HEALTH SCIENCES
RESEARCH REVIEW
2016 - 2017

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

FACULTY OF HEALTH SCIENCES

CONTENTS

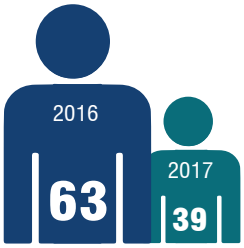
FACULTY IN **NUMBERS** 2016-2017

Publications

Total Units

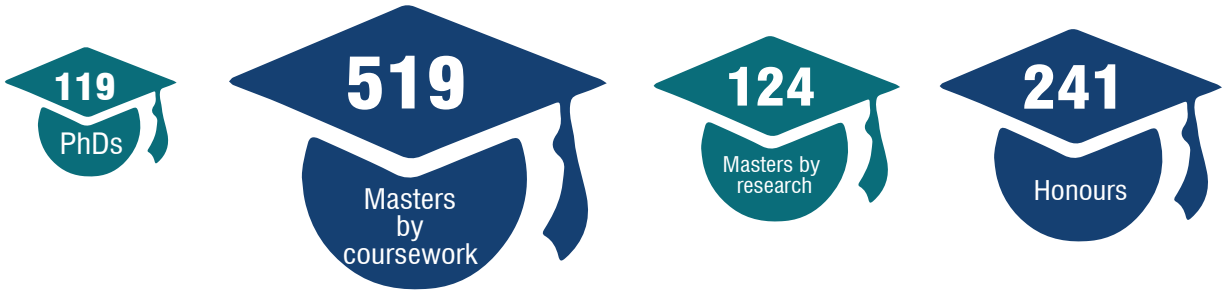
Postgraduate Students (2016 and 2017)

Postdoctoral Fellows

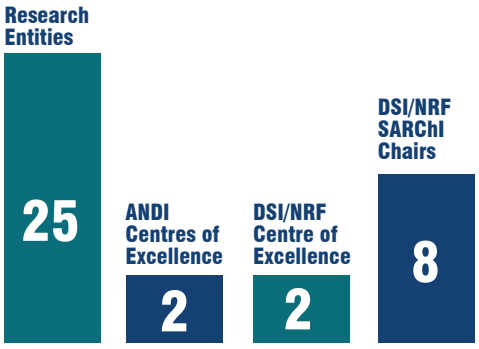


Postgraduate throughputs (2016 and 2017)

In 2016 and 2017 the Faculty graduated



The Faculty was home to



The Faculty hosts

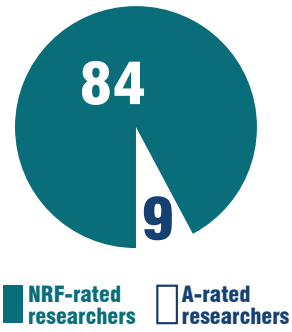


Photo by: Eyescape

RESEARCH **FOCUS**

Implanting actigraphy devices for measuring sleep in elephants in their natural habitat in Chobe, Botswana.

SCHOOL OF ANATOMICAL SCIENCES

Head of School **Professor Maryna Steyn**

The School of Anatomical Sciences has considerable research strengths in the Neurosciences and Biological Anthropology. Other research interests include toxicology, cell biology (breast cancer) and anatomical variations. In 2016, the Human Variation and Identifi cation Research Unit (HVIRU) was established, and most of the research in Biological Anthropology is now conducted under the auspices of this unit. The School has many collections available for research, and has excellent equipment amongst which is a unique MBF Bioscience Imaging System that includes Neurolucida, Stereoinvestigator and Biolucida Cloud systems that are used for neuron tracing and analysis as well as quantifi cation of cells on histological slides.

Highlights for 2016/2017 include a study entitled "Inactivity/sleep in two wild free-roaming African elephant matriarchs does large body size make elephants the shortest mammalian sleepers?" by Dr

Nadine Gravett, Dr Adhil Bhagwandin, Professor Paul Manger and colleagues which received wide national and international media coverage. The research was published in PLOS ONE. This research featured on over 400 000 websites. Professor Paul Manger was interviewed live on BBC world news the interview was seen globally. The publicity of this study raised over 2.1 million rand in Advertising Value Equivalency in South African media alone for the University. Using recently developed techniques in the study of sleep research (actigraphy), this study showed elephants sleep an average of two hours per day, can go without REM, or dreaming, sleep for three to four days, and can go without sleep for up to 48 hours when threatened by predators.

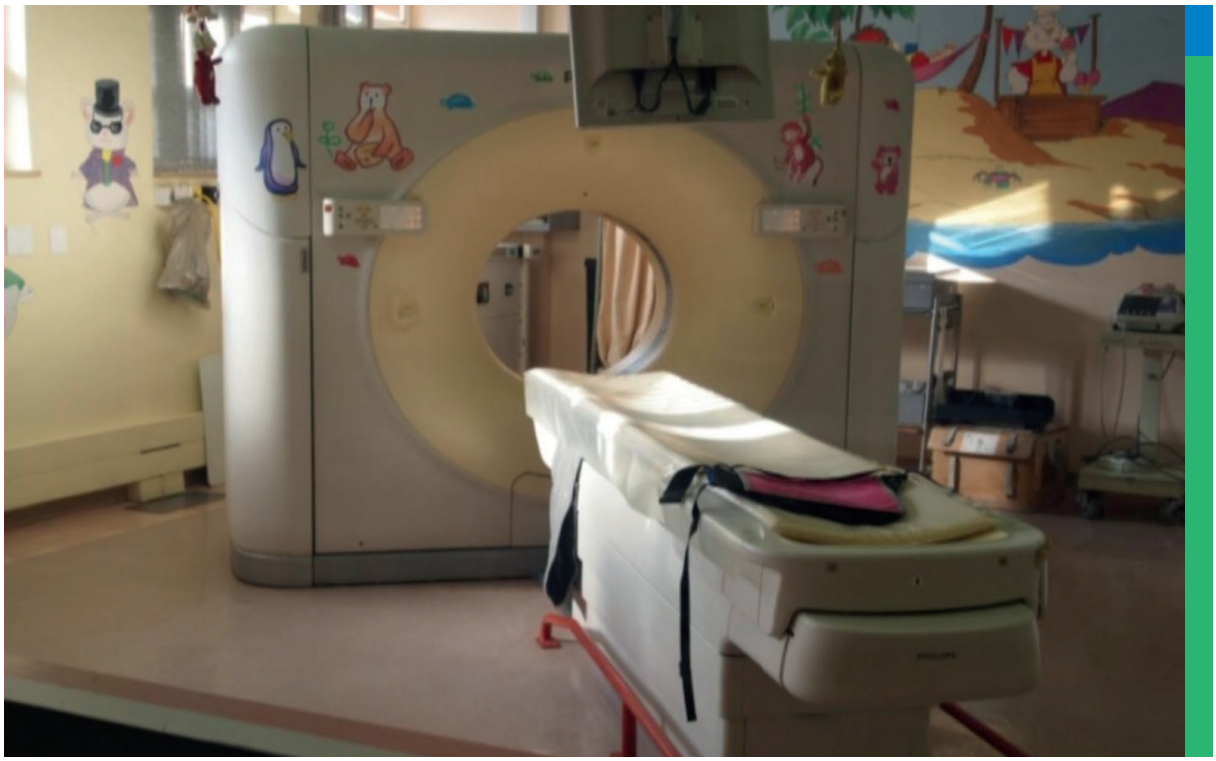
A separate study on crocodile brains, by Mr. Brendon Billings, Professor Paul Manger and colleagues refined the use of functional MR imaging to examine the functional capabilities of the crocodile forebrain, showing that the crocodile forebrain is more complex than previously thought (**https://community.sfn.org/t/sfn-day-1-poster-round-up-crocs-listening-to-bach-hummingbird-neurophysiology-and-estrogen-treatment-for-schizophrenia-more/8364**). This study was presented at the Society for Neuroscience meeting and was published in *Proceedings of the Royal Society of London. Series B: Biological Sciences.*

HUMAN VARIATION AND IDENTIFICATION RESEARCH UNIT

Director **Professor Maryna Steyn**

The Human Variation and Identification Research Unit was founded mid-year in 2016. Biological Anthropology has long been one of the mainstays of research in Anatomical Sciences. The diversity of living peoples in Southern Africa, together with our richly documented sequence of over 2 million years of fossil and archaeological materials, provides unique research opportunities that cannot be found elsewhere in the world. The aim of this research unit is to study modern human variation, how this variation came to be, and some of its practical applications (e.g., when it comes to human identification in forensic contexts or use in assessing modern growth processes). The results of this research shed light on modern human adaptations, specifically with respect to patterns of health and disease.

It bridges the gap between the study of fossil hominids and modern, living people and sheds light on where we are today – the modern human experience. Focus areas include Forensic Anthropology, Craniofacial Identification, Bioarchaeology, Human Variation and Taphonomy. Highlights included a co-authored paper in Science, entitled "Southern African ancient genomes estimate modern human divergence to 350,000-260,000 years ago" (CM Schlebusch, H Malmström, T Günther, P Sjödin, A Coutinho, H Edlund, AR Munters, M Vicente, M Steyn, H Soodyall, M Lombard, M Jakobsson. Science 2017 358:652-655). Professor Lynne Schepartz, along with her student TA Esan published the Wits Atlas of tooth formation and emergence. A set of two papers by Professor Schepartz and TA Esan on the earliest hominid cancer and earliest neoplastic disease in the fossil record attracted wide attention (the earliest hominid cancer paper made it into the Altmetric 100 list, which is the top 100 most-publicized papers published in the world). Other projects included the virtual reconstruction of the skull and face of a Griffin Warrior from Pylos, Greece, found beside the Mycenaean Palace of Nestor.



SCHOOL OF CLINICAL MEDICINE

WITS SCHOOL OF CLINICAL MEDICINE

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 and other dyslipidaemias, insulin resistance, diabetes mellitus as well as other related metabolic disorders. The unit is well recognized both nationally and internationally for their work on familial hypercholesterolaemia and has one of the largest cohorts, if not the largest cohort, of homozygous FH patients in the world. The unit has contributed and continues to contribute to the management of the homozygous FH patients.

We continue to research novel therapies such as antisense apo B-100 and PCSK9-inhibitor monoclonal antibody therapy and more recently siRNA 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 as lead articles in the Lancet with Professor Raal as fi rst 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. Professor Raal co-authored several reviews on the management of homozygous and heterozygous FH, side effects of statin therapy as well as a Consensus statement

on LDL-lipoproteins being the cause of atherosclerosis published in the European Heart Journal. Professor Raal was asked to write several editorials on aspects and treatment of familial hypercholesterolaemia. He was also invited to give lectures on novel therapies for familial hypercholesterolaemia in Japan, Hong Kong, Taiwan, South Korea, Europe and Australia in 2017.

CLINICAL HIV RESEARCH UNIT

Director: **Associate Professor Ian Sanne**
Department of Internal Medicine

The key areas of research that the Clinical HIV Research Unit (CHRU) has been involved in are drug sensitive and drug resistant TB, drug resistant HIV, Kaposi Sarcoma and cervical cancer in HIV and the long-term cardiovascular risk in individuals on ARV's. Renovations at the site were completed in 2016 and this included a TB clinic with an air filter system and a chemotherapy infusion unit. This places the unit in a strategic position to conduct more TB clinical trials as the TB research agenda is expanding. During this period, the unit has been involved in several noteworthy clinical trials such as the NIX trial, which explored the shortening of XDR treatment. The A5279 study, funded by the NIH through the ACTG network showed that ultra-short TB prophylaxis with Rifapentine and INH was as effective as nine months of INH prophylaxis in HIV positive individuals. This could affect the control of TB in the HIV population. The preliminary results of the STREAM 1 study showed that the nine-month treatment regimen for MDR TB achieved favourable outcomes in almost 80% of those treated. The CHRU remains one of the top sites in the ACTG network concerning recruitment and retention of study participants. The Health Economics and Epidemiology Research Office (HE2RO) a department within the CHRU has also continued to grow over the past two years with 12 grants by the end of 2017 for research projects and associated studies underway in South Africa and neighbouring countries.

Their research alongside their collaboration with Boston University on the INROADS (Innovations Research on HIV/AIDs) grant continues to inform and shape HIV and TB policy in South Africa through research and tools developed to support changes to national and international guidelines around HIV care and treatment as well as contributions to the costing of the NSP (2017-2022). Other notable HE2RO research includes:

- The ENHANCE study which enrolled 7943 patients to evaluate the impact of interventions, costs and cascade of care of the National Adherence Guidelines for Chronic Diseases in SA;

- The SLATE study which tests a simplified algorithm for same-day initiation of ART in 600 patients and the various studies conducted under the EQUIP programme such as geospatial modelling for viral load sample transport optimisation and evaluation of differentiated models of care and service delivery including self-testing.

- The CHRU continues to thrive within the international clinical trial research setting as well as affecting the national public health programme in which HE2RO works closely with the National Department of Health, National Health Laboratory Services and healthcare providers as well as with international collaborators, by sharing health epidemiology and economic research.

EFFECTIVE CARE RESEARCH UNIT

Director: **Professor Justus Hofmeyr**
Department of Obstetrics and Gynaecology

The Effective Care Research Unit (ECRU), a WHO Collaborating Centre based at Frere and Cecilia Makiwane Hospitals in East London, Eastern Cape, continues to focus on innovations, randomized trials and systematic reviews relevant to maternal health in low-income settings. In 2016/17, we completed recruitment and follow-up for three randomized clinical trials:

- The Calcium and Pre-eclampsia Trial (Funding: University of British Columbia, a grantee of the Bill & Melinda Gates foundation. USD 1,600,000 over 5 years) This was a double blind randomized clinical trial of supplementation with calcium 500mg versus placebo commencing prior to pregnancy, up to 20 weeks gestation, to reduce the risk of pre-eclampsia. The trial was led by ECRU and co-ordinated by WHO, with collaboration with University of Cape Town, Chris Hani Baragwanath Academic Hospital, University of Zimbabwe, University of Stellenbosch and collaborators in Argentina.
- The Gentle Assisted Pushing Study (funding: WHO USD 600 000). This was a randomized clinical trial comparing three methods of conducting the second stage of labour: Upright posture, upright posture with controlled fundal pressure, versus routine care. Recruitment took place at Frere Hospital, Cecilia Makiwane Hospital and Butterworth Hospital.
- The Heat stable carbetocin for prevention of postpartum haemorrhage study (Funding: WHO USD 173 000). This was a WHO randomized clinical trial comparing heat-stable carbetocin with oxytocin for routine management of the third stage of labour.

We continued recruitment of the Evidence for Contraceptive options and HIV outcomes Trial (ECRU funding: WHO USD 2.2million). ECRU is part of a consortium conducting an international randomized trial to assess the effects of depot medroxyprogesterone acetate, the copper intrauterine device and the levonorgestrel implant on HIV acquisition and pregnancy risk. We started recruitment in February 2016. We published 26 papers in peer-reviewed journals.

HEPATITIS VIRUS DIVERSITY RESEARCH UNIT

Director: **Professor Anna Kramvis**
Department of Internal Medicine

The team of the Hepatitis Virus Diversity Research Unit (HVDRU) and their collaborators has proven to be very productive during the course of 2016 and 2017. Publications included eight papers, one chapter, and eight new submissions by the end of 2017.

Highlights included the publication of papers on the expression of HBeAg by different genotypes/subgenotypes of hepatitis B virus, a major interest of Professor Kramvis and her team. With the construction of replication competent plasmids of the African strains of HBV, the team has been able to show that the control of HBeAg expression occurs at different levels in subgenotype A1, which prevails in sub-Saharan Africa and this may have clinical implications. Bioinformatics tools were developed to meet the needs of the team and various bioinformatics analyses undertaken to facilitate in the understanding of how the genotypes/subgenotypes influence the clinical manifestation of HBV and its response to antiviral agents.

Dr Constance Wose-Kinge, postdoctoral fellow gave a well-received oral presentation on the Establishment of Stably Transfected Cell Lines Expressing Genomic Replicons of Hepatitis B Virus Subgenotype A1 at the 2017 International HBV Meeting on Molecular Biology of Hepatitis B Viruses, Omni Shoreham, Washington D.C., United States of America from 3rd – 7th September 2017. At the same meeting, postdoctoral fellow Dr. Trevor Bell won First Prize for Poster Presentation, Session III: Antiviral Therapy, Genotypes & Variants, Hepatocellular Carcinoma for the poster entitled CCT: An online co-ordinate conversion tool for hepatitis B virus.

Two new students registered for their Masters of Science in Medicine in March 2016. One Masters Student successfully upgraded to a PhD and a PhD student from Kenya joined us in 2016. Masters student, Ms Suzanne Wolhuter graduated on 12th December 2016, with distinction. Two new students registered for their Masters of Science in Medicine in March 2017. Ms Lanish Singh graduated in December 2017.

As part of the collaboration between the Guangxi Zhuang Autonomous Region Centre for Disease Prevention and Control and the University of the Witwatersrand, Professors Kramvis and Fang organized an International Symposium: Hepatitis in Africa: No room for complacency at the University of the Witwatersrand, Johannesburg from 28th – 29th November 2016. The two-day symposium was opened by Professor Mac Lukhele, Head of the School of Clinical Medicine (in 2016) and was attended by 45 delegates. As part of this knowledge interchange programme between South Africa and China, Professor Kramvis and five Masters of Science (Medicine) students, Ms Lanish Singh, Mr Daniel Mak, Mr Daniel Simelane, Ms Trodia Zitha and Mr Khudani Nhekwevha visited Nanning, China in 2016 and 2017. This was the first trip for most of the young students outside South Africa. They had the opportunity to present their work and to interact both with their peers in China as well as established researchers. They were also exposed to Chinese culture and traditions and were given the opportunity for some sightseeing. It was a very rewarding educational experience. The Chinese team was hosted in South Africa in November 2016 and 2017. A joint publication has emanated from this collaboration.

Dr Jennifer Grant, MD, (Masters of Science student in Clinical Investigation and as part of her Infectious Diseases Fellowship training at Northwestern University, Chicago, USA), on the request of her supervisor Dr. Claudia Hawkins, spent a three week internship to learn bioinformatics from 29th April– 20th May 2016. Dr. Micah Ongeri Oyaro, Department of Human Pathology, University of Nairobi, spent the period 7th November to 7th December 2016, in our unit. The University of the Witwatersrand Africa Residency Programme grant funded him. This was the final year of the three-year fellowship. These internships have yielded two publications. Ms Motswedi Anderson from the Botswana Harvard AIDS Institute Partnership and the Faculty of Science, Department of Biological Sciences, University of Botswana, Gaborone, Botswana spent 4 weeks in our unit in April 2017, where she was taught various bioinformatics methods and we helped her analyze her data towards completing her PhD, which she submitted in early 2018. Two joint publications have resulted from this internship and are under review.

Professor Kramvis was on Sabbatical at the Justus Liebig University, Giessen Germany from 02 April 2017 to 28 October 2017. Professor Kramvis was awarded a fellowship to attend the Commonwealth Science Conference, organized by the Royal Society and the National Research Foundation, Prime Minister's office, Singapore, and took place on 13-16 June 2017 in Singapore. Together with Professor Jake Liang, of the National Institutes of Health, Professor Kramvis organized the 2017 International HBV Meeting in Washington DC, September 3rd – 7th, 2017. Wits marketing sponsored the bags for the meeting.

MATERNAL, ADOLESCENT AND CHILD HEALTH RESEARCH UNIT

MRU | MatCH Research Unit
Department of Obstetrics and Gynaecology
Faculty of Health Sciences
University of the Witwatersrand

Director: **Professor Jennifer Smit**
Department of Obstetrics and Gynaecology

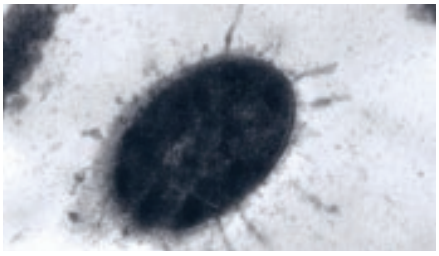
In February 2016, the University of the Witwatersrand offi cially awarded "Unit Status" MatCH Research Unit (MRU). This reflected our growth in projects, our ability to compete for and secure grant funding from a range of international donors and our academic outputs.

Through collaborations and self-initiated grant applications, MRU successfully applied for several grants, including two NIH grants. Our work expanded into several new areas of sexual and reproductive health (SRH) including Pre-Exposure prophylaxis (PrEP) for HIV Prevention, with the award of a fi ve-year NIH funded study in collaboration with Harvard University and Massachusetts General Hospital, Boston. We continued our research programme in Contraception and Barrier methods, HIV Prevention, Maternal Health, Key Populations, Menstrual Management and Health Systems. In our research, we remain focused on capacity building and training of researchers locally, regionally and internationally.

During the 2016-2017 period, MRU published 23 articles in peer-reviewed journals, as well as a chapter in the 2017 South African Health Review. We played a high profile at the 2016 local SA AIDS Conference, held in June 2016 in Durban, at which we presented five orals and 14 posters. Dissemination of the National Female Condom Evaluation continued, with a satellite meeting hosted by MRU at the International AIDS Society Conference, 2017, held in Paris.

Our Biennial Research Dissemination Day was held in 2017, where updates on many of our projects were given to our stakeholders including the Provincial and National Departments of Health who we continue to provide a high level of support to in policy, programme and implementation in SRH, with a focus on contraception. Globally we participated in activities supporting the World Health Organization's (WHO) Department of Reproductive Health and Research and UNFPA. Professor Smit attended the Scientific and Strategic Advisory Committee (SSAC) for the Contraception Technology Innovation (CTI) Initiative, North Carolina, in 2017.

PULMONARY INFECTION RESEARCH UNIT



Director: **Professor Charles Feldman**
Department of Internal Medicine

The research unit, initially named the Human Ciliated Epithelium Research Unit and later renamed the Pulmonary Infection Research Unit, received initial recognition from the University of the Witwatersrand in 2001, under the leadership of Professor Charles Feldman. The research unit has successfully undergone three 5-year reviews, the last being in 2015. The unit undertakes both basic research and clinical studies. During the review period 2016-2017 a considerable part of the basic research was investigating the effects of Pneumolysin, considered by many to be one of the most important virulence factors of the pneumococcus, the most common bacterial cause of pneumonia, on human platelet and neutrophils. These studies documented that Pneumolysin induced neutrophil extracellular trap (NET) formation, and activated platelets with the formation of both platelet aggregation and neutrophil: platelet aggregation. It is thought that these effects, if operative in vivo, may be contributing to cardiovascular events that occur in patients with community-acquired pneumonia.

The clinical studies are part of large multicentre international collaborations enrolling patients with community-acquired pneumonia, such as the CAPO (Community-Acquired Pneumonia Organisation) collaboration. During the review period, the unit produced one book chapter and 35 publications in indexed journals, and had 29 congress presentations. One PhD thesis and one MMED research report were submitted for evaluation and three MMED research reports were awarded.

SCHOOL OF ORAL HEALTH SCIENCES

Head of School:
Professor Simon Nemutandani

The highlight of the year 2017 was the School of Oral Health Sciences Research day, which was held in partnership with the International Association for Dental Research (IADR). The event was attended by 365 participants, including staff members, undergraduate and postgraduate students. Also present were representatives from other schools within Wits, other Dental Schools in the country as well as visitors from the SADC region. Abstracts submitted for the programme were representative of all the departments, including Oral Medicine and Periodontology, Oral Rehabilitation, Oral Biological Sciences, Oral Pathology, Maxillo-Facial and Oral Surgery, Oral Hygiene, Orthodontics and Paediatric Dentistry, Community Dentistry, General Dental Practice and Maxillo-Facial and Oral Radiology. This was to showcase the variety of research niche areas covered in the school. There were 33 poster and 14 oral presentations by staff, postgraduate and undergraduate students. There were four oral and four poster presentations by other Dental schools in the country. Awards were given to the best oral and poster presentations.

The undergraduate student Ms L. Mbele and her group received the "Best undergraduate oral presentation". Dr V. Premviyasa from the Department of Maxillo-Facial and Oral Surgery and Ms Z. Gulube from the Department of Oral Biological Sciences received the "Best Oral and Poster presentation by a Postgraduate student" respectively. Students presentations at the Research Day are benefi cial as the students gain experience of presenting to large audiences, in preparation for national and international exposure. In order to strengthen collaborations with SADC regions, the School invited Dr E. Simon, Dean of the School of Dentistry, Muhimbili University, Tanzania, who gave a talk on "Collaborative research among developing countries as a means of achieving equitable provision of oral health services".

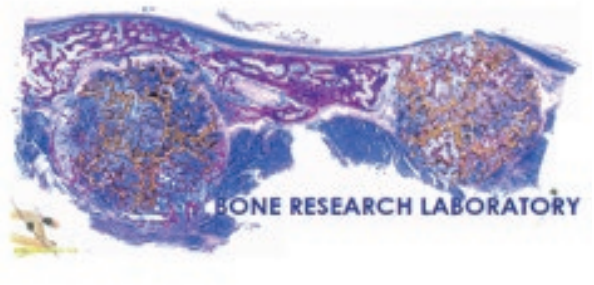
Special achievements by postgraduate students included Dr D.V. Bwerinofa from Department of Prosthodontics being awarded best poster presentation at the International College of Prosthodontics 17th Biennial Meeting held in Santiago, Chile, held in September 2017. The presentation was on "Delayed oncology implant rehabilitation in an irradiated maxillectomy defect". Dr R Garrana was invited as an International speaker by the International Team for Implantology (ITI) in 2017.

Other highlights included Professor M. Patel retaining NRF rating of C3 and Dr S. Moeno retaining her NRF rating of Y2. Dr J. Molepo and Professor M. Patel from the Department of Oral Biological Sciences were awarded substantial MRC grants to assist them and their postgraduate students with their research projects. The School achieved another milestone when Dr S. Ngwenya was elected as the President of the IADR - South African Division for 2017-18. A number of staff attended overseas conferences and the school also had an opportunity to host one international visitor. Dr Molepo applied

for and received funding from Wits Health Consortium in 2017 to hold writing retreats for the school in a quest to improve the School's publications. The number of publications in the school increased from 25 in 2016 to 35 in 2017. The school congratulates Profs Ripamonti, Evans and Shackleton for chapters published in books in 2017. The school has improved multi-disciplinary research collaborations within the school, with other schools in the University, and other universities both nationally and internationally.

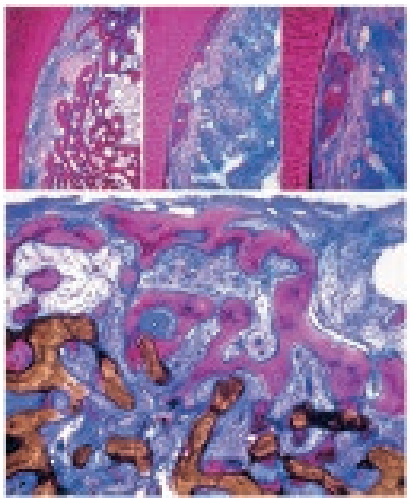
As we concluded the two-year period, as a school we will continue to strive to improve our research outputs to be in line with the Faculty of Health Sciences and the University goals. My gratitude goes to all the staff members and the students of the School of Oral Health Sciences for their contribution in research.

BONE RESEARCH LABORATORY

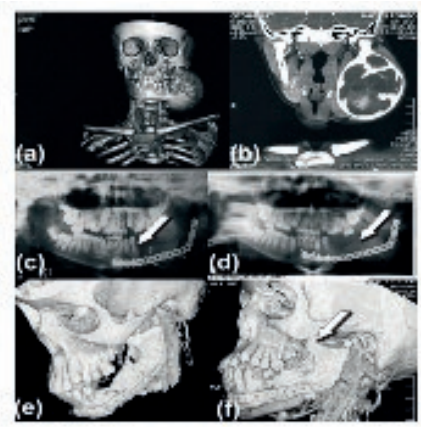


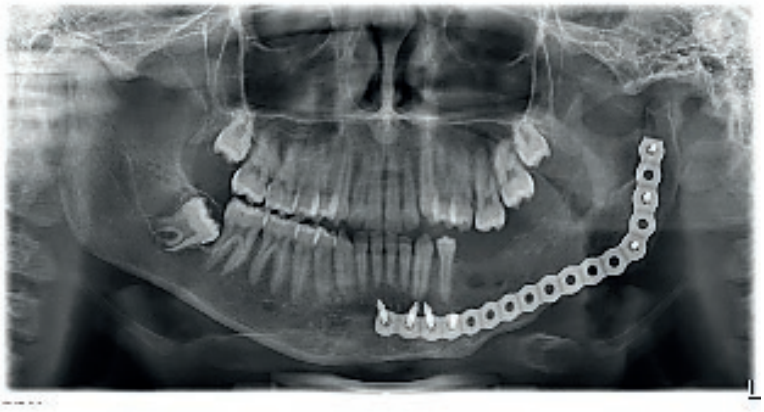
Director: **Professor Ugo Ripamonti**

The unit is making seminal contributions to the understanding of periodontal tissue regeneration. Our studies resulted in two important publications in the Journal of Periodontal Research (2016) and in the Journal of Clinical Periodontology (2017). The former has re-defined periodontal tissue regeneration in primates and sets the new rules of periodontal tissue engineering (Ripamonti U. Re-defining the induction of periodontal tissue regeneration in primates by the osteogenic proteins of the TFGF-β supergene family. J Periodont Res 2016; 51: 699-715). More importantly however, the unit has additionally provided the world's first in vivo study correlating tissue induction and morphogenesis by the hTGF-β3 with a time gene expression's study. The data showed that cementogenesis and osteogenesis as initiated by the hTGF-β3 isoform in furcation defects of Papio ursinus entails the expression of TGF-β3, Osteocalcin with fine tuning and modulation of BMP-2 and OP-1, and up-regulation of Cemp1 (Cementum Protein-1), within the harvested cementum (Ripamonti U. et al. J Clin Periodontol 2017; 44: 83-95)(IF 3.95). This paper, the first paper worldwide to correlate morphology to molecular biology data in a pre-clinical study in vivo let alone the non-human primate Papio ursinus.

