



2001 Annual Report

1 Introduction

It is my great pleasure to present the 8th Annual Report of the research activities of the Windward Islands Research and Education Foundation (WINDREF). WINDREF was registered in the USA with the Internal Revenue Service 501 (C) (3) as an educational non-profit foundation in 1994. WINDREF is also registered in Grenada as an NGO and is registered in the UK as a charitable Trust. In 2001 WINDREF established an office in St Vincent. Drs Edward Johnson and Frederick Ballantyne serve as the Director and deputy director respectively. The opening of this new office greatly facilitates WINDREF's regional research activities. WINDREF's mission is to advance health and environmental development both internationally and regionally through the creation of multidisciplinary collaborative research and education programs.

The year started brightly with a fundraiser hosted by the Chairman of WINDREF (UK), Lord Walton of Detchant at The House of Lords. The evening was oversubscribed and supporters came from far and wide. The guest of honor was Lord Rix who has had a long relationship with charitable foundations and is the chairman of Mencap. Another notable fundraising event was a successful London marathon run by a member of the WINDREF (UK) board, Dr Richard Summerfield. The Lounsebury Foundation renewed the rheumatic fever grant which will keep the project going through 2002. New substantial grants were made to WINDREF by The Liverpool Support Group (using funds donated to them by the Bill and Melinda Gates Foundation

and DFID funds) and from GlaxoSmithKlyne to support postgraduate training of students from Guyana and Suriname. These donations will enrich our contribution to regional health issues.

There were a number of significant changes made to the WINDREF boards in 2001. Dr Allen Pensick was appointed to the WINDREF (Grenada and USA) board replacing Dr Peter Bourne. Lord Walton will step down at the end of 2001 as the chairman of WINDREF (UK). His contribution was enormous and we wish him and Lady Walton well. Lord Soulsby of Swaffam Prior has agreed to assume the chairmanship of WINDREF (UK). We are fortunate indeed to have an individual of Lord Soulsby's stature to take over in the UK. His illustrious career in Veterinary Schools, on both sides of the Atlantic, and his global perspective on so many topics will serve WINDREF well. Professor Graham Serjeant, the world's leading authority on sickle cell disease joins the Scientific Advisory Board. Since the index case of sickle cell was described in a Grenadian patient we have more than a passing interest in the subject. Changes were also made to the IRB with the retirement of Ms Florient Johnson and Mr Charles Daniel/ and the new appointment (2002) of Ms Ane-Marie George.

1.1 WINDREF projects in 2001

During 2001, WINDREF's researchers completed studies on a number of local and international projects. These included studies on the prevalence of lymphatic filariasis (LF) and intestinal parasitoses in Guyana; a comparative study on human behavior as it pertains to HIV transmission in Botswana and Grenada; a cancer registry and an initial cross-sectional prevalence study on sickle cell in Grenada. Progress

was made with the ongoing collaborative rheumatic fever (RF) project which aims to eventually eliminate RF as a public health problem in Grenada. The dengue project made considerable progress in establishing the capability to diagnose the virus in Grenada and serotyping studies revealed serotype 3 to occur in Grenada for the first time. The public health significance of this is of concern as dengue hemorrhagic fever (DHF) or dengue shock syndrome (DSS) may now present a greater likelihood of occurrence. Our international links were strengthened by the development of close collaborative ties with a number of countries in North and Southern Africa. In North Africa studies on the epidemiology and prevalence of *Echinococcus granulosus* which causes cystic hydatid disease in Morocco continued. This year over 7,000 people were screened by ultrasound as part of the baseline data collection for a national control program. In Botswana, Mr Derrick Tlhoiwe, a WINDREF research scientist has compared risk factors where the prevalence of HIV reaches over 33% in some areas to those of age, sex matched cohorts in Grenada where the prevalence is only about 0.5%. The study demonstrated little change in risk taking behavior was observed in Botswana. A number of new studies were started, including assistance to Guyana to participate in their national lymphatic filariasis elimination program. In Grenada WINDREF's long standing association with studies on medicinal plants was continued with a new project to examine their use in the treatment of diarrhea.

The tragic events of September 11th which impacted the world had a number of repercussions in Grenada. It

is likely to affect the fundraising ability of small NGO's, such as WINDREF and globally funds earmarked for health have been diverted to more pressing needs of security. There were a number of anthrax alerts in different countries which prompted the Ministry of Health to proactively set up a national Task Force. As part of the Task Force WINDREF brought in biohazard suits and masks to protect Task Force members dealing with suspect events and packages.



The Hon. Dr C. Modest Curwen, MD, Minister of Health, Grenada, making a speech in which she thanked WINDREF for the biohazard suits. Listening is the Permanent Secretary of Health, Ms Sandie David and Mr Trevor Noel.

The second WINDREF lecture was presented by Professor Adedokumbo Lucas MD, DPH, DSc (hons) who is currently the chairman of the global forum of health research. He formerly was professor of International Health at Harvard School of Public Health and Chair of Carnegie Corporation's grant program concerned with strengthening human resources in developing countries. The title of his lecture was "*International Collaboration for Health Research*".



Professor Adedokumbo Lucas

In closing, I would like to extend my thanks to our many donors, Board of Directors, Board of Trustees, Scientific Advisory Board, Senior Research Fellows, Research Scientists, Staff, St. George's University faculty and other collaborators. I also thank the Government Ministries in Grenada, St. Vincent, Guyana, Morocco and Botswana for their contributions to our research activities during 2001. We look forward to developing new links in 2002 and to strengthening the valued partnerships we have developed in the past.



Calum N.L. Macpherson
Director

2.0 The WINDREF Research Institute

The WINDREF Research Institute is located on the strategically sited grounds of St. George's University at its True Blue campus in Grenada West Indies.



A summary of the over forty different research projects, on a variety of different topics, has been completed at the Institute. They are listed at the back of the 2001 Annual Report.

2.1 The WINDREF Research Institute- Board of Directors

The WINDREF Board of Directors (USA) and Grenada comprises:

- Drs Keith Taylor, D.M., F.R.C.P. (President)
- Calum N.L. Macpherson Ph.D. D.I.C. (Vice President)
- Ms Margaret Lambert M.A. (Secretary/Treasurer)



- Dr Allen Pensick, PhD

- Mr Bartholomew Lawson
- The Honorable Ambassador Joseph Zappala.

2.2 The WINDREF Research Institute- Scientific Advisory Board

WINDREF Research Institute appointed a Scientific Advisory Board in 1994. Members currently serving on the Scientific Advisory Board include:

- Frederick Ballantyne M.D.
- John R. David, M.D.
- Edmund Fischer, DSc
- James Hospedales M.B., B.S, MSc
- Sir Malcolm MacNaughton M.D., L.L.D., F.R.C.P.G., F.R.A.C.
- Calum Macpherson Ph.D, DIC
- Thomas W. Meade C.B.E., D.M., F.R.C.P., F.R.S.
- Graham Serjeant, MD, FRCP, CMG
- Sir Kenneth Stuart M.D.,D.Sc. (Hon),
- MS Swaminathan D.Sc.
- Keith Taylor D.M.,F.R.C.P.
- Sir Gordon Wolstenholme O.B.E., M.D., L.L.B., F.R.C.P.
- John B. Zabriskie, M.D.

2.3 The WINDREF Research Institute- Research Fellows

The following investigators have been appointed to the Windward Islands Research Institute as research fellows and are currently conducting collaborative research projects.

2.3.1 Senior Research Fellows:

- Paul Garner, Ph.D. Liverpool School of Tropical Medicine
- Duane Gubler, Sc.D.-CDC Fort Collins
- Ed Johnson, M.D.-Dean, Kingston Medical College
- Larry McCrorey Ph.D.-University of Vermont
- Ruth Milner M.Sc. -Vancouver Hospital
- Stephen Morse, Ph.D.-Columbia University



- Leslie Ramsammy, PhD – Minister of Health, Guyana
- Paul Sayer, BVSc, PhD – St George's University, School of Veterinary Medicine
- Robert E. Sturrock Ph.D, DIC.-London School of Hygiene and Tropical Medicine
- Stanley Weiss, M.D.-University of Medicine and Dentistry, New Jersey
- Alan Kocan, Ph.D.-Oklahoma State University

2.3.2 Research Fellows

- Glennis Andall, PhD
- Michael Bunbury, MB BS
- Justine Dunn, PhD
- Mary Glenn, PhD

- Theresa McCann, MPH, PhD
- Barrymore McBarnette, MD
- Craig McCarty, PhD

2.4 WINDREF Research Institute- Research Scientists

Research Scientists appointed to the Research Institute include: Sadiq Al-Tamini, Sumita Asthana, Yitzhack Asulin, Charles Avgeris, Jean- Pierre Barakat, Keith Bensen, Matthew Boles, Karen Brennan, Mmakgomo Coangae, Rae Connolly, David Evans, Vamsi Guntur, Sebastian Krietschitz, Erik Lacy, Setshidi Makwinja, Baher Maximos, John McCormack, Jessica Morlok, Trevor Noel, Andrew Nagangast, Andre Panagos, Terri Parker, Sandeep Pulim, Sean Ramsammy, Tarek Refaie, Alan Rhoades, Laura Robinson, Karin Schioler, David Tortugal, Derrick Tlhoiwe, Sarah Treter, Nghia Truong, Frank Van Natta, Ru-Amir Walker, Colleen Wunderlich, Elliot Yung.

2.5 The WINDREF Research Institute-Staff

Mrs. Isha English continues in her role as Executive Secretary, assisting scientists with all administrative aspects of their research projects. Ms English had a baby boy in September, Peter Jr, and both are doing well. In Ms English's place Ms Anna Neckles held the fort for the last few months of the year. Mr Trevor Noel (research scientist), Mrs. Louise Mott (community health nurse – till Sept 2001) and Nurse Perrotte complete the staff in Grenada.

3.0 WINDREF (USA)

WINDREF USA was established to facilitate charitable donations from the United States to the WINDREF Research Institute. As a non-profit organization, its goal is to enhance the development of WINDREF's research and educational programs. The offices are located on Long Island in New York to provide administrative and logistical support for the WINDREF Research Institute. Ms Donna Damm replaced Ms Jeannie Giarratano in the New York office. WINDREF would like to thank Ms Donna Damm for all her hard work during the year.

4.0 WINDREF (UK)

WINDREF (UK) was set-up 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 outreaching to a larger scientific community, WINDREF will broaden its research opportunities by forming collaborations with scientists from the European community.

4.1 WINDREF (UK) - Board of Trustees

A Board of Trustees was appointed in 1999 to oversee the activities of WINDREF (UK). Our distinguished Board of Trustees members were selected for their scholarly academic accomplishments and international acclaim. Members include:

- Lord Walton of Detchant M.B.B.S., M.D., D.Sc., M.A.(Oxon), F.R.C.P. (Founding chairman–till 31:12:2001).
- Lord Soulsby of Swaffam Prior M.A., Ph.D., D.Sc., D.V.M., F.R.C.V.S (Chairman from 1st January 2002).

