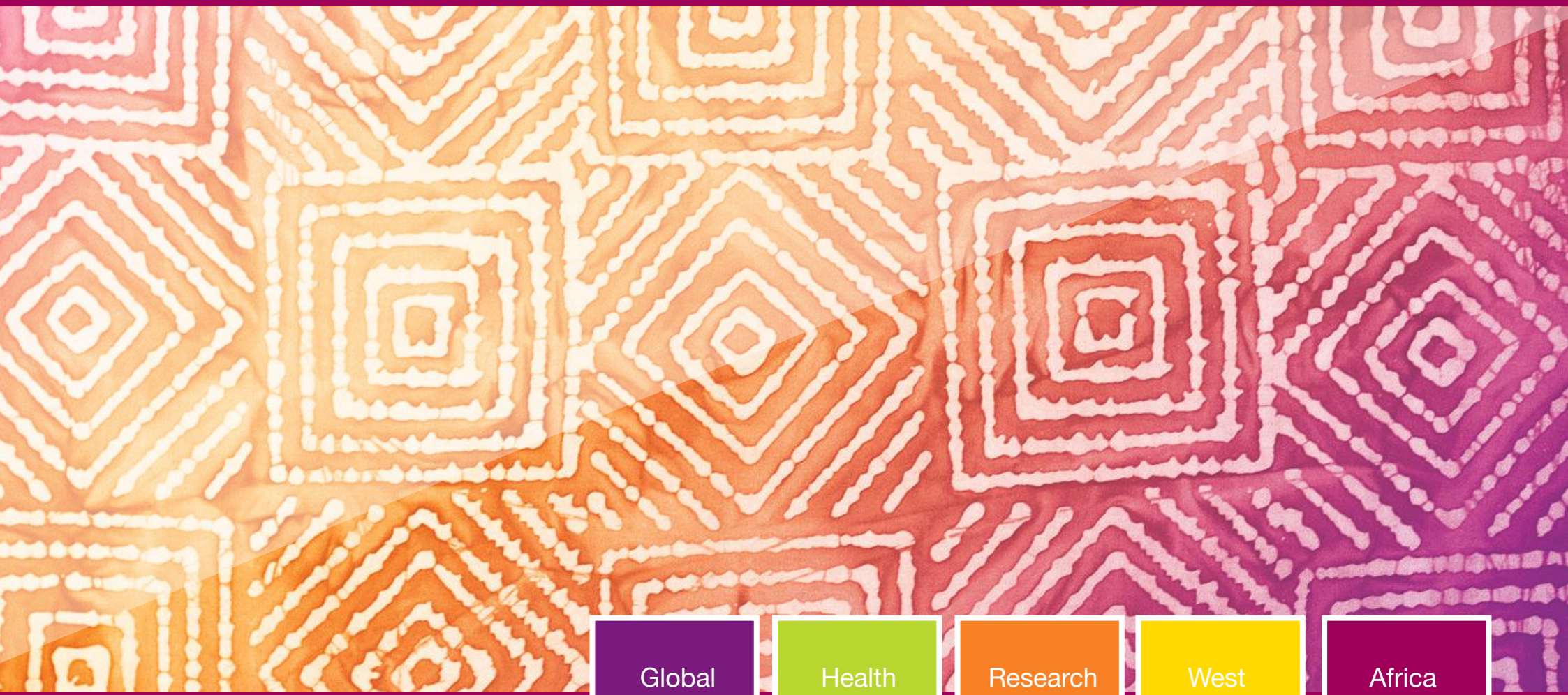


MRC

Unit  
The Gambia

# Annual Report 2016



Global

Health

Research

West

Africa





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# FOREWORD

The year 2016 has been extremely important for The Unit; our quinquennial plan was launched on April 1st; in June a new memorandum of understanding between the Gambian Government and the Medical Research Council was signed and replaced the previous document signed in 1989. In addition, we signed a memorandum of understanding with the University Cheikh Anta Diop and the Institut de Recherche en Santé de Surveillance Epidémiologique et de Formation, both institutions in Dakar, Senegal, for the creation of the West Africa Global Health Alliance (WAGHA). Such Alliance aims at creating a regional pole for research and training in which joint research projects, training activities and staff exchanges will be carried out. We will be appointing one Scientist to be based in our partner institutions in Senegal, who will focus on maternal and neonatal health. The Unit has already substantial research activities in maternal and neonatal (and child) health across its three research themes, namely Disease Control & Elimination, Nutrition, and Vaccines & Immunity. Nevertheless, because of the high burden of maternal and neonatal mortality in the West African region, The Unit will further invest in this area of research.

Training and capacity building represents a substantial proportion of our activities. In 2016, The Unit hosted several international courses/workshops: the Mixed Methods in International Health Research (QMM) course; the Bridging Biobanking and Biomedical Research across Europe and Africa (B3Africa) workshop; the first regional School of Immunology of Infectious Diseases; and the 10th annual international conference of the West African Research and Innovation Management Association. The excellent reputation of The Unit is further highlighted by the World Health Organisation's request to help investigate a meningitis outbreak in Ghana. The latter shows The Unit's capability to respond to outbreaks of infectious diseases in the West African region.

In 2016, The Unit supported the training of 181 individuals, including 41 MSc/MPhil, and 38 PhD, the large majority Gambians, though other African countries are represented. The Unit's research training strategy is aligned to its research requirements, with the aim of building the needed human capital for the advancement of scientific health research in The Gambia and the sub-region.

All our activities are carried out in close collaboration with the Gambian Government, and more specifically the Ministry of Health & Social Welfare. The Unit participates and provides expertise to several technical committees at the Ministry of Health & Social Welfare and last September we successfully held the 61st Gambia Government/MRCG Joint Committee Meeting, in which research findings relevant to the Ministry of Health & Social Welfare activities were presented and discussed. These included the results of the Pneumococcal Surveillance Project that showed a 55% decrease of invasive pneumococcal disease after the implementation of the pneumococcal conjugate vaccine, the interaction between iron metabolism and malaria, and the analysis of multi-drug resistant tuberculosis in West Africa.

We are now at the end of the first year of our quinquennial plan and activities have been implemented according to schedule. This is a great achievement that has been possible because of the commitment of all our staff. I would like to thank them all for their work and support. In addition, The Unit's success has been possible thanks to the constructive collaborations with many research partners. Such collaborations will continue and will hopefully involve even more institutions. Research cannot be efficiently done in isolation; it is a joint venture and requires the contribution of all involved partners.




Professor Umberto D'Alessandro  
Unit Director

# MRCG DIRECTOR'S AWARD 2016 PHOTOS



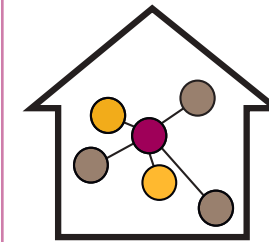
# WHO WE ARE



ISO 15189:2012  
Medical  
Laboratories  
Requirements  
for Quality and  
Competence

The Unit maintains compliance  
to the standard requirements

**184** individuals  
of different nationalities  
benefiting from MRCG  
training support



**MRCG**

has been selected as  
1 of 10 sites involved in  
our study to assess new  
TB diagnostics



Our Clinic Services **188** Patients  
**89** in Fajara **99** in Keneba  
per day

**37** New Patients  
each day



The Gate  
**184** Pa



**31**  
Health  
and  
Safety  
Trainings



Blue Lamp Trust Training of Motorcycle Trainers



Training of Unit Fire Wardens on Fire Safety Management by AVON Fire Bridgade

## Collaborations



B3 Africa Workshop



ImmunoGambia Workshop

Clinic see  
**117** Patients  
per day  
(in Fajara)



**117** Patients  
admitted in Fajara each  
month  
**42** Patients  
in Keneba

# STRATEGY





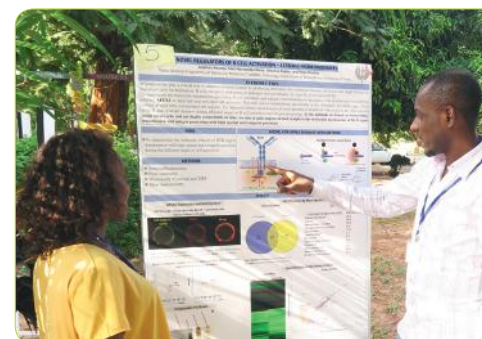
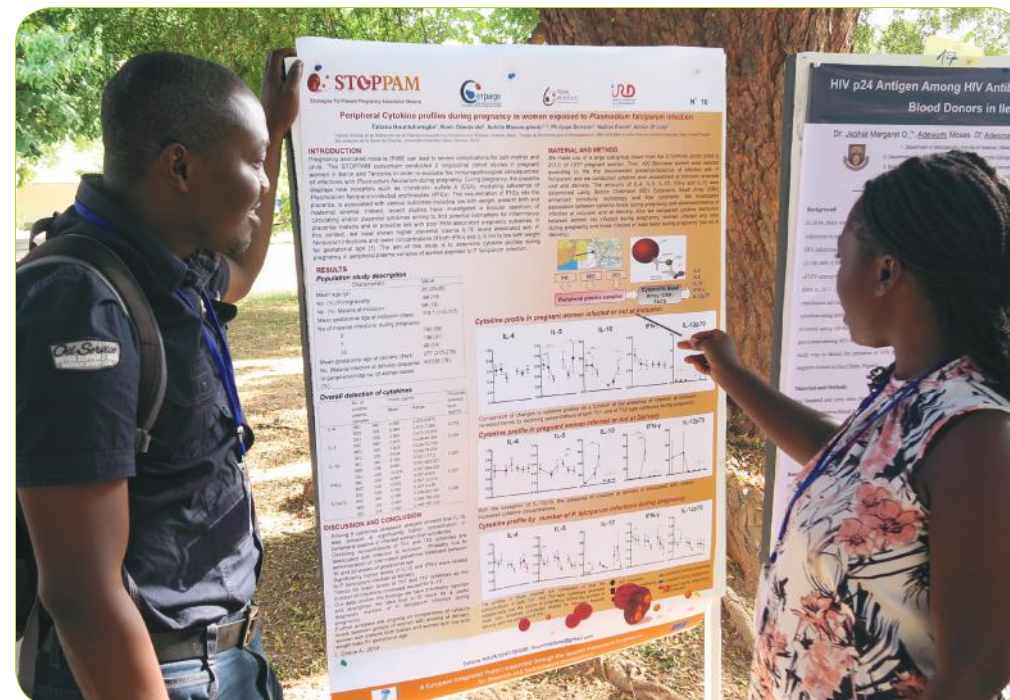
We have made significant progress in the implementation of our strategy as outlined in the quinquennial plan.

