



**WINDWARD
ISLANDS
RESEARCH
& EDUCATION
FOUNDATION**



2014 Annual Report



Cover Photo: Using cutting edge Turning Point clicker technology in the conduct of Research in Grenada.



Mission Statement

Founded in 1994, WINDREF seeks to advance health and 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, 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.

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Director's 2014 Report

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 2014 a very successful year for WINDREF. If I had to use one word to describe the past year at WINDREF, it would be: Growth. We continue to expand on our existing research and education programs while initiating new ones, working with more international and regional colleagues and receiving more funding from donors all over the world.

Baroness Howells of St. David, who joined the UK Board of Trustees in 2005, assumed her duties as the new President of WINDREF at the start of the year. We were delighted that Northumbria University awarded Baroness Howells an Honorary Doctorate of Civil Law and she also generously hosted a dinner at the House of Lords to support the Sports for Health program which has gone from strength to strength.



Baroness Howells receives her honorary Doctorate of Civil Law.

2014 was a year that was dominated in the health arena by the unprecedented outbreak of the zoonotic virus Ebola, in West Africa. I take this opportunity to recognize Baron Peter Piot, who is now the Director of the London School of Hygiene and Tropical Medicine and who serves as a member of WINDREF's Scientific Advisory Board for his discovery of the Ebola virus in 1976. The 2014 Ebola outbreak caught the world by surprise.



Dr. Baron Peter Piot, who discovered the Ebola virus in 1976, with Dr. Heidi Larson, a prominent researcher in the field of vaccination at the London School of Hygiene and Tropical Medicine, and the WINDREF Director in his office in Grenada in 2012.

Given the interconnected world we live in, patients traveled to almost a dozen countries and a few of these countries recorded autochthonous cases, spreading widespread fear across the globe. In Grenada, WINDREF worked closely with the Ministries of Health and Tourism, the Department of Public Health and Preventive Medicine (DPHPM) and the University Health Center to help prepare the country in the unlikely event of an introduced case of the virus. Thankfully, this did not occur, but it did raise awareness of how such a deadly virus would stretch the resources of any country.

Chikungunya virus (CHIKV) also arrived in the Western Hemisphere for the first time in December 2013 and spread rapidly throughout the Caribbean in 2014. WINDREF worked closely with the Grenada Ministry of Health and the DPHPM to prepare for the unlikely arrival of CHIKV. WINDREF imported insecticide treated nets (ITN's) which were placed in the wards of the main hospitals in Grenada. CHIKV is transmitted by the diurnal mosquito, *Aedes aegypti*, a highly efficient vector of CHIKV and dengue which has adapted to live closely to human habitats. WINDREF also worked closely with the Department of Microbiology to help install a CHIKV diagnostic capability in collaboration with the US Navy. The virus was first reported in Grenada around the middle of 2014 and the epidemic began in mid September and ended in mid November during which time between 30 and 60 percent of the population of Grenada were infected. Using the clinical diagnostic form developed in WINDREF for dengue in 2002 and adapted for CHIKV, over 600 patients sera were collected and stored at -80 °C until being tested using ELISA and molecular techniques at the US Navy labs in Bethesda,

Maryland in December 2014. Over a hundred of these samples were tested and it was found that if the patient had three of the listed clinical symptoms then they had a 99% chance of being positive for CHIKV. The results of this study will be presented at the Caribbean Public Health Agency (CARPHA) during their Diamond Jubilee Conference which will be held at St. George's University in June 2015. To raise awareness of the Global knowledge of CHIKV, WINDREF invited Dr. Desiree LaBeaud, MD, a world renowned expert in the field of CHIKV, to deliver a Public Lecture on the topic.



(L to R): Don Jungkind (SGU), Trevor Noël (SGU), GIS Representative, Desiree LaBeaud (Stanford University), Francis Martin, Head of DMO's (Grenada Ministry of Health [MOH]), Lydia Philip, Health Promotion Officer (Grenada MOH), Myrna Hagley, Permanent Secretary (Grenada MOH), Alistair Antoine, Epidemiologist (Grenada MOH) exchanging ideas during a meeting at the Grenada MOH prior to delivering her public lecture entitled "Chikungunya and Dengue in Grenada and the Americas: What Are We In For?"



(L to R): Don Jungkind, Chair, Microbiology Department, SGU, Todd Myers, United States Navy, and Calum Macpherson following preliminary CHIKV discussions.

Given the prominence of viruses in 2014 it was perhaps auspicious that WINDREF started the year collaborating with the Global Virus Network, the Institute for Human Virology, to run a virology workshop for journalists from 30th January to 1st February, 2014. Journalists from more than 14 countries attended the workshop which was attended by many of the worlds leading

virologists, including Dr. Robert Gallo and Dr Anders Vahlne.

WINDREF assisted the Grenada Ministry of Health during the year with its vaccination program by donating refrigerators to the District Health Centers. This enabled the Ministry to surpass the service offered in the past. In November, Grenada received from PAHO the Henry C. Smith Award for Immunization. This trophy was for the country with the most improved immunization coverage. Grenada was adjudged the winner from 29 countries throughout Latin America and the Caribbean. This is the first time that Grenada has received this prestigious award.



(L to R): Myrna Hagley, Permanent Secretary (Grenada Ministry of Health [MOH]), Trevor Noël (WINDREF), Allyson Clouden, Senior Community Health Nurse, George Mitchell, Chief Medical Officer (Grenada MOH), Mr. Clement Gabriel, Chief Planner (Grenada MOH), Kester Dragon, Medical Director, (Grenada Hospitals) holding the Henry C. Smith Award for Immunization.

The 6th annual Keith B. Taylor memorial / 14th annual WINDREF lecture was delivered by Dr. John Strasswimmer, MD, PhD, whose lecture reflected on the 100th anniversary of Dr Albert Schweitzer. The title of his lecture was “Dr. Albert Schweitzer, his life; legacy and the future: A celebration of his centenary”. Dr Strasswimmer is the

Director of Dermatology Medical Missions, a 501(c)3 Foundation in Florida, and has been coming to Grenada for the past 18 months to deliver much needed dermatology clinics in collaboration with the Ministry of Health.

A number of climate change initiatives



(L to R): Jamie Schwarz, Karin Strasswimmer, John Strasswimmer, Calum Macpherson, Trevor Noël, Isha English and Paul Garner at the 2014 WINDREF and KB Taylor Memorial lecture.

established in 2013 continued in 2014. This included the work of the established United Nations Framework Convention on Climate Change (UNFCCC) Regional Collaboration Centre (RCC), in partnership with the DPHPM. Small island developing states, which compose most of the Caribbean Region, are particularly vulnerable to climate change. Further, the changing weather patterns pose a significant threat to the health and well being of peoples in the region. The UNFCCC’s Clean Development Mechanism promotes reduced carbon emissions by assisting developing nations to earn certified emission reductions, which can be traded or sold to industrialized nations. The St. George’s RCC will support governments, NGOs, and the private sector throughout the Caribbean in registering projects for certified emission reductions. This

collaborative effort will see climate experts from the UNFCCC stationed at WINDREF and the DPHPM over the next several years.

Another climate change program initiated towards the end of 2013 was the United Nations Development Program / Global Environment Facility (UNDP GEF) funded *Energy for Sustainable Development in Caribbean Buildings (ESD-CARAIRES)*. This five-nation initiative (Antigua & Barbuda, Belize, Grenada, St. Lucia, Trinidad & Tobago) aims to bring about a 20% reduction in greenhouse gas emissions from the building sector in the five participating countries, through efficiencies and changes in construction methods. WINDREF and the DPHPM will monitor and evaluate the projects in all of the five participating territories. In conjunction with this initiative, representatives of the Canadian Government visited the WINDREF Institute (figure 7) to see first hand and meet with the participants of the IDRC funded Grenada



(L to R back row): Dr. Rebecca Andall, Research Assistant, Dr. Roger Radix, Principal Investigator, Dr. Naomi Andall, Research Assistant, Mr. Trevor Noël, Project Manager, Dr. Jane Noël, Supervisor (Westmorland School) Dr. Calum Macpherson, Director (WINDREF).

(L to R front row): Christal Radix, Research Assistant, Devinder Shory, Member of Canadian Parliament, Isabelle Morin, Member of Canadian Parliament, Elizabeth B. Kingston, Canadian Parliamentary Association Secretary, Notre-Dame-de-Grace-Lachine, Debbie DesRosiers, Counsellor (Foreign Policy & Diplomacy), Enya Noël, Form 1 student,

School Nutrition Study in April of this year.

In September, WINDREF hosted the 7th annual US Department of Agriculture (USDA) funded Regional Fungal Identification Workshop. The participants included trainees from thirteen countries throughout the region, who were presented with certificates upon completion of the course.

A number of WINDREF researchers



Participants and Instructors at the USDA's 7th Annual Regional Identification workshop.

and administrators attended research meetings and conducted fieldwork in 2014. A list of these and other annual scholarly achievements are detailed in this report. As a member of the Research Advisory Committee (RAC) of CARPHA, I attended RAC board meetings and also the annual conference in Aruba. The 60th annual CARPHA meeting will be held in June 2015 in Grenada. The conference attracts participants from around the region and internationally to present their research outcomes.

A Caribbean Grant Writing and Scientific Peer Review Workshop organized and funded by the National Cancer Institute (NCI) Center for Global Health and the

National Institutes of Health (NIH), in collaboration with CARPHA, St. George's University, the Pan American Health Organization (PAHO) and WINDREF was held from September 17 to 19 at the Radisson Hotel in Grenada. The workshop's primary objectives were to increase Caribbean scientists' participation in the grant writing and review process, develop strategies for sustainable research support, and to use grant writing skills as a means to research regional and global health problems. Workshop participants came from six countries, representing such organizations as the NCI, National Institute of Allergy and Infectious Diseases (NIAID) at NIH, CARPHA, and the PAHO. The Grenada Minister of Health, the Honorable Clarisse Modeste-Curwen, formally welcomed the delegates at the opening of the workshop.



Members from the National Cancer Institute, National Institutes of Health, St. George's University, and WINDREF prior to the Grant writing workshop held in Grenada.

On the granting front, a total of 24 grant applications were submitted to donors for consideration for funding in 2014. Of these, 10 were successful and 11 are pending a decision. The total value of the grants

obtained was just over USD \$1.6 million, which will be dispersed to the PI's in the coming years. More details can be found in the external grants and funding section. Congratulations to all involved.



(L to R): WINDREF Board members Joseph Feldman, Ellen Ratner, Patrick Orr, Baroness Howells (President), Trevor Noël, Mary Jeanne Kreek, Calum Macpherson (Director), Margaret Lambert,

WINDREF had another successful House of Lords dinner on the 22nd May 2014. The theme for the dinner was "Preventing diabetes and obesity". During the dinner, the ninth annual Mike Fisher memorial award for 2014 was awarded to Professor Allan Fenwick, PhD, OBE, Professor of Tropical Medicine from Imperial College for his enormous and original contributions to our



Professor Allan Fenwick receives a plaque from the President of WINDREF, Baroness Howells, with the Chancellor of St Georges University, Charles Modica and the Director of WINDREF, Calum Macpherson at the House of Lords dinner, May 22nd, 2014.

understanding of the Neglected Tropical Diseases, especially schistosomiasis. Professor Fenwick founded the Schistosomiasis Control Initiative more than 20 years ago and the initiative was recognized by receiving the Queen's award for excellence. A plaque was presented to Professor Fenwick at the House of Lords dinner.

We thank all of our donors for supporting the work of WINDREF in this, our 21st Anniversary year, and look forward to your support in the many years to come.

A handwritten signature in black ink, reading "Calum Macpherson". The signature is written in a cursive style with a long horizontal line extending from the end of the name.

Calum N. L. Macpherson,

Director, WINDREF

WINDREF Organization

WINDREF Board of Directors (USA/Grenada)

- 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, MRCVS, DVSM, MA, CBIol, FIBiol, DSc (Hon), (Past President)

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- 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)

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- John R. David, MD
- John J. Ferguson, MBChB, FRCGP

- Malcolm Ferguson-Smith, MBChB, FRCP, FRCPath
- Edmond Fischer, DSc
- Sir Malcolm Macnaughton, MD, LLD, FRCPG, FRAC
- Calum Macpherson, PhD, DIC, FRSPH
- 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.
- 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 was promoted to Assistant Administrator, and Ms. Naomi Alexander continued in her role as Secretary.

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 office is located in Great River, New York. Ms. Courtney Losito provides administrative and logistical support, and Mr. Michael Cahill provides legal support.

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. It is hoped that by reaching out to a larger scientific community, WINDREF will broaden its research opportunities by forming collaborations with scientists from the European community. A Board of Trustees was appointed in 1999 to oversee the activities of WINDREF (UK). Ms. Jenny Casswell provides administrative support for 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, UMDMJ
- Melinda Sothern, PhD
- Richard Scribner, MD

Research Fellows

- Muge Akpinar-Elci, MD, MPH
- John Adamski, MD, MSc, 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, DSc
- Orazio Giliberti, MD
- Richard Kabuusu, DVM, MPH
- Victoria Kimotho, MPH
- Svetlana Kotelnikova, PhD
- Barbara Landon, PsyD
- Matthias Lorenz, PhD
- Marios Loukas, MD, PhD
- Theresa McCann, MPH, PhD
- Barrymore McBarnette, MD
- Craig McCarty, PhD
- Clare Morrall, PhD
- Shamdeo Persaud, MD, MPH
- Roger Radix, MD, MPH, MIB, FRSPH
- Bonnie Rusk, MSc
- Samina Rutrecht, PhD
- Hugh Sealy, PhD, P.Eng
- Karen Schioler, PhD
- Shanti Singh, MD, PhD

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, 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,

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, 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.

Current Projects

Emerging Infectious Diseases

The year 2014 could be considered a year of emerging challenges. Specifically, the emergence of Chikungunya and the potential for emergence of Ebola were reasons for heightened activities. In response, WINDREF co-hosted a conference on emerging viruses for journalists in the Caribbean and other countries of the Americas in January 2014. The conference was timely as it occurred at the very beginning of the Chikungunya outbreak in the Caribbean and prior to the Ebola outbreak in West Africa and imported cases in the Western Hemisphere. WINDREF supported the efforts in the response to the Chikungunya challenge, together with St. George's University, hosting visiting scientists from the Walter Reed Army Institute of Research to assist in capacity building for sample processing and diagnosis for Chikungunya. WINDREF further collaborated with Grenada's Ministry of Health to process samples from Grenada for diagnostic investigations. In the area of education, WINDREF worked with the Ministry of a Health to prepare and disseminate educational materials and information throughout Grenada on

mosquito control and case management of Chikungunya. WINDREF and St. George's University also hosted a public lecture on Chikungunya delivered by Dr. Desiree LaBeaud, a leading expert on Chikungunya research. WINDREF also prepared a research proposal to further develop effective diagnosis, prevention and control of Chikungunya, which adversely affected all sectors of Caribbean society in 2014.

WINDREF's role in relation to the potential emergence of Ebola was towards participating in a coordinated effort of preparedness with the Government of Grenada, St. George's University and stakeholders in Grenada. WINDREF led education programs for healthcare workers at the international airport and community organizations. WINDREF also assisted the Government of Grenada towards developing its National Policy specific to Ebola, including immigration and customs restrictions, surveillance at the ports of entry and communities and preparedness of medical staff and facilities for any potential case entry.

Submitted by Satesh Bidaisee

Community Health Initiatives—Sport for Health, Touch Toes Test, One Health One Medicine Initiative

WINDREF's Sports for Health program continued in 2014 with its community exercise program and school based athletic project. Participants in the Sports for Health program continued to observe a reduction in their Body Mass Index (BMI) and Waist to Hip Circumference (WHC), which serves to reduce their risk for heart disease, diabetes and other chronic diseases. Participants that began the Sports for Health program in overweight and obese BMI categories were within normal BMI

measurement in 2014. WINDREF further explored community dynamics of the Sports for Health program, which identified socio-cultural barriers for persons to participate in the Sports for Health program. WINDREF in 2015 will be seeking to mitigate the identified barriers towards increasing the access and involvement of persons in the Sports for Health program.

