 95% reference intervals and 90% confidence intervals for each test. (Figure 2) This is the first record of health assessment in healthy,

All animal handling and sample collection was done under the direct supervision and with the assistance of the Directorate of the Galápagos National Park – the government authority in charge of wildlife care and conservation in the Galápagos. This research was

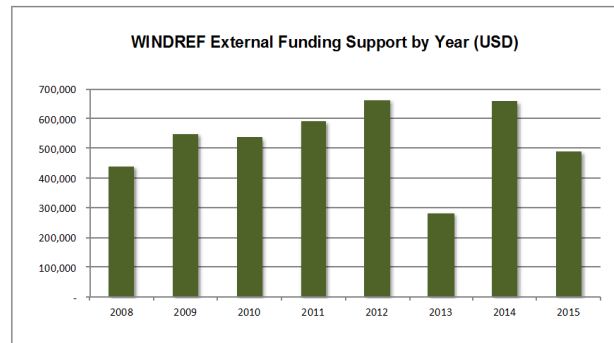
Submitted by Adrien Zap, Marie Rush and Andrés G. Ortega Ojeda

WINDREF External Grants and Funding

We thank all of the donors who have made WINDREF's work possible in 2015:

- American Veterinary Medical Association
- Bartholomew J. Lawson Foundation
- Caribbean Public Health Agency (CARPHA)
- Charles and Lisa Modica
- Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) – Integrated Climate Change Adaptation Strategies (ICCAS) Grenadapts
- Dr. Mary-Jeanne Kreek, Kreek Laboratory, Rockefeller University
- 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
- Grand Challenges Canada – Saving Brains Program
- Helen Johnston Family Foundation
- International Development Research Centre (IDRC)
- Morris Animal Foundation
- The Nature Conservancy (TNC)
- Produmar, S.A.
- St. George's University Christian Students' Association
- St. George's University, for ongoing support, including the Small Research Grant Initiative
- United Nations Framework Convention on Climate Change (UNFCCC) Secretariat – Clean Development Mechanisms Programme

- United States Fish and Wildlife Service – Division of International Affairs, through the International Fund for Animal Welfare



2015 Grant Applications

Seven research grant applications were submitted to external funding agencies in 2015. The total potential value of these grant applications was \$8,022,471 USD – a 24% increase over the total potential value of all grant applications in 2014. To date, one of these applications was funded, three were not funded, and decisions on the other three are outstanding. The grant applications are listed below (green: funded, red: not funded, black: pending).

- Zap, A. & Rush, M. (2015). Thyroid Hormone Concentrations in Galápagos Giant Tortoises – *Morris Animal Foundation*
- Sothern, M., Scribner, R., Radix, R., Noël, T., & Waechter, R. (2015). The Grenada Intervention Study: Identifying Mechanisms in Support of Sustainable Diet and Physical Activity Behaviors in Black Adolescent Females. *The National Institutes of Health*
- LaBeaud, D., Macpherson, C., King, C., Macker, H., Noël, T., & Waechter, R. (2015). Host and Viral Determinants of Chronic Chikungunya Disease in Grenada. *National Institutes of Health*.

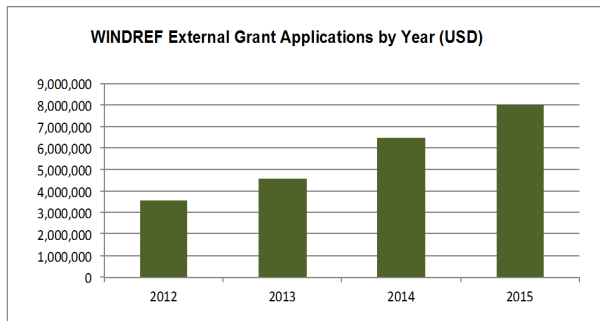
- Macpherson, C., Ganta, R., Luckhart, S., Wilkerson, M., Stone, D., Gibson, K., Butler, B., Cox Macpherson, C., Waechter, R., Simeon, D., & Olowukure, B. (2015). Vector-borne Disease Research Training in the Caribbean. *National Institutes of Health*. sends a 45% success rate over this four-year period.

Ongoing externally funded projects

There were eighteen ongoing funded projects in 2015 with a total multi-year value of almost \$2.7 million USD:

- Ragin, C., Rodrigo, S., et al. (2015). Planning for a Sustainable and Robust Regional Centre of Research Excellence in the Caribbean. *National Institutes of Health – National Cancer Institute*.
- Keku, E., Richards, C., & Chrislon Jones, V. (2015). Determination of Prostate Cancer Risk Factors in Grenada, Eastern Caribbean: A Cross-Sectional Study. *Memorial Sloan Kettering Cancer Center*.
- Sealy, H., Morrall, C., & Waechter, R. (2015). A Community-based Approach to Managing Sargassum Seaweed. *Community Disaster Risk Reduction Fund*.
- Ferguson, H. (2011-2014). Investigation of Disease in Pre-growout Fish in a Commercial Aquaculture Operation in Ecuador. *Produmar, S. A.* \$61,995
- Lawson, K. & Tyrrell, M. (2013-). Reach Within. *Bartholomew J. Lawson Foundation*. \$135,242
- Macpherson, C., Noël, T. & Bidaisee, S. (2011-). Sport for Health. *House of Lords Fundraiser and Ratner Family Fund*. \$55,000
- Ratner, E. & Macpherson, C. (2013-). Outreach Activities in South Sudan. *Multiple Donors*. \$199,000
- 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*. \$40,000
- Radix, R. (2012-2015). Grenada School Nutrition Study. *International Development Research Centre*. \$311,927

The final external research grant count for 2014 is as follows: Twenty-five applications with a total value of \$6,463,006 USD were submitted, of which 14 were successful. This represents a 56% success rate. Total external research grant funds awarded in 2014 amounted to \$773,617 USD.



