



RESEARCH FOR DEVELOPMENT

RESEARCH FELLOWSHIP PROGRAMME

FACULTY of Medical Sciences

Screening, Assessment and Identification of Anti-Nutritional Factors in Selected Common Caribbean Food Crops and Spices and a Study of the Effects of their Consumption in Normal and Diseased States

Principal Researcher: Professor Helen Asemota
Department of Basic Medical Sciences

Research Fellow: Dr. Felix O. Omoruyi

This completed research project centered on the screening, assessment and identification of anti-nutritional factors in different varieties of selected Caribbean food crops with a view to elucidating the effects of their consumption in normal and some diseased states.

A major factor limiting the wider use of many tropical plants is the ubiquitous occurrence in them of a diverse range of natural compounds capable of precipitating deleterious effects in man and animals. Compounds, which act to reduce nutrient utilization and/or food intake, are often referred to as anti-nutritional factors. Although toxic compounds are widely distributed in the plant kingdom, it is generally known that tropical legumes contain a more complex array of these substances than any other crop species. The most commonly eaten food crops in the Caribbean have many beneficial nutrients, but there are also traces of anti-nutritional components such as cyanoglucosides, phytic acid, phenolics, protease inhibitors, and heavy metals. These anti-nutritional factors in foods may have adverse effects on health through the inhibition of protein digestion, growth, iron and zinc absorption (Liener and Kakade, 1980 and Larsson et al., 1996). However, these food crops may also contain natural products that may be beneficial to man.

The following food crops, namely, gungo peas, red peas, lettuce, callaloo, pumpkin, green banana, yellow yam, dasheen, cocoyam and sweet potato have been analyzed for some anti-nutritional factors/natural products. The effect of processing, such as roasting (over open flame) and cooking (in boiling water), on the levels of some anti-nutritional factors in yellow yam, cocoyam and sweet potato were also assessed. Additionally, there was a study done on the effects of consumption of the phytic acid extract from sweet potato, sapogenin extracts from bitter yam and Jamaican bitter yam preparation, respectively, on the general metabolism, using animal models. Studies were carried out in the normal and diseased states with a view to exploiting these Jamaican tuber crops in the pharmaceutical and nutraceutical industries for sustainable development.



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It was found that the bitter yam preparation tends to have an anti-hypercholesterolemic property which also serves to prevent the development of associated cardiovascular diseases such as hypertension. The Phytic acid extract from sweet potato plus zinc supplement may play a vital role in the control of blood glucose and lipid distribution. Cooking tended to reduce the levels of anti-nutritional factors in all the tuber crops except for sweet potato where the ratio of phytate to zinc was sufficiently high enough to affect zinc utilization. Work is currently underway on the investigation of the toxicity of the preparation in hypercholesterolemic rats. These various research activities are geared towards developing a product from Jamaican bitter yam suitable for the management of hypercholesterolemia and cardiovascular diseases in humans.

The research led to the publication of several articles in many refereed journals, including *Nutrition Research*, *Diabetologia Croatica*, *Plant Foods for Human Nutrition*, *International Journal of Food Sciences and Nutrition*, *Bioscience Research Communication*, *West Indian Medical Journal*, *Nutrition and Food Sciences*. There have also been a number of local and international conference presentations.



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Paediatric and Perinatal HIV/AIDS Leadership Initiative in Kingston: Outcomes of Infants Born to Women with HIV Infection

Research Coordinator: Professor Celia D.C. Christie
Department of Obstetrics, Gynaecology and Child Health

Research Fellow: Dr. Julianne Steel-Duncan

Throughout the Caribbean region, there have been ongoing efforts in the health care sector to prevent the many incidences of the mother-to-child transmission (pMTCT) of the Human Immunodeficiency (HIV) virus. Consequently, health care professionals have utilized the drug, zidovudine prophylaxis as the first line of attack, and this has had the effect of reducing the transmission rate from 27%-44% to less than 10%. This research project seeks to document these interventions, the preliminary outcomes and challenges in caring for HIV-exposed infants in a pMTCT-HIV programme within the context of limited resources. This project represents a collaborative effort between the Elizabeth Glaser Paediatric AIDS Foundation, the Pfizer Foundation, the University of the West Indies and its hospital and the Ministry of Health and its hospitals in Kingston, St. Andrew and St. Catherine.