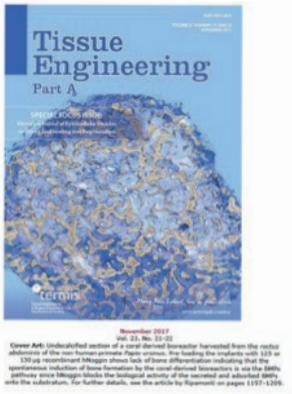


Induction of cementogenesis and alveolar bone formation (top three digital images) along exposed roots after creation of furcation defects implanted with doses of hTGF-β3 in Matrigel matrix (Ripamonti et al. J Clin Periodontol 2017) correlating with the induction of bone formation by coral-derived macroporous constructs (bottom image) pre-loaded with doses of hTGF-β3 and implanted in the rectus abdominis muscle of Papio ursinus (Ripamonti et al. J Clin Periodontol 2017).





Severe craniomandibulofacial neoplastic mass requiring the surgical ablation of the left hemimandible reconstructed with 250µg hTGF-β3 per gram of human demineralized bone marix as carrier. Rapid induction of tissue morphogenesis within the implanted matrix with restitutio ad integrum of the operated hemimandible.



Important work on the spontaneous and/or intrinsic induction of bone formation by macroporous calcium phosphate-based bioreactors, a topic in the which the BRL is at the forefront of research worldwide, was published as an Expert Opinion paper in Tissue Engineering with a cover page in the November 2017 issue of the Journal.

SYSTEMATIC REVIEW INITIATIVE FOR EVIDENCE-BASED MINIMUM INTERVENTION IN DENTISTRY

Director: **Professor Steffen Mickenautsch and Professor Veerasamy Yengopal**

The Systematic Review Initiative for Evidence-based Minimum Intervention in Dentistry (SYSTEM) Research Programme continues in its quest to provide high quality evidence in the form of Cochrane-type systematic reviews on clinically related topics that affect patient care in Dentistry. Despite severe funding constraints and no income over the last fi ve years, the Director, Professor Steffen Mickenautsch is already recognised as one of the world's leading experts on Minimum Intervention in Dentistry and the use of Glass ionomers in dentistry. SYSTEM's systematic review questions are selected from propositions that are logically interconnected within coherent belief clusters ('web-of-beliefs') of a particular clinical topic. The logically interconnect is derived by use of simple deductive inference (categorical syllogisms). Our research focus has also been expanded to examine the valid-

ity and reliability of quality assurance scales used to determine methodological rigor in randomised controlled trials of restorative materials. Huge prevention programmes to prevent tooth decay among children have been implemented in South Africa and internationally to reduce the burden of tooth decay. Their success of particularly resin-based sealants has been reported as retention rates and this has significantly been superior to glass ionomer sealants implying superior protection from tooth decay. We at SYSYEM investigated the logic behind this proposition, and its validity. A logical framework of the proposition was established. The mechanism of caries development was transferred into a directed acyclic graph, and this was used to investigate the logical framework.

The sensitivity and specificity of full sealant retention in the prediction of dental carious lesion development and the number of false positive/false negative prediction rates were computed. The sensitivity/specificity was statistically compared to that of random values. A contradiction in the logical framework was identified. The overall false prediction rate was 33.7%, with 16.9% and 16.8% false negative and false positive predictions, respectively. The sensitivity/specificity was too low and the false prediction rate was too high to consider retention a valid proxy for caries prevention. The logic behind the investigated proposition is flawed, contradicted by the current empirical evidence, and thus invalid. The finding of this review has been used to change clinical practice in terms of material choice and outcome measurement to measure the success/failure of fissure sealant prevention programmes.

SCHOOL OF PATHOLOGY

Head of School:
Professor Johnny Mahlangu

In the Faculty of Health Sciences, the School of Pathology remains a relatively complex entity located in seven different campuses in Johannesburg. The 220 joint academic staff, together with associated support staff, students, service and research resources, are located at the Faculty of Health Sciences Medical School Campus, Charlotte Maxeke Johannesburg Academic Hospital, Helen Joseph Hospital, Chris Hani Baragwanath Academic Hospital, NHLS Braamfontein Campus, NHLS Sandringham Campus as well as the National Institute of Communicable Diseases in Sandringham. Despite this geographic dispersion, the School has been able to focus and accomplish its triple mandate of delivering world-class pathology teaching and training, responsive and appropriate diagnostic services and cutting edge research and innovations in the multitude of disciplines and sub disciplines of pathology and molecular medicine in the School.

The research output of the School continued to increase in the 2016/2017 period, with the School achieving an average of 74 DoHET units compared to 70 in the previous biennial period. There were 445 peer reviewed publications emanating from research done in the School which is a 20% increase compared to the 2014/2015 biennial period. The majority of these publications (>75%) were in international high impact journals across the spectrum of pathology and molecular research fields.

Many members of the School academic staff, support staff and postgraduate student community were recognised for their research excellence through a number of prestigious awards, appointments and promotions in the School. The noteworthy of these were the NRF ratings in which five members of the School received NRF B- rating whilst eight received NRF C ratings. The School is home to three NRF A-rated Scientists.

The many awards received by our academic staff and students included four promotions to Professorial positions, 13 prizes won in national and international congresses, six appointments to national and international scientific bodies and no less than 15 successful competitive grant funding applications. The details of these awards and recognitions can be found elsewhere in this report.

ANTIVIRAL GENE THERAPY RESEARCH UNIT

Director: **Professor Patrick Arbuthnot**
Department of Molecular Medicine and Haematology

The Wits Antiviral Gene Therapy Research Unit (AGTRU), which is also an extramural research unit of the South African Medical Research Council (SAMRC), aims to develop use of therapeutic nucleic acids (gene therapy) to counter serious viral infections of public health importance in sub-Saharan Africa. As gene therapy is based on rational drug design, the technology is very powerful and potentially applicable to many previously 'undruggable' diseases of South African importance. Expertise in gene therapy within South Africa is currently modest. The Wits/SAMRC AGTRU is one of the only laboratories in the country with the range of skills that is required to advance gene therapy to completion of preclinical evaluation. Training of young scientists is a fundamental activity of the unit. We are pursuing this activity to grow expertise and ensure that internationally competitive and relevant research is carried out in the unit. Particular emphasis is placed on ensuring that demography of the team reflects the broader South African community.

The Wits/SAMRC AGTRU focuses mainly on advancing a cure for persistent infection with hepatitis B virus (HBV). Chronic infection with HBV is hyperendemic to sub-Saharan Africa and continues to be a signifi cant cause of public health problems. Carriers of the virus are at high risk for the life-threatening complications of cirrhosis and liver cancer. Currently licensed anti-HBV drugs are poorly effective and there is a need for improved treatment. Research completed in our unit shows that gene therapy has the potential to eliminate the virus from infected cells. This work was published in several journal articles and has been presented at many international and South African conferences. Advancing our technology to use in patients is being undertaken in partnership with large US-based partners in the pharmaceutical industry.

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 300, including laboratory scientists, medical scientists, biostatisticians, epidemiologist, medical doctors, nurses and research assistants.

Since the success by RMPRU of undertaking the first studies on the efficacy of pneumococcal conjugate vaccine and rotavirus vaccines in Africa, the results of which informed the World Health Organisation recommendations for the introduction of these vaccines into public health immunisation programmes of low-middle income countries. The field-evaluation on the effectiveness of these vaccines in South Africa by RMPRU, has demonstrated 40% reduction in severe pneumonia and 45% reduction in severe diarrhoea hospitalisation among children since 2009 when the vaccines were introduced into the public immunization programme.

More recently, RMPRU has focussed on vaccination of pregnant women to protect the mother, her foetus and her young infant. This included the first randomised controlled trial globally to show that influenza vaccination of pregnant women protected HIV-infected and HIV-uninfected women against influenza illness. In addition, the studies also uniquely showed that maternal influenza vaccination protects their young infants from all-cause pneumonia hospitalization (45% reduced risk during first 3 months of life)) and protects the mother from pertussis infection – a unique finding which was published in the New England Journal of Medicine. RMPRU has also been at the forefront of vaccine development against Group B streptococcus, with South Africa reporting the highest incidence in infants globally over the past two-decades. This included the first studies of a trivalent GBS polysaccharide protein conjugate vaccine in HIV-uninfected women and a follow-on study in HIV-infected women, the results of which were published in Lancet Infectious Diseases.

The unit has also at been at the forefront of the clinical development of vaccines against Respiratory Syncytial Virus, which is the leading cause of lower respiratory tract infections in children, in South Africa and globally. This includes new generation long-acting monoclonal antibody and nanoparticle vaccines targeted at pregnant women to confer passive protection to their infants. The results of these studies, which RMPRU assumed a pivotal role in enrolment, will be forthcoming in 2019.

Between 2016-2017, RMPRU was awarded a total of R241 million in grant funding, including approximately R45 million rand for the Child Health Mortality Prevention Surveillance (CHAMPS) programme, which RMPRU was one of 7 successful groups in applying to be a network site off. This programme will also lend itself to establishing a District Health Surveillance System in Soweto, which will serve as a platform by which to interrogate the health of urban dwellers in South Africa, over and above understanding the specific causes of under-mortality and adverse pregnancy outcomes.

Between 2016 to 2017, RMPRU in total published 128 manuscripts, including in leading journals such as New England Journal of Medicine, and the top-ranking journals in the field of Infectious Diseases such as Lancet Infectious Diseases (n=7), Clinical Infections Diseases (N=37). Furthermore, there were 17 PhD students that graduated from RMPRU between 2016 and 2017, Dr Michelle Groome who received the Faculty of Health Sciences Prestigious Best PhD award, the third consecutive year in which this award was awarded to a PhD student mentored under the unit director.

DST-NRF CENTRE OF EXCELLENCE FOR BIOMEDICAL TB RESEARCH

Director: **Associate Professor Bavesh Kana**

Research at the Centre of Excellence for Biomedical TB Research (CBTBR) can be divided into four broad thematic areas that span from fundamental research to the delivery of TB diagnostics. The first theme involves the identification and validation of novel drug and vaccine targets for TB, with a particular focus on the bacterial peptidoglycan as a tractable area for the discovery of new drug targets. Enzymes that remodel the peptidoglycan are essential for bacterial cell division and the CBTBR has uncovered a novel class of amidases and low molecular weight penicillin binding proteins that are essential for bacterial survival. In the search for new drug targets, the CBTBR has also directed effort in studying enzymes involved in DNA repair. The second focus area encompasses the characterization of differentially culturable tubercle bacteria (DCTB) in patients with active TB disease.

Treatment of TB is protracted, requiring six months of combination chemotherapy to obtain non-relapsing cure. It has been hypothesized that this long duration of chemotherapy is necessitated by the presence of organisms that are tolerant to drug treatment. The CBTBR has further investigated this phenomenon through the quantification and characterization of DCTB in HIV-1 infected and uninfected TB patients with pulmonary disease prior to the initiation of TB treatment. The third focus area entails the construction, confirmation and bulk production of diagnostic verification reagents for molecular TB diagnostics. For the past 5 years, the CBTBR has been providing support for the rollout of TB molecular diagnostics in over 20 countries. For this, a set of verification reagents that can be used to declare newly installed diagnostic devices as "fit for purpose" and for continuous external quality assurance programmes have been developed by the CBTBR. These reagents can be provided at a low cost and do not require a cold chain, thus making them suitable for low resource settings. The fourth focus area is targeted at the development of novel screening modalities for new TB drugs.

SCHOOL OF PHYSIOLOGY

Head of School: **Professor William Daniels**

Research in the School is grouped under four research themes, namely (i) Neurophysiology, (ii) Cardiovascular Physiology, (iii) Movement Physiology and (iv) Endocrinology and Metabolism. Under these themes, a number of research topics, spanning both human and animal physiology and pathophysiology, are studied. The School hosts two URC/FRC research entities namely, the Brain Function Research Group (BFRG) and the Cardiovascular Pathophysiology and Genomics Research Unit (CPGRU). These research entities are major drivers of research within the School.

Neurophysiology

Research of the members of the BFRG falls into four main fields, namely

- Pain physiology led by P. Kamerman and A. Wadley
- Sleep physiology led by K. Scheuermaier and S. Iacovides.
- Pathophysiology of fever, sickness behaviour and inflammation led by L. Harden, and
- Wildlife conservation physiology led by A. Fuller

Other staff members, who also research the brain and its functions, but are not affiliated to the BFRG, are

- N. Pitts focusing on the pathophysiology of stress in the wild
- D. Muller investigating the long-term consequences of early life adversity on behaviour and neuroendocrinology, and
- W. Daniels researching the neurobiology of addiction

Cardiovascular Physiology

The core research thrusts of the CPGRU include studying the pathophysiology of heart failure; hypertension and identifying genetic risk factors relevant to cardiovascular disease. Embedded in these topics are related studies that include investigations into

- The molecular mechanisms of heart failure, and cardiovascular pathologies associated with patients suffering from rheumatoid arthritis
- Hormonal mechanisms involved in the pathophysiology of hypertension and heart failure
- The impact of diet and lifestyle on cardiovascular parameters and
- Telomeres as biomarkers of pathology

Movement Physiology

The research interests of staff members in this group cover a variety of topics with the study of movement as the common factor. These include

- Restless legs syndrome
- Understanding specific movements in sports to maximise performance and
- Physical activity and sedentary behaviour in Health and Disease with a focus on bone quality in children

Endocrinology and Metabolism

The common theme in this group is the study of endocrine and/or metabolic systems in diverse conditions. For example

- The usefulness of plant-derived products that may be considered to replace currently used animal-based feeds given to livestock
- The deleterious consequences of high fat diets on physiological parameters including hematologic, endocrine and metabolic markers
- The effects of dietary supplements on physiological processes such as growth and metabolism in health and pathological conditions
- The molecular structure, function and internalisation of the GnRH receptor.

The School continually invests substantial resources in infrastructure and technical support to enable its staff to perform at the highest level possible. This approach has resulted in our School being one of the most research-productive physiology entities in southern Africa, with its members consistently producing field-leading and innovative research that is published in high-quality international journals.

BRAIN FUNCTION RESEARCH GROUP

Director: **Associate Professor Andrea Fuller**

The Brain Function Research Group, which evolved in 2008 from the Brain Function Research Unit and Brain Function Research Programme (initiated in 1988). In 2017, the group underwent a successful quinquennial review, resulting in its continued recognition by the University for the period 2018-2022. The group, housed in the School of Physiology, focuses its activities on physiologically driven areas of nervous system function, namely pain, sleep, and fever physiology, as well as wildlife conservation physiology (which includes, and devolved from, the Group's interest in thermoregulation).

In the period of 2016-2017, the pain laboratory extended its research focus on HIV-related pain to include genetic risks for painful HIV neuropathy, and psychosocial factors influencing pain and the ability to cope with pain. The team also introduced core methodologies required for deep phenotyping of individuals and established a new line of research on diabetic polyneuropathy. The sleep laboratory focused on sleep in HIV and autoimmune disorders, and developed methods to study sleep fragmentation and assess sleep in non-English speakers. The fever laboratory extended its focus on fever and sickness behaviours associated with simulated Mycoplasma infections, introduced new methodologies for investigating potential long-term detrimental sequelae of early-life infection with streptococcal bacteria, and undertook research on the association between inflammatory mediators and neurodevelopmental morbidity in infants with invasive Group B Streptococcus disease. The Wildlife Conservation Physiology Team advanced their understanding of how mammals respond to hotter and drier environments, and further investigated opioid-induced respiratory depression in immobilised mammals, including the development of protocols to immobilise animals safely.

The group contributed significantly to the University's strategic research goals by publishing 58 peer-reviewed research publications, hosting five postdoctoral fellows, graduating ten postgraduate students (half at PhD-level) and establishing collaborations with researchers at leading universities, including the Universities of Oxford, Cambridge, Imperial College and Harvard.

CARDIOVASCULAR PATHOPHYSIOLOGY AND GENOMICS RESEARCH UNIT

Director: **Professors Gavin Norton and Angela Woodiwiss**

The Cardiovascular Pathophysiology and Genomics Research Unit 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 communities in South Africa. In the past two years (2016-2017), the work of the unit has resulted in 48 publications, mostly in high or intermediate impact factor international journals, and has supported presentations of a number of 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. Importantly, during this time, Professor Norton was awarded an MRC Gold Medal for his contributions over the years and Professor Woodiwiss has acted as the President of the Southern African Hypertension Society.

As hypertension is the principle cause of cardiovascular disease in Africa, the laboratory has continued to focus on better understanding the haemodynamic mechanisms responsible for cardiovascular events. In a series of papers published in the Journal of Hypertension, the Journal of the American Society of Hypertension and the American Journal of Hypertension, the unit has continued its work in investigating the role of components of central aortic blood pressure. This included the role of aortic forward and backward waves on cardiovascular damage, the factors that determine the impact of aortic backward waves on target organ damage and the determinants of aortic dysfunction. These findings have all contributed toward a better understanding of how aortic dysfunction may add to the

prediction of cardiovascular risk beyond conventional risk factors such as hypertension or diabetes mellitus and the best approaches to assessing these effects.

Bearing in mind the high prevalence of obesity in urban, developing communities in South Africa, the laboratory has continued to work towards a better understanding of the adverse effects of obesity-associated cardiovascular changes beyond those mediated by conventional risk factors. This work has contributed to several papers published in high impact journals including the Journal of Hypertension and the International Journal of Cardiology and reports on the role of obesity-associated inflammatory changes and alterations in insulin resistance independent of the development of diabetes or hypertension on cardiovascular changes.

As several conditions associated with chronic inflammation, including rheumatoid arthritis, are thought to contribute toward cardiovascular events, the laboratory has continued to publish work related to the mechanisms of these effects. In this regard, the laboratory has produced several meritorious papers describing some of these mechanisms in high impact journals including Autoimmunity Reviews, Science Reports and Clinical Science.

SCHOOL OF PUBLIC HEALTH

WITS School of Public Health

Head of School: **Professor Tobias Chirwa**

Research entities and training programmes have contributed to research growth in the School during the 2016/17 period. Mentorship, inter-divisional and multi-institutional collaborative efforts are key to

such success and draws on emerging and black African researchers. Studies range from health policy and systems; health investments and priority settings, occupational health, partnerships for big data, communicable and non-communicable diseases, sexual and reproductive health to the dynamics of health, migration, urbanisation and social transitions.

Such studies attracted multi-million research grants from the Bill & Melinda Gates Foundation, Wellcome Trust, Department of International Development, UK Medical Research Council, UK Economic and Social Research Council, National Institutes of Health (NIH), Foundation and Royal Dutch Embassy among others. Nationally, the Department of Science and Technology provided funding for a South African Population Research Infrastructure Network and the City of Johannesburg funded a study on electrifying informal settlements.

The increase in individual recognition for research excellence therefore does not surprise. We have seen promotions to senior lecturer, reader and associate professor level and an increase in the number of NRF "A" rated researchers. Professors Lenore Manderson and Karen Hofman were elected into the Academy of Science of South Africa and Dr Shakira Choonara was the 2017 Woman of the Year in Healthcare. The Faculty recognised Dr Chodziwadziwa Kabudula for his Lancet Global Health publication and Dr. Michelle Groome for the most prestigious PhD.

Members of staff are serving on various high profile public health boards, associations and committees globally. Professor Laetitia Rispel was elected President of the World Federation of Public Health Associations.

Health economics, implementation science and biostatistics are some of the new fields of study initiated in the period. Funding to support such initiatives include the DELTAS Africa Initiatives, WHO/TDR, GlaxoSmithKline and NIH grants. Structured research support for students led to increased 2017 throughput.

CENTRE FOR HEALTH POLICY

Director: **Dr Jane Goudge**

The Centre for Health Policy (CHP) continues to conduct research on health systems and health policy, drawing together theoretical insights and empirical evidence to understand health system changes and to propose strategies for health system development, and influence policy both nationally and internationally. Over the two year period, we have led or been involved in several multi-national projects examining the following: human resource and governance policies and interventions; mainstreaming a health systems approach for delivering maternal services; how to strengthen PHC services for treating hypertension in rural South Africa; the effects of different forms of supervision and location on CHW performance; and the determinants of anti-biotic prescribing in primary health care. In the 2016/17 period the Centre for Health Policy graduated five PhD students (Bronwyn Harris, Prudence Ditlopo, Pascalia Munyewende, Shakira Choonara, and Felix Limbani), and seven Masters of Public Health students.

HIGHTLIGHT 1: Our cluster randomised controlled trial on using lay health workers to strengthen management of hypertension in PHC clinics was finalised in 2017 with the trial paper published in BMJ Global Health in early 2018. The trial showed that the introduction of lay health workers did not improve management of hypertension, despite its success in increasing the number of hypertension patients attending the clinic, as well as the number that attended on their appointed day. We believe that the study was compromised by the following factors:

- Demands on primary care that continue to increase (the number of chronic patients increased by 75% over an 18 month period),
- The dominance of the vertically funded HIV programme leading nurses to focus on HIV (for example clinics have to report data on patients outcomes for HIV but not hypertension), and
- The poor standards of equipment in clinics.
- The BP machines regularly broke down and cuffs were often stitched or stapled together

Our study shows that adding additional human resources (even if readily available and relatively inexpensive), is unlikely to have an effect on health outcomes, without the necessary equipment (e.g. to accurately measure blood pressure), and sufficient clinical staff to treat the growing numbers of chronic patients. To be successful task-shifting interventions need to take account of all aspects of the patient encounter, and if possible, other system-wide contextual changes (such as rapidly increasing patients).

HIGHLIGHT 2: CHP's Chair of Health Policy and Systems Research (SARChI) is a five-year programme on three inter-related building blocks derived from WHO - financing, health workforce, and leadership and governance – in 2014. We have added a four area – access to health care. This programme contributes to scientific and research capacity by mentoring and producing PhD and postdoctoral fellows, as well as supporting new PhD supervisors within the school and developing research skills of Masters of Public Health students. In the first four years, we have published 32 peer-reviewed papers (exceeding our target of 24 over the 5-year period). Similarly, the end of the fourth year, we have already met or exceeded our five year student targets. We are currently drafting our self-evaluation report for the first five years, and the proposal for the next five years.

MRC/WITS RURAL PUBLIC HEALTH AND HEALTH TRANTIONS RESEARCH UNIT

Director: **Professor Stephen Tollman**

Situated in resource-poor rural environments, the MRC/Wits-Agincourt Unit undertakes community-oriented research to elucidate causal pathways, test interventions across the life-course, inform health and social systems, and strengthen evidence to guide policy and programmes.

Recent efforts serve to: (1) deepen observational work through strengthening population-based cohorts; (2) extend the portfolio of intervention-research notably trials; (3) add to research infrastructure; and (4) enhance capacity to support research training and career development.

Several cohorts are underway, sampled from and articulating closely with the Agincourt population platform, and focusing on special populations or subgroups along the life course including adolescents, young adults, middle-aged and older persons, and temporary / labour migrants. Nested sub-studies include work on HIV-cardiometabolic disease interactions at cellular level; validation of the HbA1c biomarker; harmonisation of cognitive assessment instruments; and depression and cognitive/executive function in young adults, and their association with HIV acquisition and markers of reproductive health.

A portfolio of work examines household responses to shocks and stresses including the use of natural resources and available energy sources; and, critically, migration patterns and livelihood strategies including migrants health status and their linkage to health services. Ongoing trials and evaluations target vital questions affecting the health and wellbeing of adolescents and young women, including HIV prevention trials and a pilot intervention to reduce risk for non-communicable conditions; community mobilisation and linkage to primary care for HIV/AIDS management; and strengthening health systems to support integrated chronic care.

Capitalising on the strengths of an HDSS platform, the unit contributes to evaluation of national policy at population, household and individual levels. Examples include effect of decentralised provision of antiretroviral therapy (HAART) in population; efforts to provide integrated chronic care through the clinic system; validation of aspects of the vital registration system, cause-of-death in particular; and impact of social support grants (old age pension, child support grant) on the health and wellbeing of recipients and other household members.

PRIORITY COST EFFECTIVE LESSONS FOR SYSTEM STRENGTHENING SOUTH AFRICA

PRICELESS SA
Priority Cost Effective Lessons for System Strengthening

Director: **Professor Stephen Tollman**

Priority Cost Effective Lessons for System Strengthening South Africa (PRICELESS) is an academic research to policy unit involved in range of research, teaching/capacity-building and technical assistance research to policy. The mission of PRICELESS is to enable smart decisions about health investments in South Africa so that its citizens can be healthier. We provide information and evidence that will improve the way in which resources are allocated and priorities are set for individual interventions, clinical services, and heath technologies, which affect population health. In 2017, PRICELESS was granted independent research entity status within the University. The team of researchers includes health economists, clinicians and social scientists who have strong and sustained record of peer- reviewed publications.

PRICELESS research clusters around two main themes Priority Setting and Health Economics and Econometrics including analyses with significant impact on salt regulations and a sugary beverage tax, an Inquiry on Fiscal Policies to identify trade and fiscal policies that have the greatest potential to

impact health. Our focus includes the prevention of non-communicable diseases, maternal and child health, immunization and community engagement on priority setting.

Professor Karen Hofman, PRICELESS SA Director is a member of Academy of Sciences of South Africa and is the South African representative to the Executive Board of the International Academy Panel for Health. She was awarded the Public Health Association of South Africa Annual award in 2016.

PRICELESS SA receives significant grants from funders including the Bill and Melinda Gates Foundation, The Canadian International Development Research Centre, the Wellcome Trust and the World Health Organisation. We have an extensive network of collaborators including HITAP in Thailand, Imperial College London, the Universities of North Carolina, York UK, Cambridge UK, Sheffield UK and John Hopkins University USA along with several South African universities.

SCHOOL OF THERAPEUTIC SCIENCES

Head of School: **Professor Judith Bruce**

Research in the School of Therapeutic Sciences is as diverse as its disciplines with varying degrees of synergy between research projects within the School and other units in the Faculty. The School's research output shows an upward trajectory, signifi cantly increasing its publication units and postgraduate output, and doubling the number of doctorates from 12 to 26. Research undertaken in the School is in the fi elds of Exercise Science, Nursing, Occupational Therapy, Pharmacy, Physiotherapy, and in Clinical and Experimental Pharmacology. The School has one research unit – the Wits Advanced Drug Delivery Platform (WADDP) Research Unit.

Advanced drug delivery technology research undertaken at the WADDP Research Unit has led to significant innovations in neuromaterials, nanomedicine, drug targeting for the treatment of specific cancers and novel drug delivery techniques for ARVs; breakthroughs in 3D-printing in medicine have led to new research projects that employ the latest technology in 3D Bioplotting for tissue engineering applications. The Pharmacology research team is involved in several projects that range from studying the cost effectiveness of antimicrobial stewardship to investigating the intra-erythrocyte stages of the life cycle of the malaria parasite. In the related field of pharmaceutical microbiology, important work is being conducted in the antimicrobial validation of natural products and medicinal plants used in selected rural communities – an important step towards "decolonising" research by producing locally relevant scientific knowledge. Research in oncology and intensive care nursing seeks to improve patients illness experiences and care; outcome measures research in occupational therapy continues to grow in the quest to improve the quality of life of differently abled people. Research in exercise, sports and biomechanics straddles physiotherapy, and sports and exercise medicine with a focus on how these activities influence persons across the lifespan and with different abilities and conditions.

Public health perspectives of HIV/AIDS and childhood disability associated with HIV are integral to physiotherapy research – the latter, in collaboration with the Empilweni Services and Research Unit at the Rahima Moosa Mother and Child Hospital. Known for its high investment in teaching and clinical training, the School has become a leader in the field of e-learning, inter-professional learning and innovative curricula. Educational research projects that address aspects of e-learning, course design and student performance have become an important feature of the research conducted across the School.

WITS ADVANCED DRUG DELIVERY PLATFORM RESEARCH UNIT

Director: **Professor Viness Pillay**

The route from drug development to commercialization is long and difficult. Three components are required to register a new pharmaceutical product viz: (an) active ingredient(s); a drug delivery mechanism; and a period of clinical testing via clinical trials. Only after successful clinical trials can the product be registered and commercialized. The drug delivery technology is therefore one of the three components required prior to commercialisation, and is interdependent on the other two components. Furthermore, this is a numbers game, i.e., from 100 technologies one or two may succeed. The South African environment is not conducive to drug discovery and development. Rather, it is focussed on manufacturing, and specifically on the manufacturing of generic formulations. Government support for the industry is via manufacturing incentives. However, this is a low mark-up industry and hence does not warrant the huge investment in clinical trials that would be required for the introduction of a new drug delivery mechanism that could, for example, use less of the active ingredient, or result in fewer side effects. Hence, international companies typically pursue drug development. The WADDP team is actively engaged in influencing the policy environment and to this end has participated in several workshops arranged by various stakeholders.

The research focus of the WADDP is on the design of pharmaceutical biomaterials and polymer-engineered drug delivery technologies that address the limitations of conventional drug delivery. The significance of our research presents indubitable benefits for drug administration in a manner that

minimises drug degradation/loss, prevents harmful side effects and increases drug bioavailability and more importantly the concentration of drug in the targeted microenvironment. As the pathophysiology of disease becomes clearer, the requirement for targeted and personalised therapies to improve quality of life of patients has surged and drug delivery technology now plays an integral role in the biopharmaceutical industry.