# STRATEGY

Our new 5-year core funding cycle with the related new Unit's strategy was launched in April 2016, an important milestone that followed the approval of our quinquennial plan by the MRC UK. The Unit's strategy is based on the ambition to significantly contribute to the post-2015 sustainable development agenda by producing the evidence base to improve health in West Africa and beyond. Therefore, the focus is on health issues that already are or will probably become in the next decade a considerable burden for the local population, namely infectious diseases, maternal and neonatal health, nutrition-related diseases, and non-communicable diseases. The Unit has been able to secure several new grants in the fields of infectious and nutrition-related diseases. Some of these new projects also fall within maternal and neonatal health. As for non-communicable diseases, this area of research needs to be developed further by establishing collaborative links with other research groups active in this field. It is worth mentioning that all research projects are supported by competitive grants obtained from a variety of sources while the core funding supports the infrastructure and the technical platforms, e.g. the clinical laboratory. It is therefore important The Unit is sufficiently competitive to attract the necessary funds to carry out research relevant to its scientific strategy. This can be achieved by improving the already-existing enabling environment for research and by promoting multidisciplinary research, and also by strengthening The Unit's collaborative links in the West African region.

In 2016, we have started implementing The Unit's strategy; we have finalised a memorandum of understanding with the Université Cheikh Anta Diop (UCAD) and the Institut de Recherche en Santé, de Surveillance Épidémiologique et de Formation (IRESSEF), both in Dakar. This strategic partnership includes, among others, developing joint grant applications and their implementation, training and capacity building of researchers and necessary support staff, shared platforms and exchange of staff.

Training and career development is an essential component of our activities because it is through promoting young and promising scientists that The Unit will be able to improve its capacity to attract competitive funding. We have also created and filled a new position to lead the training and career development department. This is essential for coordinating capacity building efforts and ensuring the best use of available resources. We have also defined the career paths for the different categories of scientific staff.



ImmunoGambia Workshop participants and their scientific posters

Working in close collaboration with the Gambian Government is essential for our research activities. Last September, we successfully held the 61st Gambia Government/MRCG Joint Committee Meeting, in which research findings relevant to the Ministry of Health activities were presented and discussed. In addition, The Unit participates and provides expertise to several technical committees at the Ministry of Health.

Overall, we have made significant progress in the implementation of our strategy as outlined in the quinquennial plan. A significant milestone is the launching of the West Africa Global Health Alliance (WAGHA), with our Senegalese partners, which is planned for the second quarter of 2017. This will be the first step to create an inter-institutional centre in West Africa which should develop into a regional hub for health research and training.



MRCG Festival - Opening ceremony



The Gambia WHO Regional Reference Laboratory hands over consumables and equipment to support the meningitis outbreak in Ghana



MRCG Festival - Nutrition Theme stand



MRCG Festival - DCE Theme stand

# YEAR IN REVIEW



Post Doc



Dr Toyin Togun offered a postdoctoral position at McGill University, Canada to further develop his research in the area of TB diagnostics and biomarkers

PhD student



Dr Saikou Y Bah, first Gambian to complete his PhD in bioinformatics and systems biology, defended his thesis at the University of Edinburgh in November 2016

Post Doc



Dr Ayden Safari completed his PhD at LSHTM and is now a Bioinformatician working on human epigenetics

Post Doc



Dr Leopold Tientcheu received Africa Research Excellent Fund (AREF) fellowship

# YEAR IN REVIEW

## JANUARY

### MRCG at the top of the charts in research collaboration



The report from the European and African Clinical Research Bibliometric analysis of publications within the scope of The EDCTP 2003 – 2011, highlights

MRCG's contribution towards reducing the global burden of diseases.

### The International Vaccine Impact on Diarrhea in Africa (VIDA) meeting



The Vaccine Impact on Diarrhea in Africa (VIDA) investigators' and International Scientific Advisory Committee (ISAC) meetings and visits to VIDA field site successfully completed on 27 January 2016.

Hosted by MRCG, the goals of the 5 days meeting and field visit were to assess the overall progress and to ensure the quality of the study at three African sites; The Gambia, Mali and Kenya.

### Voices of Women in Science – An Open Discussion



The 'Women in Science' open discussion was an incredible success with enlightening contributions from the panelists and audience (also via WebEx). The forum was

organised by the Management Lab of the MRCG on Monday 1st February 2016.

## FEBRUARY

### Pneumococcal Surveillance Project (PSP) Press Briefing



The Gambia Government, through the Ministry of Health and Social Welfare (MOHSW), and the MRCG called on all the press offices in The Gambia in March, to disseminate the study results

from the Pneumococcal Surveillance Project conducted in the Upper River Region of The Gambia. This forum is the first to engage and share study findings with the media to facilitate a wider dissemination of the results, especially in the rural areas.

### MRCG Keneba Biobank reaches a milestone with the recruitment of 10,000 participants



The Keneba Biobank, within MRCG Keneba Field Station, is a data and sample repository capturing the whole of the rural population of the Kiang West District of The Gambia. Initiated in May 2012,

the Keneba Biobank has now reached a significant milestone, completing data and sample collection on 10,000 participants.

### MRCG Host Molecular Approaches to Clinical Microbiology in Africa



The Wellcome Trust Advanced Course on 'Molecular Approaches to Clinical Microbiology in Africa' organised by the Wellcome Genome Campus Department of Courses and Conferences

held its annual training course hosted by MRCG in Fajara. It was successfully completed on the 12th of March 2016.

## MARCH

### MRCG and WHO join forces to deal with Meningitis outbreak in Ghana



At the center of the meningitis outbreak response in Ghana, the MRCG and the World Health Organisation (WHO) join forces. Official figures as of 17th Feb 2016, from the Ghana's Health Ministry

indicate that at least 86 people have died with 637 cases in the recent outbreak of a strain of pneumococcal meningitis in Ghana.

### Largest ever clinical trial on malaria during pregnancy in Africa



A four-year study (2012 - 2015), led by the Belgian Institute of Tropical Medicine Antwerp (ITM) and coordinated by Professor Umberto D'Alessandro, shows four available antimalarial

treatments are safe to use in pregnancy, providing sound scientific evidence on their use. The results of the PREGACT study (PREGnancy Artemisinin-based Combination Treatments), involved over 3000 women in Burkina Faso, Ghana, Malawi and Zambia.

### The 2016 QMM Course in International Health Research at MRC Unit The Gambia



The annual Mixed Methods in International Health Research (QMM) 2016 course, hosted by MRCG, successfully completed on Friday 26th February 2016. The international short specialised

course was offered by the Institute of Tropical Medicine, Antwerp, Belgium, for researchers, professionals and students who focus in international health.

## APRIL

### MRCG Scientific Advisory Board and the Launching of The Unit's 5 year Strategic Plan



The launch of the MRCG's 2016-2021 Quinquennial on the 1st April 2016 which coincided with the MRCG Scientific Advisory Board annual meeting. It was successfully attended by over 400 staff, collaborators and partners. The event offered the opportunity to share our vision, plan for training and highlight recent success stories.

### The Ethics and Regulation Workshop of B3Africa hosted by MRCG



The Bridging Biobanking and Biomedical Research across Europe and Africa (B3Africa) workshop, hosted by MRCG successfully completed on Wednesday 13th, April 2016 at Kairaba Beach Hotel. The broad objective of the workshop was to identify legal and ethical issues that apply in Biobanking and to define the regulatory framework to be applied within an Information Technology (IT) platform.

### Pfizer Receives EU Approval for New MDV Presentation of Prevenar 13, conducted by MRCG



On Wednesday, April 6th, 2016, Pfizer announced that the Committee for Medicinal Products for Human Use (CHMP) of the European Medicines Agency (EMA) approved a new four-dose, multi-dose vial (MDV) presentation of Prevenar 13. The vaccine has been licensed based on the results of a study conducted by MRCG in collaboration with the Ministry of Health and Social Welfare of The Gambia.

## MAY

### Our study shows that Oral azithromycin given during labour decreases bacterial carriage in the mothers and neonates



Bacterial sepsis remains a leading cause of death among neonates with *Staphylococcus aureus*, group B *streptococcus* (GBS) and *Streptococcus pneumoniae* identified as the most common causative pathogens in Africa. Early-neonatal sepsis is mainly due to intrapartum bacterial vertical transmission during delivery (in the birth canal) or during the first weeks of life as a result of the close physical contact with the mother if she carries pathogenic bacteria.