As part of the project's activities, a cohort of HIV infected pregnant women were identified at the leading maternity centres in Greater Kingston through HIV counselling and testing. Antiretroviral prophylaxis with zidovudine, or nevirapine was given to these HIV-positive women and their newborns along with formula feeding. The clinical progress of the infants was then followed and the definitive HIV-infection status would be later confirmed at 18 months of age with the administration of the HIV ELISA or the Determine Rapid Test. Other infants were also drafted into the project and their medical progress tracked irrespective of whether they had received antiretroviral prophylaxis.

During the period, September 1, 2002 - August 31, 2003, about 132 HIV-exposed infants were identified. Ninety percent (90%) of the infants received cotrimoxazole prophylaxis and 88% continued in the follow-up care aspect of the project. Of all the infants, 92% remained asymptomatic and 5 died, where one was a possible HIV-related death (that is, severe sepsis at 11 weeks). This infant was retrospectively identified and received no anti-retroviral prophylaxis and was also breastfed. For the group that was prospectively enrolled in the project (that is, 78), 97% received antiretroviral prophylaxis and 90% were not breastfed.

The main challenges that were encountered in the first year of the project's life, included the stigma of the disease, the patients' compliance with the drug, antiretroviral chemoprophylaxis, and also, the issues related to breast-milk substitution and follow-up care.



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The project also had to contend with issues related to financial constraints and laboratory quality assurance which adversely affected the ability to give an early diagnosis of the disease. Nonetheless, the project benefited from the work of a multidisciplinary team at the various pediatric centres involved in the supervision and protocol-driven management of the care given to the infants. With this contribution, it is hoped that the work carried out under this project should help to prevent 50 new cases of HIV/AIDS per year in children living in the Greater Kingston area.

Information coming out of the project's research activities has been used in the preparation of the journal article given below:

J.C. Steel-Duncan, R. Pierre, T. Evans-Gilbert, B. Rodriguez, M.F. Smikle, P. Palmer, S. Whorms, I. Hambleton, J.P. Figueroa, C.D.C. Christie. Uptake of interventions, outcomes and challenges in caring for HIV-exposed infants in Kingston, Jamaica. *West Indian Medical Journal*, 2004;53:5;308-315 (October).



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The Prevalence of Cutaneous Diseases among HIV-Positive Patients and the Correlation with the Degree of Immunodeficiency and/or Progression to AIDS in Patients Attending Three Outpatient Clinics in Kingston, Jamaica

Principal Investigators: Dr. Althea East-Innis
Department of Medicine

Professor Brendan Bain
Department of Community Health and Psychiatry

Research Fellow: Dr. Debbie Thompson

To date, many skin disorders have been associated with the Human Immunodeficiency Virus (HIV) infection and according to studies done outside of Jamaica, between 80% and 95% of HIV infected patients are affected by at least one skin disorder during the course of their illness. Moreover, some skin changes appear to be markers of disease progression. Based on a review of the literature, there has been no previous study of the Jamaican population or a predominantly black Afro-Caribbean population documenting the spectrum of skin disease and the correlation of skin disorders to CD4 count, total lymphocyte count or the onset of AIDS-defining illnesses.

Additionally, in developed countries, very expensive laboratory tests are used to assess the stage of progression of HIV/AIDS and to help clinicians decide (a) when to commence anti-retroviral drug treatment, and (b) when to modify treatment. The two tests that have been used for these purposes have been the T-helper inducer cell (CD4 cell) and the HIV viral load. However, it has now become necessary to identify lower cost alternatives to the CD4 count and HIV viral load that are valid and reliable.

One of the main aims of this research project which will shortly commence, is to determine the incidence and prevalence of cutaneous diseases associated with the HIV disease and their correlation with the degree of immunodeficiency and/or progression to AIDS. To this end, the study will focus on patients who have been attending HIV/AIDS outpatient clinics in Kingston and St. Andrew, Jamaica. The study will also seek to investigate whether the presence of the total lymphocyte count and certain skin manifestations may be used as predictors of the CD4 count in patients with HIV/AIDS, and hence become a viable practical alternative to this expensive test for poorer patients.