We are highly regarded for many breakthrough technologies in designing stimuli-responsive biomaterials, targeting nanosystems, innovative oral matrices and transbuccal technologies to address the shortcomings of conventional drug delivery. Our research has a bench-to-bedside profile and some of our seminal work over this period included the design of a stimuli-active matrix for stimuli-responsive release of 5-ASA (a first-in-the-world spaced-defined treatment option for ulcerative colitis) and a first in-the-world chelating nanosystem for Alzheimer's intervention. The PEiGOR theory was conceptualized which describes a critical jump diffusional mechanism is a first such phenomenon observed for electro-responsive hydrogels. In addition, we published the first-ever MRI analysis of the hydration dynamics from an oral triple-layered tablet from in silico modeling to pre-clinical in vivo studies. Our mechanistic research on a multi-elemental transbuccal system that appeared on the cover page of the journal Pharmaceutical Research was recognised as the cutting-edge research in that issue.

Although drug delivery systems design is an extensive and highly competitive research area, we have been able to maintain an upward trajectory of high-quality research publications that attain a high impact in leading international journals. We have an extensive publication record with metrics that reflect the impact of our work. The WADDP's total publications in the last five years include Editorials of two books, 17 book chapters and over 200 papers in ISI-accredited peer-reviewed journals. The journal papers have been cited over 4187 times (Google Scholar). The H-indices of our team members have increased since the last Biennial Report with the highest by Professor Viness Pillay at 33 (Google Scholar), 29 (Scopus) and 25 (Thomson Reuters ResearcherID). These metrics position us highest of all pharmaceutics researchers in SA and places us amongst the leading international researchers. We received the highest number of Best Publication Awards (total= eight; five in consecutive years) of all pharmaceutics researchers from the Academy of Pharmaceutical Sciences of SA – a testament to the impact of our research. Our paper with the highest citations has been cited 285 times. Nine papers have been cited >100 times and 22 papers >50 times. Most of our papers are in journals that are ranked in the top five in pharmaceutics. We have filed 36 patents in the last five years (8 granted; 28 under prosecution in US, EUR, CHN, JPN, IND).

In 2011, Professor Pillay received a NRF B2 rating (awarded to researchers who enjoy considerable international recognition by their peers for the high quality and impact of their recent research outputs) and two other researchers on the team viz., Professor Yahya E. Choonara and Professor Lisa C. du Toit have received Y1-ratings. Much of our work is applied and we are in the process of commercialisation with Wits TTO. Recognition of the value of our research is attested in the grant funding awarded to us which in the last five years comprised more than 50 awards totalling >R85 million.

In total we presented at more than 350 conferences with >50% at international meetings. In the five years we presented at >100 conferences. Team members have also Chaired, Adjudicated or been on the Organising Committee of more than 40 scientific meetings and have been invited as Plenary/Keynote Speaker by over 25 local and international conferences. In the last five years, we have published more than 160 papers in ISI-accredited journals. These publications have been cited >3500 times. We co-supervise and mentor a large number of students and in the last five years, we have mentored 15 postdoctoral and graduated 14 PhDs and 38 Master's students. On average, we examine two to three PhD theses annually from universities locally and abroad. We have also mentored 12 researchers from the postgraduate level to independent academics to promote capacity building.

Our network of collaborators extends on six continents: North and South America, Europe, Asia, Middle East and Africa. We conceptualise projects and experiments; contribute substantially to data interpretation and play a leading authorship role in all publications. Our collaboration with clinicians is considered by world experts in the field to be a beneficial way to conduct preclinical drug delivery research. Our work is translational and includes basic and preclinical studies. The basic research deals with aspects of drug delivery systems design to optimise drug bioavailability using mechanisms for controlling drug release. The preclinical studies are an extension into establishing important in vivo pharmacokinetic data and safety profiling of technologies in collaboration with expert clinicians.

During the next five years we will aggressively pursue our research with more innovative and ground-breaking projects that we have already conceptualised from our current research and from new initiatives in the following five thematic areas: 1) Neurodegenerative Disorders, 2) Targeted Cancer Therapy, 3) Lifestyle Diseases, 4) Wound Healing and 5) Infectious Diseases. The complexities associated with drug formulations is the primary reason for patient non-compliance. In this context, we plan to evaluate how nanomedicine and 3D printing can positively affect health outcomes by designing more patient-friendly bioavailable formulations. We intend to extend our knowledge on the mechanistic understanding of biomaterials based on our previous research. Biomaterials are core to our work and their landscape is constantly changing in terms of nanomedicines and tissue engineering.

INSTITUTES associated with the Faculty

SYDNEY BRENNER INSTITUTE FOR MOLECULAR BIOSCIENCES

SYDNEY BRENNER INSTITUTE FOR MOLECULAR BIOSCIENCE

Director: **Professor Michele Ramsay**

Sydney Brenner Institute for Molecular Biosciences (SBIMB) research focuses on understanding the historical and health-related impact of African population genome, epigenome and microbiome diversity. Our studies range from complex disease genetic-association studies (including cardiometabolic diseases, cancer, glaucoma and rheumatoid arthritis), to genetic mutations in Mendelian traits and unravelling the demographic history of African populations.

Our more applied research is in the area of pharmacogenomics as an avenue towards precision medicine. The SBIMB team published 16 high impact research articles in 2017 (including four in Nature Genetics (IF=31.6) and the pilot study of the Southern African Human Genome Programme (SAHGP) in Nature Communications (IF=12.1)), in addition to 15 publications in 2016. In 2017, a thirty-year research journey culminated in the identification of the causal mutation for a rare skin disease, Keratolytic Winter Erythema. It is a non-coding duplication of an enhancer element that causes upregulation of cathepsin B. The SAHGP pilot study demonstrated that whole genome sequence data provide the power to identify genetic differences between ethnolinguistic groups that diverged as recently as 1000 years ago and could provide insights into disease susceptibility. We have a Human Research Ethics Committee (Medical) approved Biobank, for storing DNA, to promote genomic research, a strong bioinformatics team and an extensive collaboration network. As a centre for learning, we graduated one MSc and five PhD students and hosted six postdoctoral fellows in 2016/2017 and currently host six MSc, eight PhD students and four postdoctoral.

The students run an active community engagement outreach programme, the SBIMB and Division of Human Genetics Community Outreach Programme (SCOP) and have developed an App on Genetic education for learners and the public. Our work was highlighted in The Conversation three times in 2017: "How a rare skin disease links South Africa to an 18th Century French seaman"; "Hypertension: the silent killer spreading across Africa"; and "Global genetic study involving different populations

WITS REPRODUCTIVE HEALTH AND HIV RESEARCH INSTITUTE

Director: **Professor Helen Rees**

As a Wits University research institute, we measure our success not only by the quality of our research work, but also by the impact of our work in the communities that we work in. There was a lot of success on the research front in 2017.

The ADVANCE Programme led by the Wits Reproductive Health and HIV Research Institute (Wits RHI) continued as the world's largest set of studies on ARV treatment optimisation. Results coming from this study facilitated the introduction of new antiretroviral which will be introduced in South Africa next year that are cheaper and have fewer side effects than the drugs that are currently available. Clinical trials have shown that treatment regimens including dolutegravir work faster have fewer side effects and demonstrate greater potency against drug resistance than standard HIV drugs used in Africa and other poor countries. Dolutegravir is a highly effective antiretroviral, which is well tolerated by patients and has fewer side effects.

Wits RHI is rolling out Africa's largest programme supporting the evaluation and rollout of HIV self-testing, which if successful could represent a major breakthrough in addressing the HIV epidemic. The HIV Self Testing Africa (HSTAR) initiative will be distributing more than two million self-testing HIV kits across South Africa. This is the world's largest programme of its kind to fight the HIV epidemic in the country.

In an effort to stem this growing tide of high infection rates, Wits RHI secured a very large grant to rollout ARVs for prevention to young women (PrEP) in partnership with the NDoH. This forms part of a sexual and reproductive health access project, which is funded by UNITAID - an international organisation that invests in new ways to prevent, diagnose and treat HIV. This project will help to fill a gap in the global evidence base for how real-life PrEP delivery can be carried out in the context of comprehensive health services for adolescent girls and young women.

Wits RHI in conjunction with the HIV Prevention Trials Network (HPTN) launched the world's first clinical trial evaluating an injectable ARV to prevent HIV among young women. If found to be safe and effective for HIV pre-exposure prophylaxis (PrEP), injectable CAB may be an easier, more desirable, discreet alternative to daily oral TDF/FTC for some women.

WITS RESEARCH INSTITUTE FOR MALARIA

Directors: **Professors Maureen Coetzee and Theresa Coetzer**

The Wits Research Institute for Malaria (WRIM) comprises over 20 academics from five schools in two Wits Faculties, the National Institute for Communicable Diseases and the London School of Hygiene and Tropical Medicine. In 2016/2017, over 60 papers were published, two in journals with Impact Factors greater than 10 (The Lancet - 44.002 and Plos Medicine - 13.585). Five book chapters were published in the same period.

The following staff were promoted: Professor Colin Menezes to Academic Head of the Department of Internal Medicine in the School of Clinical Medicine in 2016; Professor Lizette Koekemoer to Research Professor in WRIM; and Professor Robyn van Zyl to Full Professor in the School of Therapeutic Sciences, both in 2017.

International collaborating Institutions included:

- Johns Hopkins Malaria Research Institute, Centers for Disease Control & Prevention, National Institutes of Health, University of San Francisco, Van der Bilt University, Penn State University, Tufts University, USA.
- London School of Hygiene & Tropical Medicine, Keele University, Sanger Institute, Austria (IAEA), UK.
- Spanish Centre for Veterinary Health Sciences, Spain.
- Wageningen University, Netherlands.
- Stockholm University, Sweden.
- Swiss Tropical Institute, Medicines for Malaria Venture, Switzerland.
- ESRF, Institut Laue-Langevin, France.
- Marburg University, Germany.
- Instituto Superiore di Sanita, Italy.
- FORTH, Greece
- Australian Army Malaria Institute, Australia
- Indian Institute of Technology, Jamia Millia Islamia, India.
- Centre Muraz, Burkina Faso.
- ICIPE, Kenya.
- Ifakara Health Institute, University of Dar-es-Salaam, Tanzania.

In 2016/2017 WRIM academics hosted three postdoctoral fellows and supervised 23 Masters and 12 PhD students.

CENTRE OF EXCELLENCE associated with the Faculty 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. It is located in the office of the Deputy Vice-Chancellor for Research and Postgraduate Affairs. The CoE-HUMAN strives to understand the historical material and social conditions that currently thwart human development in South Africa, as well as the conditions required to achieve the fulfilment to which we all aspire. This requires a multi- and inter-disciplinary approach, across social, psychological, biological and public health disciplines.

The CoE-HUMAN is a virtual centre, operating on a spoke and hub model, with leadership and management at the core, currently linked to – and linking – researchers and postgraduate students at 11 universities, two science councils and a professional economic services firm with close links to government policy processes. The current staff include the Director, the Centre Manager, a financial administrator, a media and events coordinator, two policy researchers, one research assistant and three postgraduate students (one Masters and two Doctoral students). Since 2015, the CoE has had 156 students – 54 at the Master's level, 70 at the Doctoral level and 32 as postdoctoral Fellows. The Centre has awarded 127 grants since 2014, of which 24% were to Black Females, 33% to White Female, 17% to Black Males and 28% to White Males. The Centre has supported 15 books, special journal issues, and 128 DHET accredited journal articles. A key aspect of the outputs of the Centre is science engagement and from 2014, two NRF-SAFM public lectures have been hosted, 24 public events or panels convened, 11 YouTube videos, 2016 newspaper mentions of its funded research and/or direct research and 48 radio and television interviews have been given.

The Centre has a significant concentration of highly rated scientist:

- 5 NRF A-rated scientists
- 7 NRF B-rated scientists
- 8 NRF C-rated scientists, and
- 3 NRF Y-rated scientists

Two of these scholars are Medical Research Council Unit Directors: Professor Shane Norris and Professor Stephen Tollman.

Between 2017 and 2018, the Centre has hosted some noteworthy events, including the 2017 Brain Matters Seminar Series, which culminated in an NRF-SAFM Science for Society public lecture presented by Professor Morten Kringelbach from the University of Oxford, and entitled "The Parental Brain: New Insights from Brain Imaging". The Centre also hosted a panel at the 2017 Science Forum, where Dr. Phil Diamond (Square Kilometre Array Observatory), Dr. Khotso Mokhele (Department of Science & Technology), Dr. Adrian Tiplady (SKA Africa), Professor Brian Armstrong (University of the Witwatersrand), Dr. Michael Gastrow (HSRC) presented on "Big Science, Human Development, and the Square Kilometre Array Telescope." On a global stage, during 2017, 70 launches in 35 countries

were held for the special issue of The Lancet led by Professor Richter "Advancing Early Childhood Development: From Science to Scale in 35 countries"

The Centre's students also carry out Science engagement. In 2017, our students Sinethemba Makanya (a medical humanities PhD candidate at Wits), Mercy Manyema (a PhD candidate in epidemiology at Wits) and Motlatšo Rampedi (who recently completed her MA in Demographic and Population Studies at Wits) won the "Spark Talk" science communication competition facilitated by the Centre to sharpen their skills in presenting their research to non-scientists. Sinethemba Makanya went on to use her skills to win the Wits heat of the Famelab SA competition and went onto the SA finals.

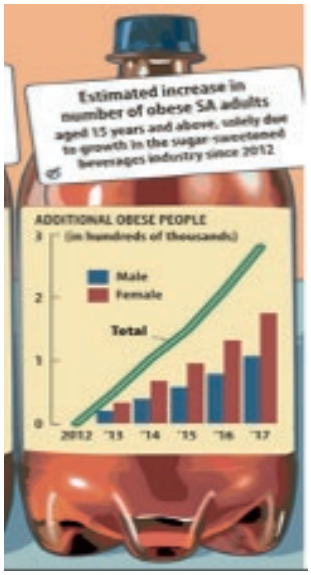
CoE-HUMAN, NRF and SAFM team at the SAFM-NRF Science for Society public lecture and Brain Matters Seminar held at the Nelson Mandela Children's Hospital, Johannesburg, 6 December 2017 and presented by Professor Morten Kringelbach (Oxford), titled "*The parental brain: new insights from brain imaging*"

RESEARCH HIGHLIGHTS

The cost of inaction against sugary drinks

Over the past decade, the prevalence of obesity has increased in South Africa, as have the sales and availability of sugar-sweetened beverages (SSBs). Exc›ess sugar consumption is associated with weight gain and increased risk for non-communicable diseases (NCDs). **Dr. Aviva Tugendhaft** from the **Rural Public Health and Health Transition Research Unit (Agincourt)** and co-authors estimated the effect of increased SSB consumption on future adult obesity prevalence in South Africa in the absence of any regulatory measures. The study shows that in the absence of preventive measures to curb consumption of sugary drinks there will be an additional 1.2 million obese adults in South Africa by 2017 compared to 2012, putting the total number of obese adults at just over 9 million. Over a quarter of this will be due to an increase in SSB consumption. By 2017, South African adults will be consuming at least six teaspoons of sugar per day from SSBs alone. This is the same amount as the World Health Organisation's daily limit and leaves little margin for consumption of other products with added or hidden sugars.

The study also highlights that the growth in the SSB market will not affect the population equally. Currently SSB consumption is greater in higher income groups but this will soon change. The largest soft drink bottler in the country is explicit about its intentions to aggressively grow its reach within the poorest sector of the population. This will place an already vulnerable population at an even greater risk for obesity related diseases, and will be exacerbated by existing poor access to quality disease screening and health care.



The National Treasury has announced a sugary drink tax to be implemented in April 2017. The Department of Health recognises other complementary cost-effective measures like advertising regulations and front of pack labelling. In the absence of such measures, SA is headed towards a future with unprecedented rising health care costs, deaths and disabilities from obesity related diseases.

REFERENCE: **Tugendhaft A, Manyema M**, Veerman L J, Chola L, Labadarios D, **Hofman K J**. (2016). Cost of inaction on sugar-sweetened beverage consumption: Implications for obesity in South Africa. *Public Health Nutrition*. 19 (13): 2296-2304

How ARV dapivirine helps protect women against HIV

The Microbicide Trials Network and International Partnership for Microbicides (IPM) announced the results of two highly anticipated clinical trials - ASPIRE and the Ring Study - that looked at the efficacy of a drug-delivering vaginal ring in preventing HIV infection. The studies showed that a monthly vaginal ring containing the antiretroviral drug (ARV) dapivirine could safely help prevent HIV infection in women.

The ASPIRE study, which was led by the National Institutes of Health enrolled 2 629 HIV-negative women ages 18 to 45 at 15 clinical research sites in Malawi, South Africa, Uganda and Zimbabwe between August 2012 and June 2015. Dr. Thesla Palanee-Phillips, Director of Network trials who led the study at the Wits Reproductive Health and HIV Institute is also the ASPIRE protocol co-chair. Women were randomly assigned to use either the dapivirine ring or placebo ring for a month at a time throughout the study. Women received a new ring at each monthly visit, plus condoms and HIV prevention counselling. The ASPIRE study found that the dapivirine ring reduced the risk of HIV infection by 27 percent overall – this means that there were 27 percent fewer women who acquired HIV in the group assigned to use the dapivirine ring than in the group assigned to use a placebo ring containing no active drug. In the second Phase III trial, the Ring Study, led by IPM, showed that the monthly dapivirine ring safely reduced HIV infection overall by 31 percent compared to a placebo. This is the first time two Phase III studies have confirmed statistically significant efficacy for a microbicide to prevent HIV.

Women in the dapivirine group who were 25 and older were 61 percent less likely to acquire HIV than women of the same age in the placebo group. Additional analyses drew a more precise line of demarcation, with lack of protection being confined to women between the age of 18 and 21 and women older than 21 seeing their risk of HIV cut by more than half (56 percent). Vaginal rings are flexible products that fit high up inside the vagina where they release a medication slowly over time. They are already used in the United States and Europe to deliver hormonal contraception. The dapivirine ring adapts that medical technology by using an ARV instead of contraception as a way to offer women potentially longer-acting protection against HIV.

REFERENCE: **Baeten JM, Palanee-Phillips T**, Brown ER, Schwartz K, Soto-Torres LE, Govender V, Mgodi NM, Matovu Kiweewa F, Nair G, Mhlanga F, Siva S et.al. (2016). Use of a Vaginal Ring Containing Dapivirine for HIV-1 Prevention in Women. N Engl J Med, 375:22, 2121-2132.

Detection and quantification of differentially culturable tubercle bacteria in sputum from patients with tuberculosis

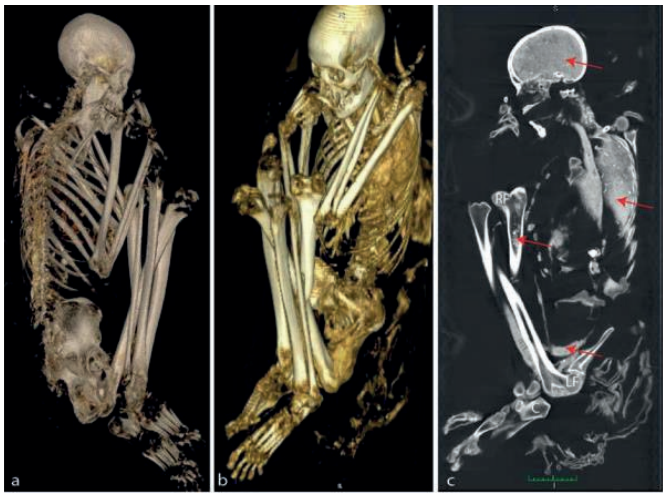
Dr Melissa Chengalroyen (supervised by Professor Bavesh Kana) from the **Centre of Excellence for Biomedical TB research (CBTBR)** and co-authors interrogated the presence of non-replicating, differentially culturable M. tuberculosis in the sputum of TB patients. Anecdotal evidence pointed to the presence, in sputum, of differentially culturable tubercle bacteria (DCTB) that are unable to grow on

solid media but can be recovered in liquid media supplemented with resuscitation promoting factors, a group of bacterial growth stimulatory enzymes secreted by M. tuberculosis. This intriguing observation was interrogated in a cross-sectional observational cohort of patients infected with TB or TB-HIV from various clinics in Soweto.

The CBTBR first established the methodology to detect and quantify DCTB and thereafter, the combination of carefully collected sputum samples and a refined methodology, allowed for the detection and definition of five operationally distinct sub-classes of tubercle bacteria in the sputum of treatment naïve TB patients. These sub-populations are expected to respond differentially to TB therapy and most likely form the microbiological basis for the protracted treatment required for achieving functional cure in TB patients. Moreover, enhanced recovery of DCTB improved bacterial detection in sputum smear negative TB patients that are generally difficult to identify using standard diagnostics. Sputum from TB-HIV-1 infected individuals, with CD4 counts >200 cells/mm3, displayed higher levels of culture filtrate-responsive organisms than sputum from TB-HIV-1 infected individuals with CD4 counts <200 cells/mm3. This study represents the most comprehensive analysis of differentially culturable tubercle bacteria to date, with important implications for diagnosis of TB particularly in individuals with paucibacillary disease. Moreover, the quantitation of differentially culturable organisms now provides a novel biomarker to assess treatment response and risk of disease recurrence. The data provide preliminary microbiological evidence to validate the long-standing hypothesis that the host immune response to TB infection drives bacteria into phenotypically distinct, drug tolerant states.

REFERENCE: **Chengalroyen MD, Beukes GM, Gordhan BG**, Streicher EM, Churchyard G, Hafner R, Warren R, Otwombe K, **Martinson N, Kana BD**. (2016). Detection and Quantification of Differentially Culturable Tubercle Bacteria in Sputum from Patients with *Tuberculosis. Am J Respir Crit Care Med.* 194(12):1532-1540. PMID: 27387272

Analysis of a Late Iron Age mummy from Botswana



Mummified human remains are valuable sources of information on past populations. In a recent collaborative study published in the South African Journal of Science, the radiological and aDNA (ancient DNA) findings of a naturally mummified individual from northern Botswana were reported. This dried-out mummy from the Tuli region is the first to have been discovered from this area. The remains were those of an older adult male of African origin. He was interred in a tightly flexed position and wrapped in an animal skin. CT-scanning revealed that none of the internal organs were preserved. Except for some degenerative changes of the lower back, the axial skeleton has remained intact. The advanced osteophytes on the vertebrae suggest an older age than what was previously estimated. The aDNA analysis confirms a Sotho-Tswana and possibly Khoesan genetic relatedness. These results represent one of the first CT scannings of a mummified individual from southern Africa, and also the first successful aDNA extraction from such remains. Professor Maryna Steyn, Head of the School of Anatomical Sciences and co-authors, coordinated the project, while the CT scans were interpreted by Swiss collaborators. The aDNA work was conducted by Molebogeng Bodiba in the dedicated aDNA labs in Switzerland.

REFERENCE: Rühli FJ, **Steyn M**, Mosothwane MN, Oehrstroem L, Bodiba M, Bouwman A. (2016). Radiological and genetic analysis of a late Iron Age mummy from the Tuli Block, Botswana. South African Journal of Science (1/2):1-7.

Bacterial respiratory infections complicating Human Immunodeficiency Virus

Opportunistic infections of the lung remain a major cause of morbidity and mortality in patients co-infected with the human immunodeficiency virus (HIV) and may be caused by a number of different microorganisms including bacteria, mycobacteria, fungi and others. Tuberculosis is the most common lung infection in HIV-infected patients in certain parts of the world, such as sub-Saharan Africa, whilst infections with other common bacteria, and especially Streptococcus pneumoniae (the pneumococcus), are the most common cause of community-acquired pneumonia (CAP) complicating HIV infection in the developed world and are second only to tuberculosis in the developing world. The current publication in focus was an invited comprehensive literature review of bacterial respiratory infections causing CAP in HIV-infected patients. The review placed particular emphasis on infections with the pneumococcus. **Professor Charles Feldman** from the **Pulmonary Infection Research Unit** and his co-author highlighted the incidence and risk factors for CAP, both HIV and non-HIV-related, and including an evaluation of the predisposing effects of HIV-mediated suppression of pulmonary host defences, possibly intensified by smoking.

Additional topics covered were clinical aspects of the common bacterial causes of CAP, the laboratory diagnosis, encompassing assessment of disease severity and outcome and appropriate antibiotic treatment. The last section addresses current recommendations with respect to pneumococcal immunization in the context of HIV infection.

REFERENCE: **Feldman C**, Anderson R. (2016). Bacterial Respiratory Infections Complicating Human Immunodeficiency Virus. Semin Respir Crit Care Med 37: 214-229.

Human Immunodeficiency Virus

Core body temperature must be monitored accurately to perform correct diagnosis and effective care of animals. Stress-induced hyperthermia occurring during game capture is a major cause of 'capture myopathy', a complex disease that may lead to death. Accurately measuring the body temperature of wild animals during game capture is thus of critical importance to monitoring hyperthermia and the efficacy of cooling interventions. Considering the importance of game management in South Africa and the heat waves that South Africa is currently experiencing, there is a growing need to find convenient and accurate ways to measure core body temperature.

Dr Benjamin Rey and co-authors from the Brain Function Research Group, School of Physiology, investigated the reliability of microchip thermometry to determine body temperature during capture and artificial cooling of wild ungulates. They simulated a field capture of springbok and investigated if temperature-sensitive microchips inserted subcutaneously between the scapula, or intramuscularly into the gluteal muscle, reflected deep core temperature as measured with data loggers implanted in the abdomen. They showed that subcutaneous temperature measured with a microchip was a

weak predictor of abdominal temperature; the bias and inconsistencies indicated that this measurement technique is not clinically acceptable. However, when inserted in the gluteus muscle, temperature-sensitive microchips provided an accurate and predictable estimate of core body temperature. Measurement of muscle temperature, which can be done easily and cheaply using microchips, therefore provides a convenient method to accurately and remotely monitor capture-induced hyperthermia and the efficacy of cooling interventions in wild ungulates.

REFERENCE: **Rey B, Fuller A, Hetem RS, Lease HM, Mitchell D, Meyer LC** (2016) Microchip transponder thermometry for monitoring core body temperature of antelope during capture. J ThermBiol (55):47-53.

Burden of stroke attributable to selected lifestyle

Rural South Africa is undergoing a rapid health transition characterised by increases in non-communicable diseases. The risk factors, such as hypertension and obesity, are preventable and treatable. Stronger policies and wider implementation in all age groups are needed to stop this epidemic. Ms Mandy Maredza and co-authors from the MRC/Wits Rural Public Health and Health Transitions Research Unit (Agincourt) estimated the burden of stroke in rural South Africa, which is attributable to high blood pressure, excess weight and high blood glucose. The premise underlying the research was that the current burden of stroke can be reduced under alternative, more favourable, exposure distributions of the risk factors, a concept termed population attributable fraction (PAF). Local data on risk exposures and cause-specific mortality derived from the Agincourt Health and Demographic Surveillance System (HDSS) site in rural North-Eastern South Africa, supplemented by data on risk factor – disease associations from large-scale prospective studies – was used to identify the proportion of disease burden attributable to a risk factor.

The study reveals that high blood pressure and excess weight, which both have effective interventions, are responsible for a significant proportion of the stroke burden in rural South Africa. Stroke burden attributable to the selected risk factors varies across age and sex sub-groups. Approximately 38% of the documented mortality and morbidity burden was due to high blood pressure (12 % males; 26 % females). This translated to 520 years of life lost (YLL) due to premature mortality per year (95 % CI: 325-678). Excess Body Mass Index was calculated as responsible for 20 % of the stroke burden (3.5 % males; 16 % females); translating to 260 YLL (CI: 199-330). Overall, burden attributable to excess BMI was disproportionately higher in young females. The authors propose that the most effective way forward to reduce the stroke burden should include both population wide policies impacting across the age spectra and health promotion and disease prevention interventions targeted at women and young people.

REFERENCE: Maredza, M, Bertram M Y, **Gómez-Olivé FX, Tollman SM** (2016). Burden of stroke attributable to selected lifestyle risk factors in rural South Africa. BMC Public Health, 16, 143.

Morphometric characteristics of the humerus and ulna in limbs bearing

The supratrochlear aperture (STA) of the humerus is an opening in the septum separating the olecranon from the coronoid fossa (see figure). Individuals with this aperture are prone to humeral fractures and exhibit unusual fracture patterns. The aetiology of the STA remains unclear, although it is associated with bone gracility, female sex and the left side. Additionally, it was proposed that the interaction of the ulna and distal humerus could result in impingement of the olecranon or coronoid fossae by ulnar processes. **Dr Ndou and Professor Schepartz** from the **School of Anatomical Sciences** found significantly smaller osteometric dimensions for STA bearing bones. The olecranon process was longer in ulnae from individuals with septal apertures whereas the coronoid process was similar irrespective of septal perforation. Therefore, the olecranon process plays a key role in septal perforation. This was further supported by discriminant function analysis that identified the olecranon process as a major factor in discriminating STA status.

The authors implicate internal bone structure in STA formation. Therefore, Dr. Ndou and Professor Schepartz are supervising a Masters student, Shayla Pillay who is investigating this proposition. The research involves using micro-CT scans to evaluate aspects of internal morphology such as volume, thickness and size of trabeculae, mineral density and the cortical thickness of humerus in relation to STA presence (see figure).

REFERENCE: **Ndou R, Schepartz LA**. Morphometric characteristics of the humerus and ulna in limbs bearing the supratrochlear aperture (STA) (2016). *Anatomical Record*., 99(2):220-33

Maternal risk exposure during pregnancy and infant birth weight

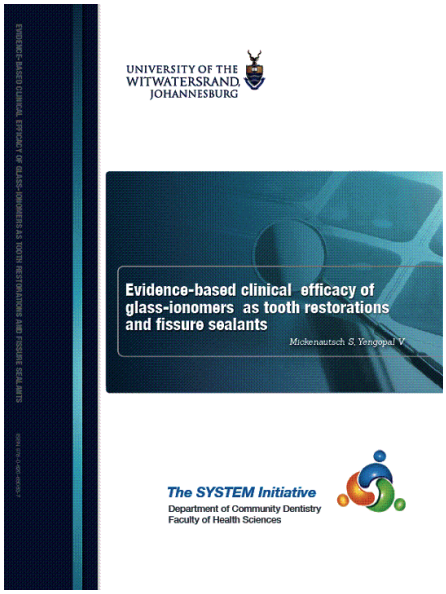
Birth weight is an established determinant of infant and adult mortality and morbidity. This study by **Wiedaad Slemming** from the **Developmental Pathways to Health Research Unit** and co-authors, aimed to identify the associations between selected maternal psychosocial and environmental risk factors assessed during pregnancy and subsequent infant birth weight. It utilised data from the well-known Birth to Twenty Plus (Bt20+) cohort study. Exposure to nine maternal risks were assessed in 1228 women who completed an antenatal questionnaire and whose infants were delivered within a seven-week period in 1990. The two most important findings were that women being unsure or not wanting the pregnancy and any tobacco use during pregnancy (cigarettes, snuff or chewing tobacco) were associated with significant reductions in infant birth weight. Exposure to both risk factors was associated with cumulative reductions in birth weight, particularly among boys.