### The large contribution of twins to neonatal and post-neonatal mortality in The Gambia, a 5-year prospective study



Results from a recent study conducted at MRCG show that twins make a significant contribution to the high burden of neonatal and post-neonatal mortality in The Gambia and preventive interventions targeting this group should be prioritized.

### Hundreds turn out for MRC Unit The Gambia's Open Day in Keneba



The first of its kind in Keneba according to the feedback received from people who came from all over the surrounding villages in West Kiang to find out more about MRCG.

MRCG's Open Day in Keneba on the 19th May 2016 attracted over 1000 residents of West Kiang. All ages were represented, from students looking for information on a potential career to mothers seeking an insight into both the projects being conducted and services provided by MRCG in the region.

## JUNE

### Does insecticide resistance contribute to heterogeneities in malaria transmission in The Gambia?



Results from our recent study showed that variation in vector species and insecticide resistance in The Gambia is associated with malaria endemicity; with a notably higher prevalence of infection and insecticide resistance in the east of the country.

### MRCG Saving lives in partnership with Chain of Hope



Chain of Hope sends specialist cardiologists to conduct teaching sessions and carry out follow-up cardiac clinics in The Gambia. As there are currently no cardiac services in The Gambia, Chain of Hope partners with the MRCG, to care for many Gambian children in need of cardiac intervention. Almost 40 young Gambian children and adolescents have benefitted from cardiac surgery, funded through the Chain of Hope charity, UK.

### A tool for interrupting Malaria Transmission



To find new tools to interrupt malaria transmission, the DCE Theme of the MRCG embarked on a clinical trial called the primaquine's gametocytocidal efficacy in malaria asymptomatic carriers treated with dihydroartemisinin-piperaquine in The Gambia (PRINOGAM). The trial focuses on the use of low doses of primaquine to interrupt malaria transmission from human to mosquitoes in individuals not sick but with a malaria infection has been successfully completed.

## JULY

### Engaging our collaborators with the MRCG Festival



The long awaited MRCG festival to promote dialogue with the public about the global benefits of our medical research attracted over 400 people at our main site in Fajara on the 21st of June

2016. The event was highly commended by collaborators from The Gambian government, non-governmental organisation, community elders and students.

### Maternal and Neonatal Immunisation in The Gambia



The VIT Theme secured funding from the Global Health Trials scheme, the European Union (EU) and the Meningitis Research Foundation for 3 clinical trials to be conducted at the MRC Unit The

Gambia. During the next Quinquennial 2016-2021, the VIT will conduct a portfolio of studies to see if vaccines given to pregnant women against pneumococci, Bordetella pertussis and meningococcus A can be shown to induce protection in babies.

### Risk factors for Group B Streptococcus (GBS) Colonisation and Disease in Gambian Women and their Infants



A longitudinal prospective cohort study conducted by investigators from the Vaccines & Immunity Theme at the MRCG evaluated the prevalence of colonising and invasive disease serotypes

of GBS in Gambian women and their infants from delivery to three months of age. The results show that GBS colonisation is dominated by serotype V, and carriage and invasive disease rates are comparable to other international sites.

## AUGUST

### Our research findings support the future co-administration of IPV, measles–rubella, and yellow fever vaccines within the EPI schedule at 9 months



The main results of the inactivated poliovirus vaccine (IPV) clinical trial published in Lancet Global Health was undertaken as part of a series of trials funded by Bill & Melinda Gates Foundation

and has generated key data required as part of the polio eradication endgame. The trial provides the only data from sub-Saharan Africa which looks at the safety and immunogenicity of ID fractional doses of IPV or of jet injector devices.

### Encouraging Wellness and Healthy Living with Staff PHME



The Periodic Health Maintenance and Examination organised by the Clinical Services Department, as an effective way to identify hidden risks of diseases and to help staff understand their

individual health risks, was a tremendous success. Lead by Dr Chibuike Okpara and supported by well-trained health facilitators, the staff PHME was conducted over a period of 4 and 5 days in Keneba and Fajara as part of The Unit's corporate social responsibility.

### World Hepatitis Day Press Briefing



In observance of World Hepatitis Day, The Gambia through the Ministry of Health and Social Welfare, MRCG and WHO International Agency for Research on Cancer, on the 28th of July 2016 held a press briefing at the Central

Medical Stores in Kotu. Under the theme "Know hepatitis – Act now" the aim of the commemoration was to increase global awareness, as well as strengthening prevention, diagnosis and treatment services.

## SEPTEMBER

### MRCG's Research on Tuberculosis Prevalence in The Gambia Appears on the Bulletin of the WHO



Results from the Gambian Survey of Tuberculosis Prevalence (GAMSTEP), a major collaborative study with the Ministry of Health and Social Welfare through the National Leprosy and

Tuberculosis Programme (NTLP) has been published in the Bulletin of the WHO. The study, shows that the burden of TB remains high in The Gambia and at 128 per 100,000 was much lower than earlier estimates of 350 and 490 per 100 000 population in 1990 and 2013 respectively.

### The 61st Annual Government/MRCG Joint Committee Meeting



The 61st annual Government/MRCG joint committee meeting to discuss research activities in The Gambia took place on Wednesday 28th of September 2016, at MRCG, in Fajara. The meeting is a

platform for MRCG and the Gambian Government to provide updates and discuss currently ongoing and future activities.

### Introducing the BRAin Imaging in Global Health (BRIGHT) Study in Gambian Infants



Numerous risk factors can impact on a child's brain development in the early years of life and most critically in the first 24 months. In 2012 the Nutrition Theme was awarded a Phase I Grand

Challenges Exploration (GCE) Grant from the Bill and Melinda Gates Foundation to investigate the feasibility of using an optical brain imaging technique, functional near-infrared spectroscopy (fNIRS).

## OCTOBER

### WHO Prequalification of pneumococcal vaccine based on MRCG study



The WHO has pre-qualified Pfizer's new four-dose, multi-dose vial (MDV) presentation of Prevenar 13®\*, based on the results of a study conducted by MRCG in collaboration with

the Ministry of Health and Social Welfare of The Gambia. The WHO pre-qualification allows for the global use of Prevenar 13® MDV by United Nations agencies and countries worldwide that require WHO pre-qualification.

### West Africa Global Health Alliance (WAGHA) Memorandum of Understanding Signed



On Wednesday 5th October 2016, at the Institut de Recherche en Santé, de Surveillance Épidémiologique et de Formation (IRESSEF), Professor Umberto D'Alessandro (MRCG),

Professor Soulaymane Mboup (IRESSEF) and Professor Ibrahima Thioub (Université Cheikh Anta Diop, UCAD) signed the WAGHA memorandum of understanding.

### Role of human milk oligosaccharides (HMOs) in Group B Streptococcus (GBS) colonisation

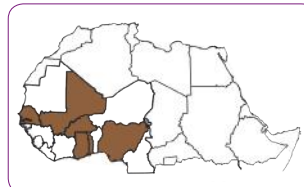


The major risk factor for GBS disease is maternal and later infant colonisation. Our research shows that the Lewis phenotype and its related HMOs in breast milk are strongly associated with

inhibition of GBS colonisation in the mother and a reduced risk of transmission to the infant. In addition, the study also indicates a possible role for specific HMOs in the prevention and clearance of maternal GBS colonisation during pregnancy.

## NOVEMBER

### Prevalence of drug-resistant tuberculosis in West Africa higher than previously thought



Multidrug-resistant TB could become a serious public health threat in West Africa unless effective surveillance and control measures are implemented, according to a study published in the open access

journal BMC Medicine. Researchers from the West-African Network of Excellence for TB, AIDS and Malaria (WANETAM) found the prevalence of multidrug-resistant tuberculosis (MDR-TB) to be unexpectedly high in eight West-African countries.

### Inspiring the next generation of Medical Doctors in The Gambia



As part of MRCG community outreach activities which encourages young people from all backgrounds to visit The Unit to have a first-hand knowledge of our research, foster home-grown

talents and inspire the next generation of Gambian doctors. On Wednesday 26th October 2016, MRCG received 44 final year medical students from the University of The Gambia (UTG).

### MRCG Team at The European & Developing Countries Clinical Trials Partnership (EDCTP) Forum



Eight staff members represented the MRCG at the Eighth EDCTP forum from the 6th - 9th November 2016, in Lusaka, Zambia. The biennial forum provides an international platform for the

presentation and discussion of frontier research to address the burden of neglected, infectious, poverty-related diseases, as well as capacity development and networking activities to support these goals.

## DECEMBER

### The West Africa Regional School on Immunology (ImmunoGambia) of Infectious Diseases Course at MRCG



The first regional School of Immunology of Infectious Diseases sponsored by the Volkswagen Foundation (VWF) and International Union of Immunological Societies (IUIS) took place at MRCG from 21st to 25th November 2016. ImmunoGambia 2016 is the first to be held in West Africa.

### MRCG hosts the West African Research and Innovation Management Association (WARIMA) Conference and Workshops



Under the theme Setting Research and Innovation Management Agenda for the Sustainable Development Goals (SDGs), the WARIMA international conference held its 10th annual conference

and workshop at MRCG. The conference was preceded by a two-day life-changing workshop to discuss challenges and opportunities of mutual interests among delegates from member countries.