- Sir Kenneth Calman K.C.B., F.R.C.S.E.
- Richard Summerfield M.B.,B.Chir., M.A., F.R.C.A.
- Sir Kenneth Stuart M.D., D.Sc.
- Keith B. Taylor D.M., F.R.C.P.
- Calum Macpherson Ph.D, D.I.C. (Ex Officio)

4.2 WINDREF (UK)-Staff

Ms. Sue Huntington continued as Executive Secretary. Ms. Huntington provides the administrative support that is central to WINDREF's (UK) fund raising and collaboration activities.

5.0 Human Subjects Institutional Review Board (IRB)

Members:

- Sir Paul Scoon (Chairman)
- Cheryl Cox Macpherson (Secretary)
- Otto George
- Martin Baptiste
- Alister Antoine
- Sister Anastasia
- Doreen Murray
- Lloyd Noel
- Ann-Marie George
- Keith Taylor (*ex officio*).



A new member of the IRB: Ms Ann-Marie George

5.1 Protocols reviewed by the IRB in 2001

This was another busy year for the IRB which met in March and November to review proposals summarized below. After six years of service: Mrs F Johnson and Mr C Daniel resigned during 2001 and the Chair Sir Paul Scoon records his appreciation of their service. Ms Ann-Marie George will join the IRB in 2002.

Projects considered:

Focus groups on end of life care – Krietzschitz. Approved.

Sickle cell anemia – Yung. The initial proposal was previously approved, and sought expansion with a questionnaire on whether learning about the disease would cause those with the trait to change their behaviors. Approved.

Rheumatic fever – Noel, Mott, and others. As part of the eradication program they will collect blood samples for lab investigations of possible molecular markers of the disease. The possible harm is the unlikely misuse of data regarding genetic markers for the disease. The project has the support of the MOH. Approved.

KAP Survey on contraception – Bell. This study sought to survey the adolescent mothers at the Program for Adolescent Mothers. Approved with stipulations: The researcher was cautioned that data might not be generalizable to other adolescent mothers in Grenada.

Asthma prevalence and treatment – Hage. Discussion centered on whether patient consent was necessary to look at the hospital emergency room logbook, and concern

about student researchers having access to confidential records. It was agreed that Dr Hage must supervise the research student, who should serve as Hage's assistant with logging and cross checking the data. Approved with stipulations: Hage must assure the IRB that he will supervise as above, and must obtain the Hospital Medical Director's approval.

Hypertension – O'Toole. This MPH project will analyze data that is publicly available. Approved.

HIV/AIDs patterns – Radix. This MPH study will analyze data that is publicly available. Approved.

Antimicrobial properties of plants – Avgeris. Extracts from plants will be tested for antimicrobial properties against *E. Coli* strains obtained from patients who will be treated immediately. Approval from Ministry of Health will be obtained before stool samples are obtained through its clinics. Approved.

Dengue prevalence: expansion of existing study – Schioler. To broaden the approved dengue study, seroprevalence will be examined using samples shared with the sickle cell study. Written consent to use the blood in both studies will be obtained. Approved.

*Submitted by Cheryl Cox
Macpherson PhD
IRB Secretary*

6.0 Current Research Projects

A number of projects which were started in 1999 and 2000 were continued through 2001 and several new projects

were initiated during the year. The projects currently being undertaken are briefly reviewed below.

6.1 Communicable Diseases

6.1.1 Rheumatic Fever (A1)

Rheumatic Fever (RF) is a nonsuppurative, immune mediated disease affecting principally children between 5–15 years of age. RF generally follows an infection, usually pharyngeal in origin, by group A Beta-hemolytic streptococci. The potential sequelae can be extremely disruptive and detrimental to the quality of everyday life. It is believed that M proteins, present on the surface of specific strains of rheumatogenic streptococci, evoke antibodies that, in conjunction with other immune mechanisms, elicit an acute disease that is systemic in nature and is characterized by polyarthritis, skin lesions, and carditis. The arthritis and skin lesions resolve, however, the cardiac involvement can lead, decades later, to permanent valvular deformity (usually scarring of the mitral valve). Recognized treatment for RF is penicillin or erythromycin, for those patients allergic to penicillin.

This project has enjoyed great progress during the past year. An extensive educational program was undertaken which is set to continue through 2002. The aim of the educational project comprises the use of the media in the form of radio and television spots used in conjunction with educational posters and pamphlets distributed throughout the Tri-island State. In April of 2001 a clinic was established for existing and incident cases of RF. The clinic is run by Dr Beverly Nelson and our newest addition to the project, Nurse Geraldina Perrotte on the fourth Thursday of every month. The clinic is free to all patients and

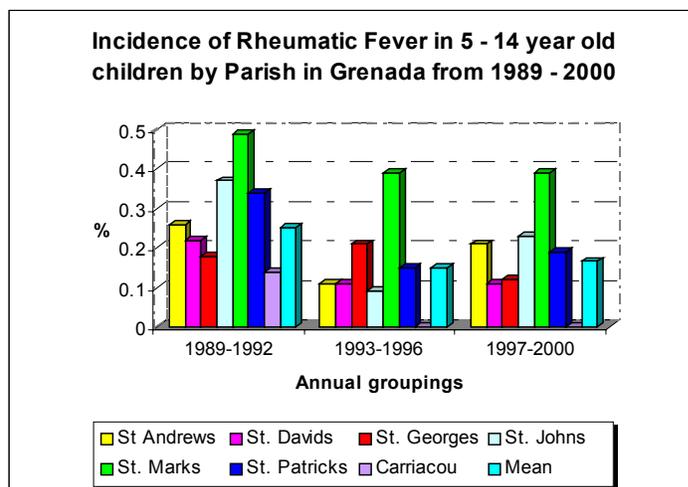
includes consultation and medications. The project has also been involved in community projects such as the St. Patrick's Health Fair, where a booth was set up and information was distributed to all those who attended. With the help of our collaborative partners, we are also currently placing educational billboards across the Tri-island State of Grenada.

Concurrent with the strides made on the educational front in the schools and the community at large, there has been tremendous progress made towards gathering data of incident cases for the target population (school children 5-15 years of age). To date data has been gathered from 17 of the 27 schools and 108 positive streptococcal samples have been sent to Rockefeller University for further analysis and sub-grouping. The remaining 10 schools are slated for completion by February, 2002. This data will provide a more comprehensive view of the current state of streptococcal infections in school aged children in Grenada.



Trevor Noel speaks with a child and her parents at Health Fair in St. Patricks.

A retroactive study examining the incidence of RF in Grenadian children 5-15 years of age was completed (Figure).



	1989-92	1993-96	1997-00
St Andrews	0.26	0.11	0.21
St. Davids	0.22	0.11	0.11
St. Georges	0.18	0.21	0.12
St. Johns	0.37	0.09	0.23
St. Marks	0.49	0.39	0.39
St. Patricks	0.34	0.15	0.19
Carriacou	0.14	0	0
Mean	0.253	0.149	0.166

This data enables us to identify the potential hotspots or outbreak areas which, in turn, allows us to focus our educational and treatment efforts in the appropriate areas. Dr. Zabriskie (Rockefeller University) and Dr Nelson are the monitors with regard to the progress of this project.

We thank various donors to the project including, the Lounsebury Foundation who generously renewed their support for another year. We have also received a generous contribution from the Grenada Bank of Commerce to facilitate the purchase of laboratory equipment and support from the Florida Caribbean Cruise Association. The project is a collaboration

involving; the Ministry of Health (Grenada), Ministry of Education (Grenada), Dr. Beverly Nelson (Pediatrician, Grenada), Dr. John Zabriskie (Rockefeller University), WINDREF, Grenada Heart Foundation and Dr. Theodore Poon King (Trinidad and Tobago). We look forward to another productive year.

*Submitted by Trevor Paul Noel
Research Scientist*

6.1.2 Serological, virological and socio-economic factors of dengue in Grenada. (A 2)

Background

Dengue is a viral disease endemic to many of the tropical and subtropical regions of the world. It is caused by one of four dengue virus serotypes, termed DEN-1, DEN-2, DEN-3 and DEN-4. Symptomatic infection by any of the serotypes may manifest as a mild febrile syndrome, dengue fever (DF), or dengue hemorrhagic fever (DHF). DF is a self-limiting febrile condition estimated to affect 50 to 100 million people each year. DHF is less common but far more serious, as it can lead to dengue shock syndrome (DSS), a complication reported to cause more than 25,000 deaths annually. Sequential infections are possible as challenge by one serotype induces homotypic immunity but incomplete cross protection. Severe DHF/DSS is generally associated with secondary infections caused by certain strains of each Serotype.

Dengue is widespread throughout South and Central America as well as the Caribbean basin. The disease activity in this region has intensified considerably during the past two decades, as epidemics of DF and DHF have become larger and more frequent.

The observed incidence of severe dengue is associated with the increased risk of sequential infections, promoted by co-circulation of all four serotypes within the region.

Data on dengue transmission in Grenada are limited, but do indicate an increase in activity over the past ten years. Recent seroprevalence studies, conducted at WINDREF, have revealed that the vast majority of Grenadians are likely to have been infected by a dengue virus. It is assumed that most infections have been caused by DEN-2, as this serotype has been identified in circulation since 1992. There have been no reported cases of DHF/DSS as yet, but the high seroprevalence in the population suggests that severe outbreaks may well occur upon introduction of new serotypes. Circulating serotypes and general increases in disease activity must be detected as early as possible if epidemic outbreaks are to be prevented or contained.

Aims

The primary aim of this project is to establish routine laboratory diagnosis of suspected dengue cases, in order to provide the basis for an active disease surveillance system in Grenada. The secondary aim is to determine the strains of circulating serotypes, their geographic origin and virulence. The third aim is to conduct an epidemiological study to identify demographic and geo-ecological determinants of disease distribution in the Grenadian population. Finally, an attempt will be made to estimate the economic impact of the disease, based on an assessment of Disability Adjusted Life Years (DALY's) lost to dengue transmission on the Island.

This brief report will focus on the applied methods relating to the primary aim

and some of the preliminary results obtained for this section of the project.

Methods

Diagnostic assays:

WHO recommendations for active disease surveillance laboratories emphasize the necessity to conduct alternative diagnostic assays, as detectable blood specimens change throughout the course of infection. Virus can only be detected in the acute phase (1-5 days post onset of symptom), while antibodies to current infection can be measured, as the disease enters the convalescent phase. This project employs different virological and serological test methods, in an attempt to secure both fast and reliable laboratory confirmation of clinically suspected dengue.