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The project's work will involve a study that is to be conducted on patients who have attended the CHARES Clinic (that is, the HIV/AIDS outpatient clinic) at the UHWI over the period, January 1, 1998 - December 31, 2003. It is hoped that this study will guide health care policy-makers to more effectively develop strategies to deal with the HIV/AIDS epidemic. Health care workers and HIV-positive persons alike should also benefit from the expanding body of knowledge as it relates to Jamaica's particular socio-economic and cultural parameters.



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Cardiovascular Disease and Osteoporosis in the Menopause Post Hysterectomy in Jamaican Black Women: A Case Controlled Study

Principal Investigator: Dr. Horace Fletcher
Dept. of Obstetrics, Gynaecology and Child Health (OGCH)

Co-Investigators: Professor Joseph Frederick, OGCH
Dr. Sharmaine Mitchell, OGCH
Professor Franklyn Bennett, Department of Pathology
Professor Rainford Wilks, Tropical Medicine Research Institute

The aim of this research project is to investigate whether premature menopause causes any long term cardiovascular side effects or osteoporosis. In the study, the focus will be on women who have undergone hysterectomies more than five years ago. The research undertaken should allow for comparisons to be made between this group of women and women who have not had hysterectomies.

In the first phase of the project, 480 women were recalled and tested out of a targeted amount of 760 (that is, 380 post hysterectomy women and 380 who have not had hysterectomies). To date, data on the first 200 women studied have been analyzed with the focus being on the osteoporosis component at this point. It has been found that the frequency of low bone mineral density is similar to that found in African American women (that is, 36%) but lower than that of European American women. The findings also indicate that low bone mineral density is related to the factors of age and Body Mass Index (size) but not related to hysterectomy or any other factor examined such as diet and exercise.

These findings were presented at the Jamaica Menopausal Society Symposium on October 2, 2004 and also at the Faculty of Medical Sciences' Research Day on November 11, 2004. They were also published in the form of an abstract, "Low Bone Mineral Density in an Afro Caribbean Jamaican Population and Associated Risk Factors" in the *West Indian Medical Journal*, Volume 53 (supp 5) oral 5.

Information from the study should be useful to health care professionals in their efforts to screen for bone density and cardiovascular disease. It should also play an important role in the development of suitable treatment programmes for post menopausal women who experience severe health conditions such as a fracture, stroke or heart attack.



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Xanthan Gum Production

Research Co-ordinator: Dr. Michelle Hamilton
Department of Basic Medical Sciences

Research Fellow: Mr. Garth Dawkins

Senior Process Engineer: Professor Winston Mellowes
Department of Chemical Engineering
U.W.I., St. Augustine

Recent challenges to the traditional sugar trading agreements, coupled with increased cost in sugar production and a decline in world prices for sugar and its traditional by-products (molasses and bagasse) have seriously jeopardised the viability of the Caribbean Sugar Industry. As a direct consequence of these events, there is a push within the region for the development of value-added products as a profitable source of revenue for the sugar industry. A novel process of xanthan gum production using raw materials from the sugar industry provides such a source.

The world market for xanthan gum is growing at roughly 5-7 % per year. This is due to its unique properties which have allowed it to find numerous applications in the food, pharmaceutical and other industries as a thickener, stabilizer, emulsifier and suspending agent. The gum is currently used in several products such as salad dressings, juices, cake mixes, antacids, cosmetic items such as toothpaste, and hair care products. The versatility of the gum is also shown by the fact that it is utilized in products such as fertilizers and paints and can even be used to enhance the recovery of oil in drilling operations.

Although the use of xanthan gum could have a significant impact on the petroleum industry in the region and the wider international community, vast quantities of the product are required for the oil recovery process. This is in turn dependent on its availability as a low-cost input. Consequently, international research has been focusing on ways of reducing the costs of production of xanthan gum.

This recently completed research project has focussed on the utilization of products from the sugar industry as inputs in the production of xanthan gum. The low cost of these raw materials contributed to the lowering of the overall production cost of the gum. The basic process involves aerobic fermentation of sugars for several days, followed by cell removal and gum precipitation using ethanol. The gum is then dried and ground to a powder. With the development of a successful pilot scale process which elicited the expressed interest of several potential industrial partners, the focus is now on the transfer of process technology to industry.