### Anemia Protects African Children Against Malaria: Iron Supplementation Reverses This Protection



Iron deficiency is the most common nutritional deficiency in the world and causes long-term adverse consequences in children. Researchers at MRCG have proven that iron deficiency

anemia actually protects children against the blood-stage of Plasmodium falciparum malaria in Africa, and treating anemia with iron supplementation removes this protective effect. Their results were published in EBioMedicine.

# RESEARCH THEMES



The MRCG is structured into three research themes, a structure that provides important opportunities for inter-theme synergy.

PhD student



Dr Abdoulie Bojang received MRCG PhD funding

Post Doc



Dr Effua Usuf's on her first year of the West African Fellowship (WAF)

PhD student



Dr Uduak Okomo  
Paediatrician/Research Clinician

PhD student



Dr Uzoh Egere completed his PhD at the University of Munich

# DISEASE CONTROL & ELIMINATION

## OVERVIEW

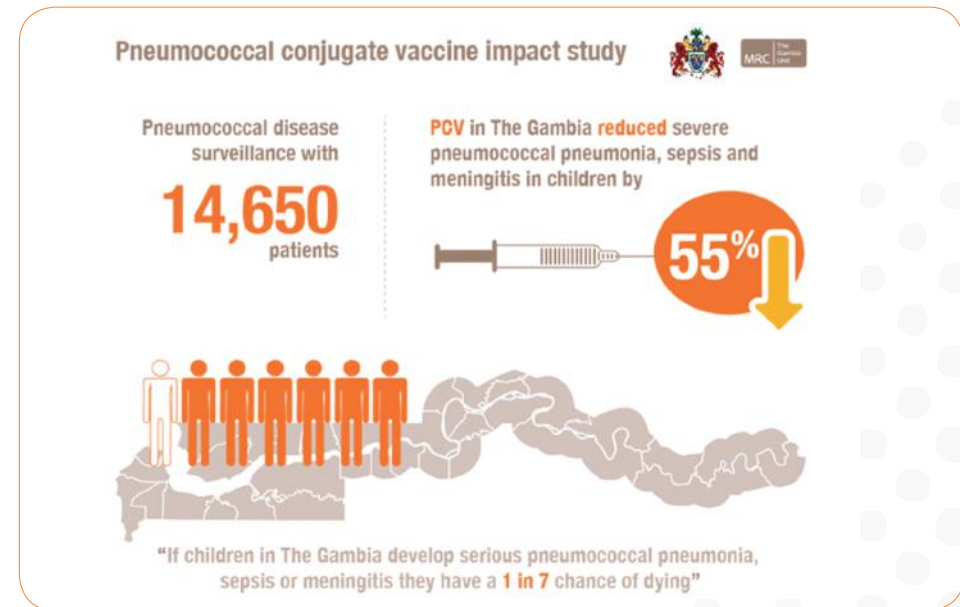
The DCE scientific strategy focuses on investigating interactions between hosts, pathogens and vectors; and evaluating interventions aimed at interrupting transmission and/or reducing the disease burden. Aiming at control and elimination of disease, beyond targeting disease itself, we also target asymptomatic or subclinical infections as these are key components for maintaining transmission in the community.

The DCE theme has a heterogeneous but coherent research portfolio that includes diseases of public health importance in West Africa at different stages of control or elimination. The research activities span from large epidemiological studies assessing burden of disease to clinical trials testing or assessing the effectiveness of new public health interventions.

Malaria remains a major research area since The Gambia offers an excellent opportunity for carrying out research related to both malaria control and malaria elimination as malaria transmission in the western part of the country has reached such a low level that it may be interrupted by additional interventions. Bacterial and viral infections have increased visibility with a wide range of epidemiological studies evaluating the effectiveness of interventions and discovery trial searching new ways to prevent transmission and disease.

Following our Unit's vision, we are steadily increasing our research activities on maternal and neonatal health. We are about to complete a multi-centre cluster randomized trial (COSMIC) evaluating the effect of community-based screening and treatment of malaria during pregnancy on maternal and infant health. Following the publication of the results of the PregnAnZI trial which assessed the impact of one oral dose of azithromycin administered during labour on maternal and neonatal bacterial colonization, we have recently secured funding for a larger multi-country trial to assess the effect of the intervention on neonatal sepsis and mortality.

## HIGHLIGHTS



Pneumococcal conjugate vaccine impact study

**Pneumococcus:** There is little information on the impact of pneumococcal conjugate vaccines (PCV) in low-income countries. The Pneumococcal Surveillance Project (PSP) at MRCG measured the impact of PCV on pneumococcal meningitis, septicaemia, and pneumonia in The Gambia where the 7-valent vaccine (PCV7) was introduced in August 2009, followed by PCV13 in May 2011. Between 2008 and 2014, we conducted population-based surveillance for invasive pneumococcal diseases (IPD) (meningitis, septicaemia, and pneumonia) among infants and children ( $\geq 2$  months old). We compared the

incidence of disease in the pre-vaccine and PCV13 periods, adjusting for changes in case ascertainment over time. The Gambian PCV program reduced the incidence of IPD in children aged 2–59 months by approximately 55% (Mackenzie et al Lancet ID 2016). Further surveillance to determine the maximum impact in the 2–4 years and older age groups is needed. Low and middle-income countries that introduced PCV13 can expect substantial reductions in IPD.



MRCG staff on the World TB Day

**TB:** The Gambian Survey of Tuberculosis Prevalence (GAMSTEP) (Adetifa et al Bull WHO 2016), was a major collaborative study with the Ministry of Health and Social Welfare through the National Leprosy and Tuberculosis Programme (NTLP). Given the need for improved, evidence-based interventions in TB control in The Gambia the study aimed at estimating the population prevalence of active pulmonary TB disease in The Gambia. Results showed that the burden of TB remains high [128 per 100,000] although the prevalence is lower than estimated by previous models. The study highlighted the significant burden of TB in men compared to women and the significant undetected TB cases as only 5% of TB cases identified during the survey were already on treatment. Less than half of all cases would have been identified if smear microscopy were the only diagnostic modality used. The key messages from this important survey are successful control efforts will require interventions targeting men, increased access to radiography and more accurate, rapid diagnostic tests. Based on the results of this survey, WHO in 2015 updated the TB prevalence estimates for The Gambia and the 1990 prevalence was revised downwards. These new estimates are expected to re-energize TB control efforts in the country.



Field collections

**Malaria:** Entomology - Variation in vector species and insecticide resistance in The Gambia is associated with malaria endemicity; with a notably higher prevalence of infection and insecticide resistance in the east of the country (Opondo et al Malar J 2016). Malaria hotspots, areas with consistently higher than average transmission, may become increasingly common as malaria declines. This phenomenon, currently observed in The Gambia, may be caused by several factors, including some related to the local vectors, whose contribution is poorly understood. The hypothesis of the study was that variation in the intensity of malaria transmission may be linked with variation in insecticide resistance, mediated by differences in species composition and resistance-related mutations was examined. Using WHO susceptibility bioassays, insecticide resistance status was determined in vector populations sampled from six pairs of villages across the country, each pair contained a low and high prevalence village based on malaria prevalence determined by a nationwide cross-sectional survey. Vector control activities carried out by (GNMCP) have probably played a major role in reducing transmission through the introduction of long-lasting insecticide-treated bed nets (LLINs) and indoor residual spraying (IRS) with DDT since 1998. However, the results of the study indicate that these gains may be reversed by the insecticide resistance that has been detected in the country.



Lump after neonatal BCG vaccination

**Neonatal vaccines:** WHO/UNICEF reports in 2014 showed high coverage rate of HBV-3rd dose, BCG and OPV-3rd dose was 77%, 84% and 77% respectively in WHO Africa region (7, 8). However, this coverage data does not consider when vaccination has occurred. Scarce information is available in the African continent on when the birth dose vaccines are administered. The Gambia recommends in Expanded Program of Immunization (EPI) to administer HBV vaccine, BCG and OPV as soon as after birth. It is one of the eight countries in sub-Saharan Africa that have introduced the birth dose of hepatitis B vaccine as this dose is key to block vertical transmission. Our results (Miyahara et al Vaccine 2016) show very low coverage of birth dose vaccines at birth and at the age of 7 days in spite of high coverage rate by 6 months of age (1.1% and 5.4% and 93.1% respectively). Contrary to the general beliefs, vaccine coverage during the early neonatal period was not higher among children born in health facilities [34/890 (3.8%) at day 7]. Our findings underline the importance of generating awareness of the importance of timely administration of birth vaccines and in tandem, we proposed the integration of birth dose vaccines into the delivery wards in health facilities as a strategy to improve early coverage of these vaccines.

# NUTRITION

## OVERVIEW

In last year's overview, we focused on the Nutrition Theme's continuing efforts to more precisely define the aetiologies of childhood stunting in our effort to map out a better route to next generation interventions. This year we focus on similar efforts in relation to iron deficiency and anaemia.

Anaemia affects over 250 million children and 500 million women worldwide, and contributes an estimated 8.8% of the total years lived with disability worldwide. In 2012, the goal of a 50% reduction in the prevalence of anaemia was adopted by the World Health Assembly as one of the key 2025 Global Nutrition Targets. This would require a reduction of 6% each year. Anaemia is highly prevalent in The Gambia with a strong urban/rural and West/East gradient with highest levels of anaemia occurring in the central and upper river regions.

