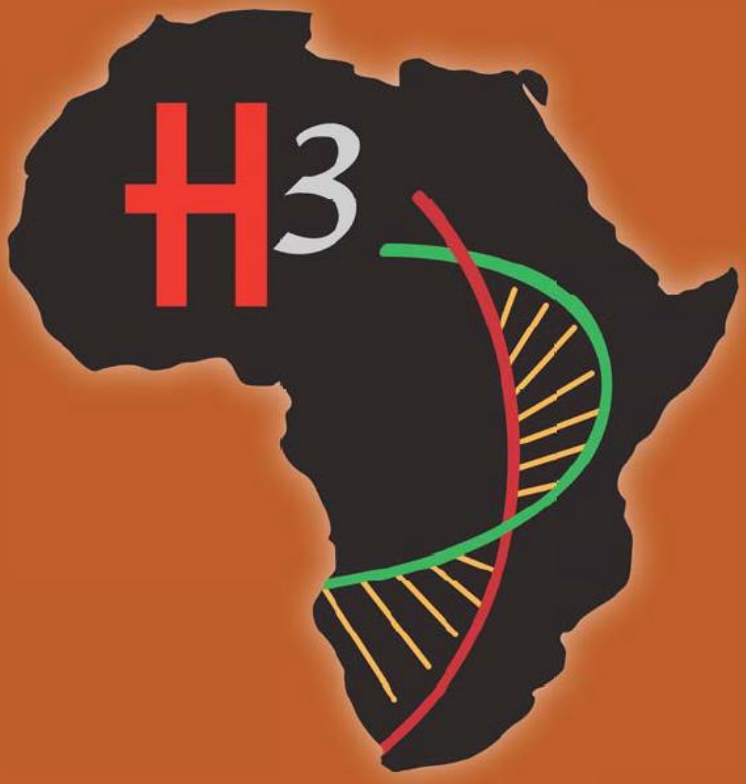
Human Heredity and Health in Africa

The Inaugural Meeting of the H3Africa Consortium

8–10 October 2012



Meeting Report

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NATIONAL INSTITUTES OF HEALTH

Report on the

Inaugural Meeting of the H3Africa Consortium

Addis Ababa, Ethiopia

8-10 October 2012

Content

1. Background

The H3Africa Initiative, which is a partnership involving the National Institutes of Health (NIH, USA), the Wellcome Trust (WT, UK), and the African Society of Human Genetics (AfSHG), was designed to facilitate a contemporary research approach to the study of the genomic and environmental determinants of diseases in Africa. The goals of H3Africa are to enhance the necessary genomic expertise among African scientists and to encourage collaborations African investigators by supporting infrastructure development and research projects. The anticipated long-term outcome of this approach is to enable African investigators to address health inequities in both communicable and non-communicable diseases, eventually leading to health benefits in Africa. The first set of 9 awards were made by the NIH and the WT in the summer of 2012, and this Inaugural Meeting of the H3Africa Consortium, comprised of the first cohort of H3Africa investigators, was held in Addis Ababa in October 2012.

2. Aims of the meeting

1. To launch the first cohort of awards made under the H3Africa Initiative
2. To provide networking opportunities for awardees, funders and other stakeholders
3. To discuss a framework for monitoring progress across the initiative as a whole, towards achieving the H3A goals of empowering African scientists, establishing research networks and building research capacity in Africa
4. To discuss consortium-wide policies and other issues of interest

3. Specific objectives of the meeting

1. To provide an opportunity for awardees to describe their research projects to the Consortium
2. To inform awardees of progress in setting up a bioinformatics network and biorepositories
3. To identify opportunities for collaboration across the Initiative
4. To discuss the opportunities and funders' expectations for sharing protocols, data and samples across the initiative
5. To discuss how to share experience in ELSI across the Initiative
6. To discuss how to build research capacity across the Initiative
7. To discuss ways of monitoring and evaluating the progress of the Initiative as a whole
8. To provide an opportunity for awardees to discuss specific issues with their funder.

4. Format of the meeting

The first day of the meeting was devoted to presentations from the Funders and Principal Investigators, setting the scene and highlighting some key issues facing H3Africa researchers. These issues were picked up in the subsequent two days, with sessions including introductory talks from experts, break-out discussion groups and reports of those discussions back to the entire group.

There was also a Press Event on the first day where the H3Africa awards were officially announced. The recording and official transcript from the teleconference can be found at http://h3africa.org/InauguralMeeting.cfm.

The meeting agenda can be found in appendix 1.

5. Introductory sessions

5.1 Session 1: Background to the H3Africa Initiative

Charles Rotimi, whose vision laid the groundwork for H3Africa and who is Director of the NIH-Center for Research on Genomics and Global Health, opened the meeting by presenting the history of the H3Africa Initiative. Pat Goodwin, a senior consultant at the WT, introduced the WT-H3Africa awardees and described how these awards continue the legacy of the WT's historic international research portfolio. She was followed by Eric Green, Director of the National Human Genome Research Institute, who introduced the NIH-H3Africa awardees and explained the context in which the H3Africa Initiative operates as a NIH Common Fund program. All three speakers concluded their talks by sharing their enthusiasm and support for the H3Africa Initiative.

5.2 Session 2: Wellcome Trust Research Networks

Audrey Duncanson introduced the Wellcome Trust H3Africa Principal Investigators. The presentations were:

- "Burden, spectrum and aetiology of type 2 diabetes in sub-Saharan Africa" (Albert Amoah, University of Ghana Medical School)
- "Genetics of rheumatic heart disease and molecular epidemiology of *Streptococcus pyogenes* pharyngitis" (Bongani Mayosi, University of Cape Town)
- "TrypanoGEN: An integrated approach to the identification of genetic determinants of susceptibility to trypanosomiasis" (Enock Matovu, Makerere University of Veterinary Medicine)

Copies of the presentations can be found on http://h3africa.org/InauguralMeeting.cfm; abstracts can be found in appendix 2.

5.3 Session 3: NIH Collaborative Centres and Research Project

Jane Peterson introduced the NIH H3Africa Collaborative Centres and Research Project Principal Investigators. The presentations were:

- "Genomic and environmental risk factors for cardiometabolic disease in Africans" (Michele Ramsay, University of Witswatersrand & NHLS)
- "H3Africa Kidney Disease Research Network Organization" (Dwomoa Adu, University of Ghana Medical School)
- "Contribution of genetic variation to pharmacokinetic variability and toxicity in patients undergoing multi-drug tuberculosis treatment in Sub-Saharan Africa: RAFAgene project" (Dissou Affolabi, National Hospital for Tuberculosis and Pulmonary Diseases, Benin)

Copies of the presentations can be found on http://h3africa.org/InauguralMeeting.cfm; project abstracts can be found in appendix 2.

5.4 Session 4: NIH Bioinformatics and Biorepository Projects

Mark Guyer and Jane Peterson provided an overview of the infrastructure development goals of H3Africa, and then introduced the Principal Investigators of the NIH H3Africa bioinformatics (H3ABioNet) and biorepository awards. The presentations can be found on http://h3africa.org/InauguralMeeting.cfm, abstracts can be found in appendix 2.

5.5 Summary of discussions in sessions 1-4

5.5.1 Vision of H3Africa

The motivation behind creating the H3Africa Consortium was to provide opportunities for the H3Africa researchers to share experience, develop common policies, create opportunities for new interactions among the funded investigators and build further synergies, beyond the collaborations already embodied in each of the funded projects, with the expectation the Consortium as a whole will be greater than the sum of its parts. At the same time, care will be taken by the funders and Principal Investigators to ensure that the activities of the H3Africa Consortium do not compromise the effectiveness of the individual research projects and networks.

5.5.2 Issues facing H3Africa researchers

Concerns common to all of the research projects and networks include informed consent, enrolment of study participants, and harmonization across the sites in multiple countries. It will be important for the H3Africa Consortium members to identify and document the ELSI issues (particularly those related to the ownership and transfer of data and biological samples) that are unique to or critical for conducting responsible research in Africa.

5.5.3 Opportunities and suggestions for the H3Africa Consortium

a. Research

- Harmonization, standard operating procedure (SOP) development, and standardization of clinical and phenotypic definitions across the H3Africa Consortium will provide additional research opportunities and, therefore, contribute to the success of the H3Africa Initiative.
- Collaborations across the H3Africa studies concerned with diabetes, hypertension, obesity and renal disorders could provide "added value."
- Increased knowledge of genetic effects could aid investigation of the role that environmental differences in urban and rural settings play in diseases in African populations.

b. Training

- There needs to be a coordinated method (possibly via the website) of informing the entire H3Africa Consortium about the training initiatives in each project.
- The H3Africa Consortium should consider creating a database to track the trainees involved in the training programs embedded in the research projects and centers. Whether the trainees remain in or return to Africa will be an important indicator of the success and sustainability of the H3Africa Initiative.

c. H3ABioNet

One of the functions of H3ABioNet will be to enable communication and harmonization among the H3Africa projects and centers. As well as providing individualised resources and training to each project, H3A BioNet will hold several grantee group training workshops per year. Although several of those have been defined, the topic of one workshop each year has been left open, with the subject to be decided by the H3Africa investigators. Establishing priorities, developing a timeline for providing services, and interfacing with the biorepositories will be the next steps for H3ABioNet.

d. Learning from other initiatives

As it is developed further, the H3Africa Consortium should make an effort to learn about the experiences of similar initiatives, for example, MalariaGen.

6. Discussion sessions

6.1 Session 5: Sharing protocols and data

This session was co-chaired by two members of the Independent Expert Committee, Rex Chisholm and Carlos Bustamante. Mark Guyer began by presenting a historic perspective on data sharing in genomics and the lessons learned from other NIH/National Human Genome Research Institute-led genomics projects. Charles Rotimi followed with a discussion of data and sample sharing in the African context, in which he emphasized the importance of finding a way to balance the genomics practice of rapid data release with the need for H3Africa investigators to have sufficient time to analyse their data and publish papers. Carlos Bustamante and Rex Chisholm closed the presentations (see http://h3africa.org/InauguralMeeting.cfm) by providing a summary of best practices for protocol and data sharing. This was followed by breakout group discussions.

6.2 Session 6: Consent and return of results

This discussion session was co-chaired by two members of the Independent Expert Committee, Ruth Chadwick and Charmaine Royal. Ruth Chadwick's presentation addressed informed consent, and she summarized key concerns that arise in working with special populations. She also discussed issues unique to genetic\genomic research. Charmaine Royal then discussed the issue of returning results to research study participants, summarizing the current debate about whether, when, and how to return results. Clement Adebamowo concluded the session by describing the need for genetics\genomics research in Africa and how to balance that need with the need to protect the communities involved. The presentations can be found at http://h3africa.org/InauguralMeeting.cfm. The remainder of the session was devoted to breakout group discussions.

6.3 Session 7: Strategic issues

Independent Expert Committee Members Solomon Nwaka, Ayoade Oduola and Philip Awadalla delivered a joint presentation and chaired a strategy session to discuss ways in which the H3Africa Consortium could identify ways to develop a stronger research capacity in Africa. Their joint presentation can be found at http://h3africa.org/InauguralMeeting.cfm. The remainder of the session was devoted to breakout group discussions.

6.4 Summary of discussions

6.4.1 Issues facing H3Africa researchers

A number of issues facing H3Africa researchers were identified:

- The vision of H3Africa is that the research and training, including analysis of the data, is carried out in Africa. However, that is not practical at the moment and currently the best way to train young African scientists in analytical skills is by collaboration with experts at centres outside Africa.
- Standard protocols are needed for data and sample collection and generation.
- Quality control and assurance across the Consortium is a top priority.
- Some H3Africa researchers considered that African data should be stored in an African database. However, H3ABioNet does not have the capacity to establish a stand- alone database and it is proposed that H3Africa data will be kept in the European Genome-phenome Archive (EGA) which is hosted by European Bioinformatics Institute (EBI), ideally with a mirror in Africa .
- H3Africa must develop policies for data release and data access which address how soon after analysis the data are made available to the research community and the process whereby the data are accessed. It was noted that there are some country-specific issues related to data and sample sharing.
- The possibility of sharing data among the Consortium members prior to public release could be considered. Software systems that enable data sharing are available and should be assessed for their usefulness, including whether they might be customised to meet the needs of the H3Africa investigators.
- The Consortium should assess the value of developing a common genotyping platform.

Specific actions include:

- A Working Group should be established to develop policies for data sharing across the consortium, and data release and access to the wider community
- A workshop to discuss common protocols should be convened as soon as possible
- H3Africa is not just a 5 year funding programme, but an opportunity to develop a research agenda for Africa, with the necessary infrastructure. This will require the

support of national leaders and pan-African agencies such as NEPAD, and researchers need to be prepared to lobby them when appropriate.