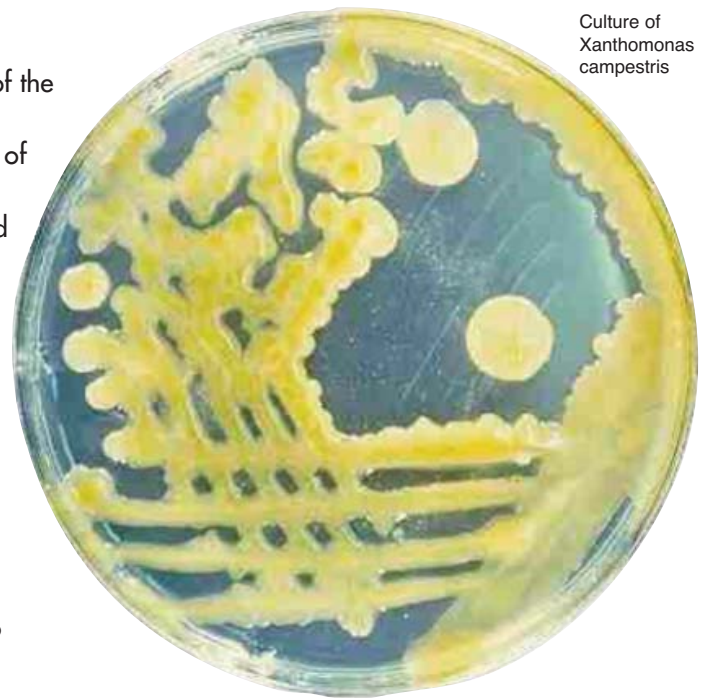
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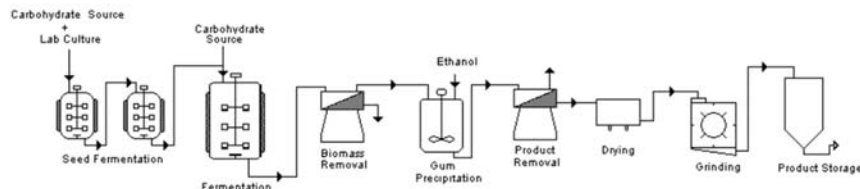
The benefits of the project's work in this area go far beyond the obvious cost reduction to include the following:

- greater profitability of the regional sugar industry as a result of the production of xanthan gum, a value-added product;
- diversification of the sugar industry both in terms of the range of products produced and markets accessed;
- the supply of xanthan gum to local manufacturers at a reduced cost with a view to increasing local utilization of xanthan gum and concomitantly increasing the quality of goods produced locally;
- the establishment of fermentation facilities at the Mona campus, which will enhance the university's teaching and research capabilities in the area of fermentation technology;
- increased revenue to the University of the West Indies through the sale of patents or licensing agreements to commercial entities involved in xanthan production; and
- positioning the University of the West Indies, Mona Campus to be better able to attract funding, given its role in the development and commercialization of a project with such far reaching implications for the economy of the Caribbean region.



Culture of *Xanthomonas campestris*

Basic Process for Xanthan Gum Production



The research carried out in this project also led to the production of several publications and conference presentations, some of which are listed below:

- *Xanthan Gum Production from Molasses*. 2003. Technical display at the Denbigh Agricultural Show. August 1-6.
- Dawkins G., Hamilton M., Mellows W. 2003. *Xanthan Gum Production from Molasses: A Potential Value-Added Product for the Sugar Industry*. The Jamaican Association of Sugar Technologists 66th Annual Conference. November 6-7.
- Hamilton M., Dawkins G., Mellows W. 2004. *Diversification of the Sugar Industry through Xanthan Gum Production*. 28th West Indies Sugar Technologists Conference. June 14-18 (awarded best paper).



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Cancer Mortality Registration

Principal Researcher: Professor Barrie Hanchard
Department of Pathology

The aim of this research project was to collect and publish data on cancer mortality in Jamaica. The project also sought to work with the established protocols to maintain the data collection and data analysis systems with a view to evaluating all parameters related to cancer mortality. This enabled the Jamaica Cancer Registry in the Department of Pathology to add another index of cancer registration to its portfolio, namely that of cancer mortality.

The registry which has been in existence since 1958 had previously collected data and published figures on cancer incidence only, using the parishes of Kingston and Saint Andrew as its population base. Current global practices in cancer registration, however, have demanded that the analysis of cancer mortality be done in addition to the customary presentation of statistics on cancer incidence. This development prompted the Jamaica Cancer Registry to acquire the facilities and the protocols to monitor cancer mortality in the local setting.

