2014
2015

BIENNIAL RESEARCH REVIEW

FACULTY OF HEALTH SCIENCES

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

FACULTY OF HEALTH SCIENCES

HSRO Health Sciences Research Office

Credits

Appreciation is expressed to the following people for their valuable assistance:

Faculty of Health Sciences

- Head of Schools
- Head of Departments
- Research Entity Directors and Researchers within the Faculty
- Boipelo Kgosinkwe
- Nomfundo Sibiya

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Cover photographs by Eyescape.

RESEARCH REVIEW

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MESSAGE FROM THE DEAN

Professor **Martin Veller**

The Faculty also offers abundant opportunity for Masters, PhD and Postdoctoral Fellows to pursue exciting research in a vibrant research environment with world class facilities.

The Faculty of Health Sciences prides itself in its research efforts and continued growth in publication outputs from 389 in the previous review to 446 units in the current period. These publications emanate from the seven Schools within which the 21 Research Entities in the Faculty are housed, with the School of Clinical Medicine continuing to be the biggest contributor to this outcome. The diversity of research in the Faculty is reflected in the pages that follow in this report.

The Faculty also offers abundant opportunity for Masters, PhD and Postdoctoral Fellows to pursue exciting research in a vibrant research environment with world class facilities. Over the period under review the Faculty graduated 438 Masters and 89 PhD students, increasing its portfolio of young and emergent researchers substantially.

Several research awards have also been garnered over the past two years, and of particular note is the Vice-Chancellor's Research Award. This is the University's most prestigious award for research, and its purpose is to stimulate research and research-related scholarly activities by acknowledging and rewarding an exceptional member of the University who has been engaged not only in research but also in more general scholarly activities. Over the past nine years, academics from the Faculty of Health Sciences have obtained this award eight times. In 2014 Professor Lynn Morris (Chief Specialist Scientist and head of the HIV Virology laboratories within the Centre of HIV and Sexually Transmitted Infections at the National Institute for Communicable Diseases (NICD)) received this award. In 2015 Professor Frederick Raal (Director of the Carbohydrate and Lipid Metabolism Research Unit) was the winner of the Vice-Chancellor's Research Award jointly with Professor Chris Henshilwood.

In addition, the National Research Foundation (NRF) rated-researchers continue to increase, and in 2015 the Faculty had 62 rated researchers with seven of these in the highly prestigious A category.

The Faculty Research Office continues to drive international collaborations. One of these initiatives is the Carnegie-WITS Alumni Diaspora Programme which is funded by the Carnegie Corporation of New York. The Programme facilitates valuable research collaborations with alumni who now work at academic institutions abroad. The Programme has enabled instrumental collaborations with the Universities of Vanderbilt, Queensland, and Johns Hopkins and has created invaluable opportunities for Faculty researchers in areas such as training and collaborative research.

The Faculty commends the Health Sciences Research Office under the leadership of Professor Beverley Kramer for overseeing the coordination of research activity and postgraduate support and thereby creating a dynamic and rich research environment.

Other awards:

- **Professor Helen Rees** was the winner of the 2014/2015 National Science and Technology Forum (NSTF) Award in the category: For a contribution over a lifetime by an Individual.
- **Professor Maureen Coetzee** was the winner of the Distinguished Women Scientist in the Life Sciences category in the 2015 South African Women in Science Awards.
- **Professor Lynn Morris w**as awarded the MRC Gold Scientific Achievement Medal.
- **Professor Beverley Kramer** was awarded the DST/SARIMA Award for distinguished contributions to research management.
- **Professor Lesley Scott** and the **Smartspot team** won the Social Innovation Award at the Innovation Prize for Africa awards ceremony.
- **Professor Sharon Fonn** was awarded an honorary doctorate from the Sahlgrenska Academy, University of Gothenburg.

MESSAGE FROM THE ASSISTANT DEAN

Research & Postgraduate Support

Professor **Beverley Kramer**

In the Wits Faculty of Health Sciences we have a myriad of excellent researchers and postgraduate supervisors who are focussed on developing the next generation of health scientists in both the clinical and basic sciences arena.

Research and capacity development are the pulsating heart of an academic institution. Without research, there is no new knowledge; without capacity development, there are no researchers and teachers to continue the training and generation of this knowledge…a reciprocal, reverberating circuit which is of vital importance to the future of health care in South Africa. In the Wits Faculty of Health Sciences we have a myriad of excellent researchers and postgraduate supervisors who are focussed on developing the next generation of health scientists in both the clinical and basic sciences arena. What makes the researchers and supervisors of the Faculty extraordinary, is that despite the heavy service delivery, the quadruple burden of disease, the heavy teaching loads and the battle of getting through the Johannesburg traffic to work each day, they have been able to double their research output over the last ten years. This research is not only of relevance locally but is cited widely in international scientific publications and appears in some of the most highly ranked journals in the world! We contribute to new discoveries, new drug delivery platforms, new policy development. Our postgraduates think critically, solve major problems and compete at the top. Through our collaborations with Alumni and other researchers both locally and abroad we are generating critical knowledge to combat HIV and TB, reduce the spread of malaria, control diabetes, improve public health and uncover the mysteries of forensic science.

I would like to pay tribute to the researchers and supervisors of the Faculty – long may they produce research and the next generation of researchers!

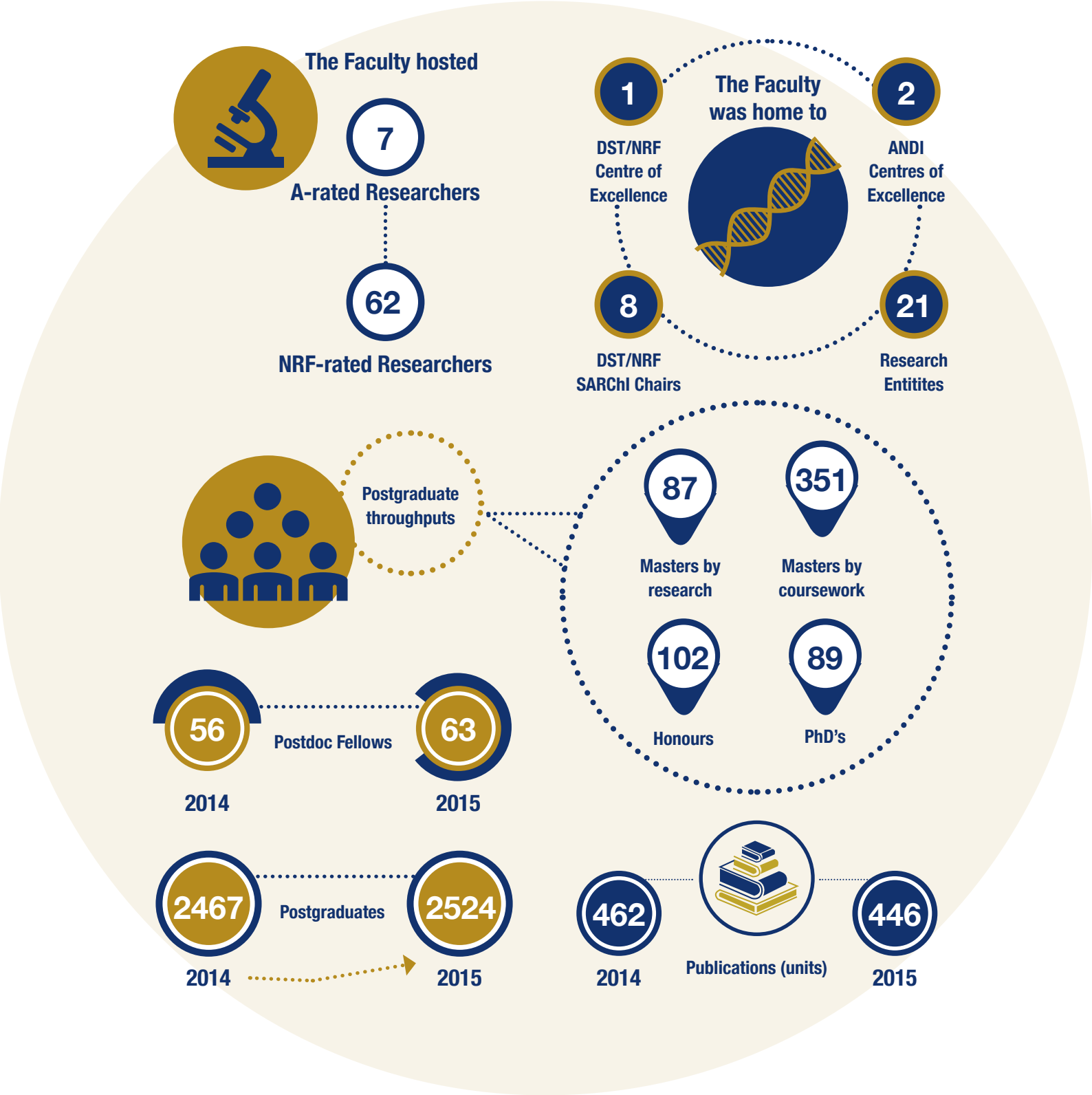
Some of the key research and capacity development achievements of the Health Sciences Research Office which have supported the Faculty's increased research outputs and postgraduate throughputs over the last few years have been:

- The introduction of the Carnegie Clinician Scientists Programme which has resulted in the graduation of increasing numbers of clinicians with PhDs.
- In providing a smorgasbord of courses and workshops which have assisted postgraduate students and staff not only with research methodology and biostatistics, but also with grant writing and scientific writing. Courses on supervision and marking of dissertations and theses continue to support staff.
- The development and support for "Writing Retreats", which has initiated a culture of writing up completed research and research reports, dissertations and thesis. This has directly supported increased research outputs and postgraduate throughputs over the years.
- In providing a voice for Postdoctoral Fellows through the Postdoctoral Forum and biennial Postdoctoral Symposium. We have had an unprecedented growth in the number of postdoctoral fellows over the last number of years.
- The Carnegie-Wits Alumni Diaspora Programme which initiated new research collaborations between Wits Health Sciences hosts and prestigious alumni at major international institutions in the Diaspora.
- An Emerging Researchers Forum for the development and support of our next generation of scientists.

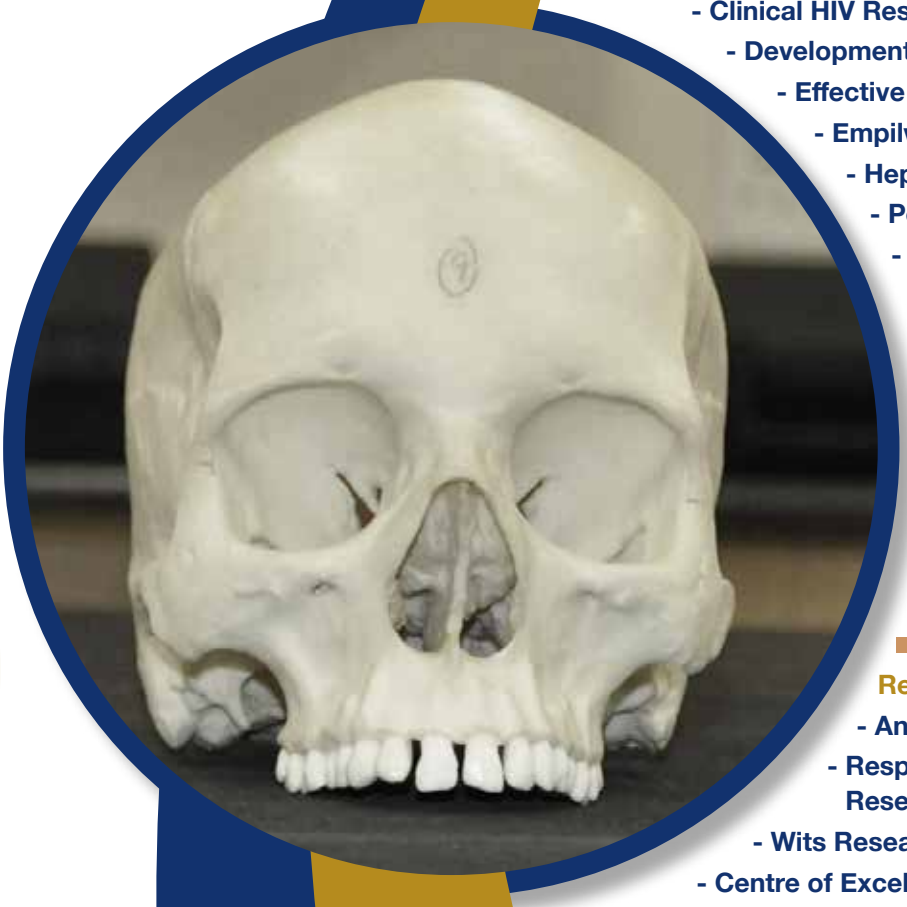
The pages of this report will illustrate our achievements and the richness and diversity of our research over the years 2014-2015. Thank you to our donors, funders and partners for enabling our research.

FACULTY IN NUMBERS

2014 - 2015



RESEARCH FOCUS



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SCHOOL OF ANATOMICAL SCIENCES

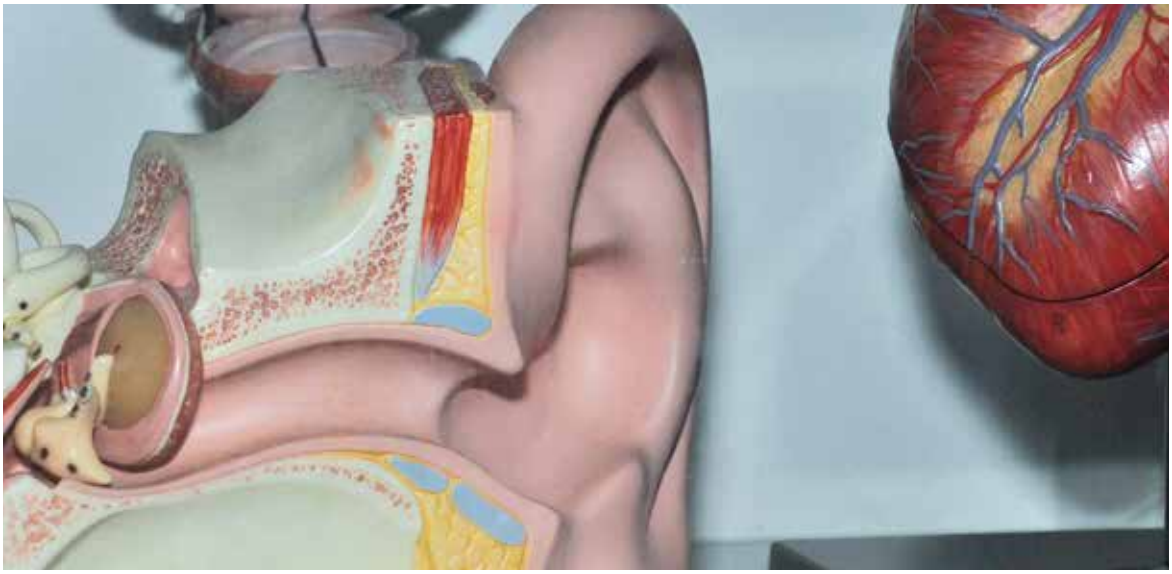
Head of School: Professor Maryna Steyn

Research in the School of Anatomical Sciences is primarily conducted in the fields of the Neurosciences (including analysis of sleep), Biological Anthropology and Histology or Cell Biology. The School of Anatomical Sciences has some of the best anatomical collections in the world including the Raymond A Dart Collection of human skeletons, comparative mammalian and dental collections. These regularly attract national and international scholars from all over the world. In 2015 the Neurosciences group acquired a Microbrightfield (MBF) Bioscience Imaging System, which is a combined MBF Bioscience Imaging System that includes the Neurolucida, Stereoinvestigator and Biolucida Cloud systems that are used for neuron tracing, analysis and for quantification of cells on histological slides. In addition, the School acquired a 3D Artec Spider scanner to be used in various 3D visualisation projects.

Some of the highlights of 2015 include the publication of a paper on San sleep patterns, the analysis of a ±40 000 year old brain of a woolly mammoth, excavation and skeletal analysis of a 3500 year old Mycenaean '*Griffin Warrior*' tomb in Pylos, Greece, and participation in the assessment of the newly discovered *Homo naledi* remains from the Rising Star Cave. Other highlights include a research article on the importance of teeth in maintaining the morphology of the adult mandible in humans and another article on assessing the effects of tooth loss in adult crania using geometric morphometrics. Publications from the Histology or Cell Biology group included an assessment on the effects of highly active antiretroviral therapy (HAART) on the expression of MUC1 and P65 in a cervical cancer cell line and the establishment of a heterotypic 3D culture system to evaluate the interaction of regulatory T lymphocytes and natural killer cells with breast cancer. As the School is dependent on the cadaver programme for teaching and research, an analysis of the cadaver programme (1921-2013) was conducted and published.

SCHOOL OF CLINICAL MEDICINE

HEAD OF SCHOOL: ADJUNCT PROFESSOR MKHULULI LUKHELE



The School of Clinical Medicine (SOCM) remains the largest School in the Faculty of Health Sciences. It has nine major Departments (Family Medicine, Paediatrics, Surgery, Internal Medicine, Radiation Sciences, Neurosciences, Obstetrics and Gynaecology, Anaesthesia and Psychiatry) and three Centres (the Steve Biko Centre for Medical Bioethics, the Wits Centre for Rural Health and the Centre for Palliative Care). 2014 saw the recognition of the '**Empilweni Services and Research Unit**' under the directorship of Adjunct Professor Ashraf Coovadia by the University Research Committee (URC). In 2015, the **Evan Stein Centre for Familial Hypercholesterolaemia** under the directorship of Professor Frederick Raal was established. A major highlight in the School in 2015 was the granting of the ***MRC/ Wits Common Epithelial Cancer Research Centre*** to Professor Paul Ruff.

The SOCM is still the highest contributor to the publication output in the Faculty.

The service workload and teaching responsibilities remain an impediment to reaching the School's full research and publication potential. Despite the workload challenges, several members of the School have been promoted to Senior Lecturer, Adjunct Professor, Research Professor and Full Professor as a result of their scholarly activities. The School is a major contributor of specialists in the country. The number of PhD's awarded from the School continues to increase with younger colleagues graduating. To promote research the School held its first Research Day in 2015 during which several researchers showcased their research findings through oral and poster presentations.

Members of the School continue to source research funds from grants and contract research. The signing of the Memorandum of Agreement with Gauteng Province Department of Health may help in consolidating protected time for research in the School.

CARBOHYDRATE & LIPID METABOLISM RESEARCH UNIT

DIRECTOR: **PROFESSOR FREDERICK RAAL**

DEPARTMENT OF INTERNAL MEDICINE

The focus of the unit's research includes the epidemiological, clinical and biochemical aspects of common diseases affecting lipid, and glucose metabolism in the different ethnic groups of Southern Africa. These include familial hypercholesterolaemia (FH) and other dyslipidaemias, insulin resistance, diabetes mellitus as well as other related metabolic disorders.

The unit is well recognised both nationally and internationally for their work on FH, and has one of the largest cohorts of homozygous FH patients in the world. It has contributed and continues to contribute to the management of homozygous FH patients in the world.

The unit reported in *Circulation* the reduction in mortality associated with advances in lipid-lowering therapy, mainly statin therapy, in the largest cohort of subjects with homozygous FH described worldwide. This paper has been widely cited. The unit continues to research novel therapies such as antisense apo B-100 and PCSK9-inhibitor therapy in this patient group.

The results of such studies with Evolocumab, an inhibitor of PCSK9 given once or twice monthly by subcutaneous injection to subjects with either heterozygous or homozygous FH, were published in the *Lancet* with Professor Raal as the first author. Professor Raal was also co-author on two papers evaluating cardiovascular outcomes with PCSK9 inhibitor therapies published in the *New England Journal of Medicine.*

CLINICAL HIV RESEARCH UNIT

DIRECTOR: **ASSOCIATE PROFESSOR IAN SANNE**

DEPARTMENT OF INTERNAL MEDICINE

The Clinical HIV Research Unit (CHRU), based in the Department of Internal Medicine, is an internationally-recognised research and technical assistance unit with a mission to deliver excellence and quality clinical, epidemiologic and health economic research services in Johannesburg. The unit hopes to further ensure that the information is invested at operational level for the prevention, treatment and management of HIV and associated diseases.

The research unit is located at the Themba Lethu Clinic, Helen Joseph Hospital, one of the largest HIV and TB clinics in South Africa. The CHRU epidemiology division operates independently under the Health Economics and Epidemiology Research Office (HE²RO) located in Parktown.

The HE²RO is a division of the Wits Health Consortium (WHC) of the University of the Witwatersrand. Its purpose is to conduct applied, policy and programme relevant research and evaluation of essential issues of public health in South Africa. HE²RO was established in 2004 as a collaboration between WHC and the Center for Global Health and Development at Boston University in the United States. It focusses on understanding the economic and epidemiological consequences of the HIV and TB epidemics and the effectiveness, benefits, and costs of interventions. It responds directly to requests for information and technical assistance from the National Department of Health, National Health Laboratory Service, provincial departments of health, PEPFAR partners, and healthcare providers, answering questions of immediate practical relevance to these stakeholders.

The CHRU's research focus is HIV treatment in adults, HIV prevention, tuberculosis (TB), cervical cancer and HIV related malignancies such as *Karposi Sarcoma*. The unit has made significant contributions to these research disciplines, with over 250 publications since its inception in 1999. CHRU in collaboration with Right to Care offers a unique third line clinic to diagnose and treat third line patients. The CHRU has completed over 66 antiretroviral

therapy (ART) studies in phase I-III research. It was the first international AIDS Clinical Trials Group (ACTG) Site in 2002, and has since been one of the highest performing ACTG international sites. CHRU implemented five new studies in 2014 and 11 in 2015.

The TB research unit established at the Sizwe Hospital remains the only inpatient referral unit for MDR TB in Gauteng. The outcome of the Strategic Timing of Antiretroviral Treatment (START) trial in which the unit participated directly resulted in a recommendation that antiretroviral (ARV) treatment may commence at any CD4 count. This has impacted on the present World Health Organisation and this should also impact on the National Department of Health's guidelines.

In April 2014, the CHRU expanded its research when it collaborated with the Department of Radiation Oncology, Faculty of Health Sciences, and registered an AIDS Malignancy Consortium (AMC) clinical trial for HIV positive patients with locally advanced cervical cancer. The unit administers chemotherapy and antiretroviral treatment for these patients. The radiation treatment consists of external beam radiotherapy and high dose Brachytherapy managed by the Department of Radiation Oncology. An appreciation for the need to further expand the research required on HIV Associated Malignancies has been realised as the unit intends to intensify this focus.

The unit's international collaboration research includes scientists from Boston, Cornell, Munich Universities as well as the University of North Carolina.

During the review of period (2014 and 2015), the CHRU and HE²RO published 93 articles. The CHRU and HE²RO researchers delivered oral presentations and posters at national and international conferences including the Conference on Retroviruses and Opportunistic Infections (CROI) and the 46th Union World Conference on Lung Health.

DEVELOPMENTAL PATHWAYS FOR HEALTH RESEARCH UNIT

DPHRU
MRC/Wits Developmental Pathways for Health Research Unit

DIRECTOR: **PROFESSOR SHANE NORRIS**

DEPARTMENT OF PAEDIATRICS AND CHILD HEALTH

The MRC/Wits Developmental Pathways for Health Research Unit (DPHRU), Department of Paediatrics, aims to address the national priorities of increasing life expectancy, decreasing maternal and child mortality and strengthening health system effectiveness. In that regard, the specific mission of DPHRU is to investigate genetic, physiological, psycho-social, and lifestyle determinants of growth and development, obesity and risk of cardio-metabolic diseases and healthy ageing. DPHRU adopts a multidisciplinary approach and associated methodologies to understand physical and mental health across the life course and the transgenerational effects and to identify possible interventions schemes to improve health outcomes. The unit forms a unique research platform with substantial infrastructure and equipment, extensive longitudinal data and well-established links with the urban and rural South African communities.

Using more than 20 years of longitudinal data from the Birth-to-Twenty (BT20) cohort study and longitudinal statistical modelling, the growth and development from birth to 20 years of age of children born in the 1990s in Soweto has been characterised. It was found that while black girls have a similar physical growth and pubertal development as their white peers, black boys have a delayed growth and development (by approximately six months) in comparison to their white counterparts. These results suggest that some biological triggers of growth and pubertal development are different between boys and girls. It was also found that children who had more adiposity (measured by body mass index) and/or were taller at five or eight years of age were more likely to have an early onset of puberty, a risk factor for cardio-metabolic diseases and an important determinant for reproductive behaviour and health. For instance, 50% of the girls in the cohort had their sexual debut by 16 years old, about 3.5 years after the mean age at menarche calculated for the cohort.

Besides the fact that these results are unique in sub-Saharan Africa, the longitudinal description of growth and pubertal maturity is also important for the investigation of their determinants and effects on physical and mental health across the life-course. The analysis of BT20 data together with data from other cohort studies in low and middle income countries contributed to the findings that show that low birth weight and greater weight gain in childhood (after two years) increases adiposity, as well as diabetes and hypertension risk in later life. Linear growth, but not weight gain, in the first two years of life is positively associated with school attainment.

These results and others provided the motivation for DPHRU to start the Soweto First Thousand Days project (S1000), a new longitudinal pregnancy and infant cohort study, which aims to do an in-depth investigation on the maternal biological and psycho-social factors that influence fetal and infant growth and development.

Most of the research recently published by DPHRU researchers has focused on the childhood and adolescent factors that lay down the premise of cardiovascular and metabolic risks in young adulthood. Based on the BT20 cohort, it has been demonstrated that the prevalence of overweight and obesity increases progressively between childhood and adolescence, particularly in females. Children are at a significantly higher risk of becoming obese by late adolescence (16 – 18 years) if they were

overweight or obese between ages four and eight years. Data from the 10-year longitudinal follow-up study showed that the prevalence of obesity rose by 14%. With regard to cardiovascular risks, 22% of the BT20 children had high blood pressure (BP) at five years of age and a third of those had sustained the elevated BP status at 18 years of age. This raises the importance of routine blood pressure assessment in paediatrics for early identification of at-risk children, which may inform timely interventions to prevent elevated blood pressure in later life.

In the ageing population, the role of behavioural factors in determining the risk of obesity and cardio-metabolic risks has been investigated longitudinally in the mothers of the BT20 study participants. Results show that while vigorous intensity activity is associated with significantly smaller gains in body weight and fat mass over time, only 45% of black South African women participated in leisure time physical activity. Another important biological aspect of ageing and health that has been the focus of recent work at DPHRU on the menopausal transition where it was demonstrated that the menopausal transition in black South African women has been associated with a decrease in lean mass and bone mineral density.

DPHRU has recently launched the African Centre for Obesity Prevention (ACTION) which aims to raise awareness on obesity and associated diseases by providing evidence-based information on obesity, and to engage with the public through recommendations on how to engage in a healthy lifestyle.

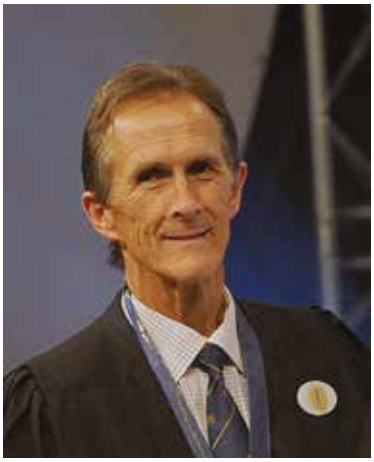
EFFECTIVE CARE RESEARCH UNIT

Effective Care Research Unit

EVIDENCE BASED HEALTH CARE FOR ALL

DIRECTOR: **PROFESSOR JUSTUS HOFMEYR**

DEPARTMENT OF OBSTETRICS AND GYNAECOLOGY



While the Effective Care Research Unit (ECRU) is a Wits Department of Obstetrics and Gynaecology based research unit, it is located in the East London Hospital complex in the Eastern Cape. The unit is also linked to University of Fort Hare, Walter Sisulu University and the Eastern Cape Department of Health. The focus of the unit's work is to undertake primary research, research synthesis, implementation research, training and dissemination of research findings, which address important issues in maternal, child and women's health in low income settings. The unit is accredited as a World Health Organisation (WHO) Collaborating Centre in reproductive health research synthesis and participates on several WHO guideline development panels.

The unit has played a leading role in global efforts to reduce the risk of pre-eclampsia by means of dietary calcium supplementation. Based on the Cochrane systematic review findings, calcium supplementation during pregnancy is now recommended by WHO and the Department of Health, South Africa. The unit has continued to lead a randomised trial of calcium supplementation starting before pregnancy, conducted in four centres in South Africa (East London, Chris Hani Baragwanath Academic Hospital, Cape Town and Stellenbosch) and in Zimbabwe and Argentina, co-ordinated by ECRU and WHO. The unit was awarded a sub-grant of USD 1 600 000 to conduct this trial from the University of British Columbia, a grantee of the Bill and Melinda Gates Foundation. More than 1200 women have been recruited.

One of the most important contributors to avoidable maternal and perinatal deaths is unintended pregnancy. In 2005 the unit embarked on a programme to improve contraceptive services in the Eastern Cape, including a strong research component. A write up of the primary paper on a pragmatic randomised trial comparing injectable progestogen contraception and the copper intrauterine device as used in the routine health services has been completed. The unit is a member of a multinational consortium conducting a randomised trial to assess the effect of various contraceptive methods on HIV acquisition (the ECHO study).

In 2015, Dr Mandisa Singata-Madliki, the Deputy Director of the unit was awarded a postdoctoral research strengthening and capacity development grant from the South African Medical Research Council (R2,500,000 over five years) for the COHERE

(Contraceptive Options for Health: Evidence, Research and Education) project.

The unit continues to recruit in East London and Butterworth for the 'Gentle Assisted Pushing' (GAP) Study, a randomised clinical trial funded by the WHO, assessing the effectiveness of upright posture and a modified method of gentle fundal pressure in the second stage of labour.

Another research theme of the unit has been postpartum haemorrhage (PPH). The first ever randomised trials of misoprostol for the prevention and treatment of PPH was conducted, and it has contributed to current WHO guidelines on PPH. In 2015, the unit was awarded a WHO grant to participate in an international randomised trial to assess the effectiveness of heat-stable carbetocin to prevent postpartum haemorrhage (the CHAMPION Study).

Professor Justus Hofmeyr and Dr Catherine Cluver have described a new method to overcome intractable shoulder dystocia (obstructed labour after birth of the baby's head) called posterior axilla sling traction, which is now included in several training programmes in South Africa and internationally.

Since 2001, the unit has presented an annual Research Methods Course, funded by the WHO, to build research capacity in the Eastern Cape and WHO AFRO region countries.

The team is responsible for updating more than 50 Cochrane reviews, which make a substantial contribution to the Cochrane Library and the WHO Reproductive Health Library.

EMPILWENI SERVICES AND RESEARCH UNIT

DIRECTOR: **PROFESSOR ASHRAF COOVADIA**

DEPARTMENT OF PAEDIATRICS AND CHILD HEALTH

The Empilweni Services and Research Unit (ESRU) based within the Department of Paediatrics and Child Health at the Rahima Moosa Mother and Child Hospital (RMMCH) is one of the new officially recognised research units in the Faculty of Health Sciences. The unit obtained official recognition in late 2014. The unit is headed by Professor Ashraf Coovadia and has a team of senior clinical researchers including Professor Gayle Sherman, Dr Karl Technau, Dr Renate Strehlau, Dr Gary Reubenson, Dr Gill Sorour and Professor Joanne Potterton.

Historically, this unit grew out of a need to provide antiretroviral access to HIV-infected children receiving care within the Department of Paediatrics at Wits. Professor Ashraf Coovadia along with Professor Tammy Meyers (Chris Hani Baragwanath Academic Hospital - CHBAH) and Dr Dalo Ndiweni (Charlotte Maxeke Johannesburg Academic Hospital - CMJAH) initially created the Wits Paeds Group which was a network of Paediatric HIV clinics that provided state-of-the art services to infants and children who were HIV-exposed or HIV-infected. This group, later called the Wits Paediatric HIV Clinics, continued to grow in staffing and eventually began research projects at the Harriet Shezi Children's HIV clinic at CHBAH. In 2000, clinical research began within the Paediatric HIV services at RMMCH which was later called the Empilweni Clinic. The name Empilweni was chosen as it translates from isiZulu as 'a place of life'. This was an apt name for the clinic

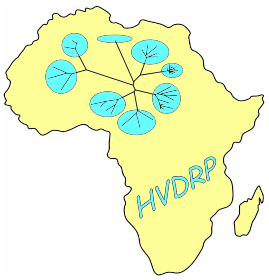
and its services at the time as the country and the HIV programme was undergoing a major change in its approach to treatment for the HIV-infected population.

In 2010, ESRU was established as a division within the Wits Health Consortium as the Harriet Shezi Children's research unit had become part of the Wits Health and HIV Research Institute (WRHI). ESRU, which received funding from the WRHI (as a sub-recipient of the Presidential Plan for AIDS Relief (PEPFAR)), continued to advance its services for HIV-infected children, HIV-infected mothers and their HIV-exposed infants as well as its research agenda.

Today ESRU boasts a staff compliment of more than 40 individuals involved in either research or service provision at the RMMCH. Its work spans advocacy, training, clinical research and importantly overseeing and managing the two important HIV programmes of the National Department of Health being the Prevention of Mother to Child Transmission of HIV (PMTCT) and the Paediatric HIV treatment programme. There are several NIH funded clinical research projects as well as pharma-sponsored trials. ESRU remains one of the few paediatric research sites across the province and the country.

The highlights of ESRU in the period under review (2014/2015) have been the official recognition of the unit by the Faculty Research Committee and the University Research Committee in 2014 and the construction of the new three-storey building at RMMCH.

Construction of the Empilweni Services and Research Unit (ESRU) based within the Department of Paediatrics and Child Health at the Rahima Moosa Mother and Child Hospital (RMMCH)



HEPATITIS VIRUS DIVERSITY RESEARCH UNIT

DIRECTOR: **PROFESSOR ANNA KRAMVIS**

DEPARTMENT OF INTERNAL MEDICINE

Initially established as the Hepatitis Virus Diversity Research Programme, the University Research Council recently (2015) granted "unit" status to this entity, which is now named the Hepatitis Virus Diversity Research Unit. The unit continued its research on the molecular epidemiology of hepatitis B virus (HBV) in Africa. This virus is estimated to infect two billion humans and is second only to cigarette smoking as an agent causing human cancer.

In 2009, HBV infection was again placed on the list of top 10 infectious diseases by the World Health Organisation. Globally, over 240 million individuals are chronically infected with HBV and a large number of them will develop hepatocellular carcinoma (HCC) or liver cancer. Close to a quarter of the world's chronic carriers reside in sub-Saharan Africa and approximately 1% in South Africa. No infectious disease research in Africa can neglect the AIDS pandemic scourging our continent, so, in addition to HBV-mono-infection, the HVDRU team is currently researching HBV/HIV co-infection and developing bioinformatic tools to facilitate the study of these infections.