Single, serum samples from the acute phase are analyzed for dengue virus by two different test methods.

- 1) Fluorescent assays (FA) are applied on virus isolates following amplification in mosquito cell cultures. The procedure is recommended as a standard method for detection of virus and serotype determination.
- 2) Serotype specific RT-PCR (reverse transcriptase polymerase chain reaction) is conducted on RNA isolates from patient sera. RT-PCR is a very rapid but experimental technique and is recommended only to supplement standard virus assays.

Acute and convalescent phase samples are compared by standard IgG ELISA, in order to detect seroconversion or a 4-fold increase in dengue antibody titres. Single, convalescent phase samples are tested for the presence of IgM antibodies, using a commercial immuno-

blot kit (INDX, DIP-S-TICKS, PanBio INDX, Inc., USA). All test results are carefully interpreted according to table 1.

Test	Sample Status	Result: Conclusion
RT-PCR Virus isolation	Acute	Neg.: Not interpretable ¹ Pos.: Acute infection, serotype determined
IgM Immuno Blot	Convalescent	Neg.: No evidence of acute infection Pos.: Presumptive evidence of acute infection ²
IgG ELISA	Acute + Convalescent	Neg. + Neg.: No evidence of acute infection Neg. + Pos.: Acute infection, serotype unknown Pos. + Pos (4x): Acute infection, serotype unknown ³ Pos. + Pos (1x): Previous, non acute infection

Table 1: Interpretation of test results

- 1 False negative results due to loss of virus viability during handling and storing of blood samples, cannot be excluded
- 2 Recent as well as acute infection may be observed, as IgM can be detected up to 60 days following infection,
- 3 Four-fold increase in IgG titre differentiates between IgG from previous infection (circulates at background level) and IgG elicited by acute infection.

Introduction of diagnostic laboratory:

A dengue diagnostic service has been established at the WINDREF laboratories based on a model tried on the Simon Bolivar Clinic (SBC) at St. George's University. Final approval of the diagnostic system was obtained from the Chief Medical Officer at the Ministry of Health in January 2001. Visits to the General Hospital, key medical stations, health centers and surveillance doctors have since been carried out in collaboration with the Division of Epidemiology, Ministry of Health. All visits have included direct communication with the chief physician or nurse at the given

institution and dissemination of written guidelines, investigation forms and blood collection items. Letters of introduction has also been submitted to all private clinics on the Island.

Sample referral and test reporting: A system for sample referral has been established in collaboration with the General Hospital Laboratory. Blood samples from patients who present with symptoms of suspected dengue (as designated by WHO) are submitted to the diagnostic laboratory along with patient data forms specifying observed symptoms, disease phase, place of residence and recent travel activity. Analyses are performed according to the sample status and results are returned to the referring physician or nurse generally within one week. Copies of all test reports are also submitted to the Division of Epidemiology at the Ministry of Health.

Results

Blood samples from 80 cases of suspected dengue infection have been received from The Simon Bolivar Clinic, since the introduction of the diagnostic model in September 1999. Two acute dengue infections have been confirmed by seroconversion and three cases have been confirmed by virology. Ten cases have been identified as presumptive acute infections, based on positive IgM tests. Forty-four acute phase cases have been categorized as "not interpretable" as a result of negative virology or lack of appropriate status information. In 15

cases there have been no evidence of acute infection, while six cases represent previous but not current infection as determined by IgG ELISA (Fig. 1).

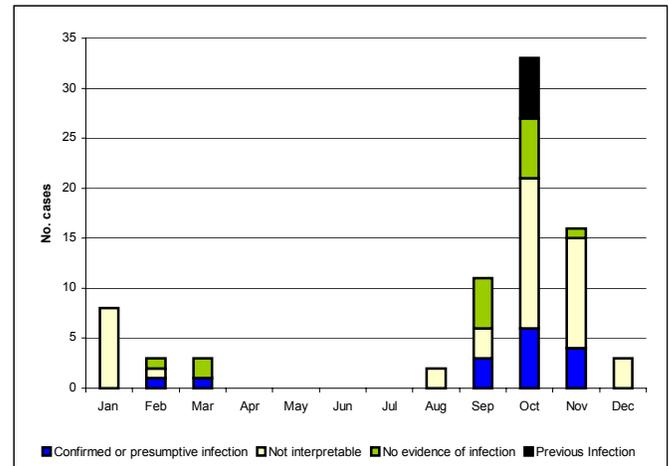


Fig. 1 General distribution of samples tested by the diagnostic laboratory. The seasonal occurrence of suspected and confirmed dengue cases is focused in the late autumn, coinciding with the peak period of the rainy season and increased densities of the mosquito vector, *Aedes aegypti*

The symptoms reported for all cases of confirmed and presumptive dengue meet the WHO criteria for suspected dengue fever. None of the referred cases have reported symptoms associated with DHF/DSS (Fig.2).

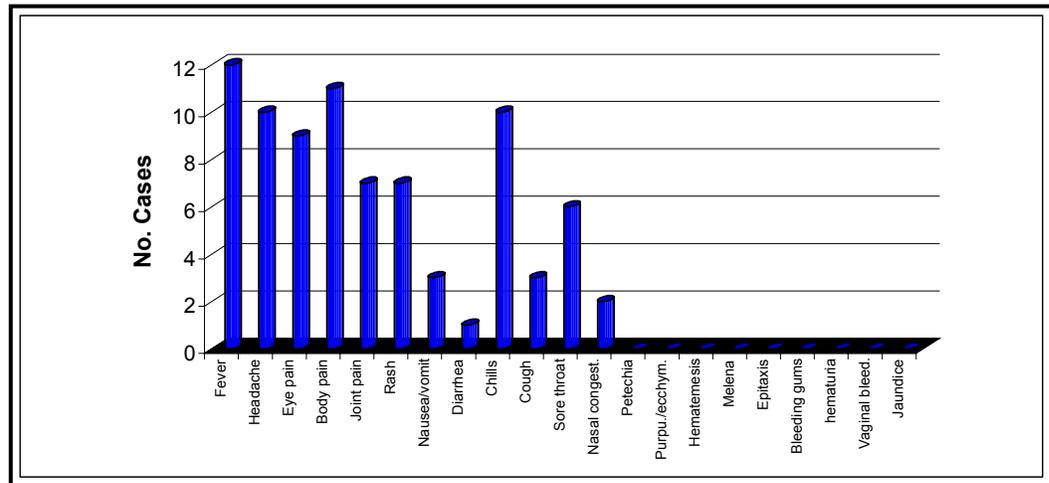


Fig. 2 Reported symptoms of confirmed and presumptive cases of dengue infection

Fifty-six cases of suspected dengue have been referred from the medical community, since the introduction of the diagnostic laboratory, spring 2001. Of these three have been confirmed as acute infections and eleven have been identified as presumptive acute infections. DEN-3 has been determined as the infecting serotype in all three cases of acute infection, marking the first report of DEN-3 transmission in Grenada

Discussion

Eighty suspected cases of dengue have been identified from SBC, since the initiation of the diagnostic model. Of these, 15 cases have been identified as acute or presumed acute infections. During the same period, the Division of Epidemiology, at the Ministry of Health has reported a total of 200 suspected cases, of which 54 have been confirmed as acute or presumptive acute infections, by the regional laboratory in Trinidad.

The disproportion between the numbers of suspected cases reported from SBC alone and those notified from the rest of the Island, supports the assumption that underreporting of dengue transmission is a significant problem in Grenada

The dengue diagnostic service at WINDREF has been available to the general health sector, since the spring of 2001. The majority of requests for laboratory diagnosis have been received from private clinics located in the parish of St. George's. Underrepresentation of public health institutions and the various health entities outside St. George's, may offer some explanation to the lack of disease notification implied by the SBC data.

Conclusion

The establishment of dengue diagnostic techniques at WINDREF has made it possible to implement active disease surveillance in Grenada. The benefit of locally available and rapid laboratory diagnosis has been underscored by the recent detection of a new serotype in the Islands. Immediate notification of the Ministry of Health has induced intensified vector control efforts and a series of public

alerts, which may prove effective in reducing or eliminating further transmission.

With the primary aim being fulfilled, attempts are now underway to complete the subsequent objectives of this project.

*Submitted by Karin Schioler
PhD candidate*

6.1.3 HIV/AIDS in Botswana and Grenada: A Comparative Study (A 3)

Botswana, a country with one of the highest HIV prevalences in the world reports 35.8 % prevalence among 15 to 49 year olds. Grenada reports less than 1 % prevalence. We hypothesized that as HIV prevalence rises and affects ones acquaintances,



ones HIV risk behavior change. We correlated prevalence with changes in risk behavior between Botswana and Grenada, and compared differences in knowledge, attitudes, and practices in each population and between genders and age groups. Questionnaires were completed by 546 respondents in Grenada and 568 in Botswana. Men and women represented about half of all respondents in either country, and ages ranged from 12 to 80. In Botswana, 58% of 12 to 19 year olds did not believe they could contract HIV, compared to Grenada's 44%. Among HIV-positive respondents, 31% in Botswana had never told their sexual partners of their HIV status, compared with 48% in Grenada.

In Botswana, 12% report knowing someone who was cured of AIDS, compared to 6% in Grenada. About 20% of men and women in Botswana said that it is improper for a woman to suggest using a condom to her partner, compared with about 10% in Grenada. Respondents in both countries displayed a spirit of nonchalance about HIV.

*Submitted by Derrek Thoiwe
and Cheryl Cox Macpherson*

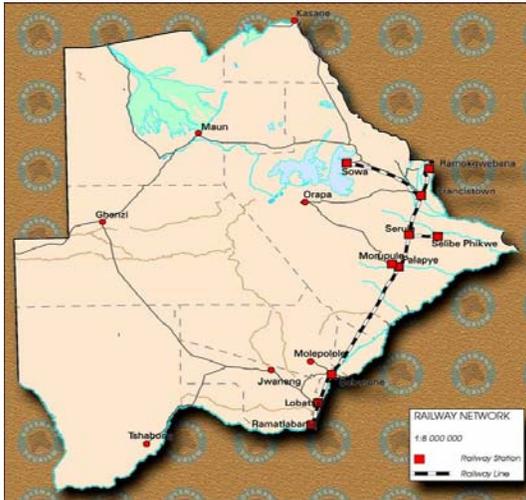
6.1.4 HIV/AIDS in rural Botswana: Differentiating between informing and educating (A 4)

Botswana is a landlocked country, surrounded by five neighboring countries; South Africa, Zimbabwe, Zambia, Angola and Namibia. It has an area 600,370 sq km (slightly smaller than Texas) with a population of 1,586,199 million. About 45% of the population fall into the sexually active bracket of 15-49 years.