6.4.2 Consent – Opportunities and suggestions for consideration

With regard to issues around consent, the following opportunities and suggestions for consideration were identified:

- H3Africa researchers will need to find a mechanism to balance ethical principles with the practicality of the environment in which they are conducting the study.
- Institutional Review Boards (IRBs) in Africa have varying levels of familiarity with genetics/genomics and might be unfamiliar and/or uncomfortable with the concept of broad consent.
- Researchers must be able to clearly explain the purpose of the study to participants in a language they can understand.
- Creating education programs, developing information strategies, and monitoring and addressing risk perception in the media and community can be useful in engaging the community and promoting understanding of the consent process.
- A template consent form should be created for the H3Africa Consortium.
- Any modification made to the form by a project should be shared with the Consortium. However, if a study has to modify an existing consent form, care should be taken not to undermine the original aims of the study.
- A dictionary of common terms used in the consent forms would be useful.
- It would be beneficial to develop guidance explaining broad consent for IRBs and national and local leaders. This could possibly be taken on by NEPAD; a presentation on genomics and H3Africa to a meeting of the African Ministers of Science/Health could be useful.
- The H3Africa Consortium has the opportunity to develop and document strategies of obtaining informed consent in Africa, including differences encountered between urban and rural regions in Africa.

6.4.3 Return of results – Opportunities and suggestions for consideration

Regarding the return of results, the following opportunities and suggestions for consideration were identified:

- There are a number of practical and ethical challenges for returning results in Africa, but the Consortium members thought that having a blanket rule that results would not be returned in H3Africa would take away the choice from the participants.
- If individual results are to be returned to participants, issues that need to be considered include validating results before being returned to participants, determining what follow-up medical resources should be made available to participants after receiving results, minimizing stigmatization, and determining to whom to give results in a patriarchal society.
- If individual results are not to be returned, other benefits for participation could include reporting aggregate results, study newsletters, etc
- Consideration must also be given to the possibility of community harms, such as incorrect extrapolation of results to a community and inappropriate interpretation of results.
- Before formulating a policy on Return of Results the H3Africa Consortium needs to engage the various stakeholders, including grantees, IRBs and relevant communities and governments, in the discussion as to whether and how to return results to participants.

6.4.4 Realizing the H3Africa Vision

The following suggestions and observations were made:

- H3Africa must look for opportunities to work with other African research initiatives.
- H3Africa could provide leadership in bioinformatics and biobanking in Africa.
- The Consortium should make exhaustive use of the data generated, and it was recognized that data analysis can continue beyond the lifetime of the grants.
- Added value could be obtained if a baseline questionnaire were developed with a view to developing a large control cohort for future studies.

6.4.5 Developing partnerships for capacity building

H3Africa has the opportunity to work with many partners:

- National and regional partners -- to build capacity in clinical trials and translational research. Examples of possible partners are the European and Developing Countries Clinical Trails Partnership (EDCTP), the African Network for Drugs and

Diagnostics Innovation (ANDI), and the South African National Health Laboratory Service.

- Organisations involved in training in Africa, such as the West African Health Organization, the African Academy of Sciences (Nairobi), and the Wellcome Trust.
- Organisations such as New Partnership for Africa's Development (NEPAD) on regulatory issues in the African context
- Organisations that might provide sustainable resources, such as the Arab Bank for Economic Development in Africa.
- H3Africa should have a coordination group which monitors the progress and success of the Consortium.

7. Conclusion and next steps for the H3Africa Initiative

7.1 H3Africa Steering Committee

An H3Africa Steering Committee, composed of the nine Principal Investigators, was convened. The Chair will rotate every year; Alash'le Abimiku was elected as the first Chair. An Executive Sub-Committee of the Steering Committee, composed of Dr. Abimiku, Charles Rotimi and Bongani Mayosi, was also organized. The Terms of Reference for these committees will be developed shortly.

7.2 H3Africa Consortium Coordinating Office

Creating, and obtaining funding for, an H3Africa co-ordinating activity is of high priority. This is required to improve the harmonization and communication within the Consortium. The Steering Committee will draft and present a proposal for a Consortium Coordinating Office to the NIH, Wellcome Trust and other funding agencies for a coordination function.

7.3 Working Groups

The establishment of a number of Working Groups was recommended. These currently include:

- Marker paper and Consortium publications
- Data and protocol standard
- Bioinformatics, data management, access and release
- Biorepositories, MTAs and SOPs
- Education and training

- Communications and public outreach
- Ethics and regulatory issues
- Study coordinators
- Genome variation

7.4 Prioritization for cross-Consortium activities

Recognizing that the top priority for individual Investigators would be to get their own studies up and running, some concern was expressed about the amount of work which would be required to take all of these activities forward. It was concluded that producing a marker paper that describes the vision, plans and policies of the H3Africa Consortium was the highest priority. Another high priority activity was for the biorepositories to draft and circulate SOPs for sample storage during the pilot phase of the H3Africa biorepositories.

7.5 The next H3Africa Consortium meeting

If possible, the next meeting of the H3Africa Consortium should be scheduled to coincide with either the next annual AfSHG meeting or the African Bioinformatics meeting.

Appendix 1 – Meeting agenda

Monday 8 October

08:30 Registration

09:00 **Session 1: Background to the H3Africa Initiative**
Chair: Charles Rotimi, NIH-Center for Research on Genomics and Global Health

09:00 Vision for H3Africa and historical perspective
Charles Rotimi, NIH-Center for Research on Genomics and Global Health

09:15 H3Africa: the Funders perspective
Pat Goodwin, Wellcome Trust

09:35 H3Africa: the Funders perspective
Eric Green, NIH-National Human Genome Research Institute

09:55 Questions

10:00 **Session 2: Wellcome Trust Research Networks**
15 minute presentations followed by 10 minutes questions
Chair: Audrey Duncanson, Wellcome Trust

10:00 Burden, spectrum and aetiology of type 2 diabetes in sub-Saharan Africa
Albert Amoah, University of Ghana Medical School

10:25 Genetics of rheumatic heart disease and molecular epidemiology of streptococcus pyogenes pharyngitis
Bongani Mayosi, University of Cape Town

10:50 TrypanoGEN: an integrated approach to the identification of genetic determinants of susceptibility to trypanosomiasis
Enock Matovu, Makerere University College of Veterinary Medicine

11:15 **Coffee break**

11:45 **Session 3: NIH collaborative centres and research project**
15 minute presentations followed by 10 minutes questions
Chair: Jane Peterson, NIH-National Human Genome Research Institute

11:45 Genomic and environmental risk factors for cardiometabolic disease in Africans
Michele Ramsay, University of Witswatersrand & NHLS

12:10 H3Africa Kidney Disease Research Network Organization
Dwomoa Adu, University of Ghana Medical School

12:35 Contribution of genetic variation to pharmacokinetic variability and toxicity in patients undergoing multi-drug tuberculosis treatment in Sub-Saharan Africa: RAFAgene project
Dissou Affolabi, National Hospital for Tuberculosis and Pulmonary Diseases, Benin

13:00 **Lunch**

14:00 **Session 4: NIH Bioinformatics and Biorepository projects**
Chair: Mark Guyer, NIH-National Human Genome Research Institute

14:00 Background to Bioinformatics Network
Jane Peterson, NIH-National Human Genome Research Institute

14:10 H3ABioNet: a sustainable African bioinformatics network for H3Africa
Nicola Mulder, Computational Biology Group, University of Cape Town

14:30 Discussion

15:00 Background to Biorepository Grants
Jane Peterson, NIH-National Human Genome Research Institute

15:10 IHVN H3Africa Biorepository (I-HAB) Initiative
Alash'le G. Abimiku, Institute of Human Virology, Nigeria

15:30 Development of H3 Africa Biorepositories to facilitate studies on Biodiversity, Disease & Pharmacogenomics of African Populations
Akin Abayomi, University of Stellenbosch

15:50 Discussion

16:15 **Tea break**

16:30 Networking and opportunity find out more from commercial exhibitors

16:30 Press briefing
Due to limited space only Funders and selected Principal Investigators are invited to this event

19:00 **Drinks and presentation**
Leverage of partnerships on Science, Technology and Innovation in Africa
Diran Makinde, NEPAD Planning and Coordinating Agency

19:30 **Dinner**

20:30 **After-dinner talk**
Enhanced Breeding of African Traditional Food Crops Utilizing NextGeneration Genomic Tools to Help End Chronic Hunger and Malnutrition
Howard-Yana Shapiro, Mars Incorporated

Tuesday 9 October

09:00 **Review of Day 1 and Introduction to Day 2**
Eric Green, NIH-National Human Genome Research Institute

09:15 **Session 5: Sharing protocols and data**

Chairs: Rex Chisholm, Feinberg School of Medicine, Northwestern University and Carlos Bustamante, School of Medicine, Stanford University

09:15 Lessons from other genomics projects
Mark Guyer, NIH-National Human Genome Research Institute

09:30 Sharing: the H3Africa vision
Charles Rotimi, NIH-Center for Research on Genomics and Global Health

09:50 Discussion

10:00 Sharing protocols – best practices
Carlos Bustamante, School of Medicine, Stanford University

10:20 Discussion

10:30 **Coffee break**

11:00 Sharing data – best practices
Rex Chisholm, Feinberg School of Medicine, Northwestern University

11:20 Discussion

11:30 Breakout groups
12:15 Report back

12:45 **Lunch**

13:45 **Session 6: Consent and Feedback of Results**
Chairs: Ruth Chadwick, Cesagen, Cardiff University and Charmaine Royal, Duke Institute for Genome Sciences and Policy

13:45 Consent: state of the art and issues arising
Ruth Chadwick, Cesagen, Cardiff University

14:05 Returning research results: the why, what, where, when, how and who
Charmaine Royal, Duke Institute for Genome Sciences and Policy

14:30 Community Harms in Genomics Research in Africa
Clement Adebamowo, Institute of Human Virology, Nigeria

14:50 Discussion

15:30 **Tea break**

16:00 Breakout groups
16:45 Report back

17:30 Opportunities for networking and discussion with Funders

19:00 **Drinks**

19:30 **Dinner**

Wednesday 10 October

07:30 Private breakfast for H3Africa Independent Expert Committee members and Funders

09:00 **Review of Day 2 and Introduction to Day 3**
Pat Goodwin, Wellcome Trust

09:15 **Session 7: Building capacity across the network**
Chairs: Solomon Nwaka, WHO-TDR and
Ayoade Odoula, Institute for Infectious Diseases of Poverty (IIDP/IRMP), Nigeria

09:15 Introductory comments
Solomon Nwaka, WHO-TDR
Ayoade Odoula, Institute for Infectious Diseases of Poverty, IIDP/IRMP, Nigeria
Philip Awadalla, University of Montreal

H3ABioNet: building capacity in bioinformatics
Nicola Mulder, Computational Biology Group, University of Cape Town

10.15 Discussion

11:00 **Coffee**

11:30 Breakout groups

12:15 Report back

13:00 **Lunch**

14:00 **Session 8: The H3Africa Initiative - what will success look like?**
Chairs: Pat Goodwin, Wellcome Trust and
Eric Green, NIH-National Human Genome Research Institute

14:00 Introductory comments
Members of H3Africa Independent Expert Committee

Discussion and breakout groups

15:30 Review of meeting and next steps

16:00 Close of meeting

Appendix 2 – Project abstracts and investigators

NIH-H3Africa Research Project

PI: Dissou Affolabi

Organization: National Hospital for Tuberculosis and Pulmonary Diseases, Benin

Title: Contribution of genetic variation to pharmacokinetic variability and toxicity in patients undergoing multi-drug tuberculosis treatment in Sub-Saharan Africa: RAFAgene project (Genetic variability and anti-TB treatment)

Scientific Description

In 2010 there were an estimated 8.8 million incident cases of tuberculosis (TB) globally, with 2.3 million of these reported in Africa, 1.1 million deaths among HIV-negative cases of TB and an additional 0.35 million deaths among people who were HIV-positive. The complex relationship between TB pathogen, host, and drug exposure in the pathogenesis of TB is poorly understood. The treatment regimen that is currently recommended by WHO for new cases of drug-susceptible TB is highly efficacious, with cure rates of around 90% in HIV-negative patients. However, even if all new TB cases were treated and patients were adherent to the treatment, there would still be 10% of patients (i.e. 880,000 patients worldwide, 230,000 patients in Africa) who fail to respond to treatment. Even if adherent to treatment, a proportion of patients, with rifampicin sensitive TB, are slow to respond to medication or are non-responders. The problem is even more complex and serious in HIV infected patients where the efficacy of the current treatments appears to be lower. Still other patients can be treated successfully, but will experience toxicity and thus treatment interruptions. While several potential determinants of the variable response to drug treatment are recognised (e.g. sex, age, ethnicity), much of the variability in response to anti-tuberculosis drugs remains unexplained. In recent years there has been a rapid development in the understanding of the genetics underlying interindividual differences in drug metabolism and treatment efficacy. The field of pharmacogenetics encompasses the study of the heterogeneity in genes related to drug transporters, drug metabolising enzymes and drug targets, in the context of efficacy of treatment and adverse drug reactions. Few studies have been conducted to explore this field for TB disease. Through this study we aim to explore and determine host genetic factors contributing to pharmacokinetic (i.e. drug concentration) and dynamic (i.e. treatment outcome) variability in TB patients. The "RAFAgene" study is a 5 year project which will be nested within two multi-country randomised phase III tuberculosis treatment trials, the OFLOTUB and RAFA trials (reg numbers NCT00216385 and PACTR 201105000291300) conducted in Sub-Saharan Africa. Patients enrolled in the pharmacokinetic studies within these 2 trials will be sampled for genetic analysis (genome-wide and targeted SNPs screening with in vitro confirmation of the biological plausibility of the association between pharmacokinetic and genetic characteristics). The proposed project is led by Dr Dissou Affolabi at the National Hospital for TB and Pulmonary (NHTPD) with partners from the National TB program in Senegal, the University Ignace Deen in Guinea, the University of Cape Town (SA), the Medical Research Council in Durban (South Africa), the University of Liverpool UK and the London School of Hygiene and Tropical Medicine UK.