Despite the study data being collected 25 years ago, recent national estimates indicate that the prevalence of unwanted pregnancy and maternal tobacco use, especially cigarette smoking, during pregnancy remains high in South Africa. Quitting smoking early in pregnancy will produce the greatest benefits, but stopping at any stage during pregnancy is beneficial to the mother and infant pre- and postnatally. There is a need for more focused prevention initiatives, which are provided along a continuum of care and that, do not only attend to biological risks but also psychosocial factors that may negatively impact pregnant mothers and their unborn children during antenatal care. The critical

importance of interventions, such as appropriate contraception and family planning, social assistance, and interventions that advance the empowerment and autonomy of women beyond current initiatives, aimed largely at adolescents, should also not be undermined.

REFERENCE: **Slemming W**, Bello B, **Saloojee H, Richter L**. (2016). Maternal risk exposure during pregnancy and infant birth weight. *Early Human Development*, 99:31-6.

Evidence-based clinical efficacy of glass-ionomers as tooth restorations and fissure sealants

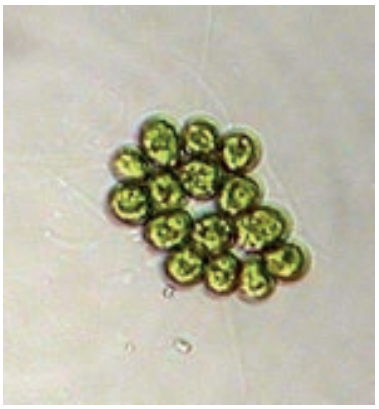


The SYSTEM Initiative, a research entity in the Faculty of Health Sciences and spear headed by Professor Steffen Mickenautsch and Professor Veerasamy Yengopal from the Department of Community Dentistry launched a new book on the clinical merits of glass ionomer cements (GIC). The book is a compilation of SYSTEMs latest research on the question of whether GICs are suitable for dental restorative care, particularly for placement as load-bearing restorations in permanent posterior teeth, as well as for placement as caries-preventive fissure sealants. The book aims to fulfil the function as detailed scientific reference to the following five key points

Concerning tooth restorations:
1. Statements based on laboratory/in-vitro results regarding the clinical inferiority of high-viscosity glass-ionomers in comparison to the current gold standard (amalgam) are generally misleading and not fit for clinical guidance;
2. Statements concerning glass-ionomer inferiority to the gold standard are based on wrong statistical comparison methods;
3. The currently available clinical data provides no evidence that the success of direct posterior tooth restorations, placed with high-viscosity glass-ionomers is inferior to that of the current gold standard;

Concerning pit and fissure sealants:
4. The currently available clinical data provides no evidence that the caries preventive effect of glass-ionomer based pit and fissure sealants is inferior to that of the current gold standard (resin composite);
5. Statements concerning glass-ionomer inferiority to the gold standard are based on a clinically invalid criterion (material retention).

The evolution of multicellular life



Throughout the history of life on Earth, multicellular life evolved from single cells numerous times, but explaining how this happened is one of the major evolutionary puzzles of our time. A number of scientists including Dr. Pierre Durand from the Department of Molecular Medicine and Haematology, School of Pathology completed a study of the complete DNA of Gonium pectorale, a simple green algae that comprises only 16 cells. The two-year research project was a global collaboration between the University of the Witwatersrand, Kansas State University, and the Universities of Arizona and Tokyo. It was published in April 2016 in the journal Nature Communications.

The authors say, "It has been difficult to explain how multicellular life evolved from single cells because it was not an easy thing to have happened. So questions like 'why did single cells live together in groups at the very beginning of multicellularity when it puts them at a fitness disadvantage' has been a challenge for a long time". Although scientists still do not know most of the answers, this study has certainly filled one of the gaps. Reporting on the genome sequencing of Gonium pectorale, the researchers discovered some of the genes that regulate cellular growth and division in this organism. The finding helps explain how single cells live together in groups, one of the earliest steps on the road to multicellularity.

Gonium pectorale (photograph from the Volvocales Information Project by Aurora Nedelcu).

REFERENCE: Hanschen ER, Marriage TN, Ferris PJ, Hamaji T, Toyoda A, Fujiyama A, Neme R, Noguchi H, Minakuchi Y, Suzuki M, Kawai-Toyooka H, Smith DR, Sparks H, Anderson J, Bakarić R, Luria V, Karger A, Kirschner MW, **Durand PM**, Michod RE, et al (2016). The Gonium pectorale genome demonstrates co-option of cell cycle regulation during the evolution of multicellularity. Nature Communications. doi:10.1038/ncomms11370

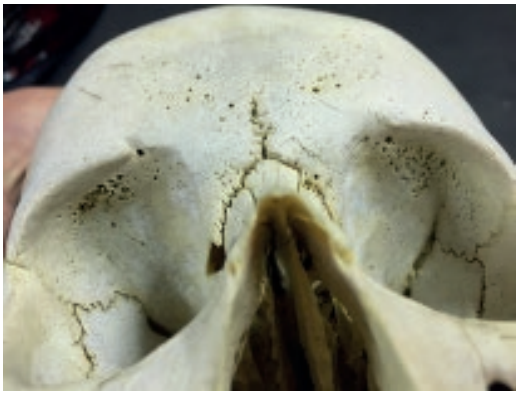
Reconstruction of mandibular defects with particulate cortico-cancellous bone grafts

Professor Carlo Ferretti and co-authors from the **Bone Research Laboratory Research Unit** evaluated the results of particulate cortico-cancellous bone grafting of mandibular defects. Patients with deficits of mandibular continuity due to injuries or resection of pathology were prepared by debridement or resection of the segment containing the pathology and placement of a patient specific reconstruction plate. Eight weeks after resection, definitive reconstruction was effected with an auto-transplant from the posterior iliac crest. Grafts were deemed successful if the regenerated ossicle (after 6 months of maturation) was adequate to place an osseointegrated fixture of at least 10mm length. Fifty-six patients were treated, of which five were lost to follow-up. For the remaining 51 patients, follow-up was 29.1 ± 18.4 months (range 6 – 80).

Mean defect length in centimeters was 12.35 ± 8.4 (range 5-18). Of the 51 reconstructions, 43 healed uneventfully and the grafts were deemed successful. Two healed grafts developed tumour recurrence, which required resection of the entire reconstruct in one, and a partial resection in another. Three patients had complete graft loss due to sepsis, five patients developed sepsis, requiring debridement with partial graft loss. Two patients in the latter group required a second grafting. One patient required augmentation grafting as the ossicle was insufficient for implant placement. The technique of staged PCCB grafting after recipient site moulding with a spacer produces unmatched restitution of mandibular anatomy with low morbidity.

REFERENCE: **Ferretti C, Muthray E**, Rikhotso E, Reyneke J, **Ripamonti U**. (2016). Reconstruction of 56 mandibular defects with autologous compressed particulate corticocancellous bone grafts. *Br J Oral Maxillofac Surg*. 54(3):322-6.

Cribra orbitalia still occurring in modern populations



Cribra orbitalia (CO) is a non-specific condition in which the superior roof of the orbit becomes porous, due to bone marrow hyperplasia. The prevalence of cribra orbitalia is often used in palaeopathological studies as an indicator of the general health status of past populations. Although debates as to its exact aetiology are still ongoing, cribra is generally accepted to be the result of a severe anemic condition (most frequently, iron deficiency anaemia). Cribra has been reported to be declining in modern populations or even be absent. In a recent study, modern, historic and prehistoric human remains from South Africa, North Carolina (North America) and the Western Hemisphere Database were assessed. Altogether, the researchers evaluated data on 844 skulls: 245 prehistoric, 381 historic (as recent as the early 20th century) and 218 modern. It was found that CO was not only present in modern populations, but that it was not even uncommon. For example, the researchers found that two of the fi ve modern North American juvenile skulls evaluated in the study – 40 percent – had CO. In addition, 15 of the 60 modern South African juveniles evaluated – 25 percent – had CO. These high rates may stem from the fact that these remains were part of forensic cases, and presumably often related to cases of homicide or neglect. These cases are thus not representative of health for all children, but indicate that conditions of poor health and nutrition still exist for large sections of the communities. Professor Maryna Steyn (School of Anatomical Sciences) and co-authors highlighted that these fi ndings drive home the fact that disadvantaged socioeconomic groups, and parts of the developing world, are still struggling with access to adequate nutrition. Unidentifi ed children found in forensic contexts are particularly at risk.

REFERENCE: **Steyn M**, Voeller S, Botha D, Ross AH. (2016). Cribra Orbitalia: Prevalence in Contemporary Populations. Clinical Anatomy. DOI: 10.1002/ca.22734

Phenotype diversity among patients with homozygous familial hypercholesterolemia

Homozygous familial hypercholesterolaemia (HoFH) is a rare but serious disorder affecting one in every million people worldwide. In South Africa, however, the condition is much more common affecting one in every 30 000 of Afrikaner, Jewish and Indian descent. Premature death from heart attack, often before the age of 20 years, was a common fate for patients with HoFH prior to the introduction of statin therapy. Consequently, HoFH has been widely considered a condition exclusive to a population comprising very young patients with extremely high cholesterol levels. In a study published in *Atherosclerosis,* **Professor Frederick Raal** from the **Carbohydrate and Lipid Metabolism Research** Unit and co-authors analysed the data from recent international studies comprising over 160 HoFH patients. The age of the patients ranged from one to 75 years, and a large proportion of the patients had cholesterol levels well below the recommended clinical diagnostic threshold for HoFH. Traditionally, patients with HoFH have invariably been considered to be young and to have exceedingly high cholesterol levels; however, this study refutes this notion. Because the HoFH patient population is diverse regarding age and cholesterol levels, consideration of a diagnosis of HoFH should not be limited to the very young or to patients with extremely high cholesterol levels.

REFERENCE: **Raal FJ**, Sjouke B, Hovingh GK, Isaac BF. (2016) Phenotype diversity among patients with homozygous familial hypercholesterolemia: A cohort study. *Atherosclerosis* 248:238-44

Exploring genetic markers of adult obesity risk in black adolescent South Africans

Obesity is a major risk factor for common, chronic diseases and is most often described in relation to body mass index (BMI), although it is not the best predictor of body composition. Heritability estimates of obesity (predominantly based on Europeans) suggest that there is a significant genetic component. The latest genome-wide association study (GWAS) of obesity-related traits has identified over hundred loci contributing to BMI alone. These findings have yet to be robustly replicated in African populations. The aim of a study by **Ms Venesa Pillay** from the **School of Pathology** and her colleagues was to assess whether six SNPs previously associated with adult BMI in Europeans showed a similar trend in a South African black adolescent cohort. The SNPs were in or near GNPDA2, MTCH2, NEGR1, SH2B1, STK33 and TMEM18.

Replication in a young cohort enables the recognition of loci that predispose to obesity early in life, which could improve our understanding of the early determinants of adult obesity. The team focused on participants of the Birth to Twenty (Bt20) cohort, which is a longitudinal study of the health and wellbeing of children who were born in Soweto, Johannesburg in 1990. Three of the SNPs tested were significantly associated with BMI, and showed a consistent (albeit smaller) directional effect to that observed in non-African cohorts. This data suggests that common genetic variants potentially contribute to obesity risk in diverse population groups.

REFERENCE: **Pillay V, Crowther NJ, Ramsay M, Smith GD, Norris SA, Lombard Z**. (2015). Exploring genetic markers of adult obesity risk in black adolescent South Africans—the Birth to Twenty Cohort. *Nutrition & diabetes*, 5, e157.

A Randomized Trial of Factor VIII and Neutralizing Antibodies in Hemophilia A

Haemophilia is a rare X-linked condition in which males have a bleeding diathesis and females are carriers. The deficient protein in Haemophilia A is clotting Factor FVIII and in Haemophilia B is Factor IX. The treatment of haemophilia is a replacement of the missing factor with clotting factor concentrate (CFC) to stop the bleeding. The CFC used for replacement can be plasma derived (pdCFC) or recombinant (rCFC). The single most serious complication of replacement therapy is development of neutralizing antibodies against the replacement protein.

The clinical equipoise since the introduction of CFC in the 1980s is whether rCFC are more immunogenic than pdCFC. In this first randomized, multicentre investigator initiated study (the SIPPET study), **Professor Johnny Mahlangu, Head of School of Pathology** and authors undertook to answer the question of immunogenicity in the minimal exposed haemophilia A patients by comparing two classes of products, viz, plasma derived and recombinant products. The study results of the SIPPET study were published in the New England Journal Medicine in which the results indicate that recombinant products were 86% more immunogenic than plasma derived products. The results of the SIPPET come in the background of a number of published studies in which no difference in immunogenicity was found between recombinant and plasma derived products. As the therapies for haemophilia continue to evolve rapidly, the real impact of the SIPPET in clinical practice should be awaited.

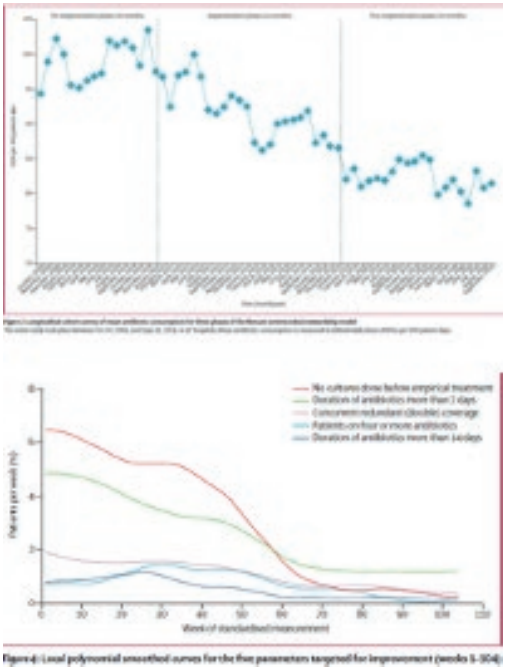
REFERENCE: Peyvandi F, Mannucci PM, Garagiola I, El Beshlawy A, Elalfy M, Ramanan V, Eshghi P, Hanagavadi S, Varadarajan R, Karimi M, Manglani MV, Ross C, Young G, Seth T, Apte S, Nayak DM, Santagostino E, Mancuso ME, Sandoval Gonzalez AC, **Mahlangu JN**, Bonanad Boix S, Cerqueira M, Ewing NP, Male C, Owaidah T, Soto Arellano V, Kobrinsky NL, Majumdar S, Perez Garrido R, Sachdeva A, Simpson M, Thomas M, Zanon E, Antmen B, Kavakli K, Manco Johnson MJ, Martinez M, Marzouka E, Mazzucconi MG, Neme D, Palomo Bravo A, Paredes Aguilera R, Prezotti A, Schmitt K, Wicklund BM, Zulfikar B, Rosendaal FR. (2016). A Randomized Trial of Factor VIII and Neutralizing Antibodies in Hemophilia A. New England Journal of Medicine. 374, (21), 2054-2064.

Antimicrobial stewardship across 47 South African hospitals: an implementation study

As resistance to antibiotics increases rapidly antimicrobial stewardship has become an absolute necessity. Practical interventions have mostly been cumbersome and difficult to introduce. Infection control and prevention is critical, but alone would be insufficient. **Professor Guy Richards from the Department of Anaesthesiology, School of Clinical Medicine** and his colleagues were involved in a remarkable project spearheaded by the "Best care always group" involving the introduction of five simple interventions in 47 hospitals of the Netcare Hospital Group aimed at reducing antibiotic prescriptions.

The intent was to introduce these changes by consent, specifically to induce behavioural change by involving all participants in the process, and if possible to create an atmosphere of competiveness between hospitals to enhance the effectiveness of the intervention. Simplicity was the key. Firstly, data was obtained from each hospital to establish the degree to which stewardship was practiced. Thereafter the study was introduced in each hospital by a designated pharmacist, not necessarily trained

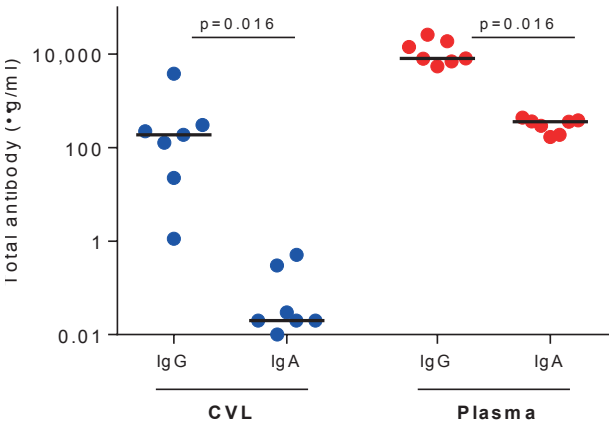
in infectious diseases, limiting the interventions to five "low hanging fruit", so termed because they were relatively accessible targets for change and could easily be monitored by the pharmacist. The five "low hanging fruits" as seen in the figure below were introduced following extensive consultation with all stakeholders emphasizing the need for change and in so doing conflict was avoided. The results were astonishing: 116 662 patients received antibiotics during 104 weeks of standardised measurement and feedback; 7934 interventions by pharmacists were recorded for the five-targeted measures. Most interventions were for excessive duration, representing 3116 (39%) of the total. This simple protocol led to a decline of 18·1% (15·71–20·4) p<0.0001 in antibiotic use. Confirming that Antimicrobial stewardship (AMS) is possible even where AMS has not previously been practiced, and that this could be achieved and coordinated despite the wide geographical distribution and the large number of hospitals involved.



REFERENCE: Brink AJ, Messina AP, **Feldman C, Richards G**, Becker PJ, Goff DA, Bauer KA, Nathwani D, van den Bergh D. (2016). Antimicrobial stewardship across 47 South African hospitals: an implementation study. *Lancet Infect Dis*., 16(9): 1017-1025.

Broadly neutralising antibody specificities detected in the genital tract of HIV-1 infected women.

Broadly neutralising antibodies (bNAbs) are considered a vital component of an HIV vaccine. Given that HIV infection occurs during sexual transmission, **Dr. Nonhlanhla Mkhize** from the **National Institute for Communicable Diseases** and co-authors examined the levels and specificities of bNAbs in mucosal samples collected from HIV infected women previously identified as having bNAbs in blood. Both IgG and IgA antibodies were isolated from cervicovaginal lavages of HIV-infected women in the CAPRISA 002 cohort. HIV-specific IgG, but not IgA, was detected in genital secretions (see figure below) and the ratio of total IgG to HIV-specific IgG was similar to plasma.

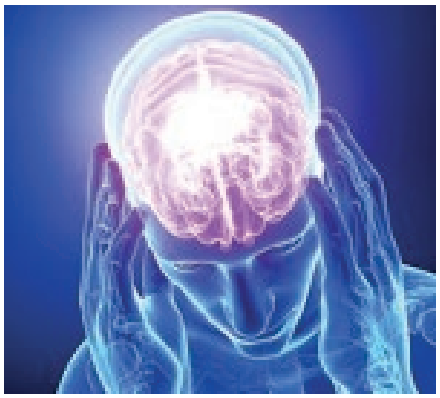


Mucosal IgG reacted with multiple envelope antigens, including V1V2, gp120, gp140 and gp41 and had neutralizing activity against both Tier 1 and Tier 2 primary HIV-isolates. Furthermore, bNAbs targeting well-known glycan epitopes and the membrane proximal region of gp41 were detected in genital secretions, and matched specificities in plasma. Overall, this study showed that women with HIV-specific plasma bNAbs have overlapping bNAb specificities in their genital tract secretions, indicating that these predominantly IgG isotype antibodies may traffic from blood to the genital tract. This finding bodes well for both active and passive immunization approaches and suggests that vaccine-elicited antibodies or those infused systemically are able to reach the genital tract, and contribute to preventing the sexual transmission of HIV.

This figure shows the concentrations of IgG isolated from cervicovaginal lavages (CVL) of HIV infected women in the CAPRISA 002 cohort. These antibodies were HIV specific and able to potently neutralize primary HIV isolates. In contrast, IgA was barely detected in CVL, unlike in plasma.

REFERENCE: **Mkhize NN, Durgiah R**, Ashley V, Archary D, Garrett NJ, Karim Q, Karim SS, **Moore PL**, Yates N, Passmore J-AS, Tomaras GD, **Morris L**. Broadly neutralizing antibody specificities detected in the genital tract of HIV-1 infected women. *AIDS* 30 (7)1005-1014.

The Mycoplasmas: forgotten pathogens?



In many countries, including South Africa, the burden of human disease caused by Mycoplasma species remains undefined. Although the Mycoplasmas are known to commonly cause pneumonia in all age groups, human studies have demonstrated central nervous system (CNS) complications such as encephalitis and meningitis. Clinical reports of neuropsychological sequelae, particularly those caused by Mycoplasma pneumoniae, have indicated cognitive deficits like memory impairment following recovery from the CNS infection (i.e., anterograde amnesia). Pro-inflammatory cytokines, including IL-1β, are released from immune cells within the CNS and play a key role in orchestrating the CNS manifestations noted in these patients. Despite the documented post-infectious neurological complications of a CNS *Mycoplasma* infection in humans, very few studies have investigated the acute inflammatory responses and sickness behaviours induced by CNS Mycoplasma infections. **Dr Tanya Swanepoel** and co-authors **from the Brain Function Research Group, School of Physiology** used an animal model to simulate CNS infections of Mycoplasma pneumoniae and Mycoplasma salivarium and investigated behavioural and inflammatory responses in rats. Authors found that intra-cisterna magna administration of either fi broblast-stimulating lipopeptide-1 (FSL-1), a pyrogenic moiety from M. salivarium, or FAM-20, a pyrogenic moiety from a more pathogenic species, namely M. pneumoniae, induced profound, dose-dependent fever, anorexia, lethargy and severe body mass stunting in rats, which lasted about a week. Rats also had signifi cant increased concentrations of IL-1β in both the hypothalamus and the hippocampus for about 27 h after FAM-20 injection.

Seven days after FSL-1 or FAM-20 injection, when rats were still sick, they maintained their fear memory to the context and tone, despite the increased hippocampal IL-1β concentration after FAM-20 administration. The study supports clinical observations showing limited retrograde amnesia in pa-

tients with Mycoplasma-induced brain inflammation, and highlights Mycoplasma-induced stunting, which may have clinical implications in humans that should not be neglected. Authors concluded that a combination of factors, and not just brain inflammation, may be responsible for causing potential neurologic deficits associated with CNS Mycoplasma infections, and that pathophysiological responses leading to CNS complications, as well as its generality across species, or age, is yet to be established.

REFERENCE: **Swanepoel T, Sabbar M, Baartman TL, Laburn HP, Mitchell D, Dukhan T, Harden LM**. (2016). Simulated acute central *Mycoplasma* infections in rats induce fever, anorexia, body mass stunting and lethargy but spare memory. *Physiology & Behavior* . 163: 294-304. doi: 10.1016/j.physbeh.2016.05.012.

Global health and cardiovascular disease: Impact of socioeconomic status, ethnicity and urbanisation on risk factor profiles of cardiovascular disease in Africa

Africa is a continent characterized by marked ethnic, socio-demographic and economic diversity, with profound changes in many regions over the past two decades. This diversity has an impact on cardiovascular disease presentation and outcomes. Within Africa and within the individual countries one can find regions having predominantly communicable diseases such as rheumatic heart disease, tuberculous pericarditis, or cardiomyopathy and others having a marked increase in non-communicable disease, such as hypertension and hypertensive heart disease. Ischaemic heart disease remains rare in most countries. Professor Karen Sliwa, Director of the Soweto Cardiovascular Research Unit and co-authors highlight the difficulties in the planning and implementation of effective health care in most African countries that are compounded by a paucity of studies and a low rate of investment in research and data acquisition.

Figure: Factors contributing to the epidemic of cardiovascular disease in low- and middle-income countries

REFERENCE: **Sliwa K**, Acquah L, Gersh BJ, Mocumbi AO. (2016) Impact of Socioeconomic Status, Ethnicity, and Urbanization on Risk Factor Profiles of Cardiovascular Disease in Africa. *Circulation*. 22; 133 (12):1199-208

Group B Streptococcus: Developing a correlate of protection for a vaccine against neonatal infections

Group B Streptococcus (GBS) is a leading global cause of sepsis and meningitis in young infants. Newborns acquire infection from pregnant women recto-vaginally colonized with GBS. Antibiotic prophylaxis given to pregnant women during labour decreases the burden of disease but this strategy is difficult to implement in low-middle income countries, where an alternate strategy is urgently required. Vaccinating pregnant women with a GBS vaccine is likely to protect the newborn against the disease. A GBS vaccine has completed phase II evaluation, and licensure could be expedited using immunological correlates of protection (i.e. an immune response that is associated with protection against GBS disease).

This review complements a systematic review *(Dangor et. al. Expert Rev Vaccine 2015; 14:135–149)* which reported an inverse association between maternal capsular antibody levels and invasive GBS disease in infants. **Dr Dangor and co-authors** from the **Respiratory and Meningeal Pathogens Research Unit** now describe putative thresholds of protection against invasive GBS disease and colonization. Furthermore, researchers reviewed the use of GBS surface-proteins as vaccine antigens, and innate mechanisms protecting against GBS infection. Presently, the group is undertaking a large clinical study (>35,000 participants) at Chris Hani Baragwanath Academic Hospital as part of a global effort to determine correlates of protection for GBS vaccination as a strategy to reduce early neonatal morbidity.

REFERENCE: **Dangor Z, Lala SG, Kwatra G, Madhi SA**. (2016). "Group B Streptococcus: developing a correlate of protection for a vaccine against neonatal infections". *Current Opinion in Infectious Diseases* 29: 262–267.

Temperature affects competition between malaria vector and non-vector larvae

Across the continent of Africa, the malaria transmission landscape is predicted to change in response to temperature shifts associated with climate change. The larvae of malaria vector and non-vector species often live in structurally similar habitats in southern Africa and thus interact for space and resources. The ecological context has a strong influence on the outcomes of species interactions, and temperature is one such condition important in mosquito ecology. **Professor Craig Davies and co-authors** from the **Wits Research Institute for Malaria** investigated the response in development

rate and survival of the malaria vector, Anopheles arabiensis, and the closely related non-vector, An. quadriannulatus, under conditions of inter- and intra-specific competition under one constant and two fluctuating temperatures. These parameters include natural conditions as well as predicted temperature extremes for southern Africa. The results suggest that if high temperature extremes were to become commonplace, the vector An. *arabiensis* will outcompete its sibling species An. *quadriannulatus*, possibly leading to increases in the disease burden. Survivorship of both species at more moderate temperatures was not significantly impacted in this study. These findings are important for defining the temperature-related parameters and quantifying the biological response of malaria vectors and provide necessary information for modelling of vector population dynamics.

REFERENCE: **Davies C, Coetzee M, Lyons CL** (2016). Effect of stable and fluctuating temperatures on the life history traits of *Anopheles arabiensis and An. quadriannulatus* under conditions of inter- and intra-specific competition. *Parasites & Vectors* 9: 342. DOI: 10.1186/s13071-016-1630-2.

Two cases of serotypeable and non-serotypeable variants of Streptococcus pneumoniae

Streptococcus pneumoniae is an important cause of meningitis, bacteraemia and pneumonia. Its polysaccharide capsule is a major virulence factor and forms the basis for serotyping and current vaccines against pneumococcal disease. More than 94 serotypes have been described to date, however the majority of disease is caused by approximately 20 serotypes. Non-serotypeable (unencapsulated) pneumococci are commonly isolated during carriage studies and very rarely cause invasive disease. Nasopharyngeal colonization may occur with more than one serotype, however disease with more than one serotype is rarely detected.

While reviewing the South African national surveillance data for invasive pneumococcal disease (IPD), **Kedibane Ndlangisa** from the **School of Pathology** and co-authors, identified two patients with mixed infections (subsequently referred to as case A and case B). Vaccine serotypes 1 and 18C were each co-detected with a non-serotypeable isolate from cerebrospinal fluid and blood of case A and B, respectively. Given the rarity of non-serotypeable isolates in causing IPD, researchers hypothesized that these non-serotypeable isolates were variants of their co-detected serotypeable isolates. Comparison of the case A non-serotypeable isolate with a serotype 1 genome revealed major deletions within the capsular locus (Figure 1). The case B non-serotypeable isolate had all 18C capsular genes, but contained two nucleotide mutations. Non-serotypeable pneumococci are not targeted by current pneumococcal vaccines and thus present a potential mechanism whereby the organism could escape vaccine pressure.