The Kgalagadi desert, which occupies approximately two thirds of the country, is home for only a small proportion of the population. The majority of the population is concentrated along the eastern railway track

connecting the two cities of the country i.e. Gaborone in the south and Francistown in the north. This railway line also provides the main route to neighboring countries, with the Zimbabwe boarder to the north and South Africa on the south (see figure).



Botswana has perhaps the fastest evolving HIV prevalence in the world which has resulted in untold human misery and suffering. The prevalence of HIV in the sexually active population increased from 19.3% in 1992 to 29.0 % in 1999 and to 38.5% today. In the late 1980's and early 1990's, in response to the public concern about AIDS, the Ministry of Health developed educational literature on HIV/AIDS, hoping to get in return some behavioral change. Despite these efforts, there appears to be little behavioral change amongst the Batswana. The HIV/AIDS problem has been for a long time regarded as an urban problem but the epidemics effects in rural areas cannot be ignored any longer. As noted by Piot ... as links between urban and rural areas increase, trade and migration are rapidly pushing HIV prevalence rates

upwards in rural areas..... The severity of the new rapidly evolving HIV/AIDS situation in rural areas needs careful assessment followed by effective mitigation strategies. The impact of HIV/AIDS on rural areas will directly bear on social structure. This will come about by impairing the transfer of knowledge form one generation to the next, agricultural production systems, household food security, socio-economics through it's capacity to disable worker and as a result, overwhelm the traditional coping mechanisms. In Kenya, the sugar plantation owners reported a 50% loss in productivity over the last two years, while 30 to 50% of Zimbabwe's farmland is now being used for subsistence farming rather than cash crops because of deaths of so many farm workers.

In cities and towns, Chief Executive Officers (CEOs) are on a daily basis consulting with appropriate personnel to ensure that their employees have adequate health insurances and actively educating them on HIV/AIDS related matters. In rural areas however, families hit by the epidemic are forced to sell productive assets to pay for funerals and health care. Old women sit helplessly watching their children die one after the other from a disease, which many of them are still suspicious about. Families are being impoverished by the epidemic as young wage earners get sick and die.

In a country where the population distribution is nearly equal; 49.7 % (urban) and 50.3% (rural) the implications of the rural HIV/AIDS scourge cannot be overlooked. The rural population is more vulnerable to many of the HIV infection determinants such as illiteracy of women, gender inequalities, culture, income distribution and accessibility to health care, education centers and sexual practices are more likely to have a significant impact in rural areas. Another important factor is the big issue of the marginalization of women.

Rural women are often powerless and cannot for example, insist in the use of a condom. In Botswana the strain that predominates is subtype HIV-1C. The main route of transmission is heterosexual with isolated increasing numbers of homosexual contacts.

Urban Rural Figures: Estimated Total No HIV cases (15 – 45 year age)

Location	Males	Females
Gaborone	20151	21452
Francistown	9310	11300
Rural areas	36154	37919

Sentinel Surveillance Report 1999

In Botswana the rural epidemic in terms of numbers has slowly been revealed with even higher values than expected as most people often return to their original areas of birth during the final days of this terminal disease. The problem of inadequate information on the scientific basis of the virus poses yet again serious problems. As most preventative methods are geared at sexual, prenatal, and transfusion rates of transmission. The possibility of cross-infection within the home environment has not been as actively explored. Many care-takers in rural villages with their limited knowledge about the nature of the virus coupled with isolated cases of doubts even about the existence of the virus, find themselves at greater risk of infection as they give end of life care for chronic AIDS patients for months and sometimes for a year or two.

This study aims to look at how the rural areas are handling the epidemic at different community levels. The study location will be in the rural area of northeastern Botswana and will involve

a sample size of approximately 400. This study will include interviews with village leaders, health professionals as well as the general rural population. Each of these groups has it's own specified questions. The village leaders had subjective type questions to answer, this was done so that an understanding of what had been done in the past about the epidemic. More importantly the study aimed to investigate what they considered as barriers in the fight against HIV/AIDS. Most of the educational campaigns that were adopted in Botswana addressed the problem at a generalized level. Factors like, religion, education level, cultural believes and social norms were not recognized as important factors that needed great consideration. The rural population as a result, is still trying to battle with overwhelming information they are given on HIV/AIDS, but the incorporation of the information into their daily lives still remains a problem.

The little bits of information that they assimilate about HIV/AIDS seem to be the problem as myths about the disease emerge. This results in people getting infected with the disease they don't really understand and many die without never really understanding what they had.



*Submitted by Setshedi Makwinja
Research scientist*

6.1.5 HIV/AIDS in rural Botswana: Differentiating between informing and educating (A 5)

After a series of deaths due to overwhelming immune suppression in homosexuals in 1981, Gay Related Immune Deficiency (GRID) syndrome was first described.

A year later as the disease was described

in intravenous drug users, female sexual partners of index cases and children of affected women

the term AIDS (Acquired immune Deficiency syndrome) was adopted.

Botswana with its population of 1.592 million is one of the worst affected countries in the world that has been ravaged by the HIV/AIDS scourge. The Ministry of Health in Botswana through the AIDS/STD Unit has been monitoring the trends of the epidemic using several monitoring tools. One of them is the sentinel surveillance that has been carried out annually since 1992 among pregnant women attending antenatal clinics and among men attending STD clinics. Pregnant women seeking antenatal care are assumed to represent the so-called “general population” and in particular the sexually active age group (15-49 years). Males with STDs on the other hand are assumed to represent groups of high-risk HIV infections,



given the close association between STDs and HIV infection. The second monitoring tool includes the reporting of cases and even though it might be less accurate with problems of underreporting and possible underdiagnosis, it is supplementary to the sentinel surveillance. Of the sub-types that have been identified, the dominant HIV-1 subtype in Botswana is sub-type C.

Botswana is located in the southern part of Africa bordered to the south and east by South Africa, to the northeast by Zimbabwe, to the north and west by Namibia and touches Zambia just west of the Victoria Falls. South Africa, Namibia and Zambia have an adult (15-49 years) prevalence of 20% while Zimbabwe follows Botswana at 25%. Botswana's adult prevalence is the highest in the world at 38.5%.

Botswana has developed a strong transport network that links the populated centers of the country. This partly explains why there is little difference between rural and urban prevalence rates – and why HIV has been transmitted so widely and so quickly from urban to rural areas. All the countries that surround Botswana have a rural population of more than 50% with Botswana having the least at 51% and Zimbabwe as the highest at 77%.

HIV and AIDS feed on the deficiencies in the choices made by individuals, households, communities and leaders at all levels regarding sexuality and responses to the epidemic. These are shaped by determinants that drive and sustain the HIV and AIDS epidemic. These could be explained partly by a low functional literacy and a lack of resources that are necessary in empowering one to overcome these determinants.

The purpose of this cross-sectional qualitative study on knowledge attitudes and practices is to determine the knowledge

absorbed from Governments information, education and communication (IEC) interventional efforts to empower Batswana with primary prevention skills against HIV/AIDS infection in being practiced in rural Botswana. The hypothesis: Batswana living in rural areas have a low functional literacy on HIV and AIDS, have not changed their risk behavior and there are few facilities and educational programs in rural areas to address the problem.

This study will be carried out in ten villages in the southern part of Botswana. The results will be compared with those from the northern part of Botswana from a similar study (6.1.3). The results and recommendations from the two studies will be presented to the Ministry of Health in Botswana.

*Submitted by Mmakgomo Mimi Coangae
Research Scientist*

6.1.6 The prevalence of cystic hydatid disease (*Echinococcus granulosus*) in the mid Atlas mountains of Morocco, North West Africa. (A6)

This is an ongoing collaboration between the veterinary team of the IAV Hassan II University in Rabat, the National Public Health Institute in Rabat, local Moroccan authorities and WINDREF. The aim of the study is to investigate the abdominal prevalence of cystic echinococcosis (CE) using ultrasound (US) in rural areas of Morocco where, from hospital records, the prevalence is likely to be highest. In 2000 just over 4,000 people were screened by US in Khenifera and in 2001 just over 7,000 people were screened in Ifrane. Both provinces are located in the mid-Atlas mountains and a

large proportion of the people live a transhumant lifestyle, herding sheep using dogs.



One of the schools where the survey was conducted. In this area, communication is poor and electricity and safe, clean drinking water are not always available.

A prevalence of CE of just over 1.0% was recorded in the 11,000 people screened by US.



Dr Malika Kachani (on donkey) together with Dr Barada and other team members 'on the road'.

The public health importance of CE in this region can now be calculated. The results are to be used to develop a national control program for CE in Morocco. The patients found to be infected will receive appropriate treatment as per WHO guidelines. The

treatment of choice depends on the cyst type and its condition and location. Albendazole is the drug of choice. A proposal has been developed for submission for funding to keep this project going in the coming years.

Submitted by Calum Macpherson

6.1.7 The prevalence of intestinal parasitoses and lymphatic filariasis in the Corentyne Region of Guyana. (A7)

Introduction

Lymphatic filariasis (LF) is a debilitating, disfiguring infection (Figure) caused by the parasitic nematode *Wuchereria bancrofti*. The parasite occurs in over 80 countries worldwide and an estimated 120 million people are currently thought to be infected; the majority of cases being in sub-Saharan Africa and Asia. It is increasingly being recognized as an infection contracted in childhood with the disfiguring morbidity evolving slowly and manifesting in older age groups. In 1997 the World Health Assembly resolved to eliminate LF as a public health problem by 2020. This resolution was made feasible by recent advances in research which had shown that ivermectin and DEC were extremely effective microfilaricides with a long residual suppressive effect on their own and increasingly so with the addition of albendazole. This revelation, together with the development of a new sensitive, specific immunochromographic (ICT) diagnostic test which only requires a few drops of blood taken at any time of the day provided the tools to make eradication practical. The magnanimous donation by GlaxoSmithKline

(albendazole) and Merck (ivermectin – for Africa only) to the program for as long as the global effort takes, coupled to donations from Foundations, international bodies provides great optimism for the parasites demise as a public health problem throughout the world. This possibility is greatly enhanced by the greater understanding of the cause of morbidity associated with the parasite and new treatment methods which have been shown to be remarkably effective.



LP patient in Guyana talking to research scientists.

In the Americas, seven countries are considered to be still endemic for LF although the disease has not been seen in three (Suriname, Costa Rica and Trinidad) for the last 20 years. Active transmission occurs in four countries, Guyana, Haiti, Dominican Republic and Brazil. For the program objectives for the elimination of LF (PELF). LF is not regarded as being a problem in Trinidad and Tobago, Suriname, or Costa Rica and in these countries surveillance and confirmation of the disappearance of the parasite has to be carried out using the ICT test mapping program. An active PELF is now required

for the endemic countries and the choice of control program is being studied.