Lay Description
While potent drug treatments are available for tuberculosis, as many as 10% of patients are not cured by such treatments, and the cure rate achieved by the treatments is even lower in HIV-infected individuals. While much of the variability to anti-tuberculosis drugs remains unexplained, one likely reason is genetic, in other words that different people respond differently to a drug because of their gene differences. This is known to be the cases for other drugs in other diseases. In this study, Dr. Dissou Affolabi and colleagues at the National Hospital for TB and Pulmonary Diseases (NHTPD), and partners from the National TB program in Senegal, the University Ignace Deen in Guinea, the University of Cape Town (Republic of South Africa), the Medical Research Council in Durban (Republic of South Africa), the University of Liverpool (United Kingdom) and the London School of Hygiene and Tropical Medicine (United Kingdom), will study the role of host genetics in the success of TB treatment in sub-Saharan Africa. Tropical Medicine (United Kingdom), will study the role of host genetics in the success of TB treatment in sub-Saharan Africa.

Dr Dissou Affolabi
National Hospital for Tuberculosis and Pulmonary Diseases, Benin
I'm the deputy-head of the National Reference Laboratory for Mycobacteria and the Head of the Operational Research Unit

Dr Corinne Merle
London School of Hygiene and Tropical Medicine
Since the beginning of my clinical specialisation in Infectious Diseases and in Public Health in 1994, I have been actively involved in research. Given the broad nature of my qualifications, and the variety of my collaborators, I have worked in multiple environment, on multiple diseases and multiple aspects of public health (prevention, treatments, costs, health policy,...). I joined the London School of Hygiene and Tropical Medicine in 2003 and for the last 10 years, I have focused my interest on tuberculosis (TB) and HIV research. In particular, I am the clinical study coordinator, for a Phase III multicentre randomised controlled trial (OFLOTUB project) aiming to shorten TB treatment to 4 months . I am also the project coordinator for a randomised trial (RAFA project), conducted in three West African countries (Benin, Senegal and Guinea Conakry) and aiming to assess, in ARV-naïve TB/HIV patients the efficacy of 3 treatment strategies.

Professor Andrew Owen
University of Liverpool
Andrew Owen, Ph.D. is a Professor in the Department of Molecular and Clinical Pharmacology at the University Of Liverpool, UK. He is also affiliated to the MRC Centre for Drug Safety Science and the Wolfson Centre for Personalised Medicine. His research interests focus on basic science and clinical research and include characterisation of proteins involved in drug disposition, pharmacogenetic correlates of variability in pharmacokinetics and evaluation of efficacy and safety of novel nano-formulations. A central theme in this research is the mechanisms that govern variability in exposure to anti-infective agents. He is the author of over 80 peer-reviewed manuscripts and patent applications, regularly delivers lectures on these topics and is the Chair of the recently established British Society for Nanomedicine.

NIH-H3Africa Collaborative Center

PI: Dwomoa Adu

Institution: The University of Ghana Medical School

Title: H3Africa Kidney Disease Research Network Organization (H3A Kidney Disease Research Network)

Scientific Description

It is estimated more than 500,000 individuals succumb to end stage renal disease annually in sub-Saharan Africa with an additional 50 million people suffering from pre-dialysis chronic kidney disease. Advanced genome-based analysis strategies, such as Mapping by Admixture Linkage Disequilibrium (MALD) in African Americans, have identified a strong association between single gene variants (e.g., MYH9 and AP0L1) and kidney disease. In addition, nearly 20 genetic variants have been linked to childhood onset nephrotic syndrome. Most of these genetic advances in elucidating the etiology of kidney disease have occurred outside sub-Saharan Africa where there is a shortage of genetic experts and the infrastructure for human genomic research is as sparse as the Sahara Desert itself. In this application, we propose to rapidly increase the capacity to conduct genomic studies of kidney disease in sub-Saharan Africa through a collaborative research network comprised of investigators based at 10 institutions in five African countries - pop. 362 million (Ethiopia, Ghana, Kenya, Nigeria and South Africa) and four North American institutions. The Network will accomplish the following seven objectives: (1) phenotype 8,000 kidney disease cases and controls (1:1); (2) conduct four genetic research projects addressing single gene mutation kidney disorders in affected families, genetic variants of single genes associated with kidney diseases in the populations and genome wide association studies; (3) establish one low-capital intensity, rugged and sustainable genomics research laboratory each in Ghana (University of Ghana) and Nigeria (University of Ibadan); (4) implement a customized six-track training and career development plan for African-based genomic researchers; (5) establish and maintain a Network-wide biospecimen repository that will harmonize seamlessly with the HSAfrica Biorepository Grants (RFA-RM-11-011); (6) establish and maintain a Network-wide data management and bioinformatics facility that will effectively integrate with the HSAfrica Bioinformatics Network (RFA-RM-11-010) and (7) cooperate and coordinate the activities of this Network with the H3Africa Consortium and the NIH Program Scientists/Staff. This application is submitted by the University of Ghana with substantial institutional support from the University of Michigan.

Lay Description

Renal disease is a major problem in sub-Saharan Africa. 50 million people suffer from pre-dialysis chronic kidney disease and more than 500,000 individuals are estimated to die annually from renal disease. Research done with non-Africa populations has identified several genes associated with kidney disease in adults and children. This grant, led by Dr. Dwomoa Adu from the University of Ghana Medical School, will study 8,000 kidney disease patients and unaffected controls using genomic technologies to find whether those genes are also associated with kidney disorders in Africans and whether there are genes that are uniquely associated with kidney disorders in Africans. The project is organized as a collaborative research effort that involves investigators based at 10 institutions in five African countries and four countries outside of Africa. This grant will also establish two genomics research laboratories in Africa and train several African genomics research scientists to study important health problems in Africa.

Dr Dwomoa Adu
University of Ghana Medical School
After a career as Consultant Nephrologist at the Queen Elizabeth Hospital and Senior Clinical Lecturer at the University of Birmingham, England I returned Ghana in 2009 to take up appointment as Honorary Consultant Nephrologist at the Korle Bu Teaching Hospital and the University of Ghana Medical School. Upon arrival in Ghana, we established the West African Kidney Disease Consortium comprised of prominent academic nephrologists and researchers in the region to fulfil the unmet need for improving the capacity for kidney disease research in the region. My current research interests have been the prevalence and causes of chronic kidney disease and we are currently embarking on genomic studies of chronic kidney disease in Africa.

Professor Seth McLigeyo
University of Nairobi
Born 1956. 1981 MChB. 1986 mmed. 1987 nephrology research fellow, Royal infirmary, Edinburg, 1988/89 ISN FELLOW, GUY'S Hospital London, 1992 nephrology fellow, Tel Aviv University - Kfar Saba Hospital. Now, Associate Professor, Internal Medicine, Univ. of Nairobi, Consultant physician and nephrologist, Kenyatta National Hospital, Deputy director, Board of Postgraduate studies -University of Nairobi.

Professor Akinlolu Ojo
University of Michigan
Dr. Akinlolu Ojo is a Professor of Medicine and Epidemiology and the Florence E. Bingham Research Professor in Nephrology at the University of Michigan. Dr. Ojo received his medical education from the University of Lagos and completed internal medicine/nephrology training at the University of Kentucky and the University of Michigan. He is also trained in in Epidemiology and Business Administration. Dr. Ojo research interest is in the epidemiology and clinical trials of chronic kidney disease and kidney transplantation. He has over 120 peer-reviewed publications, serves on several journal editorial boards and on NIH study sections. Dr. Ojo is the Director of the Department of Medicine Global Health Initiative at the University of Michigan and he maintains active research collaboration with investigators in Africa, Europe, the Caribbean, Brazil, and the Far East. Dr. Ojo is an elected member of the American Society of Clinical Investigation and the Association of American Physicians.

Dr Charlotte Osafo
Korle-Bu Teaching Hospital, Ghana
Dr Osafo received her medical education at the Kwame Nkrumah University of Science and Technology and the West African Postgraduate Medical College in Ghana, West Africa. She is a consultant nephrologist and lecturer with the Department of Medicine, University of Ghana Medical School. Dr Osafo is currently the head of the renal unit in the Department of Medicine, Korle-Bu Teaching Hospital and a Co-Investigator in the H3Africa Kidney Disease Research Network.

Professor Tunde Salako
University of Ibadan, Nigeria
Professor Salako works at the University of Ibadan, Nigeria and currently the chair of the department of medicine both at the college of Medicine and the University College Hospital, Ibadan. His interest is in clinical nephrology and research and presently has an ongoing collaboration with the Department of Preventive Medicine and Epidemioly, Loyola University, Chicago.

Dr Yewondwossen Tadesse Mengistu
Addis Ababa University

I was Born in October 1960 in Addis Ababa,Ethiopia. I Went to Medical School (obtaining MD Degree in 1984) and did residency training in Internal Medicine in the School of Medicine,Addis Ababa University. I trained in Nephrology at the University of Kwazulu Natal in Durban,South Africa through a fellowship grant obtained from the International Society of Nephrology. I am currently head of the department of internal medicine and head of the renal unit at the School of Medicine,College of Health Sciences,Addis Ababa University. My areas of interest are the changing trends in non communicable diseases in Ethiopia And the epidemiology of acute kidney injury and chronic kidney disease. I have served a term as president of the Ethiopian Medical Association and currently serve as council member of the African Association of Nephrology and as member of the Africa Committee of the International Society of Nephrology Global Operations(ISN GO).

NIH-H3Africa Collaborative Center

PI:	Michèle Ramsay
Institute:	University of the Witwatersrand & NHLS, South Africa
Co-PI:	Osman Sankoh
Institute:	INDEPTH, Ghana
Project Title:	Genomic and environmental risk factors for cardiometabolic diseases in Africans (Genomics of cardiometabolic diseases)

Scientific Description

The long-term vision of the Collaborative Centre (CC) is to build sustainable capacity in Africa for research that leads to an understanding of the interplay between genetic, epigenetic and environmental risk factors for obesity and related cardiometabolic diseases (CMD) in sub-Saharan Africa. The CC will be consolidated under the auspices of the University of the Witwatersrand (Wits) and the International Network for the Demographic Evaluation of Populations and Their Health in Developing Countries (INDEPTH). It will capitalize on the unique strengths of existing longitudinal cohorts, including the urban Soweto and rural Agincourt studies in South Africa (Wits based), and the well established INDEPTH demographic health and surveillance centers in Kenya, Ghana, Burkina Faso and South Africa. The centers offer established infrastructure, trained fieldworkers, long-standing community engagement, and detailed longitudinal phenotypic data, focusing on obesity and cardiometabolic health. Key strengths are harmonized phenotyping across sites, building on strong existing cohorts, and representation of the geographic and social variability of African populations. We aim to: 1. Build sustainable infrastructure (biobanks and laboratories) and capabilities (well characterized population cohorts, genotyping and bioinformatics) for genomic research on the African continent; 2. Understand the genomic architecture of sub-Saharan populations from west, east and south Africa to guide genomic studies (genome sequencing and high throughput SNP and CNV arrays using unrelated individuals and family trios to improve the accuracy of haplotype analyses) and; 3. Investigate the independent and synergistic genomic contributions to body fat distribution (BMI, hip/waist circumference, subcutaneous and visceral fat) in these populations considering the relevant environmental and social contexts (rural/urban communities, quickly transitioning obesity prevalence, differential HIV, TB, and malaria infection histories). We will investigate the effect of obesity and fat distribution on the risk for CMD in the longitudinal cohorts. The CC will draw upon a wide group of highly experienced African scientists and international collaborators to ensure the success of its vision.