The Touch Toe Test campaign, first launched by WINDREF in 2012, continued in 2014. This campaign, which educates persons to screen for any loss of sensation in their toes (peripheral neuropathy), continues to identify persons (mainly with diabetes mellitus) with peripheral neuropathy. The goal of the Touch Toe Test campaign is to promote healthy feet among persons with peripheral neuropathy and prevent complications, which can sometimes require amputations.

The One Health Concept was further advanced in 2014 as WINDREF published a paper on a review of One Health in the International Journal of Parasitology Research. The paper served to provide a retrospective review of One Health as a concept since 1983, including the themes and trends that evolved over time. An online course on One Health: A Global Health perspective was also developed and delivered as a Massive Open Online Course (MOOC). This course, which attracted hundreds of persons from around the world, focused on emerging infectious diseases, zoonotic diseases, food safety, environmental health and international health.

Submitted by Satesh Bidaisee

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 currently living in residential care facilities in 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. In 2014 reachwithin focused on 3 key areas: 1) caregiver education and capacity building; 2) youth services; and 3) support activities and special projects.

1) Caregiver Education

Reachwithin services the following residential care facilities: Queen Elizabeth Home, Belair Home, Father Mallaghan's Home for Boys, the Emergency Shelter, and the Dorothy Hopkins home. The caregiver-coaching program, delivered by reachwithin staff, provided over 68 hours of coaching support to assist caregivers with their understanding of the Conscious Discipline training they had previously received. Additionally, reachwitin was able to provide funds for 120 workbooks to those participants who underwent Conscious Discipline training.



reachwithin caregiver training

Monthly mini-retreats/training sessions are provided to caregivers trained in reachwithin's Youth Life Skills, with 10 two-hour sessions, delivered off-site, focusing on yoga, mindfulness, self-care and child development training.

In June of 2014, reachwithin commenced its first conference "*Children and Caregivers: The Importance of their Relationships.*" Two hundred participants from the local community attended the conference, with international and local professional speakers. Feedback declared the conference a success with people eagerly anticipating a follow-up.

2) Youth Services

In 2014, reachwithin delivered disability learning tools to Dorothy Hopkins (home for residents with disabilities) to aid residents in their participation in the yoga program.



Youth engaged in reachwithin's summer art programme

Reachwithin also funded a weekly summer art camp for residents of all the homes, facilitated by local artist, Stacey Byer. The camp was so popular that the decision was made to hold an additional art class in December 2014. A video was created during the art camp, highlighting the August art sessions.

Ongoing programs involve yoga, drumming, and enrichment activities.

3) Special Activities

Reachwithin provided staffing for the Grenada Down Syndrome Association event, the Orphans and Elderly Christmas Party and made staff available to offer support to trainees in the Conscious Discipline program.

Future Plans

In 2015, reachwithin will continue to provide youth and caregiver programs and we hope to host our second Annual Conference with SGU. We will continue on in our community capacity building efforts and hope to launch our pilot S.E.E.D. (Social Emotional Education Development) program using the Hawn Foundation Mindup curriculum.

Reachwithin Staff Members

- Ms. Meghan Tyrrell: 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 Brown: communications and PR specialist
- Ms. Calisha Charles: a Licensed Clinical Social Worker and internationally certified drug and alcohol counselor, who serves

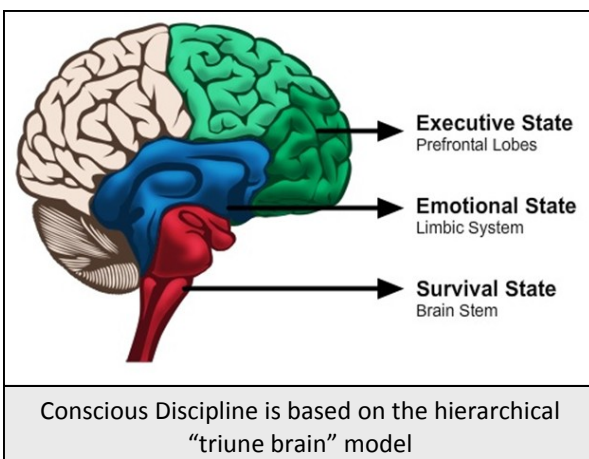
as a Conscious Discipline educator and coach in several of the homes;

Ms. Lorna Douglas: an expert in youth development through her work at NEWLO, a vocational training school, who also coaches caregivers in several homes

Submitted by Meghan Tyrrell

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

Dr. Randall Waechter and Dr. Barbara Landon secured a two-year \$270,000 CDN grant from the Grand Challenges Canada “Saving Brains” initiative in 2014. Their project aims to maximize brain development in Grenadian children by training parents and caregivers in the principles of Conscious Discipline (CD). CD is an evidence-based comprehensive self-regulation program that integrates social-emotional learning and brain science. The core of the program is the “Triune Brain Model”. In this model, the human brain consistently asks the following hierarchical questions: “Am I safe?” “Am I loved?” “What can I learn from this?” In order to maximize learning and brain development, children must feel safe and



loved. CD teaches parents to recognize when children are not feeling safe and loved, and how to promote these states through their own self-regulation.

Through ongoing positive connections, parents will rely less on corporal punishment in disciplining children.

The project got underway on October 1, 2014. Accomplishments to date include:

- The identification and hiring of key project personnel – a project manager (Stephanie Holmes), bus driver, and research assistants.
- The identification and initial training of 90 Roving Caregivers, who already work with the Ministry of Social Development in Grenada. The Rovers will receive intensive hands-on training with the founder of Conscious Discipline, Becky Bailey, in January 2015.
- The identification of outcome measures and planning for training of research assistants in how to collect outcomes data at the end of the study.
- The collection of baseline data from 200 Conscious Discipline intervention parents and 200 wait-list control parents
- The purchase and refurbishment of a used SGU bus, which will become the Conscious Discipline Mobile Resource Unit. This bus, staffed by a Conscious Discipline expert, will travel to communities throughout Grenada, offering hands on training and supporting the work of the Roving Caregivers.

Over the course of the project, 70 Roving Caregivers will travel into communities throughout Grenada to train 1,700+ parents of children under the age of 30 months in CD over the course of 16 months. At the end of the intervention, research assistants will travel to randomly selected homes to collect a number of

outcome measures from the parents and their infants. It is hypothesized that parents who have been exposed to CD training differ significantly from waitlist control parents on measures of attitudes toward corporal punishment, interaction with infants, and use of CD techniques in the home.



Co-investigators on the project include Dawne Cyrus, Tammy Martin, Lauren Orlando, and Susan Brathwaite. We thank Grand Challenges Canada for supporting the initiative and the Grenadian Roving Caregivers, who are donating their time to learn about and share CD throughout Grenada. The project would not be possible without their passion and dedication.

Submitted by Randall Waechter and Barbara Landon

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.

Adolescence represents one of the critical periods associated with establishing an obesogenic lifestyle and becoming an obese adult (Whitaker, Wright et al., 1997). In fact, obesity in adolescence is the single strongest predictor of obesity as an adult. The GSNS is designed to target modifiable factors in the environment that lead to obesity among adolescents in the tri-island nation of Grenada. 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 objectives:

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.

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.

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.

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.

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 January 2015, the GSNS is in the final year of its ongoing three years funding from IDRC. At this point the GSNS has completed Objectives 1, 2, and 3 and completed a number of the analyses associated with Objective 4. Consequently, completion of Objectives 4 and 5 will be the focus of the final year of IDRC funding.

With regard to Objective 1, the structured interviews contributed to the development of the study instruments (i.e. Student Survey, Eat Habits Questionnaire, Store Assessment, Principal Survey, Parent Survey). The results of the structured interviews influenced both the content and cultural appropriateness of the study instruments.

With regard to Objective 2, a multistage probability sample of all first year secondary school students (i.e., Form 1) across the 23 secondary schools in Grenada was carried out. Randomization resulted in an eligible sample of 1,004 students in 35 classrooms making up roughly 55% of all Form 1 students in Grenada. Parental refusals (n= 276) and students who were absent on the survey day or did not complete all the assessments or surveys (n=39) resulted in an effective sample of 689 students in the cohort. All students were assigned a unique identifier linked to their informed consent signed by their parents. The consent also gave permission to follow the students in subsequent surveys. Personal identifiers in the form of parents name, phone number and school identification were collected for possible follow-up. For the effective sample the following data were collected 1) Student Survey, 2) Anthropomorphic Assessment, and 3) Eating Habits Questionnaire. On a subsample of students (n=219), accelerometry and a parent survey were

administered.

With regard to Objective 3, each school's food and physical activity environments were assessed using Store Assessments and a Principal Surveys. Store assessments were accomplished with the aid of a Geographic Information System (GIS). The GIS was used to identify all stores selling food within a 750-meter buffer around each school. Field observations of each store (i.e., Store Assessments) were conducted by project staff members (n=154). A survey was completed by the principal of each school (n=23) to characterize the school policy and environment related to nutrition and physical activity.

Objective 4 is the current focus of efforts in the final year. To date, the Student Survey, Anthropometric Assessments, Principal Survey, and Store Assessments have been entered into the master GSNS database. The transcribing of the Eating Habits Questionnaire is roughly 50% completed. The accelerometry data has also been entered into the database. Preliminary analyses involving data cleaning and descriptive statistics are ongoing. The analyses have resulted in three abstracts that have been submitted to a regional meeting (i.e. Caribbean Public Health Agency (CARPHA)), which takes place in Grenada this year (24th to 26th June 2015). The following abstracts were submitted to the conference organizers:

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

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 ($p=0.004$). With regard to Objective 5, the results from the above analyses will serve as the basis of dissemination efforts in addition to ongoing analyses. Peer-reviewed manuscripts and presentations based on these analyses are planned; the results of which will be that will be disseminated to students, parents, and policymakers.

In summary, the GSNS is on schedule to complete the original objectives of the project. The preliminary findings hold the promise of identifying drivers of the obesity epidemic by studying a select cohort of adolescent Grenadians not yet affected by the epidemic. We anticipate every success in both information gleaned regarding obesogenic lifestyles among Grenadian youth and research capacity building in Grenada and the Region. We thank the IDRC for its on-going support and look forward to future collaboration with this project and a likely follow up project to take advantage of the opportunity of following this cohort of adolescents longitudinally.

Our team also wishes to thank the Grenada Ministries of Education and Health, who have supported this project from its inception. We wish to thank our research assistants who have been an indispensable part of this project. We would like to thank our Consultants and friends, Richard Scribner and Melinda Sothern from Louisiana State University for their invaluable assistance and guidance during this project. I would like to personally thank the Director of WINDREF, Dr. Calum Macpherson and his staff for their excellent support and assistance with this

project. I would also like to show my great appreciation for my project manager, Trevor Noël as well as Randall Waechter, for their constant help, advice and invaluable assistance. Finally I would like to thank my Chair, Dr. Omur Elci and the Faculty and Staff of the Department of Public Health and Preventive Medicine at St. George's University for their tremendous support for this project.

Submitted by Dr. Roger Radix

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. Recent talks have been held to include nurses from the St. George's University School of Nursing and the Ministry of Health (Grenada). These nurses have been entrusted with the process of receiving a signed informed consent form and drawing the blood and administering the Family Origin Questionnaire and the KMSK scale to the participants.

The Kreek Lab collaborates with WINDREF in Grenada in an effort to gain a better understanding of the biology of addictive diseases, particularly the genetic basis of addiction. Grenada provides a unique study sample as heroin and other such opiates have yet to enter the country. In most countries, opiate and cocaine addiction is



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

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 (GRENIN). GRENIN celebrated its eleventh 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 eleven years.

Submitted by Trevor P. 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 Epidemiology Network (GRENEN) 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.

During the first half of 2015 we plan

to expand the Project Advisory Committee to include representation from the Ministry of Youth Empowerment and Sports and to add the expertise of a specialist who has been working with young offenders and substance abusers whom the court has mandated into a behavior modification program. Focused research activities will commence in the summer 2014 session of the MPH program.

Ethics of North-South Collaborative Research

In 2010, Dr. Martin Forde, from the Department of Public Health & Preventive Medicine, along with Drs. Sandra Tomsons, Karen Morrison and Angela Gomez, secured a US\$70K grant to identify and characterize the issues and challenges faced by collaborating researchers from North (developed) and South (developing) countries, and generate a set of appropriate guidelines and recommendations that would adequately address these issues.

Although a substantial body of literature exists that details how to address ethical issues and provide ethical oversight for research study designs, there currently is very little guidance available to researchers on how to deal with the unique and novel challenges that arise when conducting North-South collaborative research.

North-South (N-S) collaborative global population health research projects are typically characterized by multi-agency involvement and participants that are often drawn from vulnerable populations. Further, N-S global population health research typically falls outside the narrow boundaries of the dominant bioethics-anchored research paradigm. Added to this complexity is the possibility of different moral principles and values or possible different interpretations of the same principles and values on the part of

researchers working on N-S teams.

Since submitting this grant's final report in 2012, much interest has been generated and expressed to have the findings of this report made more widely available. Thus, the Canadian International Development Research Centre (IDRC) on September 2014 awarded the same researchers listed above a grant for \$15K in order to have the reports findings published as a book and several journal papers.

The proposed book that will be released in 2016 will address the issues and challenges facing global North-South population health research teams. The major themes include global health research, ethical principles and values, and ethical relationships. The book will draw on the interdisciplinary research on which it is based to provide examples and suggest ways in which ethical dilemmas can be avoided. By sharing this information with global health researchers, funders, members of ethics review boards, and others the book seeks to facilitate a collaborative process that will eliminate and/or reduce some of the ethical challenges frustrating global health researchers as they attempt to efficiently design and implement their research activities.

Submitted by Martin Forde

Bioethics of Climate Change

The Wellcome Trust Ethics and Society grant received in April 2013 (Bioethics and Health in the Caribbean: Climate Change) was completed and data submitted for publication in November 2014. Participants in that study were Caribbean healthcare providers and, in keeping with ethical standards of informing participants about the

outcomes, a summary of the study findings was shared with them by email, and shared with the public through media interviews with Grenada Broadcasting Network Television (GBN) in June 2014, Grenada Government Information Service (GIS) Television in November 2013, and SGU Radio in November 2013. The data was also submitted for presentation at CARPHA's 2015 conference. Part of that grant funded a BSEC symposium in November 2013 sponsored by the Bioethics Department, during which the data was presented and, in a structured format, participants provided insights into its interpretation and significance.

Submitted by Cheryl Cox Macpherson

Caribbean Research Ethics Education Initiative (CREEi)

SGU's Bioethics Department received two major grants in 2014. The NIH Fogarty International Center provided a Training Grant for US\$1.1 million over 5 years to Cheryl Macpherson (WINDREF and SGU, Grenada), Sean Philpott (UGC, USA) and Robert Hall (UAQ, Mexico), and The Saving Brains awarded \$270,000 CDN to Barbara Landon and Randall Waechter (see related report herein).

The Fogarty project, the Caribbean Research Ethics Education Initiative (CREEi), will train three cohorts of Caribbean researchers, physicians, ethics committee members, and similar in research ethics. The curriculum is designed specifically to address issues of the Caribbean basin, and will be delivered in English by the Bioethics Department, and in Spanish by the Universidad Autonoma Queretero (UAQ) in Mexico. Trainees will receive graduate credit through Union Graduate College in New York.

After completing the first three courses, trainees will receive a Certificate. Those who do well may go on to complete an additional three courses and receive a Diploma, and opportunities to pursue a masters degree will be available to the best performing trainees. The grant will fund tuition and associated costs for each trainee.