Work has already commenced on the next five-yearly review of cancer incidence which is to be published during the first half of 2005. This review will utilize the information coming out of a special linkage study and in particular, the incidence and mortality data on specific cancers as recorded in the Registry. The incidence and mortality data will allow for the determination of the various survival rates for the common cancers in the local population. The information that will be provided in this soon-to-be published review should enable health care administrators to better evaluate local treatment protocols in terms of their efficacy.



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Exploring and Documenting Current Knowledge on Issues Related to Caribbean Mental Health and the Biological Basis for Normal and Abnormal Psychological Functioning

Principal Investigator: Professor Frederick W. Hickling
Department of Community Health and Psychiatry

Research Fellow: Dr. Roger Gibson

Who we are is heavily influenced by our socio-cultural environment. Yet, in many respects, what makes us “Caribbean” has not been well-defined. This is the case for issues pertaining to psychology and psychiatry. Is there any such thing as a Caribbean psyche? Do features of mental illness in Caribbean people differ from those in people elsewhere in the world? How have the legacies of slavery and colonialism shaped how we see ourselves and the world? These are the kinds of questions that this research project will explore and attempt to answer.

The main premise of this research is that, to a great extent, the answers are already available, but that they now exist as scattered fragments to be found in scientific journals, history books, art, literature, government documents, acts of law, and many other sources. The method of investigation will depend on the collaboration of leading Caribbean thinkers in psychiatry, psychology and neuroscience who will put the fragments together in a coherent form which may be made easily accessible to the Caribbean people and to other interested persons.

The focus of the project’s work will be on getting the participation of contributors from across the Caribbean and coordinating the many activities involved in the collaborative effort. The work will culminate in the publication of four books over a two-year period. The first will be a book on Caribbean Psychiatry published as part of the World Psychiatric Association’s *Images of Psychiatry* series. The second will be a compendium of twenty-five of the most influential journal articles on Caribbean psychiatry. The third book is on Caribbean psychology and will explore cultural factors impinging on the psychological life of the individual, as well as models of problem-solving and therapy which are distinctly Caribbean.

The fourth book is somewhat different from the others and will look at how the anatomy and physiology of the brain can be correlated to different psychological states and to signs and symptoms of psychiatric disorders. It will be relevant even outside the context of the Caribbean but will depend on the input of Caribbean scholars for its production. It is likely to be particularly beneficial to students of neuroscience.

The exploration of Caribbean issues in psychology, psychiatry and the neurosciences will clarify the current state of knowledge in these areas, influence practice in related disciplines, and indicate future directions for research.



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Maternal Mortality in Jamaica, 1998-2003: Has Surveillance Reduced Mortality?

Principal Researcher: Dr. Affette McCaw-Binns
Department of Community Health and Psychiatry

Research Fellow: Miss Sonia Alexander

Vital registration statistics underestimate maternal mortality in Jamaica by 76%. The only accurate way to determine incidence is by direct survey, the last of which covered the years, 1993-1995. That review recommended that maternal deaths be made a Class I notifiable disease, which by statutory requirement (1998), must be reported to public health authorities. This ongoing research project therefore seeks to document the maternal mortality ratio for Jamaica for the years, 1998-2003, and to determine whether surveillance has influenced incidence.

The study utilized a listing of reported deaths in the various health regions which was provided by the National Maternal Mortality Surveillance System (MMSS). Verifiers independently visited all public hospitals (n = 20) and pathologists' offices to identify deaths in women aged 10-50 years. A case extraction form was completed for women with evidence of pregnancy within one year of the death and classified as direct, indirect, accidental/incidental, and late maternal deaths. Definitions and coding of cause of death and pregnancy complications were consistent with the ICD-10 and previous national studies with respect to the inclusion of incidental and late deaths. Key informant interviews were conducted with surveillance team members at the regional level to share the findings and to determine not only regional surveillance activities but also their need for technical assistance.