Lay Description

This Wits-INDEPTH H3Africa Collaborative Centre (CC) under the leadership of Drs. Michele Ramsay and Osman Sankoh aims to study the genetic and environmental risk factors for obesity and related cadiometabolic diseases (CMD). It is a partnership between the University of Witwatersrand and the International Network for the Demographic Evaluation of Populations and Their Health in low- and middle-income countries (INDEPTH), using five INDEPTH member health and demographic surveillance system (HDSS) field sites across four African countries, Ghana, Burkina Faso, Kenya and South Africa, as well as an urban study site in Soweto.

The study will begin by examining the genetic architecture of these African populations and will progress to investigate genomic contributions to body fat distribution, considering the

relevant environmental and social contexts, in order to contribute to an understanding of cardiometabolic disease susceptibility.

Professor Michele Ramsay
University of the Witwatersrand & NHLS, South Africa
Professor in the Division of Human Genetics, NHLS and University of the Witwatersrand (Wits), and Interim Director of the Sydney Brenner Institute for Molecular Bioscience (SBIMB) at Wits. My research interests include African population genetic and epigenetic diversity and their role in diseases exacerbated by adverse lifestyle choices, including obesity and cardiometabolic disease and foetal alcohol spectrum disorders (FASD). Research collaborations include studies on obesity, hypertension, bone development, HIV related kidney disease and glaucoma in South African populations. Joint editor and author of a textbook, "Molecular Medicine for Clinicians" (Wits University Press, 2009). Joint PI for an NIH funded training program "Wits Non-Communicable Disease Research Leadership Program", joint PI for the Southern African Human Genome Programme, chair of the Southern African Society for Human Genetics and chair of the Wits Bioinformatics Steering Group.

Professor Marianne Alberts
University of Limpopo
My position is Emeritus professor at the University of Limpopo. My main interest is in Chronic Diseases of Lifestyle and at present i am involved in a project " Prevention, control and management of chronic diseases in a rural community, South Africa. This project is funded by VLIR.

Professor Nigel Crowther
National Health Laboratory Service & University of the Witwatersrand, South Africa
I obtained my PhD in 1990 at the University of Sussex, UK on the study of the isolation and insulin secretory activity of porcine islets of Langerhans. I was then employed as a postdoctoral researcher in the Department of Clinical Biochemistry, Addenbrooke's Hospital, University of Cambridge (1990-5), where I worked on the production of monoclonal antibodies for assays of proinsulin and related molecules. I moved to the National Health Laboratory Service, University of the Witwatersrand, Johannesburg in 1995, as head of research in the Department of Chemical Pathology. My current research interests are as follows: body fat distribution and insulin sensitivity; genetics of obesity and type 1 diabetes; developmental origins of type 2 diabetes; molecular control of intra-cellular lipid accumulation; HIV and anti-retroviral effects on metabolism.

Dr Catherine Kyobutungi
African Population and Health Research Center, Nairobi
Catherine heads the Health Challenges and Systems Research Program at the African Population and Health Research Center (APHRC) where she joined as a post-doctoral fellow in May 2006. She has been, and is, the PI on several projects in the program, which has a current portfolio of nine projects. Her research interests are in the epidemiology of non-communicable diseases in the African region and in health systems strengthening. Catherine holds a Masters of Science degree in Community Health and Health Management (2002) and PhD in epidemiology (2006) both obtained from the University of Heidelberg, Germany. She is a qualified medical doctor having studied Medicine at Makerere University, Kampala (1996). She worked as a medical officer in a rural hospital in Western Uganda. Before and during her graduate studies, she was an assistant lecturer and later a lecturer in the Department of Community Health at the Mbarara University of Science and Technology.

Dr Abraham Oduro
Navrongo Health Research Centre, Ghana
Epidemiologist and Director of the Navrongo Health Research Centre, Ghana.

Dr Hermann Sorgho
IRSS/URCN, Ouagadougou
After obtaining my PhD degree in 2006 in Parasitology, from the University of Ouagadougou (Burkina Faso), I joined the national health research institute (IRSS) where I worked as co-investigator on a project evaluating the humoral and cellular response to Plasmodium falciparum in children supplemented with micronutrients. I also co-directed a project focused on the development of serodiagnostic tools for the detection of schistosomes in humans. In 2008, I was granted a permanent staff scientist position in the same institute, and I has been invited to join the newly created Clinical research Unit of Nanoro (CRUN) led by Dr Tinto. In this Unit and in parallel of my research activities, I occupy the position "site specific coordinator for phase III vaccine trial. In addition to the technical aspects of my training, I have gathered great experience in the coordination of research projects including the management of large teams.

NIH-H3Africa Biorepository

PI: Akin Abayomi

Institute: National Health Laboratory Services, Stellenbosch University Faculty of Medicine, Cape Town, South Africa.

Title: Development of H3 Africa Biorepositories to facilitate studies on Biodiversity, Disease & Pharmacogenomics of African Populations (Development of H3Africa Biorepositories)

Scientific Description

The objective of this application is to develop a plan towards a full scale H3 Africa Central Biorepository and service facility in a joint collaboration between the National Health Laboratory Services of South Africa and the Faculty of Medicine and Health Science, University of Stellenbosch, in the Division of Haematological Pathology to support H3 Africa and other large research projects on the Continent in a sustainable manner. In phase I, we will set up governance, operations and test protocols towards biorepositories for nucleic acids, blood, haematological malignancies, cultured stem cells and mesenchymal stromal cells and any other human derived sample as the case may require from the H3 Africa consortium projects. This approach builds upon existing infrastructure and capacity for processing the above sample types that exists in this institution. New perspectives in our approach will be to evaluate room temperature storage of human samples as a sustainable energy efficient option for Africa. Furthermore, we will evaluate the possibility of automation for sample preparation and processing of nucleic acid, storage and cryopreservation in order to meet the expected service demands of 100,000 samples a year in phase II. Our proposed approach to create renewable cell lines would be by both conventional methods and induced Pluripotent Stem Cells (iPSC).There are several key challenges to overcome in this later approach. Although there are many large scale Biorepositories internationally, there are no large human specimens Biorepositories in the African continent, this therefore poses as a challenge to evaluate what is feasible on the African continent.

Secondly, to our knowledge the proposed method of generating iPSC renewable cells has not previously been used in Africa, therefore it is essential that a thorough evaluation of the feasibility of our approach be conducted. We will convene a panel of experts in the biobanking field to develop an agenda for full scale biorepositories in Phase II. We will benchmark international biorepositories and stem cell biobanks, set up governance that will set the technical and ethical guidelines as well as long term sustainability planning. Furthermore, we will evaluate current and prospective biorepository operations at the University of Stellenbosch in the Division of hematological pathology against the industry best practices adherence to a set of best practices such as those set by the International Society for Biological and Environmental Repositories (ISBER) and the National Cancer Institute (NCI). We will develop a Biorepository Informatics Management System (BIMS) for all aspects of biorepository operations with our collaborative bioinformatics centre, SANBI at the University of the Western Cape in conjunction with the H3 Bioinformatics network. We will develop automation, iPSC reprogramming and room temperature biobanking with our collaborative centres, the RUCDR in New Jersey, IFASEMB, the SCRIPPS Research Institute, Centre for Regenerative Medicine in San Diego California and the Cape Haematology Stellenbosch University Satellite Bone Marrow Transplant Unit in Cape Town. We will explore the possibility of a partnership with these institutes to promote an agenda for stem cell and nucleic acid large scale biobanking for studies on the health, diseases and pharmacogenomics of African populations. A common theme in our approach will be

stringent governance, harmonization and sustainability. Creation of a full scale biorespository will be an important part of scientific capacity building on the African continent and will support large scale genomic studies that will be performed on the continent. These studies and supporting infrastructure are necessary to address the health needs of the continent that is plagued with infectious disease such as HIV/AIDS and its numerous complications as well as an ever increasing burden of non communicable diseases such as the metabolic disease syndromes and cancer. Biorepositories will also function as a repository to preserve representative samples of the vast human biodiversity of the continent, harmonize sample collection efforts, be a training centre for African scientists and a community outreach portal to educate the public about the implications of biobanking and genomics for the health of African populations.

Lay Description

This grant supports a two-year pilot effort to establish an H3Africa biorepository that will receive, store, and distribute biological research samples obtained in the H3Africa Initiative. This H3 Africa pilot biorepository is directed by Professor Akin Abayomi, from National Health Laboratory Services (Tygerberg Hospital Business Unit) and the Faculty of Medicine of Stellenbosch University in collaboration with South African National Bioinformatics Institute (SANBI), Rutgers University (RUCDR), IFASEMB and the SCRIPPS Research Institute for regenerative medicine. During the pilot phase, the biorepository team will set up governance, operations and test biorepository protocols for human tissues such as nucleic acids and blood. To achieve the Phase I goal, the biorepository will assess its current practices to identify its strengths and weaknesses, upgrade repository practice and infrastructure and conduct Phase II implementation and quality control tests. At that point, the biorepository's progress will be reviewed and, if the group is found to have made sufficient progress, it will be scaled up to a full-scale H3 Africa biorepository which will be funded for an additional five years. The goals for the Phase II scaled up biorepository will be to build upon the progress made in Phase I to provide, by the end of 3 years of funding (in both Phase I and II), a fully functioning biorepository capable of receiving and distributing samples from and to African countries utilizing international standards.

Professor Akin Abayomi
University of Stellenbosch, South Africa

Prof Emmanuel Akin Abayomi Position: Head of Department of Haematopathology Tygerberg Academic Hospital and Associate Professor of Haematology University of Stellenbosch, Cape Town. Qualifications: MBBS (London), MRCP (UK), FCPath Haem (SA), MPhil (UP), FRCP(Edin) PhD Project: Stem cells in HIV disease. My current position is as Chief Pathologist and Head of the Division of Haematology and Associate Professor Faculty of Health Sciences, University of Stellenbosch University, Cape Town, South Africa (www.sun.ac.za/haema). I am a specialist in internal Medicine and Haematology, I studied at the Royal Medical College of St Bartholomew's Hospital in the University of London where I attained my first graduate degree in Medicine. Specialized in Internal Medicine and Haematology, obtaining fellowships from both Royal College of Medicine in the United Kingdom and the College of Medicine of South Africa. I have worked in several countries around the world in both Internal Medicine and Haematology and have been exposed to a variety of geographical variations and disease patterns within the discipline of Internal Medicine and Haematology. My focus has mainly been on the complications of HIV and the development of laboratory and clinical capacity to rise to the challenge of the HIV epidemic in the Developing world and Africa.

Dr Eyitayo Fakunle
The Scripps Research Institute, United States
Dr. Eyitayo "Tayo" Fakunle is a stem cell scientist and key personnel on H3 Africa Biorepositories Grant Awarded to PI, Dr. Akin Abayomi, NHLS/University of Stellenbosch, Cape Town, South Africa. Tayo is currently a professional scientific collaborator where she did her postdoctoral training at the Laboratory of Dr. Jeanne Loring, Center for Regenerative Medicine, The Scripps Research Institute La Jolla, California, U.S.A. While at the Scripps, Eyitayo generated the first induced pluripotent stem cells (iPSCs) of African descent (Yoruba ethnicity) under a grant award by the Bill and Melinda Gates Foundation. IPSCs are cutting edge biotechnology that may revolutionize medicine. These cells can be created for sample collections such as blood; self renew and can be converted into numerous tissue types of the body that harnesses the donor's genetic background. Tayo will collaborate with Dr. Akin Abayomi to integrate iPSCs as a form of renewable cell lines in African biorepositories.

Dr Carmen Swanepoel
Divison of Haematology, Stellenbosch University/National Health Laboratory Services
Carmen Swanepoel is a medical scientist (PhD:Medical Biochemistry-2011) in the Division of Haematology at the National Health Laboratory Service and the Faculty of Medicine and Health Sciences of the University of Stellenbosch, South Africa. In her current position, she is involved in the training of staff and students and the development of diagnostic laboratory tests. She has also been involved in the development of a flow cytometry research and training laboratory as well as a cell culture facility in the department of Pathology and current research projects involve flow cytometry and its application in cytokine detection and the culturing and characterization of mesenchymal stem cells for its application in regenerative medicine. She has expertise in various molecular based techniques such as nucleic acid isolation from various sample types, PCR/q-PCR, sequencing, cell culturing and genetic association studies and is the scientist on their NIH H3Africa Biorepository Project.