Following an extensive review of the molecular epidemiology of HBV in Africa, it became evident that there were a number of African countries for which there were no data. Therefore the HVDRU has undertaken to close some of the knowledge gaps and to expand the database of African HBV sequences. To date, the HVDRU team has characterised HBV isolates circulating in South Africa, Zimbabwe, Namibia, Kenya, Sudan, Angola and Madagascar. Their studies have also shown that HBV strains from Africa have been dispersed to various regions of the world as a result of human migrations. The major genotypes of HBV circulating in Africa are genotype A (subgenotype A1), genotype D and genotype E. Subgenotype A1 has unique molecular characteristics differentiating it from subgenotype A2, the subgenotype of genotype A circulating outside Africa.

Over the period 2014-2015, the HVDRU published 12 research articles. One PhD student graduated in July 2014 and later joined the Unit as a Postdoctoral Fellow. In addition, the unit gained a second Postdoctoral Fellow.

PERINATAL HIV RESEARCH UNIT

IMPROVING LIFE THROUGH RESEARCH
Perinatal Research Unit of the University of the Witwatersrand

DIRECTOR: **DR NEIL MARTINSON**

DEPARTMENT OF PAEDIATRICS AND CHILD HEALTH

In 2014, Professor Glenda Gray, the former Director of the Perinatal HIV Research Unit (PHRU), was appointed as the President of the South African Medical Research Council. Dr Neil Martinson took on the leadership of the PHRU. Over the past two years, the PHRU in Soweto has revitalised critical research infrastructure. After re-engineering support services and having successfully applied for two capital expenditure grants from the University of the Witwatersrand the unit has rationalised and modernised its back up power - installing a 250kVA generator capable of providing power for 24 hours, replacing dangerous wiring and installing modern switchgear. It has upgraded its IT infrastructure- installing a 30Mb/s fibre internet connection, updating email services and replacing ageing laptops and PABX.

The clinical research pharmacy has had major renovations, creating additional space for new freezers and laminar flow hoods, which are a vital part of the capacity building particularly as PHRU expands its vaccine-related research. The unit continues to build research infrastructure at the Klerksdorp Tshepong Hospital Complex in North West Province, which has a small research lab capable of processing immediate specimens with daily courier service to Johannesburg, and soon will have installed a fibre internet network with WiFi connectivity to the large parts of the Tshepong hospital. We have also funded multiple doctors and nurses to attend TB and HIV conferences both locally and abroad.

By December 2015, the PHRU five circumcision sites had circumcised over 100,000 young men. Finally we plan to expand our collaborations and build research infrastructure in Limpopo where we have several small projects in Vhembe, a health district with the lowest annual TB incidence in South Africa, as a counterpoint to Matlosana which has an extremely high TB burden.

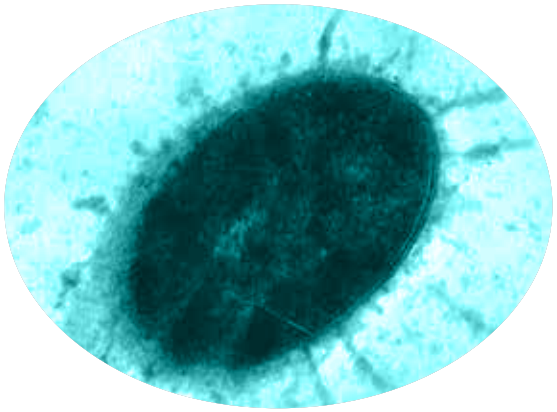
Researchers in the PHRU were co-authors of 92 internationally peer-reviewed publications over the period 2014-2015; many of these articles were published in high impact journals. PHRU authors were frequently first or last authors in these publications. In 2015 alone PHRU authors were part of three papers published in the *Lancet* journal and one in the *New England Journal of Medicine*.

PULMONARY INFECTION RESEARCH UNIT

DIRECTOR: **PROFESSOR CHARLES FELDMAN**

DEPARTMENT OF INTERNAL MEDICINE

This unit was initially established in 2001 as the 'Human Ciliated Epithelium Research Unit' and underwent a name change in 2006 to the 'Pulmonary Infection Research Unit'. The main reason for the name change was because the focus of the basic research in the unit, which has been investigating host-bacterial interactions, shifted away from research on the human ciliated epithelium to focus more on the bacteria. The unit has undergone three successful five-year reviews by the University, the last one in 2014.



The main area of research interest in the unit is in the field of community-acquired pneumonia, particularly pneumococcal infections. The unit undertakes both basic research as well as clinical studies. As indicated, the basic research has been investigating host bacteria interactions, to better understand pathogenic mechanisms in community-acquired pneumonia. This initially included studies of the interaction of the major pneumococcal toxin virulence factors, including pneumolysin, hydrogen peroxide, hyaluronidase and neuraminidase, with human ciliated epithelium.

Ongoing basic research is currently investigating the interactions of pneumolysin, considered by many to be one of the most important toxin virulence factors of the pneumococcus, with human neutrophils. This has recently documented that pneumolysin induces neutrophil extracellular trap (NET) formation in human neutrophils, which may represent an additional mechanism by which pneumolysin may cause injury in the human host, particularly in severe infections. In addition, the unit has continued to investigate the effects of cigarette smoke condensate (CSC), recognising that cigarette smoking is a major risk factor for pneumococcal infections, on the pneumococcus concentrating on pneumococcal growth, biofilm formation and the genetic changes that occur in the micro-organisms on CSC exposure.

The unit also participates in major clinical collaborations, including Community-Acquired Pneumonia Organisation (CAPO) with cases of community-acquired pneumonia being entered into a web-based case report form. A number of publications and conference presentations on various topics in community-acquired pneumonia continue to emanate from this collaboration.

SOWETO CARDIOVASCULAR RESEARCH UNIT

DIRECTOR: **PROFESSOR KAREN SLIWA**

DEPARTMENT OF INTERNAL MEDICINE

Professor Karen Sliwa and her team established a number of cohort studies in Soweto under the overarching name 'Heart of Soweto Studies' with the aim to investigate the prevalence, presentation and management of cardiac disease in an urban African population tertiary care as well as in the communities. These studies were conducted on more than 8000 patients and they highlighted the high prevalence of hypertension, obesity and cardiac diseases in an urban African population. The first seminal paper was published in *The Lancet*, 2008 and since then more than 25 papers have emerged from this cohort (www.socru.org). The impact of these studies was highlighted in Sliwa's profile published in *The Lancet*, 2014, and a further profile article published in the *European Heart Journal*, 2015, highlighting her role as a global leader in cardiovascular medicine.

The Heart of Soweto studies have recently expanded under the umbrella of the 'Heart of Africa' studies to other African countries, including Mozambique, Nigeria, Tanzania, Kenya and Sudan. One of those cohorts has been the THESUS study on more than 1000 African patients with acute heart failure reporting on the predictors of mortality, gender differences and co-morbidities that have been published since 2012. These studies have provided data for the PhD theses of Dr A Becker, Dr L Ntyinyane, Dr K Tibazarwa and Dr O Ogah. In addition, they serve as a basis of postdoctoral research work for Dr D Ojji, Dr K Lamont, D K Tibazarwa and Dr A Dzudie funded via the NIH Millennium Fogarty Chronic Disease Leadership programme and supervised by Professors Sliwa, Libhaber and Kerstin-Klipstein-Grobusch.

THE REACH US SMS Project: The recently established Reliable Equitable Accessible Healthcare Utilising SMSs (REACH US) study aims to understand the underlying issues that cause poor pregnancy outcomes by testing pregnant women's knowledge about risk factors that should be avoided. Dr K. Lamont published a paper in the *Journal of Health Education* in November 2015 surveying the literature: 'Short message service (SMS) as an educational tool during pregnancy: A literature review'.

The Heart of Soweto Outreach Project: The successful '*Heart of Soweto Hypertension and Heart Failure Management Programme*' funded by the Medtronic Foundation USA 2010-2014 was expanded into a broader 'Chronic Disease Management Programme' to the Soweto Primary Health Clinics under Sandra Pretorius Leadership as part of her PhD thesis. The aim is to improve health outcomes in the increasing number of people affected by chronic diseases of lifestyle as obesity, hypertension and heart failure. The programmes incorporate awareness and education around healthy weight, blood pressure, glucose, cholesterol levels, healthy eating, cooking and exercise (as demonstrated in the videos on **www.hedu-africa.org**).

Non-traditional factors for the development of non-communicable diseases

Data on 1311 subjects, attending two primary health care clinics in Soweto, South Africa served as the basis to determine whether other environmental factors (including sleep duration, smoking and physical activity) are related to body anthropometry and blood pressure (BP). Anthropometric and BP measurements were taken. The data suggested that environmental factors rarely collected in African populations are related, in gender-specific ways, to body anthropometry and blood pressure. Further research is required to fully elucidate these associations and how they might be translated into public health programmes to combat high levels of obesity and hypertension. Sandra Pretorius is the first author on the publication in PLoS One investigating the association between sleeping patterns and other environmental factors with obesity and blood pressure as part of her PhD thesis (submitted).

Future Plans - Clinic in a Can

The future plans of SOCRU are to focus on mobile health, increasing the dissemination of information via cell phone, website and mobile units such as *Clinic in a CAN*. In addition to this, the group will also focus on the effects of non-conventional contributors such as sleep pattern and pollution on Cardiovascular Disease (CVD).

Launch of the Hedu-Africa project at Elias Motsaledi Clinic (www.hedu-africa.org)

WITS REPRODUCTIVE HEALTH AND HIV RESEARCH INSTITUTE

DIRECTOR: **PROFESSOR HELEN REES**

WITS REPRODUCTIVE HEALTH & HIV INSTITUTE

The Wits Reproductive Health and HIV Re search Institute's areas of expertise cover HIV, sexual and reproductive health and, increasingly, vaccine preventable diseases, as well as the intersections between these key areas. During this reporting period the Institute continued to grow its research footprint and provide support to the formulation of key global and national policy and guidelines. Wits RHI has consolidated its leadership in the fields of both HIV treatment and prevention, completing several globally significant trials, and launching a number of new research initiatives on HIV treatment optimisation for adults and children. The unit has grown its focus on pre-exposure prophylaxis (PrEP) for HIV prevention in key populations, as well as its portfolio of work on the structural drivers of HIV. A large cash transfer trial for HIV prevention in young women was completed. The unit expanded several projects aimed at preventing violence against women and girls. Building on previous work, 2015 saw the research agenda expanding to include vaccine preventable diseases and, in partnership with other research entities in the University working in the field, the unit has formed a consortium to strengthen vaccinology research in the southern African region.

Overall, the number of new grants awarded grew by an impressive 163%, from 16 in 2014 to 26 in 2015, while 76 manuscripts were accepted for publication and a further 12 are under review. Ten new staff received joint appointments within the Faculty during the year and 38 staff registered for postgraduate degrees, including 15 who registered for PhDs. The Wits RHI's contribution to policy development continued to gain global and local recognition. The growing number of personal awards received by staff also reflects the unit's leadership and expertise in the field. Wits RHI hosted numerous high-level visitors from the USA and the UK, as well as a visit from the South African parliamentary portfolio committee for Science and Technology.

Wits RHI continues to go from strength to strength, and the unit looks forward to consolidating this growth even further in the year ahead.

www.wrhi.ac.za/

SCHOOL OF ORAL HEALTH SCIENCES

HEAD OF SCHOOL: PROFESSOR PHUMZILE HLONGWA

The School of Oral Health Sciences made a small but noticeable improvement in the 2014/2015 period regarding research activities. The year 2014 was marked by the number of staff members attending the 92nd General Session of the International Association of Dental Research (IADR) Congress in Cape Town. This international conference was held in South Africa for the first time. There were 15 poster presentations by staff, postgraduate and undergraduate students. Awards and recognitions were given to undergraduate student, Ms Jainisha Desai and postgraduate student, Mrs Zandiswa Gulube as winners of the IADR South African Division Colgate Competition to represent South Africa in the 2015 IADR Conference in Boston, USA. Dr Sizakele Ngwenya was appointed as the President-elect of the IADR - South African Division for 2014-2016.

We wish to recognise two staff members who received NRF ratings in this period, Professor Mrudula Patel and Dr Sharon Moeno. The School congratulates Professor Ugo Ripamonti for his patents and the book he published in 2015. A number of staff members raised research grants which assisted them in their research endeavors. A milestone in the School was the appointment of the first Postdoctoral Fellow in the School.

A major highlight for 2015 was the hosting of the School of Oral Health Sciences Research Day which was attended by 210 staff and post-graduate students. In addition, the School was granted the opportunity to host Professor Cyril Meyerowitz from Rochester University, USA as part of the Carnegie-Wits Alumni Diaspora Programme.

BONE RESEARCH LABORATORY

DIRECTOR: PROFESSOR UGO RIPAMONTI

The Bone Research Laboratory (BRL) has since September 2014 administratively settled under the aegis of the School of Oral Health Sciences, Department of Oral Medicine and Periodontology. The BRL has gained scientific momentum as judged by its high impact factor publications and awarded research grants. The current position of the Director is a salaried post from the Gauteng Department of Health as a Specialist Dentist in Oral Medicine and Periodontology.

The research of the BRL is primarily focused on tissue biology and regenerative medicine. The BRL has shown that in non-human

primates the induction of bone formation is a recapitulation of embryonic development; this recapitulation has been exploited to engineer postnatal tissue induction and regeneration and which has now been translated into clinical applications.

The BRL is the only scientific research enterprise to have shown that different and novel osteogenic soluble molecular signals initiate the induction of bone formation in primates only. The Director has filed US, EU and WO PTC patents with the help of the Technology Transfer Unit in Wits Enterprise. The University has been awarded three patents, two US and one EU patent. The novel and rapid osteoinductive capacity of the hTGF-β3 isoform together with the novelty of the biological concept of 'tissue transfiguration in vivo' has made it imperative that the US and EU patents be licensed so as to reap the financial rewards for the unique studies of the Bone Research Laboratory.

SYSTEMATIC REVIEW INITIATIVE
FOR EVIDENCE-BASED MINIMUM INTERVENTION IN DENTISTRY

DIRECTORS:
DR STEFFEN MICKENAUTSCH AND PROFESSOR VEERASAMY YENGOPAL

The Systematic Review Initiative for Evidence -Based Minimum Intervention in Dentistry (SYSTEM) Research Entity is located in the Department of Community Dentistry and only has two members, Dr Steffen Mickenautsch and Professor Veerasamy Yengopal.

The aim of the SYSTEM is to establish an applicable evidence-based body of clinical knowledge in Minimum Intervention (MI) dentistry. The objectives of SYSTEM are to systematically appraise the current evidence to MI related clinical topics and to report these in the form of quantitative systematic review articles; to regularly update completed systematic reviews; to regularly update and revise applied systematic review methods in keeping with international standards and recommendations as provided by the Cochrane collaboration; to develop coherent overviews over current systematic review evidence to MI related clinical topics; to encourage research concerning the implementation of systematic review evidence in daily dental practice, e.g. in form of clinical case studies; qualitative and/or observational studies; and to provide recommendations for further research on basis of current systematic review findings.

SYSTEM has adopted the '*Journal of Minimum Intervention in Dentistry* (JMID)' or online: **www.jmid.org** as its in-house journal and bulletin. The rationale for the JMID is based on the intent to increase transparency and counter own publication bias risk by making - as far as possible – any unpublished and unpublishable part of SYSTEM's work (= its 'grey literature') available to public scrutiny. (Publication bias, also considered as the 'file drawer problem', is created when only 'publishable' research is published. The available output is thus systematically skewed with a large part remaining obscure [1].) Because of their preliminary/grey-literature status, SYSTEM's JMID articles are not regarded as SYSTEM's formal research output.

SCHOOL OF PATHOLOGY

HEAD OF SCHOOL: PROFESSOR JOHNNY MAHLANGU

The School of Pathology remains the largest platform for research, teaching and training in Pathology in South Africa. It comprises of seven pathology disciplines, five University recognised research units and a number of evolving research units supported within the various Divisions. In the period under review, the School's research base was strengthened by the establishment of a University recognised HIV Pathogenesis Research Unit and the re-establishment of a Division of Virology within the Faculty.

The School's research agenda continued to focus on the triple disease burden of tuberculosis, HIV and malaria anchored on the backbone of a comprehensive diagnostic pathology platform of the National Health Laboratory Service (NHLS). These areas of priority are headed by the well-established researchers supported by the Department of Science and Technology (DST)/National Research Foundation (NRF) Chair funding. The current three SARChI Chairs in the School are Professor Maureen Coetzee, Professor Shabir Madhi and Professor Caroline Tiemessen. The School's research strategy to establish and support research into non-communicable diseases has shown significant progress with research outputs in areas such as diabetes, molecular genetics of cancer, haemostasis and thrombosis showing a steady increase.

In the period under review, the School's research output continued to increase with a number of publications in influential high impact factor international journals which include the *New England Journal of Medicine*, *The Lancet*, the *Journal of the American Medical Association and Blood.* The vaccination paper by Professor Shabir Madhi published in the *New England Journal of Medicine* has changed policy both nationally and internationally.

The School continued to attract high calibre postgraduate students in various pathology disciplines as well as research units. In the period 2014-2015 there were 128 postgraduate and 24 Postdoctoral Fellows in the School. The graduation throughput for masters and doctoral degrees increased by 8% in the period under review when compared to the previous period.

Research in the School is funded from diverse sources both nationally and internationally. International funding included competitive grants from the NIH, the Bill and Melinda Gates Foundation Grants, the Grand Challenges, the Wellcome Trust, the European Union to name a few. In addition to these, some research in the School is carried out and funded in the context of collaborations with many research centres in Africa, Europe and North America.

ANTIVIRAL GENE THERAPY RESEARCH UNIT

AGTRU
antiviral gene therapy research unit

saMRC
advancinglife

DIRECTOR: **PROFESSOR PATRICK ARBUTHNOT**

DEPARTMENT OF MOLECULAR MEDICINE AND HAEMATOLOGY

Infection with hepatitis B virus (HBV) is hyper-endemic to sub Saharan Africa and carriers of the virus are at high risk for cirrhosis and liver cancer. Currently available HBV therapies have limitations and improving treatment to prevent complicating cirrhosis and hepatocellular carcinoma is a global medical priority. Gene therapy has significant potential for elimination of HBV infection, and technology developed with this approach is applicable to treating other viral infections of importance to sub Saharan Africa, such as HIV-1. The specificity of mutagenesis that may be induced with customised DNA-binding proteins, and also the gene silencing that may be achieved by activating RNA interference (RNAi) indicate that the approach has potential for HBV therapy. The primary focus of the unit's research has been to advance gene therapy to a stage of assessment in a clinical setting. Partnering with a large US-based pharmaceutical company is important to enable achievement of this objective.

In 2014, the Antiviral Gene Therapy Research Unit was made an extramural unit of the South African Medical Research Council. This award enables substantial funding for the unit for the next five years, and may be renewable for a further two terms of five years.

The Antiviral Gene Therapy Research Unit formalised a partnership with Janssen, the pharmaceutical division of Johnson and Johnson. The research partnership is aimed at developing gene editing to treat persistent infection with HBV.

RESPIRATORY AND MENINGEAL PATHOGENS RESEARCH UNIT

DIRECTOR: **PROFESSOR SHABIR MADHI**

The MRC/URC Respiratory and Meningeal Pathogens Research Unit (RMPRU) and the NRF/DST SARChI Vaccine Preventable Diseases Unit are at the forefront of epidemiology, translational and laboratory research in the prevention of major vaccine preventable diseases causing mortality and morbidity especially in young children; i.e. pneumonia, diarrheal disease and neonatal sepsis. The unit also conducts research on vaccines in HIV-infected adults and pregnant women, who are high-risk groups for many vaccine preventable diseases. The unit has a staff complement of approximately 250, including laboratory scientists, medical scientists, biostatisticians, epidemiologist, medical doctors, nurses and research assistants.

Since the success of undertaking the first studies on the efficacy of pneumococcal conjugate vaccine and rotavirus vaccines in Africa, the findings from these studies have informed the World Health Organisation recommendations for the introduction of these vaccines into public health immunisation programmes. These studies were also instrumental in South Africa being the first African country to introduce these vaccines into its public immunisation programme since 2009. The field-evaluation on the effectiveness of these vaccines in reducing under-5 childhood morbidity and mortality has been investigated over the past three years by RMPRU. Findings include a 40% reduction in all-cause diarrhea hospitalisation resulting from rotavirus vaccination, whilst pneumococcal conjugate vaccine (PVC) has been effective in reducing all-cause bacterial pneumonia hospitalisation by 39% and has also reduced vaccines-serotype invasive pneumo-

VPD
Vaccine Preventable Diseases
RMPRU
Respiratory & Meningeal Pathogens Research Unit

coccal disease by >80% in children. An additional benefit of PCV vaccination of young infants, including in South Africa, has been reduction in pneumococcal exposure and invasive disease in unvaccinated individuals, including HIV-infected adults, due to vaccinated young children now being less likely to transmit pneumococcus in the community.

There were two landmark studies (both published in the highest ranking medical journal globally - the *New England Journal of Medicine*) in the past year, which has important implications for South Africa and globally. Included among these is the first randomised controlled trial globally to show that influenza vaccination of pregnant women protected HIV-infected and HIV-uninfected women against influenza illness, as well as their infants. These data will be used to inform WHO policy on maternal influenza vaccine prioritisation. Following this study, the South African National Advisory Group for Immunisation has recommended that pregnant women be prioritised for influenza vaccination in South Africa. Further to this the unit was part of a study which has now documented the impact of the introduction of PVC in childhood immunisation programme on young infants and in older unvaccinated age-groups.

Similarly, the unit provided the first evidence from Africa on the effectiveness of the introduction of rotavirus vaccine, which we were also the first to demonstrate the efficacious in black Africans, on reducing diarrheal hospitalisation. These results were published in the highest ranking journal in the field of Infectious Diseases (*Lancet Infectious Diseases*), and included an editorial commentary on the importance of these data for advocating for the inclusion of rotavirus vaccine into low-middle income country immunisation programmes.

In the past year the unit has been awarded three grants from the Bill and Melinda Gates Foundation with a total value of approximately R100 million. These independent studies will have the global aim to define the public-health importance of Group B streptococcus, influenza, respiratory syncytial virus and pertussis (whooping cough) during the first few months of life; and explore the potential of intervening through vaccination of pregnant women to protect the women and their babies against these infectious diseases.

Over the past two years (2014-2015), the unit has produced 72 manuscripts in high ranking international peer reviewed journals, including three in the *New England Journal of Medicine,* three in the *Lancet Infectious Diseases*, four in the *Clinical Infectious Diseases* and five in the *Journal of Infectious Diseases* (the latter four being the top ranking journals in infectious diseases).

WITS RESEARCH INSTITUTE FOR MALARIA

DIRECTORS: **PROFESSORS MAUREEN COETZEE AND THERESA COETZER**

The Wits Research Institute for Malaria was established in 2013 to bring together malaria researchers from six Schools across two Faculties: the Schools of Pathology, Therapeutic Sciences, Clinical Medicine and Public Health in the Faculty of Health Sciences, and the Schools of Animal, Plant and Environmental Sciences and Chemistry in the Faculty of Science. The aim of the Institute is to promote research into all aspects of the disease and its transmission with the goal of supporting South Africa's objective to eliminate malaria. Several joint projects have been successfully initiated, particularly in the fields of drug discovery and insecticide resistance. A facility has been established to infect malaria vector mosquitoes with *Plasmodium falciparum*, the most common malaria parasite in Africa and the deadliest, causing around 400,000 deaths per annum across the continent, according the World Health Organisation's 2015 World Malaria Report. The Institute was appointed as a Collaborating Centre of the South African Medical Research Council in 2015.

Entomology: Research on the Sterile Insect Technique has continued in Kwazulu-Natal, funded by the South African Nuclear Energy Corporation (Necsa) through its Nuclear Technologies in Medicine and Biosciences Initiative (NTeMBI) – a national platform funded by the Department of Science and Technology and the International Atomic Energy Agency. Research from the NIH International Centre of Excellence for Malaria Research in Zambia and Zimbabwe has resulted in policy changes being made to the vector control programmes in both countries with a marked reduction in malaria transmission in Zimbabwe. A new project with the London School of Hygiene and Tropical Medicine aims to evaluate the usefulness of targeting vector control interventions in certain areas of South Africa. New products for killing mosquito adults and immatures are being tested with good results for several of the products.

Parasitology: Research to screen and evaluate compounds active against *Plasmodium falciparum* gametocytes continued in collaboration with the University of Pretoria and the Council for Scientific and Industrial Research. Various other research projects focused on fundamental aspects of the biology of *Plasmodium falciparum*. These include an investigation of biochemical markers and genes involved in the phenomenon of regulated parasite cell death, induced by either exposure to sunlight or high parasite density. Collaboration with the European Synchrotron Radiation Facility (ESRF) and Institut Laue Langevin (ILL) in Grenoble, France, has been initiated to investigate the structures of macromolecular complexes, such as the interaction of a parasite transcription factor with DNA. The question of whether hypnozoites cause relapse in *Plasmodium vivax* malaria was also addressed.

Pharmacology: The laboratory investigations into the inhibitory properties of numerous natural and synthetic compounds were evaluated for antimalarial, larvicidal and toxicological activities. Various novel quinolones, pyrimidine and folate inhibitors, bisphosphonate derivatives and phytomedicines are being tested. In collaboration with Dr C Menezes and Dr A Karstaedt (Wits School of Clinical Medicine) a retrospective study of the past five years of clinical data from malaria infected patients admitted to the Chris Hani Baragwanath Academic Hospital will be collated. In addition, the clinical effect of the antimalarial regimens on patient outcome and disease progression are being investigated and will be correlated to the drug sensitivity of the malaria parasite.

DST-NRF CENTRE OF EXCELLENCE FOR BIOMEDICAL TB RESEARCH

DIRECTOR: **ASSOCIATE PROFESSOR BAVESH KANA**

The Wits node of the DST-NRF Centre of Excellence for Biomedical TB Research (CBTBR) is part of a flagship programme established by the National Research Foundation (NRF) to facilitate biomedical research on tuberculosis (TB) at three distinct nodes, Wits, Stellenbosch University and the University of Cape Town. The research conducted at the WITS node is primarily aimed at understanding aspects of the basic biology of *Mycobacterium tuberculosis* with the ultimate aim to identify and validate new drug targets for TB. The Centre has adopted translational, cross-disciplinary approach to their work that spans from basic, mechanistic studies to clinical research. Their research focusses on fundamental questions regarding pathogenesis and clinical manifestation of TB disease such as how tubercle bacteria enter/exit from a dormant state, mechanism of drug resistance and energy metabolism in mycobacteria. The resulting findings have challenged existing perceptions and shifted paradigms on these topics and currently, the CBTBR is involved in investigating how these phenomena determine the outcome of TB infection in HIV positive/negative people. A notable accomplishment with the Wits node of the CBTBR is their development of a new generation of industry standards for the validation and external quality assurance of next-generation TB diagnostics. Current and potential novel molecular diagnostics for TB require a mechanism for verification and continuous quality assurance. To facilitate this, the CBTBR developed a production stream for non-hazardous forms of pathogenic mycobacteria, which are then spotted on cards as dried culture spots. These are used as standards for verification and quality assurance for GeneXpert. This product was developed in strong collaboration with the Department of Molecular Medicine and Haematology, who have led the worldwide distribution of these reagents, and has now been endorsed by the World Health Organisation for use in over 30 countries, many of these on the African continent.

SCHOOL OF PHYSIOLOGY

HEAD OF SCHOOL: PROFESSOR WILLIAM DANIELS

The School of Physiology hosts a variety of research thrusts spanning both human and animal physiology. These thrusts are spear-headed by two University Research Committee recognised research entities namely, the Brain Function Research Group (BFRG) and the Cardiovascular Pathophysiology and Genomics Research Unit (CPGRU). These research entities are complemented by other active research areas covering exercise physiology, neurophysiology (that focusses on stress and addictive behaviour), biomechanics, gastrointestinal physiology and receptor biology.

Exercise Physiology Research Laboratory

This Laboratory focusses on the roles that exercise, physical activity and sedentariness (too much sitting) play in relation to chronic diseases of lifestyle and overall health. The lab is a strong proponent of the 'Exercise is Medicine' campaign - a global initiative which aims to make physical activity a standard part of non-communicable disease prevention. In this respect, the lab uses the latest activity monitoring technology to understand physical activity behaviour in specific populations. Through research, our ultimate objective is to

drive policy change in physical activity prescription for South Africans. The lab has also recently collaborated with clinicians in the Department of Orthopaedic Surgery at the Charlotte Maxeke Johannesburg Academic Hospital as well as in the Department of Rheumatology at the Chris Hani Baragwanath Academic Hospital, in an effort to drive research into physical activity and its benefits on musculoskeletal health in patients suffering from mobility limiting diseases.

Animal nutritional physiology and indigenous plant characterisation laboratory

Indigenous plants are an underutilised resource. The research thrust of this laboratory is to investigate the nutraceutical and medicinal properties of indigenous plants. The lab has three key focus areas, the first involves the *in vitro* characterisation/screening of indigenous trees (seed, leaves) for nutrients, oils and medicinal properties. The second focus area is the evaluation of non-conventional feed resources for improved livestock production and their (non-conventional feed resources) effects on animal physiology and animal product quality. In the third research focus area, the phytochemicals are tested *in vivo* in animal models, with an emphasis on the effects in neonatal programming of metabolic dysfunction and nutritional physiology.

Neurophysiology Laboratory

The research interests of this laboratory span two domains, i.e. (i) the physiological pathophysiological consequences of stress, and (ii) the neurobiology of substance use disorder. The stress research covers two separate but intrinsically linked areas: (1) human and laboratory-based investigations of stress and the associated psychoneuroimmune responses and (2) field-based investigations of the stress of capture, handling and confinement of wild-life, including translocated rhinoceroses.

Research investigating substance use disorder focusses mainly on the effects of cocaine addiction on the transcriptome and epigenome, and how these effects influence the inheritability of addictive behaviour.

Receptor Biology Laboratory

The Receptor Biology group studies the mechanisms of action of G protein-coupled receptors, using two model receptors that are important in reproductive health. The group uses a range of molecular techniques to study the mechanisms by which gonadotropin-releasing hormone, the central regulator of reproduction, interacts with its receptor to stimulate release of gonadotropic hormones (LH and FSH). Similar approaches are used to study how chemokines and HIV interact with the CCR5 chemokine receptor, which mediates HIV infection. Better understanding of these receptors is important for developing new strategies to treat reproductive disease and prevent HIV infection.

Biomechanics Laboratory

The research conducted in the biomechanics laboratory is focused around three different themes all of which explore the interaction between physiology and biomechanics (specifically human movement). The first research theme is sports performance, where current studies investigate the role of biomechanics and physiology in cricket and rugby performance. The second theme has to do with clinical research and involves exploring the biomechanical and physiological differences between the gait and reflex responses of sufferers of restless syndrome as compared to normal control subjects. The final research thrust is pure (non-applied) biomechanics. Under this latter theme current studies are investigating the measurement of the human centre-of-mass.

BRAIN FUNCTION RESEARCH GROUP

DIRECTOR: **ASSOCIATE PROFESSOR ANDREA FULLER**

The Brain Function Research Group (BFRG) was granted formal Research Group status by the University 27 years ago. The Group, now with a circle of international collaborators and honorary fellows, continues to thrive, attaining high research outputs in recent years in the fields of pain, sleep, fever and wildlife conservation physiology.

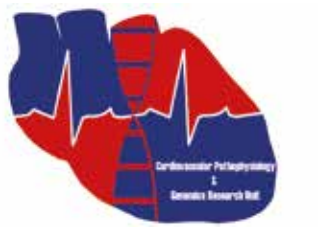
The Pain Laboratory, one of the four research laboratories in the Group, has two main research thrusts: pain related to HIV infection and dysmenorrhoeic pain. The research on HIV-related pain covers the assessment, epidemiology, genetics and pathophysiology of HIV-related pain, with a particular focus on chronic pain resulting from peripheral nerve damage by the HI virus and neurotoxic antiretroviral drugs. Year 2015 saw the introduction of a new aspect to the HIV research, namely, the relationship between resilience and pain burden and the effect of HIV stigma on pain reporting. The team's research on dysmenorrhoeic pain, a common painful condition in women that recurs every month across the reproductive years, aims to better understand the pathophysiology of dysmenorrhoeic pain, including its effects on sleep quality. Current research focusses on the differences in pain sensitivity across the menstrual cycle between women with dysmenorrhoea and women without the condition, and the pharmacological treatment of dysmenorrhoeic pain.

The Wits Sleep Laboratory is the only dedicated sleep research unit in Southern Africa. Its research topics comprise of: the interaction between immune function, sleep and circadian rhythms; restless legs syndrome (RLS); sleep and exercise. In a cross-sectional and longitudinal study, the team is investigating the association between sleep disruption and immune reconstitution in HIV patients. Another study is examining how sleep disruption and circadian misalignment may contribute to the pathogenesis of autoimmune conditions. The team has extended its recently published work on RLS to investigate RLS in children and how magnetic stimulation affects RLS, and also is conducting research on how a nap may affect exercise performance.

The Fever Laboratory has two main thrusts: pathophysiology of fever and sickness behaviour and immune activation, cognition and physical growth. The team has published research recently on the role of cytokines and prostanoids as endogenous mediators of fever and sickness behaviours, in particular anorexia and lethargy. The team's research on immune activation, cognition and physical growth covers investigating the degree to which physical growth and cognition, specifically learning and memory is compromised by acute and recurrent acute infections during distinct periods of development, namely infancy, adolescence and adulthood. Given that the sex of an individual can have profound influences on the functioning of the developing nervous and immune system, they also are focussing on determining if sex differences exist with regard to the consequences of immune activation on cognitive functioning.

The Wildlife Conservation Physiology section has two main research themes: to understand the physiological plasticity of free-living mammals, particularly in the face of climate change; and to improve the welfare of mammals during game management practices. The work has yielded imported insights recently on how large mammals may buffer some consequences of climate change through behavioural and physiological modifications. The team also has published important studies describing approaches to immobilise wild mammals, particularly rhinos, without compromising respiratory and cardiovascular function in these animals.

CARDIOVASCULAR PATHOPHYSIOLOGY AND GENOMICS RESEARCH UNIT



DIRECTORS: **PROFESSORS GAVIN NORTON AND ANGELA WOODIWISS**

The Cardiovascular Pathophysiology and Genomics Research Unit (CPGRU) aims to identify novel mechanisms responsible for cardiovascular damage and dysfunction; to enhance cardiovascular risk prediction; and to develop the most appropriate strategies to prevent cardiovascular events in poor communities in South Africa. In the past two years (2014-2015), the work of the unit has resulted in 38 publications, mostly in high impact factor journals, and has supported presentations of 15 PhD and MSc students at international and national congresses. Some of the more meritorious findings of the unit over this time period are highlighted below.