Guidelines for preparing and implementing a national plan to eliminate LF in countries where onchocerciasis is not endemic have been produced by WHO. These guidelines are being followed by the LF endemic countries in the Americas. Most countries have created National Task Forces (NTF-ELF), and are in the process of choosing the best intervention approach, given the unique characteristics in each endemic country. An initial mapping exercise using ICT test cards is to be used by each country and this study was to examine the prevalence of LF in a rural area of Guyana. Since albendazole may be one of the treatment choices this study also aimed to examine the prevalence of the geohelminths in the same region of rural Guyana. Soil transmitted helminths are increasingly being recognized as an important public health problem, especially in developing countries. The group that harbors the heaviest infection rates, as well as the worst cases of morbidity is school age children. In 1993, the World Bank ranked intestinal helminths as the number one cause of disease burden in children between the ages of 5 and 14 (www.WorldBank.org). During the years of 1995 and 1996, worm infestation was ranked as the second leading cause of morbidity among children in the 0=<4 year range according to the World Health Organization. In 1998, intestinal parasites not only claimed nearly two million lives under the age of five, but also accounted for 1.5 billion bouts of illness in children under five in developing countries.

The hypothesis of this study was that in rural Guyana intestinal helminths would be very prevalent whilst LF would have a low prevalence compared to urban areas. If this hypothesis turned out to be correct then using albendazole in rural areas would have a dual benefit for the local population.

Materials and Methods

Region VI in rural Guyana, a Heavily Indebted Poor Country (HIPC), was selected as an ideal site for the study. Four primary schools in a community in Berbice were selected for study. The work was cleared through WINDREF's IRB and subsequently through the Ministries of Health and Education in Guyana. Schools were visited and several parent teachers meetings were held to discuss the goal of the study and what it involved. Informed consent was obtained from all who participated in the study. Stool collection cups were given to children and returned with a stool specimen the next day. Blood samples were taken from children and parents in the same area. All samples were transported to a lab in Georgetown and stored until tested. The blood samples were tested using the ICT test cards provided by CDC. Stool samples were flown to the WINDREF laboratory in Grenada on ice and tested using the salt (hypertonic saline - NaCl) floatation technique. A questionnaire was administered to all participants to examine risk factors. The questionnaire was pre-tested and local terms were applied. Because of dialect differences, the questionnaire was administered by Guyanese trained laboratory staff.

Results

None of the 200 stool samples collected and tested were positive for geohelminths (hookworm, *Ascaris lumbricoides* or

Trichuris trichuria). The results of the ICT test cards is presented in the Table below.

Age Range	No Tested	No Positive	% Positive
12-13	179	1	4.5
14-20	20	1	3.4
21-30	22	0	0.0
31-40	27	1	3.7
41-50	26	2	7.7
50+	21	2	9.5
Total	295	14	4.8

Table: Age prevalence of the blood samples tested for *Wuchereria bancrofti*

Discussion

The prevalence of LF in the community did show a gradual increase with age (Table). The overall prevalence was far lower than the > 45% reported from Georgetown. Another study in Georgetown and New Amsterdam found prevalences of 30% and 20% respectively. The prevalence of LF appears to be much lower in rural Guyana as expected. The reasons for this may be the smaller human population, which is spread out and lower transmission infection pressure. Certainly breeding sites (particularly pit latrines for *Culex quinquefasciatus* which is likely to be the major vector) are numerous. The fewer number of people infected may contribute to the lower transmission pressure. The negative geohelminth result is

surprising. It was noted that the Rotary club of Virginia had recently completed a mass treatment program with albendazole for schoolchildren in the region and this may have been a contributory factor. This fact was not reflected in the answers given in the questionnaire which asked about treatment in the previous months. Albendazole is available in the shops and education is given high value in this community. As elsewhere in the Caribbean treatment of children for worms at the start of the school year is done. Since the introduction of albendazole in the mid eighties the prevalence of intestinal helminths has been falling in many Caribbean nations and they now occur at low levels. Whatever the reason our hypothesis for this aspect had to be rejected and the alternate accepted.



Dr Ramsammy (Minister of Health, Guyana), Dr Macpherson discuss the outcome of the study carried out by Jessica Morlock and Sean Ramsammy (research scientists).

A regional LF meeting hosted by PAHO in Georgetown in 2001 helped determine the choice of elimination strategy to be employed by the local Task Force in Guyana. Ivermectin is to be reserved for use in Africa. Distribution of DEC and albendazole has its own drawbacks in a

country where the population is not easily accessible, especially in remote, rural areas. A further option of the use of DEC-fortified salt was suggested and accepted. The feasibility of this approach is due mainly to the fact that there are only 2 suppliers of salt to Guyana: these being Jamaica and Trinidad. Thus strict control on the importation of only fortified salt can be achieved. The product has a long shelf life, has no odor, is tasteless, is not destroyed by cooking and is effective against the microfilariae at low doses for prolonged periods of time. DEC-fortified salt was in fact the control approach used so successfully by the Chinese to eliminate LF in China. The use of this approach will mean that the intestinal helminths will not be affected. The low prevalence found in this study, however, suggests that local rural populations are taking care of this problem by themselves – at least in our study population.

*Submitted by Sean Ramsammy, Jessica Morlock,
Leslie Ramsammy and Calum Macpherson*

6.1.8 Prevalence of heartworm in owned dogs in Grenada, West Indies (A 8)

Introduction

Heartworm (*Dirofilaria immitis*) is a common cause of morbidity and mortality in dogs in most tropical and subtropical areas of the world and even in some temperate climates. There have been few reports of the occurrence and prevalence of the parasite in the Caribbean region and none have been previously conducted in Grenada. Early autopsy results conducted by faculty at St George's University, School of Veterinary Medicine (established in August 1999) indicate that the prevalence of the disease in dogs would

be high. General practitioners in Grenada report that the disease is a significant cause of mortality in dogs on the island.

The aim of this study is to examine the seroprevalence of *D. immitis* in dogs throughout the island state of Grenada using sensitive and specific serological tests. The study will also examine the prevalence of microfilariae in seropositive dogs. Since the prevalence is expected to be high the positive predictive value of the tests, given their high sensitivity and specificity of the test kits should also be high.

Materials and Methods

The project was passed through the St George's University Institutional Animal Use and Welfare Committee. Owners of dogs from all over the island who bring their pets to a free rabies vaccination clinic, run by the Grenada Society for the Protection of Cruelty to Animals (GSPCA), will be offered a free test to see if their pet (s) is infected with *D. immitis*. If they give oral consent then a small volume of blood (3.0ml) will be drawn into an EDTA coated blood collection tube and stored on ice in a cold box for transportation back to the WINDREF laboratory. The blood will be screened for microfilariae using the modified Knott's test and by looking at a fresh 20 microlitre sample of blood on a warmed microscope slide. The remaining blood will be centrifuged and the serum aliquotted into cryogenic tubes and frozen at -70°C until tested. The sera will be tested using the ELISA DiroCHECK antigen test kits (Symbiotics). Results of the test will be returned to the owners, if positive, and the dogs will receive appropriate treatment.

Sample size

A sample size of 600 dogs will provide good prevalence data.

Time frame

Blood samples will be collected at all GSPCA rabies vaccination clinics. These are planned at regular intervals. The first collections will take place on Sat 1st December, 2001. It is anticipated that about 60 dogs will be available during each clinic. The project will run through August 2002.

Initial results

Blood was collected from a total of 25 dogs from the Belmont road area in St. George's Parish on December 1st 2001. The serum was stored at -2^0 until undergoing antigen testing on December 31st, 2001. Within this population 6 (24%) of the dogs were serologically positive for *D. immitis*. The presence of a cough was a symptom reported by the owners of all of the positive patients. The ages of the dogs ranged from 1 to 8 years, 4 of the cases were male, 2 female. Housing was outdoors only for 5 of the dogs, 1 was indoor-outdoor.

Submitted by Nannette Wagner, Paul Sayer and Calum Macpherson

6.2 Non-Communicable Diseases

6.2.1 The prevalence of abnormal hemoglobin traits in Grenadian secondary school children. (A9)

The index case of sickle cell disease was in a dental student, Mr Walter C. Noel, a Grenadian, who was diagnosed with this disease whilst studying in Chicago in 1904. This is the first systematic, randomized study to examine the prevalence of sickle cell trait and anemia in secondary school students, aged 14-18 years in Grenada

After obtaining informed consent from parents and guardians, a 5-ml anticoagulated venous blood sample was

drawn per child with the assistance of community public health nurses. Blood samples were examined by cellulose acetate electrophoresis in order to detect abnormal hemoglobin genotypes. Questionnaires were administered to students to collect data on history of sickle cell anemia and demographic information such as date of birth and ethnic origin. To protect confidentiality, each student was identified by a code number. Hemolysates produced from a rapid method with tetrasodium EDTA were examined by cellulose acetate electrophoresis and stained by benzidine to detect various hemoglobin traits. Citrate agar electrophoresis is needed to confirm the abnormal hemoglobin genotypes and to differentiate between hemoglobin C and A2.



Dr Graham Serjeant, a new member of the Scientific Advisory Board together with Dr Theresa McCann and research scientists, Nghia Truong (far left), Elliot Yung (far right) and Jenny Cherman, MPH.

The results obtained from 426 patients showed the prevalence of AS in Grenada to be 9.2%. This is similar to the

reported prevalences of AS in other Caribbean nations which have been reported as 10% in Jamaica, 7% in Barbados, and 13-14% in St. Lucia and Dominica.

Individual results were returned to participants and their parents. Summary statistics without identifying information was made available to the Ministry of Health.

Determining the prevalence of abnormal hemoglobin is needed in order to provide useful data for program planning and educational efforts (the latter objective was taken up by Elliot Yong – see below). The frequencies of the abnormal hemoglobin genes in the population can be used to predict the frequency of the different forms of sickle cell disease at birth. With such estimations using population gene frequencies in Grenada, the Ministry of Health can carefully plan health care and provide services to sickle cell disease patients

*Submitted by Nghia Truong
Research Scientist*

6.2.2 Knowledge, Attitudes, Beliefs and Practices (KABP) of Grenadian primary and secondary school teachers on sickle cell anemia (A 10)

Sickle cell anemia is a group of inherited red blood cell disorders caused by structural abnormality in the beta-globin chains of hemoglobin. Two main abnormal properties caused by sickle cell disease are the polymerization of the sickle hemoglobin (HbS) to form fibers and rods that cause the sickle cell deformation when the erythrocytes are de-oxygenated, and also that HbS may spontaneously decompose because it is more unstable than normal hemoglobin.

These properties cause the erythrocytes to change from their usual biconcave disc shape to an irregular disk shape, increasing the internal viscosity of red blood cells, giving them a higher propensity to stick to the blood vessel walls, clogging the vessels and preventing normal blood flow.