Based on data analysis which was done with SPSS for Windows (11.5), the results showed a significant decline in deaths directly related to pregnancy (such as hypertension in pregnancy and haemorrhage), which in the 2001-2003 triennium accounted for 57% of pregnancy related deaths compared to 84% between the years, 1981 and 1983. This however was negated by an increase in medical complications leading to maternal death, due mainly to HIV/AIDS; up from zero in the 1993-1995 period to 10 (1998-2000) and 18 (2001-2003) cases respectively. For the 2001-2003 period, the five leading causes of maternal death were hypertension in pregnancy, haemorrhage, HIV/AIDS, cardiac conditions and embolism (clots in the lungs). Many women with hypertension (40%), cardiac disorders (53%) and diabetes (100%) were obese. Women who live in parishes without an obstetrician were twice as likely to die from pregnancy complications compared to residents of parishes with an obstetric specialist at the parish hospital. Reporting of maternal deaths to the Ministry of Health steadily increased from 23% in 1998 to 84% in 2003 with full compliance from the north east and south east regions and only 50%-60% of cases reported from the other two regions.



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Because of the increase in medical complications while obstetric complications were declining, there was no overall improvement in the maternal mortality ratio which for the 2001-2003 period stood at 106.5/100,000 compared to 97.7/100,000 live births for the 1993-1995 period. Most of this increase was due to the impact of HIV/AIDS and an increase in deaths due to cardiac complications, conditions which may be prevented by greater attention to health behaviour.

The study's findings indicated that the current surveillance guidelines should be expanded to include reporting of late deaths with guidelines to improve the identification of these cases. A more comprehensive postnatal programme is needed to ensure continuity of care for women with chronic disorders, including those with HIV/AIDS. Technical assistance is needed to assist local teams to develop action plans to correct the deficiencies identified by the surveillance process.



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Community Dental and Maternal Health

Principal Researcher: Dr. Affette McCaw-Binns
Department of Community Health and Psychiatry

Research Fellow: Ms. Sonia Alexander

There is current evidence that one possible etiology of preterm birth in low risk women may be oral infections. An oral disease, periodontitis has been associated with preterm/low birth weight (PTLBW) due to the spread of bacteria and bacterial products from the mouth to the fetoplacental unit. This results in preterm labour and premature delivery of a low birth weight baby. Treatment of this disorder has been associated with reduced incidence of preterm low birth weight infants in studies in Chile, Venezuela, and the United States. A preliminary review of the oral health status of 72 post natal mothers in Jamaica and St. Lucia found that all but two women had some degree of periodontal disease, with 74% classified as severe and only 7% having mild periodontitis or none at all, suggesting that this may be one explanation for the high preterm delivery rate in Jamaica (14.5%). If a cost effective method could be found to control this problem, it has the potential for significant social, economic and health benefits for families and the society.

The aim of this ongoing research project is to determine whether oral health care can reduce the rate of preterm low birth weight in Jamaica. Much of the work on the project will centre on the efforts to conduct a randomized trial among 1,500 antenatal women at selected community health centers in the southeastern region of the island that should provide information on:

- the periodontal status of pregnant women;
- socio-demographic characteristics associated with pregnancy outcome and periodontal status; and
- whether preventive care and treatment of periodontal disease reduces PTLBW; and hospital care costs incurred at delivery.

Community Dental and Maternal Health Study
Participant Information

Things you need to know!

You Will:

- Get your teeth cleaned before or after your baby is born
- Be seen three times during the study
- Be asked questions about yourself (your information will be kept private)
- Sign a consent form to be in the study

You can:

- Leave the study at anytime and it will not affect your antenatal care

We will:

- Make you comfortable while we check and clean your teeth

Dental care is free!

Questions?
Contact: Mrs. Sonia Alexander
Dept. Community Health and Psychiatry
UWI, Mona
Tel: 927-2476
Email: sonia.alexander@uwimona.edu.jm



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Women will be assigned to two groups based on the health centre they attend and a treatment and control group. The treatment group will receive periodontal care and oral health instruction while the control group will be interviewed and examined, but their dental care needs will not be addressed until after delivery. Dental care providers and public health nurses/midwives will screen all women and provide the necessary care. Women will be provided with oral and written information on the study at the time of recruitment.

Data collection commenced in October 2004 and is expected to continue for two years.



PREGNANT?

For healthy teeth and gums and a happy healthy baby!

Brush your teeth 2 times a day

Floss your teeth everyday!