In a series of papers published in the journals *Hypertension*, *Hypertension Research* and *Journal of Hypertension*, the unit has continued its work in investigating the role of components of central aortic blood pressure. The unit has demonstrated that aortic reflected (backward) waves (derived from pulse wave and wave separation analysis) are more important than aortic forward waves in mediating increases in aortic pressure and end-organ damage; that reflected waves account for brachial pulse pressure (PP)-independent relations between aortic PP and end-organ changes; and that aortic augmentation index underestimates these effects.

Over the past two years work on the impact of obesity on cardiac diastolic function was undertaken and it was demonstrated that when comparing the impact of an excess adiposity versus BP on moderate-to-severe LV diastolic dysfunction, BP is by far the most important determinant of LV diastolic dysfunction (*Journal of Hypertension*). Most importantly however, researchers in this unit have recently demonstrated that the effects of obesity on moderate-to-severe LV diastolic dysfunction, occur in a specific portion of obese individuals. In this paper, it was discovered that obesity effects on LV diastolic function depend on the type of LV structural (geometric) remodelling involved and are largely attributed to insulin resistance. This is particularly important as, it was demonstrated that the LV remodelling process shows heritability and intra-familial aggregation (*American Journal of Hypertension*) suggesting that the impact of obesity on LV diastolic dysfunction may depend on inherited factors.

Bearing in mind the high prevalence of obesity in urban, developing communities in South Africa, we have continued our research into the impact of obesity on the heart. In this regard, we have shown that circulating concentrations of the adipokine, resistin, but not adiponectin associate with left ventricular hypertrophy in excess of that predicted by left ventricular workload, and LV myocardial systolic dysfunction (*International Journal of Cardiology*) as well as aortic stiffness (*Journal of Hypertension*) independent of circulating concentrations of the general inflammatory substance, C-reactive protein, and insulin resistance.

SCHOOL OF PUBLIC HEALTH

Head of School: Professor Laetitia Rispel

As shown by the staff research awards and recognition, substantial research grants and hosting of scholarly events, the 2014/2015 biennial period has been exceptional for the Wits School of Public Health. Two research entities based in the School, both recognised by the Medical Research Council, continue to flourish. During the review period, the School was awarded an Anglo-American endowed chair (occupied by Professor Derk Brouwer) and an additional SARChI Chair (occupied by Professor Laetitia Rispel). Professor Lenore Manderson, a world renowned medical anthropologist, commenced her tenure as a distinguished scholar. The appointment of Professor Jonathan Levin has strengthened the biostatistics support provided to the Faculty as a whole. The School also made major strides in diversifying its staff profile, with the appointment of several emerging researchers.

The School obtained multi-million rand grants from the Wellcome Trust, the World Health Organisation Tropical Disease Research, the UK Department for International Development, the US National Institutes for Health, and an endowment from the Sheiham Family Foundation. The 2014 year saw an increase of 132% on the number of publication units for which the School was recognised at the Faculty Research Awards Ceremony. During 2014, the Centre for Health Policy recruited one Postdoctoral Fellow, and in 2015, five Postdoctoral Fellows were recruited in the School (three of these were funded by the School). National and international networks and partnerships were expanded. A vibrant academic programme of bi-weekly academic meetings, monthly research methodological seminars, monthly School meetings where senior and junior staff are twinned to present their research and teaching activities and annual writing retreats all continued to take place.

CENTRE FOR HEALTH POLICY

DIRECTOR: ASSOCIATE PROFESSOR JANE GOUDGE

The Centre for Health Policy (CHP) conducts research on health systems and health policy, combining theoretical insights and empirical evidence to understand health system changes and to propose strategies for health system development. The CHP conducts independently-funded and commissioned research and continues to engage in and influence policy both nationally and internationally.

Over the two year period (2014-2015), the CHP has been involved in seven multi-national projects exploring issues from human resource and governance policies for responsive and resilient health systems, universal health coverage, mainstreaming a health systems approach for delivering maternal services, and strengthening community based outreach services for treating hypertension in rural South Africa.

A multi-country project which ended in 2014, the Consortium for Health Policy and Systems Analysis in Africa (CHEPSAA), saw the CHP organising an African networking meeting which brought together leaders in health policy and systems research and analysis. The meeting showcased the project's key activities over four years which included the Emerging Leaders Programme and the development of a health policy and systems research and analysis (HPSR+A) curriculum comprising three Open Access courses.

In 2015, the CHP and collaborating partner Warwick University were awarded a research grant of R14-million from the UK Medical Research Council for a study on developing a Community Health Worker (CHW) service model to evaluate current CHW programmes in the Sedibeng Health District. The findings of the study will provide practical lessons for implementing a CHW programme at scale in South Africa and similar settings in other low and middle income countries.

The CHP continues to strengthen its local partnerships, particularly at district health level. These collaborations ensure our research is grounded in the changing realities of South African service provision. The CHP is working with districts in Gauteng, North West, Eastern Cape and KwaZulu-Natal to support current primary health care reforms.

The Centre places strong emphasis on building capacity in the field of health policy and systems research. In September 2014, Dr Nonhlanhla Nxumalo was one of only three Emerging Voices invited to speak at the opening plenary of the 3rd Global Symposium on Health Systems Research held in Cape Town. One young PhD research fellow, Shakira Choonara, was selected to be a Future Leader to represent the voice of youth at the *European Development Days* 2015 (EDD15) in Brussels in June 2015. She participated in the Right to Health panel with three senior WHO officials. Following this, the President of the UN General Assembly invited her to participate in the Sustainable Development Goals meeting in New York.

Significant research appointments included the promotion of the Director, Jane Goudge, to Associate Professor; Dr Nonhlanhla Nxumalo was appointed CHP's Deputy Director; and Professor Frances Griffiths, the Head of Social Science and Systems in Health Research Unit at Warwick University was appointed Honorary Professor.

In 2014, the CHP recruited a Postdoctoral Fellow to focus on hospital governance in public and private hospitals in South Africa in view of the public health sector reforms currently underway. Two new PhD fellows joined the CHP in 2014, and two CHP staff members submitted their PhD theses in 2015.

In striving to make its work more accessible, the CHP issued 13 policy briefs, had 10 items published in the media, and published 57 journal articles and two technical reports in the period 2014-2015.

MRC/WITS RURAL PUBLIC HEALTH AND HEALTH TRANSITIONS RESEARCH UNIT

AGINCOURT
Health & Population Unit
School of Public Health - University of the Witwatersrand
Medical Research Council Wits Rural Public Health and Health Transitions Research Unit

DIRECTOR: **PROFESSOR STEPHEN TOLLMAN**

Agincourt: Picture taken by L Hunt

The MRC/Wits Rural Public Health and Health Transitions Research Unit (Agincourt), based in the School of Public Health and the Mpumalanga Province adjacent to southern Mozambique, is among the leading population-based research centres on the continent. It generates vital evidence to support health and development of the country and region's vulnerable and marginalised citizens. Some 350 field and scientific staff, many from local communities, support an interdisciplinary programme of observational, interventional and policy-oriented research that spans clinical, public health and socio-environmental spheres. Respectful and engaged partnership with local communities is paramount and reflects the unit's core values.

Critical questions address the dynamic health, population and social transitions underway and their implications for health and well-being at stages of the life course: children, adolescents, working adults and elders. A recent trial found that cash transfers to young women increased high school attendance and lowered the risk of intimate partner violence but did not reduce HIV acquisition. An on-going multi-centre [1]INDEPTH study, a first on the continent, focusses on ageing and cognitive change, including dementia, in settings where chronic infections and vascular disease are intensely prevalent. A body of work determined that local natural resources provide a critical buffer for the poorest households and those beset by shocks such as death of a breadwinner.

The PRICELESS initiative, supported by the Department of Health and Treasury, played a pivotal role supporting new regulations on the salt content of bread (effective from 2016). With the MRC's Burden of Disease Unit and the Health Systems Trust, PRICELESS works closely with government on the cost evaluation of priorities for maternal and child health; and is assessing the health promoting potential of targeted taxes and subsidies.

With sister centres in Limpopo and KwaZulu-Natal, MRC/Wits-Agincourt is working to establish a 'National Research Infrastructure' supported by the Department of Science and Technology. This is anticipated to cover 250,000 persons initially, where new urban centres will bridge the urban-rural divide.

[1] INDEPTH: International Network for the Demographic Evaluation of Populations and Their Health

SCHOOL OF THERAPEUTIC SCIENCES

HEAD OF SCHOOL: PROFESSOR JUDITH BRUCE

The School of Therapeutic Sciences comprises of seven disciplines: Exercise Science, Sports Medicine, Nursing, Occupational Therapy, Pharmacy, Pharmacology and Physiotherapy, making it the most diverse School in the Faculty. Over the past two years, the School has made substantial gains in its teaching, research and partnership endeavours. Much of these gains come from building on identified strengths and investing in staff and future scholars. The years 2014/2015 saw a significant increase in the School's research output, in higher degree graduations and in publications. Researchers in the Department of Pharmacy and Pharmacology are significant contributors to the school's publications output. There is also an improvement in the higher degree qualifications of staff from 90% to 93%; 50% of academics have PhDs.

In 2014 the Department of Physiotherapy celebrated 75 years of academic and research excellence. The Department's research focus on HIV disability in children and adults, chronic disease rehabilitation and cardiorespiratory rehabilitation has increased the Department of Physiotherapy's expertise and standing among their peers. Sixty percent of physiotherapy academics have PhDs. The Departments of Occupational Therapy (OT) and Nursing Education continue to make their mark on graduating high numbers of master's graduates, concomitantly publishing their own and students research. Outcome measures research spearheaded by Associate Professor Daleen Casteleijn has paved the way for collaborative research between OT and nursing – an Outcome Measures Research Programme was established in 2014. Nursing's research niche in oncology and palliative care, focusing on cancer prevention and living with cancer, has given nursing its first NRF-rated scientist.

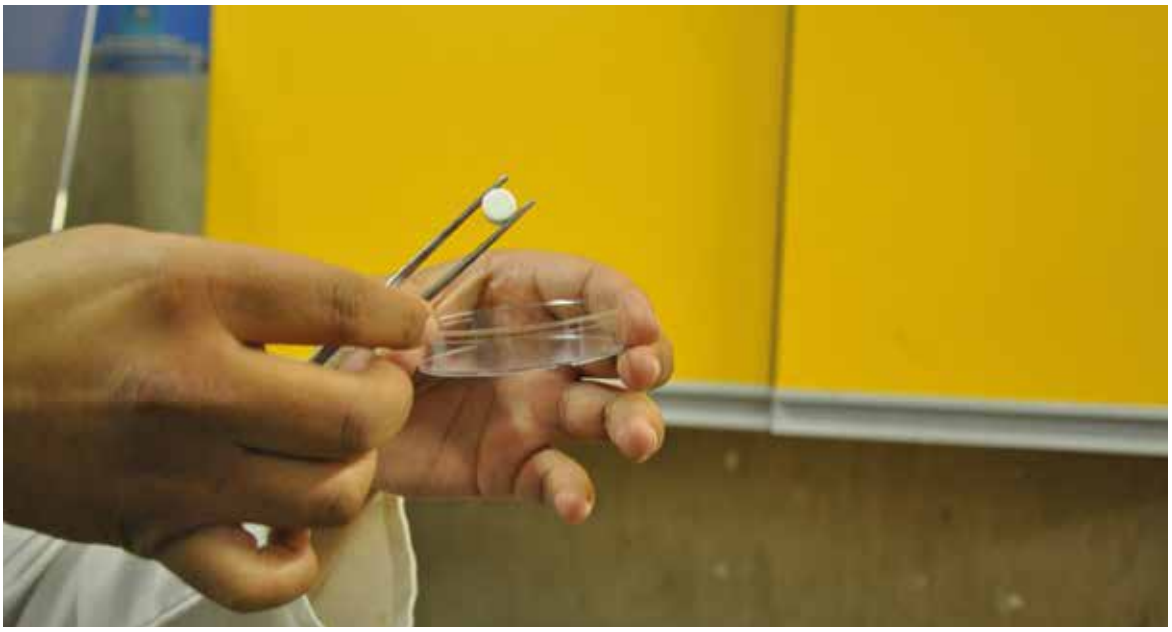
The Division of Pharmacology headed by Associate Professor Robyn van Zyl undertakes several experimental and clinical projects, which have advanced knowledge in the fields of malaria and toxicology research, anticancer compounds, medicinal plant blends and other plant-based products. The WADDP Research Unit is well known for excellence in drug delivery research in South Africa and Africa, with a solid foundation for postgraduate scientific training and innovation in drug delivery. The team is involved in the development of new, intelligent, drug delivery formulations, for delivering drugs and other biomolecules that have numerous attractive properties, but are often associated with one or more less desirable characteristics, such as poor bioavailability. Being the only unit in its domain in South Africa, the WADDP has a mission informed by the South African government's biotechnology strategy and intends to enhance its position as a leading unit by sustaining globally competitive standards of excellence in drug delivery and pharmaceutical biomaterials research.

Having acquired much needed space, the School is in a better position to support its research endeavours and to accommodate its increasing Postdoctoral Fellows. Strategically, the space is shared with the School of Pathology, our joint partner in the Wits Research Institute for Malaria (WRIM). Together with WADDP's newly awarded status as a research unit there is great promise of collaborative research excellence, innovations and inventions.

WITS ADVANCED DRUG DELIVERY PLATFORM RESEARCH UNIT

WADDP
The Wits Advanced Drug Delivery Platform

DIRECTOR: **PROFESSOR VINESS PILLAY**



The Wits Advanced Drug Delivery Platform (WADDP) Research Unit published a total of 52 research publications in 2014/2015 in ISI-accredited international journals and presented podium talks at 16 international conferences in the USA, UK, India and Sweden. In addition, a further five patents have been filed with Wits Enterprise bringing the total patent suite of the WADDP to over 45 patents under prosecution in the USA, Europe, UK and Japan. Several postgraduate students graduated at the PhD and Masters levels and a total of eight Postdoctoral Fellows have been trained within each of the five research thematic areas. Sub-projects within each thematic area encompassed the following focus areas:

1. Neuroregeneration of traumatic Spinal Cord Injury using spino-nimetic neural devices
2. Implantable antineoplastic-loaded nanomicelles for ovarian cancer cell targeting
3. Intrascleral bioresponsive devices for treating infectious eye diseases and disorders
4. Neuro-durable scaffolds for treating neurocognitive and neurodegenerative disorders
5. Composite polymer devices for the reduction and prevention of STI and HIV transmission

The Unit's work continues to have a local, continental and international impact in terms of meeting the priorities of improving healthcare through pharmaceutical innovation. In addition, there is currently a dearth of pharmaceutical scientists in South Africa with expertise in developing, manufacturing and evaluating medicines. The unit's research continues to contribute to the training of pharmaceutical scientists with specific skills for both the pharmaceutical industry and academia. This provides a stimulatory environment for the local pharmaceutical industry to design and manufacture pharmaceuticals of high quality, excellence and affordability for optimum and cost effective patient healthcare.

DST-NRF CENTRE OF EXCELLENCE IN HUMAN DEVELOPMENT

DIRECTOR: **PROFESSOR LINDA RICHTER**

The DST-NRF Centre of Excellence in Human Development (CoE-HUMAN) was awarded to the University of the Witwatersrand in December 2014. The CoE-HUMAN is situated in the office of the Deputy Vice-Chancellor for Research and is associated with both the Faculties of Health Sciences and Humanities. The Centre's offices are located in the School of Public Health, close to two research entities with which it has close links: the MRC/Wits Developmental Pathways to Health Research Unit and the MRC/ Rural Public Health and Health Transitions Research Unit (Agincourt).

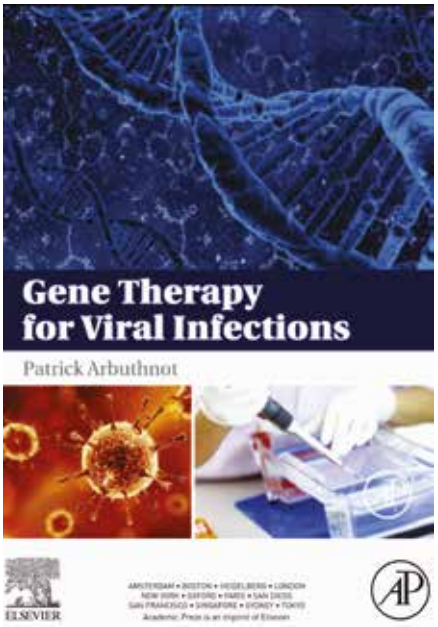
The CoE-HUMAN is a virtual multi-disciplinary centre linking researchers from the Human Sciences and the Medical Research Councils and 10 universities working on issues of human development at the individual level, across generations and from a socioeconomic perspective. The CoE-HUMAN is staffed by the Director, the Centre Manager, a financial administrator, two research assistants and four postgraduate students (1 Masters and 3 Doctoral students). In 2015, the Centre awarded bursaries to 25 postgraduate students (11 Masters, 11 Doctoral and two Postdoctoral Fellowships) and supported 23 researchers through Opportunity, Accelerator and Strategic Grants.

A unique feature of the Centre is its focus on human development across time, considered from a lifespan, life cycle and life course perspective. It brings together researchers and topics from the unique birth cohort studies, Birth to Twenty Plus (Bt20) and Soweto First Thousand Days (S1000), social and health panel studies such as the National Income Dynamics Study and the health and demographic platforms established at Agincourt and the Africa Centre, and repeat cross-sectional studies conducted by the Human Sciences Research Council and Statistics South Africa.

RESEARCH HIGHLIGHTS

Contents

A review of gene therapy



A book entitled 'Gene Therapy for Viral Infections' by **Professor Patrick Arbuthnot** aims to provide a comprehensive review of using nucleic acids to treat viral infections. Coverage begins with exploration of the fundamentals of viral infections and their susceptibility to gene therapy as a mode of treatment. Topics of harnessing RNAi to silence viral gene expression, antiviral gene editing, viral gene therapy vectors, and non-viral vectors follow.

Subsequent detailed coverage of specific infections expands the review of particular application of the technology. The book aims to bridge the gap between basic science and clinical applications of gene therapy for viral infections. Potential advantages of gene therapy over current treatment options are discussed in detail. Principles of rational design of antivirals and hurdles that currently face the technology are addressed. The work is thus intended to provide a broad readership with the information needed to stay abreast of this increasingly important field.

Arbuthnot P (2015). *Gene Therapy for Viral Infections, 1st edition.*

Influenza vaccination of pregnant women protects mothers and their babies

This landmark study is the first randomised -controlled trial globally to show that influenza vaccination of pregnant HIV-uninfected and HIV-infected women is safe and protects the women against confirmed influenza illness. Also, influenza vaccination of the pregnant women protected their young infants against influenza illness.

The protection of HIV-infected pregnant women, who constitute approximately one-third of all pregnant women in South Africa, was particularly important as HIV-infected individuals have a 4-8 fold greater risk of hospitalisation and a 4-fold greater risk of influenza associated mortality than do HIV-uninfected individuals.

In addition to protection of pregnant women, the study also showed that the infants born to mothers who received the influenza vaccine were less likely to develop influenza confirmed illness until 6 months of age. This included 48% fewer episodes of influenza illness in infants born to influenza-vaccinated HIV-uninfected women and a similar trend was observed in those born to HIV-infected women.

The mechanisms by which the infants were protected were either transplacental acquisition of maternal antibodies or reduced transmission of influenza virus from the mother to the baby. Between 30-50% of mothers of infants with influenza illness were themselves affected by influenza illness at the time when their child was ill.

The protection of the infants less than six months of age against influenza illness is of high public health importance, as these infants are the most severely affected by influenza illness in high-income and low-middle income countries; and there is no licensed influenza vaccine for this age-group. Previous studies from Soweto have shown that the risk of hospitalisation for influenza illness in infants under 6 months of age was approximately 35-fold greater compared to adults; and infants were also the greatest at-risk age-group for influenza-associated death in South Africa. Globally each year, influenza illness is estimated to cause up to 196 000 deaths in children under-five years of age, with a large proportion of these deaths likely occurring in the first six months of life.

The findings from this study are expected to result in a paradigm shift with regard to advocacy and adoption of influenza vaccination of pregnant women in low-middle income countries, to protect both the mother and her child.

This particular study was funded by a USD 10 million grant from the Bill and Melinda Gates Foundation.

Madhi SA, Cutland CL, Kuwanda L, Weinberg A, Hugo A, Jones S, **Adrian PV,** van Niekerk N, Treurnicht F, Ortiz JR, Venter M, Violari A, Neuzil KM, Simões EAF, **Klugman KP** and **Nunes MC** (2014). Influenza Vaccination of Pregnant Women and Protection of Their Infants. *The New England Journal of Medicine*; 371:918-31. DOI: 10.1056/NEJMoa1401480

Developmental pathway for potent V1V2-directed HIV-neutralising antibodies

A future HIV vaccine is widely assumed to require broadly neutralising antibodies, which are able to recognise and neutralise diverse viruses from across the world. No vaccine so far has managed to elicit these kinds of antibodies, but some HIV infected people are able to naturally develop broadly neutralising antibodies. Understanding how and why these rare people are able to make these antibodies may therefore provide a roadmap for HIV vaccine design.

In a paper published in *Nature*, WITS/NICD researchers **Associate Professor Penny Moore**, **Jinal Bhiman** (a PhD student) and **Professor Lynn Morris**, along with a consortium of researchers in South Africa and the USA describe the developmental pathway of one such antibody.

Antibodies which target a conserved epitope in the V2 region of the HIV envelope develop fairly frequently during infection. These are characterised by long CDRH3 'arms', which are required to penetrate through the glycan shield that protects the HIV envelope. Until now it was not clear how these long CDRH3s developed. In this study, the team isolated a family of V2-directed antibodies with long CDRH3s from an infected donor, CAP256. Using deep sequencing of the antibody genes over three years of infection, they showed that the unmutated common ancestor (UCA) of the antibody family emerged 30-38 weeks after infection. Interestingly, the UCA contained a fully formed long CDRH3, which arose entirely as a result of VDJ recombination, and in contrast to the idea that this might take many years to develop.

A second part of the study defined exactly how breadth developed in CAP256. The UCA was initially able only to neutralise the virus that superinfected CAP256 at 15 weeks post-infection. However in response to extensive viral diversification, there was rapid somatic hypermutation resulting in these antibodies becoming broadly reactive for HIV within four months.

This study demonstrates that a future vaccine targeting this region will rely on immunogens that are able to engage the rare subgroup of naïve B cells expressing B cell receptors with pre-formed long CDRH3. However this work also suggests that sequential immunogens that mirror viral evolution may be needed to drive the development of breadth. Overall, the precise delineation of the developmental pathway for the CAP256 antibody lineage should provide a basis for attempts to elicit broad V1V2-directed HIV-1-neutralising antibodies through vaccination.

PhD student Jinal Bhiman holds a shirt printed with the crystal structure of the CAP256 antibody, showing the long CDRH3 protruding above the framework.

Doria-Rose NA, Schramm CA, Gorman J, **Moore PL**, **Bhiman JN**, Staupe RP, Ernandes MJ, Pancera M, Altae-Tran HR, Bailer RT, Crooks ET, Garret N, Georgieve IS, Longon NS, Louder MK, Nonyane M, O'Dell S, McKee K, Roark RS, Rudoincell R, Schmidt S, Sheward DJ, Soto C, **Wibmer CK**, Willamson C, Yang Y, Zhang Z. NISC Comparative Sequencing programme, Mullikan JC, Binley JM, Abdool Karim S, **Morris L**, Kwong PD, Shapiro L and Mascola JR (2014). Developmental pathway for potent V1V2-directed HIV-1-neutralisingantibodies. *Nature*. doi:10.1038/nature13036.

The African genome variation project

The African Genome Variation Project (AGVP), funded by the Wellcome Trust, the Bill and Melinda Gates Foundation and the UK Medical Research Council, is a multi-country initiative aimed at facilitating medical genetic research in Africa. The University of the Witwatersrand has been a partner in this ongoing collaborative project and was represented by **Professor Michèle Ramsay, Professor Stephen Tollman, Professor Shane Norris and Dr Ananyo Choudhury** (a Postdoctoral Fellow from the Sydney Brenner Institute of Molecular Bioscience, who was part of the bioinformatics analysis team) in the AGVP marker paper published in the journal *Nature*.

This landmark paper details the largest and most extensive investigation of the genomics of African populations. Genetic data were generated from 1,481 individuals from 18 ethno-linguistic groups across seven African countries (Ethiopia, the Gambia, Ghana, Kenya, Nigeria, South Africa and Uganda) using a genotyping array that tested 2.5 million sites in the genome. In addition, whole genome sequences for 320 individuals from some of these ethno-linguistic groups were generated for the study. The study found 30 million genetic variants in the sequenced populations, a fourth of which have not previously been identified in any population group. It was also shown that in spite of this genetic diversity, it is possible to design

new methods and tools to help identify and understand genetic risk factors for disease in Africa.

Most of the sedentary populations in sub-Saharan Africa are descended from the Niger-Kordofanian language group, which includes Bantu-speakers, populations of agriculturists and pastoralists thought to have expanded across large parts of Africa around 5,000 years ago. The population genetic analyses from the AGVP study show evidence for genetic admixture between hunter-gatherers and the Bantu populations that occurred at different time points in different parts of the continent. This provides important insights into hunter-gatherer populations that likely existed in Africa prior to the Bantu expansion. Interestingly, the hunter-gatherer admixture was found to be highest (estimated to be greater than 20%) in the Zulu and Sotho populations from South Africa. Moreover, evidence for complex and regionally distinct admixture with multiple Eurasian populations across sub-Saharan Africa over time was also observed. One of these dates back to about 9,000 years ago in West Africa, supporting the hypothesis that Europeans may have migrated back to Africa during this period.

The study identified novel and supporting evidence of how diverse local environmental forces, such as climate and exposure to infectious agents, have shaped the genomes of Africans and their susceptibility to many conditions, including malaria, Lassa fever and trypanosomiasis (sleeping sickness). The stark differences in genetic variant frequencies in populations from endemic and non-endemic regions suggest that this effect may be in response to the different environments these populations have been exposed to over time.

The data from the AGVP can be accessed through application to the African Partnership for Chronic Disease Research (APCDR) at Cambridge University **(www.apcdr.org/)**. This is in line with the international trend toward open access to data for the global benefit of biomedical research. The AGVP data will be pertinent to the design of genomic studies in a variety of African populations.

Gurdasani, D, Carstensen, T, Tekola-Ayele, F, *et al*. (2015). The African Genome Variation Project shapes medical genetics in Africa. *Nature*, 517(7534), 327–332.

Viral variants that initiate and drive maturation of V1V2-directed HIV-1 broadly neutralising antibodies

Jinal Bhiman from the Department of Virology School of Pathology published a study entitled 'Viral variants that initiate and drive maturation of V1V2-directed HIV-1 broadly neutralising antibodies' in the prestigious journal *Nature Medicine*. Jinal was supervised by Professors Penny Moore and Lynn Morris.

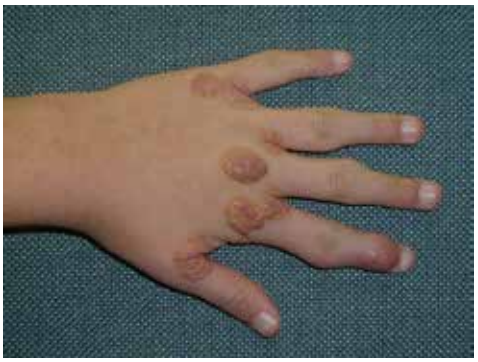
Professors Moore and Morris led the team of 17 researchers from the University of the Witwatersrand, the Centre for the AIDS programme of Research in South Africa (CAPRISA), and University of Cape Town who were involved in this study. The study focusses on a process that could drive the production of broadly neutralising antibodies.

Jinal Bhiman and co-authors describe how the changing viral swarm in an HIV infected person could drive the generation of antibodies able to neutralise HIV strains from across the world. The study also has important implications for the design of a protective HIV vaccine that has the potential to fight and destroy various mutations of the Human Immune deficiency Virus (HIV). The researchers say that this ground-breaking research provides insights that will assist in research which underpins the design of vaccines. This will initiate and shape the maturation of broadly neutralising antibodies in HIV-negative individuals.

Bhiman JN, Anthony C, Doria-Rose NA, Karimanzira O, Schramm CA, Khoza T, Kitchin D, Botha G, Gorman J, Garrett NJ, Karim SSA, Shapiro L, Williamson C, Kwong PD, Mascola JR, **Morris L** and **Moore PL** (2015). Viral variants that initiate and drive maturation of V1V2-directed HIV-1 broadly neutralising antibodies. *Nature Medicine*. doi: 10.1038/nm.3963. [2(11):1:332_6]

New drug achieves significant additional cholesterol lowering

Familial hypercholesterolaemia (FH) is one of the most common inherited disorders and affects between 1:250 to 1:300 persons worldwide. Statins are remarkable drugs but, even at high dose, only lower Low-Density Lipoprotein (LDL) cholesterol by 50-55%. Therefore, even in combination with other lipid-lowering drugs like ezetimibe, many patients with FH do not get their LDL-cholesterol levels to target.



The RUTHERFORD-2 study was a large worldwide multinational study of the use of the PCSK9-inhibitor, evolocumab, in over 300 patients with heterozygous familial hypercholesterolaemia (HeFH) who had elevated LDL-cholesterol levels despite statin with or without ezetimibe therapy. Evolocumab administered either 140 mg biweekly or 420 mg monthly as a subcutaneous injection, much like an insulin injection, on top of high dose statin with or without ezetimibe, was well

tolerated with minimal side effects and markedly reduced levels of LDL cholesterol or 'bad cholesterol' by an additional 60% compared to placebo. This allowed the majority of HeFH patients to achieve LDL-cholesterol target levels (<1.8 mmol/L).

In the TESLA study, which was also an international study, **Professor Frederick Raal** and colleagues in a Lancet publication showed that even those individuals with the much rarer 'double dose' of inherited cholesterol - homozygous FH - also respond to evolocumab, although not as well. However, for these patients who have markedly elevated LDL-cholesterol levels of over four times normal, any reduction in LDL-cholesterol is of benefit, so the overall reduction in LDL-cholesterol of 30% in these subjects was unexpected and will definitely be of benefit.

The addition of evolocumab is now able to get the majority of FH patients to LDL-cholesterol target and is able to 'cure' heterozygous FH. However the challenge remains to identify those patients with an asymptomatic condition which often results in sudden death from a heart attack in the prime of their lives. Both the RUTHERFORD-2 and TESLA studies were relatively short-term studies (3 months) but if the reductions in LDL-cholesterol can be maintained long-term and if the therapy is found to reduce cardiovascular events, as is being studied in a large cardiovascular outcome study (FOURIER study), the addition of evolocumab will allow patients with FH to live healthier, longer lives.

Raal FJ, Stein EA, Dufour R, Turner T, Civeira F, Burgess L, Langslet G, Scott R, Olsson AG, Sullivan D, Hovingh GK, Cariou B, Gouni-Berthold I, Somaratne R, Bridges I, Scott R, Wasserman SM, Gaudet D, for the RUTHERFORD-2 Investigators (2014). PCSK9 inhibition with evolocumab (AMG 145) in heterozygous familial hypercholesterolaemia (RUTHERFORD-2): a randomised, double-blind, placebo-controlled trial. *Lancet*. published online Oct 2.

Raal FJ, Honarpour N, Blom DJ, Hovingh GK, Xu F, Scott R, Wasserman SM, Stein EA, for the TESLA Investigators (2014). Inhibition of PCSK9 with evolocumab in homozygous familial hypercholesterolaemia (TESLA Part B): a randomised, double-blind, placebo-controlled trial. *Lancet*, published online Oct 2.

New guidelines for painful neuropathy

Painful neuropathy affects between 6% and 10% of adults, with this prevalence being significantly greater (up to 40%) among individuals with specific conditions (e.g., HIV infection, diabetes mellitus, stroke). The pain is associated with significant decreases in quality of life and socioeconomic well-being, even more so than non-neuropathic chronic pain. The pain is often difficult to treat with atypical analgesic drugs forming the cornerstone of therapy. January 2015 saw the publication of a new pharmacological treatment guideline for neuropathic pain in The Lancet Neurology.

The study undertaken by the Neuropathic Pain Special Interest Group (NeuPSIG) of the International Association for the Study of Pain (IASP) provides updated evidence-based recommendations following an extensive new systematic review and meta-analysis of clinical trials. Importantly, data were sourced from published and unpublished clinical trials and included an assessment of whether publication bias significantly distorted effect sizes (~10% inflation). An international panel of experts in neuropathic pain graded the evidence and made recommendations. **Professor Peter Kamerman** from the School of Physiology, Wits Faculty of Health Sciences was the only representative from Africa.

The panel made strong recommendations for the use of tricyclic antidepressants, serotonin-noradrenaline reuptake inhibitors, pregabalin and gabapentin for first-line monotherapy. A weak recommendation was made for the use of tramadol as second-line treatment and strong opioids and botulinum toxin A (peripheral neuropathic pain only) as third-line therapy. An indicator of the importance of the article and the attention it is attracting is reflected by its rating in the top 5% of all articles ever tracked by Altmetric.

Finnerup NB, Attal N, Haroutounian S, McNicol E, Baron R, Dworkin RH, Gilron I, Haanpää M, Hansson P, Jensen TS, **Kamerman PR**, Lund K, Moore A, Raja SN, Rice ASC, Rowbotham M, Sena E, Siddall P, Smith BH, Wallace M. Pharmacotherapy for neuropathic pain in adults: a systematic review and meta-analysis. *Lancet Neurol*. 2015;14:162–173.

Valvular disease in pregnancy

A recent single centre cohort study of 225 consecutive women presenting with cardiac disease in pregnancy at a dedicated cardiac disease in maternity clinic at Groote Schuur Hospital, Cape Town, highlighted the complex burden of symptomatic rheumatic heart disease (26%), congenital heart disease (32%) and severe cardiomyopathy (27%), amongst other cardiac conditions (Sliwa et al. Heart 2014). Mortality occurred typically in the postpartum period beyond the standard date of recording maternal death as also highlighted in a recent publication in *The Lancet* (Kassebaum 2012).

A confidential inquiry into maternal death in South Africa reported that, of the 4867 deaths over two years, 14% were due to hypertensive disorders, with another 8.8% due to medical and surgical conditions (NCCEEMD 2012). This study has identified cardiac disease as the most common species of medical disorders likely to account for maternal mortality. Overall, medical disorders complicating pregnancy were the fourth most common cause of maternal death during pregnancy. Within this background **Professor Karen Sliwa**, Director of the Soweto Cardiovascular Research Unit was asked to prepare an invited review on the management of valvular disease in pregnancy (Sliwa EHJ 2015). She invited an obstetrician and cardiothoracic surgeon and included colleagues from high and lower-to-middle

income countries to provide a practical guide on the management of valvular disease (e.g. as in rheumatic heart disease) in pregnancy, including pre-conception counselling, risk stratification as well as surgical and medical management.