Common symptoms of sickle cell disease are caused by vaso-occlusive events or tissue damage from obstructed blood flow. They include pain crises, acute chest syndrome, cerebrovascular accidents, splenic and renal dysfunction, and increased susceptibility to bacterial infections.

There is normally a high incidence of sickle cell trait in Caribbean countries, roughly 10%, making education regarding the disease very important. For an educational system with sickle cell disease to be set up in Grenada, the attitudes and beliefs that are in place now should be known. It is especially important that teachers in the schools have a good knowledge of the disease and its symptoms as they manifest themselves in their students. Teachers in primary and secondary schools are an important target for any health educational program. They have extensive contact with the students as well as their parents, and would be an excellent educational resource for these two groups regarding sickle cell disease.

The levels of knowledge, attitudes, beliefs and practices of the teachers in Grenada regarding sickle cell disease are important in understanding the perceptions of teachers and predicting how they will treat children with sickle cell disease. Young children are particularly dependent of their teachers and may be very susceptible to their influence about chronic health problems. Teachers, especially in primary schools, may have the role of making decisions about the child's participation in various activities. The

knowledge and attitudes of teachers are major determinants of how well children will be able to cope with their condition and perhaps more importantly, how children will come to perceive themselves in the long run.

The objective of this project is to determine the levels of knowledge, attitudes, beliefs and practices (KABP) of the primary and secondary school teachers on sickle cell anemia in Grenada. This study would provide the levels of KABP on sickle cell for educators in Grenada, and also determine if there are differences in the knowledge and attitudes that could be explained by characteristics of the teacher's backgrounds. The results of this project will be used to help of Ministry of Education of Grenada implement sickle cell educational programs directed at the teachers of Grenada. A questionnaire will be used to collect the demographic data as well as the levels of KABP. Over a 5 month period in 2001, the teachers of 30 primary and secondary schools from the seven parishes of Grenada will be administered a questionnaire to determine the KABP.

The results of this project will be entered into a statistical database and analyzed. Statistical analysis will include descriptive tables of the different levels of knowledge, attitudes, beliefs and practices of the Primary and Secondary school teachers in Grenada. A geographical profile of the levels of education of sickle cell anemia for the different parishes, and also a profile of the years of teaching experience and personal contact sickle cell disease will be generated. This project should hopefully not only raise awareness of sickle cell disease for teachers in

Grenada, but also, in working in conjunction with the Ministry of Education, may help the Ministry examine their own levels of education required for the educators in Grenada.

*Submitted by Elliot Yung
Research Scientist*

6.2.3 End of Life Care in Grenada (A 11)

In industrialized countries, medical advancement is delaying the onset of death with a shift towards institutionalized care.

Quality versus quantity of life has now become a concern for dying patients and their families. With this, major problems are being faced, such as lack of training for physicians regarding end of life care and patients wishes. Little is known about end of life care in the Caribbean or other developing countries. In Grenada, anecdotal accounts say dying patients suffer from pain and receive little assistance from health professionals. The objective of this study was to identify concerns about end of life care in Grenada.

To provide cross sectional data, participants included those who had recently lost a loved one, physicians, and nurses. Through community contacts, focus groups were formed, and individual interviews were conducted. In Grenada there is a tendency to send people home to die when the hospital cannot treat them, and because patients typically request this. Often times, caretakers are family members and friends. Life-extending medical treatment such as dialysis is not available in Grenada. Dying patients, seeking this type of medical treatment in other neighboring Caribbean islands, can leave their families in financial hardship when they pass away. Unlike in more developed countries such as the United States, there is no economic safety net for Grenadian citizens. Other issues raised by participants centered on pain, medical and

nursing care, and spirituality. Pain was a common experience. Physicians are often confronted with patients who feel illness is a God-given destination and do not mind suffering in pain before their death. In the hospital, family members complained of their dying loved ones being neglected by the hospital nurses. Outside the hospital, end of life care social support services were negligible. Spirituality played an important role in comforting dying patients and helping them through their pain. One participant stated “you have to have the grace of God to go through some of these painful diseases.”



Participants recommended the need for better hospital equipment and facilities. They also suggested the improvement of nurse working conditions and salaries, as well as the reduction of their workload

*Submitted by Sebastian Kreitschitz
Research Scientist*

6.2.4 The Incidence and mortality of cancer in Grenada: 1990-2000. (A12)

Cancer is a major cause of morbidity and mortality worldwide. As a source of mortality, cancer is ranked second to cardiovascular disease and first among disease-linked causes of death for children in the United States. Age-specific mortality rates have increased for lung, breast, and prostate cancer in most countries. Many studies report similar increasing trends in Europe, North America, and Asia.

Several Caribbean studies show increasing trends in cancer incidence and mortality. Deaths due to prostate cancer increased 65% during 1980-1990 in the Caribbean where cancer is currently ranked as the 2nd leading cause of death. In Jamaica, an increasing trend in cancer incidence has been reported during 1988-1992. In Antigua/Barbuda, cancer mortality has reportedly risen throughout the past century .

Descriptive statistics on cancer are necessary for the efficient allocation of public health resources to minimize the impact of cancer on both individual health and national economies. This requirement is especially acute for the developing nations of the Caribbean constrained by limited funds. In this study the available cancer incidence and mortality data for Grenada for the period 1990-2000 is summarized and discussed. Prior to this study, cancer incidence and mortality statistics for Grenada were limited in the absence of a cancer registry.

Materials and methods

Data for analysis came from three sources. The Grenada Department of Statistics provided population and age distribution data, 1990-2000. The age structure of Grenada, was stable during the period 1990-2000, with 81% aged 0-44 years, 11% aged 45-64 years, and 8% aged 65+ years. Annual population growth was estimated from the 1991 census.

Cancer incidence data came from a review of all entries in the St. George's General Hospital histopathology specimen log books from 1996-2000. During this period, St. George's General Hospital was the sole pathology center in Grenada and data prior to this period were not accessible for this study. Cancer mortality data came from a review of all death entries from 1990-2000 in the death registry records of

the Grenada Ministry of Health. Occasionally, the death records were unclear about cancer as a cause of death versus cancer present at death; both occurrences were counted as a cancer-associated death.

Each reported cancer was classified using ICD-9 codes and grouped cancers by year, gender, age, and parish. Standard approaches of regression and categorical data were used for the analysis to examine relationships among these four categories. Statistics were judged significant when $P \leq 0.05$. To compare Grenada's rates with populations that differ by age, we adjusted all rates using the World standard population to obtain age-standardized rates (ASRs) per 100,000 persons per year.

Results

A total of 680 records of incident cancer diagnoses were found for 1996-2000 and 1,293 records of cancer-associated mortality, 1990-2000. The crude cancer incidence and crude cancer associated mortality varied by gender and site. Most cancer types were rare. To permit meaningful comparisons between Grenada and other countries, age-standardized rates per 100,000 (ASR) were calculated for overall cancer and the four most frequent cancers by gender. During 1996-2000, the age-standardized cancer incidence rate for females was 170.2 per 100,000 (95% CI, 154.2-186.6) and for males was 158.2 per 100,000 (95% CI 142.8-174.0). During the period from 1990-2000, the age-standardized cancer mortality rate for females was 105.4 per 100,000 (95% CI 96.8-114.0), while for males it was 165 per 100,000 (95% CI 154.4-175.8).

Among incident cancer diagnoses, prostate and cervical were

most numerous. Age-standardized rates for the four most frequent cancers varied by gender and age. Among cancer related deaths, those associated with prostate and breast were most numerous.

While there was little change in the incidence and mortality of most cancer sites over time, we found statistically significant temporal trends for two types of cancer in males. The incidence of prostate cancer rose during 1996-2000 as did prostate cancer mortality rates from 1990-2000. The incidence of stomach cancer in males decreased during 1996-2000. The percentage of mortality attributed to cancer did not vary significantly by year but did vary among parishes ($\chi^2=195.8$, $p=0.001$).

Discussion

This study provides the first estimate of incidence and mortality rates of cancer in Grenada. Per 100,000 population, the age-standardized incidence rates for females and males were 170.2 and 158.2, respectively. Likewise, per 100,000 population, the age-standardized mortality rates (ASRs) for females and males were 105.4 and 165.0, respectively. Incident cancer diagnoses were more common in females than in males, but mortality associated with cancer was more common in males than in females. Mortality rates for females in Grenada were higher than those reported in Barbados and higher than the overall Caribbean rate of 96.9 per 100,000, but substantially lower than rates reported for African-Americans in the United States. Similarly, mortality rates for males in Grenada were higher than those reported in Barbados, and higher than the overall Caribbean rate of 114.6 per 100,000, but much lower than rates reported for African-Americans.

Cervical cancer was the most commonly diagnosed malignancy in Grenada, during 1996-2000. The incidence of cervical cancer was 60.7 per 100,000,

which was nearly two times the overall Caribbean rate, and nearly six times the rate reported for African-Americans in the United States. However, the estimated cervical cancer mortality rate of 9.7 per 100,000 was comparable to the rate in Barbados and the overall Caribbean rate (16), but higher than the rate reported for African-Americans. The fatality ratio (mortality/incidence) was lower in Grenada (0.16) than in the United States (0.52), which bears further exploration.

Prostate cancer was the second most commonly occurring cancer in Grenada, 1990-2000. The average incidence rate in Grenada was 61.4 per 100,000 which was higher than the overall Caribbean rate of 43.4 per 100,00, but substantially lower than the rate reported for African-Americans in the United States at 234.2 per 100,000. A recent study from Jamaica has also reported an increase in prostate cancer incidence. Similarly, the mortality rate in Grenada of 53.6 per 100,000 was higher than the rate reported in Barbados and the overall Caribbean rate of 19.1 per 100,000, and similar to rates reported for African-Americans. Increasing incidence rates for prostate cancer may reflect improved diagnostic acumen in recent years and mortality rates in our study and other reports may be high since it was difficult to distinguish a death due to prostate cancer from a death concurrent with prostate cancer. Of interest is the high fatality ratio for prostate cancer in Grenada of 0.87, which suggests that only about 13% of diagnosed cases survive. This survival rate is much lower than for African-Americans in the United States of 77%.

Although rare in comparison to world rates and elsewhere in the

Caribbean, deaths due to stomach cancer were the third most common cancer associated mortality among males in Grenada, 1990-2000. The age-adjusted incidence of stomach cancer decreased between 1996 and 2000. The average incidence of stomach cancer for males was 10 per 100,000 which was lower than the overall Caribbean rate for males of 16.2 per 100,000, and similar rate for African-Americans but much lower than rates among males in Japan and in other Asian countries.