The CREEi program will be delivered primarily online, with the introductory and closing courses delivered onsite. It will build research ethics capacity (and research capacity) in the Caribbean Basin, establish Center of Excellence in Research Ethics at SGU and UAQ, and develop a regional research ethics network. The curriculum is guided by an Advisory Committee of internationally recognized experts in research ethics including Donald Simeon, CARPHA's Executive Director, Ruth Macklin of Albert Einstein, and Elizabeth Heitman of Vanderbilt University. Faculty for the English-speaking program come from SGU and the Caribbean Public Health Agency (CARPHA), and include Derrick Aarons, past president of the Bioethics Society of the English-speaking Caribbean (BSEC).

Cheryl Macpherson and Sean Philpott hosted a special Symposium on bioethics and climate change at the International Association of Bioethics (IAB) Annual Conference in Mexico City in June 2014. Speakers included representatives from Grenada, Trinidad, Mexico, and the USA, and notable bioethicist James Dwyer, and leading expert on health impacts of climate change, Sir Andrew Haines, were in attendance.

Submitted by Cheryl Cox Macpherson

Conservation Leaders in the Caribbean (CLiC)

In 2014, Dr. Andrea Easter-Pilcher collaborated with a group of international colleagues to secure a \$125,000 grant from the United States Fish and Wildlife Service (USFWS) that will empower emerging leaders in marine and wildlife conservation across the Caribbean region. The overarching vision for Conservation Leaders in the Caribbean (CLiC) program is "healthy, functional marine and terrestrial Caribbean ecosystems enabling ecologically and economically sustainable development to meet both human and wildlife needs." The program will facilitate the careers of young conservation professionals by teaching them the skills to launch, develop, and implement successful conservation campaigns, while connecting them with existing leaders in the field. The primary goal of CLiC is to establish an enduring Caribbean leadership-training program that will enable effective regional networking and action to achieve sustainable conservation. CLiC candidates must be Caribbean or Latin American residents and have completed their bachelor's degree in a related field. The program will get underway in the Region in 2015.

A main objective of the inaugural CLiC program is to support 20 young leaders from across the Caribbean while they plan, implement, and complete five unique conservation projects that address direct or indirect threats to known conservation targets. The completion date for these projects is October 2016. During the process, the young leaders will work on project teams with colleagues in marine and wildlife conservation from other Caribbean or Latin American countries. This strategy will provide them with valuable experience in international collaboration and networking.

The young leaders emerging from CLiC will be capable of initiating and managing new conservation initiatives within their home countries and across international boundaries.

The CLiC program is funded by the USFWS Division of International Conservation's Wildlife without Borders program. The investment being 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. Project partners for CLiC include the United States Fish and Wildlife Service, International Fund for Animal Welfare, St. George's University and WINDREF. The Conservation Leaders in the Caribbean (CLiC) leadership training program will be based at SGU. Dr. Easter-Pilcher currently sits on the Board of Directors.

Submitted by Andrea Easter-Pilcher

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

The Regional Collaboration Centre (RCC) St George's started its operation in July 2013. 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.

Since starting operations in July 2013, RCC St. George's has come a long way in serving the Caribbean region. The Centre has focused its work on the sixteen independent Caribbean countries and has actively engaged with eight (50%) by establishing direct support. The activities of the RCC St George's in 2014 are summarized below.

1) Capacity Building

RCC St. George's hosted its first intern, a renewable energy Masters student from the University of West Indies (UWI) in Trinidad and Tobago, with the aim of training her about the CDM framework, focusing on carbon accounting for renewable energy and transport. This forms part of the capacity building collaboration agreement between the GIZ Renewable Energy and Energy Efficiency Technical Assistance (REETA)



The RCC St. George's Team with Graduate Intern Student from University of the West Indies. From L to R: Odran (Nigel) Edwards, Devimaya Budhooram, Karla Solis-Garcia, Alexandre Gellert Paris

project. GIZ funded the three-week intensive training, while RCC St. George's provided technical expertise support. The UWI has shown interest in continuing with the internship for carbon accounting, whereas GIZ has regarded it as a key outcome of the

REETA project, which aims at building up capacities in technologies of the electricity and transport sectors. The student is using her findings to prepare her master thesis on feasible clean options for the electricity and transport sector of Trinidad and Tobago.

During 2014, RCC St George's staff members attended a number of conferences and workshops:

Pasha, S. (2014). Environmental Impacts due to Anthropogenic Activities and Mitigation of those Impacts. *One Health, One Medicine Conference*. Grenada

Solis, K. (2014). How Can Clean Technologies Prevent Health Issues for the Poor? *One Health, One Medicine Conference*. Grenada

Solis, K. (2014). Regional Collaboration Centres Serving the Latin American and Caribbean Regions. *Regional Workshop on CDM and NAMAs*. Colombia

Paris, A.G. (2014). Standardized Baselines Approach and International Cooperation. *Latin American and Caribbean Carbon Forum*. Colombia

Paris, A.G. (2014). Regional Collaboration Centre St. George's. The Clean Development Mechanism of the Kyoto Protocol and the Regional Collaboration Centre Initiative. *SGU Research Day*. Grenada

Solis, K. (2014). Carbon Accounting and Modeling Tools. Workshop on Energy Information and *Knowledge Management Systems*. Jamaica

Solis, K. (2014). Activities of the UNFCCC Regional Collaboration Centre in the Caribbean. *Sustainable Pathways Protected Areas and Renewable Energy (SPPARE) Workshop*. Antigua and Barbuda

Solis, K. (2014). Carbon Accounting and Market Opportunities for the Electricity Sector. *OOCUR 12th Annual Conference*. Dominica

Paris, A.G. (2014) Carbon Trading as a Financial Tool for Renewable Energy Projects. *Renewable Energy Latin America and Caribbean Conference and Exhibition (RELACCx)*. Puerto Rico

Paris, A.G. (2014). Case Studies on Street Lighting Energy Efficiency CDM Projects. *SIDS DOCK Support Programme: Caribbean Energy Efficiency Lighting Project (CEELP) Training*. Barbados

2) Partnerships

During its first year and a half of operation, RCC St George's have identified key stakeholders in the Caribbean with regards to climate change mitigation. RCC St George's has forged several partnerships during 2014 working together in regional activities with institutions such as UNDP-Barbados, UNEP DTU, EU, GIZ, World Bank, CCCC 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.

RCC St. George's was appointed as a member of the Technical Advisory Committee (TAC) of the Caribbean Energy Efficiency Lighting Project (CEELP). The TAC consists of eight members from CARICOM, CARILEC, UWI and independent consultants. The project is coordinated by UNDP-Barbados and is part of the SIDS DOCK Support Program. The aim of the project is to support Eastern Caribbean countries in implementing energy efficiency lighting for streets and public buildings. The role of RCC St. George's staff members is to support project evaluation of the proposals.

In December 2014, UNDP-Barbados organized energy efficiency for lighting training programme. RCC St. George's contributed to the training by sharing CDM case studies on energy efficiency for street lighting in India and Thailand.

RCC St. George's established a partnership agreement with the Caribbean Community Climate Change Centre (CCCCC), a well-established institution that provides *inter alia* climate change policy advice to CARICOM, the Caribbean Community member States. The RCC will assist the development of baselines for energy efficiency measures under the framework of the project "Energy for Sustainable Development (EDS) in Caribbean Buildings". The ESD project is funded by the Global Environment Facility (GEF), and it is going to provide assistance to: Antigua and Barbuda, Belize, Grenada, St Lucia and St Vincent.

3) CDM Project Support

The RCC 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). Furthermore, support has been given to the development of a CDM programme of activities (PoA) for small scale renewable energy in the region. Currently, the RCC is supporting the manager of this PoA in seeking for potential projects that would be interested in joining the PoA. Finally, the RCC St. George's is also supporting the matchmaking between CDM projects and investors. For example, the Nordic Environment Finance Corporation (NEFCO) assigned by the Government of Norway launched a call for proposals to purchase carbon credits from CDM activities. RCC St George's helped preparing two (2)

proposals, both for CDM activities in Haiti that aim to manufacture and install improved cooking stoves.

4) 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 2014, RCC St George's supported the development and submission for approval of the CDM Executive Board of several SBL in the region. These included the SBL for grid emission factor (GEF) of Antigua and Barbuda, Belize, Dominican Republic, Grenada, Jamaica, St Vincent, Trinidad and Tobago. The GEF establishes the rate of emissions that are released by unit of electricity generation, e.g. XX tCO₂/MWh. The centre is also supporting SBL for the waste sector of Antigua & Barbuda, Belize, Dominican Republic and Grenada. This SBL renders 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.

5) Policy Input for the CDM Executive Board

The objective of this activity was to provide pragmatic policy input to the CDM Executive Board by suggesting improvements to the CDM project cycle. Based on the

Caribbean regional context in 2014 RCC George's supported stakeholder's specific inputs to the waste sector CDM methodologies (AMS III.G. and AMS III.H.).

The RCC also prepared three (3) concept notes on the topics of: (i) simplified project design document (PDD), (ii) landfill gas methodologies and (iii) validation and verification requirements for Least Developed Countries (LDC) and Small Island Developing States (SIDS). The concept notes had the objective to inform the CDM Executive Board and to propose ways to reduce time, complexity and transactional costs of CDM projects.

Submitted by Karla Solis-Garcia and Alexandre Gellert Paris

Climate Change Negotiations and Clean development Mechanism

Dr. Hugh Sealy is a Research Fellow at the Windward Islands Research and Education Foundation (WINDREF) and the Director of the Environmental Health Track and a Professor in the Department of Public Health and Preventive Medicine (DPHPM) at St. George's University (SGU).

Dr. Sealy has been a lead negotiator for the Alliance of Small Islands States (AOSIS), a grouping of 44 countries from the Atlantic, Indian and Pacific Oceans, at the negotiations under the United Nations Framework Convention on Climate Change (UNFCCC) since 2007.

In 2014, he was elected as the Chair of the Executive Board of the Clean Development Mechanism (CDM), a market-based financial instrument established under the Kyoto Protocol of the UNFCCC to promote sustainable development in developing countries, and to assist developed

countries in the achievement of their greenhouse gas emission reduction targets. Dr. Sealy has served on the Executive Board, nominated first by Barbados, then Grenada and currently Nauru, since 2008.

The following is a brief summary of the highlights and low points of the climate change negotiations and the CDM in 2014.

Status of the Clean Development Mechanism

The CDM became fully operational in 2005. By the end of 2014, the CDM had become the world's only global carbon market. The CDM has registered over 7,500 projects, achieved over 1.5 gigatonnes of CO_{2eq} emission reductions, saved developed countries approximately US\$3.6 billion in Kyoto Protocol compliance costs and facilitated over US\$200 billion in investment in developing countries. This is a proud record, but since the beginning of 2013, the CDM has been dying. Due to the global recession that started in 2008, the decision by the European Union to restrict the purchase of Certified Emission Reductions (CERs) from the CDM post 2012 and a general lack of mitigation ambition on the part of developed countries, the per unit price of



CERs has plummeted from a high of US\$15 to less than US\$0.40. In short, the carbon market has collapsed. The future role of an international carbon offset mechanism like the CDM is now unclear and will require a clear signal in the new global agreement to be signed in Paris in December 2015, which will essentially replace the Kyoto Protocol.

In response to the market crisis, the CDM Executive Board has taken the following strategic decisions:

- Trim the annual operational budget of the CDM Secretariat (approximately 130 staff) in Bonn, Germany from US\$32 million (2013) to US\$26 million (2015) to ensure that the CDM can continue to serve all the registered projects until the end of the second commitment period of the Kyoto Protocol in 2020.
- Create a new role for the CDM as a means of monitoring, reporting and verifying greenhouse gas emission reductions achieved under projects using results-based finance. Discussions have commenced with the World Bank, the Global Environmental Facility and the Green Climate Fund.
- Widen the market for CERs by the promotion of voluntary cancellation. A dedicated website will be launched in mid 2015 that will allow any individual, company, organisation or country who wishes to play its part in the global effort against climate change to purchase and immediately cancel CERs. For example, the organizers of the last football World Cup in Brazil in 2014 used voluntary cancellation to reduce the carbon footprint of the event.

Status of the Climate Change Negotiations

The Earth's atmosphere and oceans are warming. Our planet is currently on a

greenhouse gas emissions pathway that will result in an average atmospheric warming of greater than 3°C (over pre-industrial times) by 2100. This will be catastrophic for many regions, in particular small islands, many of which will cease to exist as viable human settlements.

In 2014, global emissions reached approximately 10 gigatonnes of carbon (GtC). Cumulative emissions (since 1750) have now reached approximately 590 GtC. The Intergovernmental Panel on Climate Change estimates that we cannot exceed a cumulative emissions budget of 1,000 GtC if we are to have a better than two-thirds chance of keeping warming below 2°C. On our current path, we will exceed the budget by 2045.

The world desperately needs a new robust international agreement to curb greenhouse gas emissions (mitigation), and help countries adjust to some of the now inevitable impacts of climate change (adaptation).

The following is an admitted oversimplification of the geopolitics and macroeconomics surrounding the current negotiations to achieve this global agreement between 194 countries via consensus. This new agreement is to be finalized in Paris at COP 21 in 2015 and come into effect in 2020.

- The major conference in Copenhagen in 2009 was perceived as a failure by the developing countries and marked a turning point in the bifurcated approach (developed vs. developing) used to implement the Convention's principle of common but differentiated responsibilities and respective capabilities. The majority of developed countries argue that the world has changed since the UNFCCC was established in 1992; that the developing

countries are now responsible for almost half of global greenhouse gas emissions; that emissions are increasing faster in the developing world. The developed countries argue that all countries should take on mitigation targets that should be nationally determined contributions but internationally monitored and verified.

- The majority of the developing countries argue that the developed countries remain historically responsible for climate change; that sustainable development and the eradication of poverty remain the priorities of most developing countries; that developing countries have the right to develop and need an equitable distribution of the remaining carbon budget. The means of implementation (finance, technology development and transfer, and capacity building) must be provided by the developed countries to the developing countries to help them adapt to climate change and to transition to low carbon development pathways. The required means of implementation is currently estimated to be at least US\$100 billion per year.

The year of negotiations culminated in Lima, Peru at the 20th Conference of the Parties (COP20) in December 2014. The conference was preceded by several major announcements and events in the year including:

- The UN Secretary General's Climate Summit
- The European Union's announcement of its target to reduce greenhouse gas emissions by 40% below 1990 levels by 2030.
- Initial pledges to the Green Climate Fund of approximately US\$10 billion.
- The USA and China announced a joint

agreement to curb emissions.

To meet the timetable of having an agreement by December 2015, the delegates in Lima needed to agree to (i) the scope of the intended nationally determined contributions, and (ii) the elements of the proposed agreements.



Members of the Alliance of Small Island States (AOSIS) huddle to consider the President's proposal for an ADP decision

Negotiations were tense. The two-week conference was scheduled to end on Friday December 12 but dragged into the Sunday morning, with the delegates finally agreeing to a compromise decision text, produced by the President of the Conference of the Parties, containing the bare minimum to keep us on track for a Paris Agreement.

The "*Lima Call for Climate Action*" consists of a preamble, 23 operational paragraphs of decision text and an Annex that contains "the elements of a draft negotiating text". AOSIS agreed to accept the text for the following reasons:

- The Lima decision keeps the door open on the legal form of the Paris Agreement: whether it will be "*a protocol, another legal instrument or an agreed outcome with legal force under the Convention applicable to all Parties.*" That battle will

continue in 2015. AOSIS wants a legally binding protocol for all parties.

- The decision confirms that the Paris Agreement “*shall address in a balanced manner, inter alia, mitigation, adaptation, finance, technology development and transfer, and capacity-building, and transparency of action and support.*” A balanced approach is critical for a number of developing countries concerned that too little attention is being paid to adaptation and the means of implementation. AOSIS remains concerned that loss and damage has not yet been recognized as a separate and distinct element of the Paris Agreement. This will be a priority for AOSIS in 2015.
- Despite the objections of the developed countries the principle of common but differentiated responsibilities and respective capabilities has been re-emphasized.
- Developed countries are urged to enhance their financial support to developing countries. However, no quantitative targets have been agreed.
- The decision allows the complex negotiations on the “*elements of the draft negotiating text*” to continue into 2015 without losing the progress made in narrowing the options in 2014.
- The decision clarifies what the intended nationally determined contributions should contain and sets a timetable for their submission. AOSIS is disappointed that the timetable will not allow for an effective review of the aggregate effect of the intended nationally determined contributions prior to the Paris Conference.
- The decision provides an essential mandate to continue the work plan to enhance mitigation ambition pre-2020.