Eat Right



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Bacterial Fc-receptors: Applications in Immunodiagnosis of Infectious Diseases and Immunogenicity Studies

Principal Researcher: Professor Norma McFarlane-Anderson
Department of Basic Medical Sciences

Research Fellow: Dr. Angel Justiz Vaillant

The prevalence of HIV infections in Caribbean countries is one of the highest in the world. The main aim of this ongoing research project is to produce antibodies in chicken eggs with the potential to be used for the treatment and/or diagnosis of HIV/AIDS. The hypothesis that will be tested in this study is that antibodies that recognize the HIV virus, and have the potential to fight the HIV virus, after consumption might be able to boost the immune system. These antibodies have been produced in chickens and identified in the egg yolks from these birds.

Preliminary data from the feeding of these eggs to cats and rats showed positive results, suggesting that eggs from immunized hens could induce the same type of immune reaction in humans and could thus be considered as one of the necessary components in the management of HIV infections. More experiments are currently being carried out to confirm these findings and to further test the utility of the egg and chicken system. Bacterial Fc-receptors are proteins used as immunological tools in different experiments. They constitute an alternative approach to the use of conventional immunological tools such as enzyme labeled secondary antibodies. The binding capacity of bacterial Fc- receptors to antibodies of several animals has been demonstrated and conjugates of these proteins used in the detection of egg yolk antibodies.

The results have been used to produce various journal articles and poster presentations, a few of which are listed below:

- Justiz Vaillant A, Smikle M, McFarlane-Anderson N. (2004). *Production of anti-HIV antibodies in layer chickens. Immunology 2004*: p. 115-118.
- Poster presentation for the 12th International Congress of Immunology and 4th Annual Conference of the International Federation of Clinical Immunology Societies, Montreal, Canada, July 2004.



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The Molecular Characterization of Insect Vector(s) Transmitting Lethal Yellowing Disease of Coconuts (CLY) in Jamaica

Principal Co-ordinator: Dr. Wayne McLaughlin
Department of Basic Medical Sciences

Research Fellow: Dr. Sherline Brown

Lethal Yellowing (LY) is a fatal disease of coconuts and other palms and has killed millions of plants in the Caribbean over the past 40 years. The sudden emergence of the phytoplasma related disease in coconuts and their rapid spread have caused much concern, especially because they have reached such epidemic proportions throughout Jamaica. To date the vector of the phytoplasma responsible for the spread of LY disease in Jamaica is still not known. Information is needed on the potential vector(s) and inoculum sources to predict the risk of new infections, to monitor disease progress and to develop control methods. The overall aim of this ongoing research project therefore is to study insect fauna associated with coconut and their potential as vectors for the transmission of lethal yellowing disease affecting coconuts.



Malayan Dwarf Coconuts

Coconut lethal yellowing phytoplasma was detected in the common weeds *Cleome rutidosperma*, *Macroptilium lathyroides* and *Stachytarpheta jamaicensis*, as well as members of the *Cedusa* species of Derbids from Jamaica by nested polymerase chain reaction (PCR). Restriction fragment length polymorphism (RFLP) analyses of the PCR products revealed that weed infecting phytoplasma strains were similar to the strain found in coconuts in Jamaica. DNA sequence analysis of the 16S rDNA showed that the phytoplasma strain found in *S. jamaicensis* and *C. rutidosperma* was 98% similar to the lethal yellowing phytoplasma found in coconuts in Florida and Jamaica. Phytoplasma found in *M. lathyroides* was 96% similar to lethal yellowing phytoplasma found in coconuts from Florida and Jamaica. RFLP analyses of the PCR product revealed variations in 8 of 13 Derbids analysed, suggesting that these plant hoppers could be infected with more than one phytoplasma or different strains of the LY phytoplasma. DNA sequence analysis of the 16S rDNA showed that the phytoplasma strain in the Derbids was over 97% similar to the phytoplasma strain found in coconuts in Florida and Jamaica. The phytoplasma strain found in the three weeds analysed as well as the Derbids, clustered together with the Jamaican and the Florida coconut lethal yellowing phytoplasma, as well as other previously characterised strains composing the lethal yellowing phytoplasma 16SrIV group.

The results obtained so far provide new information on possible insects and plant weeds that could act as potential vectors and hosts, respectively, for phytoplasma associated with coconut lethal yellowing disease.