Much of our work in this field is underpinned by the new insights provided by the discovery, a decade ago, of hepcidin. Hepcidin is the master regulator of iron metabolism. The discovery of hepcidin, together with related genetic discoveries, has transformed our understanding of the problem. The traditional view was that humans are poorly evolved to absorb iron and this led to the prescription of large non-physiological doses of highly absorbable iron that probably caused considerable iatrogenic disease. Insights from hepcidin, and its upstream and downstream regulatory networks, have revealed that, far from being poor absorbers of iron, children living in unhygienic environments are actively blocking iron uptake to protect themselves from infection. This fresh perspective is underpinned by an advancing knowledge of genetic variants that affect iron status; with few exceptions these variants lead to iron overload not deficiency. The Nutrition Theme is applying these new basic science discoveries across a wide range of studies to redefine our understanding of the causes of anaemia in rural African mothers and children.

## HIGHLIGHTS



Morgan Goheen working in the flow cytometry lab in Keneba.

### Iron deficiency, anemia and malaria:

Debates about the interaction between iron and malaria continue to challenge policy-making bodies and hence inhibit the implementation of preventative measures against iron deficiency. MD/PhD student Morgan Goheen, working under the supervision of Dr Carla Cerami, introduced elegant FACS-based erythrocyte-stage malaria culture assays to Keneba. Application of these methods to mothers and children participating in the HIGH (Hepcidin and Iron in Global Health) studies has greatly extended our understanding of the mechanisms at play. We have demonstrated, in children, that anaemia and iron deficiency strongly inhibit

blood-stage replication of both laboratory strains and local clinical isolates of *Plasmodium falciparum* (Goheen et al, EBioMedicine 2016; epub Nov 9). Goheen and colleagues calculate that, on a population basis, this protection is several-fold more important than the protection offered by carriage of sickle-cell trait. They further demonstrated that this protection is completely abrogated by 7 weeks of iron supplementation in children, emphasising that acute administration of therapeutic doses of iron should always be accompanied by malaria prophylaxis and ensured provision of insecticide-treated bednets.



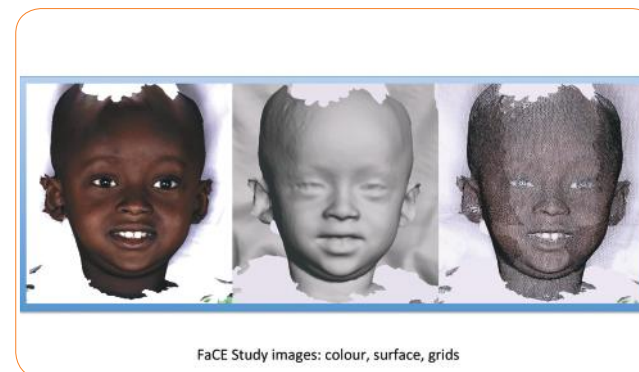
Maternal diet at conception affects her child's risk of obesity

**POMC and obesity:** Working with Peter Kühnen and his team at Charité Universitätsmedizin Berlin we have demonstrated that differences in methylation at the pro-opiomelanocortin (POMC) gene influence the risk of obesity in both children and adults (Kühnen et al, Cell Metabolism 2016;24;502-9). These methylation differences are stronger predictors of later obesity than all the known genetic predictors put together. Our results yield several important insights into the mechanisms involved. We have strong evidence that POMC is a metastable epiallele; which means that the epigenetic patterns are laid down in the first few days after conception. Analysis of POMC methylation in Gambian children showed that the degree of methylation varied according to the season in which the child was conceived and was predicted by levels of methyl donor nutrients in the mother's plasma in early pregnancy. This suggests the possibility of intervening to prevent intergenerational transmission of obesity. We are currently seeking funds to investigate how methylation at POMC affects resilience to malnutrition and especially to wet season weight losses in Gambians throughout the lifecourse.



The BRIGHT study receives funding for longer-term follow-up

**The BRIGHT Study:** The Brain Imaging in Global Health (BRIGHT) Study has received additional funding from the Bill and Melinda Gates Foundation to allow the cohort to be followed up to 24 months. This study uses non-invasive functional near-infrared spectroscopy (fNIRS – see [www.globalfnirs.org](http://www.globalfnirs.org)) to make objective and culturally-neutral assessments of cognitive development in young infants and children. The methodology has transferred well to our remote field station in Keneba (Begus et al, Adv Exp Med Biol 2016;876:273-9) and is yielding the first informative data that will allow us to assess how undernutrition affects cognitive development by comparison with a parallel longitudinal cohort in Cambridge, UK (Lloyd-Fox et al, Dev Cog Neurosci 2016; 27 Nov 2016).



FaCE Study images: colour, surface, grids

Face Study Images: Colour, surface, grids

**The FaCE Study:** The Facial Characteristics and Embryogenesis (FaCE) study commenced in 2016. We have previously shown that children conceived in different seasons (wet vs dry) have distinct variations in their epigenome especially in regions known as metastable epialleles. Changes in these regions indicate that the differential methylation patterns were laid down in the first few days after conception. We have shown that there are variations in genomic regions that affect immune function, tumour suppression and obesity. The FaCE study aims to use facial asymmetry as a signal to confirm the presence of epigenetic variations. The shape and symmetry of our faces is known to be very sensitive to developmental variations. Facial asymmetry can already be used to diagnose a number of extreme syndromes caused by epigenetic errors. The FaCE study will search for much more subtle variations. Our interest is not in facial asymmetry in its own right, but to use it as a measurable indicator of other generalised physiological variations that may have health implications.

# VACCINES & IMMUNITY

## OVERVIEW

The Vaccines & Immunity Theme (VIT) works towards a better understanding of the ontogeny of immunity in order to inform the design of vaccines and maximise their impact. Our portfolio of discovery and delivery science projects addresses key questions: a) what kind of immune responses that vaccines should elicit to induce maximal protection and b) which vaccines are safe, immunogenic and effective in the long term in resource poor settings and how are they best used within the EPI program? Clinical trials of existing and novel vaccines and longitudinal observational cohort studies including entire households and mother/infant pairs serve as a platform to investigate host responses in individuals of different ages and to dissect the interactions between host and pathogen under vaccine or disease pressures. Over the last year, the VIT team concluded a number of important large scale clinical trials, published over 50 peer reviewed papers and attracted over £ 2.2 million in grant income. We also celebrated the graduation of 11 students and members of staff at all levels.

To mention just a few highlights: led by Dr Ed Clarke, we concluded our work on the use of injectable polio vaccine in conjunction with EPI vaccines at 9 months of age with a publication in *The Lancet Global Health*. We also started our first maternal immunization study on a newly established platform, which includes antenatal ultrasound, and we are now well set up for future maternal immunisation studies. We demonstrated that a novel preparation of conjugated pneumococcal vaccine was as immunogenic and safe as the already licensed preparation and delivered the salient data for pre-qualification of this product by WHO, thereby impacting on global health recommendations.

The team led by Prof Martin Antonio published the first comprehensive analysis of multi-drug resistant strains of TB in West Africa in collaboration with the West African Network for TB, AIDS and Malaria (WANETAM) and was instrumental in identifying the causative pathogens in a recent meningitis outbreak in Ghana. The TB team led by Dr Sutherland attracted funding from the MRC to develop a novel diagnostic test for TB, based on her recently submitted patent. The childhood TB program is well on its way to transition the administration of prophylactic medication for children exposed to TB to the National TB Program. We are looking forward to closer interactions with our West African colleagues in Senegal, as we further develop and enhance our cross cutting activities across the Unit, particular with a focus on maternal and neonatal health.

## HIGHLIGHTS



The Gambia WHO Regional Reference Laboratory (WHO RRL) team in Ghana.

### MRC Unit The Gambia and WHO join forces to deal with Meningitis outbreak in Ghana

In February 2016, The MRC Unit in Gambia assisted the WHO to deal with a Meningitis outbreak in Ghana. The team was led by Prof Martin Antonio and Dr Brenda Kwambana. The official figures from Ghana's Health Ministry indicated that at least 93 people had died with 548 cases in the recent outbreak of a variant strain of pneumococcal meningitis in Ghana and MRCG was approached for help.

The Gambia WHO Regional Reference Laboratory (WHO RRL), through the Director, Prof Martin Antonio, provided diagnostic services with assistance from the MRCG response team in Ghana led by Dr Brenda Kwambana-Adams. The team mobilised resources and responded

remarkably to support the 2016 meningitis by identifying pathogens to support the surveillance network for Invasive Bacterial Vaccine-Preventable Diseases (IB-VPD) in the WHO African Region (AFRO).

Whilst on the ground, MRCG assisted in training laboratory personnel on basic bacteriology and antimicrobial testing and introduced them to latex serotyping. In Fajara the MRCG team determined the serotypes and confirmed laboratory results. Preliminary results from lab tests done by the MRCG/WHO mission team on a few isolates tested alongside with colleagues from the National Laboratories in Ghana confirmed that the outbreak was mostly caused by *Streptococcus pneumoniae*, in particular serotype 1.



Award winner Elizabeth Stanley-Batchilly

### Best paper of the year awarded to Elizabeth Stanley-Batchilly

Elizabeth Stanley-Batchilly, Theme Project Manager, Vaccines and Immunity Theme, was awarded the prestigious “Best Paper of the Year Award” by the Society for Research on Administrators (SRA) International’s for a paper titled Creating a Sustainable Research Environment through Capacity-Building Initiatives.

Elizabeth’s paper focused on how research capacity is being built in Africa considering the pivotal role that research plays in global health. Her paper emphasised the need to build functional health research systems that will promote identification of new tools as well as optimise the use of old tools to improve the health of the people.