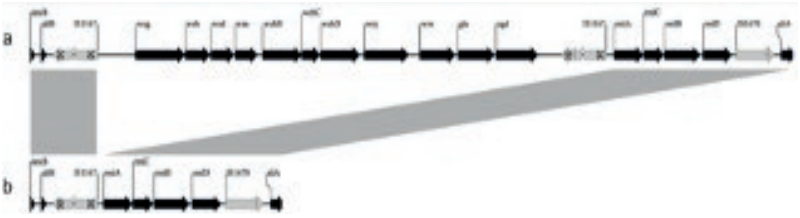


Figure 1: Schematic diagram representing comparison between the capsular polysaccharide locus of a non-serotypeable isolate (b) co-detected with a serotype 1 isolate (a) during an invasive disease episode in South Africa

REFERENCE: **Ndlangisa KM, du Plessis M**, Allam M, **Wolter N, Mohale T**, de Gouveia L, Birkhead M, Klugman KP, von Gottberg A. (2016). Two cases of serotypeable and non-serotypeable variants of Streptococcus pneumoniae detected simultaneously during invasive disease. *BMC Microbiology*. 16(1):126. doi: 10.1186/s12866-016-0745-0

An evidence-based measure for nurses to report on changes in independent lifestyle

To participate meaningfully in multidisciplinary discussions in restorative nursing care settings, such as home-based care, old age homes or retirement villages, nurses require evidence-based measures to report on their patients progress or decline towards living an independent lifestyle. **Hendrik Loubser** from the **Department of Nursing Education** and co-authors, highlighted eight items that represent the underlying construct that the GAMMA® intends to measure, i.e., those activities that are instrumental to patients independent living abilities on a daily basis (Figure 1). The GAMMA® is one of a series of nursing measures with tested clinical utility and psychometric properties that were developed and published. The GAMMA® satisfies the Rasch Model with a good to excellent fit. Based on data from a sample of 570 individuals in retirement villages and nursing homes, Rasch analyses further revealed that the GAMMA® functions optimally as an interval scale that provides metric evidence of patients ability and degree of independence. As a standardized measure the GAMMA® provides nurses with empirical data on patient outcomes. The authors concluded that using a validated nursing measure such as the GAMMA® has the potential to provide evidence of patient improvement or decline, nursing performance, burden of care and effectiveness of nursing service delivery.

Figure 1: The items of the GAMMA® nursing measure for instrumental activities of daily living.

REFERENCE: **Loubser H, Casteleijn D, Bruce J**. (2016). The GAMMA® nursing measure: calibrating construct validity with Rasch analyses. Health SA Gesondheid. 21: 11- 20.

Duration of infant protection against influenza illness conferred by maternal immunization

Young infants are at increased risk for influenza infection and hospitalizations associated with influenza infection. While active annual influenza vaccination is the most effi cient mode for prevention of influenza infection, current vaccines are poorly immunogenic and not licensed for use in infants younger than six months. An alternative strategy to prevent influenza illness in young infants is passive protection through vaccination of pregnant women. In 2014 **Dr. Marta Nunes** from the **Respiratory and Meningeal Pathogens Research Unit** and co-authors reported that immunisation of pregnant women with trivalent inactivated influenza vaccine was safe, immunogenic and partially protected the women and their infants with a vaccine effi cacy of approximately 50% against laboratory-confi rmed influenza illness during a six month follow-up post-delivery. The exact duration of the protection in

the infants was, however, never assessed and is generally described during the overall follow-up period (often the first six months of life).

In this new study, researchers show that the vaccine efficacy in infants is much higher in the first eight weeks of life (85%) before decreasing to non-significant estimates. Furthermore, researchers describe the kinetics of the transplacental acquired influenza antibodies in infants and they determined that the concentration of maternally-acquired antibodies decreased rapidly in infants, mimicking the reduction in vaccine efficacy. Several potential mechanisms of protection have been proposed such as, protection of the mother against influenza providing indirect protection of the infant by preventing transmission of influenza virus from the mother to the baby, maternal antibody-mediated protection through transplacental transfer or maternal antibody-mediated protection through breast-milk. This study suggests that the most likely mechanism of protection of the infants is through transplacental transfer of maternal antibodies.

Immunization of pregnant women with trivalent inactivated influenza vaccine is safe, immunogenic and efficacious in protecting women and their infants against influenza illness even if this protection is shorter than previously estimated very high protection is achieved for the first eight weeks of life.

REFERENCE: **Nunes MC, Cutland CL**, Jones S, Hugo A, Madimabe R, Simoes EA, Weinberg A, **Madhi SA**. (2016). "Duration of Infant Protection against Influenza Illness Conferred by Maternal Immunization." *JAMA Pediatr*. doi:10.1001/jamapediatrics.2016.0921.

Possible mechanism for the increased hepatocarcinogenic potential of subgenotype a1 of the hepatitis b virus

Hepatitis B virus (HBV) is hyperendemic in Southern Africa, with subgenotype A1 prevailing. Infection with this subgenotype is associated with rapid disease development and a high frequency of progression to hepatocellular carcinoma (HCC) compared to subgenotype A2 and D3. Subgenotype A2 is the genotype of A circulating outside Africa, whereas subgenotype D3 is the genotype of D circulating in southern Africa. The precore/core (PreC/C) region of subgenotype A1 has unique sequence characteristics, differentiating it from subgenotypes A2 and D3. This region encodes for hepatitis B e antigen (HBeAg), which acts as a tolerogen against HBV because it shares epitopes with HBcAg, the viral capsid protein. The aim of the study was to follow the expression of HBeAg in cells transfected with subgenotype A1 relative to subgenotypes A2 and D3, in order to explain the mechanisms for the higher hepatocarcinogenic potential of subgenotype A1.

Huh7 cells were transfected with replication competent plasmids of HBV belonging to subgenotypes A1, A2 and D3. The subcellular localization of HBeAg in the secretory pathway, activation of the unfolded protein response (UPR) and subsequent activation of apoptosis was determined.

Dr Nimisha Bhoola and Professor Anna Kramvis from the **Hepatitis Virus Diversity Research Unit** found that following transfection, subgenotype D3 HBeAg passes through the secretory pathway earlier than genotype A HBeAg. Subgenotype A1 showed a lower expression of HBeAg in the secretory pathway and a higher co-localization in the nucleus. This reduced secretion of HBeAg and its intracellular retention was accompanied by greater ER stress and an earlier and prolonged activation of

the UPR. Cells transfected with subgenotype A1 had increased apoptosis. In the presence of reduced HBeAg, HBcAg, may be targeted directly by both the cellular or humoral immune responses *in vivo*. Considering that HBcAg elicits a significantly more vigorous antibody response than HBeAg *in vivo*, this canlead to necrosis of hepatocytes and liver damage. Liver damage is an important contributing factor in the development of HBV-related HCC. This study therefore suggests a mechanism by which liver damage many be induced and contribute to the higher hepatocarcinogenic potential of subgenotype A1.

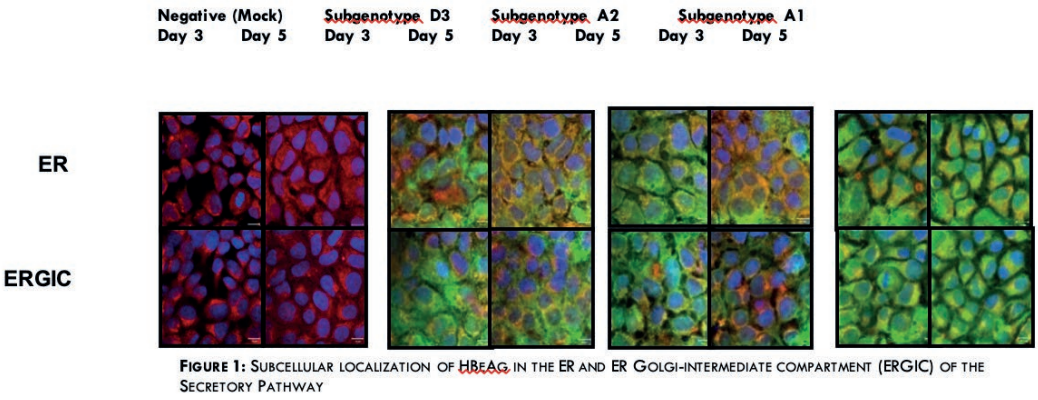
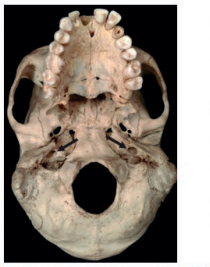


Figure 1: Subcellular localization of HBeAg in the ER and ER Golgi-intermediate compartment (ERGIC) of the Secretory Pathway

REFERENCE: **Bhoola NH, Kramvis A** (2016). Hepatitis B e Antigen Expression by Hepatitis B Virus Subgenotype A1 Relative to Subgenotypes A2 and D3 in Cultured Hepatocellular Carcinoma (Huh7) Cells. *Intervirology* 59(1):48-59.

Potential of essential oils as antimicrobials and source for discovering new antimicrobial lead compounds

Antimicrobial resistance is a global problem with microorganisms developing resistance considerably faster than the rate at which new antibiotics are developed. Essential oils, one of the most widely used natural products to date, have been used since antiquity to treat infections, even before the discovery of penicillin. In a published study, 59 different commercial essential oils were investigated against 13 skin pathogens, including microorganisms such as methicillin and gentamicin resistant *Staphylococcus aureus* as well as *Pseudomonas aeruginosa*, two pathogens that are globally responsible for severe nosocomial infections and high morbidity rates. Excellent broad-spectrum activity was observed for lemongrass, bay, patchouli, clove and vetiver oils. The chemical profi les for all the essential oils were identifi ed using gas chromatography coupled to mass



Human skull. Arrows point to the internal carotid foramina, which allow passage for the internal carotid arteries that supply blood to the brain. Photo credit: Edward Snelling. Sourced from the Raymond Dart Collection of Human Skeletons, School of Anatomical Sciences, Faculty of Health Sciences, University of the Witwatersrand.

Hominin skull casts. Photo credit: Roger Seymour. Sourced from the South Australian Museum, Adelaide, Australia

spectrometry. This data was interlaced with the antimicrobial activity using chemometric analysis. From this, it was possible to predict the compounds responsible for the noteworthy antimicrobial activity, which included amongst others eugenol, geranial and geraniol. **Mrs Ane Orchard** and co-authors from the **Department of Pharmacy** carried out further analysis to determine the antimicrobial activity individually as well as other compound combinations, with the aim to develop new synthetic antimicrobial oil with advanced antimicrobial efficacy.

REFERENCE: **Orchard A, Sandasi M**, Kamatou G, Viljoen A, **van Vuuren S**. (2016). The in vitro antimicrobial activity and chemometric modelling of 59 commercial essential oils against pathogens of dermatological relevance. *Chemistry and Biodiversity*.doi: 10.1002/cbdv.201600218.

Smarter brains are blood-thirsty brains

Dr Edward Snelling from the **Brain Function Research Group** and co-authors have found a way to calculate the change in the blood flow rate to the brain across 3 million years of human evolution. The authors used the dimensions of the holes at the base of the skull, termed the *internal carotid foramina*, to calculate the blood flow rate of the arteries that passed through these holes and supplied the brain with blood in our human ancestors. Their findings, published in *Royal Society Open Science*, unseat previous theories that the progression of human intelligence is simply related to the increase in the size of the brain. Their research shows that while brain size has increased by about 350% over human evolution, blood flow rate to the brain has increased by an impressive 600%. According to Dr. Snelling, blood flow is a much better indicator of brain metabolism and cognition than simple estimates of brain size. Dr. Snelling said, "The disproportionate increase in blood supply to the brain over human evolution appears to be closely linked to the progression of human intelligence whereby the human brain has evolved to become not only larger, but more energetically costly than previously believed."

REFERENCE: Seymour RS, Bosiocic V, **Snelling EP.** (2016). Fossil skulls reveal that blood flow rate to the brain increased faster than brain volume during human evolution. *Royal Society Open Science* 3: 160305.

Knowledge of appropriate blood product use in perioperative patients among clinicians at a tertiary hospital

Blood products are an expensive and scarce resource with inherent risks to patients. The current knowledge of rational blood product use among clinicians in South Africa is unknown. In this study, **Dr. Bradley Yudelowitz** from the **Department of Anaesthesiology** and co-authors described the level of clinicians knowledge related to all aspects of the ordering and administration of blood products from the South African Blood Services for perioperative patients at a tertiary hospital. A self-administered survey was distributed to 210 clinicians of different levels of experience from the Departments of Anaesthesiology, General Surgery and Trauma, Orthopaedic Surgery, Obstetrics and Gynaecology at the study hospital. The questions related to risks, cost, ordering procedures and transfusion triggers for red cell concentrate (RCC), fresh frozen plasma (FFP) and platelets. A total of 172 (81.90%) surveys were returned.

The overall mean for correctly answered questions was 16.76 (±4.58). The breakdown by specialty

was Anaesthesiology 19.98 (±3.84), General Surgery and Trauma 16.28 (±4.05), Orthopaedic Surgery 13.83 (±4.17) and Obstetrics and Gynaecology 15.63 (±3.51). Anaesthesiology performed better than other disciplines ($p<0.001$) and consultants out-performed their junior colleagues ($p<0.001$). Seventy percent correctly identified triggers for RCC transfusion and 50% for platelets. Administration protocols were correctly defined by 80% for RCC and FFP just over 50% for platelets. Thirty eight percent of respondents deemed infectious and non-infectious risk sufficient to obtain informed consent. Knowledge of costs and ordering was below 30%. Clinician's knowledge of risks, resources, costs and ordering of blood products for perioperative patients is poor. Transfusion triggers and administration protocols had an acceptable correct response rate.

REFERENCE: **Yudelowitz B, Scribante J, Perrie H**, Oosthuizen E. (2016). Knowledge of appropriate blood product use in perioperative patients among clinicians at a tertiary hospital. *Health SA Gesondheid* (21): 309-314.

Uterine artery Doppler screening as a predictor of pre-eclampsia

Hypertensive disorders represent the second most common cause of maternal death, affecting 5 to 10% of pregnancies worldwide and accounting for 19% of maternal deaths in South Africa.

Pre-eclampsia is believed to develop from inadequate trophoblast invasion of the maternal spiral arteries. Doppler imaging permits non-invasive evaluation of the uteroplacental circulation and is invaluable in the management of high-risk pregnancies.

A prospective quantitative experimental study tested the hypothesis that uterine artery (UA) spectral Doppler screening is able to identify patients at risk for developing preeclampsia. Convenience sampling allowed for the recruitment of 144 patients (11 to 14 weeks gestation) who attended the antenatal clinic at Rahima Moosa Mother and Child Hospital between November 2008 and July 2010. A complete record of 121 participants was available for the final analysis. The results of this study revealed that seven (5.8%) participants developed pre-eclampsia. Race was identified as the most significant independent variable with an odds ratio OR of 1.5, 26 and 9 to 1 for developing PET in the 1st, 2nd and 3rd trimesters respectively.

Professor Ermos Nicolaou from the **Department of Obstetrics and Gynaecology** and co-authors highlighted that uterine artery Doppler is promising. An ultrasound-screening programme in high-risk pregnant women would offer clinicians the opportunity to pre-empt the disease before it manifests clinically.

REFERENCE: Casmod Y, Van Dyk B, **Nicolaou E**. (2016). Uterine artery Doppler screening as a predictor of pre-eclampsia. *Health SA Gesondheid*.(21): 391-396.

Mapping of research on maternal health interventions in low- and middle-income countries

The large rise in research outputs indicates the number of researchers on the topic has expanded. The rapid rise in health systems, health promotion and qualitative research also likely reflects a cognisance that context and social dimensions determine the effectiveness of health interventions. Allocations for a number of maternal health conditions are dwarfed by funding for HIV research. The mapping thus strongly calls for funding to better reflect the distribution of the causes of maternal deaths.

A few major funders dominated, and they addressed similar topics and geographical areas. This duplicates efforts, and diffuses the focus of researchers, who develop a broad knowledge of several topics, rather than an in-depth understanding of a few. **Professor Chersich Matthew** from the **Wits Reproductive Health and HIV Institute** and co-authors highlighted that researchers should have a coordinated effort to develop a long-term, progressive accumulation of knowledge on a topic, produced by teams of funders and researchers who steadily acquire the specialised skills required for advancing a topic. Key funders would then each take responsibility for research on certain topics and regions, and develop specialised expertise both within their organisation and in research teams. Notably, an agenda driven by intellectuals across Low Middle Income Counties (LMIC) seems a far-off goal in the current context where HIC researchers appear to dominate the terms of collaboration. Too often, money is only provided to LMIC researchers for technical tasks, such as running research sites, and recruiting and retaining participants. These tasks consume their energies, and are not accorded value in authorship guidelines.

Tracking whether the burden of different conditions matches research funding in different settings might promote accountability and research governance. More stringent authorship oversight and reconsideration of authorship guidelines could accelerate growth in LMIC leadership and counter inequities between LMIC researchers and their more prominent HIC counterparts. Against the background of a strategic repositioning of maternal health within the Sustainable Development Goals era, such measures could usher in a golden era for maternal health.

REFERENCE: **Chersich M, Blaauw D**, Dumbaugh M, **Penn-Kekana L, Thwala** S, Bijlmakers L, Vargas E, **Kern E, Kavanagh J, Dhana A**, Becerra-Posada F, Mlotshwa L, Becerril-Montekio V, Mannava P, Luchters S, Pham MD, Portela AG, **Rees H**. (2016). Mapping of research on maternal health interventions in low- and middle-income countries: a review of 2292 publications between 2000 and 2012. *Global Health* 12(1):52. doi: 10.1186/s12992-016-0189-1.

HIV Co-infection with Hepatitis B Virus (HBV) Increases the Prevalence of Liver Cancer-related Mutations in HBV

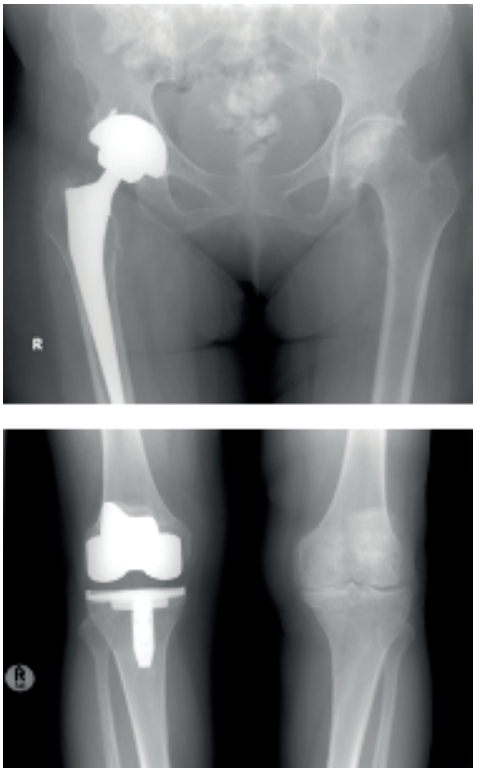
Sub-Saharan Africa (SSA) and southern eastern Asia (SEA) fall within the high endemicity regions of hepatitis B virus (HBV) infection. Of the 0.75 million deaths attributed to HBV-related diseases, recorded annually worldwide, the majority occur in these two geographical regions. **Professor Anna**

Kramvis from the **Hepatitis Virus Diversity Research Unit** and co-authors emphasized that chronic HBV infection is the most important aetiological agent for the development of primary liver cancer or hepatocellular carcinoma (HCC) in both Africa and Asia, which report high levels of HCC. HIV infection is common in both SSA and SEA. SSA has been referred to as the epicentre of the HIV pandemic. By the end of 2009, Guangxi was ranked second among provinces in China in terms of the total number of accumulated HIV/AIDS cases. Thus, HBV/HIV co-infection is common in both South Africa and China. HBV/HIV infection can accelerate the development of HCC. The major finding of this study is that co-infection with HIV is associated with increment in the prevalence of HCC-related HBV mutations including the BCP double mutation and PreS deletions (1). Both these sets of mutations have been shown to be risk factors for the development of HCC and therefore their presence in patients could be used as biomarkers for the prioritization of treatment, in order to prevent the development of HCC. This research was carried out as part of the Bilateral Scientific Collaboration between the University of Witwatersrand and Guangxi Zhuang Autonomous Region Centre for Disease Prevention and Control, funded by the National Research Foundation (NRF) of South Africa and the China International Science and Technology Cooperation.

REFERENCE: Li KW, **Kramvis A**, Liang S, He X, Chen QY, Wang C, Yang QL, Hu LP, Jia HH, Fang ZL.(2016). Higher prevalence of cancer related mutations 1762T/1764A and PreS deletions in hepatitis B virus (HBV) isolated from HBV/HIV co-infected compared to HBV-mono-infected Chinese adults. *Virus Res*. 227: 88-95. doi: 10.1016/j.virusres.2016.10.002.

Inpatient mortality after elective primary total hip and knee joint arthroplasty in Botswana

Total hip and knee joint arthroplasty rank among the most successful orthopaedic operations. Both procedures have shown to be cost effective in terms of increased quality-adjusted life expectancy and cost per quality-adjusted life year gained. Total hip and knee joint arthroplasty carries some complications including the risk of death, although low in the immediate post-operative period. The aims of the study were to measure the incidence and assess the determinants of in-hospital mortality after the first consecutive elective primary hip and knee arthroplasty performed between 2009 - 2015 in one of the neighbouring states and compare it with previous studies. The hospital is one of the two main referral hospitals in Botswana covering the Southern region of the country. An outreach programme was started in March 2009 by a team of orthopaedic surgeons from the University of the Witwatersrand, South Africa in conjunction with local orthopaedic surgeons with the aim of improving access to total joint arthroplasty (TJA) within the country. Prior to this initiative, no TJA procedures were done in public hospitals in Botswana but patients were referred to South African private health facilities. All patients who had elective primary



TJA for advanced osteoarthritis, inflammatory arthritis, and osteonecrosis were included. Professor Mkhululi Lukhele from the School of Clinical Medicine and co-authors highlighted that 346 elective joint replacements were performed comprising 153 Total Hip Arthroplasties (THA) and 193 Total Knee Arthroplasties (TKA).

REFERENCE: Lisenda L, Mokete L, Mkubwa J, Lukhele M. (2016). Inpatient mortality after elective primary total hip and knee joint arthroplasty in Botswana. Int Orthop (12):2453-2458.

Pomegranates against dental caries

The oral cavity contains a wide variety of commensal microflora that exists in harmony with the host. *Streptococcus mutans* is one of the major flora and it exists in the form of a biofilm.
S. mutans has the ability to rapidly ferment dietary carbohydrates, particularly sucrose, to produce strong acids and cause demineralization of enamel, which results in dental caries. In addition, *S. mutans* also causes root canal infections, odontogenic abscesses and endocarditis. The acidic environment also stimulates growth and virulence of *Candida* in the oral cavity, which causes oral candidiasis. *S. mutans* produces soluble and insoluble extracellular polysaccharides (EPS) which serve as nutrients and adherence moieties. Biofilm formation, production of acids and EPS are therefore considered as virulence properties of *S. mutans.* Inhibition of acid, EPS and biofilm formation is important in the prevention of dental caries. Many oral hygiene products containing antimicrobial compounds such as fluoride, triclosan, chlorhexidine and iodine, have been used for this purpose. However, medicinal plants have attracted attention due to their antimicrobial effects against oral bacteria. Punica granatum (pomegranate) which has been used traditionally for the treatment of infections throughout the world, including in South Africa was studied in the Oral Microbiology laboratory. The results showed that at high concentrations, pomegranate fruit peel was bactericidal. However, at sub-bactericidal concentrations, it reduced biofilm formation, acid and EPS productions, which are three key factors, required for the development of dental caries. **Dr Zandiswa Gulube** and **Associate Professor Mrudula Patel** from the **Division of Clinical Microbiology and Infectious Diseases** specified that it is ideal because the high concentrations are difficult to maintain in the oral cavity due to the constant saliva flow. The chemical constituents responsible for the beneficial effects are currently being identified.

REFERENCE: **Gulube Z, Patel M**. (2016). Effect of Punica granatum on the virulence factors of cariogenic bacteria Streptococcus mutans. *Microbial Pathogenesis* 25(98):45-49. doi: 10.1016/j.micpath.2016.06.027.

2017

Third molar impaction and agenesis: Influence on anterior crowding

The influence of third molars on anterior dental crowding is controversial, but they are assumed to play a major role in compromising the dental arch space by exerting pressure on the arcade. To investigate this question, Dr. Temitope Esan and Professor Lynne Schepartz from the School of Anatomical Sciences examined the correlations between third molar status (impaction, agenesis or normal eruption) and anterior crowding in 535 black South African males in the Raymond A. Dart Collection of Human Skeletons, School of Anatomical Sciences. Crowding was determined using Little's (1975) irregularity index.

Individuals with third molar impaction showed increased moderate to extreme levels of crowding compared to those with agenesis. Bilateral molar presence was more frequently associated with ideal to minimal crowding. Weak positive, but significant, correlations between crowding and impaction were found. The direction was the opposite for the bilateral presence of molars. Odds of mandibular crowding were greatest in individuals with impaction. Maxillary results were similar.

Third molar impaction plays a role in anterior crowding. However, third molar presence was not associated with anterior crowding, and agenesis did not explain crowding absence. If there is sufficient room in the dental arch, third molars erupt normally and do not contribute to anterior crowding. These results are very pertinent to current orthodontic practice, where third molars are often extracted before any crowding has occurred. The rationale for extraction is based on the assumption that they contribute to crowding which is unsubstantiated by the research that was conducted.

REFERENCE: **Esan T, Schepartz LA** (2017). Third molar impaction and agenesis: influence on anterior crowding. *Ann Hum Biol*. 1-7. 44(1):46-52. doi: 10.3109/03014460.2016.1151549.

Quality of integrated chronic disease care in rural South Africa: user and provider perspectives

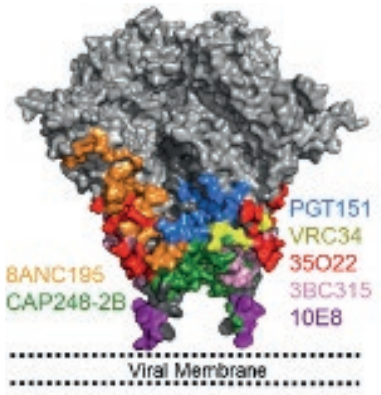
The Integrated Chronic Disease Management (ICDM) model was introduced as a response to the dual burden of HIV/AIDS and non-communicable diseases in South Africa. **Dr Soter Ameh** from the **Rural Public Health and Health Transitions Research Unit (Agincourt)** and co-authors described the viewpoints of operational managers and patients regarding quality of care in the ICDM model. In 2013, the authors conducted a case study of the seven PHC facilities in the rural Agincourt sub-district in north-east South Africa. Focus group discussions were used to obtain data from 56 purposively selected patients older than 18 years. In-depth interviews were conducted with operational managers of each facility and the sub-district health manager. Donabedian's structure, process and outcome theory for

service quality evaluation underpinned the conceptual framework in this study. The manager and patient narratives showed the inadequacies in structure (malfunctioning blood pressure machines and staff shortage); process (irregular prepacking of drugs); and outcome (long waiting times). There was discordance between managers and patients regarding reasons for long patient waiting time, which managers attributed to staff shortage and missed appointments, while patients ascribed it to late arrival of managers to the clinics. Patients reported anti-hypertension drug stock-outs (structure); sub-optimal defaulter-tracing (process); rigid clinic appointment system (process); and HIV stigmatisation in the community due to defaulter-tracing activities of home-based carers. These findings could have implications for the nationwide scale up of the ICDM model in South Africa.

REFERENCE: **Ameh S**, **Klipstein-Grobusch K**, D'ambruoso L, **Kahn K, Tollman SM, Gómez-Olivé FX** (2017) "Quality of integrated chronic disease care in rural South Africa: user and provider perspectives". *Health Policy Plan*. 32(2): 257–266.

Structure and Recognition of a Novel HIV-1 gp120-gp41 Interface Antibody

A preventative HIV vaccine will require broadly neutralising antibodies to be able to recognise diverse viruses from across the globe. Such antibodies have not yet been elicited by vaccination, but develop in some HIV-1-infected individuals during chronic infection. A better understanding of the regions on HIV-1 envelope trimers targeted by broadly neutralising antibodies may contribute to HIV-1 vaccine design.



In a paper in PLoS Pathogens, Dr Kurt Wibmer from the Department of Virology, supervised by Professors Lynn Morris and Penny Moore, described the isolation of an antibody called CAP248-2B, and characterised its epitope using X-ray crystallography, and negative-stain electron microscopy. This novel epitope spanned both gp120-gp41 interfaces in a manner that is distinct from known HIV antibodies, extending the interface target to include the gp120 C terminus, encircling the base of native pre-fusion trimers.
The study also characterised viral escape pathways from CAP248-2B, and identified unusual mutations in the gp160 cleavage sites that allowed the virus to escape these antibodies. These mutations made HIV-1 viruses 10-100-fold more sensitive to antibodies targeting another highly conserved epitope, the membrane-proximal external region. Incorporating these mutations into vaccine candidates will therefore improve the immunogenicity of gp41, and inform HIV-1 immunogen design.

Figure legend: Surface view of the HIV envelope trimer colored to show the core epitopes for gp41-directed broadly neutralising antibodies, including CAP248-2B in green.

REFERENCE: **Wibmer CK**, Gorman J, Ozorowski G, **Bhiman JN**, Sheward DJ, Elliott DH, Rouelle J, Smira A, Joyce MG, Ndabambi N, Druz A, Asokan M, Burton DR, Connors M, Abdool Karim SS, Mascola JR, Robinson JE, Ward AB, Williamson C, Kwong PD, **Morris L, Moore PL**. (2017). Structure and Recognition of a Novel HIV-1 gp120-gp41 Interface Antibody that Caused MPER Exposure through Viral Escape 2017. *PLoS Pathogens*. DOI:10.1371/journal.ppat.1006074.