Sliwa K, Libhaber E, Elliott C, Momberg Z, Osman A, Zühlke L, Lachmann T, Nicholson L, Thienemann F, Roos-Hesselink J, Anthony J. Spectrum of cardiac disease in maternity in a low-resource cohort in South Africa. Heart 2014; doi: 10.1136/heartjnl-2014-306199. IF 6.0 Kassebaum NJ, Bertozzi-Villa A, Coggeshall MS, **Sliwa K**, Lozano R, et al. Global, regional, and national levels and causes of maternal mortality during 1990–2013: a systematic analysis for the Global Burden of Disease Study 2013. *Lancet*. 2014:384:980-1004. IF 39.0

First national survey of pulmonary tuberculosis trends

With an estimated 400 000 new cases a year, South Africa has the highest annual incidence of pulmonary tuberculosis (TB). HIV infection has contributed to the burden of TB and as much as 70% of TB cases are co-infected with HIV. Despite the scale of this public health problem, there has been no published data on national or sub-national trends of microbiologically confirmed pulmonary tuberculosis (mPTB).

Researchers from the National Institute for Communicable Diseases (NICD), including Ms **Ananta Nanoo**, a PhD student and **Dr Alane Izu**, a Postdoctoral Fellow from the Respiratory and Meningeal Pathogens Research Unit (RMPRU), published the results of their study in the prestigious and highest ranking infectious diseases journal, *The Lancet Infectious Diseases* in June 2015. They show that mPTB incidence in South Africa peaked in 2008 and has been declining since. This is attributable to the expansion of antiretroviral therapy (ART) coverage despite ongoing increases in HIV prevalence. Sub-national data reveal that these trends persist in different parts of the country with the TB epidemic peaking earlier in some provinces and later in others, depending on the rate of expansion of ART coverage. The highest rates of mPTB were observed in KwaZulu-Natal (1307/100 000; 95% CI 1300-1314), with this province also having the highest numbers of cases annually. Men and women aged between 25-44 years have the highest mPTB incidence rates.

In addition, the researchers analysed data from the national Electronic TB and Electronic Drug Resistant TB Registers. While the incidence trends of cases registered for treatment mirror those in mPTB incidence, the findings highlight gaps between the numbers of cases diagnosed and those initiating treatment. As many as 33% of people diagnosed with TB in 2006 were not registered on treatment that year; although this decreased over time, the figure remains high, at 20% in 2012.

The research represents a landmark as it signals the establishment of a national micro-

biologically confirmed TB surveillance platform and the first time that such data has been published for South Africa.

The World Health Organisation has set ambitious targets as part of the post-2015 End TB Strategy, requiring countries to reduce TB incidence rates annually. The researchers have demonstrated that South Africa has begun to reduce TB incidence. However this gain needs to be sustained and improved by initiating and retaining on treatment as many TB cases as possible.

Nanoo A, **Izu A**, **Ismail NA**, **Ihekweazu C**, Abubakar I, Mametja D and **Madhi SA** (2015). Nationwide and regional incidence of microbiologically confirmed pulmonary tuberculosis in South Africa, 2004–12: a time series analysis. *Lancet Infect Dis*15(9): 1066–1076.

Marker paper for the human heredity and health in Africa consortium (H3Africa)

The University of the Witwatersrand is the host of a Collaborative Centre which is a Wits-INDEPTH partnership. A number of Wits researchers across faculties were co-authors on the Marker paper for H3Africa entitled 'Enabling the genomic revolution in Africa' which was published in Science. The publication included 17 authors from the AWI-Gen project (Wits: **Professors Ramsay M** (PI), **Hazelhurst S**, **Norris S**, **Crowther N**, **Tollman S**, **Kahn K** and **Soodyall H**, **Drs Lombard Z**, **Carstens N**, **Wade A** and **Gomez-Olive X**. INDEPTH: Sankoh O (Co-PI); Agonogo G, Alberts M, Kyobutungi C, Oduro A, Sorgho H and Halidou T). Wits also hosts a node of the Pan-African Bioinformatics Network, H3ABioNet, under the leadership of Scott Hazelhurst. One of the primary objectives of the Consortium and of AWI-Gen is building and developing capacity for health-related genomic research in Africa. H3Africa has a large African footprint (see map) and the AWI-Gen project has partners in Ghana, Burkina Faso and Kenya as well as the University of Limpopo. H3Africa was established on the belief that diseases and non-medical issues relevant to Africans can be best explored in partnership with inhabitants of Africa (both researchers and research participants) who can provide a rich context and deep knowledge of the continent's past and present environment. African genomes and the unique genetic structure of African populations harbor many clues to understanding human evolutionary history which, in turn, can help shed light on disease etiology.

The H3Africa Consortium has developed an approach that attempts to balance (i) protection of the ability of African scientists to be the first to analyse and publish findings about their main research questions, given their limited resources and capacity to deal with data as quickly as scientists in developed countries with (ii) the benefit of global access to H3Africa data and biospecimens.

The H3Africa Consortium (2014). Enabling the genomic revolution in Africa. *Science* 344(6190): 1346-1348.

www.sciencemag.org/content/344/6190/1346.full

Common longitudinal studies are unsuitable to guide clinical restorative dentistry

New findings show that the results of common longitudinal studies without control treatments are misleading when choosing the correct type of tooth restorations in clinical dental practice.

For decades, restorative dentistry has been informed by volumes of clinical longitudinal studies, which do not include control treatments but only investigate the success and failures of novel tooth restorations over periods of time. In order to establish which dental restoration type performs best, particularly when placed in posterior load bearing teeth, prestigious expert reviews have traditionally offered advice to the dental profession on the basis of simply comparing the success rates between different longitudinal studies.

The **Systematic Review Initiative for Evidence-based Minimum Intervention in Dentistry** (SYSTEM) has investigated the accuracy of comparing results from longitudinal studies with that from randomised control trials (RCT). RCTs are considered the gold standard in investigating the merits of clinical interventions. SYSTEM's investigation shows that there is very poor agreement between these results. While comparisons within an RCT would show that the number of treatment failures of two treatments is exactly the same, the comparison between different longitudinal studies would erroneously show a 64% higher failure rate of one type of treatment over the other. Accordingly, expert reviews would mistakenly recommend the merit of placing one type of tooth restoration above another.

Largely for this very reason, high-viscosity glass-ionomer restorations have been regarded as clinically inferior to that of silver amalgam in dental practice. When the results of all longitudinal studies published during the last ten years, for high-viscosity glass-ionomer restorations were compared with that of amalgam restorations placed in posterior load bearing teeth; a largely higher performance for amalgam was found. However, no difference between high-viscosity glass-ionomer and silver amalgam was found in all randomised control trials, published during the same time period.

Owing to the lack of a randomly selected comparative group, longitudinal studies are vulnerable to many sources of error. These may include misleading factors whose effects may increase with the length of the study period. Longitudinal studies of tooth restorations thus suggest incorrectly that their results are only due to the chosen restorative material type and not to any other influencing factors. Longitudinal studies with longer follow-up periods are commonly regarded as of higher clinical value than those with shorter periods. The irony is that the results of the former may be even more misleading than those of the latter.

Ease and relative low costs make clinical longitudinal studies ideal for the collection of first information concerning new fields of investigation and thus are most suitable in the preparation of complex and costly randomised control trials. However, clinical longitudinal studies are not suitable for guiding clinical practice and may become the cause of the fallacious condemnation of one type of intervention above others, as has been the unfortunate fate of tooth restorations placed with high-viscosity glass-ionomers for years.

SYSTEM's findings suggest that clincial longitudinal studies are unsuitable to guide clincial practice and that clincial decisions should instead, be based on the results of well conducted randomised control trials.

Mickenautsch S, SYSTEM Research note on: How should competing clinical interventions be compared in dentistry? – A simulation-based investigation (2013). *J Minim Interv Dent* ; 6: 73-80.

Mickenautsch S, **Yengopal V**. Direct contra naïve-indirect comparison of clinical failure rates between high-viscosity GIC and conventional amalgam restorations (2013). An empirical study. *PLoS One*; 8: e78397.

The potential impact of a 20% tax on sugar-sweetened beverages

A suggested tax on sugar-sweetened beverages has been given more credence in a research paper by academics from the Wits School of Public Health, University of the Witwatersrand. The paper, entitled '*The potential impact of a 20% tax on sugar-sweetened beverages on obesity in South African adults*: *A mathematical model*', was published in the prestigious open-access journal *PLoS One* in August 2014.

Authors **Manyema M**, Dr Veerman L, Dr Chola L, **Tugendhaft A**, **Professor Sartorius B**, Professor Labadarios D and **Professor Hofman K**, hail from several institutions contributing to the paper.

The paper measures the effect of a 20% tax on sugar-sweetened beverages (SSBs) on the prevalence of obesity among adults in South Africa. The study found that taxing SSBs could impact the burden of obesity in South Africa, particularly in young adults, as one component of a multi-faceted effort to prevent obesity. By instituting a 20% tax, in other words a 20% price increase per unit of SSB, a 3.8% reduction in obesity in men and a 2.4% reduction in obesity in women is predicted, translating to a decrease of more than 220 000 obese adults in South Africa.

South Africans have become more obese over the last 30 years and is now considered the most obese country in Sub-Saharan Africa. Over half of the country's adults are now overweight and obese; this fraction includes 42% of women and 13% of men who are obese. While SSBs alone may not be the only reason for an increase in body fat, these drinks do not contain any essential nutrients, have high sugar content and a strong link to weight gain.

The paper follows a recommendation by the South African Minister of Health, Dr Aaron Motsoaledi, on the need to regulate foods high in sugar in order to address obesity and its related diseases. The President of Mexico instituted a tax on SSBs in 2013. There is also evidence from the United Kingdom, Ireland, India and Brazil, showing that policies such as a tax on SSBs can reduce consumption, leading to reductions in weight of people in the population.

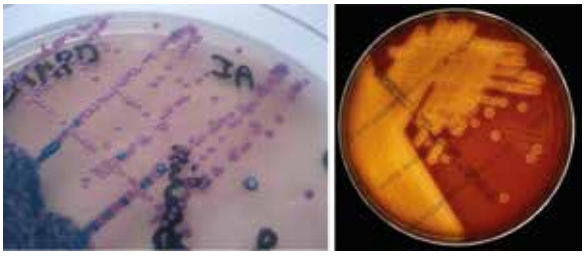
Manyema M, Veerman LJ, Chola L, **Tugendhaft A**, **Sartorius B**, Labadarios D, **Hofman KJ**. The Potential Impact of a 20% Tax on Sugar-Sweetened Beverages on Obesity in South African Adults: A Mathematical Model. *PLoS One*, 2014. DOI: 10.1371/journal.pone.0105287.

Group B streptococcus

Group B Streptococcus (GBS) is a leading cause of neonatal sepsis with a high incidence in South Africa (3 per 1000 live births). Effective interventions for reducing early onset disease (antenatal screening and intrapartum antibiotics) are resource intensive and seldom accessible to women in developing countries, including South Africa. GBS capsular polysaccharide-protein conjugate vaccines (GBS-CV) aimed at immunisation of pregnant women to protect infants, are under development.

Three PhD students, being supervised by **Professor Shabir Madhi** in the MRC Respiratory and Meningeal Pathogens Research Unit/ DST/NRF SARCHI on Vaccine Preventable Diseases at the University of the Witwatersrand (RMPRU), based at Chris Hani Baragwanath Academic Hospital (CHBAH), have published research manuscripts on various aspects of GBS.

Rectovaginal colonisation with GBS in pregnant women is the main risk factor associated with GBS disease in infants. Almost 30% of pregnant women in Soweto are colonised with GBS at 31-35 weeks gestation1. In a recent manuscript, **Gaurav Kwatra** (Scientist, RMPRU) described that GBS serotype- specific capsular polysaccharide (CPS) antibody levels are associated with lower risk of acquisition of rectovaginal GBS colonisation during pregnancy. Serum CPS IgG values of ≥1µg/mL for serotype V and ≥3µg/mL for serotypes Ia and III were significantly associated with protection against rectovaginal acquisition of the homotypic serotype. Functional CPS antibody titres measured by opsonophagocytic activity (OPA) correlated more strongly than IgG concentrations in relation to new acquisition of GBS serotypes Ia and III. A GBS vaccine that induces sufficient capsular antibody in pregnant women could protect against rectovaginal colonisation in late pregnancy (1) (2).



Dr Clare Cutland (Senior Research Medical Officer, RMPRU) confirmed that GBS incidence between 2004 and 2008 remained high (2.72/ 1000 live births) in Sowetan infants as compared to studies in the late 1990's, with early-onset disease (EOD, 0-6 days old) incidence of 1.50 and late onset disease (LOD, 7-90 days) incidence of 1.22/ 1000 live births. Infants exposed to maternal HIV infection had a 2.25 fold (95% CI 1.84- 2.76) greater risk of developing GBS disease than HIV-unexposed infants. This was evident for EOD (2.10 vs. 1.24 cases/ 1000 live births; risk ratio 1.69, 95% CI 1.28-2.24) but more so for LOD (2.36 vs. 0.74 cases/ 1000 live births; risk ratio 3.18, 95% CI 2.34-4.36). Assuming that national incidence of GBS is similar to incidence in Sowetan infants, a trivalent GBS-CV including the three most common invasive GBS serotypes (Ia, Ib & III), could prevent approximately 2105 GBS cases and 278 GBS-related deaths in South African infants annually (3).

Dr Ziyaad Dangor (Paediatrician, CHBAH) has confirmed that despite implementation of antiretroviral therapy in HIV-infected

pregnant women, HIV-exposed infants presenting to one of Johannesburg's three Wits-affiliated teaching hospitals in 2013 had a significantly increased risk of developing late onset GBS disease than HIV-unexposed infants (risk ratio 4.67, 95% CI 2.24-9.74). Additionally, HIV-exposed infants were 6.85 fold (95% CI: 2.64-18.31) more likely to present with meningitis than HIV-unexposed infants. GBS-affected infants were 13.18 (95% CI: 1.44–120.95) more likely to have neurological sequelae at 6 months of age than matched controls (4).

A phase-III efficacy study of a trivalent GBS-CV under development will require a large sample size (approximately 70 000) in a setting with a high burden of GBS disease but minimal access to preventative strategies. Currently, the RMPRU is enrolling 35000 mother-newborn pairs into an observational study at CHBAH which aims to establish a serological correlate of protection, which could potentially be used as an alternative route to vaccine licensure.

In conclusion, the burden of invasive GBS disease in South Africa is partly driven by the high maternal HIV-prevalence. A GBS vaccine will prevent the majority of disease in this setting and possibly reduce maternal GBS colonisation.

1. **Kwatra G**, **Adrian PV,** Shiri T, **Buchmann EJ**, **Cutland CL**, **Madhi SA**. Serotype-specific acquisition and loss of group B streptococcus recto-vaginal colonisation in late pregnancy. *PLoS One*. 2014; 9(6):e98778.
2. **Kwatra G**, **Adrian PV**, Shiri T, **Buchmann EJ**, **Cutland CL**, **Madhi SA**. Natural acquired humoral immunity against serotype-specific group B Streptococcus recto-vaginal colonisation acquisition in pregnant women. *Clinical microbiology and infection*: the official publication of the European Society of Clinical Microbiology and Infectious Diseases. Feb 10 2015.
3. **Cutland CL**, Schrag SJ, Thigpen MC, *et al*. Increased Risk for Group B Streptococcus Sepsis in Young Infants Exposed to HIV, Soweto, South Africa, 2004-2008(1). *Emerg Infect Dis*. Apr 2015;21(4):638-645.
4. **Dangor Z**, **Lala SG**, **Cutland CL**, *et al*. Burden of invasive group B streptococcus disease and early neurological sequelae in South African infants. *PLoS One.* 2015;10(4):e0123014.

Online bioinformatics tools for sequence analysis

Bioinformatics is a field of study concerned with computational analysis and storage of biological data. The field is broad, ranging from the study of DNA and proteins, to structural biology, drug design and comparative genomics. **Dr Trevor Bell** and **Professor Anna Kramvis**, from the Hepatitis Virus Diversity Unit (HVDRU) in the Department of Internal Medicine, have developed a number of free, online bioinformatic tools, described in several Open Access papers (1-4).

The standard workflow in the HVDRU includes DNA extraction, PCR amplification, direct DNA sequencing, viewing and checking of chromatograms, preparation of curated sequences, multiple sequence alignment, sequence analysis, serotyping, genotyping, phylogenetic analysis and preparation of sequences for submission to public databases such as GenBank. The tools developed in the HVDRU are used at several of the steps in this process,

with a particular focus on processing of chromatograms and DNA sequence data. Although developed and tested with sequence data from hepatitis B virus (HBV), sequences from other organisms can be submitted to most of the tools.

The suite includes the following tools: plot and visualise chromatogram quality scores; generate contigs directly from forward and reverse chromatograms; conservatively clean or curate sequence data; extract HBV protein sequences; calculate 2-by-2 contingency tables; determine HBV serotype; merge long overlapping sequence fragments; summarise and graph nucleotide or mutation distribution; automate phylogenetic analysis and prepare fragments for GenBank submission. Two tools have been developed to assist with processing and analysis of ultra-deep re-sequencing (pyrosequencing) data.

These stand-alone, web-based tools allow users on any operating system platform to access the tools they require from any location with an internet connection, without needing to learn a new bioinformatics software suite or a new programme and without having to install any software on to their computer. The appropriate tool is simply used as and when required. They are available online at no cost and do not require extensive computer skills or training to use. Data can easily be processed by a mixture of online tools and other software packages, as standard file formats are used. Using specific tools designed to perform a single task, means that workflows can be partitioned into logical units and that processes or analyses can be easily repeated.

The tools are available online on the HVDRU server at the following addresses:

http://hvdr.bioinf.wits.ac.za/tools

http://hvdr.bioinf.wits.ac.za/SmallGenomeTools

The source code for some of the tools is released under the GPL version 2 and is available online via GitHub, at the following address:

https://github.com/DrTrevorBell/SmallGenomeTools

The tools are described in the following papers:

1. **Bell TG**, **Kramvis A** (2015). Bioinformatics tools for small genomes, such as hepatitis B virus. *Viruses*, 7, 2:781-97.
2. **Bell TG**, **Kramvis A** (2013). Fragment merger: an online tool to merge overlapping long sequence fragments. *Viruses*, 5, 3:824-33.
3. **Bell TG**, **Kramvis A** (2013). Mutation Reporter Tool: an online tool to interrogate loci of interest, with its utility demonstrated using hepatitis B virus. *Virology Journal*, 10:62.
4. **Yousif M**, **Bell TG**, Mudawi H, Glebe D, **Kramvis A** (2014). Analysis of ultra-deep pyrosequencing and cloning based sequencing of the basic core promoter/precore/core region of hepatitis B virus using newly developed bioinformatics tools. *PLoS ONE*, 9, 4:e95377.

Laboratory trial results in tooth restoration

Researchers from the **Systematic Review Initiative for Evidence-based Minimum Intervention in Dentistry (SYSTEM)** conducted a systematic search of the current dental literature for laboratory and controlled clinical trials, which directly compared the efficacy of high-viscosity glass-ionomer cement (HVGIC) with amalgam as the current gold standard for placing tooth restorations. These trials were

identified through the search of international data sources, such as CENTRAL accessed via the Cochrane Library; MEDLINE accessed via PubMed; Biomed Central; Database of Open Access Journals (DOAJ); IndMed; OpenSIGLE and Google Scholar. After the literature review, the laboratory and clinical results of the identified trials were analysed and their joint effect magnitudes and effect direction statistically compared. While the laboratory trials indicated inferiority of HVGIC to amalgam, no significant differences between both types of tooth restorations using either material were found in clinical trials. This might not be translated into any clinically higher fracture rate, because placed glass-ionomer restorations are generally smaller than amalgam fillings. Furthermore, HVGIC placed in tooth cavities may shift due to its potentially lower wear resistance. For these reasons, HVGIC restoration may not be exposed to the same extent of daily masticatoric forces in the oral cavity as are amalgam restorations. Therefore, while the laboratory measured material properties such as compressive strength, fracture toughness or microleakage of HVGIC may indeed be inferior to that of silver amalgam, these may not be sufficiently strong enough to translate into clinically meaningful differences, due to other influencing factors that are not present during laboratory trials.

The established evidence shows that laboratory results concerning HVGIC versus amalgam for tooth restorations have no similar effect direction and magnitude than that of controlled clinical trials. The reasons remain unclear but may be due to multifactor influences, particularly due to the lack of clinical factors that are absent in laboratory trials.

A large percentage of evidence concerning dental interventions is based on laboratory research. The apparent wealth of laboratory research or *in-vitro* evidence is sometimes used as the basis for clinical inference and for daily dental practice recommendations.

Traditionally, glass ionomer cements are considered not suitable for clinical use as a permanent filling material in the posterior dentition, due to poor mechanical properties measured *in-vitro*. Specifically, *in-vitro* measured low material strength and wear resistance have been stated as reasons why glass-ionomers cannot rival amalgam as truly universal posterior restorative material.

Hence, while laboratory trial results may provide valuable explanations for observed clinical phenomena and may serve during the hypothesis development process, they appear not to be suitable as the basis for clinical inference and clinical recommendations concerning HVGICs in daily dental practice.

Mickenautsch S, Yengopal V (2015). Do laboratory results concerning high-viscosity glass-ionomers versus amalgam for tooth restorations indicate similar effect direction and magnitude than that of Controlled Clinical Trials? - A Meta-Epidemiological Study. *PLoS ONE* 10(7): e0132246.

Body size perception linked to obesity in African women

Black African women in South Africa have the highest prevalence of obesity in the sub-Saharan African region, and this is predicted to increase over the next 15 years. Environmental factors have been associated with the increase in obesity in developing countries. However, little is known of how these factors contribute to the longitudinal change in body composition. Moreover, traditional African culture is accepting of large body size, suggesting that the obesity problem in African women could be associated with psychosocial factors. Findings from the longitudinal study entitled 'The role of lifestyle and psychosocial factors in predicting changes in body composition in black South African women' by **Philippe Gradidge** from the Centre for Exercise Science and Sports Medicine, and co-authors demonstrated that most of the women with obesity underestimated their actual body size.

This was associated with lower weight gain over the 10 year study period, and a greater desire to lose weight than women who correctly classified their current body size. Interestingly, two different groups of obese African women were identified, one group who wanted to lose weight and the other who were happy with their body weight. The authors recommended that different approaches may need to be developed to reduce the prevalence of obesity in these two distinct groups of obese African women.

This study also found that smoking was inversely associated with change in lean mass, suggesting that tobacco consumption may increase the early onset of sarcopaenia (loss of muscle mass) in African women as they age. Sarcopaenia has been shown to increase the risk of cardiometabolic diseases in a number of different population groups. Vigorous physical activity was associated with a lower change in measures of adiposity, suggesting that higher intensity physical activity protects against fat accumulation and the risk of cardiovascular disease. However, the number of subjects in this study cohort who participated in vigorous physical activity was very low, suggesting that future obesity intervention studies must focus on increasing the level of physical activity in this population.

Gradidge PJ, Norris SA, Micklesfield LK, Crowther NJ (2015). The role of lifestyle and psycho-social factors in predicting changes in body composition in black South African women. *PLoS One*, 10(7):e0132914.

The STI vaccine roadmap – a long overdue intervention

The name herpes comes from the Greek meaning to 'Creep and Crawl', and centuries later Shakespeare referred to herpes as the 'blister plague'. In the Middle Ages syphilis was treated with mercury leading to the expression that 'a night in the arms of Venus means a lifetime spent on Mercury'. Yet despite the

millenniums of suffering that sexually transmitted infections (STIs) have caused, and the enormous advances in symptomatic treatment and cure of STIs, the epidemics of syphilis, human papillomavirus (HPV), herpes, chlamydia, gonorrhea and trichomoniasis continue to cause pain, suffering and death. STIs don't only cause genital symptoms and psychosocial consequences, but they remain a major cause of pregnancy complications, infertility, enhanced HIV transmission, and are linked to a range of cancers including cervical cancer. An estimated 499 million curable STIs (gonorrhoea, chlamydia, syphilis, and trichomoniasis) occurred globally in 2008. In addition, well over 500 million people are estimated to have a viral STI such as herpes simplex virus type 2 or HPV at any point in time. Current STI prevention and control activities are hampered by behavioural, biological, technological and implementation challenges, and new prevention interventions are urgently needed.

In 2013, the World Health Organisation (WHO) organised a technical consultation on STI vaccines, focusing on the following five STIs: herpes simplex virus, *Chlamydia trachomatis, Neisseria gonorrhoeae, Trichomonas vaginalis,* and *Treponema pallidum* infections.

This consultation developed a Global Roadmap to Accelerate STI Vaccine Development and this was published by **Professor Helen Rees**, Director of the Wits Reproductive Health and HIV Research Institute in a special issue of the journal *Vaccine*.

The scientific challenges, concerns about return on investment and the social stigma attached to STIs, has discouraged this area of research and development. But new opportunities now exist that have renewed interest in this field of research. First has been the remarkable success demonstrated by the development and introduction of Hepatitis B vaccines and more of HPV vaccines. The uptake and impact of both these vaccines demonstrated that with the correct investment in science and a careful analysis of the public health need and of potential global markets, breakthroughs can be achieved in the field of STI vaccines. Secondly, the adoption by the World Health Assembly of the Decade of Vaccines and the strategic direction laid out in the Global Vaccine Action Plan (GVAP) has provided the field with a global push towards new innovation for previously neglected diseases. The GVAP states that 'New and improved vaccines are expected to become available during this decade, based on the robust vaccine pipeline that includes several products for diseases that are not currently preventable through vaccination.' Thirdly, the field of vaccine development and of public health partnerships is evolving. The reliance solely on big pharma to develop new vaccines is changing with the emergence of public-private partnerships. The establishment of these partnerships involving public health institutions, donor agencies, academia and the pharmaceutical industry, has the potential to create a new era for vaccine development.

For an academic institution like Wits, the opportunities for new partnerships to support innovative STI vaccine research from the bench to the community, offer relevant and exciting research opportunities, which Wits as a South African institution is uniquely placed to address.

Rees H, Holmes K (2014). The STI vaccine roadmap—A long overdue intervention. Vaccine; 32: 1638–1639. http://dx.doi.org/10.1016/j.vaccine.2014.01.055

Streptococcus pneumoniae in South Africa

In a recent publication, researchers from the **MRC/ WITS Respiratory and Meningeal Pathogens Research Unit**, Faculty of Health Sciences and the DST/NRF Chair in Vaccine Preventable Diseases, in collaboration with the Centre for Vaccines and Immunology at the National Institute for Communicable Diseases explored the acquisition of *Streptococcus pneumoniae* in children vaccinated with the 7-valent pneumococcal conjugate vaccine (PCV7) at 6, 14 and 40 weeks of age.

PCV7 was introduced into the South African national public immunisation programme in April 2009, with the use of a novel three dose schedule, with two primary doses, given to infants at 6 and 14 weeks of age and a booster given at 40-weeks of age and no catch-up campaign in older children. In this work the authors measured the prevalence of pneumococcal colonisation and the rate of new serotype acquisition in young children receiving PCV7 as part of the immunisation programme (PCV-2+1 cohort). They also compared the colonisation prevalence and acquisition of vaccine-serotypes and non-vaccine serotypes to two historical cohorts who had received a 3+1 PCV7 dosing schedule (PCV7-3+1 cohort) and another which was PCV-naïve.

Two hundred and fifty children aged 6-12 weeks were enrolled from December 2009 to April 2010 and followed up until 2 years of age. Participants had nasopharyngeal swabs collected on eight occasions that were used for bacterial culture. The two historical cohorts consisted of 124 infants enrolled into the PCV7-3+1 cohort and 124 PCV-naïve infants. In the current cohort S. pneumoniae was identified in 1081 (61.4%) of 1761 swabs collected. Pneumococcal colonisation peaked at 41-weeks of age (76.8%) and decreased to 62.8% by 2 years of age; PCV7-serotype colonisation decreased during the same period from 28.6% to 15.6%. Children from the PCV-2+1 cohort compared to PCV-naïve children were less likely to be colonised by PCV7-serotypes from 40-weeks to 2 years of age and acquired PCV7-serotypes less frequently. No differences in overall pneumococcal, PCV7-serotype and non-PCV7-serotype colonisation or new serotype acquisitions were detected comparing the current cohort to the historical cohort who received the 3+1 PCV7 schedule.

The authors concluded that the 2+1 PCV7 schedule implemented in South Africa was associated with a reduced risk of vaccine-serotype colonisation compared to historically unvaccinated children. Also, vaccine-serotype acquisition rate using the 2+1 schedule was similar to that in the 3+1 dosing cohort, suggesting that similar indirect protection against pneumococcal disease could be derived from either schedule in South Africa. This and other recent studies indicate that the 2+1 PCV7 dosing schedule implemented in South Africa has been effective in reducing acquisition, transmission and invasive pneumococcal disease in South Africa, even in the absence of a catch-up campaign of older children.

Nunes MC, Jones SA, Groome MJ, Kuwanda L, Van Niekerk N, von Gottberg A, de Gouveia L, Adrian PV, Madhi SA. Acquisition of Streptococcus pneumoniae in South African children vaccinated with 7-valent pneumococcal conjugate vaccine at 6, 14 and 40 weeks of age. *Vaccine*, 2015. 33(5): p. 628-34.

The prevalence of premalignant lesions of the uterine cervix in an unusual group of HIV-infected women

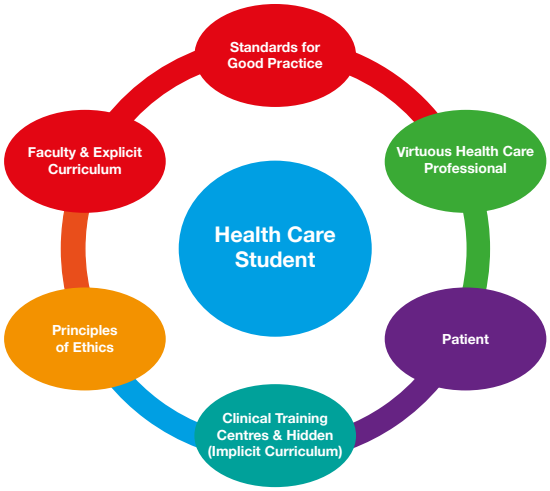
The usual cause of HIV infection is a gradual, but inexorable decline in immune function over a period of 8-10 years. In the absence of anti-retroviral therapy, the prognosis is poor with serial CD4 counts declining with time. However, a small proportion (1-3%) of HIV-infected individuals are able to resist the deleterious effects of HIV infection in the absence of HAART. These individuals are divided into two groups based on viral load and CD4 count respectively. The larger group is made up of people who for a period of 5-10 years have had CD4 counts greater than 500 cells/mm3: they are long term non-progressors (LTNP). There is another even more unusual presentation; patients who do have detectable HIV DNA or RNA but whose viral load is <400 copies/ml at least twice (400 copies/ml is the level of detection of earlier viral load assays). This group is called (interchangeably): HIV controllers, elite controllers (EC) or elite suppressors. Clearly these unusual individuals may provide valuable data on which to base novel HIV vaccines or HIV treatments. **Dr Neil Martinson** obtained funding from SACEMA and started identifying LTNP's and ECs from a variety of sources using an about-to-expire discounted viral load to screen potential ECs. Dr Martinson and his colleagues found over 100 potential study participants of whom about a third were not eligible to be in the study because either their CD4 count had declined by the time of the study visit or their viral load measured on state of the art equipment at NHLS, was too high (56.8%). Because our and others previous research work showed HIV-infected women were at high risk for the development of premalignant lesions of the cervix, they included and annual Papanicolou (pap) smear in the investigations on women participants. Pap smears were read at the NHLS Division of Cytology.

It was found that a high proportion of the women in this cohort with protective responses to HIV, were not able to contain human papilloma virus (HPV) - the oncovirus causally linked to most cervical cancers. Indeed the majority of women were found to have a premalignant lesion. Compared to other cohorts of HIV-infected women attending clinics, even those whose CD4 count was >500 at the pap smear, the women in this study appeared to have remarkably high prevalence of premaliginant lesions, despite being able to contain their HIV infection. In a published letter to the *Journal of Acquired Immunodeficiency Syndromes* (JAIDS), the researchers suggest that the HLA-C1 allele may be responsible for both the ability to resist HIV and the predilection to HPV infection. (1) This is a hypothesis that Professor Tiemessen is testing in her laboratory in Sandringham.

McLeod KE, Omar T, **Tiemessen CT**, Tshabangu N, **Martinson NA** (2014). Prevalence of Premalignant Cervical Lesions in Women With a Long-term Nonprogressor or HIV Controller Phenotype. *J Acquir Immune Defic Syndr*; 65(1):e29-32. doi: 10.1097/QAI.0b013e31829ce738. PubMed PMID: 24419070.

Professionalism a topical issue in the 21st Century

BCMP Framework of Professionalism



Professionalism remains a topical issue in the 21st Century among academics, practitioners and professional bodies. This interest is largely driven by the fact that the desired doctor-patient relationship demands that students are taught professionalism and communication, recognising that today's patients are knowledgeable and conscious of their rights and that health care providers have corresponding obligations to their patients. Furthermore, cases of self-reported breaches of professionalism by students, such as cheating and plagiarism, as well as clinicians who display negative and disruptive behaviours, have been documented as a growing concern. The Bachelor of Clinical Medical Practice (BCMP) degree with its unique offering required a teaching approach which provided for an accelerated transition from the classroom to the patient's bedside.

The study was led by Nontsikelelo Mapukata -Sondzaba, under the supervision of Professor Ames Dhai and Dr Norma Tsotsi. Professor Eleanor Ross provided expert input on qualitative methodology. The study sought to establish whether current teaching and assessment strategies as evidenced through exhibited personal attributes adequately prepared final year BCMP students to be reflective practitioners.

The most interesting findings were the tangible benefits associated with early exposure to the clinical setting, as the BCMP students appeared to have internalised the Hippocratic Oath as well as reflective practice which was patient-centred. Of concern was students coining the term 'pushing the line', which was perceived to be a South African concept borne out of a shortage of healthcare workers and a patient load that was a burden to the BCMP students.

Mapukata-Sondzaba N, **Dhai A**, **Tsotsi N** and **Ross E** (2014). Developing personal attributes of professionalism during clinical rotations: views of final year bachelor of clinical medical practice students. *BMC Medical Education*, 14:146. doi:10.1186/1472-6920-14-146.

A systematic review on stunting in South Africa

Stunting in children refers to a failure to grow optimally (height-for-age below -2SD from the median of the growth standard) and is usually caused by chronic undernutrition and/or infections. It is associated with poor physical and cognitive development in childhood and higher risks of cardiovascular and metabolic diseases in adulthood. In order to assess the change in prevalence of stunting in children under six years of age in South Africa between 1970 and 2013, **Dr Said-Mahomed** and co-authors undertook a systematic review. It was found that despite a reduction of about 6% between

1999 and 2013, stunting has been persistent in the last 20 years with prevalence between 20 and 30%. Moreover, disparities in the prevalence of stunting persist: black and mixed ancestry children, children under three years-old and children living in rural areas or in informal settlements are the most vulnerable. The authors recommended a multisectoral nutrition sensitive and equity driven approach to improve maternal health and infant feeding practices during the first thousand days of life. In addition, to allow the analysis of trends over time to improve the monitoring of the prevalence of stunting and to facilitate the evaluation of national intervention programmes, Dr Said-Mohamed and co-authors recommended the standardisation of nutritional survey's methodology (sampling, definition of stunting, data centralisation etc.) both regionally and nationally.