Of the 44 grant applications submitted and decided on between January 2012 and December 2015, 20 were successful. This repre-

- Bonaparte, B. (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
- Sealy, H. (2013-). UNFCCC Clean Development Mechanism (CDM) Caribbean Regional Collaborating Centre (RCC) at St. George's University. *UNFCCC Secretariat Clean Development Mechanisms Programme*. \$136,505
- 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*. \$42,189
- 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*. \$270,000.
- 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)*. \$129,371.
- Kotelnikova, S., Sealy, H., Morrall, C., & Waechter (2014-). Sustainable Financing and Management of Eastern Caribbean Marine Ecosystems Project: Woburn Clarke's Court Bay Marine Protected Area Water Quality Improvement Demonstration Site Project. *The Nature Conservancy*. \$71,888.
- 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) Grenadapts* . \$9,895.
- Gibson, K. (2015). Student Chapter Student Associate AVMA Faculty Advisor Program. *American Veterinary Medical Association*. \$1,000.
- Zap, A. & Rush, M. (2015). Thyroid Hormone Concentrations in Galapagos Giant Tortoises. *Morris Animal Foundation - Veterinary Students Scholar Program*. \$5,000
- 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.

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
- 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 *Anopheles* 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

Infectious Diseases

- 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
- 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 coren-

- tyne 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)
- 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-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
- 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 Pro-

- tected 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 – Kenyon Award. \$8,862

Publications

Books and Book Chapters (0)

Journal Articles (62)

- Akobo S, Rizk E, Loukas M, Chapman JR, Oskouian RJ, Tubbs RS (2015). "The odontoid process: a comprehensive review of its anatomy, embryology, and variations". *Childs Nervous System*, 31(11):2025-34
- Akpinar-Elci M, Martin F E, Behr J G, Diaz R (2015). Saharan dust, climate variability, and asthma in Grenada, the Caribbean. *International Journal of Biometeorology*. 9 (11):1667-71
- Akpinar-Elci, M, Coomansingh, K, Blando, J, Mark, L (2015). Household bush burning practice and related respiratory symptoms in Grenada, the Caribbean. *Journal of Air & Waste Management Association*. 2015 Sep ; 6 5 (9) : 1 1 4 8 - 5 2 . doi : 10.1080/10962247.2015.1070773.
- Amaral-Zettler, LA, Zettler, ER, Slikas, B, Boyd, GD, Melvin, DW, Morrall, CE, Proskowski, G, and Mincer, TJ (2015). The biogeography of the Plastisphere: implications for policy. *Front Ecol Environ* 2015; 13(10): 541–546, doi:10.1890/150017
- Bernard S, Loukas M, Rizk E, Oskouian RJ, Delashaw J, Tubbs RS (2015). The human occipital bone: review and update on its embryology and molecular developments.

- Childs Nervous System, 31(12):2217-23
- Bidaisee, S., Quereshi, A., Dookeeram, D. (2015). Animals as sentinels of environmental hazards to humans: case of hardware diseases in Grenada. *Caribbean Medical Journal*; 77:S(2)1.
- Bosmia AM, Hogan E, Loukas M, Tubbs RS, Cohen-Gadol AA (2015). Blood supply to the human spinal cord: part I. Anatomy and hemodynamics. *Clinical Anatomy*, 28(1):52-64
- Bosmia AM, Tubbs RS, Hogan E, Bohnstedt BN, Denardo AJ, Loukas M, Cohen-Gadol AA (2015). Bloody supply to the human spinal cord: part II. Imaging and pathology. *Clinical Anatomy*, 28(1):65-74
- Bosmia AN, Tubbs RS, Hogan E, Bohnstedt BN, Denardo AJ, Loukas M, Cohen-Gadol AA (2015). Blood Supply to the human spinal cord. II. Imaging and pathology *Clinical Anatomy*, 28(1):65-74
- Brown M, Chikweto A, Sharma R (2015). A retrospective study of tumors in nasal and paranasal regions of dogs in Grenada, West Indies. *J Anim Res.* 5(3): 403-406.
- Butt AM, Gill C, Demerdash A, Watanabe K, Loukas M, Rozzelle CJ, Tubbs RS (2015). A comprehensive review of the sub-axial ligaments of the vertebral column: part II histology and embryology. *Childs Nervous System*, 31(7):1061-6
- Butt AM, Gill C, Demerdash A, Watanabe K, Loukas M, Rozzelle CJ, Tubbs RS (2015). A comprehensive review of the sub-axial ligaments of the vertebral column: part I anatomy and function. *Childs Nervous System*, 31(7):1037-59
- Cesmebasi A, Baker A, Du Plessis M, Matusz P, Tubbs RS, Loukas M (2015). The surgical anatomy of the inguinal lymphatics. *American Journal of Surgery*, 81(4):365-9
- Cesmebasi A, John A, Etienne D, Shane Tubbs R, Loukas M (2015). Heinrich Obersteiner and his contributions. *Clinical Anatomy*, 28(1):5-11
- Cesmebasi A, Loukas M, Hogan E, Kralovic S, Tubbs RS, Cohen-Gadol AA (2015). The Chiari malformations: a review with emphasis on anatomical traits. *Clinical Anatomy*, 28(2):184-94
- Cesmebasi A, Melafant J, Patel SD, Du Plessis M, Renna S, Tubbs RS, Loukas M (2015). The surgical anatomy of the lymphatic system of the pancreas. *Clinical Anatomy*, 28(4):527-37
- Cesmebasi A, Muhleman MA, Hulsberg P, Gielecki J, Matusz P, Tubbs RS, Loukas M (2015). Occipital neuralgia: anatomic considerations. *Clinical Anatomy*, 28(1):101-8
- Cesmebasi A, Yadav A, Gielecki J, Tubbs RS, Loukas M (2015). Genitofemoral neuralgia: a review. *Clinical Anatomy*, 28(1):128-35
- Chotai PN, Loukas M, Tubbs RS (2015). Unusual origin of the levator scapulae muscle from mastoid process. *Surgical and Radiologic Anatomy*, 37(10):1277-81
- Coomansingh CM, Yabsley M, Wagner N, Pinckney R, Bhaiyat MI, Chikweto A, Macpherson C, Fields P (2015). Meta-analysis of the prevalence of *Dirofilaria immitis* in dogs from Grenada, West Indies. *Int J Vet Med. Res. And reports.* Vol. 2015 article ID 429690, 8 pages. DOI: 10.5171/2015.429690.
- Du Plessis M, Ramai D, Shah S, Holland JD, Tubbs RS, Loukas M (2015). The clinical anatomy of the musculotendinous part of the diaphragm. *Surgical and Radiologic Anatomy*, 37(9):1013-20
- Forde, M.S., Dewailly, E. (2015). What Is in the Caribbean Baby? Assessing Prenatal Exposures and Potential Health Outcomes to Environmental Contaminants in 10 Caribbean Countries. *West Indian Med J.* 2015