This was an absolute priority for AOSIS, as the science clearly indicates that we need to reduce our greenhouse gas emissions as quickly as possible and cannot afford to wait until the new agreement comes into effect.

Lima delivered what it had to. A lot of work remains to be completed before AOSIS will be satisfied that the Paris meeting will deliver a legally binding international agreement that will provide a reasonable chance of survival for all small islands.

Submitted by Hugh Sealy

Soil Transmitted Helminths and the Streptococci Infections Among School Children in St. Andrews Parish

This research project is a two part study. The first component is the streptococcal portion being conducted in St. Andrew’s parish, Grenada. This component, which is now complete, is to investigate the incidence of Streptococci infections among school going children between the ages of 5-15 years old in the Parish of St. Andrew’s. The second component focused on the Incidence of Neglected Tropical Diseases with a specific emphasis on the “Soil Transmitted Helminths” with the aim to eliminate the three main helminths, hookworms (*Ancylostoma duodenale*, *Necator americanus*), Roundworms (*Ascaris lumbricoides*) and Whipworms (*Trichuris trichiura*). The second component of this study has evolved into a control/ elimination program for Grenada, Carriacou and Petite Martinique.

The streptococcal portion has all fourteen (14) Primary schools in the parish of St. Andrew’s included in the study. The schools included are Belair Government, St.

Matthew's Roman Catholic (R.C.), St. Michael's R.C., Holy Cross R.C., Holy Innocent Anglican, St. Giles Anglican, St. Mary's R.C., Telescope Government, Paraclete Government, St. Andrew's R.C., St. Andrew's Methodist, Tivoli R.C. St. Andrew's Anglican and Crochu R.C. Rheumatic Fever is as a result of exposure to *Streptococcus pyogenes*. The sequelae of this can lead to Rheumatic heart disease. Rheumatic heart disease is a debilitating condition that is usually brought on by stenosis of the mitral or aortic valves.

The anticipated sample size for this study was 750 children. The throat and blood samples were observed in the laboratory for Streptococci (throat and blood samples). The study involved drawing blood samples and throat swabs. A total of 590 blood samples and 590 throat samples were collected by our community nurse and physician. The school children were randomly selected and were between the ages of 5 – 15 years old.

The protocol for this study was passed and approved through St. George's University IRB and subsequently passed and approved by the Research Oversight Committee at both the Ministry of Education and the Ministry of Health. Eleven hundred informed consent forms were distributed to the schools mentioned above. In each school, the distribution was random with the classes being selected using a random number generator. We received 729 signed informed consent forms, and 698 completed knowledge, attitudes, behavior, and practices (KABP) questionnaires. In total, 590 blood samples and 590 throat samples were collected and analyzed.

The blood samples were subjected to Anti streptolysin O titres tests and the throat swabs to cultural isolation for *beta hemolytic streptococci*. Positive *beta hemolytic streptococci* samples are currently stored in

the WINDREF Institute in Grenada and will be sent to Rockefeller University and the University of Minnesota for further subtyping. The Streptococcal sample collection component of the study began in May 2010 and was completed in January 2012. In addition, to this testing, there was an educational component that provided and continues to provide the primary prevention through multi media mass education. The educational component of the study was begun with the initial sensitization of the community nurse and educational workers.

The positive sera samples for anti – bodies to streptococcal infection (% ASOT +) and throat swab cultures positive for beta hemolytic *streptococci* infection can be seen in Table 1. The prevalence results of this sample of an average of 6.3 % positive ASO titer and 12.05% positive combined β Hemolytic Streptococci are lower than those that were done nationally in the 2000 – 2002 study. However, these will be compared with the previous study and discussed as part of the PhD thesis.

All positive cases were seen by the physician and treatment was given by the community nurse and physicians (both from the St. Andrew's area) at the schools or at decentralized clinics in the community. The medication (penicillin/erythromycin) was

SCHOOL	Positive ASO Titre %	Positive Combined β S %	Total Students
Belair Government	9.8	6.6	61
St. Matthew's R.C.	4	10	50
Telescope Government	13	6	54
Paraclete Government	11.1	7.4	27
St. Andrew's Anglican	0	6.9	29
St. Michael's R.C.	4.3	19.6	46
Holy Cross R.C.	6.1	12.2	49
Holy Innocent Anglican	4.8	11.3	62
St. Giles Anglican	0	17.1	35
St. Mary's R.C.	6	39	33
Crochu R.C.	2.6	12.8	39
St. Andrew's R.C.	0	4	25
St. Andrew's Methodist	23.7	15.8	38
Tivoli R.C.	2.4	0	42
Total	6.3	12.05	590

Table 1: Results of streptococcal survey for St. Andrew's schoolchildren 5 – 15 years in 2010 - 2012.

purchased by WINDREF through Parris Pharmacy in Grenville. We chose this pharmacy because it is owned by Mr. Reginald Buckmire, PhD (a St. Andrew's Parish based businessman). This meant that all the persons that took responsibility for the persons in this area were from St. Andrew's lending to a strong sense of ownership and empowerment.

The second portion of this study focuses on the Incidence of Neglected Tropical Diseases with a specific emphasis on the "Soil Transmitted Helminths" with the aim to tackle the three main helminths, The second component of this study has been increased from only the St. Andrew's area to be part of an elimination program for Grenada, Carriacou and Petite Martinique. From an ethical perspective, the elimination program was approved by the St. George's University IRB and the Research Oversight Committees of both the Ministry of Education and Ministry of Health (Grenada) at the national level (Grenada, Carriacou and Petite Martinique).

The evolution of this project from solely the St. Andrew's area, to be a Grenadian National elimination program has resulted in a revision of the sample size and an increase from 14 to 58 schools involved. On the advice of our statistician thirty nine of the fifty four primary schools have been selected for inclusion in this study and if a grade/standard is selected all members of that grade/standard will be given the opportunity to participate regardless of class size to adhere to ethical soundness. The fecal samples obtained will be analyzed using salt flotation.

The 1,100 informed consent forms and knowledge, attitudes, behavior, and practices (KABP) questionnaires were distributed to the 39 schools. They were

disseminated by the school principals to the parents/guardians. These informed consent forms and knowledge, attitudes, behavior, and practices (KABP) questionnaires had already been pilot tested in the fourteen St. Andrew's schools. The Incidence of Soil transmitted helminths was ascertained and



Children receiving albendazole at the school and in the community.

we investigated the possible correlation of these results with the KABP questionnaire. The pharmaceutical company, Glaxo Smith Kline along with the World Health Organization (WHO)/ Pan American Health Organization (PAHO) have promised the drug, albendazole free of cost for three years for this elimination program.

We received a total of 522 stool samples from Grenada, Carriacou and Petite Martinique. These stool samples were analyzed using the Zinc Sulphate flotation technique. Seven (7) positive cases were discovered by this method.

Children were treated in one day with the WHO recommended drug albendazole that was available over the counter from a local pharmacy.

We have carried out contract tracing in the homes and surrounding locations of the positive cases. The map of Grenada below displays the location of our positive cases. They are all in the rural area of mainland Grenada. There were no positive cases from Carriacou or Petite Martinique. The educational component continues in that we continue to maintain the printed posters for sensitization purposes in all the Primary and Secondary schools in Grenada, Carriacou and Petite Martinique (see Figure 3).

In addition to this we initiated a study to assess the short and long-term knowledge of primary school children on the transmission and prevention of soil transmitted helminths using Turning Point Technologies. The design and methods took the form of a longitudinal study that was carried out on schoolchildren attending thirty nine out of all fifty four (72.2%) primary schools from Grenada, Carriacou and Petite Martinique between March and November 2014. The schools were randomly selected for inclusion in the study. Turning Point

Technology (Clickers) was used to assess the knowledge and administer the subsequent intervention (STH PowerPoint presentation) to all students see Figure 2. The Pre, immediate Post and long-term Post STH PowerPoint intervention (seven months later) data was analyzed using Chi Square analysis.

Question number	Pre-March/Post-March χ^2 -values (p values)	Pre-March/Post-October χ^2 -values (p values)	Post-March/Post-October χ^2 -values (p values)
1. Can worms enter through the skin of your feet? (Yes, some of them can and others have to be eaten)	142.56 (<0.001)	182.27 (<0.001)	28.73 (<0.001)
2. Can you get worms through eating worm eggs in unwashed vegetables or unpeeled fruit? (Yes, if worm eggs are on fruit and vegetables)	142.39 (<0.001)	237.87 (<0.001)	74.29 (<0.001)
3. How can you get rid of worms? (Taking Centrell)	70.32 (<0.001)	59.15 (<0.001)	4.81 (0.028)
4. Where do people get worms from? (Other people who have it)	249.19 (<0.001)	60.59 (<0.001)	37.81 (<0.001)
5. Where do worms live in infested people? (Intestines)	266.57 (<0.001)	228.88 (<0.001)	2.44 (0.118)
6. Can having worms affect your school performance? (Yes)	411 (0.04)	46.34 (<0.001)	13.75 (<0.001)
7. After playing outside reduce your chances of getting worms? (Yes, washing hands removes worm eggs)	158 (<0.001)	159.11 (<0.001)	3.91 (0.048)
8. The best way to protect yourself against having worms would be to (a)	15.66 (<0.001)	81.97 (<0.001)	32.82 (<0.001)
All Schools (Average)	123.97 (<0.001)	132.45 (<0.001)	6.49 (0.011)
Test Score Before	58.90%	59.20%	79.60%
Test Score after	80.30%	84.1%	84.20%
Change	21.4%	24.90%	4.6%
Percentage of possible change	51.00%	61.00%	22.90%

A total of 962 students participated in March 2014 and 805 students participated in October 2014 in this exercise. The questions and the results including p values of Pre, immediate Post and long-term Post intervention are provided in the table below.

There was no significant ($p < 0.05$) inter school difference in the answering of questions. This displayed a ubiquitous knowledge transfer across the primary schools. For each question, the students on average made a significant ($p < 0.001$)

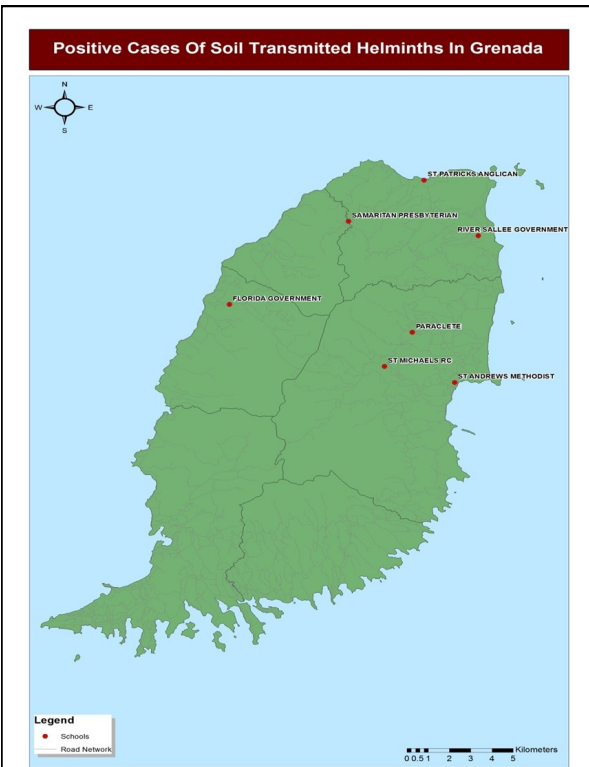


St. Paul's Government school participants with their clickers (Turning Point Technology); Knowledge Assessment through the use of clickers.

improvement in their knowledge post turning point intervention and maintained this improvement up to seven months post



Morne Jaloux School participants assigned as the caretakers of the educational poster.



Map of Grenada displaying the location via GPS of positive cases of Soil Transmitted helminths.

point technologies to impart this knowledge where class responses appear instantly, anonymously and can be used for immediate discussion were numerous. These include *inter alia*, active engaged participation.

The final stool survey was completed between November and December 2014. We are happy to report that of the 504 samples including the original 7 positives samples (see figure 4); none of the samples were positive. To date three papers have been submitted (pending approval) for presentation at International conferences from this study. The initial funding for this study was provided by the Bartholomew J Lawson Foundation through REACH (Grenada). This NTD project is



Kirani James centre (Commonwealth Gold and Olympic Gold Medalist) our main STH control advocate. He is flanked on his left by Trevor Noël and Ronaldo Nehemiah (Agent) and on his right by

incorporated as part of the wider WINDREF vision of the Sports for Health Program. The sensitization and ultimate success of this control program can also be accredited in part to the sporting advocate's involvement.

The results of this study will be written up in a PhD dissertation over the next quarter.

intervention. The advantages of using turning *Submitted by Trevor Paul Noël*

Genetic diversity and antibiotic resistance of clinical and non-clinical isolates of *Escherichia coli* in Grenada

Urinary tract infection (UTI) accounts for nearly 8 million physician visits and hospitalizations annually, resulting in escalated morbidity and elevated medical costs that can increase the burden on healthcare infrastructure (Foxman, 2003). Uropathogenic *Escherichia coli* is the most prominent pathogenic agent, resulting in over 80% of UTI infections (Ronald, 2002). One fifth of clinical visits at St George's University's Clinical Services from January 2013 to January of 2014 resulted in isolation of *E.coli* from the urine cultures.

Grenadian tropical waters are popular tourist destinations for over half a million visitors per year (Tourism in Grenada, 2011). It was shown that *E. coli* from marine waters shared antibiotic resistance patterns to human *E. coli* in Grenada (Amadi *et al*, 2013). Same study demonstrated that *E. coli* exhibits an increasing resistance to broad spectrum antimicrobial agents as well as the subsequent generations of these drugs.

Iguana is a popular food source in the Caribbean and Central America, including Grenada. Previous genetic diversity studies indicated transmission of food-borne and farm animal *E.coli* strains to human patients (Manges *et al.*, 2007). *E. coli* isolated from chicken meat was shown to share genetic makeup with UTI *E. coli* (Manges *et al* 2007). It is important to study the genetic diversity and antibiotic-resistance patterns in both clinical and environmental *E. coli* to predict the transmission potential of organisms and genes - coding for a resistance to antibiotic drugs - from the environment and animals to humans through water or food. The aim of the current study was to compare the genetic

diversity and antibiotic resistance patterns of uropathogenic *E.coli* (UPEC) isolated from human urine, to strains isolated from freshwater, seawater and iguanas.

Multiple strains of *E. coli* were isolated from human urine (25), iguana gut (39), fresh (11) and marine waters (10) in Grenada. *E.coli* isolates were identified using API20E *E.coli* ATCC 25922 as a reference strain, followed by Rep-(GTG)₅ PCR and BOX-PCR extragenic DNA fingerprinting. The DNA barcodes were transformed into a matrix, and later processed using DendroUPGMA and FigTree™ (Fig 1). Both DNA fingerprinting methods targeted non-protein coding or extragenic DNA and demonstrated enormous diversity within the population of the studied bacteria. In compliance with DendroUPGMA comparison of DNA fingerprints based on the Pearson's coefficient, we found that 56% of clinical UTI *E. coli* isolates were unique for human hosts, while 24% were related to iguana *E. coli* isolates. The co-clustering relatedness analysis of the (GTG)₅ dendrograms confirmed the results of the fingerprinting of dominating ecotypes, indicating that clinical isolates were most often related to the iguana isolates, since they shared more pairs than any other ecotype tested (Table 1).