Said-Mohamed R, Micklesfield LK, Pettifor JM, Norris SA (2015), Has the prevalence of stunting in South African children changed in 40 years? *A systematic review BMC Public Health*, (15)534. doi: 10.1186/s12889-015-1844-9

The road to high blood pressure in adults

Hypertension is a rapidly increasing global public health problem that disproportionally affects low and middle income countries. South Africa has the highest prevalence of hypertension in adults (78%), according to a recent global report from the World Health Organisation (WHO) Strategic Advisory Group of Experts (SAGE) collaborative study.

Findings from the **MRC/WITS Developmental Pathways for Health Research Unit** (DPHRU) suggest that the road to hypertension in adulthood might start as early as in childhood and adolescence in the urban black South African population. The study, entitled 'Blood pressure tracking in urban black South African children: birth to twenty cohort', is the first in South Africa to show that elevated blood pressure in childhood and adolescence, classified according to blood pressure charts for age, sex and height, significantly persists into early adulthood. Using Birth to Twenty cohort data of children born in Soweto, Johannesburg in 1990, investigators reported that approximately a third to half of the participants of black ethnicity with elevated blood pressure at one occasion between childhood and adolescence, had sustained the elevated blood pressure status at 18 years of age.

This work may suggest the importance of routine blood pressure measurement in children for early identification of at-risk children, which may inform timely interventions to prevent complications associated with elevated blood pressure.

Kagura J, Adair L.S, Musa MG, Pettifor JM, Norris S.A (2015). Blood pressure tracking in urban black South African children: birth to twenty cohort. BMC Pediatr 15:78. DOI: 10.1186/s12887-015-0402-z.

ß-arrestin-dependent internalisation

G-protein coupled receptors (GPCRs) regulate many physiological processes and are the target of approximately 40% of all prescription drugs. GPCRs stimulate cellular signalling and regulate cell function by acting on G-proteins and arrestin inside the cell. Arrestin also terminates GPCR activation of G-proteins by stimulating the removal of GPCRs from the cell surface via internalisation to the inside of the cell. Gonadotropin-releasing hormone (GnRH)

is the main hormone that regulates fertility and reproductive function in mammals. There are two receptors for GnRH termed the type I (GnRH R1) and the type II (GnRH R2), which bind GnRH and activate G-proteins. The major difference between the GnRH R1 and GnRH R2 is that the GnRH R1 does not have the intracellular carboxyl-terminal tail present in the GnRH R2. As the carboxyl-terminal tail is the main arrestin-interaction site, the GnRH R1 does not bind to arrestin, whilst the GnRH R2 does. **Dr Michael Madziva**, from the School of Physiology, and his colleagues investigated how GPCRs interact with arrestin using the GnRH R2 as a model system.

The authors studied how the GnRH R2 interacts with arrestin by making chimaeric receptors consisting of parts of GnRH R1 and GnRH R2. The results were refined using site-directed mutagenesis, in which the authors specifically mutated basic amino acid residues in the third intracellular loop of the GnRH R2. These mutant receptors were expressed in cells and stimulated with GnRH so that their internalisation rate and extent were measured by radioligand binding. In addition to interacting with phosphorylated amino acids in the carboxyl-terminal tail, it was found that arrestin also interacts with basic amino acids in the GnRH R2 third intracellular loop. The results suggest that the carboxyl-terminal tail and basic residues in intracellular loop 3 are required for arrestin-dependent internalisation of the GnRH R2.

Madziva MT, Mkhize NN, **Flanagan CA**, Katz AA (2015). The carboxy-terminal tail or the intracellular loop 3 is required for β-arrestin-dependent internalisation of a mammalian type II GnRH receptor. *Mol Cell Endocrinol*; 411:187-97.

Why would an individual actively kill itself? It's been an evolutionary mystery

A study by scientists at the University of the Witwatersrand and the University of Arizona found that in single-celled algae, suicide benefits the organism's relatives. 'Death can be altruistic – we showed that before – but now we know that programmed cell death benefits the organism's relatives and not just anybody,' says **Dr Pierre Durand** from the Department of Molecular Medicine and Haematology and the Sydney Brenner Institute for Molecular Bioscience (SBIMB) at Wits University. When Durand and his colleagues from the University of Arizona released the results of their first study on suicide in single-celled algae in 2011, they showed that when an organism commits suicide by digesting up its own body, it releases nutrients into the environment that can be used by other organisms. In a new study, they have proven that these nutrients can only be used by relatives. In fact, the nutrients inhibit the growth of non-relatives, so not only does suicide benefit relatives, it can also harm competitors. This is remarkable. Even after death, an organism can continue to exert species-specific fitness effects on its neighbours. 'If one focusses purely on the individual organism, programmed death doesn't fit with the paradigm of survival of the fittest. Why should something like suicide exist at all? This has been an evolutionary mystery and we have discovered one of the clues,' says Durand.

The team used *Chlamydomonas reinhardtii* (a type of alga) as a model organism, but they suspect that this phenomenon is happening in all unicellular organisms.

The trigger is a stressful environment. 'When the environment becomes difficult for every-

body, some individuals sacrifice themselves for the benefit of kin. We suspect that it is the older and more damaged who are more likely to commit suicide,' says Durand. For example, during algal blooms in freshwater or marine environments the nutrients eventually run out causing some algae to commit suicide to sustain the others.

The increased environmental stresses of climate change could also impact the dynamics of programmed death. 'The planet won't be able to sustain everyone at the current rate of exploitation. Whether we're talking about humans or microbes, it is becoming a crowded place and this is impacting the way microbes respond,' says Durand.

Durand PM, **Choudhury R**, Rashidi A and Michod RE (2014). Programmed death in a unicellular organism has species-specific fitness effects. *Biological letters*, 10: 20131088.

Evaluating youth-friendly health services

Youth-friendly health services are a popular strategy to improve young people's experiences of health services and increase their utilisation. South Africa's Youth Friendly Services (YFS) programme is one of the few to have been scaled-up. This evaluation by Dr Rebecca Geary (London School of Hygiene and Tropical Medicine (LSHTM) and University College London), **Professor Shane Norris** (Developmental Pathways for Health Research Unit) and colleagues from LSHTM was the first since the Department of Health took over this programme from loveLife in 2006.

To avoid observation bias, the researchers used the simulated client method, where the healthcare provider is not aware that a given client is participating in research. Simulated clients were recruited from the Birth-to-Twenty cohort. Young men requested information about the reliability of condoms and for a demonstration. Young women asked for information on contraceptive methods more broadly. Experience was measured in terms of simulated clients interactions with staff, details of their consultation, privacy, confidentiality and the clinic environment.

There was no evidence that clinics using the YFS programme provided a more positive experience to simulated clients than those not providing this programme. They were also not more likely to be recommended by simulated clients to their peers. However, this may reflect limited implementation. Positive and negative experiences were predominantly determined by the healthcare worker's attitudes and behaviour. Worryingly there was limited discussion and demonstration of condoms and no HIV tests were offered.

With improved implementation, the YFS programme could provide positive experiences and high quality services to young people. Non-judgmental and confidential services, comprehensive information, condom demonstrations, HIV tests, monitoring and training will be key.

This research has been published in Global Health Action and presented at the 10th

International Association of Adolescent Health World Congress, the New Directions in Public Health Evaluation conference and at the International Population Conference of the International Union for the Scientific Study of Population (IUSSP).

Geary RS, **Webb EL**, **Clarke L**, **Norris SA**. Evaluating youth-friendly health services: young people's perspectives from a simulated client study in urban South Africa. *Global Health Action*. 2015; 8:26080

Sterile insects to control Malaria

Researchers in the newly established **Wits Research Institute for Malaria** (WRIM) have published a paper in the Malaria Journal (2014, 13: 27) describing the field study site selection, species abundance and monthly distribution of anopheline mosquitoes in the northern Kruger National Park. This is part of a large project to assess the feasibility of using the sterile insect technique (SIT) for the control of our local malaria vector mosquitoes under the leadership of Professor Lizette Koekemoer. The research requires a detailed understanding of the biology and behaviour of natural populations of mosquitoes and is funded by the International Atomic Energy Agency, the Industrial Development Corporation and the South African Nuclear Energy Corporation (Necsa) via its Nuclear Technologies in Medicine and the Biosciences Initiative (NTeMBI). The project forms part of the Business plan of NTeMBI which operates as a national technology platform, managed and developed by Necsa and funded by the Department of Science and Technology. The sterile insect technique has been used successfully against fruit flies in the Western Cape and against the screwworm flies that attack sheep in the USA. It involves the mass rearing and release of sterile males that mate with wild females who then produce no offspring, thus suppressing the target insect populations without the need for harmful chemicals.

Munhenga G, **Brooke BD**, **Spillings B**, **Essop L**, **Hunt RH**, Midzi S, Govender D, Braack L, Koekemoer LL (2014). Field study site selection, species abundance and monthly distribution of anopheline mosquitoes in the northern Kruger National Park, South Africa. *Malaria Journal*. 13:27.

Effect of HIV-1 exposure and antiretroviral treatment strategies in HIV-infected children on immunogenicity of vaccines during infancy

Vaccines are one of the most cost-effective strategies for improving child health. Children with HIV are at increased risk for many vaccine preventable diseases, which is compounded by HIV-infection impairing humoral and cell-mediated immune responses to vaccines. A previous landmark study carried out by **Omphile Simani** and co-authors indicated that early initiation of antiretroviral treatment (ART) in HIV-infected infants prior to immunological or clinical deterioration was associated with improved survival. This study published in *AIDS*, leveraged on the earlier study and studied immune responses to common childhood vaccines in HIV-infected children initiated on early ART, as well as HIV-exposed-uninfected (HEU) and HIV-unexposed-uninfected (HUU) children to common childhood vaccines.

The results of the study showed that pre-vaccination antibody geometric mean concentrations (GMCs) were higher in HUU

than HEU infants for tetanus-toxoid, but lower for Hepatitis B surface antigen (HBsAg), diphtheria-toxoid and filamentous hemagglutinin (FHA). Postvaccination GMCs and proportion with seroprotective antibody levels or sero-conversion rates were similar between HUU and HEU infants for all vaccines. Postvaccination GMCs were higher in HUU for tetanus-toxoid, diphtheria-toxoid, HBsAg and FHA than HIV-infected children started on ART at 4-12 weeks of age; and for tetanus-toxoid, HBsAg and pertussis-toxoid in HIV-infected infants in whom ART was deferred until clinically indicated. Nevertheless, there was no difference in proportion of HUU and HIV-infected infants who developed sero-protective vaccine-specific antibody levels postvaccination. The timing of ART initiation generally did not affect immune responses to vaccines between HIV-infected groups.

Conclusion: Early initiation of ART in HIV-infected children results in similar immunity following vaccination with DTwP-HibCV/HBV compared with HUU children.

Simani OE, Izu A, **Violari A**, Cotton MF, van Niekerk N, **Adrian PV**, **Madhi SA** (2014). Effect of HIV-1 exposure and antiretroviral treatment strategies in HIV-infected children on immunogenicity of vaccines during infancy. *AIDS*, 28(24): 531- 541.

Responses of large mammals to climate change

Animals have three options when faced with climate change. Firstly, they may shift their distribution range to habitats where the climate is within the species tolerance limits. Secondly, they may remain in a location but adjust to new climatic regimes either through a change in the genetic composition of a population or by phenotypic plasticity, which results in a different phenotype from an existing genotype via changes in epigenetic control of gene expression. Finally, if neither range shifts nor adjustment is possible, global or local extinction may result. Extinction has been a common outcome for species facing past climate change events of comparable magnitude. The charismatic large mammals of South Africa are likely to be particularly vulnerable to current climate change, with the extinction risk of South African mammals estimated to be as high as 69 % by 2050 if dispersal is limited.

Large mammals in fragmented, human-dominated, habitats, like those prevailing in South Africa, will be precluded from shifting to a new habitat in response to current climate change. Furthermore, the rate of climate change is too fast for genetic adaptation to occur in mammals with longevities of decades, typical of large mammals. For those that also cannot shift their ranges, survival is likely to be entirely dependent on the expression of latent phenotypic plasticity to buffer effects of climate change.

The expression of phenotypic plasticity includes anatomical variation within the same species, changes in phenology (timing of events), and employment of intrinsic physiological and behavioural capacity that can buffer an animal against the effects of climate change. Whether that buffer will be realised is unknown, because little is known about the efficacy of the expression of plasticity, particularly for large mammals. In a recent review, **Robyn Hetem** and her colleagues from the Brain Function Research Group argue that future research in climate change biology will require the measurement of physiological and

behavioural characteristics of many identified individual mammals for long periods, probably decades, to allow us to detect whether expression of phenotypic plasticity will be sufficient to cope with climate change.

Hetem RS, **Fuller A**, **Maloney SK** and **Mitchell D** (2014). Responses of large mammals to climate change. *Temperature*, 1 (2), 115-127.

The forensic science of *Homo naledi*

September 2015 saw the release of two major articles detailing the taxonomy, geological and taphonomic context of a new hominin species Homo Naledi from the Rising Star Cave in the Cradle of Humankind. The articles outlined the discovery of over 1500 fossils recovered to date. This discovery is the largest single hominin fossil assemblage found on the African continent (Fig: 1). H. naledi is combined with a primitive or australopith-like thorax, shoulder and pelvis, hands and feet that are humanlike in functional morphology; H. naledi was capable of long-distance walking with a hand adapted to both climbing and tool manufacture.

The structure of the cave where H. Naledi was found was such that the fossil chamber was only accessible by a near-vertical chute and crawls so narrow that only very small and slender individuals could access it. The authors (including **Professor Patrick Randolph Quinney**, a lecturer in the School of Anatomical Sciences) adopted a multidisciplinary framework, bringing a wide range of expertise in buried environments to ensure that the most complete range of evidence was collected. When combining geological and sedimentological analyses with forensic taphonomy, the assemblage is unique. It presents no fossils other than those of H. naledi, no evidence of breakage or trauma around death, no carnivore puncture marks or gnawing, no cut marks, no weathering, no evidence of water transportation and no evidence of burning.

The assemblage was not carried in by carnivores, nor transported by water, or exposed on the surface before being brought into the cave, and shows no evidence of having fallen into a death trap. What the sedimentology, spatial context and forensic taphonomy has demonstrated is evidence for ritualistic complex behaviour – specifically the deliberate disposal of the dead, a feature that we traditionally associate with much larger brained, more modern looking hominins. Dr Patrick Randolph Quinney has been part of the Rising Star project from the start. He developed the excavation and body recovery protocols in line with international best practice in forensic recovery methods, and undertook analyses of weathering, skeletal damage patterns and other taphonomic processes in the deposition and formation of the assemblage when the fossils had been excavated.

Figure 1: A representative sample of the fossil material from the Dinaledi Chamber

Randolph Quinney PS (2015). A new star rising: Biology and mortuary behaviour of Homo naledi. *South African Journal of Science* 111 (9/10).

Barriers and facilitators of physical activity

The promotion of physical activity is encouraged in people living with HIV as an attempt to improve health and wellness. Adherence to exercise programmes is often poor and a home-based approach is suggested as a means of improving adherence. The personal and environmental factors that may be considered barriers or facilitators of physical activity in a home-based pedometer walking programme were investigated by **Ronel Roos** and her co-authors from the Department of Physiotherapy. Knowledge of these factors is beneficial as it can be useful when developing a physical activity programme at community level.

Two prominent barriers highlighted during the study were psychological complaints e.g. 'I was stressed but I try so hard to reach my goals…' Another was the physical environment due to participants walking outdoors to reach their daily step count e.g. 'I am fine, the weather is the problem'. A prominent facilitator identified was the support and encouragement received from participants friends and family e.g. 'My husband helps me with walking…' and 'In the morning I walk a long distance with my child'. Additional facilitators were religious practices during worship e.g. 'We went to church and we danced a lot…' and community environment such as having access to parks and sport fields e.g. 'I was walking around the field…' The study highlighted that barriers are multifactorial and often include challenges that a health care worker cannot modify.

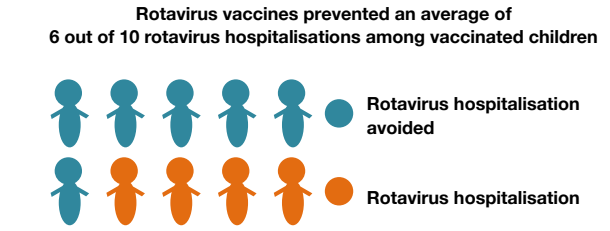
Roos R, Myezwa H, Van Aswegen H. 'Not easy at all but I am trying': Barriers and facilitators to physical activity in a South African cohort of PLWHA participating in a home-based pedometer walking programme. *AIDS Care* 2014; 30: 1 - 5.

Rotavirus vaccination

Rotavirus is the leading cause of diarrhoeal morbidity and mortality in children under five years of age, accounting for an estimated 453 000 global deaths in 2008 with >90% of mortality occurring in low-income countries in Africa and Asia. South Africa was the first African country to introduce rotavirus vaccine into its national immunisation programme, beginning August 2009, with vaccination recommended at 6 and 14 weeks of age. The effectiveness of the rotavirus vaccine against hospitalisation for acute rotavirus-diarrhoea in children under two years of age was evaluated in a multi-centered study led by the Respiratory and Meningeal Pathogens Research Unit (RMPRU).

The results of the study were published recently in the highest ranking infectious diseases journal, *Lancet Infectious Diseases*, by **Dr Michelle Groome**, a senior researcher and epidemiologist at the RMPRU, and colleagues. The study

found that between April 2010 and October 2012, South African children under two years old who were fully vaccinated against rotavirus were 57% less likely to be hospitalised for rotavirus diarrhoea compared to unvaccinated children.



Additionally, children who received just one dose of rotavirus vaccine were still 40% less likely to be hospitalised for rotavirus diarrhoea. The study also showed that protection from severe rotavirus diarrhoea was sustained throughout the first two years of life, and similar protection was found in both HIV-exposed but uninfected children and HIV-unexposed children. The vaccine was also found to be effective against severe rotavirus diarrhoea hospitalisations for a variety of rotavirus strains.

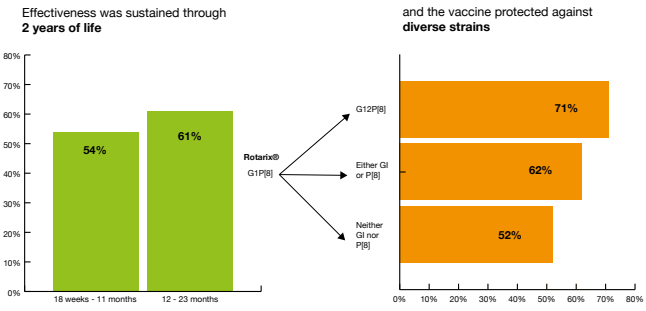


Figure 1: Vaccine effectiveness against hospitalisation for acute rotavirus-diarrhoea, stratified by age group and rotavirus strain.

These results are encouraging and establish the public health value of rotavirus vaccine in an African setting, especially as rotavirus vaccines are introduced into an increasing number of African countries. It is estimated that globally the lives of over 200 000 children could be saved annually, were rotavirus vaccine to be introduced in low-income countries.

Groome MJ, Page N, Cortese MM, **Moyes J**, Zar HJ, Kapongo CN, *et al.* Effectiveness of monovalent human rotavirus vaccine against admission to hospital for acute rotavirus diarrhoea in South African children: a case-control study. *Lancet Infect Dis*. 2014; 14:1096-1104.

Variants of maternal HLA-G genes associate with in utero mother-to-child transmission of HIV-1

Human leukocyte antigen (HLA)-G is a non-classical class-I molecule with immunosuppressive properties that is highly expressed at the maternal–foetal interface where it has a major role in mediating immunotolerance towards the semi-allogeneic foetus. Thus, it is plausible that HLA-G could create a tolerogenic environment that may allow HIV-1 to avoid host immune responses. Several studies have associated certain HLAG alleles, as well as a 14bp indel within the 3' untranslated region (3'UTR), with an altered risk for mother-to-child transmission (MTCT) of HIV1, but these studies have largely focused on each of these parameters individually and, where studies have been comparable, the results have often not shown consensus.

As part of her PhD study **Dr Heather Hong** (graduated July 2015), her supervisors **Professor Caroline Tiemessen** and **Dr Maria Paximadis** from the School of Pathology and National Institute for Communicable Diseases, and **Professor Louise Kuhn** (Columbia University, NY) and **Professor**

Glenda Gray (Perinatal HIV Research Unit, School of Clinical Medicine), investigated the influence of HLA-G alleles and polymorphisms within the 3'UTR in MTCT of HIV-1, using a cohort of 216 mother-infant pairs classified as HIV-1 non-transmitting (NT) or HIV-1 transmitting (TR) with either intrapartum (IP) or in utero (IU) infected infants. Through linkage disequilibrium (LD) analysis between HLAG alleles and the 3'UTR we found two independent HLAG factors that were associated with increased risk for IU transmission in MTCT: the G*01:01:02 allele in strong LD with the 14-bp Ins (associated with decreased HLA-G expression) and a 3'UTR haplotype (UTR1) which is in complete linkage with the 14-bp Del as well as the +3187G SNP (associated with higher HLA-G expression and mRNA stability, respectively). Our data provide the first description of HLA-G in a Black South African population and shows that maternal HLAG alleles and/or 3'UTR single nucleotide polymorphisms that might alter expression of HLA-G can potentially influence in utero transmission of HIV-1.

Hong HA., **Paximadis M**, **Gray GE**, Kuhn L and **Tiemessen CT**. 2015. Maternal human leukocyte antigen-G (HLA-G) genetic variants associate with in utero mother-to-child transmission of HIV-1 in Black SouthAfricans. *Infect Genet Evol*, 30; 147-158

Natural sleep and its seasonal variations in three pre-industrial societies

A paper on sleep in hunter-gatherer societies (Current Biology 2015; impact factor 9.571) by Yetish et al. (including **Professor Paul Manger** from the School of Anatomical Sciences) was featured extensively in the media (at least 434 media reports in the New York Times, Reuters, BBC World, Yahoo, Science, Nature, etc). The authors investigated sleep patterns of individuals from traditional living societies, before the modern era, and found that hunter-gatherers/horticulturalists sleep only 6.4 hours/day, with 1 hour more in winter than in summer. Onset of sleep was found to be about 3.3 hours after sunset, and sleep occurred during the nightly period of falling temperature. These individuals rarely napped. The sleep period consistently occurred during the nighttime period of falling environmental temperature, was not interrupted by extended periods of waking, and terminated, with vasoconstriction, near the period of the lowest temperature. It was proposed that the daily cycle of temperature change, largely eliminated from modern sleep environments, may be an important natural regulator of sleep.

Yetish G, Kaplan H, Gurven M, Wood B, Pontzer H, **Manger PR**, Wilson C, McGregor R, Siegel JM (2015). Natural Sleep and Its Seasonal Variations in Three Pre-industrial Societies. *Current Biology* 25(21): 2862-2868.

The prehistoric *Tumulus of Lofkënd* in Albania

Professor Lynne Schepartz published a two-volume monograph, T*he Prehistoric Tumulus of Lofkënd in Albania*, (co-authors J Papadopoulos, S Morris, L Bejko, L Schepartz; LA: UCLA Cotsen Institute Press). The work presents results from a 5-year archaeological excavation of a Bronze-Iron Age burial mound. Schepartz was in charge of the bioarchaeological aspects of the project. In addition, the discovery of a Bronze Age Mycenaean warrior's grave from Pylos, Greece made world headlines in 2015 (**www.nytimes.com/2015/10/27/science/a-warriors-grave-at-pylos-greece-could-be-a-gateway-to-civiliations.html**).

Dubbed the 'Griffin Warrior', he was buried with over 1,500 artifacts including gold and silver vessels, ivory, bronze swords, mirrors and vessels, and many gold and precious stone jewels. Schepartz, who has led the bioarchaeological team at Pylos since 1998, will

conduct the skeletal analysis. This will include stable isotopes to reconstruct the diet and migration history of the warrior, as well as sampling for intestinal parasites. In 2016 Schepartz and Dr Tobias Houlton (School of Anatomical Sciences Postdoctoral Fellow) will attempt a facial reconstruction using state-of-the-art resources available in the new SoAS Craniofacial Identification Lab.

Papadopoulos JK, Morris SP, Bejko L, and **Schepartz LA**. The Excavation of the Prehistoric Burial Tumulus at Lofkënd, Albania (Monumenta Archaeologica), 2015.

The FACTS 001 trial results

In February 2015, **Professor Helen Rees** presented the results of the FACTS 001 trial, a multi-centre phase III licensure trial of tenofovir 1% gel at the Conference on Retroviruses and Opportunistic Infections in Seattle. The FACTS consortium is an all-South African consortium and the largest medical research trial ever funded by the South African Departments of Science and Technology and Health. The trial was supported by USAID and the Bill and Melinda Gates Foundation (BMGF), and led by three Wits researchers – Professor Helen Rees, Professor Glenda Grey and Professor Sinead Delany-Moretlwe.

This well-conducted trial showed that tenofovir gel was not effective in preventing HIV infection in young South African women and highlighted the urgent need for new HIV prevention methods for this group at high risk for HIV infection. Two other large, multi-centre trials led by Wits RHI researchers completed participant follow-up in 2015: The ASPIRE trial (MTN 020) is a phase III trial of the safety and effectiveness of a dapivirine-containing intravaginal ring. The trial enrolled 2 629 women across several sites in Africa and results are expected in early 2016. Dr Thesla Palanee-Phillips was the international co-chair of this trial. A trial comparing low dose stavudine (d4T) with tenofovir (TDF), led by Professor Francois Venter, also completed participant follow-up at the end of 2015.

Rees H, **Delany-Moretlwe SA**, Lombard C, Baron D, Panchia R, Myer L, Schwartz JL, Doncel GF, Gray G (2015). FACTS 001 Phase III Trial of Pericoital Tenofovir 1% Gel for HIV Prevention in Women. Conference on Retroviruses and Opportunistic Infections (CROI), Seattle, USA, abstract 26LB, 2015.

Huntington Disease (HD) and Huntington Disease-like 2 (HDL2) in South Africa

A study of Huntington Disease in South Africa entitled 'Clinical and Genetic investigations into Huntington Disease (HD) and Huntington Disease-Like 2 (HDL2) in South Africa', is a multi-disciplinary, collaborative project headed by **Professor Amanda Krause**. It is based on a long-standing research interest in HD in the Division of Human Genetics, Faculty of Health Sciences as well as a recent publication (Krause et al. 2015) which reported the relatively high frequency of HDL2 in South Africa and the common haplotype shared by affected individuals.

Dr Dave Anderson is a specialist neurologist registered for a PhD under the supervision of Professor Krause. His research aims to evaluate the clinical presentation and progression of HD and HDL2 in affected individuals. Dr Fiona Baine is a Postdoctoral Research Fellow hosted by Professor Krause. Her research aims to identify molecular pathogenic mechanisms that result in the phenotypic overlap

between HD and HDL2, a proposed collaborative project with the Centre for Genomic Regulation (Barcelona, Spain). Funding for the project was awarded to Professor Krause by the Medical Research Council and the NHLS Research Trust.

Krause A, **Mitchell C**, **Essop F**, **Tager S**, **Temlett J**, Stevanin G, Ross C, Rudnicki D, Margolis R. (2015). Junctophilin 3 (JPH3) expansion mutations causing Huntington disease like 2 (HDL2) are common in South African patients with African ancestry and a Huntington disease phenotype. *American Journal of Medical Genetics* Part B 168B:573–585

The potential of natural antioxidants in traumatic neural injuries

Neural injuries, initiated by trauma, ischemia, demyelination, infection, or inflammation, are characterised by morphological alterations, biochemical variations, and pathophysiological damage, eventually leading to neurological dysfunction and functional paralysis. Researchers at the **Wits Advanced Drug Delivery Platform** (WADDP) Research Unit published an in silico study to determine the neuro-therapeutic and -protective potential of natural food grade antioxidants, curcumin (a polyphenolic component extracted from turmeric) and quercetin (a bioflavonoid obtained from grape juice), for traumatic neural injury' intervention. Calpain, a proteolytic enzyme activated by an increase in intracellular Ca++ levels after the injury, has been reported to be responsible for the degradation of myelin and cytoskeletal proteins causing axonal degeneration and myelin vesiculation followed by destabilisation of central nervous system cellular architecture and finally neural tissue destruction.

The recent research findings explored the magnitude of interactions that exist between polyphenols and calpain to reduce the primary and secondary injury after traumatic spinal cord injury. The modelling paradigm employed in the study provided the first ever detailed account of corroboration of enzyme inhibition efficacy of calpain inhibitors and the respective calpain/calpain-inhibitor molecular complexes energetic landscape, along with a detailed polyphenol–calpain interaction profile via molecular mechanics, dynamics and docking analysis. Subsequently, both curcumin and quercetin demonstrated potential calpain inhibitory capability with higher potency as compared to most of the standard inhibitors (SJA6017, AK275, AK295, PD151746, leupeptin, PD150606) tested. 'Given the varied and bulky binding pockets of curcumin and quercetin with calpain, as well as the wide-ranging energetic modification of calpain's proteolytic site by the polyphenols, the additive and synergistic potential of curcumin and quercetin in the repair, regeneration, restoration and reconstruction of the spinal cord after mechanical insult cannot be ignored with implications reaching to pre-clinical and clinical studies', says Professor Viness Pillay, Director of WADDP and lead author of the research published in Molecules.

Kumar P, **Choonara YE**, **Pillay V** (2015). In Silico Affinity Profiling of Neuroactive Polyphenols for Post-Traumatic Calpain Inactivation: A Molecular Docking and Atomistic Simulation Sensitivity Analysis. *Molecules*; 20(1):135-168.

Nano/targeted bioactive delivery to SCC

Squamous Cell Carcinoma (SCC) is a form of cancer that develops in the epithelial cells lining diverse tissues including the lips, mouth, oesophagus, head and neck, urinary bladder, prostate, lung, vagina, and cervix. Although combination chemotherapy is the major therapeutic intervention for SCC, it is not immune to drug resistance rendering the treatment paradigm ineffective and inefficient. However, after

the advent of phage technology, it has now been possible to screen and identify cancer specific molecular markers, or molecular zip codes, which in turn can be employed for targeted anti-cancer nanomedicine cargos. Researchers at the **Wits Advanced Drug Delivery Platform** (WADDP) Research Unit recently published a review article in the high impact journal Current Pharmaceutical Design – the number one journal for reviews in drug design and drug discovery.

The work highlights the advancements in SCC related nanomedicine and provides an interesting insight into the operational and design aspects of functionalised nano-constructs employing receptor ligands and homing peptides as a cancer targeting approach. For example, LyP-1, a nine-amino-acid cyclic peptide (CGNKRTRGC) isolated from human MDA-MB-435 breast cancer xenografts, has shown potential as a dual-effect homing peptide for targeting tumor cells and vasculature while CGKRK, a pentapeptide, has demonstrated effectiveness in penetrating the nucleus of the targeted cell. 'These targeting peptides can further be conjugated with other functional peptides or nano-archetypes to augment targeted drug delivery against SCC related tumours. Additionally, a combinatorial strategy of attaching both homing peptides and receptor ligands as dual moieties on nano-cargos can further strengthen the advantages of each technology in cancer targeted therapy' says Professor Viness Pillay, Director of the WADDP. His research team is highly involved in the field of nanomedicine applied to cancer drug targeting. Their most recent innovation explores the use of 3D-Bioprinting as a game-changing strategy in this domain.

Adebowale AS, **Choonara YE**, **Kumar P**, **du Toit LC**, **Pillay V** (2015). Functionalised nanocarriers for enhanced bioactive delivery to Squamous Cell Carcinomas: Targeting approaches and related biopharmaceutical aspects. Current *Pharmaceutical Design*, 21: 3167-3180.

Accuracy of the Berger-Exner test

Randomised Controlled Trials (RCTs) are highly influential upon medical decisions. Thus RCTs must not distort the truth. One threat to internal trial validity is the correct prediction of future allocations (selection bias). The Berger-Exner test detects such bias but has not been widely utilised in practice. One reason for this non-utilisation may be a lack of information regarding its test accuracy. The objective was to assess the test accuracy of the Berger-Exner test on the basis of relevant simulations for RCTs with dichotomous outcomes. Simulated RCTs with various parameter settings were generated, using R software, and subjected to bias-free and selection bias scenarios. The effect size inflation due to bias was quantified. The test was applied in both scenarios and the pooled sensitivity and specificity, with 95% confidence intervals for alpha levels of 1%, 5%, and 20%, were computed. Summary ROC curves were generated and the relationships of parameters with test accuracy were explored. An effect size inflation of 71% - 99% was established. Test sensitivity was 1.00 (95% CI: 0.99 – 1.00) for alpha level 1%, 5%, and 20%; test specificity was 0.94 (95% CI: 0.93 – 0.96); 0.82 (95% CI: 0.80 – 0.84), and 0.56 (95% CI: 0.54 – 0.58) for alpha 1%, 5%, and 20%, respectively. Test accuracy was best with the maximal procedure used with a maximum tolerated imbalance (MTI) = 2 as the randomisation method at alpha 1%. The results of this simulation study suggest that the Berger-Exner test for identifying third-order selection bias is generally accurate and should be used routinely, not only when selection bias is suspected, in randomised trials.

Mickenautsch S, Fu B, Gudehithlu S, Berger VW. Accuracy of the Berger-Exner test for detecting third-order selection bias in Randomised Controlled Trials: a simulation-based investigation. *BMC Med Res Methodol* 2014, 14:114.

RESEARCH RECOGNITION

Contents

NATIONAL RESEARCH FOUNDATION (NRF) RATINGS

The National Research Foundation (NRF) is an independent South African government agency which aims to promote and support research in all fields of scientific endeavour. The NRF uses a peer-evaluation and rating system as a mechanism to support scholarship and grow the country's research capacity. Ratings are awarded based on researcher's recent research outputs and impact as perceived by international peer reviewers.

NRF A-RATED RESEARCHERS

Researchers who receive NRF A-ratings are unequivocally recognised by their peers as leading international scholars in their field for the high quality and impact of their recent research outputs. The Faculty hosts **seven A-rated researchers**.

Professor Charles Feldman

Professor Charles Feldman obtained his MBBCh degree at the University of the Witwatersrand and subsequently received his FCP (SA), PhD and DSc. He was registered as a sub-specialist in Pulmonology in 1993 and was elected to the Fellowship of Royal College of Physicians (FRCP) in 1997.Professor Feldman is Professor of Pulmonology and Chief Physician at the Charlotte Maxeke Johannesburg Academic Hospital and the Faculty of Health Sciences, University of the Witwatersrand. He is also the Director of the Pulmonary Infections Research Unit in the School of Clinical Medicine.