- Jan;64(1):23-8. doi: 10.7727/wimj.2015.112. Epub 2015 Apr 28.
- Forde MS, Mitchell L (2015). Trends in reported occupational injury claims for Grenada and Dominica. *West Indian Medical Journal*. 2015, 1-75.
- Forde MS, Robertson L, Laouan Sidi E A, Côté S, Gaudreau E, Drescher O, Ayotte P (2015). Evaluation of exposure to organophosphate, carbamate, phenoxy acid, and chlorophenol pesticides in pregnant women from 10 Caribbean countries. *Environ Sci Process Impacts*. 17(9):1661-71.
- Griessenauer CJ, Yalcin B, Matusz P, Loukas M, Kulwin CG, Tubbs RS, Gadol AA. (2015). Analysis of the tortuosity of the internal carotid artery in the cavernous sinus. *Childs Nervous System*, 31(6):941-4
- Griessenauer CJ, Raborn J, Foreman P, Shoja MM, Loukas M, Tubbs RS (2015). "Venous drainage of the spine and spinal cord: a comprehensive review of its history, embryology, anatomy, physiology, and pathology". *Clinical Anatomy*, 28(1):75-87
- Haffner MJ, Oakes P, Demerdash A, Yammine KC, Watanabe K, Loukas M, Tubbs RS (2015). Formaldehyde exposure and its effects during pregnancy: recommendations for laboratory attendance based on available data. *Clinical Anatomy*, 28(8):972-9
- Hayat M, Hill M, Kelly D, Tubbs RS, Loukas M (2015). A very unusual complication of amniocentesis. *Clinical Case Reports*, 3(6):345-8
- Ivashchuk G, Loukas M, Blount JP, Tubbs RS, Oakes WJ(2015). Chiari III malformation: a comprehensive review of this enigmatic anomaly. *Childs Nervous System*, 31(11):2035-40
- Kimball D, Kimball H, Matusz P, Tubbs RS, Loukas M, Cohen-Gadol AA (2015). Ossification of the posterior petroclinoid dural fold: a cadaveric study with neurosurgical significance. *Journal of Neurological Surgery. Part B, Skull Base*", 76(4):272-7
- Kimball D, Kimball H, Shane Tubbs R, Loukas M (2015). Variant middle meningeal artery origin from the ophthalmic artery: a case report. *Surgical Radiologic Anatomy*, 37:105–108
- Kimball D, Ples H, Kimball H, Miclaus GD, Matusz P, Loukas M (2015). Fusiform aneurysm of a persistent trigeminal artery associated with rare intracranial arterial variations and subarachnoid hemorrhage. *Surgical and Radiologic Anatomy*, 37(1):115-8. doi: 10.1007/s00276-014-1304-8.
- Kimball D, Ples H, Miclaus GD, Matusz P, Loukas M (2015). Persistent hypoglossal artery aneurysm located in the hypoglossal canal with associated subarachnoid hemorrhage. *Surgical Radiologic Anatomy*, 37(2):205-9. doi: 10.1007/s00276-014-1285-7.
- Larner SP, Mcquone B, Schober JM, Loukas M, Terrell M (2015). Perceptions of the living dead: an assessment of knowledge and opinions about whole body donation and its process and willingness to become cadaveric donors in Pennsylvania. *Clinical Anatomy*, 28(4):442-8
- Loukas M (2015). Translational Research in Anatomy: The Future of our Discipline. *Translational Research in Anatomy*. 2015, December pp.1 doi:10.1016/j.tria.2015.10.004
- Loukas M, Du Plessis M, Louis RG Jr, Tubbs RS, Wartmann CT, Apaydin N (2015).The subdiaphragmatic part of the phrenic nerve - morphometry and connections to the autonomic ganglia. *Clinical Anatomy*, 29(1):120-8.
- Loukas M, Germain AS, Gabriel A, John A, Tubbs RS, Spicer D (2015). Coronary artery fistula: a review. *Cardiovascular Pathology*,

- 24(3):141-8
- Loukas M, Tubbs RS, Louis RG Jr, Apaydin N, Bartczak A, Vefali H, Alsaiegh N, Fudalej M (2015). Erratum to: an endoscopic and anatomical approach to the septal papillary muscle of the conus. *Surgical and Radiologic Anatomy*, 37(5):569
- Macpherson CC, Akpınar-Elci M (2015). Caribbean heat threatens health, well-being, and the future of humanity. *Public Health Ethics*. 2015. Vol: 1-13. doi:10.1093/phe/phv008
- Marasa L, Tubbs I, Loukas M, Tubbs RS (2015). Neurosurgical contributions of Samuel D Gross. *Acta Medico-Historica Adriatica*, 13(1):105-12
- Matusz P, MİCLĂUŞ GD, Banciu CD, Sas I, Joseph SC, Pirtea LC, Tubbs RS, Loukas M (2015). Congenital solitary kidney with multiple renal arteries: case report using MDCT angiography. *Romanian Journal of Morphology and Embryology*, 56(2):823-6
- Matusz P, MİCLĂUŞ GD, Gabriel A, Cătereniuc I, Olariu S, Tubbs RS, Loukas M (2015). Single ectopic thoracic renal artery associated with a normal kidney position and renal artery stenosis: a case report and review of literature. *Romanian Journal of Morphology and Embryology*, 56(2):557-62
- Miclaus GD, Pupca G, Gabriel A, "Matusz P, ", Loukas M (2015). Right lump kidney with varied vasculature and urinary system revealed by multidetector computed tomographic (MDCT) angiography. *Surgical Radiologic Anatomy*, 37(7):859-65. doi: 10.1007/s00276-014-1390-7
- PLEŞ H, Kimball D, MİCLĂUŞ GD, Iacob N, Kimball H, Matusz P, Tubbs RS, Loukas M (2015). Fenestration of the middle cerebral artery in a patient who presented with transient ischemic attack. *Romanian Journal of Morphology and Embryology*, 56(2):861-5
- PLEŞ H, Loukas M, Iacob N, Andall NR, MİCLĂUŞ GD, Tubbs RS, Matusz P. (2015). Duplication of the distal end of the left vertebral artery with fenestration of the right posterior cerebral artery. *Romanian Journal of Morphology and Embryology*, 56(2):575-7
- Raeburn K, Burns D, Hage R, Tubbs RS, Loukas M (2015). Cross-sectional sonographic assessment of the posterior interosseous nerve. *Surgical and Radiologic Anatomy*, 37(10):1155-60
- Shoja MM, Tubbs RS, Bosmia AN, Fakhree MA, Jouyban A, Balch MW, Loukas M, Khodadoust K, Khalili M, Eknoyan G (2015). Herbal diuretics in medieval Persian and Arabic medicine. *Journal of Alternative and Complementary Medicine*, 21(6):309-20
- Tubbs RI, Barton JC III, Watson CC, Kollias T, Ward RJ, Loukas M, Barbaro NM, Cohen-Gadol AA. A novel method for sciatic nerve decompression: Cadaveric feasibility study with potential application to patients with piriformis syndrome. *Translational Research in Anatomy*. (2015) 40e-43 doi:10.1016/j.tria.2015.10.006
- Tubbs RS, Blouir MC, Singh R, Lachman N, D'Antoni AV, Loukas M, Hattab E, Oskouian RJ (2015). Relationship between regional atherosclerosis and adjacent spinal cord histology. *Cureus*, 7(9):e329.
- Tubbs RS, Bosmia AN, Gupta T, Chawla K, Loukas M, Sahni D, Cohen-Gadol AA (2015). The enigmatic psalterium: a review and anatomic study with relevance to callosotomy procedures. *Neurosurgery*, 11(2):322-8
- Tubbs RS, Griessenauer CJ, Bilal M, Raborn J, Loukas M, Cohen-Gadol AA (2015). Dural septation of the inner surface of the jugular foramen: an anatomical study.