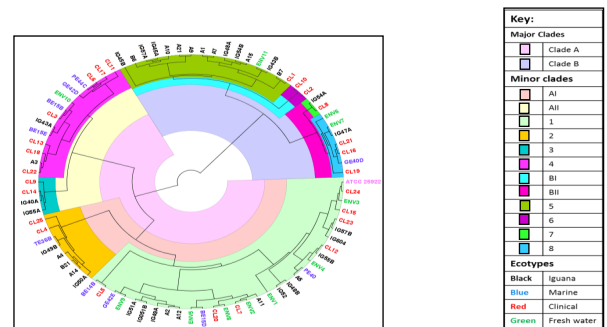


Figure 1. Dendrogram based on UPGMA analysis based on comparison of normalized distances of the (GTG)₅ PCR amplified DNA markers

All of the isolated *E. coli* studied in the project exhibited the same biochemical and phenotypical properties. Antibiotic resistance was assessed using the Kirby-Bauer disc diffusion method against the

strains were resistant to a single drug and 2.56% to multiple drugs. Surprisingly, 20% of marine and 64% of freshwater isolates were

	Clinical	Iguanas	Fresh water	Marine Water
Clinical	2	6	2	3
Iguanas		8	2	3
Fresh water			0	2
Marine Waters				0

Table 1. Summary of the number of isolates from the same ecotype based on the nearest adjacent leaf of the Dendrogram tree utilizing UPGMA comparison of (GTG)₅ barcoding (Co-clustering analysis).

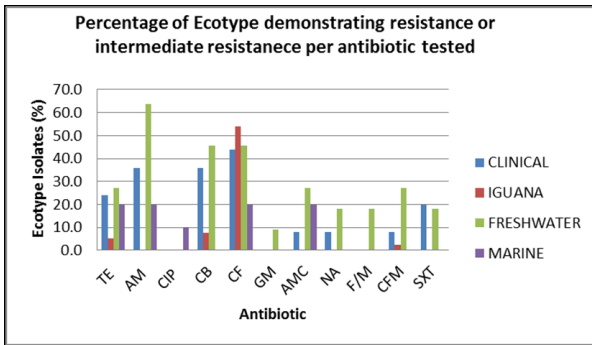


Figure 2. Percentage of resistant strains per ecotype per drug tested

eleven most commonly prescribed antibiotics in Grenada. Drug resistance was identified both in clinical and non-clinical ecotypes (Figure 2, Table 2). We found that 16 % of

	MDR (%)	SDR (%)	NO RESISTANCE (%)
Clinical (n=25)	8 (32%)	4 (16%)	13 (52%)
Iguana (n=39)	1 (3%)	7 (18%)	31 (79.5%)
Fresh (n= 11)	7 (64%)	0	4 (36%)
Marine (n=10)	2 (20%)	1 (10%)	7 (70%)

Table 2: Percentage of Isolates that exhibit Multidrug Resistance (MDR) and Single Drug Resistance (SDR)

clinical UTI were resistant to a single antibiotic and 32% were resistant to two or more drugs, while 18% of iguana *E. coli*

Resistant	AM	CB	CF	AMC	CFM	TE	CIP	GM	STX	NA	F/M	Drugs*
Clinical(25)	32%	36%	8%	8%	8%	24%	0	0	16%	8%	16%	63.7%
Iguana(39)	3%	3%	18%	0	3%	0	0	0	0	0	0	27.3%
Freshwater(11)	55%	45%	45%	18%	27%	18%	0	9%	18%	8%	9%	90.9%
Seawater (10)	20%	0	20%	10%	0	10%	10%	0	0	0	0	83.3%

Table 3. The percentage of drug resistant *Escherichia coli* strains isolated from variable sources in Grenada in 2013. AM, Ampicillin; CB, Carbenicillin; CF, Cephalothin ; AMC, AMOX/Clavulanate; CFM, Cefixime TE, tetracycline; CIP, Ciprofloxacin; GM, Gentamicin; STX, Trimethoprim/sulfamethoxazole; NA, Nalidixic acid; F/M, Nitrofurantoin. *- fraction of tested drugs with detected resistance to.

multi-drug resistant (Table 3). Furthermore, the clinical isolates demonstrated the most antibiotic resistance of all tested isolates.

In accordance with t-test analysis of resistant/susceptible patterns among four ecotypes the most similar patterns (83.3%) were observed between freshwater and marine water isolates, as well as in marine and iguana isolates. Clinical *E. coli* was similar to marine (50%), iguana (72.7%) and fresh water (72.7%) (Table 4). There were only three drugs which showed significant

T-test	Dissimilarity of antibiotic resistance pattern	Similarity of antibiotic resistance pattern
clinical vs fresh water	3 of 11 (27.3%)	8 of 11 (72.7%)
clinical vs iguana	3 of 11 (27.3%)	8 of 11 (72.7%)
fresh water vs iguana	4 of 11 (36.36 %)	7 of 11 (63.6%)
clinical vs marine waters	3 of 6 (50%)	3 of 6 (50%)
fresh water vs marine waters	1 of 6 (16.67%)	5 of 6 (83.3%)
marine waters vs iguana	1 of 6 (16.7%)	5 of 6 (83.3%)

Table 4. Comparison of antibiotic resistance patterns between the ecotypes of *E.coli*.

difference between the UPEC and the freshwater isolates, namely ampicillin,

amoxicillin/clavulanate and nitrofurantoin (results are not shown). We identified resistance to β -lactam antibiotics and lack of resistance to ciprofloxacin and gentamycin both in clinical and most of non-clinical strains of *E.coli* (Figure 2). The fractions of drug resistance strains and resistance patterns of the UPECs were similar to *E.coli* isolated from natural sources in Grenada.

Submitted by Svetlana Kotelnikova, Karla Farmer, James Naraine, Ivan Boudakov, Ateef Qureshi, Victor Amadi, Wayne Sylvester, & Grace Dolphin-Bond

Presence of Non-Coliform Bacteria in Potable Water in the Tropics

Clean drinking water is an essential component for human health. It is important to ensure that the accessible water is free from chemical and bacteriological pollution. Here we report names and numbers of viable and cultivable gram-negative bacteria that persist in drinking water. The aim of our study was to investigate the bacteriology of potable water in the tropics.

In this study, water samples (n=444) were collected on a weekly basis from 15 sampling sites on three university campuses: True Blue, Grand Anse and the University Club between 25 January 2013 and 28 January 2014, using the protocol devised by the Environmental Testing Unit at SGU (Kotelnikova, 2003). Viable microorganisms were quantified using the membrane filtering technique. Bacteria were isolated by streak plating on the Eosin-Methylene Blue (EMB), or M-ENDO agars, followed by incubation at 37C for 24 hours. The isolated bacteria were tested for their ability to produce gas by being incubated in the EC, or

lactose broths at 44 degrees C for 24 to 48 hours. The biochemical identification of unknowns was performed using a series of differential tests to identify Enterobacteriaceae (Farmer et al., 2014), and confirmed using API-20E test strips in accordance with the manufacturer's instructions for BioMérieux, Inc. (Holmes, Willcox, & Lapage, 1978). The organisms that did not produce gas in the EC or lactose broths at 44.5 degrees C were considered to be non-coliform bacteria.

In total, 20 different gram-negative non-gas producing species were isolated, 95 percent of which belonged to the class Gammaproteobacteria, and 5 percent of which belonged to the class Flavobacteria.

Table 1 and Figure 1 list the isolated species and their prevalence in the drinking water during 2013. Sixty-five samples and sites resulted in too-numerous-to-count (TNTC), or greater than 50 cells per 100 ml. The most commonly identified non-coliform organisms were *Acinetobacter lwoffii* and

Bacterial name	Isolation occasions	Frequency %	Concentration (cells/100 ml)
<i>Acinetobacter lwoffii</i>	13	2.92	1 to 60, TNTC
<i>Acinetobacter anitratus</i>	3	0.67	10 to 50
<i>Cedecea lapagei</i>	13	2.92	3 to 60
<i>Pseudomonas aeruginosa</i>	7	1.57	1 to 60
<i>Shigella serogroup 6</i>	5	1.12	1 to 40
<i>Enterobacter cloacae</i>	4	2.7	5 to 50
<i>Stenotrophomonas maltophilia</i>	3	0.67	15 to 40
<i>Enterobacteria sp.</i>	3	0.67	3 to TNTC
<i>Yersinia pseudotuberculosis</i>	2	0.45	40 to 44
<i>Enteric Group 17</i>	1	0.22	70
<i>Serratia rubidaea</i>	1	0.22	70
<i>Citrobacter amalonaticus</i>	1	0.22	TNTC
<i>Klebsiella pneumoniae</i>	1	0.22	7
<i>Serratia marcescens</i>	1	0.22	8
<i>Enterobacter agglomerans</i>	1	0.22	1
<i>Enteric group 60</i>	1	0.22	TNTC
<i>Kluyvera cryocresense</i>	1	0.22	TNTC
<i>Enterobacter taylorae</i>	1	0.22	70
<i>Chryseobacterium meningosepticum</i>	1	0.22	TNTC
<i>Cedecea devisal</i>	1	0.22	60
Total positives	64	15	
No bacterial presence detected	380	85	

Table 1. Types of bacteria, their quantities and frequencies of pollution

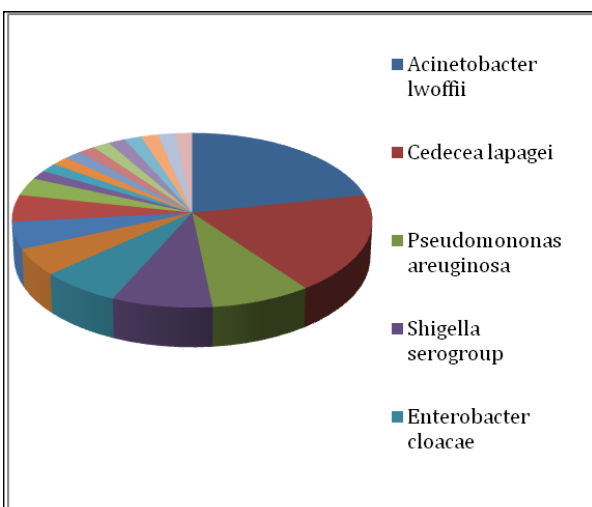


Figure 1. Bacterial genera most commonly isolated from drinking water during 2013. Coloured cake fractions represent percentages out of the total number of isolates.

Cedecea lapagei, both found in 2.29% of samples collected. *A. lwoffii* was isolated and confirmed 15 times during 2013 (Table 2). *A. lwoffii* is an important soil organism that contributes to mineralization of aromatic compounds, and is commonly present in water and soil. It is known to form multi drug resistant biofilms in intravascular and urinary catheters (Seifert et al., 1993, Tega et al., 2007). *C. lapagei* is rarely isolated from the environment. It is more commonly found in urine and blood samples. A case of *C. lapagei* pneumonia was reported in Mexico (Lopez et al., 2013). *C. lapagei* was identified 11 times in the drinking water during 2013/2014.

Pseudomonas aeruginosa was isolated and identified six times during the tested period in the drinking water. *P. aeruginosa* is a citrate, catalase, and oxidase positive gram-negative bacterium. It is an opportunistic pathogen, which is known to cause pneumonia in cystic fibrosis affected and post-surgery patients (Worlitzsch, 2002). *P. aeruginosa* is commonly found in soil,

Isolation site	Date of isolation	Concentration (cells/100 ml)
Permastore Tank 2	5/3/2013	5
Tank D1	5/3/2013	3
University Club # 4	5/3/2013	TNTC
Nawasa	5/3/2013	TNTC
Tank D1	4/12/2013	1
University Club Tank # 4	5/3/2013	14
Tank B	25/4/2013	TNTC
Tank D1	4/4/2013	5
Gym Fountain	4/4/2013	8
University Club Kitchen Tap	4/4/2013	3
Tank D1	4/10/2013	1
University Club Tank # 6	5/16/2013	60
University Club Tank # 6	5/31/2013	35

Table 2. Prevalence of *Acinetobacter lwoffii* in drinking water during 2013.

water, skin flora, and most man-made environments including international space stations (Balcht et al., 1994, Poole, 2004, Cornelis, 2008).

During the analysed period there were no fecal indicators detected in any of the samples; however gram-negative bacteria were encountered and identified in 15.25% of samples. In total we isolated and identified 19 different gram-negative non-gas producing species, 94.7 percent of which belonged to the class *Gammaproteobacteria*, while only 5.26% were distributed within the order of *Flavobacteria* (Figure 1). Most of the species were identified only once. They belonged to the families of *Xantomonadaceae*, *Moraxellaceae*, and *Flavobacteriaceae*. The most prevalent organisms belonged to *Enterobacteriaceae*, which represented 8 genera and 15 different species.

Most of the species were of environmental origin and did not represent a health risk to non-immune compromised individuals depending on infectious dose and prevalence. However, high cell counts

of *Shigella* serogroup 5 represented a water borne pathogen in 3/444 collected samples. Prevalence of antibiotic resistant *Shigella* serogroups was identified as a major pathogen in hospitalized patients in Southern Trinidad (Fitzroy et al., 2007). *Shigella* serogroup 5 was responsible for 10% of the diarrhea in children younger than 10, while *S. sonnei* was responsible for 75%, *S. boydii* for 4.5%, and *S. dysenteriae* for 1.8% of the diarrhea in children older than 10 years old (Fitzroy et al., 2007). *S. flexneri* was more prevalent in adults and caused 85% of the diarrheas observed in hospitalized adults. The isolates in Fitzroy et al.'s (2007) study were multi drug resistant and sensitive only to ciprofloxacin and gentamicin. An infectious dose of *Shigella* is as low as 10-100 cells per ml, which is above 10 to 40 cells per 100 ml observed five times during our study (Table 1).

Enterobacter cloacae, another opportunistic pathogen typically present in soils and beneficial to plants, is also known to cause urinary tract infections, meningitis, and pneumonia in immune compromised or young patients (Liu et al., 2013). Multiple genes for antibiotic resistance were identified in the genome of *E. cloacae* (Liu et al., 2013). *E. cloacae* was also commonly present in drinking water: it was isolated and identified four times during 2013 at cell numbers ranging between 10 and 50 cells per 100 ml .

During the studied period there were no fecal indicators detected in 85% of the drinking water samples; however, gram negative bacteria were encountered and identified in 15% of the samples. Most of the species were opportunistic pathogens of environmental origin and did not represent a risk to the quality of potable water depending on the infectious dose and prevalence. Some bacterial species detected

were opportunistic pathogens and had the potential to be multi-drug resistant. However they did not represent a risk to the health of non-immune compromised individuals.

Submitted by Karla Farmer, Makeda Matthew and Svetlana Kotelnikova

Undergraduate and Graduate Research in Genomics

As of January 2015, there is still a major challenge to annotate microbial genomes



Spring 2014 SGU Undergraduate IMG-ACT participants.

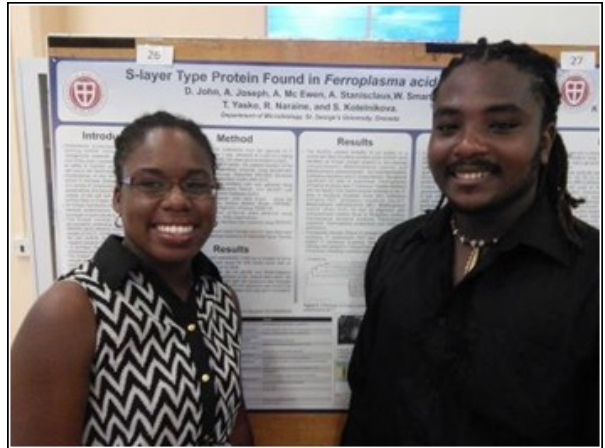
and metagenomes (ASM). SGU candidates studying Conservation Biology, Marine Biology and Genetics are trained in the use of the Annotation Collaboration Toolkit (ACT), developed by the Human Genome



Fall 2014 SGU Faculty & Undergraduate Genome project participants.



All about genome of *Ferroplasma* poster discussion group, including SOM and SAS students and faculty at SGU Research Day 2014.