Acute kidney injury, risk factors, and prognosis in hospitalised HIV – infected adults in South Africa

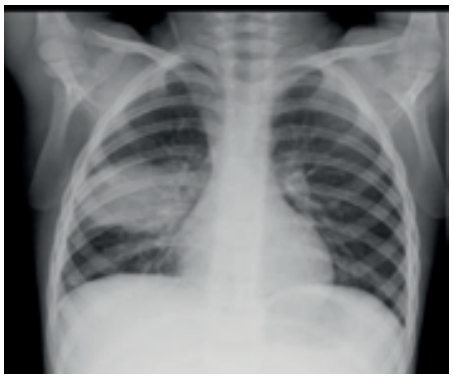
HIV-infected individuals have increased risk for renal disease in whom acute kidney injury (AKI) is a major cause of morbidity and mortality. Tenofovir (TDF), as part of first line antiretroviral therapy (ART) in South Africa, is increasingly dispensed to HIV infected adults. TDF is nephrotoxic and physicians encounter some patients being treated with TDF who present with AKI. Clearly, the role of TDF in this scenario needs investigation but data describing AKI in patients on TDF is limited. **Dr Faheem Seedat** from the **Department of Internal Medicine** and co-authors planned to better characterise this relationship.

Researchers conducted a case study by recruiting patients with AKI taking TDF and patients with AKI and naïve to TDF and/or ART. He compared various clinical factors by TDF exposure, and followed the patients up to three months after discharge from hospital. Whilst the risk factors, aetiology and mortality of AKI were similar in all HIV-infected patients, regardless of TDF exposure, Dr Seedat found that those treated with TDF had more severe and longer lasting AKI. Moreover, a large proportion of all patients had co-morbid TB, which appeared to be associated with mortality. Dr Seedat concluded that TDF appears to result in more severe AKI and that to reduce mortality in patients with AKI, more intensive follow-up, with a reduced threshold for dialysis is necessary, particularly in those with tuberculosis.

REFERENCE: **Seedat F, Martinson N, Motlhaoleng K, Abraham P**, Mancama D, **Naicker S, Variava E**. (2017). Acute Kidney Injury, Risk Factors, and Prognosis in Hospitalised HIV-Infected Adults in South Africa. *AIDS research and human retroviruses*, 33(1):33-40. doi: 10.1089/AID.2016.0098.

Hospitalisation for Culture-confirmed Pulmonary Tuberculosis in the Era of Childhood Pneumococcal Conjugate Vaccine Immunization

Streptococcus pneumoniae and *Mycobacterium tuberculosis* are common causes of childhood pneumonia in Sub-Saharan Africa. Hospitalisation for pulmonary tuberculosis in children frequently presents with pneumonia that may be related to superimposed pneumococcal infection.
Dr. Vijay Mammen and co-authors from the **Department of Paediatrics and Child Health** as well as **Respiratory and Meningeal Pathogens Research Unit** undertook a retrospective study of children hospitalised with pulmonary tuberculosis at the Chris Hani Baragwanath Academic Hospital from 2005 to 2012. The aim of the study was to determine the temporal



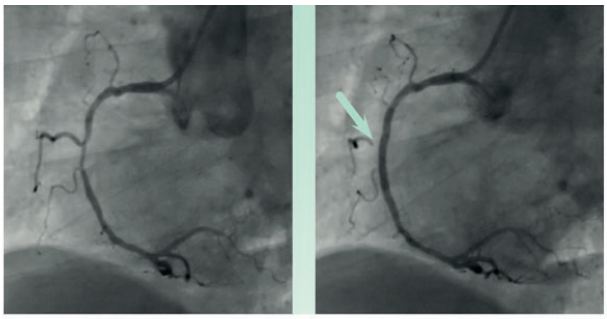
association between routine infant pneumococcal conjugate vaccine immunization, which was introduced in 2009, and the incidence of hospitalisation for culture-confirmed pulmonary tuberculosis.

The incidence of hospitalisation for pulmonary tuberculosis declined significantly before the implementation of the pneumococcal conjugate vaccine, most likely due to the roll out of antiretroviral therapy in South Africa. Further declines in the pneumococcal conjugate vaccine era could not be attributed to childhood immunisation with the pneumococcal conjugate vaccine. Ongoing surveillance is, however, planned to monitor whether changes might have occurred after 2012 and with a change from the 7-valent pneumococcal conjugate vaccine to the 13-valent vaccine.

REFERENCE: **Mammen VG, Dangor Z, Moore DP, Izu A, Beylis N, Madhi SA** (2017). Hospitalization for Culture-confirmed Pulmonary Tuberculosis in the Era of Childhood Pneumococcal Conjugate Vaccine Immunization. *Pediatr Infect Dis J*. 36(1):e14-e21.

Periprocedural Myocardial Infarction

Coronary artery disease (CAD) has the highest global burden of morbidity and mortality. This is also true for the developing world where there was significant urbanisation. Percutaneous coronary intervention (PCI) is a widely accepted therapeutic modality for physiologically significant CAD. Periprocedural myocardial infarction (PMI) is a common complication of PCI and well documented in developed countries. However, there is a paucity of data from developing regions, especially in sub-Saharan Africa on the prevalence of PMI despite an increasing incidence of CAD and concomitant increase in PCI.



Dr Nqoba Tsabedze from the **Department of Internal Medicine** and co-authors have published work from the Division of Cardiology at the Charlotte Maxeke Johannesburg Academic hospital. The researchers used the third universal definition of myocardial infarction to analyse pre-and post PCI cardiac biomarkers amongst a group of consenting adults undergoing coronary intervention. The findings were that PMI occurred in 10.5% of participants undergoing PCI. The research group recommends that large multicentre studies are required in our demographic region to better define risk factors associated with PMI.

Figure legend: Coronary Angiogram images showing Right Coronary Artery (RCA) Mid-Vessel Stenosis and Post-Stenting Side-Branch Pinching

REFERENCE: **Tsabedze N, McCutcheona K, Mkhwanazia L, Gardaa R, Vachiata A, Ramjeea R, Moosaa J, Malulekea T, Mukeshimanaa G, Karoliab S, Mpanya D, Manga P** (2016). Periprocedural myocardial infarction during percutaneous coronary intervention in an academic tertiary centre in Johannesburg. *Int J Cardiol*. 230:175–180

Adapting a developmental screening tool for young children in Southern Africa

In middle and low-income countries, there is a paucity of data on children's early development, contributing to the invisibility and lack of attention to the problems of poor early development. A major contributor to this lack of empirical evidence about early child development and relationships to later outcomes in southern Africa is limited access to standardized developmental assessment and screening tools, with most instruments designed and normed in Western countries. This has far-reaching consequences for identifying and supporting children with developmental difficulties and their families, for monitoring the effects of interventions, and for estimating the national prevalence of developmental delays.

The goal of this study was to test the psychometric properties and appropriateness of the Ages and Stages Questionnaire Third Edition (ASQ-3) in South Africa and Zambia through a combination of caregiver-completed questions and direct observations. The aim was to determine how the instrument might need to be adapted to render age-appropriate assessment in the region. Addressing this gap conveys benefits for both research and health, social and educational services working with young children in this region.

Celia Hsiao from the **Developmental Pathways for Health Research Unit** and co-authors found consistent psychometric properties of the ASQ-3 in southern Africa compared with those found in the extant literature in other regions of the world. Analysis of item difficulty at each age revealed adequate levels of difficulty for majority of the items, with exception of the problem-solving domain where half of the items at 54 and 60 months have poor pass rates. Sociodemographic variables were significantly associated with children's performance:

- Higher caregiver levels of education is associated with higher toddler scores on the personal-social domain and higher pre-schooler scores on the problem solving domain;
- Children whose caregivers earn a salary have higher fine motor scores during toddlerhood and higher problem-solving scores during preschool;
- Children who attend preschools have higher gross motor scores during toddlerhood and higher fine motor scores during the preschool years.

Overall, this is the first study to provide evidence to support the psychometric properties and feasibility of using the ASQ-3 in both South Africa and Zambia through a combination of caregiver-report and direct observations as a screening instrument to identify potential developmental delays among children 2 months to 5 years who need further assessment.

REFERENCE: **Hsiao C, Richter L**, Makhusha T, Matafwali, B, van Heerden A, Mabaso, M. (2016). Use of the Ages and Stages Questionnaire Adapted for South Africa and Zambia. *Child Care Health and Development*, 43, 59-66.

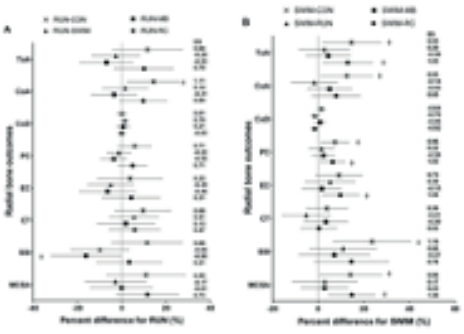
Sugar and health in South Africa: Potential challenges to leveraging policy change

A growing body of evidence indicates that excessive sugar consumption is driving epidemics of obesity and related non-communicable diseases (NCDs) around the world. South Africa, a major consumer of sugar, is also the third most obese country in Africa, and 40% of all deaths in the country result from NCDs. A number of fiscal, regulatory, and legislative levers could reduce sugar consumption in South Africa one of which is a sugary drinks tax, and the focus of this paper. South Africa has announced that a sugary drinks tax will be implemented in 2017.

This intervention has the potential to prevent obesity at the population level and save lives from NCDs. **Dr Alex Myers** from the **Rural Public Health and Health Transitions Research Unit (Agincourt)** and co-authors highlighted the challenges that government might anticipate with regards to a sugary drinks tax, many of which are already playing out in the South African context. The research is focused on the industrial, economic, and societal context. The affected industry actors have been part of the South African economy for over a century and remain influential. To deflect attention, the targeted industries can be expected either to advocate for self-regulation or to promote public–private partnerships. The research findings caution against both approaches as evidence suggests that they will be ineffective in curbing the negative health impacts caused by excessive sugar consumption.

REFERENCE: **Myers A**, Fig D, **Tugendhaft A, Mandle J**, Myers J, **Hofman K**. (2017). Sugar and health in South Africa: Potential challenges to leveraging policy change. *Global Public Health*. 12 (1) 98-115.

A comparison of limb bone and muscle size and structure between four popular endurance sports



Low magnitude bone-loading sports may benefit bone size and strength in the exercised limbs bearing in mind that a bigger bone size translates to a stronger bone. This study compared three-dimensional (peripheral quantitative computed tomography-pQCT) measures of lower arm and lower leg strength and structure, and limb muscle cross-sectional area and strength in male endurance athletes taking part in four different sports that load the relevant exercising bones differently. The first two groups of athletes consisted of men taking part in non-weight bearing and non-impact sports i.e. swimmers and road cyclists. The next group consisted of men taking part in the non-weight bearing, impact sport of mountain biking, and finally there was a group of men who performed the weight bearing and impact sport of road running. All the athlete groups were also compared to a sedentary group of men. **Professor Tanja Oosthuye** from the **School of Physiology** and co-authors found that the group of swimmers tended to have bigger arm muscles, a greater upper body strength and greater arm bone size as well as strength compared to the sedentary men and/or the road cyclists.

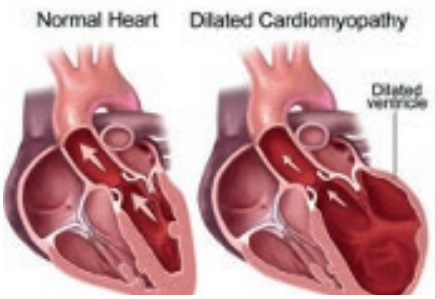
There were however no differences in arm muscle size or strength or bone size and strength between the swimmers and the groups of mountain bikers or runners. Runners had greater lower leg bone size compared to the sedentary men, the swimmers and the road cyclists, without showing differences in lower leg bone strength or lower leg muscle size and strength. Both mountain bikers and road cyclists failed to display any difference in lower-leg bone size and strength or lower-leg muscle size and strength compared to the sedentary men.

Researchers concluded that in swimmers, the muscle and bone size and strength of the main exercised limbs, the arms, is greater than controls and road cyclists. Conversely, although runners experience impact and weight-bearing loading, lower-leg bone size is greater without a substantial difference in bone strength compared to controls and non-impact sports. Failure to observe a difference in lower-leg bone and muscle measures indices in mountain bikers and road cyclists to the sedentary group was unexpected.

REFERENCE: **Oosthuyse T, McVeigh JA, Micklesfield LK, Meiring RM**. (2017). Radial and tibial bone indices in athletes participating in different endurance sports: a pQCT study. *Eur J Sport Sci*. 17, 231–240. doi:10.1080/17461391.2016.1219770.

Sex-Specific Effects of Adrenergic-Induced Left Ventricular Remodeling in Spontaneously Hypertensive Rats

Systemic hypertension is the leading cause of heart failure in urban, economically developing communities in South Africa. Understanding the mechanisms responsible for the progression from compensated left ventricular hypertrophy to heart failure in hypertension is therefore an important goal in South Africa. In response to a pressure overload on the heart, women develop more marked concentric hypertrophy and systolic function remains higher than in men.



To explore the possibility that males are more susceptible to adrenergic-induced left ventricular dilatation in pressure overload hypertrophy, the aim was to assess the impact of sex on chronic adrenergic-induced left ventricular dilatation, eccentric remodeling, and the mechanisms thereof, in spontaneously hypertensive rats (SHR). **Dr Frederic Michel** and co-authors from the **Cardiovascular Pathophysiology and Genomics Research Unit, School of Physiology** demonstrated that data compared with female SHR and male SHR are more susceptible to the adverse effects of chronic adrenergic receptor stimulation in the transition from pressure overload hypertrophy to cardiac dilatation. An increased fi brosis may be responsible for the observed sex difference in adrenergic receptor stimulation-induced left ventricular remodeling in hypertension. This research brought evidence that testosterone may play a role in the adverse effects of sympathetic nervous system activation on the progression to heart failure in hypertension. Future studies will investigate the role of sex steroids in this process.

REFERENCE: **Michel FS, Magubane M, Mokotedi L, Norton GR, Woodiwiss AJ**. (2017). Sex-Specific Effects of Adrenergic-Induced Left Ventricular Remodeling in Spontaneously Hypertensive Rats. *Journal of Cardiac Failure*, 23(2) 161-168.

A new malaria vector mosquito in South Africa

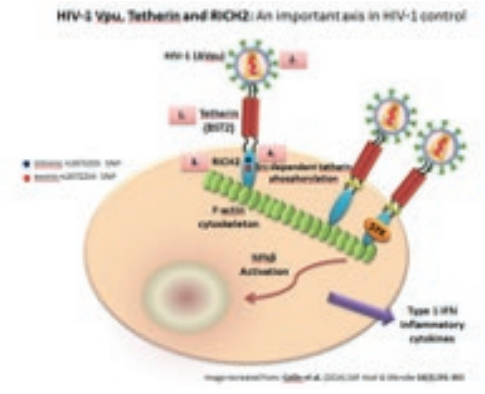
Researchers from the Vector Control Reference Laboratory, **Wits Research Institute for Malaria** and the Centre for Emerging, Zoonotic & Parasitic Diseases, NICD, have discovered a new malaria mosquito in South Africa. Two adult females of the mosquito species *Anopheles vaneedeni,* one collected from an outdoor placed trap in Mpumalanga and another from a similar trap in northern KwaZulu-Natal, were found to be infected with Plasmodium sporozoites. This means that they were able to transmit malaria. *Anopheles vaneedeni* was, until now, considered medically unimportant although this species will readily take blood from humans.

Malaria in South Africa is based on well-coordinated insecticide based control programmes that employ the indoor residual spraying (IRS) technique. This method has proved especially successful and has enabled South Africa to adopt a malaria elimination agenda. Although the IRS technique produces a high level of vector control, some vector mosquitoes, such as An. vaneedeni, tend to rest outdoors and are therefore out of the reach of the IRS programmes. This helps to explain why low-level malaria transmission persists in some districts of South Africa's endemic regions.

REFERENCE: **Burke A, Dandalo L, Munhenga G, Dahan-Moss Y**, Mbokazi F, Ngxongo S, **Coetzee M**, **Koekemoer L & Brooke B** (2017). A new malaria vector mosquito in South Africa. *Scientific Reports* 7, 43779.

Photograph: Outdoor ceramic pot trap for collecting wild mosquitoes

RICH2 is implicated in viraemic control of HIV-1 in black South African individuals



HIV-1-infected individuals have variable rates of disease progression and viral control. The study of individuals displaying these broad clinical phenotypes provides valuable insights into the biology and mechanisms of viral control and disease progression, which informs rational design of novel therapeutics and vaccines.

The burden of the AIDS epidemic lies in sub-Saharan Africa however, most studies investigating HIV control have focused on populations of European ancestry. One such study (Le Clerc et al., 2011) found an intronic single nucleotide polymorphism (SNP) in RICH2 (rs2072255; 255i), in complete linkage disequilibrium (LD) with an exonic SNP (rs2072254; 254e), to be associated with progression to AIDS in Caucasian individuals. RICH2 links tetherin to the cortical actin network

and the RICH2/tetherin interaction has been shown to be important for the downstream activation of NF-κβ and consequential promotion of proinflammatory responses.

Dr Maria Paximadis from the Centre for HIV and STIs, School of Pathology and co-authors found that in black South Africans, LD between these two SNPs was low; however, a 254e minor allele was always present with a 255i minor allele but not vice versa. Furthermore, the combination of 254e major allele homozygosity and 255i heterozygosity (254eAA/255iGA) was significantly under-represented in HIV-1-infected ARV-naive controllers with viral loads greater than 400 RNA copies/ml compared to both healthy controls and HIV-1-infected progressors. In silico analysis predicted loss of an exonic splice enhancer site with the 254e-G allele. These findings point to a role for RICH2 and tetherin in viraemic natural control of HIV-1.

Note: This work formed part of an Honours project conducted by Ms Refilwe. N. Ngqobe registered in the Department of Molecular Medicine and Haematology, Wits University.

Figure Legend: Schematic showing: 1. Tetherin, a type II transmembrane protein with a unique topology that allows it to tether enveloped viruses to the surface of infected cells, thereby restricting virus release. 2. HIV-1 encoded Viral Protein U (Vpu) can counteract the effect of tetherin; however, neutralizing effect of Vpu is not absolute suggesting balance of tetherin and Vpu may be important in HIV-1 control. 3. RICH2 links tetherin to the actin cytoskeleton; depletion of RICH2 by RNAi affects NFkβ activation but not ability of tetherin to tether HIV particles. 4. A study in Caucasians found two SNPs (designated by blue and red dots) in complete linkage disequilibrium (LD), and the minor allele/s to be associated with accelerated disease progression (Le Clerc et al., 2011). In this study, conducted in black SA HIV-1-infected ARV-naïve controllers, progressors and healthy controls, low LD between SNPs were found, and combination (rs2072254AA/rs2072255GA) linked to viraemic (>400 RNA copies/ml) HIV-1 control.

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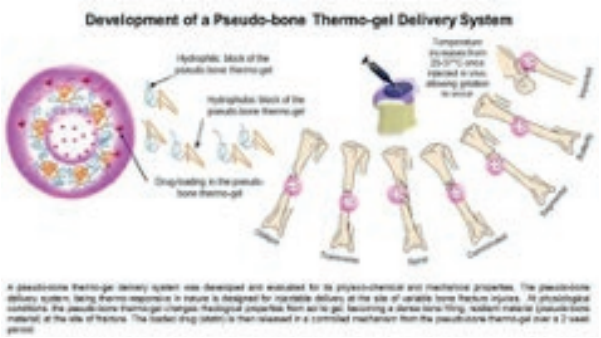
Development of an injectable pseudo-bone thermo-gel for application in small bone fractures



Pariksha Kondiah from the **Wits Advanced Drug Delivery Platform Research Unit** and co-authors synthesised and evaluated a pseudo-bone thermo-gel for its physicochemical, physico-mechanical and rheological properties, with its application to treat small bone fractures. The pseudo-bone thermo-gel was proven to have thermo-responsive properties, behaving as a solution in temperatures below 25 C, and forming a gel when maintained at physiological conditions. Polypropylene fumerate (PPF), Pluronic F127 and PEG-PCL-PEG were strategically blended, obtaining a thermo-responsive delivery system,

to mimic the mechanical properties of bone with sufficient matrix hardness and resilience. A Biopharmaceutics Classification System (BCS) class II drug, simvastatin, was loaded in the pseudo-bone thermo-gel, selected for its bone healing properties. In vitro release analysis was undertaken on a series of experimental formulations, with the ideal formulations obtaining its maximum controlled drug release profile for up to 14 days. Ex vivo studies were undertaken on induced 4mm diameter butterfly-fractured osteoporotic human clavicle samples. X-ray, ultrasound as well as textural analysis, performed on the fractured bones before and after treatment displayed significant bone filling, matrix hardening and matrix resilience. These characteristics of the pseudo-bone thermo-gel proved significant potential for application in small bone fractures.

REFERENCE: **Kondiah P.J, Choonara Y.E, Kondiah P.P.D, Kumar P, Marimuthu T, du Toit L.C, Pillay V**. Development of an injectable pseudo-bone thermo-gel for application in small bone fractures. *International Journal of Pharmaceutics*. 2017, 520 39–48.

Early Antiretroviral Therapy in Infants and Virologic Control

Consistent benefits on rate of initial viral suppression when antiretroviral therapy (ART) was initiated in infants less than six months of age was not found, however, better sustained virological control after initial viral suppression was observed among infants and young children starting ART when less than six months of age. These were the main findings reported by Wits researchers in a recent publication entitled: Early age at start of antiretroviral therapy associated with better virologic control after initial suppression in HIV-infected infants. Researchers at the Empilweni Services and Research Unit, located at Rahima Moosa Mother and Child Hospital in Johannesburg, evaluated data from five cohorts of HIV-infected infants and young children. Three non-overlapping cohorts (N=1260) were suitable to examine the association between age at ART initiation - <6 months and 6-24 months – and initial response to ART. Early initiation only showed benefits in one of three cohorts, and of concern, viral suppression rates at 6 months post-ART initiation were low.

The other two cohorts (N=488) were suitable for analysis on long term viral suppression rates, and this data showed early ART initiation to be beneficial on sustained rates of viral suppression. Compared with children starting ART between 6-24 months of age, infants who initiated ART when <6 months of age were less likely to experience viral rebound and showed a lower cumulative viral load in follow up. The study demonstrates improved long-term virological control when ART is initiated early, however, consistent benefits of early ART on initial viral suppression were not found.

Photograph: Empilweni Services and Research Unit

REFERENCE: **Shiau S, Strehlau R, Technau K-G, Patel F**, Arpadi SM, **Coovadia A**, et al. Early age at start of antiretroviral therapy associated with better virologic control after initial suppression in HIV-infected infants. *AIDS*. 2017, 31(3):355-64.

Health and Ageing in Africa

The global population is ageing. As a result, low and middle-income countries, including sub-Saharan Africa, are experiencing an increasing burden of disease and related mortality due to chronic diseases, including cardiometabolic diseases (CMD). The change of life style and the increase of older population, together with a higher survival of people living with HIV due to the widespread uptake of anti-retroviral therapy (ART) has produced a double burden epidemic with the co-existence of CMD and HIV. In order to explore the major forces shaping the trajectory of the prevalence, incidence, and risk factors of CMD in rural South Africa, Professor Tollman, Director of the MRC/Wits Rural Public Health and Health Transitions Research Unit, Professor Berkman, Director of the Harvard Center for Population and Development Studies and colleagues designed and implemented the NIH-funded study "Health and Aging in Africa: A Longitudinal Study of an INDEPTH Community" (HAALSI). This study recruited 5059 men and women ≥40 years of age drawn from the Agincourt Health and socio-Demographic Surveillance System in Mpumalanga Province.

The results show high overall prevalence of hypertension (58%), dyslipidemia with 43% of the sample with at least one abnormality in their lipid profile, diabetes (11%), overweight/obesity (58%) and elevated hsCRP levels (40%), all of them higher on women than men. Moreover, the prevalence of hypertension and diabetes increased with age. However, and given the high levels of risk factors, the prevalence of reported advanced cardiovascular conditions (angina, stroke, "heart attack", and heart failure) was lower than expected. Women had higher self-reported prevalence of CVD conditions, except for myocardial infarction (MI). The predicted risk of cardiovascular-related events and mortality over a period of ten years, showed an increased risk across age categories for both men and women. Different risk scores predicted CMD risk and mortality around 10% for the entire cohort. The prevalence of HIV (23%) was similar for men and women, decreasing with age. When evaluating CMD risk factors by HIV status we found higher risk for cardiovascular disease on those HIV negative who also suffered from higher proportions of multiple CMD co-morbidities. The HAALSI study shows high levels of CMD risk in this rural, middle-aged and older South African cohort, coupled with a high prevalence of HIV. Further waves of HAALSI will allow us to study the long-term impact of this demographic transition in a population with a double epidemic of HIV and NCD, as well as, the impact that these chronic conditions will have in the South African Primary Health Care systems.

REFERENCE: Thomas A. Gaziano; Shafika Abrahams-Gessel, Dr PH; **F. Xavier Gomez-Olive; Alisha Wade; Nigel J. Crowther**; Sartaj Alam; Jennifer Manne-Goehler; **Chodziwadziwa W. Kabudula; Ryan Wagner**; Julia Rohr; Livia Montana; **Kathleen Kahn**; Till W. Bärnighausen; Lisa F. Berkman; **Stephen Tollman**. Cardiometabolic Risk in A Population of Older Adults with Multiple Co-Morbidities in Rural South Africa: The HAALSI (Health And Aging In Africa: Longitudinal Studies of INDEPTH Communities) Study. B*MC Public Health*, 2017; 17:206

Photographs: Participants in Mpumalanga being tested as part of the study

Genetic mutation responsible for keratolytic winter erythema in South African and Norwegian Families

Keratolytic winter erythema (KWE) is a rare autosomal dominant skin disorder characterized by recurrent episodes of palmoplantar erythema (redness) and epidermal peeling. Interestingly, the symptoms worsen in winter. KWE is relatively common in South African Afrikaners (1/7200) and Coloureds (1/90500), and is due to genetic drift by a founder effect. Twenty years ago, the KWE mutation (in Afrikaners) was localised on chromosome 8p23.1-p22, between and including markers D8S1759 and D8S552, also known as the KWE critical region, but the mutation remained elusive until now. A 7.67 kb tandem non-coding region duplication was identified using next generation sequencing in 23 affected individuals and 19 unaffected individuals and validated in an additional 11 affected individuals. The duplication lies upstream of the CTSB gene and encompasses an enhancer element that is active in keratinocytes (cell type affected in KWE). The tandem duplication segregated with the disease was not found in any of the unaffected individuals. It overlaps with a 15.93 kb tandem duplication independently identified in two Norwegian families at a 2.62 kb region where the active enhancer is located suggesting that the enhancer duplication leads to the manifestation of the KWE phenotype. The duplication of the enhancer element leads to a significantly higher expression of CTSB mRNA and the overabundance of CTSB protein in the granular layer of the epidermis in affected individuals but not in controls. These data will allow for the accurate diagnosis of suspected KWE patients. However, more research is required to determine how the duplication and dysregulation of CTSB and its protein leads to KWE.

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Differences in the Prevalence and Awareness of Hypertension across sub-Saharan Africa

Hypertension is abnormally high blood pressure. It is a condition in which the force of the blood against the artery walls is too high. This causes the heart to work harder than normal, which is dangerous.

Professor Michèle Ramsay of the Sydney Brenner Institute for Molecular Bioscience at Wits and Dr. Osman Sankoh from the International Network for the Demographic Evaluation of Populations and Their Health (INDEPTH) published a ground-breaking study, which reports on the prevalence of hypertension in approximately 10,000 older people at six sites across sub-Saharan Africa. The study also assessed awareness and control of blood pressure.

This was a first-of-its-kind cross-sectional study and it revealed astounding results – there were stark differences in the prevalence, aware-ness and control of high blood pressure in the cohort studied. Prevalence of hypertension ranges from:

- 15% in the west of southern Africa
- 25% in the east of southern Africa
- between 42% and 54% in South Africa

Pooled analysis also showed some gen-der differences. For men, only 40% were aware of their hypertension condition. Of those who knew and were being treated, only 39% had controlled blood pressure. For women, the picture was better with 54% being aware of their hypertension condition, and of those undergoing treatment, 51% had controlled blood pressure.

South Africa has the highest prevalence of hypertension and the largest number of people whose blood pressure is still not controlled, even whilst being on treatment.

Cardiovascular diseases, particularly hypertension, are considered diseases of the ageing population. Increased life expectancy due to access to antiretroviral treatment to those with HIV is expected to increase the incidence of hypertension. Consequently, non-communicable diseases, including hypertension, need to be prioritized and managed to reduce the public health burden and avert a new epidemic in Africa.

This research supports the need for regionally tailored interventions. For example, whilst the east of Africa shows lower levels of hypertension, possibly due to being in the early phases of an epidemiological and health transition, levels of awareness and control are also low.

The study was conducted under the auspices of the Wits-INDEPTH Partner-ship for Genomic studies (AWI-Gen) and leveraged the INDEPTH network's existing Health and Demographic Surveillance System (HDSS) centres in rural Navrongo (Ghana), Nanoro (Burkina Faso), Agincourt and Dikgale (South Africa), urban Nairobi (Kenya), as well as the Developmental Pathways for Health Research Unit in urban Soweto. AWI-Gen is part of the Human Heredity and Health in Africa (H3Arica) Consortium.
The Wits-INDEPTH Partnership, through AWI-Gen, will continue to investigate the main drivers – and consequences – of hypertension in the different regions by revisiting study participants five years after their enrolment in the original study.

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Commemorations and Memorials in Anatomy

Professor Beverley Kramer (School of Anatomical Sciences) together with co-author Professor Graham Louw of the University of Cape Town (UCT), have published a book chapter entitled "Commemorations and Memorials in Anatomy: Tribute to the Donors and the Indigent Givers". This chapter, published in the book "Commemorations and Memorials: Exploring the Human Face of Anatomy", explores the emotional impact, along with coping mechanisms, of human dissection on Health Sciences students. The book interrogates aspects, which have been introduced in the early phase of admit-

tance into health sciences studies such as dedication ceremonies, which were put in place to assist students with accepting the cadaver as an educational gift and to aid students with the acceptance of death. In this chapter, Kramer and Louw describe the dedication ceremonies that were introduced at Wits and UCT and some personal memories of early dissection.