Similarly, although rare in comparison to world rates, deaths due to breast cancer were the most common cancer associated mortality among females in Grenada, 1990-2000. The incidence rate for breast cancer 49 per 100,000 was higher than the overall Caribbean rate of 33.5 per 100,000, but substantially lower than the rate reported for African-Americans of 101 per 100,000. In contrast, Grenada's mortality rate of 17.9 per 100,000 was equivalent to the overall Caribbean rate of 16 per 100,00, lower than the rate reported in Barbados which was 27 per 100,000 and lower than the rate reported for African-Americans in the United States of 31.4 per 100,000. While breast cancer incidence and mortality rates are much lower in Grenada than in the United States, fatality ratios are similar at 0.37 and 0.31 respectively.

Lung cancer mortality rates were 2.4 times higher for males than for females in Grenada, 1990-2000. Because lung cancer is generally attributed to smoking and is thus preventable, further epidemiological investigation may be justified, especially to determine current trends in smoking behavior. These rates are substantially lower than for African-Americans but the male-female ratio is similar at 2.9.

Although biases inherent in measuring cancer incidence and mortality from hospital records and death registries

have been documented, these biases are likely to be consistent from year to year within studies and among studies from similar regions. Given these limitations, we believe that these rates may be compared to rates reported elsewhere. Misclassification of incident cancers or cancer related deaths during data abstraction might have lead to a potential bias in the number and type of cancers recorded. Care was taken to be consistent in data collection by use of standardized work sheets, so any error is likely to be random and should not affect incidence and mortality rates in a biased manner.

It was not always possible to ascertain whether cancer was the primary cause of death or if the person died of a different cause but was known to have cancer at the time of death. Thus, death registry data did not always precisely differentiate the 'primary cause of death' from 'association with death'. For people who died at home, it was not certain that the person completing the death certificate had all the information available. In addition, persons who were diagnosed with cancer abroad, but returned to Grenada before death, would not have been counted in the incidence rates, although they would have appeared in the death registry. Conversely it is possible that persons diagnosed in Grenada, but who died elsewhere, could have been recorded in the incidence data, but not in the death registry.

All incidence data were obtained from histopathology records at the General Hospital. Cancer diagnoses by doctors in the private sector may be underrepresented although the number of missing records should be very small, because almost all biopsy specimens

were sent to the pathology lab at the General Hospital. Patients diagnosed abroad would also not be recorded in the histopathology records.

The availability of a new screening test such as the PSA test for prostate cancer, or a new screening program such as Pap smears for cervical cancer, could easily affect the estimated rates. The extent of bias will depend upon the impact these changes have on the incidence and mortality rates at different points in time. Increases in prostate and cervical cancer incidence during the five years of our study in Grenada suggest that changes in practice may have influenced the observed trends, but to what degree is unknown.

Grenada's relatively small population of under 100,000 people means that the rates were derived from a small number of malignancies per year. Consequently, the calculated rates may be unstable for specific cancers. Age distribution among parishes may also affect cancer incidence and mortality rates, for instance, higher average-age in rural areas may lead to higher incidence and mortality rates. Finally, the trend analyses in this report were limited by the relatively short period of time involved. This issue was of greater concern when analyzing incidence rates over a five-year period, but provided reasonable time intervals for assessing mortality trends over the 11 year time period.

It is hoped that this report has demonstrated the need for continued monitoring of cancer incidence and mortality in Grenada. The efforts by others in establishing cancer registries in other Caribbean states is laudable and it is hoped that this report will serve as a seed to fulfil such a need in Grenada.

*Submitted by Yitzhack Asulin, Theresa McCann,
Pat Rooney, Robbie Haig, Charmathy Subbarao and
Calum Macpherson*

6.2.5 Effects of Grenadian medicinal plants on endemic microbial causes of diarrhoeal disease (A13)

Diarrhoeal disease due to microbial gastroenteritis continues to be a primary cause of infant mortality and childhood morbidity worldwide, particularly in the developing world and in tropical areas such as the Eastern Caribbean. Standard antimicrobial agents are indicated only for particular organisms (eg they are ineffective in viral infections), and their application is further limited by increasing drug resistance, and by variable access to and use of such agents in rural areas. The purpose of the proposed study is to investigate the potential antimicrobial properties of certain herbs native to the island of Grenada, with respect to organisms commonly responsible for endemic childhood diarrhea.

Based on a background review of documents from PAHO and Eastern Caribbean health services, the following three pathogens have been identified as three of the most significant causative organisms: Rotavirus, enterotoxigenic *E. Coli* (ETEC), and *Giardia lamblia*. This immediate focus of this study will be the culturing and sensitivity testing of ETEC. A preliminary list of plants to be screened for antimicrobial properties has been determined based upon a prior ethnobotanical survey conducted as a part of a 1996 MSc project at WINDREF (“Investigation of Medicinal Plants in Grenada, West Indies ” by B. Politi). The selected plant species include Albe (*Cordia polycephala*), Guava bud (*Psidium guave*), Gully Root (*Pertivera alliacea*), and Worm Bush (*Portulaca oleraceae*).

The field research will seek to confirm or disprove the continued indigenous use of the above herbs as local treatments for diarrhoeal disease.

At least two popular “bush doctors” from each parish will be interviewed regards to the abovementioned plant use, and the plants in question will undergo positive botanical



Psidium guave

identification and field collection. An additional element of the field research will be the collection and processing of stool samples. The collection of pathological samples will take place with the collaboration of local clinics in the parish St. George’s, and isolation/identification of microorganisms will be provided by CAREC; the isolated bacteria will later be used to test for sensitivity in the laboratory stage of the project. The bulk of the laboratory research will be undertaken during the spring of 2001, and will consist of testing an aqueous extract of each of the chosen dried plants against the target organism for antimicrobial effects. Any effects will be quantified and subject to statistical comparison with established growth curves. Bacterial culture and sensitivity, and preliminary GIT cell toxicity studies, will be conducted under the auspices of St. George’s University Microbiology Department.

Submitted by Charles C. Avgeris
Research Scientist

7.0 Acknowledgements

WINDREF works in close collaboration with a number of local and internationally based institutions and individuals. In Grenada, we would like to thank the Ministry of Health, Ministry of Education, Ministry of Agriculture and the National Parks and Protected Areas Department, Ministry of Tourism and the Forestry Department for their help and cooperation with the research projects. We would also like to thank Dr Bernard Gittens, CMO and Dr Alister Antoine, MOH and Ms Agatha Clarke, the director of the hospital laboratory for their help and collaboration with the various health related projects. The input by the IRB members, particularly the chairman, Sir Paul Scoon, and the secretary, Dr Cheryl Cox Macpherson are very much appreciated.

Internationally WINDREF collaborates with a growing number of Institutions and individuals who are listed in 7.1.

7.1 Associated faculty, staff and collaborators



Dr John Zabriskie, Rockefeller University who collaborates with the RF project.



Dr Theresa McCann, research fellow, who collaborates on a number of the WINDREF projects.



Mr Martin Baptiste, CEO in the Ministry of Education has been instrumental in helping with the school based projects carried out in Grenada.

Collaborator	Affiliation	Project(s)
Dr. D. A. Addiss	CDC, Atlanta, USA	A7
Dr. A. Antoine	Ministry of Health, Grenada	A1, A2, A9
Mr. M. Baptiste	Chief Education Officer, Ministry of Education, Grenada	All projects in Grenada
Dr S. Barada	National Institute of Health, Morocco	A6
Dr. B. Bhusnurmath	SGU	A9
Dr. F. Brahim	SGU	A7
Dr. B. Brathwaite	Former Chief Medical Officer, MOH, Grenada	A2
Ms A. Clarke	Hospital laboratory, MOH, Grenada	A12
Dr. G. Clark	CDC, San Juan, Puerto Rico	A2
Dr. C. Cox-Macpherson	SGU	All projects
Dr. R. Cummings	Chief Medical Officer, Guyana	A7
Mr. S. Dabreo	Vector Control Division, MOH, Grenada	A2
Dr. P. Finley	SGU/General Hospital	A2
Dr. L. Fredericks	Ministry of Health, Grenada	A9
Dr S. Gaborone	Ministry of Health, Botswana	A4, A5
Dr P. Garner	Liverpool School of Tropical Medicine, UK	A2 Mrs. R. Kopycinski
Ms. I. Gomez	CDC, San Juan, Puerto Rico	A2
Mrs D. Harris	Ministry of Health, Grenada	A12
Dr. R. Hage	SGU	A12
Dr. E. Johnson	Kingston Medical College, WINDREF, St. Vincent	A3
Mr. A. John	Minister, Ministry of Education, Grenada	All projects in Grenada
Dr. L. Joseph	Ministry of Health, Grenada	A1
Dr M. Kachani	Hassan 11, Rabat, Morocco	A6
Mr. J. Kopycinski	SGU	A1
Mrs. R. Kopycinski	SGU	A1
Dr E. Lyagoubi	National Institute of Health, Morocco	A6
Ms. M. Lambert	SGU/WINDREF	All projects

Dr B. Lewison	CVO, Ministry of Agriculture, Grenada	A8
Dr. B. McBarnette	Ministry of Health, Grenada	A10
Dr. C.N.L. Macpherson	SGU/WINDREF	All projects
Dr. T. McCann	SGU/WINDREF	A8, A9, A10, A12
Ms K. McGrath	GSPCA, Grenada	A8
Dr. R. Milner	Vancouver Hospital	All projects
Dr. C. Modest Curwen	Minister, Ministry of Health, Grenada	All projects in Grenada
Dr. B. Nelson	Grenada Medical Association	A1, A9, A10
Dr. A. Pensick	SGU	A2
Nurse G. Perrotte	Ministry of Health, Grenada	A1
Dr S. Persaud	Ministry of Health, Guyana	A7
Dr. J. Pettus	SGU	A11
Dr. T. Poon-King	Ministry of Health, Trinidad and Tobago	A1
Ms T. Patterson	SGU	A8
Dr. L. Ramsammy	Minister of Health, Guyana	A7
Dr. P. Reiter	CDC, San Juan, Puerto Rico	A2
Ms. K. Richardson	Grenada Heart Foundation	A1
Dr. Riwanna	University of Guyana	A7
Dr. P. Rooney	SGU	A3, A4, A5, A12
Dr. Z. Ross	SGU	A13
Dr. G. Serjeant	Sickle Cell Trust, Jamaica	A9
Dr P. Sayer	SGU	A8
Mr M. Shepherd	SGU	A6
Dr. C. Subbarao	SGU	A 2, A10, A11
Dr. K. Taylor	SGU/WINDREF	All projects
Dr. V. Vorndam	CDC, San Juan, Puerto Rico	A2
Mr. A. Worme	Ministry of Health, Grenada	A2
Dr. J. Zabriskie	Rockefeller University, NY, USA	A1

7.2 Grants

We would like to thank all of the donors who have made WINDREF's work possible in 2001. These include:

- The Lounsbury Foundation who kindly renewed the grant for the collaborative project on rheumatic fever in Grenada for a second year.
- Professor David Molyneux, Director of the Liverpool Support Group, who made funds available from their grant from the Bill and Melinda Gates Foundation and DFID grant to enable students from Guyana and Suriname to come to WINDREF at St George's University for postgraduate training.
- Dr Brian Bagnall of GSK for additional funding to help the same postgraduate training for students interested in lymphatic filariasis.
- The Heffer Foundation, Fogarty International and Texas A&M for financial assistance with the CE project in Morocco.