SAS candidates Antonia Stanislaus and Wayne Smart present their research on unique protein coding S layer, which was earlier unknown in *Ferroplasma*.

Consortium Institutes in collaboration with the University of Hiram Geni-ACT and SGU faculty. The SGU students have been involved in the genomic study of the extremophilic *Archaeum Ferroplasma acidarmanus* Fer1, by modeling functions for hypothetical genes using the IMG and GENI ACT platforms. *F. acidarmanus* represents a mesophilic *Euryarchaeota* that thrives at pH between 1 and 2.5. In addition to the ACT, we extended the list of bioinformatic tools and created our own WIKI-based toolbox using PB Works SGU Genetics site. The results of the research

performed since 2010 have been reported on sgugenetics.pbworks.com webspace in folders designated for Gene Annotation in at the end of each term, therefore being available for the scientific community. The forum PB Works SGU Genetics provided to the students the opportunity to present their discoveries while practicing their scientific writing skills. Since Fall 2010, the project at SGU has enabled 245 undergraduates to experience the



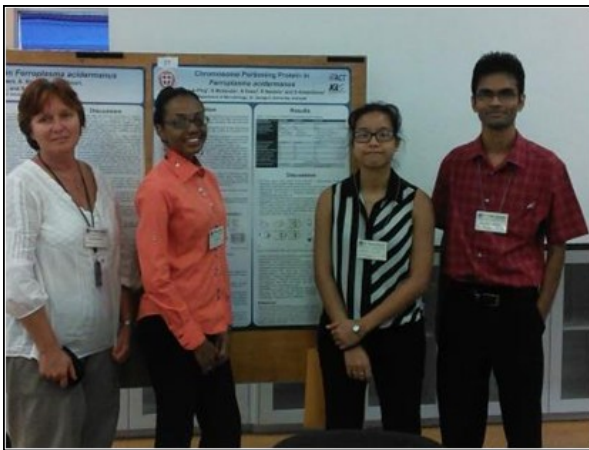
Medical candidate Mr. Bishoy Elgallab is presenting his paper during the SGU Research Day on



(L to R): R. Naraine, MS (SGU), D. Greenidge, E. Etherington, S. Ajao, & Dr.Kotelnikova presenting a poster on Cupin protein in *Ferroplasma* during the SGU Research Day in True Blue, September, 20, 2014.

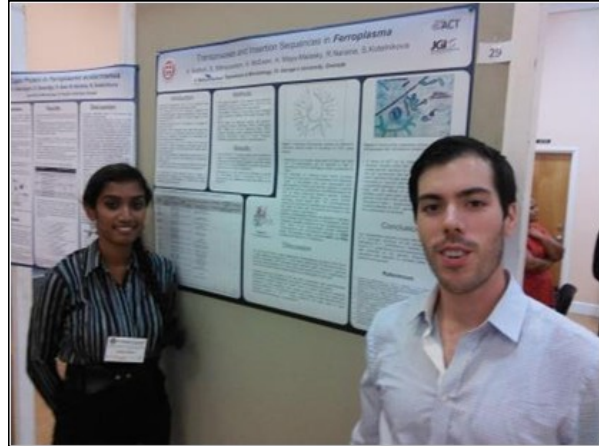
bioinformatic research using 320 hypothetical protein genes. During the year of 2014, fifty-eight undergraduate students participated in the project. They worked using hypothesis- and evidence-based research while using the statistically established criteria.

The research of the students and faculty resulted in the successful annotation of multiple genes within the *Ferroplasma* genome. The undergraduate SAS student participants worked in small groups under



(L to R): Dr. Kotelnikova with SGU Pre-med students, N. Ross & K. Lee-A-Ping, and R. Naraine presenting posters on new chromosome partitioning proteins in *Ferroplasma*, at the SGU Research Day 2014.

the supervision of their Genetic's Professor, Dr. Kotelnikova, PhD in Microbiology, Mr. Naraine, MS in Microbiology and a teaching assistant. In addition to the discovering new functions for previously hypothetical genes, the students are annotating biochemical pathways by filling the informational gaps of previously unannotated enzymatic proteins. The students who discover new functions for their protein-coding genes are invited to submit an abstract for the SGU Research Day for a poster or oral presentation. At that time they start the Schools of Medicine or Veterinary Medicine or start their



SGU medical students, S. Bukkuri, and H. Mayo-Malasky, presenting their study of transposition in *Ferroplasma*.

appointed jobs. This practice provided twenty individuals to give talks at the SGU Research Day 2014. One of the topics presented during the Research Day was by Jean Marc Pierre, Sean Harford, Bishoy Elgallab, Karla Farmer, Ravindra Naraine and Svetlana Kotelnikova. This research involved, Chorismate Mutase in *Ferroplasma acidarmanus*, revealing a unique enzyme providing the *Archaeum* with ability to produce tryptophane. The other poster dealt with the discovery of a potentially new, earlier unknown protein coding for S-layer subunit.

Submitted by Svetlana Kotelnikova & Ravindra Naraine

Preliminary Results into the Expression of Selected Danger Associated Molecular Patterns (DAMPs) in Two Types of Canine Tumours

Cancer has been dubbed a major cause of death in both humans and animals, with between 15 and 30% of individual dogs dying from cancer. The Danger Associated

Molecular Patterns (DAMPs) signal, amongst others, is through pattern recognition receptors such as toll-like receptors. DAMPs are a diverse group of endogenous compounds released or produced in the process of cell death or stress. Many DAMPs exist, amongst which are heat shock proteins (Hsps), ATP, BCL2, high mobility group B1 (HMGB1), calreticulin (CRT) and many others. The DAMPs studied in this project (Hsp60, 70 and 90, and HMGB1) all signal through Toll-like receptor (TLR) 2 and/or 4. Recent evidence suggests a role for both specific heat shock proteins (Hsp) and high mobility box group 1 (HMGB1) in cancer in humans. In the dog, abnormal levels of heat shock protein 90 have been described in osteosarcomas and mammary tumours. Furthermore, the overexpression of HMGB1 was confirmed in canine lymphoma. In this report we describe the relative expression of HMGB1, Hsp60, Hsp70 and Hsp90AA1 in canine sarcomas and transmissible venereal tumours (CTVT).

The aims of this study were to determine the relative expression of High Mobility Group B1 and Hsp60, Hsp70 and Hsp90AA1 in canine sarcomas and transmissible venereal tumours.

Seven CTVT and seven sarcoma samples were used for this study and collected from research studies conducted at St. George's University (CTVT) and Cambridge University (sarcomas). Both CTVT and Sarcoma tissues were stored in RNAlater at -80° until further processing. RNA was extracted using RNeasy Minikit (Qiagen), according to the manufacturer's instructions. Extracted RNA was quantified in each sample using a light spectrophotometer (NanoDrop) and stored at -20°C. Extracted RNA was then converted into cDNA using a high capacity RNA to cDNA kit (Applied Biosystems) according to the

manufacturer's instructions. Finally, RT-PCR (Rotorgene 3000 by Qiagen) were run on cDNA of the sarcoma samples labelled 1-7 and CTVT samples labelled 207, 342, 345, 198, 205, 336, 204 isolating for genes Hsp60, Hsp70, Hsp90AA1 and HMGB1. Delta Ct and Delta-Delta Ct values for sarcoma tumours and CTVT tumours were calculated. The delta-delta ct values were used to calculate an increase or decrease of expression of the genes of interest in each tumour type. The sarcoma tumours were used as the control for this study to calculate Delta Ct and Delta-Delta Ct.

This study compared the expression of

Gene of Interest	Expression of Gene of Interest in Sar1-3 compared to 207,342,345 CTVT Samples	Expression of Gene of Interest in Sar4-7 compared to 198,204,205, 336 CTVT Samples
HMGB1	9	6.44
Hsp60	2.91	4.41
Hsp70	0.81	1.24
Hsp90AA1	1.02	1.39

Comparison of Gene of Interests in Sarcoma and CTVT samples

HMGB1, Hsp60, Hsp70 and Hsp90AA1 amongst seven sarcoma tumour samples and seven CTVT samples. In this study, the mean of sarcoma Ct values of each run was used as controls. The expression of HMGB1 in the sarcoma samples was markedly higher than in the CTVT samples. Expression of Hsp60 in the sarcoma samples was notably elevated compared to the CTVT samples. The expression of both Hsp70 and Hsp90AA1 were unremarkable for both sarcoma samples and CTVT samples.

In our study, the expression of HMGB1 was profoundly higher in the sarcoma tumour samples than in the CTVT tumour samples. The over expression of

HMGB1 has been detected in mammary carcinoma, tumours of the gastrointestinal tract, hepatocellular carcinomas and malignant lymphomas in humans and in dogs [9]. The study by Meyer and colleagues showed that the expression of HMGB1 was higher in canines with lymphoma compared to healthy canine patients [9]. The lower expression of the HMGB1 gene amongst CTVT type tumours in our study may be a unique characteristic to the development and progression of CTVT compared to sarcoma. The increased extracellular expression of HMGB1 has been associated with increased proliferation and migration of cancer cells as well as increased stem cell self-renewal and inhibition of tumour cell apoptosis [9]. It may be beneficial to study the variability of expression of HMGB1 amongst various types of tumours and its role in tumour genesis; this is part of an ongoing study. Our results show that the expression of Hsp90 was the same across both CTVT and sarcoma tumour types. One study noted that Hsp90 immunoreactivity was detected in all osteosarcoma tumour cases and could be used to target canine osteosarcoma therapy. [3]. This could mean that Hsp90 expression may not be specific to osteosarcoma tumour types only and may not play a significant role in isolating and targeting (osteo-) sarcoma and CTVT tumours for chemotherapeutic purposes. Finally, this study showed that the expression of Hsp60 gene amongst sarcoma tumours was moderately higher than the expression of the same gene in CTVT. It would be interesting to assess the function and role of Hsp60 in the development of canine tumours, specifically canine sarcomas. The results from this study warrant a larger scale investigation into a wider variety of tumour types and genes and

this is currently ongoing.

Submitted by Arno Werners

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

We continue to investigate the cause of a significant mortality of farmed tilapia in Ecuador (Figure 1). To give some idea of the scale of the problem, last year (2013) saw the loss of approximately 23 million fish. Although the fish probably die due to a protein-losing enteropathy, the most distinctive lesion in dead fingerlings is the presence of syncytia within an inflamed liver, and accordingly we have named the disease "syncytial hepatitis". Working in



Figure 1. Aerial view of tilapia grow-out ponds - part of the 4500 acre fish farm in Ecuador.

conjunction with Dr. Jorge del Pozo in Edinburgh University, Scotland, and Dr. Ian Lipkin's viral discovery group in Columbia University, New York (with whom we have a formal agreement) we have managed to demonstrate in affected livers the presence of large numbers of virions (Figure 2). High throughput sequencing has confirmed the presence of several viruses, and we are in the process of sorting these out, and trying to establish their role in the pathogenesis of

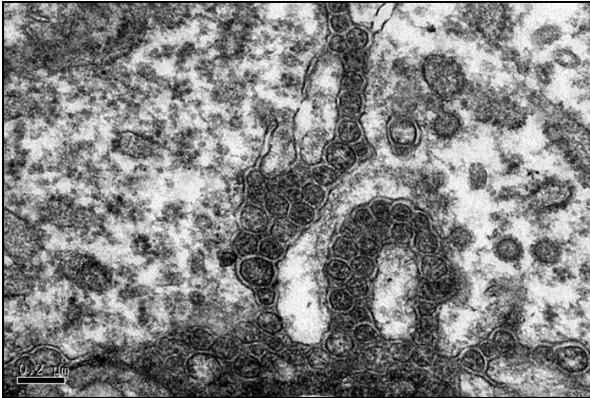


Figure 2. Electron micrograph of liver from affected tilapia, showing the presence of large numbers of viral particles (arrow).

this disease. Suffice to say at this stage that using molecular tests we are now able to identify infected as well as exposed but resistant strains of fish. This capability should enable us to start tracking down the source and spread of the infection, and to investigate the role of possible vectors. Drs. Cheetham-Brow and Kabuusu in SVM, Pathobiology, are both part of the SGU research team effort.

A large project is underway in Canada, comparing the diseases of farmed versus wild fish in British Columbia. This work is being carried out in conjunction with scientists from Pacific Biological Station, Nanaimo (Dr.

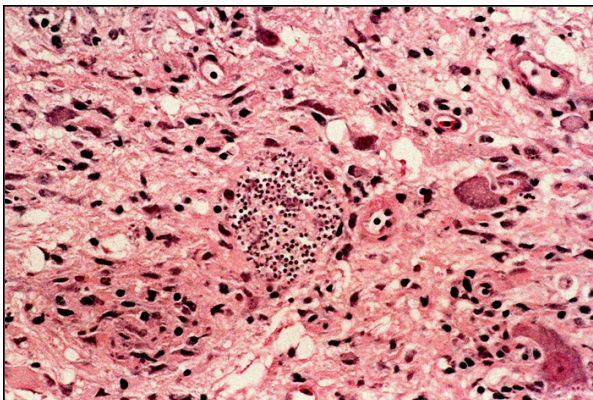


Figure 3. H&E-stained micrograph of brain from salmon showing a degree of gliosis and the presence of large numbers of 1-2 micron microsporidian parasites (arrow).

Kristi Miller), and Pacific Salmon Foundation, Vancouver (Dr. Brian Riddell), as well as with veterinarians from Atlantic Veterinary College, Prince Edward Island (Drs. Larry Hammell and Ian Gardner). Initial stages of the study involved the screening by histopathology of large numbers of salmonid fish. This has revealed some interesting, although not necessarily novel lesions, one of them being an encephalitis associated with microsporidian parasites (Figure 3).

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 extension 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.

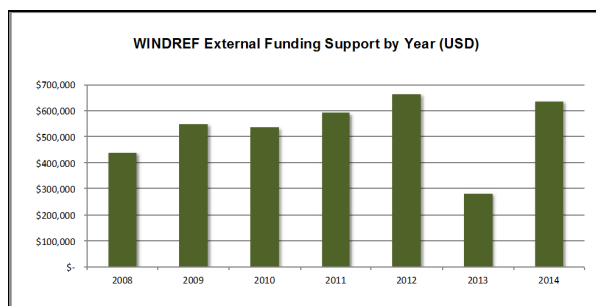
There are a number of bee research centers around the globe, including OIE Reference Labs in France and Germany, one associated with the USDA in the United States, one in South Korea, two major centers in Canada (University of Guelph and the University of Alberta), and one in Argentina. As such, Grenada 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 ECRBEC 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 ECRBEC will serve as a regional center for the study of entomology with a specific focus on agriculture/apiculture. It will provide a forum for scholarly directed and self-directed study, and provide opportunities for researchers and educators to collaborate (network) share and develop best practice in apiculture.