REFERENCE: **Kramer B,** Louw GJ. (2017) Commemorations and Memorials in Anatomy: Tribute to the Donors and the Indigent Givers. In: Štrkalj G, Pather N (eds), Commemorations and Memorials in Anatomy.

Viral and host characteristics of a child with perinatal HIV-1 following a prolonged period after ART cessation in the CHER trial

Wits researchers reported that a nine-year-old South African child who was diagnosed with HIV-1 infection at one month of age and received limited antiretroviral treatment (ART) during infancy has suppressed the virus without anti-HIV drugs for eight and a half years.

The child was definitively diagnosed as HIV-1 positive during 2007 at 32 days of age, and then enrolled on the NIAID-funded Children with HIV Early Antiretroviral Therapy (CHER) clinical trial. HIV-1 infected infants in the trial were assigned at random to receive one of three treatments - either deferred ART, or early limited ART for 40 or 96 weeks. The current child was assigned to receive early ART (AZT, 3TC, Lopinavir/ritonavir) for 40 weeks. Before starting ART, the child had a viral load of >750 000 RNA copies/ml, but following ART, suppressed the virus to undetectable levels. Investigators halted treatment after 40 weeks as per the trial randomization. The child remained in good health during years of follow-up examinations.

When the child was nine and a half years old, investigators conducted thorough laboratory and clinical studies to assess the child's immune health and the presence of HIV-1. Analyses of stored blood samples taken during follow-up visits showed that the child has maintained undetectable levels of HIV-1 (< 20 RNA copies/ml) since treatment interruption.

The child had a healthy level of key immune cells and no symptoms of HIV-1 infection. The HIV-1 DNA reservoir was calculated using qualitative nested qPCR and quantitative semi-nested qPCR, and was similar at one year and 9.5 years of age (≈ 5 copies/1 x 106 PBMCs). However, no replication-competent virus was detected in supernatants following two co-culture methods. There were weak but detectable HIV-specific antibodies and Gag-specific CD4 T cell responses, and no CD8 T cell responses. Additionally, the child does not have genetic characteristics that have previously been associated with spontaneous control of HIV-1 in adults, suggesting that host factors, as well as the 40 weeks of ART provided during infancy may have been key to achieving HIV-1 remission in this case.

To date, the Berlin patient, Timothy Brown is the only patient to have been clinically cured of HIV-1 infection. His case raised hope that effective viral eradication strategies and/or a functional cure can be developed against HIV-1. Durable HIV-1 remission after interruption of ART has been reported in some adults who started treatment early during primary infection. Worldwide, the South African child appears to be the third reported instance of sustained HIV-1 remission in a child after early, limited ART. The first case, the "Mississippi Baby," born with HIV-1 in 2010, received ART beginning 30 hours after birth, stopped therapy around 18 months of age, and controlled the virus without drugs for 27 months before it reappeared in her blood.

The second case reported in 2015, described a French child who was born with HIV-1 in 1996, started ART 3 months after birth, stopped treatment sometime be-tween ages 5.5 and 7 years, and continued to control the virus without drugs more than 11 years later. These finding confirm that long-term HIV-1 remission is possible in perinatally infected children who receive early ART. Further studies are needed to understand the mechanisms associated with HIV-1 remission and whether early treatment of infected children might favour conditions required to achieve HIV-1 control (or a functional cure) after treatment interruption.

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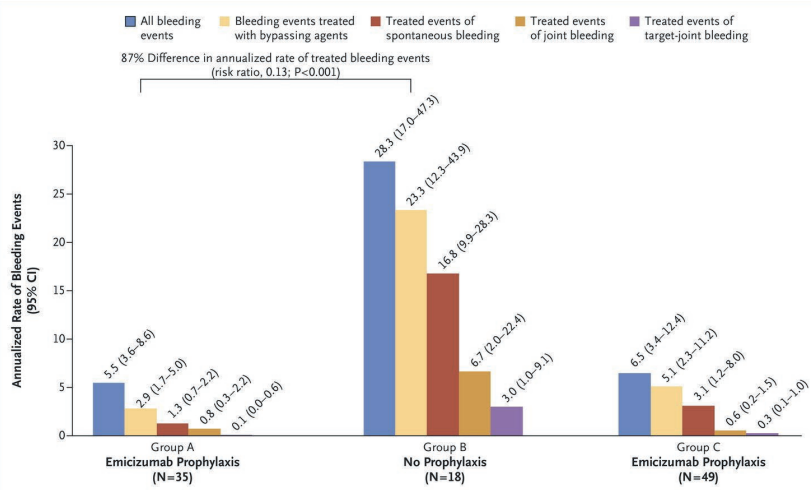
Emicizumab replaces factor VIII function in Hemophilia A

Professor Johnny Mahlangu, Head of School of Pathology was the co-author on a landmark paper simultaneously presented at the International Society on Thrombosis and Haemostasis 2017 Congress, 8-13 July 2017, Berlin, Germany, and published online in the New England Journal of Medicine.



The authors described the results of the open label HAVEN 1 trial, where hemophilia A participants were randomly assigned 2:1 to use emicizumab, a bispecific monoclonal antibody that bridges activated factor IX and factor X and thereby replaces the missing factor VIII, or to no prophylaxis. Overall, there was an 87% reduction in the annualized bleeding rate between the groups—2.9 bleeds/year (95% CI 1.69–5.02) with prophylaxis vs 23.3 bleeds/year (95% CI 12.33–43.89) without prophylactic emicizumab (P<0.0001).
Results represent a potential paradigm shift and new standard of care for treatment of hemophilia A patients with inhibitors, with an effective weekly subcutaneous, prophylactic therapeutic option.

IMAGE: Annualised Bleeding Rate in Trial Groups A, B, and C.

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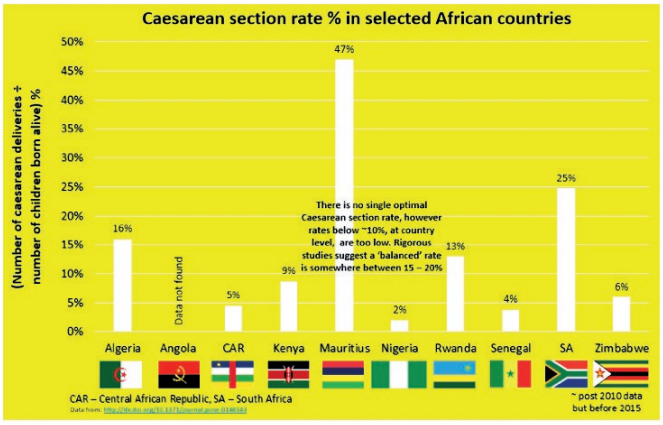
Increasing caesarean sections in Africa could save more mothers lives

Dr Salome Maswime (Lecturer and Director of the Wits University Obstetrics and Gynaecology Clinical Research Division) and Dr Gwinyai Masukume (Epidemiologist and Biostatistician, University College Cork) reported in The Conversation that the low caesarean section rate in many African countries could be one of the reasons for the high maternal mortality rate in Africa. Approximately two thirds of all maternal deaths occur in Africa, which has about a sixth of the world's population.



They propose that improving access to caesarean sections could save more lives. They propose that improving access to caesarean sections could save more lives. Whilst the caesarean section rate has increased considerably globally, Sub-Saharan Africa has the lowest caesarean section rates (3.5%), even below the threshold (about 10%) to save mothers lives and new-borns. Essentially, women who require a caesarean section as a life-saving procedure cannot get it. This increases the number of avoidable deaths and life-long childbirth injuries. South Africa has a high caesarean section rate of 24%, which is higher than many African countries. The challenge is in countries where the caesarean section rate is as low as 1%. Access to hospitals, electricity in healthcare centres, transportation delays are some of the reasons why women cannot access caesarean sections timeously. https://theconversation.com/increasing-caesarean-sections-in-africa-could-save-more-mothers-lives-75879

Reflective portfolios support learning, personal growth and competency achievement in postgraduate public health education

Portfolios are increasingly used across a range of disciplines in health professional education to support reflective practice and to help assess students' academic and professional development. However, their value in postgraduate education is uncertain. The objective of this study is to identify the role of portfolios in the development and assessment of professional competencies in postgraduate maternal and child public health education.

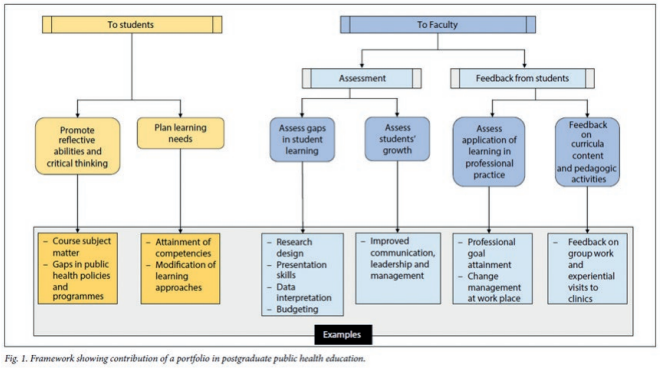


Fig. 1. Framework showing contribution of a portfolio in postgraduate public health education.

A qualitative retrospective review of 35 student portfolios was con-ducted. Thematic content analysis of portfolios was done, identifying emerging themes and analysing patterns. Two major themes

were explored – the benefit of the portfolio to the student and to the Faculty. For students, portfolios promoted reflective abilities and critical thinking and assisted them in planning learning needs. For the Faculty, the portfolios assisted in monitoring students' growth over time, identified learning gaps, helped to establish if expected learning outcomes were being attained and provided feedback on students application of academic learning to professional practice. Portfolios also offered students an opportunity to provide critical feedback on curricula content and course pedagogic activities.

The continuing development and improvisation of higher education in specialised fields of health, such as maternal and child health (MCH), demand more valid and reliable assessment of knowledge, competency and skill attainment, as well as attitude and behaviour assessment. A reflective portfolio can successfully serve this purpose for both students and the Faculty. Portfolios written by MSc/MPH students contained crucial evidence of reflective practice, critical thinking, self-growth, professionalism, knowledge management pro-cesses and heightened appreciation of exit competency out-comes. The portfolio also enabled us, as a Faculty, to attain a better understanding of student experiences and exit outcomes accomplishment.

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Ground-breaking GBS vaccine pioneered by Wits Scientists

Scientists at the Wits/Medical Research Council Respiratory and Meningeal Pathogens Research Unit (RMPRU) have contributed to the first comprehensive study of Group B Streptococcus (GBS), which are bacteria that infect pregnant women and cause stillbirths and severe invasive disease and death in infants.

Led by Professor Shabir Madhi, director of the RMPRU and the DST/NRF SARChI Chair in Vaccine Preventable Diseases, the GBS burden of disease analysis involved more than 100 re-searchers from around the world and the published supplement comprises 11 research papers. Conservative estimates show that GBS infection causes some 150,000 preventable stillbirths and infant deaths every year.

The new research found that globally, GBS colonise the rectum and vagina of pregnant women, and an average of 18% of pregnant women carry (are colonised with) GBS, ranging from 11% in eastern Asia to 35% in the Caribbean, and totalling 21.7 mil-lion in 195 countries.

What is new?

Researchers present the first systematic estimates of the worldwide burden of Group B Streptococcus (GBS), one of the great "black holes" for public health data worldwide. They include all relevant

out-comes for pregnant women, new-borns, and infants, including subsequent disability and deaths, as well as stillbirths, and preterm birth associated with GBS. Previous estimates have focused on infant deaths and mainly in North America. This work includes in-puts from about 100 countries in around 20 languages.

How large is the worldwide burden of GBS?

GBS is present in all regions of the world among pregnant women, with 21.7 million pregnant women colonized worldwide. In 2015 researchers estimated that, worldwide, there were at least 319,000 infants <3 months of age with this life-threatening infection resulting in 90,000 (UR 36,000-169,000) deaths plus at least 10,000 (UR 3000-27,000) children with disability related to GBS meningitis. In addition, they estimated that 33,000 (UR 13-52,000) maternal cases occurred and 57,000 (UR 12000-104,000) stillbirths were due to GBS disease; this very conservative estimate for stillbirths changes the investment case for maternal immunization. The burden of GBS is high, particularly in Africa.

What effect are current prevention strategies having?

Intrapartum antibiotic prophylaxis (IAP) is used in some high-income countries for preventing early-onset GBS. Worldwide policies and implementation are variable and require clinical screening and/or laboratory capacity as well as antibiotic use, when indicated. In countries where access to laboratories and skilled care at birth is limited, or where most births occur at home, implementation of IAP would be a challenge.

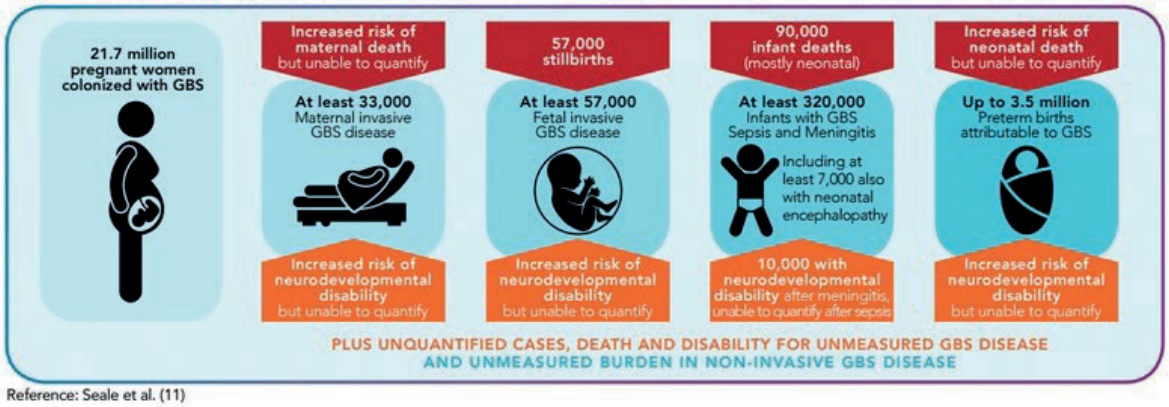
What is the potential impact of a Maternal GBS vaccination?

GBS is responsible for a higher burden of disease than other infectious diseases for which maternal vaccines are under development or in use, and accounts for more than the combined young infant deaths due to respiratory syncytial virus, pertussis, and tetanus. A GBS maternal vaccination with 80% efficacy and 90% global coverage could prevent 231,000 (UR 114,000-507,000) infant and maternal GBS cases, 41,000 (UR 8,000-75,000) stillbirths and 66,000 (UR 12,000-123,000) infant deaths annually.

What are the priority data gaps?

Stillbirth data are lacking, with no included study from Asia. Disability outcomes are lacking and require cohort studies. Researchers found some evidence of preterm birth association with maternal GBS colonisation, but more definitive burden estimates require standardized case definitions and more inputs, noting the "inverse data law" where the highest burden falls on the most vulnerable, yet the least data are collected to address that burden.

Figure 3: Summary of outcomes and measurement gaps in terms of deaths and disability from Group B *Streptococcus* in pregnant women, stillbirths, and infants worldwide in 2015.



Reference: Seale et al. (11)

Southern African ancient genomes estimate modern human divergence to 350,000 to 260,000 years ago

Southern Africa is consistently placed as a potential region for the evolution of Homo sapiens. Researchers present genome sequences, up to 13x coverage, from seven ancient individuals from KwaZulu-Natal, South Africa. Three Stone Age hunter-gatherers (about 2000 years old) were genetically similar to current-day southern San groups, while four Iron Age farmers (300 to 500 years old) were genetically similar to present-day Bantu-speakers.

The researchers estimate that all modern-day Khoe-San groups have been influenced by 9 to 30% genetic admixture from East Africans/Eurasians. Using traditional and new approaches, they estimate the first modern human population divergence time to between 350,000 and 260,000 years ago. This estimate increases the deepest divergence among modern humans, coinciding with anatomical developments of archaic humans into modern humans as represented in the local fossil record.

REFERENCE: Schlebusch, C., Malmström, H., Günther, T., Sjödin, P., Coutinho, A., Edlund, H., Munters, A.R., Vicente, M., **Steyn, M., Soodyall, H**., Lombard, M., Jakobsson, M. (2017) Southern African ancient genomes estimate modern human divergence to 350,000 to 260,000 years ago. Science 10.1126/science.aao6266

RESEARCH **AWARDS/ RECOGNITION**

National Research Foundation 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 **nine A-rated** researchers.

Shabir Madhi is Professor of Vaccinology at the University of the Witwatersrand, Johannesburg, South Africa; and co-founder and co-Director of the African Local Initiative for Vaccinology Expertise (ALIVE). Professor Madhi completed his undergraduate and postgraduate training at Wits, qualified as a paediatrician in 1996 and obtained his PhD in 2003.

He currently holds the positions of Director of the South African Medical Research Council Respiratory and Meningeal Pathogens Research Unit and Research Chair in Vaccine Preventable Diseases of Department of Science and Technology/National Research Foundation. He served as the immediate-past Director of the National Institute for Communicable Diseases (2011-2017), and currently serves as the Chair of the National Advisory Group on Immunization in South Africa.

Author of over 360 scientific publications between 1997-2017, his research focus has been on epidemiology, and clinical development of vaccines against pneumonia, diarrheal disease and for maternal immunization. These studies have been pivotal to informing WHO and SAGE policy on the use of such vaccines in low-middle income countries. He has served as a temporary–consultant/technical advisor to World Health Organization in the field of pneumonia and vaccines.

Professor Madhi is also recipient of scientific awards which include the European Society for Infectious Diseases Young Investigators Award (2006), a number of National Awards including the 2009 National Science and Technology Forum: TW Kambule Award (2009), National Research Foundations President's Award: Transformation of the Science Cohort (2010), Medical Research Council Life Time Award (Platinum medal; 2013), and the European & Developing Countries Clinical Trial Partnership

award for Scientific Leadership (2016). He is an elected member of the Academy of Science of South Africa (2012), Royal Society of South Africa (2016) and in 2017 was elected as a Fellow of The World Academy of Sciences.

Professor Derk Brouwer is an exposure scientist and holds the Chair in Occupational Hygiene in the Division of Occupational Health, School of Public Health. He has a chemical engineering degree and is a trained and certified occupational hygienist. Prof Brouwer received his PhD degree from the Utrecht University, NL with a thesis focused on occupational exposure to agrochemicals. Prior to his current position, he was a senior scientist (exposure assessment) with the Netherlands Organization for Applied Scientific Research TNO and coordinator/ principal scientist/work package leader in various European projects on NanoSafety & Health. His research focuses on the interaction between (environmental and occupational) stressors and the human being (see Figure). Research topics are: measurement strategies, occupational and residential exposure modeling, exposure prevention and control strategies, life cycle driven risk assessment, risk mitigation, and the safety of nanomaterials.

Professor Brouwer has chaired the series of International Workshops on Harmonization of Measurement Strategy for nanomaterials and participated in various international working groups, e.g. CEN TC 137, and ISO TC 146 SC2. He is former convenor of CEN TC 137 WG on Dermal Exposure. Professor Brouwer is a member of WHO Guideline Development Group on Nanomaterials and Workers Health, OECD WPNM SG8 Exposure Assessment and Mitigation, and SABS ISO TC 146 mirror committee.

He has presented over 35 invited lectures and published over 90 peer-reviewed publications of which more than 30 as first author. The scientific publications are cited more than 2700 times. Over 35 invited lectures, 30 peer reviewed publications and book chapter as first author, >60 peer reviewed publications as co-author. The scientific publications are cited more than 3200 times. H-index: Scopus 23, Google 29.

Professor Lynn Morris is the Interim Executive Director of the National Institute for Communicable Diseases and Head of the HIV Virology Section. She holds a joint appointment as a Research Professor at the University of the Witwatersrand and is an Honorary Senior Scientist (Humoral Immunity) at CAPRISA.

She completed her undergraduate studies at the University of the Witwatersrand and obtained a DPhil from the University of Oxford in 1988. The National Research Foundation awarded Professor Morris an A rating in 2016 for her significant contributions to studies on the antibody responses to HIV infection. This ground-breaking work revealed how virus evolution shapes the development of broadly neutralizing antibodies which has provided crucial insights for HIV vaccine design. Her laboratory is responsible for performing neutralizing antibody assays for clinical trials of candidate HIV vac-

cines in South Africa. Furthermore, her team was involved in the isolation of an exceptionally potent and broad neutralizing antibody that is being developed as a biological drug for HIV prevention.

Professor Morris has supervised 30 PhD and MSc students and has published over 230 papers. Her current author H-Index is 56. She has received several awards for her contributions, including: the University of the Witwatersrand's Vice Chancellor Research Award (2014), the South African Medical Research Council's Gold Merit Award (2015), a Harry Oppenheimer Memorial Trust Fellowship Award (2017) and the World Academy of Sciences Prize in Medical Sciences (2018). She is listed on the Thomson Reuters ISI list of the 3000 highest cited researchers in the world, for the past 3 years.

Professor Chris Mathew is a Distinguished Professor in the Sydney Brenner Institute for Molecular Bioscience at the University of the Witwatersrand. He holds a joint appointment as Professor of Molecular Genetics in the Department of Medical and Molecular Genetics in the Faculty of Life Sciences and Medicine at Kings College London. His main research interest is the investigation of genetic factors that contribute to the development of African cancers, and of genomic changes that are driving tumour development.

He is a Principal Investigator on two major grants from the Newton Fund to investigate the genetics of common African cancers. He has published over 260 peer-reviewed articles and has an H-index of 83, with >30,000 citations.

His contribution to an increased understanding of the genetics of human disease was recognised when he has elected as a Fellow of the Academy of Medical Sciences UK in 2001. In 2017, Professor Mathew was awarded an A rating by the National Research Foundation.

Professor Lenore Manderson is Distinguished Professor of Public Health and Medical Anthropology in the School of Public Health at the University of the Witwatersrand. In the School of Public Health, she runs a programme for Postdoctoral Fellows and emerging researchers. Professor Manderson teaches medical anthropology at a Masters level in the Department of Anthropology, School of School Sciences, Faculty of Humanities. Her research focuses on medical interventions and how access and equity are shaped by complex social factors in relation to both chronic and acute health conditions. Through this lens, Professor Manderson is collaborating with Dr Duane Blaauw (Centre of Health Policy in the School of Public Health) on the primary care prescription of antibiotics. She is recognised internationally for her work in anthropology, social history and public health. Professor Manderson has played a lead role in training and in conducting research on inequality, social exclusion and marginality, the social determinants of infec-

tious and chronic disease, gender and sexuality, immigration and ethnicity in Australia, Southeast and East Asia, Solomon Islands, South Africa and Ghana. She is also a Distinguished Visiting Professor of Anthropology and Environmental Studies in the Institute at Brown for Environment and Society (IBES), Brown University, Providence RI.

Professor Manderson has worked in advisory capacity with the Special Programme for Research and Training in Tropical Diseases (TDR) for 30 years. She chairs the Social Innovation in Health Review Group and is a member of the TDR Scientific Working Group for Research for Implementation. Professor Manderson is the editor of the international journal Medical Anthropology and a new book series on medical anthropology for Rutgers University Press. In 2016, the National Research Foundation awarded Professor Manderson with an A-rating. In addition, she was elected as a member of the Academy of Science of South Africa in 2016, and was awarded the biennial Career Achievement Award of the Society for Medical Anthropology for her theoretical and methodological contributions to the field.

Professor Charles Feldman

During the review period, 2016-2017, Professor Feldman was Professor of Pulmonology and Chief Physician, Charlotte Maxeke Johannesburg Academic Hospital and Faculty of Health Sciences, University of the Witwatersrand. He was also the Director of the Pulmonary Infection Research Unit, which undertakes both basic and clinical studies in the field of community-acquired pneumonia. The basic studies are involved in the investigation of aspects of the pathogenesis of community-acquired pneumonia and its complications, while the clinical studies are part of multicenter, international collaborations investigating the clinical features and management of community-acquired pneumonia. Professor Feldman holds both a PhD and a DSc from the University of the Witwatersrand, both for theses on the topic of community-acquired pneumonia.

Professor Feldman has been a National Research Foundation A-rated scientist since 2010. In 2016, he was elected to the Academy of Science of South Africa.

Professor Rachel Jewkes is a medical doctor and physical health specialist. She is the Executive Scientist for Research Strategy in the Office of the South African Medical Research Council's President. Professor Jewkes is an NRF A1 rated scientist and she has received an SAMRC gold medal. In 2014, Professor Jewkes was listed in the Thomson Reuters list of the World's Most Highly Influential Scientific Minds. She is a global leader of research on the intersection of gender inequity, gender-based violence and health. She has worked for over two decades to build public understanding of gender-based violence, and to use research for stronger global policy, prevention interventions and services for survivors. She is the Secretary of the Sexual Violence Research Initiative, the global knowledge hub on gender-based violence research, and the Consortium Director of the DFID-funded What Works to Prevent Violence? Global Programme which leads research on prevention of violence against women in 13 countries. She has written over 300 peer reviewed journal articles, reports, training manuals

and book chapters. She is a member of the WHO Expert Advisory Panel on Injury and Violence Prevention and Control and WHO Scientific and Technical Advisory Group for the WHO's Department of Reproductive Health and Research. She was formerly Director of the South African Medical Research Council's Gender and Health Research Unit and is an Honorary Professor at the University of the Witwatersrand School of Public Health.

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.

Glenda's global profile includes a role as Co-PI of the HIV Vaccine Trials Network (HVTN), a transnational collaboration for the development of HIV/AIDS prevention vaccines. She is also Director of International Programmes for HVTN and Chairperson of the Board of the Global Alliance for Chronic Diseases, and a member of the Institute of Medicine of the National Academies, USA.

She received South Africa's highest honour the Order of Mapungubwe for her pioneering research in PMTCT. Other prestigious accolades include the Nelson Mandela Health and Human Rights Award for her significant contributions in the field of mother-to-child transmission of HIV. Selected as one of Time's 100 Most Influential People in the World in 2017, Glenda is a recognised leader in her field.

Professor Duncan Mitchell is Emeritus Professor of Physiology at the University of the Witwatersrand and Honorary Professorial Research Fellow in the Brain Function Research Group where he retired as the director in 2006. Professor Mitchell is Adjunct Professor in the School of Anatomy, Physiology and Human Biology at the University of Western Australia, Perth. Before joining the University of the Witwatersrand in 1975, he was on the scientific staff of the National Institute for Medical Research, London, England, and of the Research Organization of the Chamber of Mines of South Africa.
Professor Mitchell's research career started in the field of applied human physiology of deep-level mining, and he progressed to research in neurophysiology, fever physiology and ecophysiology to a lifelong career in thermal physiology. His interest in neurophysiology has led to a parallel research programme in pain pathophysiology and pharmacology. He has lectured in twenty-six countries in the course of his career. He has supervised 43 PhD and MSc students, and published more than 270 papers. The University of the Witwatersrand awarded him the Harry Oppenheimer Fellowship in 2010 and an honorary Doctor of Science degree in 2012. With his colleagues and students at the University of the Witwatersrand, University of Western Australia, University of Lethbridge (Canada) and Justus Liebig University (Germany), he is currently pursuing research in conservation physiology related to climate change, in the pathophysiology of pain resulting from HIV and its treatment, and in sickness behaviour.

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. The Faculty is home to eight SARChI Chairs.

Chair in **Research on the Health Workforce for Equity and Quality: Professor Laetitia Rispel**

Professor Laetitia Rispel holds a South African Department of Science and Technology/ National Research Foundation Research Chair, entitled Research on the Health Workforce for Equity and Quality and is Professor of Public Health at the University of the Witwatersrand in Johannesburg, South Africa. She is both a former Head of the Wits School of Public Health (2012-2017), and a former Head of the Gauteng Provincial Government Department of Health in South Africa (2001-2006).

Professor Rispel obtained a PhD from Wits University, and has additional qualifications in epidemiology, economics, management and leadership. She has extensive and wide-ranging experience of research, teaching, and health leadership in different settings, and has published on different aspects of health policy and the transformation of the South African health system. She has won several national and international awards, including: the South African Shoprite/Checkers/SABC2 woman of the year award in the health category (2003); International Nurse Researcher Hall of Fame of the Sigma Theta Tau Nursing Honors Society (2013); Gauteng branch of the South African Medical Association award in the allied category (2013); University vice-chancellor's academic citizenship award (2014); Academy of Science of South Africa membership award (2015); co-chair of the South African Lancet Commission, on High-Quality Health Systems in the Sustainable Development Goals (2017). She is the current president of the World Federation of Public Health Associations, the first woman from Africa in the 50-year history of the organisation to achieve this honour.

Chair in **Virus-Host Dynamics for Public Health: Professor Penny Moore**

Professor Penny Moore is a Reader and DST/NRF South African Research Chair of Virus-Host Dynamics at the University of the Witwatersrand and the National Institute for Communicable Diseases. She holds a joint appointment as Honorary Senior Scientist in Virus-Host Dynamics at the Centre for the AIDS Programme of Research in South Africa (CAPRISA), University of KwaZulu-Natal. She obtained her MSc in Microbiology at the University of the Witwatersrand, studying gastroenteritis-associated adenoviruses. This was followed by a PhD in Virology (Medicine) at the University of London (studying the Hepatitis B virus) in 2003 before returning to South Africa to

join NICD/WITS. Moore co-directs a team of more than 15 scientists and 10 graduate students, with the team's research focused predominantly on HIV neutralizing antibodies and their interplay with the evolving virus. She has extensive experience with amplification and sequencing of env, and the isolation and characterization of monoclonal antibodies to HIV antigens. Her research is currently funded by the NIH, the SA Medical Research Council SHIP programme, the International AIDS Vaccine Initiative and the SA National Research Foundation.