NIH-H3Africa Biorepository

PI:	Alash'le G. Abimiku,
Institution:	Institute of Human Virology, Nigeria (IHVN)
Title:	IHVN H3Africa Biorepository (I-HAB) Initiative (IHVN H3A Biorepository Initiative)

Scientific Description

The proposed IHVN H3Africa Biorepository (I-HAB) initiative is directed by Dr. Alash'le Abimiku, a highly experienced African laboratory scientist with two decades of research and repository experience in Africa, and the Principal Investigator of the current proposal. The goal of Phase I implementation is to: *Advance the capacity of the IHVN Biorepository to achieve International Society for Biological and Environmental Repositories (ISBER) best practices required for Phase II implementation.* To achieve the Phase I goal the I-HAB partners with the Coriell Institute to implement three Specific Aims: 1) Assessment of current practice and identify strengths and gaps; 2) Upgrade repository practice and infrastructure; 3) Conduct pilot Phase II implementation. This two year Phase I process engages an iterative quality assessment-based interaction between experienced African scientists and technicians at IHVN and their counterparts from Coriell Institute who provide objective assessment, interactive didactic and mentored capacity building to instill ISBER best practices for Phase II implementation drawing upon Coriell proven models. The goal of Phase II is to: *Expand the capacity of the I-HAB to support multiple H3Africa investigators to conduct high quality genomics and translational research in Africa using well processed, preserved and quality controlled and redundantly protected human biological samples accessible to the H3Africa and larger research community.* To achieve the 5 year Phase II goals the I-HAB targets 5 Specific Aims: 1) Implement a high quality biorepository of primary human biologic samples; 2) Develop, implement, manage and support robust cloud computing based bioinformatics tool to support biorepository capacity; 3) Establish administrative governance and Quality Assurance/Quality Control (QA/QC) procedures and sustainable funding strategies; 4) Conduct short, medium and long term training and mentoring of staff on Biorepository and Biobanking Sciences; 5) Integrate best practices in biobanking and biorepository ethics. This 5 year plan implements a staged expansion of staffing and infrastructure to support multiple African genomic research partners including Dr. Clement Adebamowo, an African scientist also at the IHVN who served as the Principal Investigator of the African Phase I HapMap Project and is a pioneering leader in genomic research and in addressing the ethical challenges of genomic research on the African Continent on the Continent. I-HAB will provide reliable sample processing support, secure shipping, rapid accession and documentation of sample quality, accessible information on clinical and epidemiological data and sample quantity and quality, reliable retrieval and proactive facilitation of collaboration to achieve best science and sustainable practice and funding. Continuous quality improvement for reliable repository function and ongoing feedback from end users fosters trust in service delivery and product quality.

Lay Description

This grant supports a two-year pilot effort to establish an H3Africa biorepository that will receive, store, and distribute biological research samples obtained in the H3Africa Initiative. This H3Africa pilot biorepository is directed by Dr. Alash'le Abimiku, of the Institute of Human Virology, Nigeria, in partnership with the Corielle Institute for Biomedical Research in the US. During the pilot phase, the biorepository will assess its current practices to identify strengths

and weaknesses, upgrade repository practices and infrastructure to meet the needs of the H3Africa Initiative, advocate for host government and community support, and conduct implementation and quality control tests that will allow it to scale up by the end of the pilot period. At that point, the biorepository's progress will be reviewed and, if the IHVN group is found to have made sufficient progress, it will be scaled up to a full-scale H3Africa biorepository and funded for an additional five years. The goals of the full-scale biorepository will be to operate at international standards that enable to receive and distribute samples from and to investigators in Africa, and eventually beyond. In doing so, the biorepository will need to develop a high quality collection and storage of primary human biological samples obtained from the H3Africa research projects; develop, implement, manage and support computer tools to support biorepository functions; establish effective administrative governance and Quality Assurance/Quality Control (QA/QC) procedures; conduct training and establish best practices in biobanking and biorepository ethics.

Dr Alash'le Abimiku
Institute of Human Virology, Nigeria
Dr. Alash'le Abimiku is the Director of the office of Laboratory diagnostics and research at the Institute of Human Virology Nigeria; and an Associate Professor at the Institute of Human Virology, University of Maryland School of Medicine, Baltimore, USA. As a trained retrovirologist/immunologist her focus on her home country Nigeria has been pivotal in her career development and the establishment of a significant laboratory infrastructure and science in Nigeria with long-term collaborations between Institutions in Nigeria and the USA and Canada. Dr. Abimiku first demonstrated the unique nature of the HIV strain prevalent in Nigeria in 1993 as subtype G. Under the PEPFAR program, Dr. Abimiku established and directs an extensive laboratory network supporting >100 clinical laboratories, 11 PCR laboratories, 3 research facilities, 5 laboratory training centres, 3 biorepositories, 1 BSL-3 laboratory, and 1 sequencing laboratory. Dr. Abimiku is the PI for the IHVN H3 Africa biorepository initiative.

Dr Christine Beiswanger
Coriell Institute for Medical Research, United States
Christine M. Beiswanger, PhD, is director of Custom Biobanking Services at Coriell Institute, offering innovative and results-oriented research services supporting scientists, both nationally and internationally. Christine also serves as the Principal Investigator of several Michael J. Fox Foundation grants and Co-Principal Investigator of National Institute of General Medical Sciences Cell Repository providing scientists with resources for cell and genetic research Prior to joining Coriell, Christine worked at Arizona State University where she studies the neural basis of behaviour; the Worcester Foundation for Experimental Biology using cell culture models to study neural plasticity; and the Neurotoxicology Laboratories at Rutgers College of Pharmacy in Piscataway, NJ. Christine received her doctorate degree in neurophysiology from the State University of New York in Albany, studying single-neuron circadian rhythms. She also received a National Institutes of Health Research Service Award at the University of Kentucky to study the neural control of photoperiodic locomotory behavior.

Ms Talishiea Croxton
E Institute of Human Virology, University of Maryland, United States
Talishiea Croxton has over ten years of research experience, including 7 years in Nigeria. She served as a Laboratory Technical Advisor for a CDC funded prospective study (REACH) to identify and monitor Nigerians with acute HIV infection. Ms. Croxton and colleagues developed procedures, facilitated trainings, provided continuous mentoring and monitoring,

and upgraded infrastructure, instrumentation, and software to this regard. Ms. Croxton later served as an advisor for the AIDS Care and Treatment In One Nigeria (ACTION) PEPFAR program. She was essential to program implementation and continues to head the Quality Management System (QMS). The QMS was the first of its kind in Nigeria and influences Nigeria's laboratory structure through mentoring and training efforts. Ms. Croxton also helped design and develop IHVN's specimen repository network. The network serves ACTION, local and international research, and the Nigerian CDC office. Ms. Croxton was instrumental in the evolution of IHVN's laboratory department.

NIH-H3Africa Bioinformatics Network

PI: Nicola Mulder

Institution: University of Cape Town, South Africa

Title: H3ABioNet: a sustainable African Bioinformatics Network for H3Africa (H3ABioNet)

Scientific Description

H3ABioNet aims to create a sustainable African Bioinformatics Network to support H3Africa researchers through the development of bioinformatics capacity on the continent. Specifically, it aims to: 1) engage with the H3Africa Consortium, providing a framework for integration and communication amongst its members to ensure progress towards the common goal of full exploitation of our genomic and environmental resources for translation into improved health in Africa; 2) develop a core bioinformatics infrastructure (hardware and human resources) to aid research in genomic medicine, high throughput biology, systems biology, genetics, and medicine, for the study of human heredity and health; S) develop tools and bioinformatics solutions appropriate for exploitation and interpretation of biological information in Africa, and make these more accessible to H3Africa researchers; 4) develop research partnerships and promote interaction between bioinformaticians, clinicians, molecular geneticists and ethics researchers to ensure integrative research into health issues in Africa; 5) develop the bioinformatics capacity of people in Africa to empower them to perform cutting edge research, and to ensure retention of bioinformatics skills on the continent; 6) facilitate secure, high-fidelity storage and management of data generated within the H3Africa framework and their deposition in public databases, so that maximum value can be derived from these data; and 7) ensure that the increasing amount of information from genomic analyses and high-throughput molecular biology is accessible to all H3Africa researchers, to promote health research, scientific progress and global competitiveness in Africa. These aims will be achieved through four major activities: user support, training and capacity development, research and tools, and outreach and communication. These activities will result in a bioinformatics support structure, continuous specialized training for bioinformaticians and researchers, development and accessibility of new tools appropriate for the African setting, and a framework for communication flow within the H3Africa Consortium. Through the pooling of existing expertise and training of the next generation of researchers, we will build critical mass in bioinformatics for H3Africa.

Lay Description

The goal of this project is create H3ABioNet, a pan-African bioinformatics network. At the outset, H3ABioNet will include nodes of computational expertise in more than 15 African countries. H3ABioNet will provide a framework for integration of and communication among all of the H3Africa research and resource projects, as well as other sites in Africa that are carrying out genomic/genetic research. The network will provide computational infrastructure and hardware, human resources, tools and computational solutions for genomic and population-based research, and communications among African researchers and other interested parties. These aims will be achieved by providing user support, training and capacity development, research and tools, and outreach and communication. By pooling existing expertise and by providing training in bioinformatics and computational biology for the next generation of researchers, H3ABioNet will build a critical mass in bioinformatics for H3Africa, thereby contributing to the larger goal of the H3Africa Initiative of improving the infrastructure for genomic and population-based research in Africa.

Professor Nicola Mulder
Computational Biology Group, University of Cape Town
Associate Prof Mulder heads the Computational Biology Group at the University of Cape Town (UCT) (http://www.cbio.uct.ac.za). After her PhD in Medical Microbiology, she spent 8 years at the European Bioinformatics Institute (EBI) in Cambridge, moving into the area of bioinformatics. At the EBI she was a Team Leader, responsible for development of one of the most heavily used Bioinformatics resources at the Institute. At UCT A/Prof Mulder works in the area of bioinformatics of infectious diseases, including pathogen and host genomics and biological networks, human variation studies and disease associations. The group also provides bioinformatics support and training for postgraduate students and local researchers. A/Prof Mulder is President of the African Society for Bioinformatics and Computational Biology and is coordinating the H3Africa Bioinformatics Network.

Dr Oyekanmi Nash
National Biotechnology Development Agency, Nigeria
Director, Molecular Biology and Bioinformatics Department at the National Biotechnology Development Agency (NABDA), Federal Ministry of Science and Technology, Abuja-Nigeria. He is the Coordinator of the Initiative for Translational Research on Tropical and Emerging Infectious Diseases at the NABDA-Southwest Biotechnology Center of Excellence at the University of Ibadan. A Visiting Professor to the Nigerian Defense Academy, he is also an Adjunct Lecturer with the Institute for Advanced Medical Research and Training, College of Medicine, University of Ibadan. Before returning to Nigeria,he was a Research Associate with the Department of Microbiology and Immunology, Albert Einstein College of Medicine, New York, where he had worked on the evolution of HIV-1 Reverse Transcriptase for Molecular Biology applications. As a Post-Doctoral Fellow with the Canadian Protein Engineering Center of Excellence (PENCE), he had worked on the engineering of the first "Mannosynthase" at the University of British Columbia, Vancouver, Canada. He is the Program Director for the West African Biotechnology Workshops Series (WABWS), and a Planning Committee member for the International Consortium on Anti-Virals (ICAV).

Dr Dean Everett
Malawi-Liverpool-Wellcome Trust Clinical Research Programme
I am a Molecular Microbiologist, with a research focus on infectious disease, particularly respiratory infection and meningitis using genomic and bioinformatic approaches.

Dr Nicki Tiffin
South African National Bioinformatics Institute, University of the Western Cape
I am a faculty member of the South African National Bioinformatics Institute at the University of the Western Cape in South Africa, researching the genetics of human disease in African patients, as well as generic approaches to disease gene identification using genomic data. Ongoing projects in collaboration with clinicians from the University of Cape Town include the investigation of genetic factors underlying salt-sensitive hypertension in South African patients and investigation of genetic factors contributing to Lupus in patients from Cape Town. I also work with the SYSCO consortium on the analysis of host macrophage response to infection with Leishmania. These projects entail high fidelity databasing of patient and genomic data, computational analysis of datasets and generation of hypotheses about disease mechanisms. I head the SANBI node of the H3Africa Bioinformatics Network, and I am responsible for the bioinformatics component of the H3 Africa Kidney Disease Research Network.

Dr Julie Makani
Muhimbili-Wellcome Programme, Tanzania
Dr Julie Makani is a Senior Lecturer and Wellcome Trust Research Fellow in Haematology and Blood Transfusion at Muhimbili University of Health and Allied Sciences (MUHAS) http://www.muhas.ac.tz, the main clinical, academic and research centre in Tanzania. She trained in Medicine at Muhimbili, and completed her postgraduate medical training (internal medicine) in the UK. Her area of interest is haematology, working as a consultant physician at Muhimbili National Hospital (http://www.mnh.or.tz/). She undertook her PhD in SCD, a neglected blood disease of public health and scientific importance. She is a member of the Royal College of Physicians (UK) and is a Research Fellow at Oxford University http://www.ndm.ox.ac.uk/principal-investigators/researcher/julie-makani. Dr Makani is a Tutu Fellow (2009) www.alinstitute.org for promoting excellence in research, education and health in biomedical science in Africa. In 2011, she received the Royal Society Pfizer Award (http://www.youtube.com/watch?v=sd17odE1YLs) in recognition of her work as a model for translating genetic research into health benefit.