His research in the field of community-acquired pneumonia includes both clinical and translational research. Much of his research has informed both local and international guidelines for the optimal management of pneumonia.

Professor Feldman was initially appointed on to the Board of the Medical Research Council of South Africa in 2010 for a three year period and re-elected on to the Board in 2014 for a second three year term. In 2014, he was elected to the Fellowship of the European Respiratory Society, in recognition of excellence in scientific and/or educational contributions to respiratory medicine over many years.

Professor Feldman was initially awarded a National Research Foundation A2 rating in 2010 and on his re-application in 2015, he was once again rated A2 (which will be effective from 1 January 2016).

Professor Glenda Gray

Professor Glenda Gray, MBBCh, FCPaeds (SA), DSc (honoris causa), a paediatrician by training, is the President and CEO of the South African Medical Research Council and a Professor in the Department of Paediatrics and Child Heath in the School of Clinical Medicine, University of the Witwatersrand. She is the co-founder of the Perinatal HIV Research Unit. She received an A-rating by the NRF in 2012. Professor Gray is an internationally acclaimed researcher. She has expertise in mother to child transmission of HIV, HIV vaccines and microbicides.

Professor Gray has received numerous accolades for her contributions to health sciences, including the Order of Mapungubwe (Gold) from President Jacob Zuma in 2013; the Hero of Medicine Award from the International Association of Providers of AIDS Care and in 2011, she received an award for Dedication and Achievement in Research from the Wits Faculty of Health Sciences.

Professor Rachel Jewkes

Professor Rachel Jewkes is an Honorary Professor in the School of Public Health and Director of the Medical Research Council's Gender and Health Research Unit. Professor Jewkes received an A-rating in 2012. She has spent 20 years undertaking research into violence against women and girls and gender inequity and health, mainly in South Africa. She was the lead technical advisor to the UN Multi-Country Study on Men and Violence in Asia and the Pacific, is a member of the WHO Expert Advisory Panel on Injury and Violence Prevention and Control and the WHO Scientific and Technical Advisory Group on HIV. She is an author of over 150 peer reviewed journal publications, and more than a 100 book chapters, reviews and technical reports. In 2014 she was awarded the South African Medical Research Council Gold medal.

In 2014, Professor Jewkes was named among the Highly Cited Researchers by the world's leading source of intelligent information for business and professionals, Thomson Reuters.

Professor Duncan Mitchell

Professor Duncan Mitchell is Professor Emeritus of Physiology and an Honorary Professorial Research Fellow in the Brain Function Research Group. He was first awarded an NRF A-rating in 1984, and on his re-application in 2011, he again received an A-rating effective from 1 January 2012. Professor Mitchell's research started in the field of applied physiology of deep level mining, and he has added research in somatosensory neurophysiology, fever physiology and thermal ecophysiology to a lifelong career in thermal physiology.

Professor Mitchell's research interests are in conservation physiology related to climate change, in the pathophysiology of pain resulting from HIV and its treatment, and in sickness behaviour.

Professor Shabir Madhi

Professor Shabir Madhi is Professor of Vaccinology and Director of the Medical Research Council/ University Research Committee (MRC/URC) Respiratory and Meningeal Pathogens Research Unit (RMPRU). He is also Executive Director of the National Institute for Communicable Diseases, National Health Laboratory Service. Professor Madhi holds the Department of Science and Technology/National Research Foundation South African Research Chair in Vaccine Preventable Diseases. He is an international leader in his field. Professor Madhi completed his undergraduate and postgraduate training at the University of the Witwatersrand. He qualified as a paeditrician in 1996 and obtained his PhD in 2003. He was awarded an A-rating by the NRF in 2011.

Professor Madhi's research focus is on reducing morbidity and mortality from infectious diseases through vaccination. His research has included studies on newly developed vaccines designed to prevent the two leading causes of death in children, namely pneumonia and diarrheal disease.

Professor Keith Klugman

Professor Keith Klugman is the Director of Pneumonia at the Bill and Melinda Gates Foundation in Seattle WA. He is the Emeritus William H. Foege Chair of Global Health at the Hubert Department of Global Health, Emory University, Atlanta, Georgia. In addition, he is an Honorary Professor in the Respiratory and Meningeal Pathogens Research Unit at the Faculty of Health Sciences, University of the Witwatersrand. Professor Klugman was first awarded an A-rating by the NRF in 2010. In 2015, Professor Klugman was elected to membership of the US National Academy of Medicine. He has chaired or served on numerous expert committees for the World Health Organisation (WHO), the Wellcome Trust and the Centres for Disease Control and Prevention (CDC). He serves as an editor or member of the editorial board of 16 journals.

Professor Klugman has contributed immensely to the field of pneumococcal disease. His work, including the demonstration of pneumococcal conjugate vaccine efficacy in the developing world, has led to interventions that have saved millions of lives especially in Africa. He has published more than 500 scientific papers which have been cited more than 25,000 times.

Professor John Pettifor

Professor John Pettifor was until his retirement in 2010 Head of the Department of Paediatrics at Chris Hani Baragwanath Hospital in Soweto, Johannesburg and the University of the Witwatersrand, and Director of the MRC Mineral Metabolism Research Unit and the Birth to Twenty longitudinal study. He now holds a part-time position in the Faculty Research Office as the Director of the Carnegie Clinician Scientist PhD Fellowship Programme and an Honorary Professorial Researcher post in the MRC/Wits Developmental Pathways for Health Research Unit within the Department of Paediatrics. He qualified as a doctor from the University of the Witwatersrand in Johannesburg in 1968, and then specialised in paediatrics which he completed in 1974. He established the Mineral Metabolism Research Unit (now known as the Developmental Pathways for Health Research Unit) and was appointed Director of the Unit by the SA Medical Research Council in 1985, a position he held until his retirement. In 1981 he obtained his PhD (Med) for studies into the role of low dietary calcium intakes in the pathogenesis of rickets in children in rural areas of South Africa.

Professor Pettifor's major research interests have focused on metabolic bone diseases in children and in particular the roles of vitamin D and dietary calcium intake in the pathogenesis of rickets. He is currently involved in a longitudinal study of the ethnic differences in bone mass in children and the factors influencing bone growth and acquisition during puberty. He has over 200 publications in accredited journals, 30 chapters in books and is co-editor of the only book internationally on paediatric bone diseases. Since 2005, he has been an NRF A2-rated scientist.

NRF NEW/RE-RATED RESEARCHERS

First Ratings

Awarded in 2014	Awarded in 2015
Professor Helen Rees (B-rating)	Professor Justus Hofmeyr (B-rating)
Professor Ian Sanne (B-rating)	Professor Kathleen Kahn (B-rating)
Professor David Lewis (B-rating)	Professor Stephen Tollman (B-rating)
Professor Charles Chasela (C-rating)	Professor Lize Maree (C-rating)
Dr Eliton Chivandi (C-rating)	Professor Gill Nelson (C-rating)
Dr Mrudula Patel (C-rating)	Dr Wendy van de Spuy (Y-rating)
Professor Witness Mudzi (Y-rating)	

Renewed Ratings

Awarded in 2014	Awarded in 2015
Professor Peter Kamerman (C-rating)	Professor Penny Moore (B-rating)
	Professor Marco Weinberg (B-rating)
	Professor Paul Manger (B-rating)
	Professor Theresa Coetzer (C-rating)
	Professor Sandy van Vuuren (C-rating)
	Professor Aimee Stewart (C-rating)

THE SOUTH AFRICAN RESEARCH CHAIRS INITIATIVE PROGRAMME

The South African Research Chairs Initiative (SARChI) programme is a national knowledge and human resource development intervention, led by the Department of Science and Technology and managed by the National Research Foundation (NRF). The key objective of the SARChI Chairs initiative is to reinforce and improve research and innovation capacity of public universities for producing high quality postgraduate students and research and innovation outputs.

In 2014 and 2015, the Faculty was honoured to have four of its researchers awarded DST/NRF SARChI Chairs. SARChI Chairs were additionally awarded to Professors Laetitia Rispel, Penny Moore, John Eyles and Michele Ramsay. This has brought the total number of SARChI Chairs in the Faculty to eight.

Chair in Research on the Health Workforce for Equity and Quality

Professor Laetitia Rispel

Professor Laetitia Rispel is Professor and Head of the School of Public Health at the University of the Witwatersrand. Since commencing her tenure in 2012, Professor Rispel has implemented several innovative educational, research and transformation initiatives. In September 2015, she was awarded one of 42 new Research Chairs for South African women by the Department of Science and Technology/ National Research Foundation. The Chair focusses on three inter-related research themes, namely: Analysing the health labour market in South Africa; Investigating health workforce performance; and a comparative analysis of health workforce policies, planning and governance in Brazil, Russia, India, China and South Africa (BRICS).

She has more than 20 years combined experience of research, teaching, and health leadership. She has published extensively on different aspects of health policy and health systems research that are central to the re-structuring and transformation of the South African health system. Professor Rispel has served on high level Health Ministerial committees over the past ten years and has provided expert technical support for health sector transformation efforts in South Africa. Professor Laetitia Rispel has won several awards, including the University of the Witwatersrand's Vice-Chancellor's Academic Citizenship Award in 2014 for her contribution to the development and growth of the Public Health Association of South Africa (PHASA) and to the growth of the discipline of public health both nationally and internationally.

Chair in Virus-Host Dynamics for Public Health

Associate Professor Penny Moore

Associate Professor Penny Moore is a Reader at the University of the Witwatersrand, a Senior Scientist at the National Institute for Communicable Diseases of the National Health Laboratory Services, and a Research Associate at CAPRISA, University of KwaZulu-Natal. She obtained her MSc from the University of the Witwatersrand in 1999, and her PhD in Virology (Medicine) at the University of London in 2003. Her research focusses on HIV neutralising antibodies and their interplay with the evolving virus. Her studies have highlighted the role of viral escape in driving the development of neutralisation breadth, with potential for translation into novel HIV vaccine strategies. In 2015, Professor Moore was awarded a SARChI Chair in Virus-Host dynamics for public health.

Her specific research focus is on the development of broadly neutralising antibodies, which are able to neutralise diverse global viruses and are likely to be required for an effective HIV vaccine.

Chair in Pharmaceutical Biomaterials and Polymer-engineered Drug Delivery Technologies

Professor Viness Pillay

Professor Viness Pillay is a Fulbright Scholar, a Fellow of the African Academy of Sciences (AAS), and the DST/NRF SARChI in Pharmaceutical Biomaterials and Polymer-Engineered Drug Delivery Technologies. He is also a Personal Professor of Pharmaceutics, Head of Pharmaceutics and Director of the Wits Advanced Drug Delivery Platform (WADDP) Research Unit and contract researcher at the Department of Pharmacy and Pharmacology, Wits.

Professor Pillay obtained his Master of Pharmacy (cum laude) from the University of Durban-Westville (South Africa) in 1996. He completed his PhD at the Temple University (USA) as a Fulbright Scholar in 2000. Professor Pillay holds an NRF B-rating.

Chair in Health Policy and Systems Research

Professor John Eyles

Professor John Eyles is world-renowned in the field of health systems and policy research. In 2014, he was appointed by the Centre of Health Policy (CHP), in the Faculty of Health Sciences as the new SARChI Chair in Health Policy and Systems Research.

He has published widely in the field with over 170 publications and has supervised 30 PhD students. Some of his papers have become standards for citation, especially in qualitative methods, health-care resource allocation and public involvement in health care decision-making. His particular areas of expertise include population health status and need; access and equity in health care; health care financing; human resources; governance and stakeholder participation; and the development of decision support tools to enable the transfer of research to practice.

Professor Eyles is involved in various collaborations within the School of Public Health; he mentors and builds research and writing capacity. He has worked with the School for over six years, during which time he has brought new insights to understanding the South African health system and its challenges. He has demonstrated enthusiastic commitment to supporting and building capacity of researchers at CHP and within the School.

Also based at McMaster University in Canada, Professor Eyles was a Research Chair for six years before becoming Director of the McMaster Institute of Environment and Health, a research institute focusing on health and the environment.

Chair in HIV Vaccine Translations Research

Professor Shabir Madhi

Professor Shabir Madhi is the Executive Director of the National Institute for Communicable Diseases, National Health Laboratory Service. He is also Professor of Vaccinology and Director of the MRC Respiratory and Meningeal Pathogens Research Unit in the School of Pathology, University of the Witwatersrand. He is listed as an NRF A-rated scientist. A brief biosketch of Professor Madhi can be found in the NRF A-rated section of this report on page 79.

Chair in HIV Vaccine Translations Research

Professor Caroline Tiemessen

Professor Caroline Tiemessen heads the Cell Biology Research Laboratory within the Centre for HIV and STIs at the National Institute for Communicable Diseases (NICD), and holds a joint appointment as Research Professor in Virology at Wits, as well as DST/NRF Chair of HIV Vaccine Translational Research.

Professor Tiemessen completed her PhD in Virology in 1993 from the University of the Witwatersrand. She has been employed at the NICD since 1986 where she has gained expertise in addressing molecular biological and immunological aspects of viral-host interactions. Her research interests include the immunology of HIV and TB, maternal-infant HIV-1 transmission as a model for study of protective immunity, natural resistance to HIV infection and disease progression in adults, chemokine-chemikine receptor interactions, HIV vaccines and immunogenetics.

Caroline's recent achievements include: the appointment as Chairperson of the Scientific Advisory Panel of the Poliomyelitis Research Foundation (PRF) of South Africa (2014), promotion to Research Professor (2015), an NRF NEP large equipment grant awarded for the acquisition of a Fortessa X-20 Flow Cytometer (2014/15), and substantial project grant awards that include a collaborative NIH U01-funded study addressing paediatric cure (South African PI), and an MRC SHIP grant for the study of South African elite and long term controllers - a study which is aimed at identifying novel viral and host targets that inform future HIV cure interventions. In 2015, she graduated 4 PhD, 2 MSc and 2 BScHons students.

Chair in Bioinformatics for African Populations

Professor Michele Ramsay

Professor Michele Ramsay is the Director of the Sydney Brenner Institute for Molecular Bioscience and Professor in the Division of Human Genetics, University of the Witwatersrand. She is also currently the President of the African Society of Human Genetics. Her research interests include African population genetic and epigenetic diversity and their role in diseases exacerbated by adverse lifestyle choices, including obesity, cardiometabolic diseases. She collaborates on genetic research into eye diseases and autoimmune diseases in African populations and studies epigenetic changes in a mouse model for fetal alcohol spectrum disorders (FASD). She is PI of an NIH funded Collaborative Centre under the H3Africa Consortium for 'Genomic and environmental risk factors for cardiometabolic diseases in Africans'.

Chair in Medical Entomology and Vector Control

Professor Maureen Coetzee

Professor Maureen Coetzee started working in medical entomology in 1975 for the South African national malaria control programme. She is currently Research Professor and Co-Director of the Wits Research Institute for Malaria.

Her major research interests are mosquito systematics, insecticide resistance in the African malaria vector mosquitoes, host-parasite interactions and novel methods for vector control.

Professor Coetzee has published over 180 peer reviewed scientific papers and book chapters. In the past two years (2014-2015) she has been awarded the Elsdon Dew Medal for contributions to parasitology (2014), won the DST Distinguished Women Scientist award in the Life Sciences (2015) and in September 2016 will be awarded a Certificate of Distinction from the Council of the International Congresses of Entomology at their meeting in Orlando, Florida, USA. She sits on numerous international committees (World Health Organisation, Roll Back Malaria, Wellcome Trust, United Nations Environmental Programme) and journal editorial boards.

RESEARCH CENTRES

MRC Cancer Research Centre

In 2015, the South African Medical Research Council awarded a Cancer Centre grant of R3 million per annum for five years to Professor Paul Ruff, Head of the Division of Medical Oncology at Wits University and the Charlotte Maxeke Johannesburg Academic Hospital. Professor Ruff is the head of the MRC/Wits '**Common Epithelial Cancer Research Centre**'. The Centre is involved in breast, colorectal and pancreatic cancer research.

MRC Collaborating Centres

In 2014 and 2015 a number of Research Entities in the Faculty were awarded Medical Research Council Collaborating Centres. The purpose of the collaborating centre is to create a national resource of collaborating centres with investigators and sites. The aim of the centres is to stimulate and/or expand basic, translational, behavioural and applied research that will advance scientific discovery and engage South African researchers working collaboratively in the areas of malaria, cancer, TB and HIV/AIDS. Below is the list of the collaborating centres awarded to the Faculty.

2014

Wits/MRC Collaborating Centre for Malaria Research

The Wits Research Institute for Malaria (WRIM) received funding from the Medical Research Council (MRC) which enabled them to further develop infrastructure and continue to engage in cutting edge research on Parasite-Vector interactions as well as parasite and vector surveillance.

2015

MRC Collaborating Centre for TB and HIV

The Wits MRC Soweto Matlosana Centre for HIV AIDS and Tuberculosis (SoMCHAT) is a group of leading HIV and TB researchers from both Wits and Johns Hopkins University and includes both adult and paediatric patients at the Chris Hani Baragwanath Academic Hospital and the Klerksdorp Tshepong Hospital Complex in Matlosana.

SoMCHAT's principal investigator is Dr Neil Martinson, from the Perinatal HIV Research Unit. Other Wits researchers are: Drs Lerato Mohapi, Avy Violari, Kennedy Otwombe, and Fatima Laher (PHRU); Professors Adrian Puren, Lynn Morris, Caroline Tiemessen (NICD); Dr Bhavna Gordhan (NRF/DST Centre of Excellence for Biomedical TB Research), Professors Alan Karstaedt and Ebrahim Variava (Wits Internal Medicine); Dr Tanvier Omar (Anatomical Pathology); Dr Leslie Scott (Molecular Medicine); and Dr Sanjay Lala (Paediatrics). Drs Chaisson and Golub, from John Hopkins University Centre for TB Research, are leading international TB and HIV researchers and enthusiatically support this initiative.

MRC Wits RHI Collaborating Centre for HIV/AIDS and TB

The Wits RHI Collaborating Centre is ideally located to conduct clinical research in both paediatric and adult cohorts. The Institute has an excellent track record of conducting research within and providing services to at-risk populations in the areas of prevention of mother-to-child transmission, TB, HIV prevention, HIV care and treatment, adolescence, women at risk and other key populations. It also has considerable experience in social science research and community engagement strategies and is well respected within the communities it serves, particularly in the Johannesburg inner city.

The Collaborating Centre includes a significant component of research capacity building and the development of early career scientists, particularly women and previously under-represented groups, in clinical science, epidemiology, social science and health economics.

MRC Collaborating Centre for TB and/or TB and HIV

The Faculty's Clinical HIV Research Unit, under the leadership of Professor Ian Sanne, was awarded a grant as a MRC Collaborating Centre for TB and/or TB and HIV. The award was in recognition of the 14-year track record of HIV and TB research performed by the CHRU. This research includes participation in a wide variety of research activities from phase I – IV clinical trial research to epidemiologic evaluation of the treatment outcomes at Helen Joseph Hospital and other 'Big Data Sets' established on TherapyEdge-HIV™ data system. The award provided R350 000 funding per annum for three years, which was used towards a novel approach towards the diagnosis of human papilloma virus on cervical smear specimens using Cepheid GeneXpert technology.

UNIVERSITY AWARDS

Vice-Chancellor's Research Award

This is the University's most prestigious award for research. The purpose of the Vice-Chancellor's Research Award is to stimulate research and research-related scholarly activities by acknowledging and rewarding an exceptional member of the University who has been engaged not only in research but also in more general scholarly activities. Over the past nine years, academics from the Faculty of Health Sciences have obtained this award eight times.

The 2014 award was bestowed on **Professor Lynn Morris** (Chief Specialist Scientist) who heads the HIV Virology laboratories within the Centre of HIV and Sexually Transmitted Infections at the National Institute for Communicable Diseases (NICD).

Professor Frederick Raal (Director of the Carbohydrate and Lipid Metabolism Research Unit) was awarded the Vice-Chancellor's Research Award in 2015.

Friedel Sellschop Awards

These awards recognise and encourage exceptional young researchers. The award takes the form of a special research grant given to worthy researchers under the age of 35. An applicant must have completed a PhD, or be able to demonstrate comparable achievement, and must have produced a substantial body of research work which has received international recognition, such that the applicant has established, or seems certain to establish shortly, an international reputation as a leader in the field.

2014

Associate Professor Lisa du Toit

Dr Benita Olivier

Dr Robyn Hetem

Dr Lois Harden

2015

Dr Benita Olivier
(renewed for 2015)

Associate Professor Lisa du Toit
(renewed for 2015)

Claude Leon Foundation Merit Awards

The Merit Awards are granted to suitable candidates in the Faculties of Science, Engineering and Health Sciences. The Merit Award programme also provides young lecturers with the opportunity to do presentations at prestigious international conferences abroad thus strengthen and increase their research output.

THE CLAUDE LEON FOUNDATION

2014 recipients:

Associate Professor Lisa du Toit

Dr Ian Murray

Dr Manette Marais

2015 recipients:

Dr Benita Olivier

Professor Colin Menezes

FACULTY AWARDS

Faculty Research Prize

The award is the Faculty's most prestigious annual research prize and is presented to researchers who have produced research of exceptional quality. The following individuals have been singled out as the top achievers and received the award in 2014 and 2015.

2014

Dr Frederic Michel (Senior Lecturer in the School of Physiology and member of the Cardiovascular Pathophysiology and Genomics Research Unit (CPGRU).

Dr Frederic Michel was the first author on the following publication in the *Hypertension* journal.

His current research interests are on the neuro-humoral mechanisms involved in the patho-physiology of heart failure and hypertension.

Michel FS, Norton GR, Maseko MJ, Majane OH, Sareli P, Woodiwiss AJ. Urinary angiotensinogen excretion is associated with blood pressure independent of the circulating Renin-Angiotensin system in a group of African ancestry. *Hypertension*. 2014 Jul; 64(1):149-56.

2015

Ms Jinal Bhiman (PhD student in the Department of Virology, School of Pathology).

Ms Bhiman was the first author on an article published in the prestigious journal *Nature Medicine*.

Bhiman JN, Anthony C, Doria-Rose NA, Karimanzira O, Schramm CA, Khoza T, Kitchin D, Botha G, Gorman J, Garrett NJ, Karim SSA, Shapiro L, Williamson C, Kwong PD, Mascola JR, Morris L and Moore PL (2015). Viral variants that initiate and drive maturation of V1V2-directed HIV-1 broadly neutralising antibodies. *Nature Medicine*. doi: 10.1038/nm.3963. Published online 12 October 2015.

Most Prestigious Postgraduate Degree Awards

The Most 'Prestigious Postgraduate Degree Awards' were instituted by the Faculty in 2009 to recognise the efforts of outstanding emerging researchers. Any Faculty of Health Sciences post-graduate student who has graduated with a Masters or Doctoral degree may be nominated by his/her supervisor if they believe that the research report, dissertation or thesis was of outstanding quality.

These were awarded as follows:

2014

Prestigious Masters by Research (100% research) Award

Ms Zelna Hubsch from the School of Therapeutic Sciences, supervised by Professors Sandy Van Vuuren and Robyn Van Zyl for her research project entitled 'Antimicrobial efficacy and toxicity profiles of convectional antimicrobial agents in combination with commercially relevant Southern African medicinal plants'.

Prestigious PhD Award

Dr Cheryl Cohen from the School of Public Health, supervised by Professor Shabir Madhi and Dr Cecile Viboud for her research project entitled 'Influenza-associated morbidity and mortality in South Africa'.

Prestigious MMed Award

Dr Mairi Bassingthwaite from the School of Clinical Medicine, supervised by Professor Daynia Ballot for her research project entitled 'Outcomes of babies born before arrival at a tertiary hospital in South Africa'.

Certificate of Commendation for the Outstanding Quality of Research

Dr Nicole Cerutti from the School of Pathology, supervised by Professor Maria Papathanasopoulos received a certificate of commendation for the outstanding quality of her PhD, entitled 'On the redox biology of immuno-virological receptor CD4: biological function and applications in HIV-1 drug and vaccine development'.

2015

Prestigious Masters by Research and Course Work (50% research) - MPH

Dr Gwinyai Masukume from the School of Public Health supervised by Professor Gill Nelson. 'Birth outcomes and associated risk factors of anaemia in early pregnancy in a nulliparous cohort'.

Prestigious MMed Award

Dr Carla Jardine from the School of Clinical Medicine, supervised by Professor Daynia Ballot. 'The use of Nasal CPAP at Charlotte Maxeke Johannesburg Academic Hospital'.

Prestigious Masters by Research (100% Research) Award

Ms Sadiyya Ahmed-Hassen, from the School of Therapeutic Sciences, supervised by Dr Jacqui Miot and Mrs Shirra Moch. 'A cost analysis of the conventional culture method versus polymerase chain reaction testing for methicillin-resistant Staphylococcus Aureus at a South African public hospital'.

Prestigious PhD Award

Dr Ziyaad Dangor from the School of Clinical Medicine, supervised by Professor Shabir Madhi and Dr Sanjay Lala. 'Clinical and Immunological Epidemiology of Group B Streptococcus (GBS)'.

Helen Laburn Research Prize

In 2015, the School of Physiology established a new prize, the **Helen Laburn Research Prize** to recognise research achievement in the School. The prize is named after Professor Helen Laburn who was a Physiologist, former Head of the School of Physiology, Dean of the Faculty of Health Sciences and Deputy Vice-Chancellor: Research. The prize will be awarded annually to a staff member of the School for their outstanding performance over the previous two year period.

2015

The School awarded the inaugural prize to **Professor Patrick Dessein**.

TH Bothwell Research Prize

The Thomas Hamilton (TH) Bothwell Research Prize was first awarded in 1993 to pay tribute to Professor Thomas Hamilton who made an outstanding contribution to both the practice of medicine and to medical research in South Africa. This is the premier research prize within the Department of Internal Medicine and was awarded as follows:

2014

Associate Professor Colin Menezes

2015

Dr Raquel Duarte

NATIONAL AND INTERNATIONAL ACHIEVEMENTS

National Achievements

2014

- **Professor Viness Pillay** was awarded the Olusegun Obasanjo prize by the African Academy of Science (AAS) for his innovative work on designing commercialisable drug delivery technologies
- **Professor Laetitia Rispel** was the recipient of the Vice Chancellor's Academic Citizenship Award
- **Professor Helen Rees** was awarded the Harry Oppenheimer Fellowship Award
- **Professor Maureen Coetzee** was the 2014 winner of the Elsdon Dew Medal of the Parasitological Society of South Africa
- **Professor Patrick Arbuthnot** was awarded the Oettlé Memorial Medal by CANSA for research in the field of cancer
- **Dr Benita Olivier** was a finalist in the 2014 Standard Bank Rising Stars Awards
- **Professor Bavesh Kana** was awarded the First Time Inventor's Prize from Wits Enterprise for the development of a globally marketable product. This award is given to staff or students at Wits University for pioneering approaches to developing patentable ideas and products
- **Professor Viness Pillay, Associate Professors Yahya Choonara**, **Lisa du Toit** and **Dr Pradeep Kumar** obtained the Wits Innovators Forum Prolific Inventor Award for having disclosed more than five inventions at Wits
- **Ms Nurit Dahan-Farkas** obtained the Wits Innovator's Forum award for a granted patent in an international examining jurisdiction in 2014
- **Dr Benita Olivier** was selected as one of the '200 Young South Africans' by the Mail and Guardian newspaper

2015

- **Professor Helen Rees** was the winner of the 2014/2015 National Science and Technology Forum (NSTF) Award in the category: Contribution over a lifetime by an Individual
- **Professor Penny Moore** was a finalist at the 2015 NSTF-BHP Billiton Awards in the TW Kambule Awards: Research and its outputs over the last 5 – 10 years by an individual category
- **Professor Sharon Fonn** was a finalist at the 2015 NSTF-BHP Billiton Awards in the Research Capacity Development over the last 5 - 10 years by an individual category
- **Associate Professor Lisa Du Toit** was a finalist at the 2015 NSTF-BHP Billiton Awards in the TW Kambule Awards: Emerging researchers category
- **Professor Lynn Morris** was awarded the MRC Gold Scientific Achievement Medal
- **Professor Linda Richer** was awarded the prestigious President's Life-time Achievement Award
- **Professor Beverley Kramer** was awarded the DST/SARIMA award for distinguished contributions to research management
- **Professor Maureen Coetzee** won the Distinguished Women Researchers (Life Sciences), DST/NRF Women in Science awards

Professor Linda Richer

Professor Maureen Coetzee

International Achievements

2015

- **Associate Professor Lisa du Toit** was the second runner-up in the Distinguished Young Women Researchers in the Life Sciences category in the 2015 South African Women in Science Awards
- **Professor Yahya Choonara** won the 2015 AU-TWAS Young Scientist National Award in the category of Basic Sciences, Technology and Innovation category
- **Associate Professor Bernard Janse van Rensburg** was the recipient of the Colleges of Medicine of South Africa (CMSA) 2015 RWS Cheetham Award for the best cross-culturally relevant manuscript in Psychiatry (published in 2014)
- **Dr Benita Olivier** was a finalist for the prestigious third annual Rising Star Award: Public and Private Service sector.
- **Dr Christopher Ealand and Dr Carren Ginsburg** were awarded MRC Career Development Awards
- **Dr Anna Haw, Ms Nonhlanhla Masina and Dr Nomathemba Chandiwana** respectively were selected as one of the '200 Young South Africans' by the Mail and Guardian newspaper
- **Ms Andrea Papadopoulos** was selected by the MRC as a National Health Scholar

Professor Yahya Choonara

Dr Anna Haw

2014

- **Professor Maureen Coetzee** was awarded the Certificate of Distinction from the Council of International Congresses of Entomology
- **Professor Charles Feldman** was elected to be one of the first group of 125 Foundation Fellows of the European Respiratory Society
- **Professor Viness Pillay** was awarded the Olusegun Obasanjo Prize 2014 for Scientific Breakthrough and Innovation in Advanced Drug Delivery Technologies

2015

- **Professor Lesley Scott** and the Smartspot team won the Social Innovation Award at the Innovation Prize for Africa awards ceremony held in Morocco
- **Professor Sharon Fonn** was awarded an honorary doctorate from the Sahlgrenska Academy, University of Gothenburg
- **Professor Anna Kramvis** was awarded the 2015 Paediatric Virology Award

Professor Lesley Scott

Professor Sharon Fonn

APPOINTMENTS AND FELLOWSHIPS

2014




Left to right: Professor Karen Silwa, Professor Beverley Kramer, Dr Lizette Louw and Professor Maryna Steyn

- **Professor Karen Sliwa** elected President of the South African Heart Association
- **Professor Beverley Kramer** elected President of the International Federation of Associations of Anatomy (2014-2019)
- **Dr Lizette Louw** was elected President of the South African Association of Nuclear Medicine Physicians (ANMP) for 2014-2016
- **Professor Maryna Steyn** was elected as President of the Anatomical Society of Southern Africa (ASSA)
- **Dr Sizakele Ngwenya** was elected President elect of the IADR - South African Division for 2014-2016
- **Professor Himla Soodyall** appointed as a Human Genome Organisation (HUGO) Council Member
- **Professor John Pettifor** elected Editor of the *South African Journal of Child Health*
- **Associate Professor Lisa du Toit** elected as a member of South African Young Academy of Science (SAYAS)





Left to right: Professor Himla Soodyall, Professor John Petifor, Associate Professor Lisa du Toit, Dr Eliton Chivandi and Professor Charles Feldman

- **Dr Eliton Chivandi** was invited to join the Board of Editors of the *South African Journal of Animal Science* (SAJAS)
- **Professor Charles Feldman** was elected to be one of the first group of 125 Foundation Fellows of the European Respiratory Society
- **Professor Beverley Kramer** was made an Honorary Fellow of the Anatomical Society (of Great Britain and Ireland)
- **Dr Richard Chawana** was appointed to serve on the Young Scientists Steering Committee of the International Society of Neurochemistry
- **Professor Maryna Steyn** served on the Board of Governors of the IACI (International Association for Craniofacial Identification)
- **Professor Maryna Steyn** was elected to the FASE (Forensic Anthropology Society Europe) Advisory Board
- **Professor Frederick Raal** was elected as a member of the European Atherosclerosis Society Consensus Panel
- **Professor Patrick Arbuthnot** was appointed chairperson of the Research Committee and board member of the Cancer Association of South Africa (CANSA)
- **Professor Andrea Fuller** was elected as Chair of the Commission on Thermal Physiology, International Union of Physiological Sciences
- **Professor Andrea Fuller** was appointed as an Extraordinary Lecturer in the Department of Paraclinical Sciences, Faculty of Veterinary Sciences, University of Pretoria
- **Professor Karen Hofmann** was appointed to serve on the Ministerial Obesity Task Team, South African National Department of Health.