The rationale behind this paper was based on the fact that research is not prioritised by African Governments, as the region has a very poor infrastructure and human resources to support health research. Most of the research being done in the region is not aligned with the health needs of the region and neither does it address the health needs of the populations.

Elizabeth will be receiving her award during the 2017 SRA International Annual Meeting, 14th – 18th October, at the Vancouver Convention Centre in Canada.



Dr Abdou K. Sillah, Research Clinician with Childhood TB Programme Grant

### Dr Abdou K. Sillah and National TB program

Dr Sillah plays a vital role in cementing the links with the National TB program, facilitated training programs in childhood TB in The Gambia and designing an implementation plan to transfer contact tracing efforts to the National Leprosy/TB Control Programme (NLTP).

On 30th June 2016 The Gambia Country Coordinating committee (GCC) which coordinates applications to the Global Fund for Tuberculosis (TB), Human Immunodeficiency Virus (HIV) and Malaria, announced the appointment of Dr Abdou K. Sillah to the GCC. The goal of the membership of the Committee from MRCG is to foster collaboration with The Gambia Government and hence increase The Unit’s visibility by highlighting MRCG’s research findings in this forum.

Dr Sillah joined the Childhood TB Programme Grant in 2013/2014 and he is currently involved in recruiting, screening and follow up of a significant cohort of childhood TB contacts with TB in The Gambia and placing those under five not infected on Isoniazid Chemoprophylaxis.

He is a Research Clinician working with the Childhood TB Programme Grant who also serves as an Adjunct Lecturer, Department of Medicine & Therapeutic, School of Medicine and Allied Health Sciences, University of the Gambia (UTG).



Dr Olubukola Idoko trained Paediatrician and Clinical Trial Coordinator

### Dr Olubukola Idoko, a star in the team of aspiring African Vaccinologist’s

Dr Olubukola Idoko coordinated the multi-dose vaccine trial for the new preparation of the 13-valent pneumococcal conjugate vaccine (PCV) 13 Prevenar vaccine. This randomised control trial recruited 500 infants in Fajikunda and compared the immunogenicity between the standard preparation, which is a single dose per vial with the multi-vial preparation of PCV13.

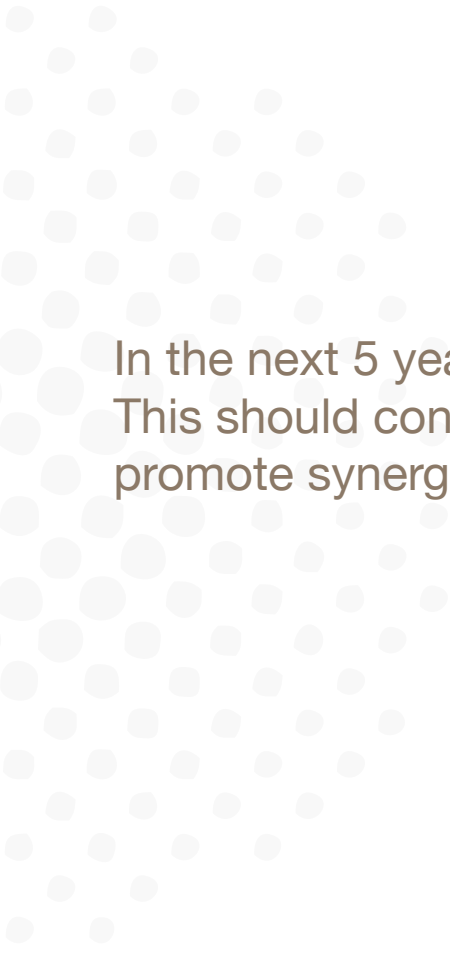
The vaccines were found to be equivalent, and the new preparation was licensed by the European Medicines Agency (EMA) in April 2016, as a consequence of the trial she led which will make the PCV vaccines more affordable for Africa.

Dr Idoko led the field team with great enthusiasm, keen to pursue further academic training in Vaccinology, Dr Idoko was awarded a 1-year Wellcome Trust Fellowship via Imperial College and a place in the PhD program at the University of Munich, Germany.

She has been involved in a number of important vaccine trials, including the studies for MenAfriVac, a very important vaccine that protects against the epidemic strains that sweep the countries of the meningitis belt. The vaccine was recently introduced into The Gambia in a mass vaccination campaign, and may become part of our national immunisation program.

# MATERNAL, NEONATAL & CHILD HEALTH





In the next 5 years, the MRCG will broaden the work on maternal, neonatal and child health. This should contribute substantially to the MRCG's engagement in West Africa and also promote synergies between themes in the field of maternal and neonatal health.

# MATERNAL & NEONATAL HEALTH

## HIGH Study



Combating iron deficiency remains a major public health challenge in Africa

Iron deficiency (ID) and iron deficiency anemia (IDA) are estimated to be the most prevalent micronutrient problems globally and are very highly prevalent in The Gambia especially in the East of the country.

The HIGH Consortium (Hepcidin and Iron in Global Health) is a Bill & Melinda Gates Foundation funded partnership between MRCG and Professor Hal Drakesmith's team at the Weatherall Institute of Molecular Medicine in Oxford. The primary aim is to test whether it is possible to develop 'hepcidin guided' interventions to combat iron deficiency and its consequent anemia. The need for new approaches to dealing with ID and IDA is driven by the fact that current approaches have poor efficacy and frequently cause harm in low-income settings. Hepcidin is the master regulator of how iron is absorbed and distributed between body tissues. It responds both to iron deficiency and to inflammation (as a register of threat of infection). Hepcidin therefore has the

potential to provide a point-of-care diagnostic that might signal 'safe and ready to receive iron'.

Two major RCTs have just been completed in The Gambia to test the utility of this screen-and-treat approach to iron supplementation. Dr Rita Wegmuller led the study in children and Mr Amat Bah led the pregnancy study for his PhD. Final analysis is still on-going but it is clear that universal (non-screened) iron administration has a greater impact on haemoglobin recovery than a screen-and-treat approach; at least in the format that we trialled. The safety analyses are on-going and have already reconfirmed that iron administration does cause a transient increase in the susceptibility of red blood cells to malaria infection.

## PregnAnZI



The study team supporting the study health facility

Neonatal deaths account for almost 40% of under-five mortality and bacterial sepsis is a leading cause of these deaths. We conducted a phase-III, placebo-controlled, randomised trial to evaluate the impact of one oral dose (2g) of azithromycin given to 829 women during labour on bacterial colonisation in the mother and the newborn. The novel underlying hypothesis was that the mother is the main source for bacterial transmission to newborns and, therefore, decreasing bacterial colonisation in the former should impact on the prevalence of colonisation in the latter and eventually on severe disease and mortality.

Trial results showed that neonates were protected from bacterial nasopharyngeal carriage of the three study bacteria (i.e. *Staphylococcus aureus*, GBS and *Streptococcus pneumoniae*) for at least 4 weeks when the last samples were collected (Roca et al Clinical Microbiology Infection 2016).

Bacterial colonisation in mothers decreased also in all study samples (nasopharyngeal swabs, breast milk and vaginal swabs). Although clinical endpoints were defined ad hoc, results are unlikely to be biased because data was collected in a blinded fashion. Clinical results showed that the intervention significantly reduced the prevalence of infections in women and newborns (Oluwalana et al In press) during at least 8 weeks. After being recently successful in obtaining further funding, we will embrace next year into a multi-country (including The Gambia and Burkina Faso) larger trial (12,500 women and their newborns to be recruited) assessing the effect of the intervention on neonatal mortality and maternal and neonatal sepsis.

## ENID: The Early Nutrition and Immune Development Trial



ENID trial participant taking her daily LNS.

In sub-Saharan Africa, many women of reproductive age, especially those living in rural poor settlements, are recognised to have low dietary intakes of essential nutrients, contributing to deficiencies. These nutritional deficiencies are exacerbated during pregnancy, causing risk to both the mother and her unborn infant. We conducted a randomized, partially-blind trial of nutritional supplementation to pregnant women and their infants in the rural West Kiang region of The Gambia. Pregnant women were randomised to 4 intervention groups (iron-folate (FeFol=standard care), multiple micronutrients (MMN), protein-energy (PE), PE + MMN) from early in pregnancy until delivery. From 24 to 52 weeks of age, infants from all groups were re-randomised to receive a daily supplement, with or without additional micronutrients.

Analysis of the main outcomes (thymic size and function, antibody response to vaccination, infant and childhood growth) is ongoing, and here we highlight one key outcome to date.

In a sub-group of ~300 mother-infant pairs we looked at how the placenta regulates iron transport from mother to infant (Jobarteh et al, 2016). Women who had lower iron status in late pregnancy had higher expression of the placental iron uptake protein TfR1. As a result, infant iron status was no different between the groups. Together, these observations suggest that, in conditions of low maternal iron status, the placenta upregulates its gene expression of iron uptake proteins, presumably to meet fetal demands in the face of low maternal supply.

## Neonatal infections in The Gambia: aetiology and the influence of maternal colonisation



Study nurses preparing a newborn for venepuncture

Prematurity, intra-partum related events (including birth asphyxia) and neonatal infections are the three potentially preventable and treatable conditions that account for over 80% of all newborn deaths, which in turn now make up 45% of all mortality in children under the age of five. Infections are acquired by newborns during labour and delivery or after birth. However, when and why such infections occur is far from certain and yet of major importance to design suitable preventive interventions. Early identification of infections and prompt and complete treatment with antibiotics dramatically increase the chances of survival.