Dr Judit Kumuthini
CPGR, South Africa
Judit received her BSc in Biomedical Science and MSc in Bioinformatics in the UK. She completed her PhD from University of Cranfield, UK in Bioinformatics in genetic network (GN) extraction using Bayesian belief framework. Judit later joined GSK (Glasgow Smith Kline, UK) as a drug target scientist prior to completing her fellowship at UCT. She is currently the Bioinformatics Manager at the CPGR (Centre for Proteomic and Genomic Research) and is leading her team to provide expertise in various fields in bioinformatics. This includes providing service, support and R&D to life scientists in "omics" field, addressing a wide range of biological questions from genomics to system biology. Judit is the associated node manager for EMBNET and elected as the PRPC (public relation and publicity) committee member. Judit is committed to human capital development in the bioinformatics arena to enhance the knowledge base in Africa. At the CPGR, Judit started and manages the mini internship programme (MIP), aimed at developing specific skill sets required for next generation of insilico biologists. She has trained and supervised many postgraduate students in Africa and Europe. Her broad research interests include African Genetic rare diseases, process optimization, algorithm development, information management and visualization and e-learning.

Wellcome Trust-H3Africa Research Project

PI: Bongani Mayosi

Organization: University of Cape Town, South Africa

Title: Genetics of rheumatic heart disease and molecular epidemiology of streptococcus pyogenes pharyngitis (H3A RHDGen Network)

Scientific Description

There are four proposed activities for the RHDGen Network:

1) To build a clinical and laboratory network for the phenotyping of patients with rheumatic heart disease (RHD) and controls;
2) To identify genetic variants affecting susceptibility and resistance to RHD;
3) To train a group of scientists and clinicians in genomic studies of multifactorial disease; and
4) To address ethical, legal, and social issues (ELSI) that are relevant to Africa.

The key goals of the network are:

1) To recruit 2,500 patients with echocardiographically-confirmed RHD.
2) To conduct a case-control genome-wide association study by genotyping 5 million single nucleotide polymorphisms in 1,500 RHD cases and 1,500 unrelated controls using micro-array technology, followed by replication in a further 1,000 independent cases and 2,000 family-based controls, and combined analysis of genotype data from all 2,500 cases and 2,500 controls or pseudo-controls to detect rarer alleles or alleles of smaller effect.
3) To train 16 scientists and clinicians in genomics and ELSI at masters, doctoral and postdoctoral levels.

Lay Description

Rheumatic heart disease (RHD) results from a harmful response of the immune system to a bacterium called *Streptococcus pyogenes* or Group A Streptococcus (GAS). Although the development of RHD can be prevented by the treatment of GAS infection with penicillin, this has not been successful in poor countries of Africa. We plan to read the genome of 2,500 people with RHD and compare with 3,500 people without RHD to identify genetic risk factors. It is likely that genetic studies may identify people at high risk for the development of RHD who may be prioritised for preventive treatment and vaccination.

Dr Bongani Mayosi
University of Cape Town

Bongani M Mayosi is Professor of Medicine and Head of the Department of Medicine at Groote Schuur Hospital and the University of Cape Town, South Africa. He qualified as a medical doctor from the University of KwaZulu-Natal, and trained in internal medicine and cardiology in Cape Town. He was a research fellow in cardiovascular medicine at Oxford University from 1998 to 2001. His research interests include genetics of heart disease, treatment of tuberculous pericarditis, and prevention of rheumatic fever.

Mr Ahmed Elsayed
AlShaab Teaching Hospital, Sudan

I am a cardiothoracic surgeon who was trained in the UK and returned to Sudan in 1999 to assist in the reestablshment of this speciality in Sudan. Since that date I have done approximately a thousand five hundred open hearts and other major thoracic and vascular

operations. I have also presented more then 50 abstracts of my work in major local, regional and international conferences. I have also trained scores of general surgery residents in the speciality and have supervised more then twenty of them in doing their graduation reserach thesis. I am also now a lead figure in setting up a local training program leading to the award of a clinical MD in cardiothoracic surgery and another one which encompasses higher nursing diplomas in the realm of critical care and operating room nursing. I am also actively involved in several local and multicountry research projects

Mr Mark Engel
University of Cape Town
Mark Engel gained an honours degree in Human Genetics and an MPH in Epidemiology from the University of Cape Town, complemented by further postgraduate studies at Harvard University. He is nearing completion of his doctoral studies under the mentorship of Dr Bongani Mayosi, focusing on the Genetic Epidemiology of Rheumatic Fever (RF) and Rheumatic Heart Disease (RHD) in South Africa. Mark joined the Stop RHD-ASAP Programme shortly after its launch in 2006 and as the Programme Manager, developed the Cape Town Demonstration Site to serve as a role model for expanding the programme across the African continent and beyond. This vision is currently being realised through the launch of the REMEDY study, featuring a large-scale registry to document and track every case of RHD from more than 20 countries. When not at the office, Mark enjoys playing piano and being the proud father of Hayden and Emily.

Dr Charles Mondo
Uganda Heart Institute
Head of Reserach and cardiology Fellowship Training; Cardiac Catheterization Program Director at the Uganda Heart Institute

Professor Raj Ramesar
University of Cape Town
Raj Ramesar is Professor and Head of the Division of Human Genetics at the University of Cape Town (UCT) and its Allied Hospitals in South Africa. This facility has wide-ranging clinical responsibilities from the quaternary and tertiary care levels, to extensive rural outreach programmes, in addition to lab-based diagnostic and research capabilities. The richness of African population biodiversity has led to Raj's latest quest to establish a research programme, 'Heritage' that crosses all academic boundaries and celebrates our origins, our diversity (lineages, cultures, languages). This quest will contribute to a more proactive and preventative approach to health. Raj serves on the Executive of the African Society for Human Genetics, and is its Liaison Officer to the International Federation of Human Genetics Societies. He serves on the Editorial Boards of several international jounral. While his non-academic pursuits include bonsai and painting in watercolours and acrylics, an added dimension to his academic life is his current enrolment in the Executive MBA programme at UCT's Graduate School of Business.

Wellcome Trust-H3Africa Research Project

PI: Enock Matovu

Organization: Makerere University, Uganda

Title: TrypanoGEN: an integrated approach to the identification of genetic determinants of susceptibility to trypanosomiasis (H3A TrypanoGEN)

Scientific Description

The over-arching aim of this network is to improve the health of people living in some of the poorest countries in the world that carry a disproportionate burden of infectious diseases. Despite their importance, the study of many tropical diseases has lagged behind that of diseases of developed countries. This network will redress the balance by performing high quality research into the neglected tropical disease of human African trypanosomiasis.

High level objectives:

1. To create an extensive biobank of both retrospective and prospective samples. In order to deliver this scientific objective, it will be necessary to achieve underpinning capacity building objectives; to establish a pan-African, interdisciplinary research team incorporating parasitologists, geneticists, genome analysts, clinicians, ethicists and bioinformaticians; to train personnel in diagnosis/sampling and depositories for both retrospective and prospective and to provide underpinning infrastructure.

2. To generate a database of human genetic variation from different African countries that will be available to the wider scientific community for research on other diseases and analysis of human genetic diversity and evolution. In order to deliver this scientific objective, it will be necessary to achieve the capacity building objective of enhancing local research capacity via development of training in advanced genomics.

Lay Description

Human African Trypanosomiasis (HAT) afflicts tens of thousands in rural sub-Saharan Africa. The study of this important disease has lagged behind, yet improved treatment is urgently needed. The aim of this project is to apply the latest advances in scientific research to HAT and subsequently train the next generation of African scientists to conduct further high-quality research into neglected tropical diseases. Our research strategy will exploit the fact that some people are naturally able to control or even eliminate the parasites. By comparing the genes in resistant and susceptible people we will identify genes/molecular pathways that are crucial in controlling the disease.

Dr Enock Matovu

Makerere University College of Veterinary Medicine, Uganda

Associate Professor Enock Matovu obtained his PhD in Molecular Parasitology from the University of Bern, Switzerland in 2001, while he worked as a Research Officer at the then Livestock Health Research Institute, Tororo, Uganda. Since then has continued his work on drug resistance and later diagnostics for African Trypanosomiasis. In 2004, he relocated to the Makerere University School of Veterinary Medicine, where he was first employed as a Lecturer. In 2008, Enock Matovu received the prestigious Royal Society Pfizer Award in recognition of his work on molecular mechanisms of drug resistance in African trypanosomes. The previous year (2007) he had obtained the Joint Third World Academy of Science Award for Young Scientists, for his contribution to the field of Molecular

Parasitology.Over the years, Enock has accumulated considerable experience in human African trypanosomiasis in the fields of surveillance, diagnostics, drug resistance and clinical trials.

Dr Issa Sidibe
CIRDES, Burkina Faso
Issa Sidibe is a senior scientist of CIRDES. He started to work on trypanosomiasis in 1984, at CRTA, in Burkina Faso. He initially worked on immunology: trypanotolerance versus trypanosusceptibility in different cattle breeds. Then, he undertook epidemiological and chemoresistance to trypanocides studies. Issa defended his PhD in 1996 at the University of Montpellier II, in France on "Genetic variability of T. congolense: taxonomical and epidemiological implications". Then, he worked on improving the molecular diagnosis of trypanosomes using PCR techniques. Issa was chairman of the ISCTRC 2001-2003 and remains a member of its Executive Committee, also member of the PAAT advisory group. In CIRDES, Issa led the Biological and Integrated Disease Control Unit. From April 2005, he was appointed scientific director of CIRDES until September 2011. In 2006, cumulatively, Issa SIDIBE was appointed National Coordinator of the Pan African Tsetse and Trypanosomiasis Eradication Campaign (PATTEC) for Burkina Faso.

Dr Vincent Pius Alibu
Makerere University, College of Veterinary Medicine, Uganda

Dr Annette Macleod
University of Glasgow
Annette MacLeod's research career began in the University of Leicester with Alec Jeffreys, where she was involved in developing novel methods for individual genetic identification. She then changed fields, to study for her PhD infectious diseases at the University of Glasgow in the WTCMP, determining the extent of mating in natural T. brucei populations. Annette launched an independent career initially with a fellowship from the Royal Society of Edinburgh in 2004 and a Wellcome Trust Career Development Fellowship in 2007. During this time she proved that the genetic system in T. brucei is Mendelian and generated the first genetic maps of T. brucei and T.b. gambiense using them to identify loci involved in virulence and growth. She has also identified a mechanism of human serum resistance employed by T.b. gambiense. Annette was awarded a Wellcome Trust Senior Fellowship in 2011 to extend her studies into host/parasite interactions.

Dr Bruno Bucheton
Institut de Recherche pour le Développement (IRD), France
I started my career in research in INSERM, where I did my MSc and PhD. There I worked on human genetic susceptibility to malaria and visceral leishmaniasis. Main findings were the first description of linkage of plasmodium parasitaemia with the 5q31 locus and the description of a major locus at 22q12 linked with susceptibility to visceral leishmaniasis. After my PhD (2003), I was recruited as a permanent research officer in IRD and was affected to CIRDES (Bobo-Dioulasso, Burkina Faso) to develop a research project on human African trypanosomiasis in collaboration with NCPs from West Africa and WHO. Field surveys and long term follow up (Côte d'Ivoire and Guinea) have provided robust evidences that infection by Trypanosoma brucei gambiense is not invariably fatal. Instead our studies have enabled to characterize trypanotolerant subjects that may be asymptomatic carriers of parasite. My main research interest now is to evaluate to which extent the observed diversity of infection outcomes is related to the genetic diversity of the host or of the parasite and to identify the key determinants.

Wellcome Trust-H3Africa Research Project

PI: Albert Amoah

Organization: University of Ghana, Ghana

Title: Burden, spectrum and aetiology of type 2 diabetes in sub-Saharan Africa (APCDR-H3A African Partnership for Chronic Diseases Research)

Scientific Description

Our primary aim is to assess the burden and aetiological characteristics of T2D in adults in SSA using large scale population based approaches. To achieve this, we aim to develop a large scale epidemiological and genomic research resource comprising up to 12,000 cases of T2D and a population based cross-sectional study of up to 12,000 participants drawn from diverse sampling frames across SSA.

Scientific objectives:

1) to assess the burden and spectrum of T2D in adults;
2) to investigate the environmental and genetic determinants of T2D in SSA;
3) to characterise the prevalence and distribution of microvascular complications associated with T2D; and
4) to study the environmental and genetic determinants of microvascular complications associated with T2D.

The research will be supported by cross-cutting research activities, which will be common to the work of most, if not all, the scientific objectives, including:

1) networking and management;
2) epidemiological design and statistical analysis;
3) bioinformatics;
4) genomics and statistical genetics;
5) capacity building; and
6) bioethics.

To achieve these scientific objectives—and as part of the vision for a sustainable research network—local capacity building, including researchers and infrastructure, will be a fundamental component of the proposed research programme.