- "Journal of Neurological Surgery. Part B, Skull Base", 76(3):214-7
- Tubbs RS, Griessenauer CJ, Hendrix P, Oakes P, Loukas M, Chern JJ, Rozzelle CJ, Oakes WJ (2015). Relationship between pharyngitis and peri-odontoid pannus: a new etiology for some Chiari I malformations? *Clinical Anatomy*, 28(5):602-7
- Tubbs RS, Lobashevsky A, Oakes P, D'Antoni AV, Hattab E, Topp K, Loukas M, Spinner R (2015). Meningeal relationships to the spinal nerves and rootlets: a gross histological and radiological study with application to intradural extramedullary spinal tumors. *Childs Nervous System*, 31(5):675-81
- Tubbs RS, Loukas M, Barbaro NM, Cohen-Gadol AA (2015). Superficial cortical landmarks for localization of the hippocampus: application for temporal lobectomy and amygdalohippocampectomy. *Surgical Neurology International*, 6:16
- Tubbs RS, Sharma A, Loukas M, Cohen-Gadol AA (2015). External cortical landmarks and measurements for the temporal horn: anatomic study with application to surgery of the temporal lobe. *Surgical Neurology International*, 6:17
- Tubbs RS, Shoja M M, Aggarwal A, Gupta T, Loukas M, Sahni D, Ansari SF, Cohen-Gadol AA. Choroid plexus of the fourth ventricle: Review and anatomic study highlighting anatomical variations. *Journal of Clinical Neuroscience*. 2015, pii: S0967-5868(15)00530-5
- Tubbs RS, Tubbs I, Loukas M, Cohen-Gadol AA (2015). Ventriculoiliac shunt: a cadaveric feasibility study *Journal of Neurosurgery. Pediatrics*, 15(3):310-2. doi: 10.3171/2014.10.PEDS14252
- Tubbs RS, Tubbs I, Loukas M, Oakes WJ (2015). Alexander Monro Tertius and his works on hydrocephalus. *Child's Nervous System*, 31(3):351-3. doi: 10.1007/s00381-014-2466-8
- Tubbs RS, Walker AM, Demerdash A, Matusz P, Loukas M, Cohen-Gadol AA (2015). Skull base connections between the middle meningeal and internal carotid arteries. *Childs Nervous System*, 31(9):1515-20
- Veith P, Watanabe K, Shoja MM, Blaak C, Loukas M, Tubbs RS (2015). Humphrey Ridley (1653-1708): forgotten neuroanatomist and neurophysiologist. *Clinical Anatomy*, 28(1):12-5
- Waechter R, (2015). Sexual Violence in America: Public Funding and Social Priority. *American Journal of Public Health*, 105(12): 2430-2437
- Wooten C, Doros C, Miclaus GD, Matusz P, Loukas M (2015). A case of bilateral tracheal bronchus: report of a rare association in multidetector computed tomography bronchoscopy. *Surgical Radiologic Anatomy*, 37(6):693-696

Abstracts/Presentations at International Conferences

Oral Presentations (20)

- Bidaisee, S. (2015). 3rd International Conference on Global Health, held at Colombo, Sri Lanka. December 10 - 11, 2015
- Charles, R. (2015). Academy of International Business, Southeast USA Chapter Annual Meeting: International Trade, Supply Chains, and Emerging Markets, held in USA. November 12 - 14, 2015
- Compton, S., Forde, M. (2015). Assessment of Grenadian coastal recreational water quality. *West Indian Medical Journal, Supplement*, Vol. 64 (Suppl 2) 1-107, June 2015. ISSN 0043-3144 WIMJAD.
- Fakoya, F. (2015). 55th Annual Meeting of the Teratology Society, held in Canada. June 27 - July 1, 2015
- Farmer, K. (2015). American Society for Microbiology, held in USA. May 8-11, 2015