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In-vitro Effects of Nitric Oxide on Insulin-mediated Signal Transduction

Principal Investigator: Dr. Dalip Ragoobirsingh
Department of Basic Medical Sciences

Co-investigator: Dr. Paul D. Brown

Research Assistant: Miss Simone Badal

Nitric oxide (NO) is an important bioactive signalling molecule that mediates a variety of normal physiological functions. Prior to this research project, preparatory work had indicated that exogenous NO (from NO-releasing drugs) inhibits *in vivo* insulin binding to its receptor on mononuclear leukocytes, which was attributed to decreased insulin receptor sites per cell. Subsequent work has demonstrated that NO significantly inhibited *in vitro* glucose uptake, and had various effects on signalling pathways in insulin-sensitive tissues, which were either dose- or tissue-specific.

The objectives of this follow-up research project are to characterize the *in vitro* effects of NO on phosphorylation of the tyrosine and serine residues in the insulin receptor substrate-1 (IRS-1), and the tyrosine residues in the insulin receptor β -subunit, using dissociated skeletal muscle and adipose tissue from Sprague-Dawley rats. Preliminary data show that NO drugs cause a significant decrease in tyrosine phosphorylation of IRS-1 in skeletal muscle cells, which supports the study's thesis that NO is a potent inhibitor of insulin mediated signal transduction and possibly in the pathogenesis of type 2 diabetes mellitus.

Understanding the mechanism(s) by which NO may play a role in NIDDM is essential to mitigate secondary type 2 diabetes in hypertensive patients, where NO drugs find application, as well as to correct impairment in signal transduction due to NO. Dissemination of the results will occur via presentations at local and regional meetings, and publication of papers in appropriate journals.



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A Comprehensive Look at the Health Development and Behaviour of Jamaican Adolescents at Age 15-16 Years: The Second Follow-up of a Birth Cohort

Principal Researcher: Dr. Maureen Samms-Vaughan
Department of Obstetrics, Gynaecology and Child Health

Research Fellow: Mrs. Uki Atkinson

A nation's future is determined by the status of development of its children. Each nation should assess the status of its children in order to identify areas of deficiency and plan appropriate interventions. Birth Cohort studies, though expensive, provide useful information for policy makers to enhance population well-being. Generally, few birth cohort studies are conducted in developing countries, where the need for information on the factors that promote and prevent the optimum development of children, may be greatest.

The Jamaican Perinatal Survey identified all children born in September and October 1986. The survey was conducted to determine the factors that affect the health of mothers and their babies. Similar to the British Birth Surveys of 1946 and 1970, plans were made to conduct longitudinal surveys of the cohort children. A geographical sub-sample of cohort children in Kingston and St. Andrew were evaluated at ages 11-12 years ($n = 1,720$) and 15-16 years ($n = 1,565$) respectively. The comprehensive evaluations sought to identify the social, family, health and lifestyle factors that impact on cognition, school achievement, behaviour and the emotional development of Jamaican children at the end of both the primary and secondary school years. During the second follow-up of the children which ended in December 2004, 63 schools were visited, in which 1,565 adolescents were evaluated. Their parents ($n = 547$) and teachers ($n = 393$) were also interviewed. Over 2,000 variables on health, behaviour cognition and emotional development are being analysed. Only the few that have undergone preliminary analysis are reported on here.

A majority of the adolescents live in households with modern social amenities. Mothers are the main parental figures in the home. Approximately three-quarters of the sample (76.3%) reported living with their biological mother while 38.3% live with their biological father. Mothers were identified as the main disciplinarian at home by approximately half of the sample. Less than 20% reported that both parents and fathers only were responsible for discipline. Based on the Conflicts Tactics Scales, adolescents report more minor violence (insults,





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threats, spiting) as methods to resolve conflicts with adults at home and school. Corporal punishment and physical abuse were not commonly reported. However, boys were more likely to experience corporal punishment and major violence in schools. Partner violence was reported by adolescents with girls more likely the recipients than boys.

Boys report beginning romantic relationships at an earlier age (13.63 ± 1.17) than girls (15.74 ± 2.79) and also report more relationships and higher break up rates. Boyfriends and girlfriends rank next to mothers and siblings in closeness and caring for their adolescent partners, while fathers, friends and teachers rank lower. Adolescents reported sexual activity both within and outside of romantic relationships. Of those who were sexually active, 60% were males and 29.5% females.





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The information coming from this survey contributes significantly to the emerging body of literature that links birth factors with later childhood and adult outcomes of health, development and behaviour. Recommendations for Health and Education policies are being formulated.



The relationships young adolescents have with their peers and adults are important in determining their outcome as adults