Lay Description

In 2010, over 12 million people in sub-Saharan Africa (SSA) were estimated to have diabetes. Recent estimates suggest that the prevalence of diabetes in SSA is around 5%. However, over the next 20 years, it is predicted that SSA will have the highest growth in the number of people with diabetes of any region in the world—with a doubling of the current prevalence. Thus diabetes is likely to be a major health problem in SSA, competing for limited health resources with infectious diseases. However, in many countries in SSA the burden and risk factors for diabetes is not clear. To help prevent diabetes and treat people with the disease, it is important to understand how many people develop diabetes and what may cause it. We aim to survey people from several countries in SSA to determine what proportion of the population has the disease and what the risk factors may be, including using genetic techniques to identify the causes of diabetes. This information will be important to identify ways to prevent and treat diabetes in Africa.

Professor Albert Amoah
University of Ghana Medical School
Dr. Albert G.B. Amoah is a Professor of Medicine at the University of Ghana Medical School (UGMS). He is the Director of the National Diabetes Management and Research and the Head of the Diabetes Research and Chronic Disease Reference Laboratory in Accra. Prof. Amoah holds an MB.Ch.B from the UGMS, a Ph.D(Biochemistry) from the University of Surrey and fellowships from a number of professional colleges and academies. He is a past Vice Dean of the UGMS and Provost (Ag.) of the College of Health Sciences at UG. He has served as temporary advisor to the World Health Organization on Chronic Disease Care and Cardiovascular Care. Professor Amoah has research interest in pathogenesis of type 2 diabetes, cardiovascular risk factor epidemiology and aetiopathogenesis of atherosclerosis. He is a member of the African Partnership for Chronic Diseases Research that has recently won a Welcome Trust H3Africa award to study type 2 diabetes.

Dr Clement Adebamowo
Institute of Human Virology, Nigeria
Clement Adebamowo BMChB Hons, FWACS, FACS, ScD is Director Office of Strategic Information, Research and Training, Institute of Human Virology, Nigeria; Convener of the Nigerian Research Consortium; Director of the Center for Bioethics, Nigeria and of the West African Framework Program on Global Health, West African Regional Board Member of the African Society for Human Genetics and an Associate Professor of Epidemiology, University of Maryland, Baltimore. Dr. Adebamowo was until recently Professor of Surgery and Director of the Institute of Advanced Medical Training and Research at the University of Ibadan, Nigeria. Dr. Clement Adebamowo is Chairman of National Health Research Ethics Committee of Nigeria (NHREC) and Principal Investigator of the West African Bioethics Training Program which develops health research ethics capacity with strategic focus on Non-Communicable Diseases and Genomics Ethics strengthens ethics committees and provides graduate level training in research ethics

Dr Charles Rotimi
NIH-Center for Research on Genomics and Global Health, United States
Charles Rotimi, PhD, a genetic epidemiologist and a biochemist, is a senior investigator in the Inherited Disease Research Branch, NHGRI/NIH. He is the Director of the Center for Research on Genomics and Global Health (CRGGH). The mission of this trans-NIH center is to advance research into the role of culture, lifestyle, genomics in disease etiology and population differences in disease susceptibility and variable drug response. Dr. Rotimi develops large-scale genetic epidemiology studies that explore the patterns and determinants of common complex diseases in human populations with particular emphasis on African ancestry populations. He leads a multiple disciplinary research team with expertise in medicine, epidemiology, social science, genomics, statistics and informatics. His team published the first genome-wide scan for hypertension in African Americans and for diabetes in West Africans. His lab contributes to the global understanding of human genetic variation. He is the president of the African Society of Human Genetics.

Dr Manjinder Sandhu
Wellcome Trust Sanger Institute, United Kingdom
Manj's research explores genomic diversity and its impact on infectious and cardiometabolic risk factors. Following his PhD, Manj undertook an MRC Fellowship in cardiovascular genetic epidemiology and in 2004 became Lecturer in Epidemiology at the University of

Cambridge. In a joint appointment with Cambridge, Manj joined the Wellcome Trust Sanger Institute in 2009. Manj's research focuses on the integration of principles and procedures underlying population genetics and epidemiology. Together with genome-wide technologies, this approach provides opportunities to identify biological mechanisms underlying the development of complex diseases. His work centres on the genetic basis of cardiometabolic traits and diseases, particularly lipid metabolism and coronary artery disease, and the use of genetic tools for causal inference. He has recently begun developing epidemiological resources to explore genomic diversity and its impact on infectious and cardiometabolic risk factors and diseases in Sub-Saharan African populations, as part of a public health and epidemiological research programme.

Dr Eugene Sobngwi
University of Yaounde 1, Cameroon
Dr Eugene Sobngwi is Senior Lecturer in Internal Medicine/Endocrinology at the Faculty of Medicine, University of Yaoundé 1, and Senior Lecturer in Epidemiology at Newcastle University, UK. He formerly worked as lecturer/registrar specialist in Endocrinology at Paris VII Medical School and St-Louis University Hospital, and as a research fellow at the Clinical Investigation Centre of St-Louis Hospital, and INSERM U671. He graduated from the Faculty of Medicine, University of Yaoundé in 1996, and undertook specialist training in Endocrinology and Diabetes in Paris, France where he also obtained his PhD in metabolism (2005). He holds an MPhil in Epidemiology (Newcastle upon Tyne, UK). His main area of expertise is Epidemiology and pathophysiology of diabetes in populations of African origin, with special emphasis on ketosis-prone atypical diabetes. He is author of 80 peer reviewed publications and 6 book chapters.

Appendix 3 – Independent Expert Committee

Professor Philip Awadalla
University of Montreal, Canada
Dr. Philip Awadalla is an Associate Professor at the University of Montreal, Ste Justine Children's Hospital Research Centre. He obtained his doctorate in population genetics from the University of Edinburgh and was awarded and a Wellcome Trust Travelling Fellowship. He moved to the University of Montreal in 2007. His research utilizes genomics approaches to capture genetic and environmental factors associated with hematological, oncological, and infectious diseases including malaria. Since 2010, he has been the Principal Investigator of the CARTaGENE program. CARTaGENE is the Quebec health survey and an open source biobank having recruited and deeply phenotyped 37,000 participants to facilitate research in chronic and aging related diseases. Dr. Awadalla is a teaching faculty at a number of international institutions and sits on the advisory board of a number of international companies and genome centres. Dr. Awadalla is the 2012 recipient of the Canadian Society for Clinical Investigation's Young Investigator Award.

Professor Carlos Bustamante
Stanford University, School of Medicine, United States
Professor of Genetics at Stanford and Adjunct Professor of Statistics at Cornell, is a population geneticists with expertise in the analysis of large genomic data sets. His group has led efforts to document global patterns of human genomic variation and has active projects in European, African and African/American, Hispanic/Latino, Native American, and Pacific Island populations. At the Stanford Center for Genomics and Personalized Medicine, his laboratory has sequenced, annotated, and analyzed hundreds of diverse human genomes. His group is also funded to undertake population genetic analysis of the 1,000 Genomes Project samples as well as 7,000 exomes sequenced by the NHLBI Exome Sequence Project. He has trained over 20 Ph.D. students at Stanford and Cornell in a myriad of fields including Applied Math, Biometry, Statistics, Genetics, Biomedical Informatics, and Biology. At both institutions he has developed novel curricula tailored for teaching Statistical and Computational Genomics to molecular biologists and geneticists and has expertise to oversee training in this area for the SGTP.

Professor Ruth Chadwick
Cesagen, Cardiff University, United Kingdom
Ruth Chadwick is Director of the ESRC (Economic and Social Sciences Research Council) Centre for Economic and Social Aspects of Genomics (Cesagen), Cardiff University, UK. She also holds a Link Chair between Cardiff Law School and the School of English, Communication and Philosophy (ENCAP). She has co-ordinated a number of projects funded by the European Commission, including the EUROSCREEN projects and co-edits the journal Bioethics and the online journal Genomics, Society and Policy. She is Chair of the Human Genome Organisation Committee on Ethics, Law and Society, and has served as a member of several policy-making and advisory bodies, including the Panel of Eminent Ethical Experts of the Food and Agriculture Organisation of the United Nations (FAO), and the UK Advisory Committee on Novel Foods and Processes (ACNFP). She is an Academician of the Academy of Social Sciences and a Fellow of the Hastings Center, New York; of the Society of Biology; of the Royal Society of Arts; and of the Royal Society of Medicine.

Dr Rex Chisholm
Feinberg School of Medicine, Northwestern University, United States
A faculty member at Northwestern University since 1984, Chisholm is author of over 140 scientific papers and abstracts. His research focuses on genomics and bioinformatics. Chisholm leads a major biobanking effort at Northwestern University, NUgene (www.nugene.org). NUgene enrolls research participants in a study focused on investigating the genetic contributions to human disease, therapeutic outcomes and gene-environment interactions. NUgene is a participant in the NHGRI-funded eMERGE network (www.gwas.net) - a network of electronic medical record (EHR) linked biobanks. The goal of his current eMERGE network project is to establish a program for genomics-informed personalized medicine at Northwestern's health care affiliates. He is PI of dictyBase (dictyBase.org), the NIH-funded genome database for the cellular slime mold, Dictyostelium and is an NIH funded member of the gene Ontology Consortium (www.geneontology.org). His research has been supported by the National Institutes of Health, American Cancer Society, American Heart Association, and the Department of Defense.

Dr Solomon Nwaka
WHO-TDR, Switzerland
Solomon Nwaka is a leading global health expert and advocate. He has over fifteen year experience in research and development, with emphasis in health product R&D and technology management, manufacturing, technology transfer and associated capacity building in developing countries. His scientific and management career spans public institutions, industry, product development partnerships and international organizations, in several countries including Nigeria, Ethiopia, Belgium, Italy, Germany, Japan, USA, Canada and Switzerland. He conceived the idea of regional innovation network at the WHO that resulted in the establishment of ANDI, of which he is presently the interim Director. Prior to this, he headed product discovery and innovation research activities of the Tropical Disease Research department at WHO, as well as the drug discovery and innovation activities of the Medicines for Malaria Venture (MMV). He has published widely on global health, product R&D, public-private partnerships, access issues as well as capacity building in developing countries especially Africa.

Professor Ayoade Oduola
Institute for Infectious Diseases of Poverty (IIDP/IRMP), West Africa
Ayoade MJ Oduola recently retired as Coordinator for Stewardship and Capacity Building for Research at the Special Program for Research and Training on Tropical Diseases at the World Health Organisation (WHO/TDR). He was a Professor and Director at the Postgraduate Institute for Medical Research (IMRAT), College of Medicine, University of Ibadan, Nigeria. He received and worked as an Investigator and a US National Research Council (NRC) Fellow at the Water Reed Army Institute for Research, Washington DC, USA. His research focused on drug discovery and drug resistance in parasitic diseases and applications of biotechnologies. He led a team that produced the Global Report for Research on Infectious Diseases of Poverty launched by the European Commission in April 2012. Oduola continues his research on chemotherapy and drug discovery in infectious diseases of poverty and facilitating strategic roles for leaders of affected populations through Universities and initiatives in West Africa including the West Africa Institute for Research on Infectious Diseases of Poverty (IIDP/IRPM) (www.riidp.org).

Dr Charmaine Royal
Duke University Institute for Genome Sciences and Policy, United States

Dr. Royal is an Associate Research Professor in the Institute for Genome Sciences & Policy and the Department of African & African American Studies at Duke University. Her research, scholarship, and teaching focus on ethical, psychosocial, and societal issues in genetics and genomics, primarily issues at the intersection of genetics/genomics and concepts of "race", ancestry, and ethnicity. Dr. Royal serves or has served as a consultant to the World Health Organization on genetic and genomic research in Africa, member of the Working Group for the H3Africa Initiative, member of the International Scientific Advisory Board of the Kenya Medical Research Institute (KEMRI)-Wellcome Trust Research Programme, and chair of the Social Issues Committee of the American Society of Human Genetics. She received a master's in genetic counseling and a doctorate in human genetics from Howard University, and completed postgraduate training in bioethics and ELSI (ethical, legal, and social implications) research at the National Human Genome Research Institute, National Institutes of Health.

Appendix 4 – NIH and Wellcome Trust staff

Dr Ebony Bookman
NHGRI\NIH, United States
Dr. Bookman is a Program Director in the Division of Genomic Medicine within the National Human Genome Research Institute (NHGRI). She received her B.S. in biology from the University of North Carolina at Chapel Hill, her M.S. in Genetic Counseling from Howard University, and her Ph.D. in Genetics and Human Genetics from Howard University. Her research portfolio includes the Genome-wide Association Studies of Treatment Response in Randomized Clinical Trials Network (GARNET), the Genomic Medicine Pilot Demonstration Projects Program, the H3Africa ELSI Program, the Next Generation Association Studies program, Life After Linkage, and the Clarification of Optimal Anticoagulation through Genetics (COAG) study. She is also a member of the Genetic Association Information Network (GAIN) Data Access Committee. Her research interests include population genomics, pharmacogenomics, complex disease and health disparities.