- Forde, M. (2015). American Public Health Association (APHA) 143rd Annual Meeting and Expo, held in Chicago, IL, US. October 31 - November 4, 2015
- Kotelnikova, S, John D, Joseph A, Mc Ewen A, Stanislaus A, Smart W, Yasko T, Naraine R (2015). Genomic evidence for s-layer in extremely acidophilic archaeum ferropasma acidarmanus fer1 fems. 2015 Federation of European Microbiology Society Conference, held in Netherlands. June 7-11
- LaBeaud, A.D., Noel, T.P., Jungkind, D., Yearwood, K., Fields, P.J., Mitchell, G., Widjaja, S., Simmons, M., Noel, D., Bidaisee, S., Myers, T.E., Macpherson, C.N.L. (2015). Chikungunya Fever in the Caribbean: Clinical Findings From Grenada. American Society of Tropical Medicine and Hygiene, October 25-29, 2015, Philadelphia, USA.
- Lambert, M., (2015) Global Medical Education: Towards the Free and Safe Movement of Physicians. Association for Medical Education in Europe Annual Conference, September 5-9, 2015, Glasgow, UK.
- Landon, B. & Waechter, R. (2015). The Saving Brains Grenada Project. Grand Challenges Canada Meeting. Beijing, China, October 2015.
- Macpherson CC (2015). Challenges in Public Health Policy and Governance: The Example of Caribbean Climate Change. CC Macpherson & M Akpinar-Elci. ASBH, Oct 22-25, 2015. Houston.
- Macpherson, CNL (2015). Vector Borne Diseases in the Caribbean: Research Directions and Funding Opportunities. Regional workshop to develop a network on surveillance and diagnosis of emerging vector-borne diseases in the Caribbean. December 8th-11th, Trinidad
- Martin, T, Waechter, R & Landon, B (2015). Saving Brains Grenada. Children: A Resource Most Precious Conference. August 2015. Perth, Western Australia.
- McKain, S. (2015). 14th International Dengue Course, held in Cuba. August 10-21, 2015
- McKain, S. (2015). ASTMH 64th Annual Meeting, held in Philadelphia, Pennsylvania USA. October 25-29, 2015
- Morrall, C. (2015). Gulf and Caribbean Fisheries Institute (GCFI), held in Panama. November 9 - 14, 2015.
- Radix, R., Andall, R., Andall, N., Radix, C., Frank, R., Benjamin, J., James, J., Benjamin, R., Noel, T.P., Leonardi, C., Chi, L., Sothern, M., Scribner, R. (2015). Overweight and obesity among Grenadian adolescents: Rural and urban differences in social determinants. Caribbean Public Health Agency (CARPHA) Health Research Conference, June 25-27, Grenada.
- Solomon, N. (2015). Short Course on Ultrasound in Infectious Diseases and Tropical Medicine, held in Italy. February 2 - 6
- Waechter, R., Angus-Yamada, C., Ma, V., & Wekerle, C. (2015). The Ethics of Child Maltreatment Research: Assessing Trauma Symptoms and Study Impact. International Society for Traumatic Stress Studies 31st Annual Meeting, held in New Orleans, USA. November 5 - 7, 2015.
- Waechter, R. (2015). The Role of Learning Institutions and Academia in Health Equity and Social Determinants of Health. Presented in Panel Format at the International Conference on Health Equity, Social Determinants, and Health in all Policies, held in Paramaribo, Suriname, October 2015.

Poster Presentations (29)

- Bahadoor-Yetman, A., Riley, L., Gibbons, A., Fields, P.J., Mapp-Alexander, V., Hage, R. and Baldwin, A. (2015). Analysis of cancer prevalence among women in Grenada. West Indian Medical Journal, Supplement,

- Vol. 64 (Suppl 2) 1-107, June 2015. ISSN 0043-3144 WIMJAD.
- Bidaisee, S., Macpherson, C.N.L. (2015). A Ten Year Retrospective Analysis of Motor Vehicle Accidents in Grenada. West Indian Medical Journal, Supplement, Vol. 64 (Suppl 2) 1-107, June 2015. ISSN 0043-3144 WIMJAD.
- Bidaisee, S., Macpherson, C.N.L. (2015). An Evaluation of the Burden of Diabetes in Grenada. West Indian Medical Journal, Supplement, Vol. 64 (Suppl 2) 1-107, June 2015. ISSN 0043-3144 WIMJAD.
- Bidaisee, S., Macpherson, C.N.L. (2015). Impact of Dropping out of the Sports for Health Programme in Grenada. West Indian Medical Journal, Supplement, Vol. 64 (Suppl 2) 1-107, June 2015. ISSN 0043-3144 WIMJAD.
- Bukkuri A, Nithisoontorn S, Mathur-Fairfield A, McEwen A, Naraine R, and Kotelnikova S (2015). Lateral gene transfer of transposases and integrases in *Ferroplasma acidarmanus*. 13th Symposium on Bacterial Genetics and Ecology (BAGECO) Milan (Italy) 14 - 18 June, 2015. DOI: 10.13140/RG.2.1.1932.3360
- Choong N, Vikram N, Khvostova, O, Mark S, Lloyd T, Naraine R and Kotelnikova S (2015). Characterization of oxidative tricarboxylic acids cycle (TCA) in the acidophilic Euarthaeum *Ferroplasma acidarmanus fer1*. Prokaryogenomics Göttingen, September, 29 - October, 2, 2015. DOI: 10.13140/RG.2.1.1670.1921
- Farmer K, James A, Sylvester W, Amadi V, Dolphin G, Kotelnikova S (2015). Genetic diversity and antibiotic resistance of clinical and non-clinical isolates of *Escherichia coli* in Grenada. 3rd International Symposium on the Environmental Dimension of Antibiotic Resistance (EDAR-3), Wernigerode, Germany, May 17 - 21, 2015, abstract and poster presentation.
- Farmer K, James A, Sylvester W, Amadi V, Dolphin G, Kotelnikova S (2015). Antibiotic Resistance patterns of Uropathogenic *Escherichia coli* compared to strains isolated from tropical freshwater, seawater and Iguana iguana in Grenada. CARPHA, June, 20, 2015, Grenada, abstract and poster.
- Farmer K, Naraine R, James A, Boudakov I, Amadi V, Sylvester W, Dolphin-Bond G and Kotelnikova S (2015). Diversity and Antibiotic Resistance of Clinical and Non-clinical Isolates of *Escherichia coli* in Grenada. FEMS 2015, Maastricht, NL, June 7-11, 2015, abstract and poster presentation
- Farmer K, Naraine R, Khvostova E, Boudakov I, Amadi V, Sylvester W, Dolphin-Bond G, Kotelnikova S (2015). Genetic Diversity and Relatedness of Uropathogenic *Escherichia coli* with Non-clinical Isolates in Grenada. CARPHA, June, 20, 2015, Grenada, abstract and poster
- Forde, M., Mitchell, L. (2015). Trends in reported occupational injury claims for Grenada and Dominica, 60th Diamond Jubilee (1956-2015) Caribbean Public Health Agency (CARPHA) Health Research Conference, June 25-27, 2015, Grenada. West Indian Medical Journal Supplement, Vol.64 (Suppl 2) ISSN 0043-3144 WIMJAD.
- Jungkind, D. (2015). The Impact of the 2014 Chikungunya Outbreak in Grenada: Lessons Learned. West Indian Medical Journal, Supplement, Vol. 64 (Suppl 2) 1-107, June 2015. ISSN 0043-3144 WIMJAD.
- Jungkind, D., Myers, T.E., Simmons, M., Macpherson, C.N.L., Noël, T., Lambert, G., Dolphin, G., Widjaja, S., Mitchell, G. and Noel, D. (2015). Establishment of Laboratory Testing Capability for Chikungunya Virus In Grenada, West Indies. West Indian Medical Journal, Supplement, Vol. 64 (Suppl 2) 1-107, June 2015. ISSN 0043-