2014




Left to right: Professor Frederick Raal, Professor Patrick Arbuthnot, Professor Andrea Fuller and Professor Karen Hoffmann

2015




Left to right: Professor Peter Kamerman, Professor Bavesh Kana, Professor Stephen Tollman and Professor Laetitia Rispel

- **Professor Peter Kamerman** was elected as President of PainSA. He is the first basic scientist to be elected to the position
- **Professor Bavesh Kana** was selected as the Titan for South Africa and the SADC region in the Medical and Veterinary category
- **Professor Stephen Tollman** was appointed to the Editorial Board of the Global Health, *Epidemiology and Genomics* (GHEG) journal
- **Professor Bavesh Kana** was elected as the new member of the Academy of Science of South Africa (ASSAf)
- **Professor Karen Hofmann** was appointed as a Member of Academy of Science of South Africa (ASSAf) Standing Committee on Health
- **Professor Laetitia Rispel** was elected as a member of the Academy of Science of South Africa (ASSAf)
- **Professor Helen Rees** was appointed as the Chairperson of the South African Medicines Control Council (MCC)
- **Professor Paul Ruff** was appointed the Editor of the South African Edition of the *Journal of Clinical Oncology*
- **Professor Bavesh Kana and Professor Yahya E Choonara** were awarded Higher Education Leadership and Management (HELM) Fellowships for 2015
- **Shobna Sawry and Jinal Bhiman** were recipients of the L'Oreal-UNESCO for Women in Science Sub-Saharan Africa research Fellowship.
- **Professor Pravin Manga** was invited to serve as one of the Deputy Editors of the *Journal of the American College of Cardiology*
- **Professor Helen Rees** was made an Honorary Fellow of the Murray Edwards College
- **Professor Christopher Szabo** was appointed a Member of the World Psychiatric Association (WPA) Operational Committee on Scientific Publications





Left to right: Professor Helen Rees, Professor Paul Ruff, Ms Jinal Bhiman (PhD student), Professor Pravin Manga and Professor Christopher Szabo

- **The Wits School of Public Health** was selected as one of three African sites and one of seven sites internationally for the WHO/TDR International Postgraduate Training Scheme on implementation science
- **Professor Anna Kramvis** was re-elected to serve on the Hepatitis Transformative Science Group (TSG) as a Virologist
- **Julian Mthombeni** was appointed to the professional board of the Health Professionals Council of South Africa (HPCSA) for Medical Technologists (2015-2020)
- **Adjunct Professor Ugash Subramaney** was appointed on the advisory board and as supervisor of Trisano Project Scholars on the UCLA- SA Research Training Programme for Chronic Mental Disorders
- **Professor Laetitia Rispel** was appointed to the Board of the Telkom Foundation
- **Associate Professor Lize Maree, Dr Sue Armstrong and Dr Shelley Schmollgruber** were inducted as fellows into the Academy of Nursing of South Africa in recognition of leadership and scholarship excellence
- **Professor Karen Hofmann** was appointed to serve on the Board of Directors: International Decision Support Initiative
- **Professor Peter Owen** was awarded Honorary Membership of the Academy of Prosthodontics of South Africa
- **Adjunct Professor Dale Howes** was elected Vice President of the International Society for Maxillofacial Rehabilitation, was appointed as a Fellow of the International College of Dentists and as a Fellow of the International Academy of Oral and Facial Rehabilitation
- **Dr Sean Chetty** was elected as the treasurer of PainSA
- **Professor Patrick Dessein** was elected to the editorial board of the *Journal of Cardiology and Therapy*
- **Professor Kathleen Kahn** was elected as a Member of the Health Data and Advisory Coordination Committee, National Department of Health (established by Minister of Health).
- **Professor Peter Owen** was elected Co-President of the International College of Prosthodontists.
- **Adjunct Professor Joy Shackleton** was elected President of the Prosthodontic Society of South Africa.
- **Professor Patrick Dessein and Ms Linda Tsang** were invited to become the only members and contributors on the African continent to the Transatlantic Risk Calculator for Rheumatoid Arthritis (ATACC-RA)
- **Professor Stephen Tollman** was elected as a Member of the International Advisory Board, Wellcome Trust, Cambridge Centre for Global Health Research, UK and as a Board member China Center for Health Development Studies (CCHDS), Peking University, Beijing, China

2015




Left to right: Professor Patrick Dessein with Professor Beverley Kramer, Professor Kathleen Kahn, Professor Peter Owen and Adjunct Professor Joy Shackleton

OTHER OUTSTANDING ACHIEVEMENTS/ DEVELOPMENTS IN THE FACULTY

2015

SmartSpot

A team of scientists from the University of the Witwatersrand, led by **Professor Wendy Stevens** and **Professor Lesley Scott** from the Department of Molecular Medicine and Haematology in collaboration with **Professor Bavesh Kana** from the DST-NRF Centre of Excellence for Biomedical TB Research, developed the SmartSpot technology. SmartSpot guarantees the quality of the molecular diagnostic tests.

The team has won several awards for its ingenuity including the Innovation Prize for Africa Social Impact Award 2015, the GAP Biosciences Business Plan Award 2014 for biotechnology entrepreneurship and the NHLS National Innovation award in 2013.

WHO/TDR International Postgraduate Training Scheme on Implementation Science

The Wits School of Public Health has been selected as one of three African sites and one of seven sites internationally for the **WHO/TDR International Postgraduate Training Scheme on implementation science**. The programme will complement the planned field of study in implementation science (as part of the MSc Epidemiology), carried out in conjunction with the University of North Carolina (which provides scholarships for South African students). The value of the TDR grant is around $500 000 per annum, and will provide scholarships for additional Master's and Doctoral TDR-sponsored students from other African countries to degree completion over the four-year period of the scheme. The grant is led by **Dr Latifat Ibisomi and Professor Laetitia Rispel** (who is co-principal investigator of the Fogerty grant on implementation science obtained jointly with the University of North Carolina in 2014).

SMARTABASE

The Centre for Exercise Science and Sports Medicine in conjunction with Wits Sport has acquired a powerful data management system for athletes called SMARTABASE. This sophisticated software is used for athlete data, for performance assessments, for patients in the School's sportsclinic@wits and elsewhere. In addition to the service aspect, the data sets are used for research purposes. The latest innovation is that raw data from the Centre's Biodex (isokinetic muscle testing apparatus) can be imported directly to SMARTABASE. Trends in injury, performance and numerous outcome measures are monitored, graphs generated and interventions analysed. Data can be entered by athletes and patients directly online via laptops and smartphones with researchers and sports administrators viewing, analysing and monitoring information. The potential in improving athlete performance and patient outcomes, and increasing research outputs in the process is enormous.

Evan Stein Centre for Familial Hypercholesterolaemia

Dr Evan Stein

In 2013 **Dr Evan Stein** and **Professor Frederick Raal** deliberated on a programme to detect and treat Familial Hypercholesterolaemia (FH). In December 2015, the Wits Council approved the establishment of the Evan Stein Centre for Familial Hypercholesterolaemia following a generous donation to the value of R16 000 000.00 from Dr Evan Stein, a Wits graduate. The Centre was established to promote awareness and to assist with the identification of subjects with FH in South Africa. The Centre will be led by Professor Frederick Raal and will become operational in 2016.

Craniofacial Identification Laboratory

A Craniofacial Identification Laboratory was initiated in the Division of Biological Anthropology, School of Anatomical Sciences with the appointment of a new postdoc fellow (T Houlton). An Artec Spider 3D scanner was obtained, which can be used to scan both hard tissues (e.g., crania) and soft objects (e.g., facial features and soft tissues). These 3D renderings can, for example, be used for geometric morphometric analyses, facial approximations, and 3D printing of objects. Initial projects at the laboratory include an assessment of the accuracy of skull-photo superimposition using face masks and their accompanying skulls, clinal variations in the human face and the relationship between the hard tissues of the skull and the mouth for forensic facial approximation.

RESEARCH EVENTS & INITIATIVES

Contents

BIENNIAL RESEARCH DAY AND POSTGRADUATE EXPO

Every second year, the Faculty hosts a Research Day and Postgraduate Expo. The 2014 biennial Faculty of Health Sciences Research Day and Postgraduate Expo took place in September at the Wits Medical School.

The Research Day and Postgraduate Expo proved to be another major success. Among the delegates that attended the 90 oral presentations, nearly 250 posters and three roundtable discussions were Heads of Schools, Heads of Departments, Research Entities Directors, academic staff, researchers, postgraduate and undergraduate students.

On the evening prior the 2014 biennial Faculty of Health Sciences Research Day and Postgraduate Expo, **Professor Reinhard Fäessler,** Director of the Department of Molecular Medicine of the Max Planck Institute for Biochemistry, Germany presented a plenary lecture on 'Disease causing adhesion deficiencies modelled in transgenic mice'. In addition, poster displays were open for viewing to the Faculty for two days.

The opening was delivered by **Professor Zeblon Vilakazi**, Deputy Vice-Chancellor for Research and Postgraduate Studies. The opening was followed by a plenary lecture delivered by **Professor Roy Zent**, Vice Chair for Research, Department of Medicine, Vanderbilt University, USA, entitled 'Targeting fibrosis from molecule to man'.

The inaugural **Phillip V. Tobias plenary lecture**, which was instituted by the Faculty for the first time in 2014, was delivered by **Professor Bernard Wood**, Professor of Human Origins, Department of Anthropology, George Washington University, USA. This lecture in honour of Phillip Tobias, doyen of the Faculty, was entitled 'Reconstructing human evolution history'.

The Research Day covered five thematic areas: Clinical Sciences and Therapeutics for Health; Education Policy and Systems; Infectious Diseases; Diseases of Lifestyle; Molecular and Comparative Biosciences. Roundtable discussions included topics such as Ethics in Biobanking, led by Professor Ames Dhai; 20 Years of Research Excellence in Democracy, led by Professor Laetitia Rispel; and Medical Catastrophes within and beyond South African Borders, led by Professor Efraim Kramer.

The Postgraduate Expo was again a hive of activity. Over 50 exhibitions by major companies, Faculty departments and entities, national research foundations such as the MRC and NRF, as well as local units undertaking student support were heavily inundated by the delegates.

At the closing ceremony, prizes were awarded to the best oral and poster presenters for both staff and students for each of the thematic sessions.

RESEARCH DAY PRIZE WINNERS

Clinical Research and Therapeutics for Health

Best Student Oral - Sarah Rayne

Best Oral - Ashraf Coovadia

Best Student Poster - Muhammed Vally

Best Poster - Carol Hartmann

Diseases of Lifestyle

Best Student Oral - Venesa Pillay

Best Oral - Mandy Maredza

Best Student Poster - Moekanyi Sibiya

Best Poster - Carren Ginsburg

Infectious Diseases

Best Student Oral - Denise Olivier

Best Oral - Michelle Groome

Best Student Poster - Ria Lassauniere

Best Poster - Stephanie Jones

Molecular and Comparative Biosciences

Best Student Oral - Jinal Bhiman

Best Oral - Samantha Nicholson
who presented on behalf of Buhle Moyo

Best Student Poster - Sibusiso Senzani

Best Poster - Patti Kay

Education, Policy and Systems

Best Student Oral - Lionel Green-Thompson

Best Oral - Duane Blaauw

Best Student Poster- Ameh Soter

Best Poster - Janine White

The 2014 Research Day and Postgraduate Expo was an inspiring, informative, enlightening and well attended event that fostered networking and academic excellence. We gained knowledge and witnessed the impressive research output of our Faculty of Health Sciences.

Acknowledgement must be made of all our sponsors.
Without them this Day would not be a success!

RESEARCH DAYS OF SCHOOLS IN THE FACULTY

2015

School of Oral Health Sciences

The School of Oral Health Sciences held its second biennial research day in August 2015. The Research Day event was organised by the School's Research Day Committee chaired by Dr Julitha Molepo, Head of Research in the School. The event was attended by 210 participants, including staff members, undergraduate students, postgraduate students, representatives from Gauteng Department of Health, the South African Dental Association (SADA) and other Schools/regions within and the external to the University.

The oral and poster presentations covered a wide-spectrum of research undertaken in various disciplines. The BDS IV group led by Ms B. Beneke received the 'Best undergraduate oral presentation' prize; Dr R Garrana from the Department of Oral Medicine and Periodontology and Ms F Mbatha from the Department of Oral Biological Sciences received the Best Oral and Poster presentation respectively by a postgraduate student.

School of Public Health

In keeping with its proud tradition of scholarly engagement, networking and sharing of research findings with the broader community, the Wits School of Public Health (WSPH) held its biennial research day in August. The theme of the conference, Healthography, a new term borrowed from the American Public Health Association, combines health and its social, ethnographic and geographical determinants. The theme encompassed all divisions and units in the School, and provided staff and students an opportunity to showcase their research and scholarly activities.

The Head of School, Professor Laetitia Rispel, welcomed delegates to the event. The Deputy Minister of Health, Dr Joe Phaahla, gave the keynote address entitled 'Healthography – revitalising health promotion, disease prevention and health protection'. He highlighted the importance of health promotion, disease prevention and health protection in the management of South Africa's complex disease burden. This was followed by Professor Beverley Kramer's (Assistant Dean: Research and Postgraduate Support, Faculty of Health Science) plenary lecture entitled 'Human sexual diversity: Policy implications'. Professor Kramer shared some recent findings of the Academy of Science of South Africa which explored the causes and policy implications of diversity in human sexuality.

The five sub-themes for the oral and poster presentations were: (1) social determinants of health, public health policies and community action; (2) burden of disease, disability and population health; (3) the natural and built environments and health; (4) improving the performance of the health system; and (5) the scholarship of education, teaching and learning. The afternoon session started with a panel discussion: Highlighting universal health coverage (UHC) and its implementation challenges in South Africa, which was chaired by Professor Jane Gouge.

The prize for the best poster presentation was presented to Dr Claire von Mollendorf (PhD student) and Shehnaz Munshi (MPH) was the runner up. The best oral presentation award was awarded to Caroline Govathson (MSc graduate) and the second prize went to Celeste Sauls (MPH).

School of Therapeutic Sciences

The 5th Biennial School of Therapeutic Sciences Research Day was held in September 2015 on the Wits Education Campus. The event was officially opened by the Dean of the Faculty of Health Sciences, Professor Martin Veller. There were more than 150 registered attendees including staff, alumni, postgraduate students as well as fourth year undergraduate Occupational Therapy and Physiotherapy students. The Research Day organisers would like to acknowledge the support and contributions made by the Faculty of Health Sciences Research Office, the Department of Physiotherapy, the Department of Occupational Therapy, the Centre for Exercise Sports Science and Medicine and the Professional Provident Society (PPS) for making this day a success.

As is the tradition at the School of Therapeutic Sciences Research Day, the first morning session was dedicated to showcasing research projects from one of the Departments in the school. This year it was the turn of the Centre for Exercise Science and Sports Medicine. Their staff and alumni presented a range of topics that dealt with physical activity, sports, exercising and the challenges which accompany these essential daily activities.

In the mid-morning and afternoon sessions, a total of 20 experienced and emerging researchers presented their research. An hour was dedicated for attendees to view posters that showcased research from all the disciplines within the school. The topics ranged from diseases of Lifestyle and interventions to improve functional ability post affliction to laboratory-based malaria and cancer *in vitro* studies.

The names of the winners of the various prize categories are as follows:

Best Oral: Gillian Mahumane (Therapeutic potential for the use of E. radiata oil as an antimicrobial).

Runner-Up Oral: Julie Jay (Providing opportunities for student self-assessment: The impact on the acquisition of psychomotor skills in occupational therapy students).

Best Poster: Fatima Kathrada (The effect of novel 4-(7-chloroquinolin-4-yl) piperazin-1-yl (pyrrolidin-2-yl) methanone derivatives on the lifecycle of the malaria parasite).

Runner-Up Poster: Denise Franzsen (Handwriting Screening Test for students in Higher education).

Emerging Researcher: Ane Orchard (Commercial essential oils against skin pathogens).

The Research Day was officially closed by the Head of School, Professor Judith Bruce, who commended the staff, alumni and students for the high quality, cutting edge and diverse research topics that were on display during the School's Research Day.

School of Clinical Medicine

In September 2015 the School of Clinical Medicine held its research day at the Marie Curie Lecture Theatre, Wits Medical School. Over 250 delegates attended the event including Professor Michael Hasenkam from Aarhus University, Denmark, Experimental Cardiac Surgery. Professor Mkhululi Lukhele, Head of the School of Clinical Medicine welcomed everyone. The opening lecture was presented by two Carnegie Fellows Dr Nimmisha Govind and Dr Susan Williams who obtained their PhDs in 2013. The Research Day covered a wide spectrum of topics with four major areas: Health Systems, Education and Bioinformatics; General (disciplines such as paediatrics, obstetrics, neurology, radiology and ophthalmology); Renal and Cardiology; and Anesthesia and Surgery. The aim of the Research Day was displaying ongoing research carried out by academic staff, postgraduate and undergraduate students. Forty oral presentations and 80 posters were showcased. The closing lecture was delivered by Professor Ian Sanne, Director of the Clinical HIV Research Unit and Chief Executive Officer, Right To Care. The Dean of the Faculty of Health Sciences, Professor Martin Veller awarded four prizes in the following categories: Undergraduate/Master in Medicine to **Dr John Thomson**; Postgraduate Masters by dissertation/PhD to **Dr Justor Banda**; Postgraduate Fellow/consultant to **Dr Nadine Harran** and one prize for the Best Poster to **Bonita Do Nascimento**.

WITS CROSS FACULTY GRADUATE SYMPOSIUM

The Sixth Cross-Faculty Graduate Symposium: October 2014

The Wits Cross Faculty Symposium provides a forum for postgraduates to showcase their work and to engage with research carried out in the different Wits Faculties and disciplines.

The Faculty of Health Sciences Winners were:

Oral Presentation category:

Sibusiso Senzani from the DST/NRF Centre of Excellence for Biomedical TB Research, School of Pathology received the first prize, the second prize was awarded to **Anna Haw** from the School of Physiology and **Tamzyn Baartman** from the School of Physiology was awarded third prize.

Sibusiso Senzani (student) receiving prize from the Vice-Chancellor and Principal of the University of the Witwatersrand, Professor Adam Habib

Poster Displays category:

Zaahida Sheik Ismail from the DST/NRF Centre of Excellence for Biomedical TB Research, School of Pathology received the first prize. **Nicholas Bacci** from the School of Anatomical Sciences was awarded second prize and the third prize was awarded to **Mhlengi Magubane** from the School of Physiology.

PRESTIGIOUS RESEARCH LECTURES

Prestigious Research Lectures

In 2014 and 2015, the Health Sciences Research Office continued the Prestigious Research Lecture Series. Two prestigious research lectures were delivered in 2014 and one was delivered in 2015. The aim of this Lecture Series is to showcase Wits' exceptional Health Sciences researchers and to provide a platform for the dissemination of research findings to local specialists, doctors, allied health science providers and the community at large. In addition, the lecture series provides a forum at which discussion of research data can be opened to debate.

Lecture X

June 2014

The Health Sciences Research Office hosted the 10th Prestigious Research Lecture. The lecture entitled 'SUPERBUGS: are the bugs winning the war?' was presented by **Professor Guy Richards** (Head of the Division of Critical Care, School of Clinical Medicine) and **Professor Adriano Duse** (Head of Department of Clinical Microbiology and Infectious Diseases, School of Pathology). **Professor Mark Cotton** (Head of the Division of Paediatric Infectious Diseases and Director of the Children's Infectious Diseases Clinical Research Unit (KID-CRU) at Tygerberg Children's Hospital, Faculty of Health Sciences, Stellenbosch University) acted as the expert commentator. The event was hosted by **Professor Beverley Kramer** (Assistant Dean: Research and Postgraduate Support).

Professor Richards presented information on the therapeutic, infection prevention and control challenges of bacterial pathogens, with Professor Duse focusing on similar challenges posed by agents which cause viral hemorrhagic fevers such as the deadly Ebola and Marburg viruses. Superbugs are micro-organisms, such as viruses and bacteria, which modern medicine is struggling to combat because they are becoming increasingly virulent and resistant to antibiotics or vaccines. 'At the same time, new antibiotics are not being developed by Pharmaceutical companies,' explained Professor Richards.

The problem of overuse of antibiotics and the myth that you should finish the course even after you feel better was addressed. 'We are talking about a crisis where people in ever greater numbers are no longer responding to the available treatments and the problem is growing, with disastrous consequences. This is largely as a result of the abuse of antibiotics – both their incorrect prescription and over prescription,' said Professor Guy Richards.

Left to right: Professor Mark Cotton, Professor Guy Richards and Professor Adriano Duse

Professor Richards emphasised that washing hands can make a difference in the spreading of bacteria, as bacteria are transferred from one person to the next by using their hands. He further recommended that individuals should go for a yearly flu vaccination in order to reduce the chances of getting ill. On discussing virus infections, Professor Duse mentioned that Filovirus (the virus family which includes Ebola and Marburg virus) outbreaks are occurring more often, with an outbreak every year to two years. Also, previously confined to small rural areas, these outbreaks are now occurring more often in larger towns and cities. He went on to describe the reality of an outbreak situation and how the disease burden can be compounded by factors such as heavy rainfall, malaria, yellow fever, and social and religious factors.

After giving evidence of how microbes evolve to combat modern drugs and how humans are responsible for their spread, Professor Duse asked the audience 'Who is the Superbug: Man or Microbe?'

Following the thought provoking lecture, the new Dean of the Faculty of Health Sciences, Professor Martin Veller thanked the speakers and commentator.

Lecture XI

December 2014

Professor Mervyn Mer (Principal Specialist in the Division of Critical Care and Pulmonology, Department of Internal Medicine, Wits) and **Professor Jeffrey Lipman**, a Wits Alumnus (Director of the Department of Intensive Care Medicine, Royal Brisbane and Womens' Hospital, Professor and Head of Anaesthesiology and Critical Care, University of Queensland) presented the eleventh lecture in the Prestigious Research Lecture series. The lecture was entitled 'Beyond Superbugs: Critical lessons in life and medicine from Africa to the first world!'

Addressing the audience Professor Lipman summarised a career in the relatively 'young' discipline of critical care, commencing with his establishment of the first intensive care unit (ICU) at JG Strijdom Hospital, and later heading up the ICU at Baragwanath Hospital. In his nearly forty years of research into the critically ill, Lipman's focus has been on determining adequate dosing in critical care patients, whose response to drugs is not typical of drug trials performed on relatively 'healthy' and non-critical test subjects. Lipman cited differences in volumes of distribution as well as augmented renal clearance as key factors in drug inefficiency in current 'standard' approaches to dosing. 'One size does not fit all', he iterated, alluding to the fact that current dosing guidelines do not make adjustments for factors such as weight, which might well impact drug efficacy. In South Africa, there are significant implications for Lipman's research, particularly when considering the treatment of critically ill TB patients and the rise of multi-drug resistant strains of TB.

Professor Mer presented on the human aspect and the local burden of these deadly diseases. He showed how famous individuals who have been diagnosed with TB have responded to having the disease. 'One person dies from TB every 20 seconds globally and one in 100 South Africans has TB', said

Left to right: Professor Charles Feldman, Professor Mervyn Mer, Professor Jefffrey Lipman, Professor Beverley Kramer and Professor Martin Veller

Professor Mer. ‘We may well not be treating TB patients adequately’, said Professor Mervyn Mer, speaking alongside Professor Lipman at the Prestigious Lecture. He discussed the various clinical findings that critically ill individuals with TB can present with. He also emphasised that doctors can do better- they can improve TB treatment. The take home message from Professor Mer’s talk was summarised by the legendary Mandela’s words ‘It is in your hands to make a difference, to make this world a better place’.

Lecture XII

June 2015

The 12th Prestigious Research Lecture entitled 'Nano-neuro-therapeutics: Unravelling neurodegeneration', was presented by **Professor Girish Modi** (School of Clinical Sciences) and **Professor Viness Pillay** (School of Therapeutic Sciences).

Left to right: Professor Beverley Kramer, Professor Viness Pillay, Professor Thirumala Govender, Professor Girish Modi and Professor Martin Veller

The lecture included insights into the design of double-encapsulated crosslinked cellulosic nanospheres for Parkinson's disease; the development of 'smart' polylactide biopolymers for Alzheimer's disease; Nanoparticles and nanovectors for CNS bio-distribution of AZT in HIV-Associated Neurological Disorders (HAND); Ligand-coupled nanobubbles for targeting mutagenic proteins and nanotubes to improve acute and chronic CNS drug targeting in stroke.

Professors Modi and Pillay's developments in nano-neuro-therapeutics have brought us even closer to the possibility of implanting neuro-gadgets into our brains that have the potential to render the debilitating effects of neurodegenerative disorders a thing of the past.

To conclude the two outstanding presentations, the commentator, Professor Thirumala Govender (Professor of Pharmaceutics, Head of the Drug Delivery Research Proto-Unit and Head of the Nano-Health Sector of the UKZN Nanotechnology Platform) praised the integrity and relevance of the presenters work. She also encouraged greater collaboration between disciplines, to draw together the efforts of neurologists, pharmaceutical scientists and pathologists.

CARNEGIE-WITS ALUMNI DIASPORA PROGRAMME

The Wits Health Sciences Alumni Diaspora Programme was initiated by the Faculty Research Office in 2010. Through the Programme, the Faculty seeks to bring research-active alumni 'home' for short periods of time, to network and explore areas of potential research collaboration. 2014 was the first year of funding from the Carnegie Corporation of New York, giving the programme the opportunity to expand on its objectives. The Carnegie-WITS Alumni Diaspora Programme has been able to develop from an opportunity for WITS alumni to 'give back' to their alma mater, to an established programme that is showing concrete research 'gains'.

During the 2014/2015 period, eighteen international alumni participated in the programme. Each spent one to two weeks in the Faculty, presenting seminars and meeting with staff and postgraduate students. The Faculty hosted the following Alumni:

In May 2014, **Professor Cheryl Levitt** (Wits MBBCh 1975) Professor of Family Medicine at McMaster University, Toronto, and the College of Family Physicians of Canada Senior Research Advisor, visited the Faculty. She was hosted by Professor Laurel Baldwin-Ragaven and the Department of Family Medicine. Professor Levitt's public lecture was entitled 'Gender Equity and Health Sciences Education'. In addition to providing research guidance to the Department of Family Medicine, she also led in a successful Department writing retreat.

Left to right: Professor Cheryl Levitt, (Family Medicine - McMaster University Canada) and Professor Laurel Baldwin-Ragaven

In September 2014, **Professor Roy Zent** (Wits MBBCh 1984), Vice –President of Research in Department of Medicine, Division of Nephrology and Hypertension, Department of Medicine, Department of Cancer Biology, Department of Cell and Developmental Biology Vanderbilt University School of Medicine, spent a week in the Faculty. He was hosted by Professor Beverley Kramer. Professor Zent's plenary lecture 'Targeting fibrosis from molecule to man' was part of the Faculty of Health Sciences Research Day and Postgraduate Expo 2014. For the fifth consecutive year, Roy together with Professor Ambra Pozzi also conducted their successful scientific paper and grant writing workshops, which give participants the opportunity for presentation and detailed feedback. As the initiator of the Vanderbilt Collaboration with Professor Beverley Kramer, Professor Roy Zent also strengthened links on this nascent project with a number of Faculty members across different Schools and Departments.

Professor Alan Stein, Head of Section, Adolescent and Child Psychiatry, Department of Psychiatry, University of Oxford, visited the Faculty in October 2014. He was hosted by Professor Shane Norris Director of the MRC/Wits Developmental Pathways for Health Research Unit, Department of Paediatrics, Professor Stephen Tollman, Associate Professor and Head: Health and Population Division, School of Public Health and Professor Kathleen Kahn, Associate Professor: Health and Population Division. Professor Stein's public lecture was entitled, 'The impact of perinatal depression on child development: mechanisms and a global perspective', and showcased his research work on how postnatal depression affects child development in the three core parenting capacities of responsiveness, emotional scaffolding and the capacity to treat the child as a psychological agent. Professor Stein furthered his joint collaboration with WITS around a number of research projects, including developing a number of early intervention programmes based on his research work.

Professor Jeffrey Lipman (Wits MBBCh 1972) is a Professor and Head: Discipline of Anaesthesiology and Critical Care, University of Queensland School of Medicine; Director: Department of Intensive Care Medicine, Royal Brisbane and Women's Hospital University of Queensland, Australia. In December 2014 he visited the Faculty and was hosted by Professor Mervyn Mer, Department of Internal Medicine. Professor Lipman was one of the presenters at the 11th Prestigious Lecture Series, entitled 'BEYOND SUPERBUGS: Critical lessons in life and medicine from Africa to the first world!' His visit cements an MOU between the University of Queensland and Wits in terms of ongoing collaboration between the two institutions' Health Science Faculties.

2014 Carnegie-WITS 'outgoing' International Visits

May/June 2014 - **Erin Hutchinson**, Lecturer and PhD Student, School of Anatomical Sciences, visited Professor Jules Kieser at the University of Otago, Dunedin, New Zealand. As part of her visit, she attended the Meeting of the New Zealand Society for Forensic Odontology in Wellington, and spent time with students studying through the Sir John Walsh Research Institute (SJWRI), to foster further research collaboration between the SJWRI and WITS as well as to work on aspects of research currently underway.

2015 Carnegie-Wits Alumni Diaspora Visitors

Professor Gary Lewis (Wits MBBCh 1982) from the Department of Medicine and Department of Physiology, University of Toronto, Director, Banting and Best Diabetes Centre, Director, Division of Endocrinology and Metabolism, University of Toronto, Sun Life Financial Chair in Diabetes Drucker Family Chair in Diabetes Research visited the Faculty in February 2015. He was hosted by Professor Frederick Raal and Professor Martin Smith and the School of Clinical Medicine.

In March 2015, **Professor David Salant** (Wits MBBCh 1969), Professor of Medicine and Chief of Nephrology, Boston University Medical Center spent a week in the Faculty. He was hosted by Professor Graham Paget and the Department of Nephrology.

Professor Salant delivered a Faculty Lecture entitled 'some new developments in membranous nephropathy', where he referred to a study that was recently published as a joint article with the University of Hamburg. He recounted the various approaches he and his team at Boston University applied in their pursuit of identifying the antigen (THSD7A) associated with this autoimmune disease. The study was published in the *New England Journal of Medicine* in 2014 and can be accessed on **www.nejm.org/doi/full/10.1056/NEJMoa1409354**

Professor Anthony Feinstein (Wits MBBCh 1945) is a neuropsychiatrist at Sunnybrook Hospital in Toronto, Director of the Hospital's Traumatic Brain Injury Clinic, and Professor of Psychiatry at the University of Toronto. In June 2015 he was hosted by Professor Christopher Szabo and the Department of Psychiatry as part of the Carnegie-Wits Alumni Diaspora Programme.

Feinstein's programme included visits to some of the Faculty of Health Sciences academic teaching hospitals, presenting seminars to the Department of Psychiatry, as well as a Faculty lecture titled 'Journalists under Fire: War and the Emotional Health of Journalists'.

Left to right: Dr Mark Paine with host Professor Basil Brooke

Dr Mark Paine is a Reader in Insect Biochemistry at the Liverpool School of Tropical Medicine (LSTM) and a Wits alumnus (BSc Hons 1983). Dr Paine visited the Faculty in July 2015 and was hosted by Dr Basil Brooke, from the Wits Research Institute for Malaria.

Dr Paine delivered a Faculty lecture entitled 'Snakes, Drugs and Tropical Diseases – Anatomy of a Wits Graduate'. Dr Paine's research interests include trying to predict resistance so that it can be managed early. He noted that the under-equipped laboratories in rural communities of the developing world can be a challenge for field research. Efforts are being made to develop diagnostic kits into handheld devices for field research.

Professor Frederic Sitas (Wits BSc 1981, BSc Hons 1983, MSc (Med) 1987) is a Wits Health Sciences alumnus and former Head of the South African Cancer Registry at the National Health Laboratory Services (NHLS, 1990 - 2002). In 2002 he relocated to Australia to direct the Cancer Research Division at Cancer Council New South Wales. Maintaining links with the Wits School of Public Health and the NHLS, Professor Sitas continued to collaborate on research projects in South Africa. In April 2015 he visited the Faculty and was hosted by Associate Professor Gill Nelson and the School of Public Health. Professor Sitas engaged in a full programme of meetings with several members of Faculty, across various disciplines, giving input on studies and developing new collaborations.

During his visit, Professor Sitas delivered two talks. One was entitled '*Does human papillomavirus (HPV) cause oesophageal cancer? Results from the InterSCOPE study*.' The international study was prompted by observations of a correlation between HPV and oesophageal cancer. Giving an account of the research methods and data collected from the study, including a large contribution from South Africa, it was concluded that no causal relationship existed between HPV and oesophageal cancer. Professor Sitas also presented a talk to the School of Public Health on '*Smoking on the South African death certificate*: Analysis of 1.7m records.'

Left to right: Professor Frederic Sitas, Professor Gill Nelson, Professor Martin Hale, Professor Laetitia Rispel and Dr Chantal Babb

In May 2015 **Professor Kelvin Hong** (Wits MBBCh 1992) visited the Faculty. He is a Professor and Chief of Interventional Radiology at Johns Hopkins University. Professor Victor Mngomezulu and the Department of Diagnostic Radiology hosted Professor Hong as part of an ongoing collaboration through the Carnegie-Wits Alumni Diaspora Programme.

During his visit, Professor Hong assisted in interventional procedures at the Chris Hani Baragwanath Academic Hospital (CHBAH) and Charlotte Maxeke Johannesburg Academic Hospital (CMJAH) where he had the opportunity to teach and interact with consultants and registrars. He also assisted with facilitating a two-day protocol development workshop where he shared his vast experience in research and gave insightful advice to the participants. Additionally, he had the opportunity to meet with some of the Carnegie Clinician Scientist PhD Fellows.

Professor Hong gave two lectures in the Department of Radiology. He presented the first lecture at CHBAH. His lecture was entitled, '*The role of interventional radiology in the management of the abdominal trauma*.' Professor Hong's second lecture was on the recent developments in interventional radiology training in the U.S. and on the ground breaking research he is currently undertaking. Professor Hong attended a very fruitful meeting with radiology research coordinators, Dr Susan Lucas and Dr Tebogo Hlabangana and the School of Anatomical Science to brainstorm ways to enrich medical student training and exposure to radiology.

This was Professor Hong's second visit as part of the Carnegie-Wits Alumni Diaspora Programme, which has already resulted in the establishment of networks and research collaboration with the Johns Hopkins Mammography department and the University of Maryland Medical Centre Thoracic Imaging Unit. The partnership with Professor Hong has also resulted in the initiation of registrar observerships to Johns Hopkins, the first of which took take place in July 2015.

Left to right: Professors Victor Mngomezulu and Professor Kelvin Hong

Left to right: Professor Kelvin Hong and Dr Su Lucas assisting a registrar in the protocol development workshop

In July 2015, the Faculty was delighted to welcome back Carnegie-Wits Alumni Diaspora Fellow, **Professor Roy Zent** (Wits MBBCh 1984). Professor Zent is the Thomas F. Frist Sr Professor of Medicine, and Vice Chair of Research in the Department of Medicine at Vanderbilt University School of Medicine. Professor Roy Zent and **Professor Ambra Pozzi** have been running annual grant writing and scientific paper writing workshops in the Faculty since 2010. They are outstanding academics who have each published more than 100 journal articles and have been awarded several large grants. They are also experienced in reviewing paper manuscripts and grant applications for the National Institutes of Health (NIH), amongst others. Joining Roy and Ambra from Vanderbilt University were **Professor David Aronoff** and **Dr Katie Klaus**. Part of the visit was structured to explore avenues to expand the Wits-Vanderbilt collaboration.

The workshops were lively and very well received. Professors Zent and Pozzi once again gave the attendees unique insight on paper and grant writing and drew attention to common errors. In the practical workshops, attendees presented their grants and papers to the group and received feedback on how to strengthen these.

Professor Pozzi also gave a presentation to the Faculty's Emergent Researchers group on 'How to be a good mentor'.

Left to right: Professor Roy Zent with the Hillel Friedland Postdoctoral Fellows, Dr Antonia Wadley and Dr Aurelie Deroubaix, and Professor Ambra Pozzi. Professor Duncan Mitchel (far right) is hosting Dr Wadley's Fellowship in the School of Physiology

Left to right: Professor Ambra Pozzi and Professor Penny Moore (coordinator of the Emergent Researcher's group)

Left to right: Professor Karen Hofmann, Dr Neil Soderlund and Professor Letitia Rispel

Dr Neil Soderlund (Wits MBBCh 1989) is the senior adviser in the Sydney office of The Boston Consulting Group (BCG) and head of Healthcare Practice in Australia and New Zealand. Dr Soderlund is also a member of BCG's Global Value Based Healthcare leadership team. Dr Soderlund visited the Faculty in November 2015 and presented two Faculty lectures entitled '*Measuring Health Outcomes*' and '*Integrated needs response outcomes (INRO): a Framework for understanding population health and focussing resources*'.