Dr Leslie Derr
OD\NIH, United States
Dr. Leslie Derr is a Program Director with the U.S. National Institutes of Health (NIH) Common Fund Program. She received a Ph.D. in Genetics from Duke University and has been working at the NIH since 1994. She began her NIH career as a Principal Investigator in the National Institute of Allergy and Infectious Disease, where her lab used the yeast retrotransposon Ty as a model organism to study RNA-mediated recombination and the role of RNA in genome evolution. She then joined the National Cancer Institute, working in the Office of the Director, driving forward "areas of extraordinary opportunity", and later serving as program manager for the cancer Biomedical Informatics Grid.
Before joining the Office of Strategic Coordination, her current position in the NIH Office of the Director, Dr. Derr spent a brief interlude in the Office of the Secretary, Health and Human Services working on healthcare reform.

Dr Jean Flagg-Newton
NICHD\NIH, United States
Jean Flagg-Newton is a program officer and Assistant Director, Division of Special Populations, National Institute of Child Health and Human Development, the National Institutes of Health (NIH). As a program officer, she has primary responsibility for the Division's Biomedical/Biobehavioral Research Administration Development Program, which includes a residential training component at the NIH. Dr. Flagg-Newton has served in a number of capacities at the NIH, including scientific review officer for research capacity building and training programs and program officer for the Fogarty International Center's international research collaborative award program. Dr. Flagg-Newton holds a B.S. from Tennessee State University and a Ph.D in physiology from Harvard University.

Dr Eric Green
NHGRI\NIH, United States
Eric D. Green, M.D., Ph.D. is the Director of the National Human Genome Research Institute (NHGRI) at the National Institutes of Health (NIH), a position he has held since late 2009. Previously, he served as the NHGRI Scientific Director (2002-2009), Chief of the NHGRI Genome Technology Branch (1996-2009), and Director of the NIH Intramural Sequencing Center (1997-2009). As Director of NHGRI, Dr. Green is responsible for providing overall leadership of the Institute's research portfolio and other initiatives. Most recently, Dr. Green led NHGRI to the completion of a strategic planning process that yielded a new vision for the

future of genomics research, entitled Charting a course for genomic medicine from base pairs to bedside (Nature 470:204-213, 2011).

Dr Mark Guyer
NHGRI\NIH, United States
Mark Guyer is the Deputy Director of the National Human Genome Research Institute, NIH (US). He has been involved in the development and support of human genome research since 1988, and in the development of the NIH component of the H3Africa program since 2010.

Professor Karen Hofman
NHGRI\NIH, United States
Professor Karen Hofman is an advisor to NHGRI on Human Subjects for H3 Africa based in Johannesburg. She is Wits medical graduate and is Board Certified in Paediatrics and Human Genetics. She has had long standing interest in issues of research governance. While on faculty at Johns Hopkins, she engaged in ELSI policy research and its implications for primary care. As Director of the Policy Division at the US NIH, Fogarty Centre, she initiated and developed training programs in low and middle income countries including a successful, long standing program to train professionals in bioethics. She was a founder of the annual Global Forum for Bioethics. In addition to this work, Prof Hofman directs an initiative in South Africa to provide an understanding of interventions that would deliver good value for money in health. She is widely published on a broad range of policy and health research in accredited international journals.

Ms Chengetai Mahomva
NHGRI\NIH, United States
Chengetai Mahomva graduated from Swarthmore College in 2011 with a Bachelor of Arts Degree in Biochemistry.She currently works as the NIH-H3Africa Program Analyst at the National Human Genome Research Institute.

Dr Marva Moxey-Mims
NIDDK\NIH, United States
Dr. Marva Moxey-Mims is the Deputy Director for Clinical Research in the Division of Kidney, Urologic and Hematologic Diseases of the National Institute of Diabetes & Digestive & Kidney Diseases (NIDDK), NIH. She is also Program Director for Pediatric Nephrology, developing initiatives for pediatric nephrology clinical studies and administers grants involving children with a wide range of kidney diseases. Some of the projects that she currently oversees include the Chronic Kidney Disease in Children Study (CKiD), the Randomized Intervention for Vesicoureteral Reflux Trial (RIVUR), and Studies of Non-Adherence in Adolescents with Chronic Kidney Disease. Dr. Moxey-Mims received her B.Sc. in biology from McGill University and her M.D. from Howard University. She did her pediatric residency and clinical pediatric nephrology fellowship at Children's National Medical Center, Washington, D.C., and a research fellowship in the Laboratory of Clinical Investigation at the National Institute of Allergy and Infectious Diseases (NIAID), NIH.

Dr Margaret Penno
NHGRI\NIH, United States
Dr. Penno has 25 years of national and international experience in biorepository design, inventory systems, equipment, and management. She established and manages the Cell Center and Biorepository at Johns Hopkins Genetic Resources Core Facility (cellcenter.grcf.jhmi.edu), a service center that has set up and stored cell lines or blood

fractions from 25,000 research participants enrolled by Johns Hopkins University faculty. In addition to blood and fibroblasts, the Cell Center and Biorepository houses hundreds of tumor lines, which are propagated, cryopreserved, and shipped to investigators worldwide. In 2008, Dr. Penno established the TB Research Laboratory at Macha, a P2/P3 bio-containment research laboratory in Zambia, Africa, and initiated a technician-training program for the culture and genotyping of m. tuberculosis (www.machamalaria.org). Dr. Penno also founded the BioTechnical Institute of Maryland, Inc. (www.biosciconcepts.com; www.biotechmd.org), which delivers professional workshops around the world while selecting and training highly motivated individuals for technical jobs in the biosciences.

Dr Jane Peterson
NHGRI\NIH, United States
Dr. Jane Peterson, Senior Advisor to the NHGRI Office of the Director at NIH, is the NIH Project Coordinator of the NIH Common Fund's H3Africa Project. She is known at NIH for her successful work on the Human Genome Project and more recently her work on The Cancer Genome Atlas Project, The Knockout Mouse Project and the Human Microbiome Project. Dr. Peterson received her BS degree from Western College in Oxford, Ohio, and Ph.D. from the University of Colorado Department of Molecular, Cellular and Developmental Biology. She joined the NHGRI Division of Extramural Research in 1989 and served as Associate Director of the Division since 2002.
She has won many awards such as the US Department of Health and Human Services Secretary's Award in 2001 for her role in the Human Genome Project and in 2005 for involvement in The HapMap Project. In 2011, she was awarded the NHGRI Director's Distinguished Award.

Dr Louise Wideroff
NIDA\NIH, United States
Louise Wideroff is the NIH science officer for the H3Africa biorepository planning grants. Her primary appointment is as a program official at the National Institute on Drug Abuse, National Institutes of Health in Bethesda, Maryland, USA. Her program responsibilities include the development and management of an extramural research portfolio examining genetic and environmental factors in tobacco use and nicotine addiction, and other addictive substances. Prior to this, she was an epidemiologist and program official at the National Cancer Institute in the U.S., conducting and promoting observational and public health surveillance studies on diverse cancer risk factors associated with urogenital and digestive cancers. She also developed research initiatives to evaluate the use of genomic and molecular technologies in cancer prevention and treatment.

Dr Audrey Duncanson
Wellcome Trust, United Kingdom
Audrey Duncanson joined the Wellcome Trust in 2000 and is now a Senior Portfolio Developer within Science Funding. Her role is to help develop and implement strategic funding initiatives in genetics, genomics and the molecular sciences and to oversee the portfolio in these areas. After receiving a BSc (Hons) in Molecular Biology and a PhD from the Department of Genetics, University of Glasgow, Audrey went on to postdoctoral studies in fly neurodevelopment at the Department of Genetics, University of Leicester. Her current responsibilities include the Wellcome Trust Case Control Consortium, the UK10K sequencing project and H3Africa.

Dr Pat Goodwin
Wellcome Trust, United Kingdom
Pat Goodwin, Ph.D., obtained her B.Sc (Physiology and Biochemistry) and Ph.D. (microbial biochemistry) from the University of Southampton. She has been a senior manager at the Wellcome Trust for over 20 years, and she managed the Molecular and Cell Panel, the Infection and Immunity Panel and the Functional Genomics Development Panel before taking over responsibility for the portfolio and strategy development in Infectious Disease and Populations and Public health. She now acts as a Consultant to the Wellcome Trust and C3Collaborating for Health. She is a Fellow and Council member of the Society of Biology, a member of the International Steering Group of the Public Population Project in Genomics and on the Board of the Centre for Longitudinal Studies.

Dr Dan Korbel
Wellcome Trust, United Kingdom
Dan Korbel's background is in infectious diseases. After his PhD at the London School of Hygiene and Tropical Medicine and the KCMC (Moshi, Tanzania) he worked as a postdoctoral researcher on the immunology of tuberculosis (LSHTM) and neonatal immunity to parasitic infections of the gastrointestinal tract (Queen Mary, University of London). Dan joined the Wellcome Trust in 2010 as a Science Portfolio Adviser in the Department of Pathogens, Immunology and Population Health to work across the Populations & Public Health and Immunology & Infectious Disease funding streams.

Ms Katherine Littler
Wellcome Trust, United Kingdom
Katherine is a Policy Adviser at the Wellcome Trust, with a background in medical law and ethics. Since joining the Trust in 2005, she has worked extensively on regulatory and ethical issues. She is currently leading work at the Trust that is looking at the importance of data access and governance mechanisms across genetics/genomics research, cohorts and longitudinal studies. She is a key adviser on ethical issues, and currently sits as the Trust's observer on the UK Biobank Ethics and Governance Council and on the UK Government's Emerging Science and Bioethics Advisory Committee. Katherine also has experience of public engagement: both in terms of commissioning work to understand public attitudes and developing strategies to influence public opinion.

Dr Suzanne Rolfe
Wellcome Trust, United Kingdom

Works as a Grants Adviser for the Wellcome Trust Population and Public Health team. Responsibilities include the operational management of grants awarded through the H3Africa initiative.

Appendix 5 – Speakers and observers

Dr. Miliard Derbew
Medical Education Partnership Initiative Project, Ethiopia
Dr. Miliard Derbew is currently serving as Project Director for Medical Education Partnership Initiative project for Ethiopia, MEPI Ethiopia is consortia project consists of four medical schools in Ethiopia (Addis Ababa University, Hawassa University, Haramaya University, and Defense College of Health Sciences) and four international partners in the US (JHU, University of Wisconsin, Emory University, and UCSD. He is also serving as President of the Surgical Society of Ethiopia and Ass. Secretary General of College of Surgeons East, Central and Southern Africa. Previously he has also served as Chief Executive Officer (with a rank of Vice President) for the College of Health Sciences, Addis Ababa University (2009 - 2011) and Dean of the School of Medicine (2007-2009). He is associate professor of pediatrics surgery since 2009 and has served as an assistant professor from 1998-2009.

Professor Diran Makinde
NEPAD Planning and Coordinating Agency, Ougadougou
Diran Makinde is the Director, NEPAD Agency, African Biosafety Network of Expertise (ABNE) based in Ouagadougou, Burkina Faso. He is the immediate past Director of the NEPAD West African Biosciences Network Dakar, Senegal. He earned the degrees of DVM and a PhD in Veterinary Physiology from the University of Ibadan, Nigeria. Prior to his current appointment, he was Professor of Animal Science at the University of Venda, South Africa where he also served a five-year term as Dean of the School of Agriculture. In addition, he taught at the universities of Ibadan and Zimbabwe. His research interest was in the field of gastrointestinal physiology of monogastrics, which includes such areas as digestibility and intestinal transport. He has well over 45 publications in peer-reviewed journals, as well as several contributions in the form of books/ chapters in books. He is a C-rated scientist as evaluated (1998) by the South Africa National Research Foundation

Dr Howard-Yana Shapiro
Mars, Incorporated, United States
Corporate Staff Officer Plant Science and External Research Mars, Incorporated Adjunct Professor Department of Plant Sciences College of Agriculture and Environmental Sciences University of California, Davis Distinguished Fellow World Agroforestry Centre Nairobi, Kenya Howard has been involved with sustainable agricultural and agroforestry systems, plant breeding, molecular biology and genetics for over 40 years. He has worked with indigenous communities, NGO's, governmental agencies and the private sector around the world, in 2007 Howard was made a Fellow of the World Agroforestry Centre and authored the IAASTD chapter on Biotechnology and Biodiversity. He was co-chair of the 1st, 2nd and 3rd World Congress of Agroforestry and is Chairperson of the External Advisory Board of the Agriculture Sustainability Institute at UC Davis. He led the global effort sequencing, assembling and annotating the Theobroma cacao genome, leads the Arachis genome global effort and the African Orphan Crops Consortium (96 plant genomes). He collects and restores classic American and modern Japanese and Italian motorcycles.