- 3144 WIMJAD.
- Jungkind, K., Yearwood, K., Mitchell, G., David-Antoine, A., Macpherson, C.N.L., Noël, T.P., Jungkind, D. (2015). The Impact of the 2014 Chikungunya Outbreak in Grenada: Lessons Learned. *West Indian Medical Journal, Supplement, Vol. 64 (Suppl 2) 1-107, June 2015. ISSN 0043-3144 WIMJAD.*
- LaBeaud, A.D., Heath, C.J., Noël, T.P., Jungkind, D., Mitchell, G., Yearwood, K., Noel, D., King, C.H., Macpherson, C.N.L. (2015). Chikungunya in the Western Hemisphere: A review of the 2014 epidemic, the potential long-term impact, and research opportunities. *West Indian Medical Journal, Supplement, Vol. 64 (Suppl 2) 1-107, June 2015. ISSN 0043-3144 WIMJAD.*
- Macpherson, C.C. and Akpinar-Elci, M. (2015). Health Impacts of Climate Change in the Caribbean. *West Indian Medical Journal, Supplement, Vol. 64 (Suppl 2) 1-107, June 2015. ISSN 0043-3144 WIMJAD.*
- Macpherson, C.C., Noël, T. , Jungkind, D., Yearwood, K., Fields, P., Simmons, M., Widjaja, S., Mitchell, G., Noel, D., Bidaisee, S. , LaBeaud, D., King, C., Myers, T.E. (2015) . Clinical, molecular and serological outcomes of the Chikungunya outbreak in Grenada. *West Indian Medical Journal, Supplement, Vol. 64 (Suppl 2) 1-107, June 2015. ISSN 0043-3144 WIMJAD.*
- Macpherson, C.N.L., McBarnette, B., Andall, N., Andall,R., Fields, P.J., Noël, T. P. (2015). A retrospective case series study of the seroprevalence of Human T Lymphocyte Virus 1 and 2 from the General hospital Laboratory in Grenada. *West Indian Medical Journal, Supplement, Vol. 64 (Suppl 2) 1-107, June 2015. ISSN 0043-3144 WIMJAD.*
- Macpherson, C.N.L., Noel, T.P., Jungkind, D., Yearwood, K., Fields, P.J., Simmons, M., Widjaja, S., Mitchell, G., Noel, D., Bidaisee, S., LaBeaud, D., King, C., Myers, T.E. (2015). Clinical, molecular and serological outcomes of the Chikungunya outbreak in Grenada. *West Indian Medical Journal, Supplement, Vol. 64 (Suppl 2) 6, June 2015. ISSN 0043-3144 WIMJAD.*
- Matthew M & Kotelnikova S (2015). Presence of non-coliform bacteria in potable water in the tropics. *CARPHA, June, 20, 2015, Grenada, abstract and poster.*
- McKain, S., King, K., High, D., Lambert, G., Naraine, R., Fields, P., Baldwin, A. (2015). The Prevalence of Dengue in Grenada: A Five Year Retrospective Study. *West Indian Medical Journal, Supplement, Vol. 64 (Suppl 2) 1-107, June 2015. ISSN 0043-3144 WIMJAD.*
- Nagaradona, C., Forde, M. (2015). Grenadian Doctors' Perceptions on Abortion. *West Indian Medical Journal, Supplement, Vol. 64 (Suppl 2) 1-107, June 2015. ISSN 0043-3144 WIMJAD.*
- Naraine R, Joseph A, Khvostova O, McEwen A, Yeates S and Kotelnikova S (2015). Characterization of CRISPR-Cas Operons and spacer elements in the acidophile, *Ferroplasma acidarmanus fer1*. Genomic VEME workshop, Trinidad, August, 3 2015 DOI: 10.13140/RG.2.1.3243.0564
- Noël, T.P., David, K., Fields, P.J., Macpherson, C.N.L. (2015). Attitude, Behavior and Practice of primary school students with regard to soil transmitted helminths in Grenada. *West Indian Medical Journal, Supplement, Vol. 64 (Suppl 2) 1-107, June 2015. ISSN 0043-3144 WIMJAD.*
- Noël, T.P., Radix, C., Fields, P.J., Rayner, J., Macpherson, C.N.L. (2015). Short and long term knowledge of the transmission and prevention of soil transmitted helminths in primary schoolchildren assessed using Turning Point Technologies. *West Indian Medical Journal, Supplement, Vol. 64*

(Suppl 2) 1-107, June 2015. ISSN 0043-3144 WIMJAD.