Lord Walton of Detchant, the outgoing founding chairman of WINDREF (UK) who hosted a magnificent dinner at the House of Lords.

Other donors in 2001 who we would like to thank include:

- St George's University
- The Florida Caribbean Cruise Association
- GBC Bank, Grenada
- Symbiotics Corporation (Gregory Soulds and Kevin Jones)

A number of individuals also supported WINDREF in 2001 and in particular we would like to thank, Lord Walton of Detchant, Dr Richard Summerfield and Mr Bart Lawson.



Dr Richard Summerfield who completed the London Marathon and donated funds to WINDREF



Dr Macpherson receives a check from Captain Wright of the Queen Elizabeth 2: a donation from the Florida Caribbean Cruise Association

8 Past, present and future research projects

(Present Research Projects bolded)

8.1 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 diarrhoea 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**

8.2 Communicable 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
- **Studies examining the elimination of lymphatic filariasis as a public health problem in Guyana.**
- **Seroprevalence of heartworm infection in dogs in Grenada.**
- **Serological, virological and socio-economic factors of 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.**
- **Rheumatic Fever in Grenada**
- **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**

8.3 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**

9.0 Conferences/meetings/workshops

January 2001 Drs McCann and Macpherson attended the Caribbean Disaster Preparedness Seminar II in Montego Bay, Jamaica. Dr Macpherson also attended the fundraising dinner at the House of Lords in London, UK, where he gave a presentation on the research projects being carried out by WINDREF.

February 2001 Drs McCann and Macpherson gave a review of the research activities that was carried out at St. George's University in 2000 at the Panel on Research and Scholarly Activity annual meeting held at the Rex Grenadian Hote. Drs. Calum and Cheryl Cox Macpherson attended the CHRC workshop on Ethics in Human Subjects Research in the Caribbean in Trinidad.

March 2001 Mr. Matthew Boles attended the 6th Annual AMSA Poster Session in California, where his poster entitled: "The effects of iron deficiency on cognition in infants" was displayed. Dr McCann attended the Humanitarian Allied Forces 2001: disaster mitigation for the Americas – regional strategies for

cooperation and education meeting in Costa Rica.

June 2001 The XXth International Congress of Hydatidology in Kusadasi, Turkey was attended by Dr Macpherson where he presented three papers. They were entitled: "Ecological and experimental evidence of wildlife cycles of *Echinococcus granulosus* in Africa", "Performance characteristics and quality control of community based ultrasound surveys for cystic and alveolar echinococcosis in human populations" and "Ultrasound classification and its application in field situations".

August 2001 Dr Macpherson was invited by PAHO/WHO to participate in the II Meeting of Lymphatic Filariasis Elimination Program Coordinators in the Americas in Guyana, from August 20th-24th.

September 2001 Dr Macpherson presented an invited paper entitled "Anemia and parasites" at the CME conference in Kingston Medical College in St Vincent.

October 2001 From October 18-19. Thorne Roberts attended the Taiwan International Public Health Workshop in Taipei, Taiwan, Dr. Macpherson attended the NGO Meeting on Lymphatic Filariasis in Philadelphia, October 8-19th. Richards C, McCann TJ. Assessment of knowledge and attitudes toward cervical cancer in Grenada, West Indies. Invited paper presentation at the American Public Health Association's 129th Annual Meeting, Atlanta, GA, October 21-25, 2001. Wilson, L, McCann TJ, Macpherson, CC. Knowledge, attitudes, beliefs and practices about domestic violence/abuse

among students in Grenada. Invited poster presentation at the American Public Health Association's 129th Annual Meeting, Atlanta, GA, October 21-25, 2001.



Thorne Roberts presents a paper on dengue vectors at the public health conference held in October in Taiwan.

10.0 Publications/papers/abstracts 2001

- ❖ Macpherson, C.N.L. 2001. The changing picture of intestinal parasitoses in the Caribbean. *Caribbean Health* 4: 11-13
- ❖ Wang, Y.H., Rogan, M.T., Vuitton, D.A., Wen, H., Bartholomot, B., Macpherson, C.N.L., Zou, P.F., Ding, Z.X., Zhou, H.X., Zhang, X.F., Luo, J., Xiong, H.B., Fu, Y., McVie, A., Giraudoux, P., Yang, W.G. and Craig, P.S. 2001. Cystic echinococcosis in semi-nomadic pastoral communities in north-west China. *Transactions of the Royal Society of Tropical Medicine and Hygiene*, 95: 153-158
- ❖ Bartholomot, B., Vuitton, D.A., Harraga, S., Shi, D., Giraudoux, P., Barnish, G., Wang, Y., Macpherson, C.N.L. and Craig, P.S. (In press). Combined ultrasonographic and serological screening of hepatic alveolar echinococcosis in Central China.

American Journal of Tropical Medicine.

- ❖ Macpherson, C.N.L. (2001). Epidemiology of *Echinococcus granulosus* in transhumant situations. In: Eckert, J., Gemmell, M.A., Pawlowski, K. and Meslin F.-X (eds). WHO/OIE Manual on Echinococcosis in Humans and Animals, WHO/OIE, Paris, France, pp. 156-163.
- ❖ Pawlowski, Z.S., Eckert, J., Vuitton, D., Ammann, R., Kern, P., Craig, P.S., Dar, K.F., De Rosa, F., Filice, C., Gottstein, B., Grimm, F., Macpherson, C.N.L., Stato, N., Todorov, T., Uchino, J., Von Sinner, W. and Wen, H. (2001). Echinococcosis in humans: Clinical aspects, diagnosis and treatment. In: Eckert, J., Gemmell, M.A., Pawlowski, K. and Meslin, F.-X. (eds), WHO/OIE Manual on Echinococcosis in Humans and Animals, OIE, Paris, France, pp. 20-71.

10.1 Completed MSc theses 2001

- Asulin, Yitzhack. Cancer incidence and mortality in Grenada: 1990-2000
- Boles, Matthew. The effects of iron-deficiency anemia on cognition and behavior in infants.
- Morlock, Jessica. The socio-economic conditions, cost analysis of treatment and prevalence of intestinal parasitoses in school children living in Guyana.
- Ramsammy, Leslie . The prevalence of lymphatic filariasis in a rural area of Guyana.
- Tlhoiwe, Derrick. A comparative study of HIV/AIDS in Botswana and Grenada.

Treter, Sarah. Determining the pathogenic significance of IL-15 in HTLV-I associated tropical spastic paraparesis.

Van Natta, James. Anurans of Grenada.

10.2 Seminars

- ❖ *Pediatric cancer research.* Dr. Tom Loew. 19th January, 2001.
- ❖ *What vets can do for river blindness.* Professor Sandy Trees. 24th January, 2001.
- ❖ *Antibiotics: Are the bugs winning?* Lord Soulsby of Swaffham Prior. 7th February, 2001.
- ❖ *International collaboration for health research.* Professor Adetokunbo O. Lucas. 9th February, 2001.
- ❖ *An alternative to equipoise in clinical trials.* Dr. Bob Veatch. 14th February, 2001.
- ❖ *End of life care in Grenada.* Mr. Sebastian Kreitschitz. 28th February, 2001.
- ❖ *Knowledge, attitudes, beliefs and practices of Sickle Cell Anemia in Grenadian Primary and Secondary school children.* Elliot Yung. 7th March, 2001
- ❖ *Adolescent fertility in Grenada: Health and social implications.* Dr. Joel Adeniran and *A study in Sauteurs: An investigation into the conditions/factors affecting the incidence of intestinal parasitic infections in school children.* Judy Joseph. 14th March, 2001.
- ❖ *Acute Rheumatic Fever.* Dr. Sanjay Doddamani, *Isolating T cells from Rheumatic Fever positive blood: Immunofluorescent assay of T lymphocytes via fluorescently labeled monoclonal antibodies.* Tarek Refaie and *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.* David Tortugal. 21st March, 2001.
- ❖ *Community participation in dengue prevention.* Dr. Carmen Perez. 28th March, 2001.
- ❖ *The human genome project: It's history, methodology and future.* Dr. Michael Anson. 11th April, 2001.
- ❖ *The role of veterinary medicine in health people 2010.* Dr. Charles Hendrix. 18th April, 2001.
- ❖ *An update on migration inhibitory factor (MIF), a cytokine critical in inflammation, infectious and autoimmunity.* Dr. John David. 25th April, 2001.
- ❖ *The prevalence of filariasis in the corentyne of rural Guyana and The prevalence of intestinal parasites in school children in rural Guyana.* Sean Ramsammy & Jessica Morlok. *Research for better decisions in health.* Dr. Paul Garner. 2nd May, 2001.
- ❖ *A comparative study of HIV/AIDS in Botswana and Grenada.* Derrick D. Tlhoiwe. 29th August, 2001.
- ❖ *The prevalence of abnormal haemoglobin traits in Grenadian secondary school children.* Nghia Truong. 5th September 2001.
- ❖ *Anaemia & Parasites.* Dr. Calum Macpherson. 12th September 2001.

- ❖ *HIV/AIDS in rural Botswana differentiating between informing and educating.* Setshidi Makwinja. 19th September 2001.
- ❖ *Isolating T cells from Rheumatic Fever Positive Blood: Immunology assay of T Lymphocytes via fluorescent labeled Monoclonal Antibodies.* Tarek Refaie. 26th September 2001.
- ❖ *Knowledge, attitudes, beliefs and practices of Sickle Cell Anemia in Grenadian primary and secondary school teachers.* Elliot Yung. 17th October 2001.
- ❖ *End of life care in Grenada.* Sebastian Kreitschitz and Dr. Wendy Crawford 24th October 2001.
- ❖ *The prevalence of abnormal haemoglobin traits in Grenadian secondary school children.* Nghia Truong. 31st October 2001.
- ❖ *Development assistance: the environment and stakeholder participation.* Dr. Jonathan Rosenberg 7th November 2001..
- ❖ *HIV/AIDS in rural Botswana differentiating between informing and educating* Mmagomo Coangae. 14th November 2001.
- ❖ *Mechanisms of drug resistance in parasites.* Visiting Dr Ray Kaplan. 21st November 2001.
- ❖ *HIV/AIDS in southern rural Botswana.* Setshidi Makwinja 28th November 2001.
- ❖ *Effects of Grenadian medicinal plants on endemic microbial causes of diarrhoeal disease.* Charles C. Avgeris 5th December 2001.

11.0 Further information

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