Submitted by Randall Waechter and Dwayne Mitchell

External Grants and Funding

We thank all of the donors who have made WINDREF's work possible in 2014:

- American Humane Association
- Bartholomew J. Lawson Foundation for Children, with Reach Grenada
- Boeing Company (for GEMS/Goats)
- Caribbean Public Health Agency (CARPHA)
- Charles and Lisa Modica
- Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) - Renewable Energies and Energy Efficiency in the Caribbean (REETA)
- Dimmitt Garrison Foundation (for GEMS/Goats)
- 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)
- Grand Challenges Canada – Saving Brains Program
- Inter-American Institute for Cooperation on Agriculture - US Department of Agriculture
- Produmar, S.A.
- International Development Research Centre (IDRC)
- Jewish Communal Fund
- The Nature Conservancy (TNC)
- Nova Southeastern University – Kenyon Award
- 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



2014 Grant Applications

Twenty-four grant applications were submitted to external funding agencies in 2014, with a total potential value of \$6,456,839 USD. As of December 31, 2014, nine of those applications were successful (green typing), four were not funded (red typing), and eleven were outstanding (black typing) (listed by Principal Investigators):

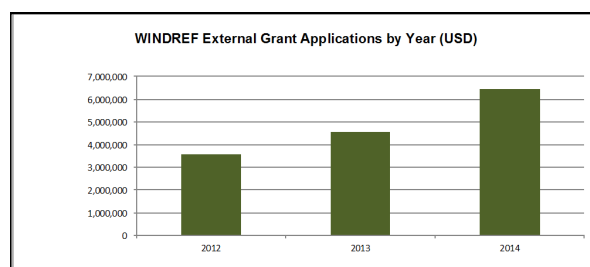
- Waechter, R. & Landon, B. (2014). A Community-based Conscious Discipline Program to Reduce Corporal Punishment in the Caribbean. Grand Challenges Canada - Saving Brains Program.
- Morrall, C. & Waechter, R. (2014). In-country Project Coordinator for the Eastern Caribbean Marine Managed Areas Network (ECMMAN) Project. The Nature Conservancy.
- Jalonen, T. & McGill, F. (2014). Tools to Increase Awareness of Sexual Health Issues Among Adolescent Girls in Grenada, West Indies. Grand Challenges Explorations.
- Werners, A. (2014). Student Fellow Stipend Agreement. American Humane Association.
- Elci, O., Mitchell, G. & Pate, E. (2014). Building Capacity to Develop a Carcinogen Exposure (CAREX) Surveillance System in the Caribbean. Pan-American Health Organization.
- Sealy, H. (2014). Master Plan and Final Designs for a Rum Distillery Effluent Treatment and Energy Recovery System. Organization of American States.
- Edwards, O. & Bidaisee, S. (2014). Addressing Agriculture Farm Land Degradation and Mitigating Occupational Safety and Health Hazard Exposure to Agriculture Workers. Organization of American States.
- Easter-Pilcher, A. (2014). Conservation Leadership in the Caribbean (CLiC). Fish and Wildlife Service - Division of International Affairs.
- Kotelnikova, S., Morrall, C., Sealy, H. & Waechter, R. (2014). The Sustainable Financing and Management of Eastern Caribbean Marine Ecosystems Project: Woburn Clarkes Court Bay Demonstration Site Concept. The Nature Conservancy.
- Macpherson, C., Jungkind, D. & LaBeaud, A. D. (2014). Tracking the spread of chikungunya virus in the Caribbean. National Institutes of Health.
- Scribner, R. & Radix, R. (2014). Determining Obesogenic Factors: A Developmental Multilevel Approach. National Institutes of Health.
- Thomas-Purcell, K. & Richards, C. (2014). Grenadian Women's Perspectives on Screening for Breast and Cervical Cancer. Nova Southeastern University - Kenyon Award.
- Forde, M., Tomsons, S., Gomez, A. & Morrison, K. (2014). Ethical Issues and Challenges in Global Population Health Research Partnerships. International Development Research Centre.
- 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).

- Waechter, R., Mitchell, D. & Aire, T. (2014). Restoration and Community Co-Management of Mangroves (RECOMM) in the Northern Telescope Coastal Area. GIZ.
- Waechter, R., Solis-Garcia, K., Gellert Paris, A. & Edwards, O. (2014). Building Climate Change Capacity among Young Grenadians for Local Adaptation and International Mitigation Initiatives. United Nations Development Programme (UNDP) - Integrated Climate Change Adaptation Strategies (ICCAS).
- Elci, O., Bidaisee, S., Akpinar-Elci, M., Roberts, D., Cutz, A. & Edwards, O. (2014). Implementing Solar Mace Dryers for Sustainable Agricultural Development and Climate Change Adaptation in Grenada. Global Environment Facility (GEF) - Small Grants Programme.
- Elci, O., Bidaisee, S., Akpinar-Elci, M., Roberts, D., Cutz, A. & Edwards, O. (2014). Preventing Land Degradation and Supporting Sustainable Agricultural Development by Replanting Nutmeg Trees - Global Environment Facility (GEF) Small Grants Programme.
- Waechter, R. & Tyrrell, J. & Tyrrell, K. (2014). Bamboo as a Sustainable Charcoal Source: Addressing Deforestation and Land Degradation - Global Environment Facility (GEF) Small Grants Programme.
- Mitchell, G., Macpherson, C., Thomas, S. & Strasswimmer, J. (2014). Skin Cancer and Sun Protection Behavior in Grenada. Caribbean Public Health Agency (CARPHA) & National Cancer Institute (NCI).
- Thomas-Purcell, K., Richards, C. & Primus-Joseph, M. (2014). Perspectives on the

Uptake of Breast, Cervical, and Prostate Cancer Screening in the English Speaking Windward Islands: A Collaborative Approach. Caribbean Public Health Agency (CARPHA) & National Cancer Institute (NCI).

- Bahadoor-Yetman, A., Baldwin, A., Jalonen, T., McBarnette, B. & Lambert, G. (2014). Measuring the Burden of HPV and HTLV in Grenada: Laying the Groundwork for Cancer Prevention and Control in Grenada and the Eastern Caribbean. Caribbean Public Health Agency (CARPHA) & National Cancer Institute (NCI).
- Nimrod, S., Waechter, R. & Morrall, C. (2014). Coral Reef and Fish Assessments in the Grand Anse Area in Grenada: Eastern Caribbean Marine Managed Areas Network. The Nature Conservancy.



Ongoing Externally Funded Projects

There were sixteen ongoing funded projects in 2014 with a total multi-year value of \$2.1 million USD:

- 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. (Ongoing). Reach Institute for Children at SGU. Reach Grenada. \$69,181.
- 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. \$159,000.
 - 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 for Children. \$41,903.
 - Noël, T. (2006-) Genetic Correlates of the Addictive Diseases: Cocaine, Alcohol and Marijuana Addiction - Grenada, W.I., Dr. Mary-Jeanne Kreek, Kreek Laboratory, Rockefeller University. \$40,000.
 - Radix, R. (2012-2015). Grenada School Nutrition Study. International Development Research Centre. \$320,000.
 - 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. \$70,835.
 - Morrall, C. & Waechter, R. (2014-). In-country Project Coordinator for the Eastern Caribbean marine Managed Areas Network (ECMMAN) Project. The Nature Conservancy. \$23,569
 - 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.
 - 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.
 - 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.
 - Waechter, R., Mitchell, D. & Aire, T. (2014-2015). Restoration and Community Co-Management of Mangroves (RECCOMM) in the Northern Telescope Coastal Area. GIZ. \$9,895

Past Research Projects

Non-communicable Diseases

- Angiotensin converting enzyme and angiotensinogen gene polymorphisms in the Grenadian population: relation to hypertension
- Development of a decision rule for screening Obstructive Sleep Apnea and its epidemiologic relevance to the people of Grenada
- Prevalence and associated risk factors

- of hypertension in a sample population of native Caribbean's in Grenada, West Indies
- Assessing the prevalence of diabetic complications by examining type I and type II adult diabetics for signs of retinopathy, neuropathy, nephropathy and dermatological changes associated with poor glucose control within the native Caribbean population of Grenada
 - Hypertension management and control in two Caribbean countries
 - Assessment of the effectiveness of broad-spectrum treatment to children with protozoan and nemathelminthic parasitic infections on diarrhea and school attendance
 - The effects of iron-deficiency anemia on cognition and behavior in infants
 - Diurnal variation of urinary endothelin-I and blood pressure: related hypertension
 - Alcohol consumption in Grenada
 - The incidence and mortality of cancer in Grenada over the ten year period: 1990-1999
 - The prevalence of abnormal haemoglobin traits in Grenadian secondary school adolescents
 - Knowledge, attitudes, beliefs and practices of sickle cell anemia in Grenadian primary and secondary school children
 - Decompression sickness among the indigenous fishing population in Grenada: Assessing the burden of disease
 - WINDREF / SGU Hurricane Relief
 - Spice Research Program
 - Sulfate-reducing bacteria in oxidized freshwater of tropical mangroves
 - Novel antibiotics from tropical marine environments: drug development in Grenada
 - Study of the mutacin C-7A
 - Gram-negative bacteria isolated from aquatic environments of Grenada (61.4° W, 12.0°N), West Indies
 - Identification of bacteria producing antibiotics isolated from deep marine biofilms of Grenada
 - SGU Environmental Testing Unit (ETU)
 - Post-hurricane water surveillance in problematic areas of Grenada
 - Evaluation of the relocation potential for villagers residing in Queen Elizabeth National Park, Uganda
 - Study of the calls of the spotted hyena at feeding
 - Survey on the attitude of villagers in Queen Elizabeth National Park, Uganda towards the threat of lions, leopards and hyenas
 - Epidemiology of human injuries resulting from wildlife in ten villages within Queen Elizabeth National Park, Uganda
 - Rural Ugandan village perspective on lion, leopard and hyena conservation
 - Epidemiology of human injuries by wildlife in six villages within Queen Elizabeth National Park, Uganda
 - Prevalence of *Campylobacter fetus* subspecies *venerealis* and other microorganisms in the reproductive tracts of cattle from the southern region of Santo Domingo, Dominican Republic
 - Antimicrobial properties of skin secretions from *Eleutherodactylus johnstonei* on bacteriological isolates
 - Examination and analysis of prostate cancer in Grenada
 - A Church-based intervention to improve hypertension prevention and control among women in Grenada
 - Occupational Health Problems among Nutmeg Factories Workers, SGU Small

- Research Grant Initiative
- Sport for Health Programme
 - Grenada School Nutrition Study: Evidence to Inform Policy
 - Genetic Correlates of the Addictive Diseases: Cocaine, Alcohol and Marijuana Addiction - Grenada
 - Promoting Resilience Among Medical Students: A Comparison of Mindfulness, Yoga, and Exercise

Infectious Diseases

- Investigation of the prevalence of SIV in the mona monkey (*Cercopithecus mona*) in Grenada
- Seroprevalence of HIV-I and HIV-II in pregnant women in Grenada, W.I. – their knowledge of AIDS and their exposure hazards to the virus
- A cross sectional study of the current status of *Schistosoma mansoni* in St. Lucia by field surveys and supplementary data collection
- Identification and characterization of hantaviruses among the mammal population of Grenada
- HIV/AIDS health education and evaluation program in Grenada
- The seroprevalence of *Toxoplasma gondii* in a population of pregnant women and cats in Grenada, West Indies
- The efficiency of diagnosing women of *Toxoplasma gondii* using PCR techniques in comparison with ELISA
- Dengue virus in Grenada: seroprevalence and associated risk factors
- A current appraisal of dengue virus in Grenada – serotype analysis and vector assessment
- A site receptivity study determining the threat of reintroduction of malaria into Grenada through the study of Anopheline spp. mosquito vectors
- Chlamydial infection among STD clinic attenders in Grenada
- Fever in Grenada
- Mosquitoes and tourism in Grenada
- Effectiveness of a formula feeding/weaning intervention program in preventing transmission of HTLV-1 from seropositive mothers to newborns in Grenada
- A multi-center longitudinal research study of the behavioral significance of the prevalence of HIV-1 infection in pregnant women and their babies on the islands of Grenada and St. Vincent
- A multi-center longitudinal research study of the ethical analysis of informed consent of the prevalence of HIV-1 infection in pregnant women and their babies on the islands of Grenada and St. Vincent
- Determining the role of IL-15 in mediating function of viral-specific CD8+ T cells in the myelopathogenesis of HTLV-1: symptomatic versus asymptomatic patients
- Intestinal protozoan infections in 6-12 year old children in Grenada
- Intestinal helminth infections in 6-12 year old children in Grenada
- The prevalence of intestinal parasites in school children in rural Guyana
- The prevalence of filariasis and its effects on children aged 8-14 in the central corentyne region of rural Guyana
- The prevalence of streptococcal infection in school children aged 5 – 15 years in Grenada, Carriacou and Petit Martinique
- Studies examining the elimination of lymphatic filariasis as a public health problem in Guyana

- Seroprevalence of heartworm infection in dogs in Grenada
- Dengue in Grenada
- Assessing the potential risk factors of dengue and dengue hemorrhagic fever in the tri-island state of Grenada, Carriacou and Petit Martinique
- A comparative study to find out if there is an association between sexual practices and knowledge in adult populations of Botswana and Grenada with the prevalence of HIV/AIDS
- HIV/AIDS in rural Botswana differentiating between informing and educating
- Evaluating the level of perceived fear and desensitization towards HIV/AIDS in Botswana
- Rheumatic Fever in Grenada
- Streptococcal program in St. Vincent
- Isolating T cells from Rheumatic Fever positive blood: immunofluorescent assay of T lymphocytes via fluorescently labeled monoclonal antibodies
- Possible genetic predisposition to Rheumatic Fever: demonstrating the inheritance fashion of non-HLA B lymphocyte alloantigen D8/17, a marker for Rheumatic Fever
- ELISA antibody titres against group A streptococcal M protein moiety and cell wall N-Acetyl-D-Glucosamine in Grenadian Rheumatic Fever patients
- Evaluating the effectiveness of educational methods in the prevention of Rheumatic Fever and knowledge, awareness and practices
- Prevalence of intestinal helminth infections in rural Grenadian school children
- Cystic echinococcosis in Morocco and Uganda
- Elimination of Lymphatic Filariasis in Guyana Program
- Neglected Tropical Diseases and Rheumatic Fever in Grenada: A project to prevent/eliminate helminthic and rheumatic fever infections among children (5-15 years of age)

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 Protected Area Mooring Buoy Installation Project
- Genome annotation in microorganisms and metagenomic libraries as a part of an undergraduate curriculum
- Molecular identification of marine *Vibrio* isolated in Grenada
- Occurrence of Antibiotic-resistant Fecal Indicators in Coastal waters of Southern Grenada
- Revitalizing the Nutmeg Industry in 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
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Books (3)

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Abstracts/Presentations at International Conferences

Oral Presentations

- Charles, R.N., & Nardi, N. (2014). Are Necessity Based Entrepreneurs more motivated than Opportunity Based Entrepreneurs in developing economies? - The Dominican Republic and Grenada. Institute of Strategic and International Studies-ISIS And International Academy for Advancement of Business Research-IAABR Conference, Miami Beach, FL, USA.
- Charles, R.N., & Nardi, N. (2014). Brand Endorsement and COO: An exploration of the Value of Multicultural Celebrity Brand Endorsers. Academy of International Business Southeast USA 2014 Annual Conference, Miami, Florida, USA.
- Charles, R.N., (2014). The Cultural Parallax: An examination of the paradox that is national culture. Academy of International Business 2014 Annual Conference, Vancouver, Canada.
- Herath, T.K., Bron, J.E., Ashby, A., Ferguson, H.W. et al. (2014). Experimental infection of salmonid alphavirus 1 in Atlantic salmon fry. Presented at the American Fisheries Society Aug.31-Sept. 4, 2014, Corvallis, USA.
- Herath, T.K., Ferguson, H.W., Weidman, M.,

- Bron, J.E., Thompson, K.D., Adams, A. & Richards, R.H. (2014). Pathogenesis of experimental salmonid alphavirus in vitro: an ultrastructural insight. Presented at the 9th International symposium on viruses of lower vertebrates. 1-4 October, 2014; Malaga, Spain.
- Macpherson, C.C. (2014). Applying for Research Ethics Review. Presented at the National Cancer Institute (NCI) Caribbean Grant Writing Workshop (CGWW). The Radisson Hotel, St Georges, Grenada 17-19 Sept 2014.
- Macpherson, C.C. (2014). Establishing and Administering Research Ethics Committees (REC); Responsibilities of Hosts, Sponsors, Investigators, and RECs. Presented at BSEC Workshop. University of Technology, Kingston, Jamaica. 12 September 2014.
- Macpherson, C.C. (2014). Health and development. Presented at the 12th World Congress of the IAB Symposium on Global Bioethics and Climate Change: Latin America and the Caribbean. Mexico City. 25-27 June 2014.
- Macpherson, C.C. (2014). IRB reviewer checklists: Mock IRB. Presented at BSEC Workshop. University of Technology, Kingston, Jamaica. 12 September 2014 (presented as a summation of the workshop).
- Macpherson, C.N.L. (2014). Role of ultrasound in the epidemiology of parasitic diseases. Short course on ultrasound and tropical medicine: Approved and recognised by WHO, Pavia University, Pavia, Italy.
- Nardi, N., Fang, T., & Charles, R.N., (2014). Embracing and Managing Contradictions: How Emerging Markets MNEs can use the Yin Yang Perspective as a strength to leverage and achieve Ambidexterity. Academy of International Business Southeast USA 2014 Annual Conference, Miami, Florida, USA.
- Sharma, R. N., Bhaiyat, M, I,, DeAllie, C., Chikweto, A., Tiwari, K., Dubey, J.P., Macpherson, C.N.L. (2014). Surveillance of *Toxoplasma gondii* in Grenada, West Indies. Platform presentation as lead paper at the Indian Association of Veterinary Pathologist congress, held at Veterinary school, University of Gujarat, Anand India; 13-15th November, 2014.
- Waechter, R., & Ma, V. (2014). Estimating the Social Priority of Addressing Violence Against Women. Presented at the 12th World Congress of Bioethics: Mexico City, Mexico.
- Wekerle, C., Waechter, R., & The MAP Research Team (2014). Suicide-Related Behaviors Among Adolescents Involved with Child Protective Services (CPS): The Maltreatment and Adolescent Pathways (MAP) Longitudinal Study. Presented at the joint American Academy of Child and Adolescent Psychiatry/Canadian Academy of Child and Adolescent Psychiatry Joint Annual Meeting: Toronto, Canada.