Noël, T.P., Radix, C., Pinckney, R., Coomansingh, C., Fields, P.J., Macpherson, C.N.L. (2015). The current prevalence and potential elimination of the soil transmitted helminth's from Grenada. *West Indian Medical Journal, Supplement, Vol. 64 (Suppl 2) 1-107, June 2015. ISSN 0043-3144 WIMJAD*

Radix, R., Benjamin, R., Andall, R., Andall, N., Radix, C., Frank, R., Benjamin, J., James, J., Noel, T.P., Mohler, M., Broyles, S., Leonard, C., Chi, L., Simonsen, N., Sothern, M., Scribner, R. (2015). Individual and school-level influences on moderate and vigorous physical activity in Grenada adolescents. *Caribbean Public Health Agency (CARPHA) Health Research Conference, June 25-27, Grenada.*

Rouchou, B., Forde, M. (2015). Infertility knowledge, attitudes, and beliefs of college students in Grenada. *West Indian Medical Journal, Supplement, Vol. 64 (Suppl 2) 1-107, June 2015. ISSN 0043-3144 WIMJAD.*

Waechter, R. & Ma, V. (2015). Gender-based Violence: Don't Ask, Don't Tell, Don't Care. *West Indian Medical Journal, Supplement, Vol. 64 (Suppl 2) 1-107, June 2015. ISSN 0043-3144 WIMJAD.*

Reviews of Journals and Boards

Thesis Defenses (3)

Ashleigh McLeish, MSc: "Zoonotic bacteria of the order Rickettsiales in tissues and ectoparasites of the small Indian mongoose (*Herpestes auropunctatus*) in Grenada, West Indies" 18 February 2015

Melissa Brown, MSc: "Dog nasal and paranasal neoplasms in Grenada" 4 May 2015

Lucian Telesford, DVM, MSc: "The potential for scombroid poisoning from ingestion of *Selar crumenophthalmus* (jacks), due to increased histamine levels in St. George's, Grenada" 27 November 2015

Graduate Seminars (33)

Jerome Kurent, MD, MPH and Gerard Corcoran, FRCS: "Cases in Neurology and Palliative Medicine: North American and British Approaches" 14 January 2015

Richard Kabusuu, DVM, MPH, PhD Student: "Epidemiological, histopathological, hematological, ultrastructural and molecular investigation of an outbreak of syncytial hepatitis in farmed tilapia" 28 January 2015

Becky Bailey, PhD: "Bioethics and neurodevelopment" 4 February 2015

Gerard Corcoran, FRCS: "Palliative Care & Opioid Availability Project: Implementing a Public Health Model for Palliative Care Development" 11 February 2015

Bruce R. Korf, MD, PhD: "Integration of Genomics into Medical Practice" 25 February 2015

Peter Slinger, PhD: "DES Student Facilitation: Evaluating Small Group Reviews" 12 March 2015

Richard Addante, PhD: "The unconscious hippocampus: how electrophysiological studies of hypoxic-amnesia patients have shed new light on the neurobiological substrates of memory" 20 March 2015

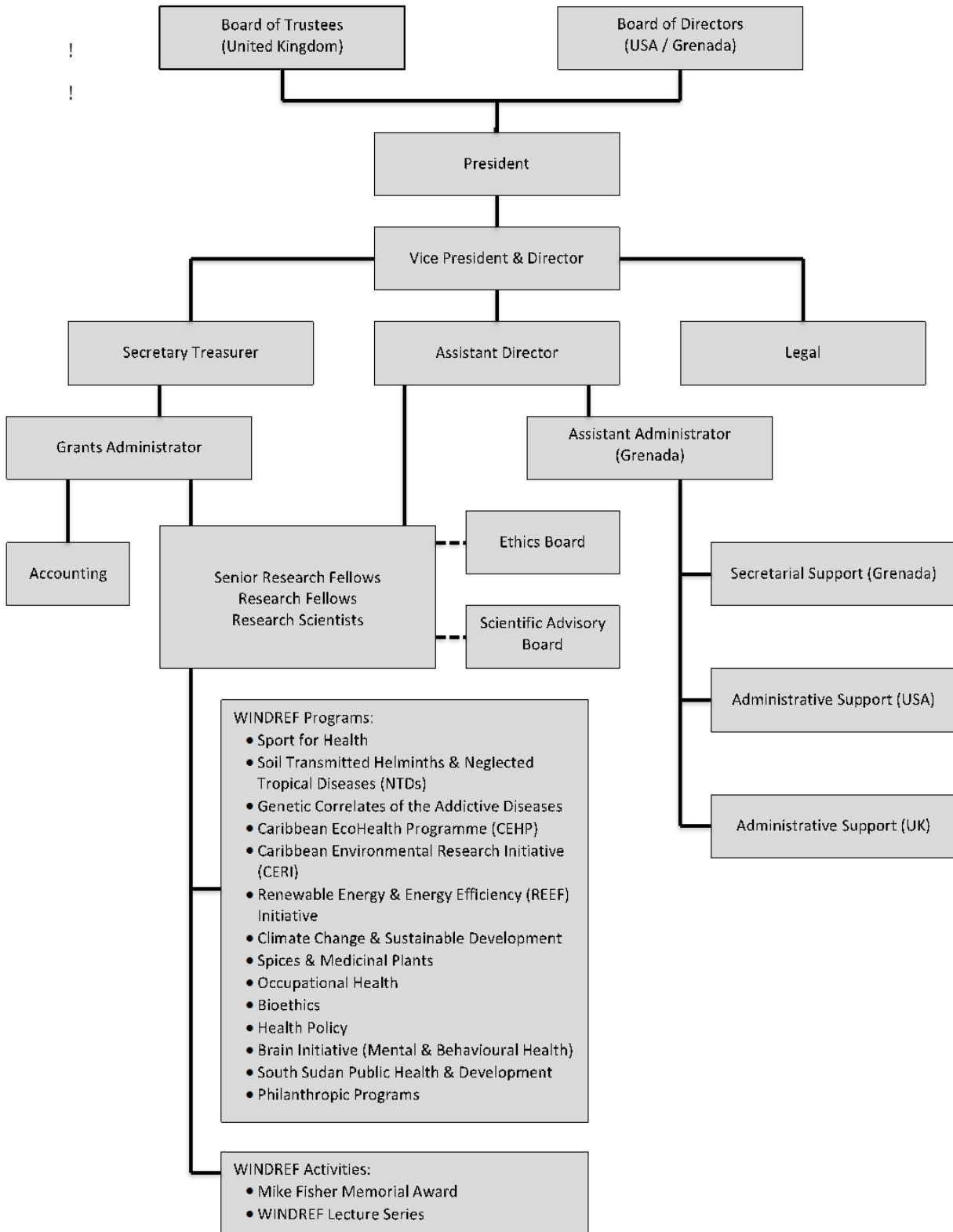
Oliver Benoit, PhD: "Ressentiment and the Emergence of Political Culture in Grenada" 1 April 2015