The aim of this case control study is to determine the predominant aetiological agents causing serious neonatal infections (sepsis, meningitis and pneumonia) in The Gambia from the perspective of in-patient care by focusing on sick newborns admitted to hospital with possible serious bacterial infections (pSBI). The study also seeks to understand infection acquisition pathways by determining the proportion of newborns with culture-confirmed infection in which the same organism was isolated from the maternal genital; and how the respiratory and gut microbiome of newborns with confirmed infection compare to the microbiomes of their respective mothers. For each sick newborn, an age-matched healthy newborn and mother from the same community are recruited. One of the highlights of this study is the use of a novel customized multi-pathogen molecular testing platform (Taqman Array card; TAC) as an adjunct to automated blood culture techniques to determine neonatal infection aetiology. The TAC includes multiple parallel singleplex real-time reverse transcriptase PCR assays that enable detection of specific bacteria and viruses possibly causing neonatal infections in this setting.

Determining the aetiology of serious neonatal infections and identifying acquisition pathways, particularly the role of maternal colonisation is an important step towards reducing the burden of infection-related neonatal morbidity and mortality.

## Community-based scheduled screening and treatment of malaria in pregnancy for improved maternal and infant health: a cluster-randomized trial (COSMIC)



Village health workers in the intervention arm taking blood for a RDT test, making a microscopy slide, and completing the Case Report forms at the monthly screening for malaria home visits.

Malaria during pregnancy can have severe adverse effects on both the mother and the child. Researchers from the Disease Control and Elimination Theme have been carrying out a trial entitled: "Community-based scheduled screening and treatment of malaria in pregnancy for improved maternal and infant health: a cluster-randomized trial (COSMIC)". In villages randomised to the intervention, village health workers received training on community-based case management of malaria in pregnancy, performed scheduled monthly screening and treatment in the women's homes and encouraged women to attend the antenatal clinics for Intermittent preventive treatment

with sulfadoxine-pyrimethamine at the right time. Led by Professor Umberto D'Alessandro and Dr Susana Scott, COSMIC aims to bring health services close to where women live, specifically to women with difficult access to the formal health system. COSMIC is a multi-centre study, which has been implemented in three West African countries: The Gambia, Burkina Faso and Benin. Preliminary results are expected in early 2017.

## Protecting From Pneumococcus in Early Life (PROPEL) and the maternal immunisation platform



PROPEL trial gestational age ultrasound assessment

In 2016, major advances have been made by the VIT to implement a safe platform to conduct maternal immunisation studies at the MRCG. As outlined in the strategic plan, we believe that maternal/neonatal immunisation could play a major role in the prevention of neonatal morbidity and possibly mortality and the VIT theme wishes to investigate vaccines potentially amenable to this strategy. Dr Ed Clarke and his team are making this strategic goal a reality at the MRC Unit.

After setting up an ultrasound facility in the clinic and creating a multi-disciplinary team including an obstetrician, Dr Clarke kicked off the PROPEL trial in the spring of 2016. This trial is funded by the Global Health Trials Scheme and will investigate the hypothesis

that colonisation of babies with pneumococcus can be reduced by vaccinating either women in pregnancy or neonates on the first day of life. The comparison group of infants is vaccinated at the usual 2-months schedule and colonisation with pneumococcus is measured as a surrogate for preventing cases of invasive disease

Dr Clarke and the team have established an extensive safety network around the pregnant women, and our experience has already been widely shared in international meetings. This trial is one of a number to come and has placed us firmly at the forefront of investigating vaccines in pregnancy.

## Maternal and Neonatal Immunisation in The Gambia



3rd International Neonatal & Maternal Immunisation Symposium (INMIS)

A critical window of susceptibility, however, remains in the first 3 months of life when the newborns have only received a very limited number of vaccines. Following the vaccines against polio, hepatitis and tuberculosis (TB) given at birth, the Expanded Programme on Immunisation (EPI) schedule only sets in at 2 months of life, and several doses of the same vaccine are needed to achieve full protection.

Immunising mothers during pregnancy against vaccine-preventable infectious diseases, such as tetanus in Africa and pertussis and flu in other settings, is an attractive strategy to reduce the infant mortality rate and has already been implemented successfully. The vaccines given in pregnancy induce an antibodies in the mother which then get transmitted to the baby through the placenta in the last trimester of pregnancy and safeguards the infant through passive protection. The strategy is already widely implemented to combat tetanus in newborns and has had an amazing impact worldwide. More vaccines can potentially be used in this manner, provided they are safe for mothers and babies.

In November 2015, the Vaccines and Immunity Theme (VIT) organized the 3rd International meeting for Neonatal and Maternal and Immunisation (INMIS) in The Gambia, which attracted over 100 international visitors from 22 countries and relevant speakers addressing the different quantitative and qualitative aspects of the ongoing research and future perspectives ([www.inmis.org](http://www.inmis.org)). Participants came from all stakeholder backgrounds: academia, public health, including WHO Afro, Bill & Melinda Gates Foundation, Programme for Appropriate Technology in Health (PATH) and industry.

As vaccination against tetanus is already implemented in Africa, and vaccines against flu and pertussis have been introduced in Europe, North America and Australia, the key areas for discussion included the development and utilisation of vaccines for pathogens that affect maternal and child health, such as pertussis, influenza, group B streptococcus, respiratory syncytial virus, meningococcus and pneumococcus. Lessons learnt from these clinical trials and implementation programs can now shape the roadmap



Infant Immunisation in progress

for research and practice and ultimately influence policy for these interventions at the WHO level.

To assess the safety and immunogenicity of vaccines given at pregnancy in The Gambia, the VIT Theme secured funding from the Global Health Trials scheme, the European Union (EU) and the Meningitis Research Foundation for 3 clinical trials to be conducted at MRC Unit The Gambia. During the next Quinquennial 2016-2021, the VIT will conduct a portfolio of studies to see if vaccines given to pregnant women against pneumococci, Bordetella pertussis and meningococcus A can be shown to induce protection in babies. We will carefully monitor safety and measure immune responses in mothers and babies to also clarify if vaccines given in pregnancy have a knock-on effect on the immunity induced in the offsprings, once they receive their own vaccinations.

# WEST AFRICAN COLLABORATION





The Unit continued its partnerships in West Africa which has been undertaken mainly through collaborative projects.

# WEST AFRICAN COLLABORATION

## OVERVIEW

In 2016, The Unit continued its partnerships in West Africa which has been undertaken mainly through collaborative projects. In Senegal, a stronger, deeper strategic partnership building on past initiatives, namely The West Africa Global Health Alliance (WAGHA), has been created with IRESSEF and UCAD.

The WAGHA builds a deeper, more engaging relationship amongst the institutions and establishes a platform aiming to integrate/synergise common resources to undertake cross-cutting research of relevance to the region and the developing world at large.



**Dembo Kanteh**  
West Africa Research Platform Coordinator

## Programme and Scientific Focus

The WAGHA will focus amongst other things in

- conducting global health research through joint grant applications and their implementation
- helping to develop capacities of local scientists in the two countries
- Engage with the public for the promotion of research in biomedical sciences
- Work with partners, government, communities to increase uptake of scientific outputs into policy and practice.



West African Collaborators

## Projects

PneumoWar is a collaboration between the MRCG and WHO/AFRO with the Unit established as Regional Reference Laboratory (RRL). In 2016, the lab continued to provide the required sub regional oversight, clinical-epidemiological technical support, and coordination and data management of the network.

The Wellcome Trust funded programme of Developing Excellence in Leadership, Training and Science in Africa (DELTAS Africa) has commenced. The Unit is a collaborating Partner in three of the programmes led by Professor Oumar Gaye in Senegal, Dr Abdoulaye Djimde in Mali and Dr Gordon Awandare in Ghana. In addition, the Unit is a collaborating Partner in the World Bank funded centres of excellence programme led by Dr Awandare at the University of Ghana. For all the programmes the Unit is a key training centre with staff and fellows participating in the programme from within and outside the Unit.



PneumoWar Participants



Professors Umberto D'Alessandro, Souleymane Mboup and Oumar Gaye signing the MOU establishing WAGHA in October 2016

## Achievements

In April 2016, during an outbreak of meningitis in Ghana, the Unit as part of the responsibilities of the Regional Reference Lab was requested by WHO to provide technical and laboratory support. As an outcome of this activity, the Unit is being considered by WHO to become a WHO referral centre. After the visit the MRCG Director said to The Science "I am extremely pleased that we have been able to assist both WHO and our Ghanaian colleagues in dealing with this devastating outbreak. It confirms MRCG's ability to help, when needed countries in the West African are confronted with similar threats. Such

activities are part of our mission to improve health and save lives through research. This includes also training and capacity building of sister institutions in the region".

2016 Dr Martin Antonio who led the TB work package of WANETAM has published the results of the Multi Drug resistance survey conducted in six countries in West Africa showing a higher than expected incidence of MDR TB in West Africa.

## 2017 Outlook

In 2017 the WAGHA alliance will further consolidate. Key staff including a senior scientist will be appointed and based in Dakar. The scientific programme once defined would enable the development and submission of joint grant applications. Greater platform and resource integration will ensue for better utilisation.

The latest publication by Dr Martin Antonio and other partners from West Africa shows the tremendous benefit created when partners work in synergy utilising the strengths of each partner. The anticipated WANETAM II will form a backbone for partner engagement in West Africa.