Dr Neil Gordon, is the CEO of INTERVENT International, LLC. In October he visited the Faculty. He obtained his MBBCh and PhD from Wits University, and after relocating to the United States, obtained his Master's degree in Public Health from UCLA. Dr Gordon served as Director of Exercise Physiology at the world-renowned Cooper Research Institute in Dallas, Texas where, amongst other things, he worked with numerous elite athletes. He was subsequently in private practice with The Dallas Heart Group. He is the founder of INTERVENTUSA Inc., and the INTERVENT lifestyle management and chronic disease risk reduction programmes. He is a Fellow of the American College of Cardiology and is Board Certified in Public Health and General Preventive Medicine.

Dr Gordon has devoted his career, spanning over 30 years, to the prevention of cardiovascular disease and other chronic illnesses. He has received many honours and awards of recognition as an international leader in the field of chronic disease prevention and management. Dr Gordon was hosted by Professor Demitri Constantinou, Centre for Exercise Science and Sports Medicine, School of Therapeutic Sciences.

Dr Neil Gordon

Professor Brynn Levy (Wits BSc1987, BSc Hons1988, MSc (Med) 1991) is a Professor of Pathology and Cell Biology at Columbia University, New York. He is also the Director of the Clinical Cytogenetics Laboratory at the New York-Presbyterian Hospital and Co-Director of the Laboratory of Personalised Genomic Medicine. In November-December 2015 Professor Brynn Levy was hosted by Professor Amanda Krause, Division of Human Genetics, School of Pathology as part of the Carnegie-Wits Alumni Diaspora Programme.

Professor Brynn Levy

In December 2015 **Professor Nicolas Sluis-Cremer** (Wits BSc 1993, BSc Hons 1994, PhD 1997) visited the Faculty. He is the Director of Basic Research in the Division of Infectious Diseases, and Associate Professor of Medicine at the University of Pittsburgh, USA. Professor Sluis-Cremer served his Postdoctoral Fellowship at McGill University AIDS Center in Canada. Professor Sluis-Cremer was hosted by Professor Maria Papathanasopoulos, HIV Genotyping Division and the HIV Pathogenesis Research Unit, School of Pathology.

Professor Nicolas Sluis-Cremer

In November 2015 **Professor Cyril Meyerowitz** (Wits D.D.S 1973), Director Emeritus of the Eastman Institute for Oral Health at Rochester University, New York visited the Faculty. He was hosted by Dr Julitha Molepo in the School of Oral Health Sciences. The Institute is one of six regional nodes of the USA's National Dental Practice-Based Research Network (NDPBR). In his Faculty lecture, Professor Meyerowitz presented on the NDPBR and on some of the studies he has undertaken thus far. Professor Meyerowitz clarified that while there is a high volume of research in the basic sciences, the studies are poor at producing interventions. NDPBR focusses on significant, day-to-day issues encountered by practices and practitioners with results that can be implemented. Professor Meyerowitz also gave insights into the administrative, regulatory and ethics processes.

Left to right: Dr Julitha Molepo, Professor Cyril Meyerowitz and Professor Phumzile Hlongwa

In August 2015 **Professor Dan Berkowitz** (Wits MBBCh 1984) visited the Department of Anaesthesiology. Professor Berkowitz is a Professor of Anaesthesia and Critical Care Medicine, and Biomedical Engineering at Johns Hopkins University School of Medicine. He is also team leader for the National Space Biomedical Research Institute Cardiovascular Alterations Team.

Professor Berkowitz delivered a Faculty lecture entitled 'Missions above low Earth orbit: Challenges for physiologic adaptation'. Professor Berkowitz was hosted by Dr Desmond Lines from the Department of Anaesthesiology.

Left to right: Professor Dan Berkowitz with hosts, Professor Chris Lundgren and Dr Des Lines

2015 Carnegie-Wits Return Visits to Alumni Fellows

Name of Wits researcher	University visited	Month
Dr Susanna Lucas and Dr Tebogo Hlabangana	Professor K Hong (Johns Hopkins University, Baltimore, USA)	March 2015
Professors Steve Tollman and Kathleen Kahn	Dr A Stein (Oxford University, UK)	June - July 2015
Ms Erin Hutchinson	University of Otago, New Zealand	September - October 2015
Dr Shune Oliver	Dr M Payne (Liverpool School of Tropical Medicine, UK)	October 2015
Rossella Bandini (Masters Student)	Professor J Lipman (University of Queensland, Australia)	November 2015
Professor Beverley Kramer	Professor R Zent, (University of Vanderbilt)	November 2015
Dr Dhesan Moodley	Professor Dan Berkowitz (Johns Hopkins University)	December 2015

Carnegie Academic Medicine Fellowship Programme

In 2010, the Carnegie Corporation of New York provided the University of the Witwatersrand with funding for three years to attract, train, develop and retain clinicians to pursue an academic and research based career in Medicine. Due to the initial success of the programme the grant from Carnegie was renewed for a further three years in 2013.The Programme's major objective was to allow young specialists the opportunity to obtain PhDs through a structured fulltime programme over two years during which they could take unpaid leave from their clinical positions within the Provincial Health services and were provided with a tax-free stipend for the period. The first cohort of four young specialists was selected and enrolled into the programme at the beginning of March 2011. Since its inception a total of 18 Fellows have been appointed into the two year PhD programme, while a further two Fellows have been given a Fellowship for one year each to allow them to complete their ongoing PhD studies.

To date seven of a possible eight fellows have successfully completed their PhDs, and the remaining cohorts are making good progress, although the expectation of them being able to complete their PhDs within the two year fellowship is not always met. During their fellowships, the candidates have attended a number of short courses on research methodology, protocol writing, statistics, research ethics, scientific and grant writing, curriculum design and student assessment.

Financial support has also been provided for the fellows to either attend and participate in an international conference or visit an overseas laboratory. Furthermore funding has been provided not only for their PhD research running expenses, but also for a year of research support in the year immediately after completing their PhDs to allow the Fellows to develop ongoing research in their clinical departments to which they return.

Overall it is believed that the programme has been uniquely successful and is at the forefront of national efforts to address the long standing decline in clinical research that has been occurring over many years in South Africa.

Carnegie Fellows Symposium

In 2014, the Health Sciences Research Office hosted the Carnegie Fellows Symposium. The symposium was held at the Department of Cardiology, Chris Hani Baragwanath Academic Hospital. The attendees were honoured to have the DVC: Research, Professor Zeblon Vilakazi, deliver the opening address. The symposium provided the Carnegie Fellows with an opportunity to present and highlight their research. The following Fellows presented their research:

Dr Martin Brand
(Supervisor/s: Professor Martin Veller and Professor Gavin Norton)

Dr Kapila Hari
(Supervisor: Professor Girish Modi)

Dr Susan Williams
(Supervisor: Professor Trevor Carmichael and Professor Michele Ramsay)

Dr Glendah Kalunga
(Supervisor/s: Professor Saraladevi Naicker and Dr Raquel Duarte)

Dr Nirthi Maharaj
(Supervisor/s: Professor Elena Libhaber and Professor Mohammed Essop)

Dr Ziyaad Dangor
(Supervisor/s: Professor Shabir Madhi and Dr Sanjay Lala)

Dr Nimmisha Govind
(Supervisor/s: Professor Mohammed Tikly and Professor Michele Ramsay)

Health Sciences Biennial Postdoctoral and Carnegie Fellows Symposium

In December 2014 Postdoctoral Research Fellows and their hosts from the Faculty of Health Sciences met for an end of year tea. The event aimed to increase contact between Postdoctoral Fellows and to provide a platform for social and academic support. The Faculty hosts over 60 Postdoctoral Fellows located across Wits Medical School, Chris Hani Baragwanath Academic Hospital and research sites. The Faculty of Health Sciences has a Postdoctoral Forum which is open to all Faculty Postdoctoral Fellows. The Postdoctoral Fellows meet quarterly to address their needs and to maintain contact with Faculty management.

The Faculty of Health Sciences Research Office hosted its Biennial Symposium for Postdoctoral Fellows in 2015. The 2015 Symposium included the Carnegie PhD Fellows as well. The Symposium was held at the Wits Club, West Campus. The purpose of the Symposium is to showcase the research of the Fellows. Twenty-eight Postdoctoral and seven Carnegie Fellows presented their research. **Professor Shabir Madhi** (Executive Director of the National Institute for Communicable Diseases, Professor of Vaccinology and Director of the MRC Respiratory and Meningeal Pathogens Research Unit at Wits) was the guest speaker.

POSTDOCTORAL FORUM

The Faculty of Health Sciences Postdoctoral Forum is open to all Health Sciences Postdoctoral Fellows and their hosts. There are more than 60 Postdoctoral Fellows associated with the Faculty and the Postdoctoral Fellows mainly reside at Medical School, Public Health, National Health Laboratory Service (NHLS) and the Chris Hani Baragwanath Academic Hospital in Soweto. With Postdoctoral Fellows spread across such a wide area, the Faculty Postdoctoral Forum aims to keep Postdoctoral Fellows up to speed with administrative issues, provides an opportunity for Postdoctoral Fellows to raise concerns and provides support throughout the stages of Postdoctoral Fellows fellowship. Additionally, the forum aims to increase the feelings of inclusion and support for Postdoctoral Fellows who are placed in remote departments or locations.

The forum has quarterly meetings, which rotate around the three main locations mentioned above. Additionally there are two social events a year, which coincide with the quarterly meeting on one occasion. An executive committee of three to five Postdoctoral Fellows runs the forum.

Postdoctoral fellows in the Adler Museum

Postdoctoral fellows at the Chris Hani Baragwanath Hospital

Vanderbilt-Wits Collaborations

Since 2010, Wits alumnus **Professor Roy Zent** and **Professor Ambra Pozzi** from Vanderbilt University, Tennessee, USA have been invited by **Professor Beverley Kramer** (Assistant Dean of Research and Postgraduate Support) to run grant and paper writing workshops at the Faculty. Driven by Professors Kramer and Zent, this relationship has prospered into an institutional collaboration between Vanderbilt and Wits facilitating a variety of interactions and projects.

Professors Kate Clouse and **David Aronoff**, from Vanderbilt, visited the Faculty in July 2015 to explore opportunities to expand the collaboration. As a result of this visit, Professors David Aronoff and **Shane Norris** (Developmental Pathways for Health Research Unit, Wits) have submitted two grant applications. The collaboration between Professors Kate Clouse and **Jo Vearey** (African Centre for Migration and Society, Wits) has been proposed.

Professors David Haas and **Sten Vermund** (Vanderbilt) invited **Professor Ames Dhai**, the Director of the Steve Biko Centre for Bioethics, School of Clinical Medicine, to visit. Professor Dhai has an interest in biobanking and Professors Haas and Vermund scheduled a tour of their genotyping and repository facility by the repository manager, Cara Sutcliffe. The group also had a meeting on biobanking.

Dr Atul Kapila, a consultant from Vanderbilt, visited the Faculty in early 2015. Dr Kapila was hosted by Dr Alan Karstaedt at Chris Hani Baragwanath Academic Hospital.

Dr Nqoba Tsabedze is a cardiologist and Carnegie Clinician PhD Fellow. He visited Vanderbilt in September 2015 and met with Charles Hong and Tommy Wang to discuss the methodology for their study. They demonstrated their capabilities on Pluripotent cardiac myocyte regeneration as well as their CRYSPER technology on gene modification to mimic true disease and correcting it. He was also introduced to their in-house genetic processing capacity and the various genetic analysis tools they have at their disposal. He found their CLC Genomics Workbench to be impressive and user friendly. Dr Tsebedze is recruiting patients and collecting blood samples to send to Vanderbilt.

In March 2015, **the School of Therapeutic Sciences** organised a visit to Vanderbilt that included five members of the school (Professor Patricia De Witt, Lize Maree, Demitri Constantinou, Dr Veronica Ntsiea, Mrs Shirra Moch) and the Assistant Dean of Teaching and Learning, Professor Lionel Green-Thompson. The delegation learnt about the Vanderbilt Programme in Inter-professional Learning for medical students. Professor Green-Thompson met with staff to gain insights into course evaluation processes, some of the undergraduate programmes, and staff development programmes. Professor Constantinou visited the Department of Physical Medicine and Rehabilitation and participated in discussions about bi-centre research on cardiac and other rehabilitation, collaborative work around Ekso Exoskeleton (which was developed by Vanderbilt University's Bioengineering Department). There is a common interest to enable academic exchanges between the Vanderbilt University and Wits.

Dr Ryan Wagner (Agincourt, Wits) and **Carolyn Audet** (Vanderbilt) have initiated a project on traditional healers in the Agincourt area. The aim of this study will be to 'create a matrix to identify and link traditional and allopathic illness diagnoses' with the goal to identify disease-specific traditional treatments, prognoses and treatment costs and 'determine healer willingness to engage with the allopathic health system and vice versa'.

Dr Larry Zwiebel from Vanderbilt participated in the Scientific Board of the Wits Research Institute in Malaria. He was hosted by Professor Maureen Coetzee with whom he is collaborating.

REDCap for Africa

In 2015, Irma Mare (REDCap Administrator) presented a talk at the Annual REDCap Conference organised by the Vanderbilt Biomedical Informatics team, hosted by Oregon Health Science University in Portland, Oregon. Her presentation was entitled: 'Unique challenges that people in Africa face when trying to support REDCap platforms'. Her presentation highlighted the reasons for the under-utilisation of the REDCap resource.

The online REDCap Consortium resources offer a platform for sharing of information, knowledge and even custom tools developed by member organisations. Mrs Mare found through her interactions with other administrators in Africa, that participation in the interactive Consortium resources is relatively low.

Diamonds and Pearls

The Faculty Research Office hosted the seminar: '*Diamonds and Pearls III: Insights into the management of Cardiovascular Disease in Women*'. The event was organised by Professor Elena Libhaber and Dr Naomi Rappaport and took place in March 2014 in the Adler Museum, Wits Medical School. The symposium included significant key topics of cardiovascular diseases in women such as: '*Autoimmune collagen vascular disease and the heart*', '*Osteoporosis and the heart' and 'Stress cardiomyopathy-Takasubo syndrome*'. The speakers were distinguished Wits Faculty and alumni: Professor Patrick Dessein, Dr Stanley Lipschitz and Dr Gavin Angel. The Academic Head of the Department of Internal Medicine and Head of the Division of Cardiology, Professor Pravin Manga, chaired the symposium. The closing remarks were addressed by Professor Pinky Sareli.

SIGNIFICANT SEMINARS/WORKSHOPS HOSTED BY THE FACULTY

Dr David Koppel, Director of the largest craniofacial unit in the UK and Honorary Clinical Associate Professor, Faculty of Medicine, University of Glasgow and Honorary Consultant Surgeon to The Royal Navy and Director of Continuing Professional Development and Professional Standards, The Royal College of Physicians and Surgeons of Glasgow visited the Faculty in July 2014. He presented a seminar entitled 'Preparing for the first face transplant in the UK'. He outlined the preparation process, documented previous successful face transplant surgeries and highlighted some of the challenges of the intricacies of soft tissue transplantation. Dr Koppel was hosted by the Faculty Research Office, together with the School of Oral Health Sciences and the School of Clinical Medicine.

Left to right: Professor Beverley Kramer (Assistant Dean: Research and Postgraduate Support), Professor Rhian M Touyz (Director - Institute of Cardiovascular and Medical Sciences, University of Glasgow and Carnegie-Wits Alumni Diaspora Fellow), Professor Martin Veller (Dean: Faculty of Health Sciences) and Dr David Koppel

ONE DAY TRAINING FOR CLINICAL TRIAL INVESTIGATORS AND STATISTICIANS

In November 2015, the Health Sciences Research Office hosted **Professors Barbara Bierer**, **Charles Knirsch** and **Lynn Sleeper** from the Multi Regional Clinical Trials (MRCT) Center of Harvard and the Brigham and Women's Hospital. The three visitors presented a one day training workshop for clinical trial investigators and epidemiologists. The workshop was attended by clinicians and statisticians in the Faculty. The presenters shared their knowledge and insights on data and safety monitoring committees, pharmacovigilance and drug and vaccine development. Two panel discussions were held. The first panel discussion was on safety issues where the panelists (**Professor Jonathan Levin** from the School of Public Health and **Professor Haroon Saloojee** from the School of Clinical Medicine) and the presenters discussed the issue of safety, efficacy and futility. The second panel discussion was on drug and vaccine development. The panelists (**Dr Michelle Groome** from the Respiratory Meningeal Pathogens Research Unit, **Dr Lee Fairlie** from the Wits Reproductive Health and HIV Institute and **Dr Avy Violari** from the Perinatal HIV Research Unit) discussed various issues around drug and vaccine development including ethical considerations and clinical trial endpoints.

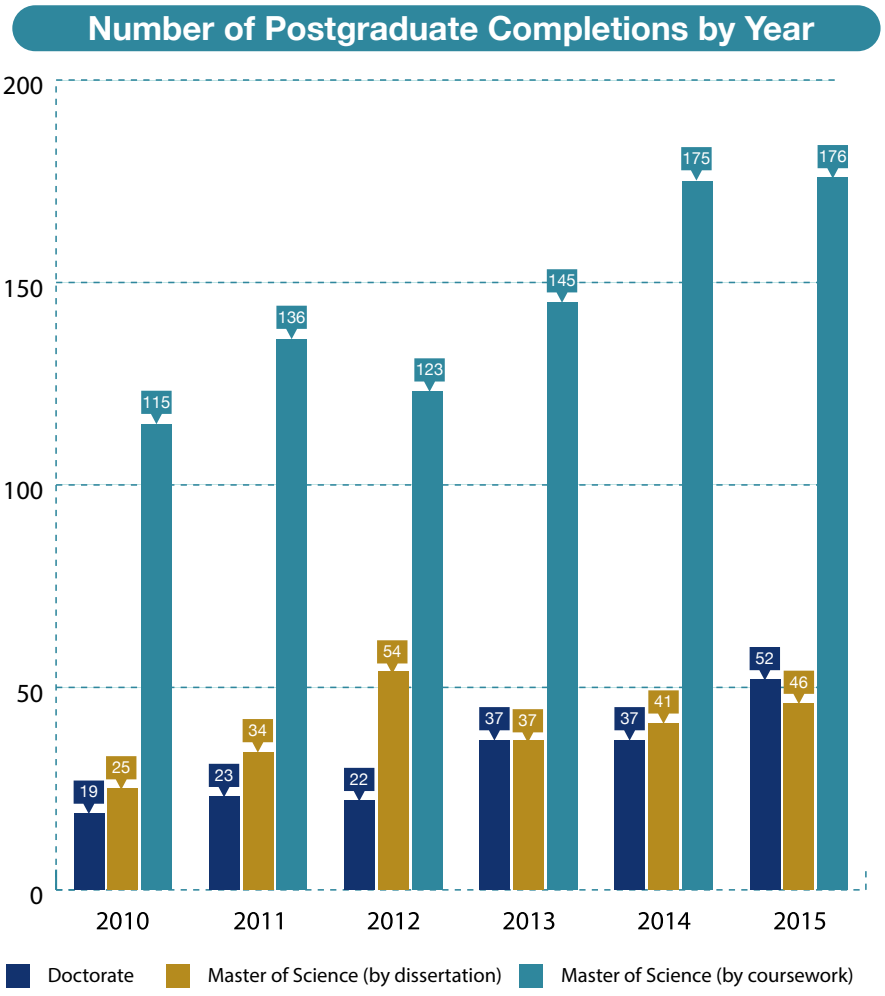
Left to right: Professor Lynn Sleeper, Professor Barbara Bierer, Mr Kennedy Otwombe, Dr Michelle Groome and Professor Charles Knirsch

RESEARCH OUTPUTS & FUNDING

Contents

POSTGRADUATES

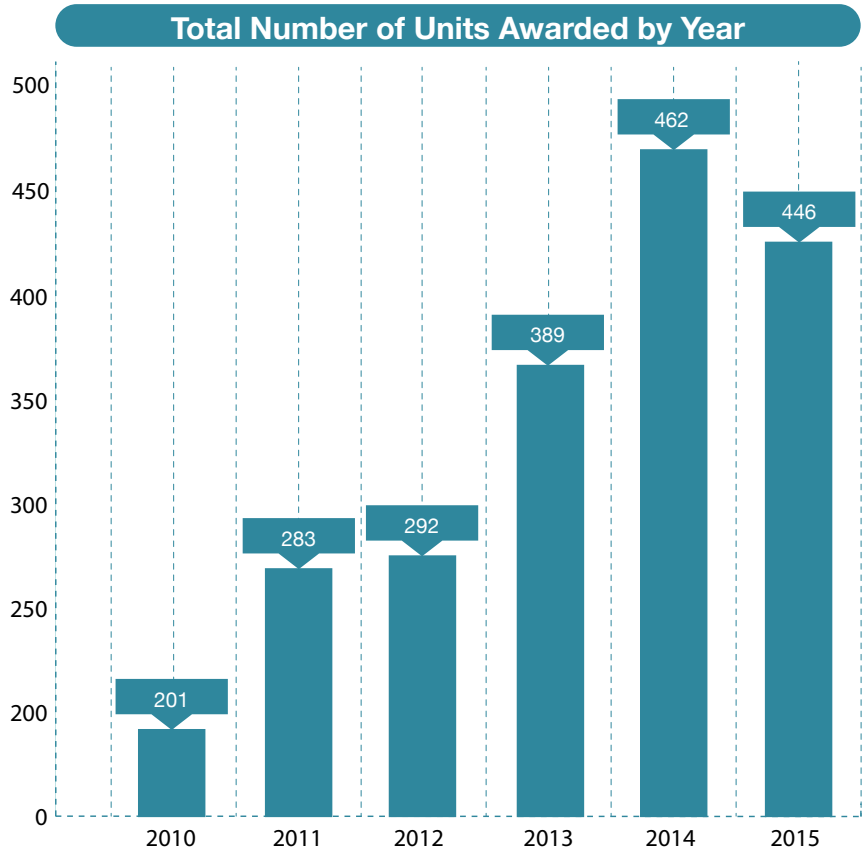
The Faculty awards Master of Science (MSc) degrees by coursework, MSc degrees by dissertation and Doctoral (PhD) degrees in all health sciences disciplines. The graph below illustrates the number of MSc and PhD students who completed their degrees in the Faculty of Health Sciences between 2010 and 2015.



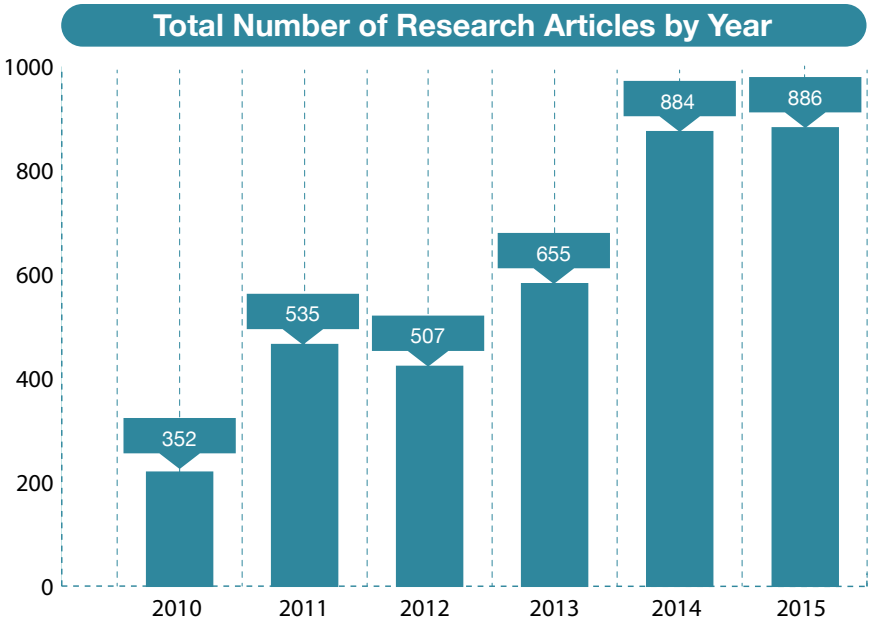
RESEARCH PUBLICATIONS

The Faculty is proud of its research publication record and continues to endeavour to increase the number of scholarly articles in publishes in reputable journals and books. The following graphs demonstrate publication outputs confirmed by the Department of Higher Education and Training (DoHET) between 2010-2015.

Note: 2015 publication units have not yet been confirmed by the Department of Higher Education and Training (DoHET).



(journal articles, chapters in books, books and conference proceedings per year)



RESEARCH FUNDING

The Faculty receives funding from a variety of sources such as the University Research Council, the National Research Foundation, the South African Medical Research Council, Bill and Melinda Gates Foundation, the NIH, amongst others. The Wits Health Consortium, a wholly-owned subsidiary of Wits, administers much of the externally-derived research funds. The table below illustrates in Rands, the funding available for research in the Faculty in 2014 and 2015.

Faculty of Health Sciences Research Funding	2014 (R'000)	2015 (R'000)
Funds allocated by the University Research Council (URC)	13 140	14 418
External research funds administrated by the Wits Health Consortium	692 123	697 286
Wits Health Consortium Dividend	2 500	3 190
Funds awarded by local external fund bodies		
National Research Foundation	43 130	44 343
South African Medical Research Council	14 374	8 617
Total	**765 267**	**767 854**

HIGHLY PRODUCTIVE AND HIGHLY CITED RESEARCHERS

The table below contains the names of current Wits Faculty of Health Sciences academics who have produced 40 or more publications in journals indexed by the Web of Science (ISI journals) in the last five years (2011 to 2015). These academics have averaged eight publications per annum. More importantly, at least half of these publications have been cited in the literature by other researchers in the last five years. The table is ranked by the percentage of documents cited.

First name	Surname	Web of Science Documents	Times Cited
Ian	Sanne	61	2 918
Shabir	Madhi	102	1 028
Mhairi	Maskew	48	411
Shane	Norris	71	375
Kathy	Kahn	66	346
Viness	Pillay	90	342
Yahya	Choonara	84	322
Lisa	du Toit	76	296
Pradeep	Kumar	87	289
Angela	Woodiwiss	55	246
Paul	Manger	41	236
Justus	Hofmeyr	41	195
Gavin	Norton	51	185
John	Pettifor	40	154

PATENTS

The following table shows the patents granted (and patents under prosecution) to researchers in the Faculty of Health Sciences in 2014-2015.

AWARDED PATENTS (2014-2015)	
PATENT NUMBER	**PATENT NAME**
U. Ripamonti University of the Witwatersrand, Johannesburg (ZA), Medical Research Council of South Africa, Cape Town, Western Cape Province (ZA). 2015. Bone Research Unit. EP 1 948 218 B1. April 15, 2015.	Osteogenic Device for Inducing Bone Formation in Clinical Contexts
U. Ripamonti University of the Witwatersrand, Johannesburg (ZA), Medical Research Council of South Africa, Cape Town, Western Cape Province (ZA). 2015. Bone Research Unit. US2012/0277879 A1. November 1, 2012	Osteogenic Device for Inducing Bone Formation in Clinical Contexts
U. Ripamonti University of the Witwatersrand, Johannesburg (ZA), Medical Research Council of South Africa, Cape Town, Western Cape Province (ZA). 2015. US9, 084,757 B2. July 21, 2015	Osteogenic Device for Inducing Bone Formation in Clinical Contexts
(PCT/IB2006/02585) (Publ 29.03.2007, WO 2007/034287), JPN Patent # 530653/2008 (Publ Kohyo 508841/2009) granted 03/14	Oramucosal pharmaceutical dosage form
(PCT/IB2008/000395) (Publ 28.08.2008 WO2008/102247), JPN Patent # 550332/2009 (Publ Kohyo 509918/2011) granted 05/14	A polyamide rate-modulated monolithic delivery system
(PCT/IB2008/000396) (Publ 28.08.2008 WO2008/102248), PCT granted in EUR (08719155.7, publ EPA 2124902) granted 10/14	An improved monolithic drug delivery system
(PCT/IB2008/000396) (Publ 28.08.2008 WO2008/102248), granted in JPN (550333/2009, 11.01.2013, Jap Patent 517847).	An improved monolithic drug delivery system
(PCT/IB2009/005828) (Publ 23.12.2009 WO 2009/153632), US Patent # 12/999,914 (Publ 28.07.2011 US 2011/0182988) granted 05/14	A gastroretentive pharmaceutical dosage form
(PCT/IB2009/005828) (Publ 23.12.2009 WO 2009/153632), JPN Patent # 2011-514137 (Publ Kohyo 2012-504551) granted 05/14	A gastroretentive pharmaceutical dosage form
(PCT/IB2009/005831) (Publ 3.12.2009 WO 2009/153634), PCT filed in US (12/999,911, publ. 2012/0003316), JPN(2011-514139, publ 15.11.2012 2012-528789), EUR 09766176.3 (publ 16.03.2011 2306981).	A transmucosal delivery system
PATENTS UNDER PROSECUTION	
PATENT NUMBER	**PATENT NAME**
US Patent App # 20060024368, filed 02/06	Compressed composite delivery system for release-rate modulation of drugs
(PCT/IB2006/02585) (Publ 29.03.2007 WO 2007/034287) PCT US (11/992,240, publ 2009-0317470, CIP 13/736,176), EUR(06795521.1 Publ 1937414).	Oramucosal pharmaceutical dosage form
US Patent App # 11/288,035 (Publ 31.05.2007 US2007/122449 CIP 13/020,943 04.02.2011, Publ 01.09.2011 US2011-0212154), PCT filed in US, 09/06	Biodegradable implantable drug delivery device
(PCT/IB2008/000395) (Publ 28.08.2008 WO2008/102247), PCT filed in US (12/528,175, published 23.12.2010, 2010/0323007, USP 8,277,841; 02.10.2012), Europe (08719154.0, publ 04.11.2009 EPA 2112922).	A polyamide rate-modulated monolithic delivery system
(PCT/IB2007/003727) (Publ 28.06.2008 WO2008/068584), PCT filed in US (US 12/312,843, published US 2010/0179170A1), EUR (07848972.1, pub EP2097067).	A heterogeneously configured multiparticulate GIT delivery system
(PCT/IB2009/005830) (Publ 23.12.2009 WO 2009/153633), PCT filed in US (12/999,824, published 28.07.2011 US 2011/0182987), JPN (2011-514138, publ 08.09.2011 2011-524890), EUR 09766175.5.	Pharmaceutical dosage form for the site-specific delivery of more than one API
(PCT/IB2009/005828) (Publ 23.12.2009 WO 2009/153632), PCT filed in EUR (09766174.8, publ 2306983A).	A gastroretentive pharmaceutical dosage form
(PCT/IB2009/005832) (Publ 23.12.2009 WO 2009/153635), PCT filed in US (12/999,925, publ 11.08.2011, 2010/0195121), JPN (2011-514140 Publ 08.09.2100 2011-524891), EUR 09766177.1 (publ 02.03.2011 2299986).	A chronotherapeutic pharmaceutical dosage form

PATENTS UNDER PROSECUTION (CONTINUED)

PATENT NUMBER	PATENT NAME
(PCT/IB2009/007583) (Publ 03.06.2010 WO2010/06124), PCT filed in SA, ARIPO.	A controlled release intravaginal system
(PCT/IB2009/007598) (Publ 03.06.2010 WO/2010/061288), PCT filed in US (13/131,820, publ 15.03.2012 US 2012/0064143), EUR (09793575.3, publ 05.10.2011 2 370 055).	Polymeric pharmaceutical dosage form in sustained release applications
(SA 2008/09707), SA Provisional filed.	A matrix for transmucosal drug delivery
(PCT/IB2011/055337) (Publ 31.05.2012 WO 2012/070030), PCT filed in US.	A pharmaceutical composition
(PCT/IB2011/055340) (Publ 31.05.2012 WO 2012/070031), PCT filed in EUR (11842468.8, publ 02.10.2013 2642985), US (13/989,462), CHN (201180065905.1), JPN (2013-540481), SA (2013/04634).	Polymeric matrix of polymer-lipid nanoparticles as a pharmaceutical dosage form
(PCT/IB2011/055331) (Publ 31.05.2012 WO 2012/070028), PCT filed in EUR (11842556.0), US (13/988.959), China (201180066162.X), Japan (2013-540480), India (5687/DELNP/2013), SA (2013/04709).	A pharmaceutical dosage form
(PCT/IB2011/055345) (Publ 31.05.2012 WO 2012/070034), PCT filed in EUR (11843806.8), US (13/989,402), CHN (201180065587.9), Japan (2013-540482), IND (5753/DELNP/2013), SA (2013/04574).	A drug delivery device
(PCT/IB2011/055343) (Publ 31.05.2012 WO 2012/070033), PCT filed in US (13/989,346), EUR (11843032.1), SA (2013/04511).	An implant for controlled release of drugs
(PCT/IB2011/055322) (Publ 31.05.2012 WO 2012/070026), PCT filed in US (13/989,435).	Polymeric hydrogel compositions for response to electrical stimulus
(PCT/IB2011/055328) (Publ 31.05.2012 WO2012/070027), PCT filed in US (13,989,401), EUR (11843763.1, publ 02.10.2013 2643020), CHN (201180066184.6), ARIPO (AP/P/2013/006939), IND (5686/DELNP/2013), BRZ (10 2013 0131237), SA (2013/04573).	A drug delivery device
(PCT/IB2011/055332) (Publ 31.05.2012 WO2012/070029), PCT filed in US 13/988,968), EUR (11843359.8, publ 02.10.2013 2642979), China (201180065538.5), ARIPO, India (5754/DELNP/2013), SA (2013/04633).	A pharmaceutical composition
(SA 2010/07277), SA Provisional filed, 10/11	A polymer-engineered neural device
(SA 2010/07276), SA Provisional filed, 10/11	An implantable device for targeted delivery
(PCT/IB2013/051052), PCT application filed.	Pharmaceutical dosage form
(PCT/IB2013/058453), PCT filed, 10/11	Pharmaceutical dosage form
(PCT/IB2013/058458), PCT filed in March 2013.	Pharmaceutical dosage form
(PCT/IB2013/059116), PCT filed in 04/13	Liposomal delivery system
(SA 2012/07430), Provisional filed, 04/13	Oral pharma dosage form
(SA 2013/03979), Provisional filed, 04/13	Probiotic delivery system
(SA 2013/03981), Provisional filed, 04/13.	An implantable sensor for disease treatment
(SA 2013/03983), Provisional filed, 04/13	Microneedle arrays
(SA 2013/03984), Provisional filed.	Xerogel oral delivery system
(SA 2013/03982), Provisional filed, 04/13	Resorbable wound dressings
(SA 2013/05584), Provisional filed, 04/13	pH-responsive pharmaceutical dosage form
(SA 2013/03980), Provisional filed, 04/13	Nanoparticulate system
SA Provisional Patent filed, 03/15	A ‘bioactive association platform’
SA Provisional filed, 03/15	An in situ crosslinked oral core-melt tablet
SA Provisional Patent filed, 03/15	Neogeometric copper nanoparticles
SA Provisional filed, 03/15	Pristine-polymer intercalated hydrogel
SA Provisional filed, 03/15	Ligand-bound nanospheres

Contact

For enquiries, comments or copies of the report, please contact:
T +27 11 717 2530 | **E research.health@wits.ac.za**

Health Sciences Research Office
3rd Floor, Phillip V Tobias Health Sciences Building
29 Princess of Wales Terrace
Parktown, Johannesburg, 2193