Tar Ching-Aw, MBBS, MSc, Ph.D., FFOM, FRCP, FPPHM: "Occupational Health Priorities in Developing Countries" 8 April 2015

Ruth Macklin, PhD: "Ethical Challenges in Implementation Research" 15 April 2015

- Kristy Fisher, MD/MSc student: "The Influence of *T. gondii* and *T. canis* on human behavior" 27 April 2015
- Wendy Romain, MSc: "Juveniles, The Law and Recidivism" 29 April 2015
- Reccia Charles, PhD: "Caribbean Liming: building social capital" 8 May 2015
- Michelle Fernandes, MB BS: "The INTER-GROWTH - 21st Neurodevelopment Assessment" 13 May 2015
- Scott Nichols, DVM, MSc: "Human and Animal Interactions" 24 June 2015
- Sandeep Pulim, MD, MSc: "Cognitive Computing at the Point of care" 21 August 2015
- Hugh Montgomery, MB BS, BSc, FRCP, MD, FRGS, FRI, FFICM: "A Febrile Planet" 26 August 2015
- Hugh Sealy, Ph.D., M.Sc., B.Eng. (Chem.): "What can Small Islands expect from a Climate Change Agreement in Paris in December?" 9 Sep 2015
- Daniel Flynn, PhD: ""The role of student learning objectives in student engagement" 16 Sep 2015
- Steve Nimrod, PhD Candidate: ""Increased density of the long - spined black sea urchin (*Diadema antillarum*) in Grenada 30 years after mass mortality: "Boom and bust" or stable populations?" 23rd Sep 2015
- Walla Al-Hertani, M.D., FCCMG: "It's All About the Man-6: Lysosomal Storage Disorder Therapy" 24 Sep 2015
- Ard Nijhof, PhD: "Control of ticks and tick-borne diseases: past, present and future" 7 Oct 2015
- Nadia Solomon, MD/MSc student: "Cystic Hydatid Disease: Evaluation of a Control Program in Turkana, Kenya" 9 October 2015
- Jerry Enoe, MSc: "Use and availability of medicinal plants in Grenada" 14 October 2015
- Ramsey Saunders, PhD: "12:30- 1:30 pm "Science and its Role in Caribbean Development" 28 October 2015
- John Wang: "Body Movement and Art Therapy" 4 November 2015
- Ian Baptiste, PhD and Arlette Wildman, MSc: "12:30- 1:30 pm Health Literacy in the Caribbean" 11 November 2015
- Annie Gill, MSc: "Grenadian Theatre and National Development" 18 November 2015
- Katheryn Kastner and Natalie Berghuis: "Nutrition's impact on cognitive development in the early years of life and decline later in life" 20 November 2015
- Wayne Sandiford, PhD: "Governing by Rules, Ruling by Numbers: The Fiscal Responsibility Bill in Grenada" 25 November 2015
- Emily Vogler, PhD: "Alzheimer's disease- A penny for your thoughts" 2 December 2015
- Alfred Chikweto, DVM, PhD (Candidate): "Isolation and genotyping of *Toxoplasma gondii* small ruminants, pigs and backyard chickens from Grenada, West Indies" 9 December 2015
- Jason Lowther, MD/MSc student: "Chikungunya in Grenada: An Evaluation of Potential Risk Factors for Chronic Chikungunya-related Arthralgia" 14 December 2015

WINDREF Organizational Chart



Contact Information

Director

Dr. Calum N.L. Macpherson
WINDREF, P.O. Box 7, St. George's, Grenada,
West Indies
Tel: 1-473-444-3068
Fax: 1-473-444-3041
cmacpherson@sgu.edu

Assistant Director

Mr. Trevor Noël
WINDREF, P.O. Box 7, St. George's, Grenada,
West Indies
Tel: 1-473-444-3997
Fax: 1 (473) 444-3041
trevornoel@sgu.edu

Grants Administrator

Dr. Randall Waechter
WINDREF, P.O. Box 7, St. George's, Grenada,
West Indies
Tel: 1-473-444-3997
Fax: 1-473-444-3041
rwaechte@sgu.edu

SGU IRB Administrator

Mr. Kareem Coomansingh
WINDREF, P.O. Box 7, St. George's Grenada,
West Indies
Tel: 1-473-444-3997
Fax: 1-473-444-3041
kcoomans@sgu.edu

Assistant Administrator

Ms. Isha English
WINDREF, P.O. Box 7, St. George's Grenada,
West Indies
Tel: 1-473-444-3997
Fax: 1-473-444-3041
ienglish@sgu.edu

Secretary

Ms. Naomi Alexander
WINDREF, P.O. Box 7, St. George's Grenada,
West Indies
Tel: 1-473-444-3997
Fax: 1-473-444-3041
nalexand@sgu.edu

Administrative Assistant (USA)

Ms. Tyeast Shaw
3500 Sunrise Highway, Building 300, Great
River, NY, 11739
Tel: 1-800-899-6337 Fax: 1-631-665-2796
tshaw1@sgu.edu

WINDREF (UK)

Mr. Patrick Orr
Tel: +44 207 630 9778
Patrick@raittorr.co.uk

Caribbean EcoHealth Programme (CEHP)

Dr. Martin Forde
St. George's University, P.O. Box 7, St.
George's, Grenada, West Indies
1-473-439-2000 x 2349
mforde@sgu.edu,
martinforde@mac.com

Caribbean Environmental Research Initiative (CERI)

Dr. Svetlana Kotelnikova
St. George's University, P.O. Box 7, St.
George's, Grenada, West Indies
Tel: 1-473-444-4175 x 2465
Fax: 1-473-439-1845
skotelnikova@sgu.edu

Renewable Energy and Energy Efficiency Initiative (REEF)

Dr. Hugh Sealy
St. George's University, P.O. Box 7, St.
George's, Grenada, West Indies
Tel: 1-473-444-4175
hsealy@sgu.edu

***WINDWARD
ISLANDS
RESEARCH
& EDUCATION
FOUNDATION***