Ebenezer Nyarko, Scientific Officer performing Bacteriology and antimicrobial testing in the field Labs in Ghana

# RESEARCH TRAINING & CAREER DEVELOPMENT



PhD student



Dr Momodou Wuri Jallow is using a genes-in-action design to study genetic causes of iron deficiency

PhD student



Dr Fatou Joof is studying the molecular mechanisms by which human genetic variations in Red Blood Cell (RBC) surface proteins impact malaria pathogenesis

PhD student



Dr Abdullahi Ahmad received Wellcome Trust PhD fellowship through the MARCAD-DELTA project

Post Doc



Dr Kevin Opondo received Wellcome Trust Post-doctoral fellowship through the MARCAD-DELTA project

# RESEARCH TRAINING & CAREER DEVELOPMENT

## OVERVIEW

The MRCG research training strategy is aligned to the research requirements of The Unit with the aim of building the needed human capital for advancement of scientific health research in The Gambia and the sub-region. MRCG is strengthening its training strategy, culminating with the appointment of an experienced training professional and research scientist, Dr Assan Jaye.

The training strategic approach is re-defined to enable the achievement of competent skills, knowledge and leadership to underpin internationally competitive science. The provision of training is being carried out through 4 strategic approaches (Figure 1) Namely: Retention Program; Technical and Research Support Competency Program; Research Leadership and Development Program; and Creating partnerships between institutions with different strengths but a shared vision.

One key emphasis is to support the continuing professional development of our senior scientists to undertake ground-breaking research; but also a strong focus to identify and develop talents in order to grow tomorrow's scientists.



Research Training and Career Development Team

## HIGHLIGHTS



Figure 1. Strategic approach of MRCG research capacity building

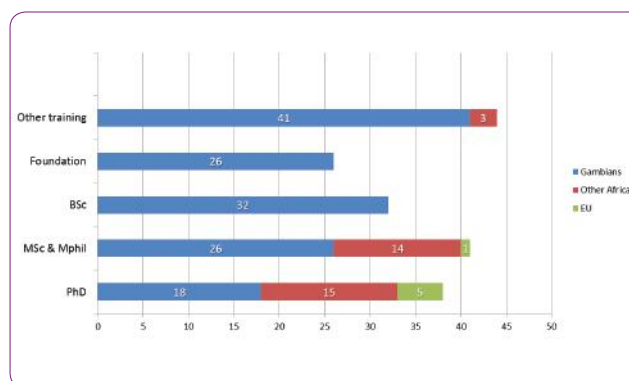


Figure 2. Total number of Trainees in 2015-2016

The number of undergraduate, post graduate and other professional trainings is steadily increasing thanks to MRCG training funds and collaborative international funding programs such as Wellcome Trust, EDCTP and Medical Research Foundation (MRF) of the MRC, UK.

The examples of training programs in 2016 highlighted are part of the current total of 181 individuals (Figure 2) of different nationalities who are benefitting from MRCG training support: 26 Foundation Science courses for BSc; 32 BSc; 41 MSc/MPhil; 38 PhD and 44 other professional trainings (including research fieldwork methodology; short term scientific specialised courses; logistics and purchasing, facility management, Good Clinical Laboratory Practice and Quality Management, Information Communication Technology and Database etc.).

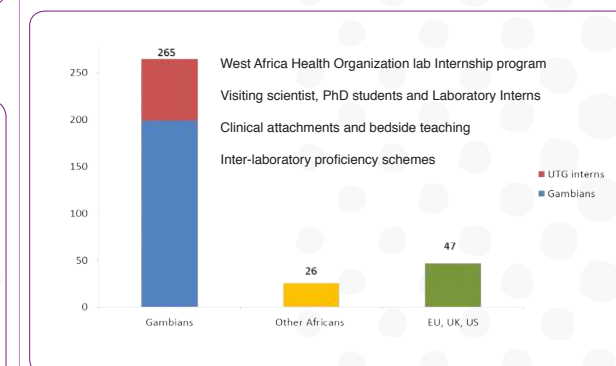


Figure 3. Internship for Career Choice and/or Professional Enrichment

The Research Training and Career Development Department has become a regional health research training hub, which continues to forge strong local, regional and international links for the production of the highest quality science. Besides formal training, 265 Gambians, 26 other African nationalities and 57 EU, UK and USA citizens had or are currently on laboratory or clinical internship placements for professional enrichment (Figure 3).

## MRCG increasing capacity of Gambians for health research and research support

In 2016, 3 Gambians gained the MRCG-MRF funding support for rising A\*star to undergo MSc training:



Jarra Manneh  
Genomic Science,  
University of  
Southampton, UK  
(2016-17)



Abdoulie Kante  
Bioinformatics and  
Systems Biology,  
Queen Mary University  
of London (2016-17)



Anna Kah  
Biomedical Engineering  
and Maintenance  
management,  
University of Toronto,  
Canada (2016-18)

MRCG-Wellcome Trust  
Sanger Institute MPhil  
Genomic Science  
Collaborative Program  
-2016



Ebrima Bojang  
MPhil Genomic Science,  
University of Cambridge  
(2016-17)

July 2016: Rahmatulai  
Maane successfully  
completed an MRF-MRCG  
funded MSc in Medical  
Ultrasound and Imaging  
from Imperial College,  
London.



Rahmatulai Maane  
MSc Medical ultrasound  
and Imaging, Imperial  
College, London (2016)

## MRCG continues to engage and commit to research leadership development

### 1. MRCG-West African DELTAS collaborative training has taken off

MRCG is a collaborative centre for the West Africa Wellcome Trust-supported DELTAS (Developing Excellence in Leadership, Training and Science) Program. These include MARCAD (Malaria Research Capacity Development in West and Central Africa) led by Cheikh Anta Diop University, Senegal; WACCBIP (West African Centre for Cell Biology of Infectious Pathogens) led by the University of Ghana; and DELGEME (Developing Excellence in Leadership and Genetic Training for Malaria Elimination in Sub-Saharan Africa) led by University of Science, Techniques and Technologies of Bamako, Mali.

Some MRCG staff have begun to succeed in tapping into this network of leadership training opportunities for PhD and Post-doctoral training:



Majidah Hamid-Adiamoh  
(Nigerian) PhD WACCBIP  
Host Genetic Factors in  
Gametocyte Prevalence and  
Transmission-blocking  
Immunity to Malaria  
University of Ghana



Hadijatou Mbye  
(Gambian) PhD WACCBIP  
Molecular analyses of  
cell-infected  
malaria parasite  
University of Ghana



Abdulahi Ahmad  
(Nigerian) PhD MARCAD  
Plasmodium falciparum  
Infections and Gametocyte  
Carriage in Maintaining Malaria  
Transmission  
University of Antwerp, Belgium



Dr Kevin Opondo  
(Kenyan) Post-doctoral  
Fellow, MARCAD  
Impact of Insecticide Resistance  
on Malaria Vector Longevity  
and Transmission Potential in  
the Wild  
MRC Unit The Gambia

## 2. MRCG Doctoral Training Program

Three MRCG staff were successfully awarded studentships to commence PhD program in the 2016:



Fatou Joof  
(Nutrition Theme)  
Red Blood Cell Determinants  
of Malaria Susceptibility  
Open University, UK



Julia Mwesigwa  
(DCE Theme)  
Malaria transmission dynamics  
in The Gambia: Defining the  
spatial and temporal spread  
of malaria at micro-level  
University of Antwerp, Belgium



Abdoulie Bojang  
(DCE Theme)  
Prevalence, vertical  
transmission and  
mechanisms of *S. aureus*  
resistance induced by one  
oral dose of 2g of  
azithromycin given to women  
in labour  
Open University, UK

## 3. Building the analytical skills of MRCG PhD students

MRCG Statistics department in collaboration with the Research Training and Career Development Department held one of the many to come series of statistics and data analytical courses for PhD students, which also introduced the statistical packages MINITAB and GENSTAT.



MRCG PhD students and Statistics Tutors Dr David Jeffries (standing; 3rd from Rt. and Dr Nurudeen Ebrahim; 2nd from Rt.)

# OUR RESEARCH PUBLICATIONS



PhD student



Dr James Cross is studying how neonates protect themselves from infection by sequestering iron

Post Doc



Dr Caitlin Naylor is studying how leptin regulates immune function in children

PhD student



Dr Julia Mwesigwa received 2016 MRCG PhD funding

Post Doc



Dr Antoine Claessens on his second year of the West African Fellowship (WAF)

# PUBLICATIONS

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7. Using fNIRS to Study Working Memory of Infants in Rural Africa. Begus K, Lloyd-Fox S, Halliday D, Papademetriou M, Darboe MK, Prentice AM4, Moore SE, Elwell CE. *Advances in Experimental Medicine and Biology*. Epub 1 Jan 2016
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10. Population structure, epidemiology and antibiotic resistance patterns of *Streptococcus pneumoniae* serotype 5: prior to PCV-13 vaccine introduction in Eastern Gambia. Ashu EE, Jarju S, Dione M, Mackenzie G, Ikumapayi UN, Manjang A, Azuine R, Antonio M. *BMC Infectious Disease*. Epub 28 Jan 2016
11. Use of lateral flow assays to determine IP-10 and CCL4 levels in pleural effusions and whole blood for TB diagnosis. Sutherland JS, Mendy J, Gindeh A, Walz G, Togun T, Owolabi O, Donkor S, Ota MO, Kon Fat ET, Ottenhoff TH, Geluk A, Corstjens PL. *Tuberculosis (Edinb)*. Epub 1 Jan 2016
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