Poster Presentations

- Amadi, V., Sylvester, W.R.B., Hegamin-Younger, C., Pinckney, R., Macpherson, C. N. L., McKibben, J.S., Bruhl-Day, R., Hariharan, H.(2014). Occurrence of antibiotic resistant *Escherichia coli* in green iguana

(iguana iguana) in Grenada, West Indies. Poster Presented at the SFAM -MVNA Summer conference . The Grand, Brighton, UK; 30 June- 3July, 2014.

Amadi, V., Sylvester, W.R.B., Hegamin-Younger, C., Pinckney, R., Macpherson, C.N. L., McKibben, J. S., Bruhl-Day, R., Hariharan, H. (2014). Wild and domestic green iguanas from Grenada are reservoir for salmonella species: Prevalence, serovars and antibiotic susceptibility. Poster presented at the International union of Microbiological Societies congresses, Montreal, Quebec, Canada, July 27-August1, 2014.

Fitzpatrick, D., Pinckney, R., Mitchell, D. (2014). Identification of viral and microsporidian pathogens infecting Apis mellifera honey bees in Grenadian apiaries. Poster presentation at 7th Annual Caribbean bee conference, University of West Indies. Croix, USVI; May 26-30, 2014.

Journal Reviews and Board Membership

Dr. Muge Akpınar-Elci: American Journal of Respiratory and Critical Medicine, The Archives of Environmental and Occupational Health, Chest.

Dr. Francis Fakoya: Journal of Anatomical Sciences

Dr. Martin Forde: Environmental Monitoring and Assessment.

Dr. Svetlana Kotelnikova: Earth Science Reviews, International Journal of Systematic and Evolutionary Microbiology

Dr. Marios Loukas: Clinical Anatomy (Ad Hoc Reviewer, 2003-2005; Associate Editor, 2006-2012; Co-Editor, 2012-present), Surgical and Radiologic Anatomy (Reviewer, 2003-present, International Advisory Board 2006-present), Neuroanatomy (Associate Editor, 2003-present), International Journal of Experimental and Clinical Anatomy (International Advisory Board, 2007-present), Clinical Medicine Case Reports (Honorary Editorial Board, 2008-present), Turkiye Klinikleri Journal of Medical Sciences (Advisory Board 2009-present), Journal Biomedicine International (Co-Editor, 2009-present), Polish Annals of Medicine (Scientific Board, 2010-present), European Journal of Anatomy (Co-Editor, 2011-present), European Journal of Surgical Research (Reviewer, 2006-present), Journal of Brachial Plexus and Peripheral Nerve Injury (Reviewer, 2007-present), Journal of Anatomy (Reviewer, 2007-present), Pain Practice (Reviewer, 2007-present), Medical Science Monitor (Reviewer, 2007-present), Indian Journal of Plastic surgery (Reviewer, 2007-present), American Journal of the Medical Sciences (Reviewer, 2007-present), Clinical Rehabilitative Tissue Engineering Research (Reviewer, 2007-present), Life Sciences (Reviewer, 2007-present), Current Urology (Reviewer, 2007-present), World Journal of Surgery (Reviewer, 2008-present), World Journal of Emergency Medicine (Reviewer, 2008-present), Acta Neurochirurgica (Reviewer, 2008-present), Turkiye Klinikleri. Journal of Ophthalmology (Reviewer, 2009-present), Journal of Clinical Medicine and Research (Reviewer, 2009-present), Anatomical Record (Reviewer, 2009-present), International Journal of Cardiology (Reviewer, 2009-present), Journal of Neurosciences in Rural Practice (Reviewer, 2009-present), Case reports in Medicine

(Reviewer, 2010-present), Malaysian Journal of Medical Sciences (Reviewer, 2010-present), Journal of Clinical Anesthesia (Reviewer, 2010-present), European Journal of Radiography (Reviewer, 2010-present), Pace (Reviewer, 2010-present), Anatolian Journal of Cardiology (Reviewer, 2010-present), Journal of Hand and Microsurgery (Reviewer, 2010-present), Medical Science Educator (JIAMSE) (Reviewer, 2010-present), Anatomical Science International (Reviewer, 2010-present), Medical Hypotheses (Reviewer, 2010-present), Archives of Medical Science (Reviewer, 2011-present), Case reports in Radiology (Reviewer, 2011-present), Anatomy Research International (Reviewer, 2011-present), International Journal of Medicine and Medical Sciences (Reviewer, 2011-present), Advances in Physiology Education (Reviewer, 2011-present), Intercontinental Journal of Medicine and Medical Sciences (Reviewer, 2012-present), Croatian Medical Journal (Reviewer, 2012-present), Osteoarthritis and Cartilage (Reviewer, 2012-present), Clinical Oral Implants Research (Reviewer, 2012-present), BMC Medical Education (Reviewer, 2012-present), Circulation (Reviewer, 2013-present), BioMedical Research International (Reviewer, 2013-present), Clinical Medicine Insights: Cardiology (Reviewer, 2013-present).

Dr. Calum Macpherson: Acta Tropica, Annals of Tropical Medicine and Parasitology, BMC Infectious Diseases, Emerging Infectious Diseases, Epidemiology and Infection, Gastroenterology, International Journal for Parasitology, Journal of the Caribbean Veterinary Medical Association, Lancet, Parasitology International, Small Animal Practice, Transactions of the Royal Society of Tropical Medicine and Hygiene, Trends in

Parasitology, Veterinary Record.

Dr. Theresa McCann: Medical Education, Injury Prevention

Dr. Clare Morrall: Revisita de Biologia Tropical (the International Journal of Tropical Biology and Conservation).

Dr. Randall Waechter: Frontiers in Human Neuroscience, Child Abuse Review, Child Welfare, Youth and Society, First Peoples Child & Family Review

Thesis Defenses (3)

Wayne Sylvester, MSc: "Prevalence and antibiotic susceptibility of Salmonella serovars and *Escherichia coli* in green iguanas (*Iguana iguana*) in Grenada" 24 March 2014

Marta Lanza-Perea, MSc: "Hemostatic parameters as clinical indicators for the presence of *Ehrlichia canis* and/or *Anaplasma platys* DNA in seroreactive clinically healthy dogs in Grenada" 2 May 2014

Karla Farmer, MSc: "Genetic Diversity and Antibiotic Resistance of Clinical and Non-Clinical Isolates of *Escherichia Coli* in Grenada" 8 December 2014

Graduate Seminars (32)

Ciaran Healy, MD, FRCS, (Plast), DCH: "The latest in skin cancer management" 29 January 2014

Ian Robertson, BVSc, PhD, MACVSc: "Controlling disease in subsistence farming situations in South East Asia" 5 February 2014

- Paul Fields, PhD: "Research Impact Metrics" 19 February 2014
- Chris Barnett, MD: "Personal fitness, health and the fight against obesity and diabetes" 21 February 2014
- David Levin, PhD: "Regulation of Osmotic Homeostasis: A Potential Strategy for Antifungal Drug Development" 26 February 2014
- Noreen Alexander, MSc: "Assessment of prevalence and severity of asthma and the frequency of the Ar16Gly polymorphism in Grenadians aged 14-17" 19 March 2014
- Karsten Pedersen, PhD: "Microbial processes in the deep biosphere: From in situ experiments to in silico simulation of microbial geochemical processes" 26 March 2014
- Clare Morrall, PhD, Leyana Romain, Julia Brunet: "An Ocean of Plastics" 2 April 2014
- June Douglas, PhD: "Medical Narratives of Death" 16 April 2014
- Nicole Taurisano, MSc. Candidate: "Streptococcus phocae infections in marine mammals: A retrospective analysis." 24 April 2014
- Shanice McKain, MSc. Candidate: "Common causes of acute diarrhea in developed and developing countries" 7 May 2014
- Trevor Paul Noël, MPH, PhD Candidate, PhD Project Proposal Defense: "Studies on the Elimination of the Neglected Tropical Diseases in the Western Hemisphere with Particular Reference to the Soil Transmitted Helminths" 14 May 2014
- Kesava Mandalaneni, MBBS, PhD Candidate, Project Proposal: "Differential expression of X chromosome in stroke patients in Grenada" 21 May 2014
- Dan Payne, MBBS, PhD Candidate, Project Proposal: "Effects of moderate exercise in Grenadian patients with pacemakers" 21 May 2014
- Kazzara Raeburn, MSc. Student, Project proposal: "Cross-sectional sonographic assessment of the Posterior interosseous nerve" 27 May 2014
- Kathleen Bubb, MSc. Candidate, Project Proposal: "Morphological and morphometric study of the abdominal inferior vena cava and certain tributaries" 27 May 2014
- Woody Davis MD JD FCLM: "The Aviation Medical Assistance Act: what's the physician's obligation?" 20 August 2014
- Todd Myers, PhD, HCLD(ABB), MB (ASCP), LCDR, USPHS Clinical Laboratory Director: "Clinical and Research Activities of the Naval Infectious Diseases Diagnostic Laboratory" 22 August 2014
- Adrien Zap, MSc Candidate, Project Proposal: "Conservation Issues Affecting Endemic Species in the Galapagos" 10 September 2014
- Jerry Mitchell, Practicum Coordinator: "Simulated Spatial and Temporal Patterns of an Influenza (H5N1) Outbreak in Grenada" 24 September 2014
- Satesh Bidaisee, DVM, MSPH: "Females in Veterinary Medicine: Why the Choice?" 1 October 2014
- Zara Ross, PhD: "Beyond the Turning Point for Research" 8 October 2014
- Neil Osheroff, PhD: "Natural Products as Topoisomerase II Poisons: The Good the Bad and the Bioflavonoids" 14 October 2014

- Kristy Fisher, MSc Candidate, Project Proposal: "Mind Manipulating Parasites" 15 October 2014
- Tita Castor, MD: "Physician Assisted Death" 22 October 2014
- Martin Forde, Sc.D., R.Eng: "Applying for an NIH grant: Essential requirements if one hopes to have at least half a chance of success!" 29 October 2014
- Ivo Boudakov, PhD: "'Emerging Trends in Molecular Diagnostics: Conceptual Shift in Clinical Assays, Tools, Technologies, and Devices" 12 November 2014
- Antonia McDonald, PhD: "Reading Old Postcards of Grenada" 19 November 2014
- Shanice McKain, MSc Candidate, Project Proposal: "Dengue: Our ability to diagnose the virus" 10 December 2014

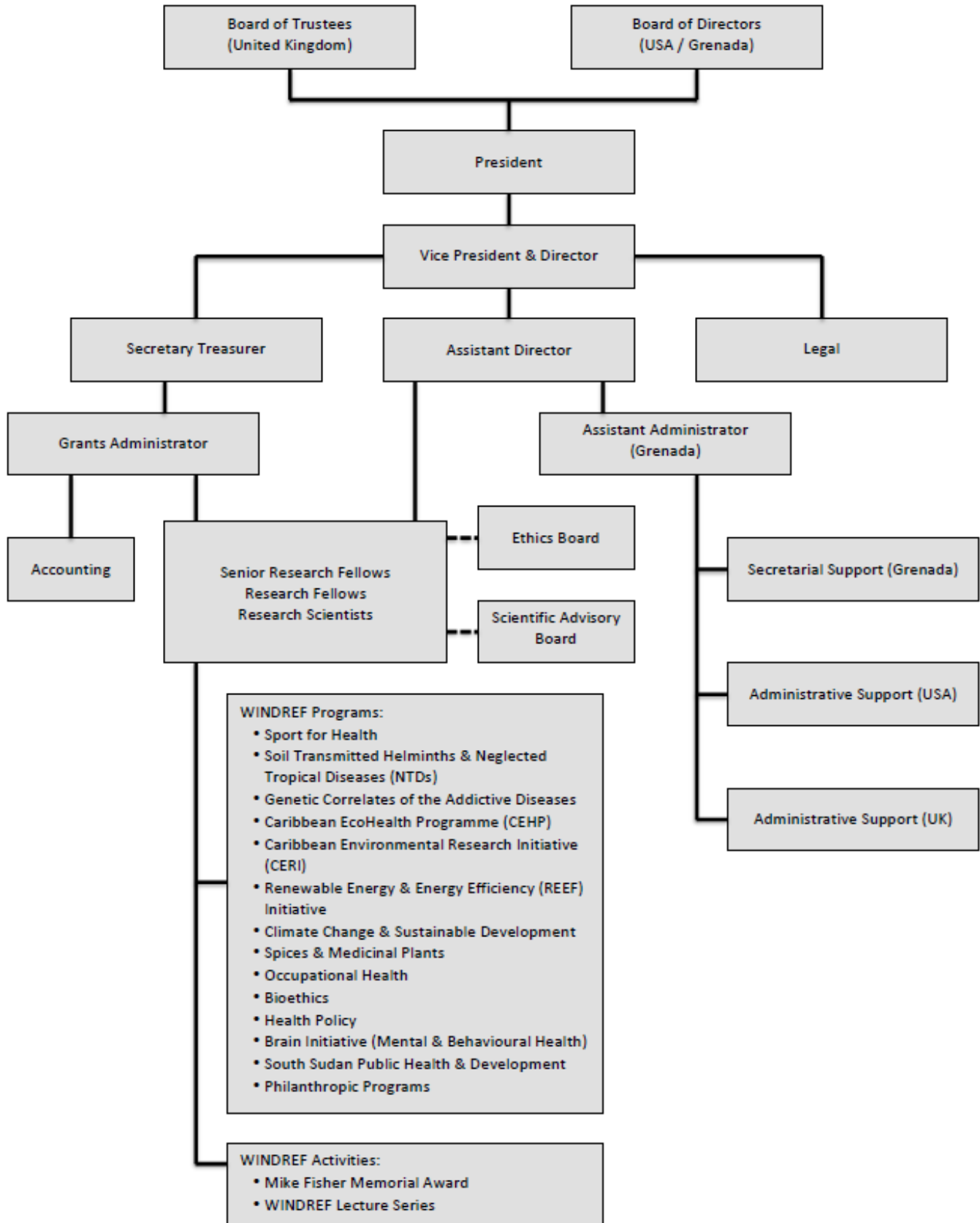
International Conferences Sponsored in Grenada

Virus Workshop for Journalists (30 Jan – 1 Feb 2014)

One Health One Medicine Caribbean Conference (16 March 2014)

USDA Regional Mite Identification workshop, executed by the USDA-APHIS, Inter-American Institute for Cooperation on Agriculture (IICA) CARICOM Secretariat with technical expertise provided by the Florida Association for Volunteer Action in the Caribbean and the Americas (FAVACA).

Caribbean Grant Writing & Scientific Peer Review Workshop (17-19 September 2014)



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