Chair in **Health Policy and Systems Research: Professor John Eyles**
Professor 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, healthcare 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 **Bioinformatics for African Populations: Professor Michele Ramsay**

Michèle Ramsay is Director of the Sydney Brenner Institute for Molecular Bioscience (SBIMB); South African Research Chair in Genomics and Bioinformatics of African Populations and Professor in the Division of Human Genetics, University of the Witwatersrand, Johannesburg. Her research interests include African population genetic and epigenetic diversity and their role in diseases exacerbated by adverse lifestyle choices, including obesity and cardiometabolic diseases. She collaborates on genetic research into eye diseases and autoimmune diseases in African populations. She is PI of an NIH funded Collaborative Centre under the H3Africa Consortium for "Genomic and environmental risk factors for cardiometabolic diseases in Africans", and is President of the African Society of Human Genetics and the International Federation of Societies of Human Genetics. She has published over 160 peer-reviewed articles and has an H-index of 30, with >3000 citations.

Chair in **HIV Vaccine Translational Research: Professor Caroline Tiemessen**

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 at the University of the Witwatersrand. In 2013 she was awarded the DST/NRF Research Chair of HIV Vaccine Translational Research in the Faculty of Health Sciences at the University of the Witwatersrand, was appointed a member of the Academy of Science of South Africa (ASSAf). Research interests include the study of HIV vaccines and HIV cure (paediatric and adult). A focus is on natural resistance models which include maternal-infant HIV-1 transmission for studying protective immunity to HIV-1, and the study of long term nonprogressors and elite controllers to understand natural attenuation of disease progression. A more recent and major focus of research efforts is in the field of paediatric HIV cure. Here her laboratory is exploring viral reservoir and host biomarkers as part of an NIH U01-funded LEOPARD clinical trial currently being conducted in Johannesburg, and is intensely studying the recent case of the HIV-infected South African child in remission. This case offers a unique study opportunity to find clues as to what might make long-term remission possible for more individuals, and could help inform the search for the more challenging goal of a complete cure for HIV.

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 South African NRF Research Chair 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. He is a Personal Professor of Pharmaceutics and Executive Director of the Wits Advanced Drug Delivery Platform (WADDP). Professor Pillay holds an NRF B-rating.

Chair in **Vaccine Preventable Diseases: Professor Shabir Madhi**

Shabir Madhi is Professor of Vaccinology at the University of the Witwatersrand, Johannesburg, South Africa; and co-founder and co-Director of the African Local Initiative for Vaccinology Expertise (ALIVE). He currently holds the positions of Director of the South African Medical Research Council Respiratory and Meningeal Pathogens Research Unit and Research Chair in Vaccine Preventable Diseases of Department of Science and Technology/National Research Foundation. A brief biosketch of Professor Madhi can be found in the NRF A-rated section of this report on page (NS to insert page number once the book has been designed).

Chair in **Medical Entomology and Vector Control: Professor Maureen Coetzee**

Professor Maureen Coetzee started working in medical entomology 42 years ago, and she is currently Research Professor and Co-Director of the Wits Research Institute for Malaria, and holds a DST/NRF Research Chair in Medical Entomology & Vector Control.

She has published over 190 peer reviewed scientific papers and book chapters. Recent awards include the DST Distinguished Women Scientist award in the Life Sciences (2015), a Certificate of Distinction from the Council of the International Congresses of Entomology, Orlando, Florida, USA, (2016) and finalist in the Standard Bank Top Women Awards (2016). She sits on numerous international committees and has recently been appointed to the WHO Malaria Policy Advisory Committee.

In the 22 years that Professor Coetzee has been involved in training post-graduate students, she has supervised 21 PhD and 27 MSc graduates, 67% black and 42% female. Her students have come from all over Africa – Nigeria, Cameroun, DRC, Sudan, Ethiopia, Eritrea, Kenya, Tanzania, Malawi, Namibia, Botswana and Zimbabwe. Some of them now run their own research groups and others work for international organizations, e.g. WHO.

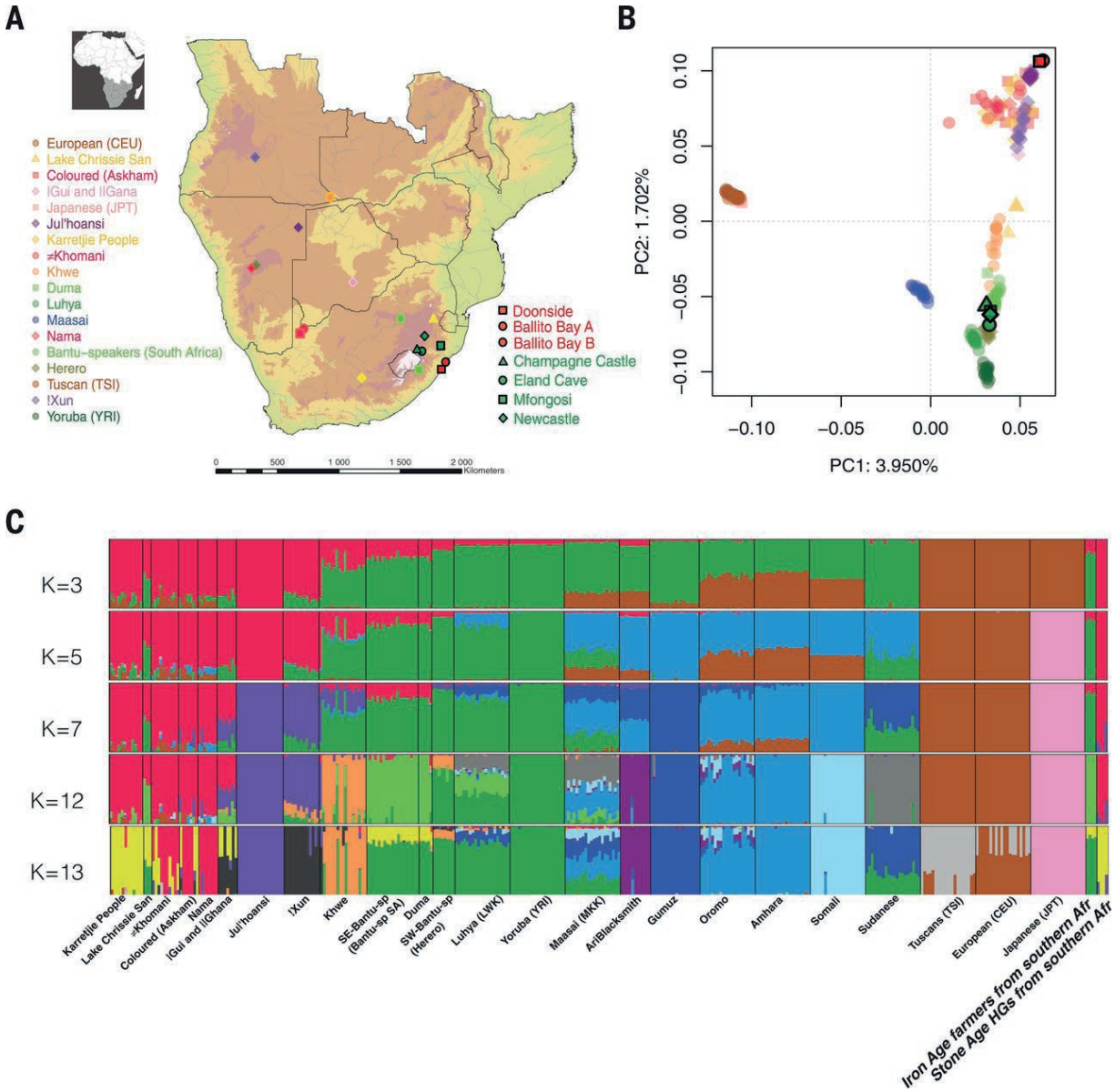
Center of Excellence (CoE)

In 2016, Professor Viness Pillay and his team were awarded a new Center of Excellence (CoE) in "Translational Neuromaterials" by the African Network for Drugs and Diagnostics Innovation (ANDI). This new CoE will be integrated into their existing CoE on "Advanced Drug Delivery Technology" previously awarded by ANDI and it will be renamed as "Advanced Drug Delivery Technology and Translational Neuromaterials". The focus of the all-encompassing CoE will be on the development of drug delivery technologies specifically targeting neurological disorders and includes the brain, spinal cord, cranial nerves, peripheral nerves and nerve roots. Emphasis will be placed on epilepsy, neurodegenerative disorders such as Parkinson's disease and Alzheimer's disease and other dementias, cerebrovascular diseases including stroke, migraine and other headache disorders, multiple sclerosis, neuro-infections, brain tumours, traumatic disorders such as brain trauma and neurological disorders as a result of malnutrition. The future of nanoscience is poised to make significant life changing breakthroughs for human kind in this defined area of Translational Neuromaterials, i.e. advanced biomaterials modified for the enhanced treatment of neurological disorders. The team will design translational neuro-materials for pharmaceutically enhanced neuro-gadgets and implantable neuro-devices to target human neuro-spaces that will allow us to effectively treat individuals suffering from chronically debilitating CNS illnesses.

DST-NRF Flagship Programme

In 2016, ALIVE consortium (African Local Initiative for Vaccinology Expertise) was launched at the University of the Witwatersrand as a South African DST-NRF Flagship Programme to strengthen African leadership in vaccinology research and advocacy. The ALIVE consortium is co-directed by Professors Shabir Madhi and Helen Rees. ALIVE brings together accomplished scientists with a broad range of expertise relating to vaccines and immunization and aims to foster multi-disciplinary collaborations, build capacity across the region and fill critical knowledge gaps for new vaccine development and deployment for vaccines considered to be priorities for African countries.

Southern African ancient genomes estimate modern human divergence to 350,000 to 260,000 years ago



NRF New/Re-rated Researchers

First Ratings

Awarded in 2016	Awarded in 2017
Professor Lenore Manderson (Public Health) - NRF A2 rating	**Professor Derk Brouwer** (Public Health) - NRF A2 rating
Professor Lynn Morris (Pathology) - NRF A2 rating	**Professor Paul Ruff** (Clinical Medicine) - NRF B2 rating
Professor Chris Mathew (Pathology) - NRF B1 rating	**Dr Avy Violari** (Clinical Medicine) - NRF B2 rating
Dr Basil Brooke (Pathology) - NRF B3 rating	**Professor Benita Olivier** (Therapeutic Sciences) - NRF Y2 rating
Dr Kevin Behrens (Clinical Medicine) - NRF C1 rating	
Professor Albert Janse van Rensburg (Clinical Medicine)- NRF C2 rating	
Professor Hellen Myezwa (Therapeutic Sciences) - NRF C2 rating	
Professor Richard Brooksbank (Physiology) - NRF C3 rating	
Professor Amadi Ihunwo (Anatomical Sciences) - NRF C3 rating	
Dr Lisa Du Toit (Therapeutic Sciences) - NRF Y1 rating	
Dr Robyn Hetem (School of Physiology/School of Animal, Plant and Environmental Sciences) - NRF Y1 rating	
Dr Abdullah Ely (Pathology) - NRF Y2 rating	
Dr Sharon Moeno (Oral Biological Sciences) - NRF Y2 rating	
Dr Eustasius Musenge (Public Health) - NRF Y2 rating	
Dr Petrus Jansen van Vuren (Pathology) - NRF Y rating	

Renewed Ratings

Awarded in 2016	Awarded in 2017
Professor Charles Feldman (Clinical Medicine) - NRF A2 rating	**Professor Rachel Jewkes** (Public Health) - NRF A1 rating
Professor Frederick Raal (Clinical Medicine) - NRF B2 rating	**Professor Shabir Madhi** (Pathology) - NRF A2 rating
Professor Angela Woodiwiss (Physiology) - NRF B2 rating	**Professor Ugo Ripamonti** (Physiology) - NRF B1 rating
Professor Andrea Fuller (Physiology) - NRF B3 rating	**Professor Patrick Dessein** (Clinical Medicine) - NRF B3 rating
Professor Bavesh Kana (Pathology) - NRF B3 rating	**Professor Deborah Glencross** (Pathology) - NRF B3 rating
Professor Saraladevi Naicker (Clinical Medicine) - NRF B3 rating	**Professor Lesley Scott** (Pathology) - NRF C1 rating
Professor Maria Papathanasopoulos (Pathology) - NRF C1 rating	**Dr Anthony Smith** (Pathology) - NRF C2 rating
Professor Daynia Ballot (Clinical Medicine) - NRF C2 rating	**Professor Nigel Crowther** (Pathology) - NRF C2 rating
Professor Elena Libhaber (Clinical Medicine) - NRF C2 rating	
Dr Lisa Micklesfield (Clinical Medicine) - NRF C2 rating	
Professor Joanne Potterton (Therapeutic Sciences) - NRF C2 rating	
Professor Kennedy Erlwanger (Physiology) - NRF C3 rating	

University Awards

Vice-Chancellor's Research Award 2017

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.

Photo by: Eyescape

Professor Caroline Tiemessen joint Research Professor in the School of Pathology at Wits and Head of Cell Biology in the Centre for HIV and STIs in the National Institute for Communicable Diseases was awarded the Vice-Chancellor's Research Award in 2017.

Vice-Chancellor's Academic Citizenship Award

2016
Professor Judith Bruce, Head of School of Therapeutic Sciences was jointly awarded the 2016 Vice-Chancellor's Academic Citizenship Individual Award.

2017
Professor Ames Dhai, Director of the Steve Biko Centre for Bioethics for jointly receiving the 2017 Vice-Chancellor's Academic Citizenship Award. The award was shared with Bhekuyise Zungu, from the School of Education.

Vice-Chancellor's Transformation Award

2017
Dr Nontsikelelo Mapukata from the School of Clinical Medicine for receiving the Vice-Chancellor's Transformation Award.

Vice-Chancellor's Teaching and Learning Team Award

2017
The Wits eFUNDANATHI Team, comprising **Paula Barnard, Janine van der Linde, Lebo Bogoshi and Phiwe Dlamini**, for receiving the Vice-Chancellor's Teaching and Learning Team Award. The eFUNDANATHI eLearning Team, based in the School of Therapeutic Sciences, was acknowledged for its pioneering excellent work that has had a major impact on teaching and learning.

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.
2016
Dr Benita Olivier (Department of Physiotherapy)

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.

2017 recipients:
- Dr Edith Machowski (DST/NRF Centre of Excellence for Biomedical TB Research)
- Dr Pradeep Kumar (Pharmacy and Pharmacology)

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 2016 and 2017.

2016
Dr Melissa Chengalroyen from the School of Pathology was awarded the Faculty Research Prize for 2016 for her research entitled; "Detection and Quantification of Differentially Culturable Tubercle Bacteria in Sputum from Patients with Tuberculosis" published in the American Journal of Respiratory and Critical Care Medicine.

Chengalroyen M.D, Beukes G.M, Gordhan B.G, Streicher E.M, Churchyard G, Hafner R, Warren R, Otwombe K, Martinson N, Kana B.D. Detection and Quantification of Differentially Culturable Tubercle Bacteria in Sputum from Patients with Tuberculosis. American Journal of Respiratory and Critical Care Medicine. 2016; 194(12): 1532-1540.

2017
Dr Chodziwadziwa Kabudula from the MRC/Wits Rural Public Health and Health Transitions Research Unit (Agincourt), School of Public Health was awarded the Faculty Research Prize for 2017 for his research entitled "Socioeconomic differences in mortality in the antiretroviral therapy era in Agincourt, rural South Africa, 2001-13: a population surveillance analysis" published in the Lancet Global Health.

Kabudula C.W, Houle B, Collinson M.A, Kahn K, Gomez-Olive F.X, Tollman S, Clark S.J. Socioeconomic differences in mortality in the antiretroviral therapy era in Agincourt, rural South Africa, 2001-13: A population surveillance analysis. Lancet Global Health. 2017; 5(9):e924-e935.

Most Prestigious Postgraduate Degree Awards
The Most 'Prestigious Postgraduate Degree Awards' were instituted by the Faculty in 2009 to recognize the efforts of outstanding emerging researchers. Any Faculty of Health Sciences postgraduate 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:
2016
Prestigious PhD Award: Dr Michelle Groome from the School of Public Health and Respiratory and Meningeal Pathogens Research Unit (supervised by Professor Shabir Madhi) for her research project entitled; "Rotavirus Vaccine and Diarrhoeal Morbidity in South Africa)".

Prestigious Masters by research (100% research) Award: Ms Ismael Tasneem Suleman from the School of Therapeutic Sciences (supervised by Professor Sandy van Vuuren) for her research project entitled; "The antimicrobial and chemical properties of South African propolis".

Prestigious MMed Award: Dr Mohamed Farzahna from the School of Clinical Medicine (supervised by Professor Pravin Manga) for his research project entitled; "A Retrospective Review of Hypertension Control at Helen Joseph Hospital over a 3 Year Period".

2017

Prestigious PhD Award: Dr. Pradeep Kumar from the School of Pathology (supervised by Professors Viness Pillay, Girish Modi, Yahya E Choonara and Dr. Dinesh Naidoo) for his research project entitled, "Design and Development of Bioactive-loaded Polymer Engineered Neural Device for Potential Application in Reducing Neurological Deficits after Spinal cord injuries and Neuro – Regeneration".

Prestigious Masters by research (100% research) Award: Ms Candice Martin from the School of Therapeutic Sciences (supervised by Associate Professor Benita Olivier and Mrs Natalie Benjamin) for her research entitled, "The functional Movement Screen and abdominal muscle activation in the prediction of injuries in high school cricket pace bowlers".

Prestigious Masters by research and course work (50% research): Ms Bianca Carzis from the School of Pathology (supervised by Ms Tasha Wainstein, Dr. Lawrence Gobetz and Professor Amanda Krause) for her research entitled, "An evaluation of preimplantation genetic diagnosis in Johannesburg, South Africa".

Prestigious MMed Award: Dr Lee-Anne Godinho from the School of Clinical Medicine (supervised by Professor Charles Feldman) for her research entitled, "Clostriduim difficile infection in Charlotte Maxeke Johannesburg Academic Hospital".

Nominated to receive the certificates of commendation for the outstanding quality of their PhD

Dr Abigail Hatcher from the School of Public Health (supervised by Nicola Christofides, Heidi Stockl and Janet Turan) for her research entitled, "Exploring the effects of intimate partner violence on prevention of mother-to-child transmission serve uptake: A nested cohort study".

Dr Thandiswa Ngcungcu from the School of Pathology (supervised by Professor Michele Ramsay) for her research entitled, "The identification and characterisation of the causative gene mutation for keratolytic winter arythema (KWE) in South African Families".

Nominated to receive the certificate of commendation for the outstanding quality of his Masters degree (MSc: Epidemiology and Biostatistics)

Dr Gbenga Olorunfemi from the School of Public Health (supervised by Mrs Ntombizodwa Ndlovu and Dr. Gwinyai Masukume) for his research entitled, "Trends and determinats of the incidence and mortality of cervical cancer in South Africa (1994-2012)".

Helen Laburn Research Prize

In 2015, the School of Physiology established a new prize, the Helen Laburn Research Prize to recognize 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.

2016

Awarded to **Professor Gavin Norton**, Co-Director of the Cardiovascular Pathophysiology and Genomics Research Unit his remarkable ongoing cardiovascular research

2017

Awarded to **Professors Andrea Fuller**, Director of the Brain Function Research Group and Angela Woodiwiss, Co-Director of the Cardiovascular Pathophysiology and Genomics Research Unit

Phillip V Tobias and Convocation Distinguished Teacher's Award
The Phillip V Tobias and Convocation Distinguished Teacher's Award for the Pre-Clinical Teaching Category in 2016 was presented to **Mrs Aleksandra Saša Jovanović.**

Phillip V Tobias Scholarships
The late Professor Emeritus Phillip V Tobias, a world-renowned scientist and teacher of great repute, bequeathed his estate to a trust entitled the "Phillip V Tobias Education Trust". The purpose to the trust is to provide bursaries and scholarships to students in need. The trust bursaries are available to students in all fields of study. One of the first Phillip V Tobias Scholarships was awarded to Ms Anja Meyer from the School of Anatomical Sciences in 2016.

NATIONAL AND INTERNATIONAL ACHIEVEMENTS

National Achievements
2016
Professor Frederick Raal (Director of the Carbohydrate and Lipid Metabolism Research Unit) who received an award for the **most cited researcher over two years in the Faculty of Health Sciences**, at the Research celebration hosted by the University in April 2016. Professor Raal is a co-author of the article entitled "Efficacy and safety of alirocumab in reducing lipids and cardiovascular events" which was published in the New England Journal of Medicine. The citation count for the article was 119.

Professor Helen Rees, Director of the Wits Reproductive Health and HIV Institute (WRHI) who was awarded the **Order of the Baobab in Silver** by the President of South Africa, the Honourable Jacob Zuma. The Order of the Baobab recognises South African citizens who have contributed to community service, business and economy, science, medicine and technological innovation. Professor Rees is internationally recognized for her expertise in the field of sexual and reproductive health, HIV/AIDS and vaccines.

Professor Gavin Norton honoured with the **2016 Gold Scientific Achievement Award** by the South African Medical Research Council.

Professor Viness Pillay honoured with the **2016 Gold Scientific Achievement Award** by the South African Medical Research Council.

Professor Frederick Raal honoured with the **2016 Gold Scientific Achievement Award** by the South African Medical Research Council.

Associate Professor Cheryl Cohen was awarded the **MRC Silver Medal 2016.**

Professor Sithembiso Velaphi was awarded the **MRC Silver Medal 2016**.

Professor Bavesh Kana was awarded a **First-time Inventor's Award** by Wits Enterprise for developing globally marketable diagnostic reagents for tuberculosis. In addition, Professor Kana was awarded the First-time Innovator's Award for licensing his products to a Wits spinoff company, SmartSpot Quality Check.

Professor Caroline Tiemessen received an award for **Excellence in Postgraduate Supervision** at the recent Research celebration hosted by the University. Professor Tiemessen is Head of Cell Biology

at the National Institute for Communicable Diseases, and holds the DST/NRF Chair of HIV Vaccine Translational Research in the University.

Emeritus Professor Saraladevi Naicker from the School of Clinical Medicine was named as one of the four **Best Postgraduate Supervisors** in 2016 at a special Wits awards ceremony held in 2017.

Dr Alisha Wade (Senior Researcher in the MRC/Wits Rural Public Health and Health Transitions Research Unit) and **Professor Linda Richter** (Director of the DST/NRF Centre of Excellence in Child Development) were the award recipients for research in their respective fields at a special Wits awards ceremony held in 2017.

Professor Maureen Coetzee, Co-Director of the Wits Research Institute for Malaria was one of the **finalists for the Top Woman in Science Award**.
Adjunct Professor Pat de Witt (Occupational Therapy) received the South African Medical Association Gauteng Branch Award. It is awarded to an allied health professional who has made an exceptional contribution to the profession or society in general.

Dr Estelle Watson (Centre for Exercise Science and Sports Medicine) received the **Biokinetics Association of South Africa (BASA) Research Excellence Award**. It is the premium award for outstanding researchers in the field of Biokinetics.

Dr Robyn Hetem received the NRF Research Career Award Fellowship in 2016.

2017
Shakira Choonara a PhD Fellow in the School of Public Health was announced the 2017 **Woman of the Year in Healthcare**. She also received the National Research Foundation (NRF) Special Recognition Award. Dr. Shakira Choonara was also listed as the **most powerful woman** under the age of 40 in South Africa by Destiny Magazine.

Dr Michelle Groome from the Respiratory and Meningeal Pathogens Research Unit was honoured for her contribution to health sciences in South Africa at the South African Medical Research Council's Scientific Merit Awards Evening where she received a **silver medal**, awarded to up-and-coming scientists for important scientific contributions made within 10 years of receiving a PhD.

Professor Amadi O. Ihunwo, from the School of Anatomical Sciences, was conferred with an **award of Excellence**. He received the "Distinguished Alumnus" award from the University of Port Harcourt, Nigeria, during the Chancellor's Dinner/Award Night.

Dr Nadine Gravett was named as one of the most influential 200 young South Africans on the Mail and Guardian list.

Ms Natalia Neophytou from the Centre for Exercise Science and Sports Medicine was named as one of the top **200 young South Africans** on the Mail and Guardian list for her work in "Autism Spectrum Disorders".

Letitia Rambally-Greener, Senior Researcher at the Maternal, Adolescent and Child Health Research Unit (MRU) was listed as one of Mail & Guardian's **200 Young South Africans** in 2017, under the Health category for her research undertaken on sex-work, gender-based violence and the impact of HIV within MRU.

Ms Paula Barnard from e-Fundanathi in the School of Therapeutic Sciences was named as one of **35**

South Africans on the Microsoft list of "Microsoft Innovative Educator Experts".

Dr Carren Ginsburg's SAMRC Career Development Award was renewed for a further 2 years 2017-2018 for her work titled: "The dynamics of migration, urbanisation and health transition in South Africa: New evidence using data from health and socio-demographic longitudinal research systems".

Dr Michelle Groome from the Respiratory and Meningeal Pathogens Research Unit is one of the researchers selected to receive an inaugural award made through **Fogarty's Emerging Global Leader Award.**

Professor Pinhas Sareli from the Cardiovascular Pathophysiology and Genomics Research Unit received the **Christian Barnard Award** from SA Heart.

Professor Bavesh Kana received an award from the Dean of the Faculty of Health Sciences for Excellence in Academic Service. In addition, Professor Bavesh Kana received Faculty Honours for notable contribution to Research.

Miss Poppy Mashilo from the DST/NRF Centre of Excellence for Biomedical TB Research was awarded merit award by the University of the Witwatersrand.

Ms Thulile Khanyile, lecturer and PhD Candidate in the Wits HIV Pathogenesis Research Unit, was named as **second runner up in the category of academic excellence** at the South African Youth Awards.

Mr. Moagi Shaku from the DST/NRF Centre of Excellence for Biomedical TB Research was appointed as a TB blogger for the online journal, *Nature Microbiology Community.*

International Achievements
2016
Professor Lynn Morris (Head of the HIV Virology laboratories at the National Institute for Communicable Diseases and Research Professor in the Faculty of Health Sciences) and **Professor Chris Mathew** (Wits Distinguished Scholar) were named as **2016 Thomson Reuters Highly Cited Researchers.**

Professor Mary Gulumian from the Department of Molecular Medicine and Haematology was awarded a **Lifetime Achievement Award** for outstanding contributions to the field of particle toxicology.

Professor Maureen Coetzee, Director of the Wits Research Institute for Malaria WAS presented with a **Certificate of Distinction for Outstanding Achievements** at the XXV International Congress of Entomology in September 2016.

Professor Shabir Madhi was awarded the **Scientific Leadership Award 2016** by the European and Developing Countries Clinical Trial Partnership (EDCTP).

Professor Frederick Raal received an **award** from the American College of Cardiology **for the highest-ranking abstract** submitted from South Africa at the ACC Annual Scientific Sessions held in Chicago, Illinois in April 2016.

2017
Professor Glenda Gray was named as one of **TIME Magazine's Top 100 most influential people in 2017.**

Professor Lynn Morris, joint Research Professor in the Wits Faculty of Health Sciences and Honorary Senior Scientist (Humoral Immunity) at the Centre for the Aids Programme of Research in South Africa (CAPRISA), was awarded the **Harry Oppenheimer Fellowship Award** for her research in the field of HIV vaccinology. She was also named a **2017 Thomson Reuters Highly Cited Researcher.**

Professor Lenore Manderson was awarded the **Career Achievement Award of the Society of Medical Anthropology**, American Anthropological Association. The award honours an individual who has advanced in the field of Medical Anthropology through career-long contributions to theory or method, and who has been successful in communicating the relevance of the field to the broader public.

Dr Soter Ameh was selected as a **Lown Scholar** with the Bernard Lown Scholars Programme in Cardiovascular Health at the Harvard T. H. Chan School of Public Health, Boston.

Candice Fick from Wits RHI was awarded the **Emerging Public Health Practitioner's Award** by the Health Systems Trust.

Nomathemba Chandiwana from Wits RHI was awarded the **7th Interacademy Partnership for Health Young Physician Leaders Programme,** Berlin.

Nonthuthuko Mvundla from Wits RHI was awarded the **7th Interacademy Partnership for Health Young Physician Leaders Programme**, Berlin.

SUBSTANTIAL GRANTS

2016

Professors Kathleen Kahn and Audrey Pettifor were awarded **USD 3,435,707** for the period 2016-2021 to support work on "Multilevel mechanisms of HIV acquisition in young South African women". This grant from the National Institute of Child Health and Human Development, NIH, USA will fund a study, which seeks to elucidate causes of HIV risk and protection for young women as they transition from adolescence into adulthood as well as to identity optimal combinations of interventions to reduce new HIV infections among young women in sub-Saharan Africa.

Professor Viness Pillay was awarded an **NRF Research Equipment Grant** under the "National Equipment Programme", for an ElastoSens System for **R 1,873,060**. He was also awarded the Technology Innovation Agency (TIA) of South Africa Seed Funding Grant for the "Commercialization of a Wound Healing Device of the WADDP" for R 499,757.

Professor Karen Hofman, Director of Priority Cost Effective Lessons for System Strengthening **(PRICELESS SA)** based at the School of Public Health was awarded **US$12.8 million by the Bill & Melinda** Gates Foundation in January 2016 as part of an international collaborative project. The project, which is called the International Decision Support Initiative (iDSI) is made up of PRICELESS SA, NICE International based in the UK, Health Interventions and Technology Assessment Programme based in Thailand and Center for Global Development based in the USA.

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. **Dr. Latifat Ibisomi and Professor Laetitia Rispel lead the grant.**

Professor Chris Mathew was awarded two large Newton grants on African Cancer Research as co-PI (Bradshaw et al., SA-MRC – R15M; Parker et al., UCT – R9M).

Professors Mark Collinson, Stephen Tollman and Kathleen Kahn succeeded in having the South African Population Research Infrastructure Network (SAPRIN) designated as a 'National Research Infrastructure' by the Department of Science and Technology (DST). This is a multi-site national initiative to link the three existing health and socio-demographic surveillance platforms in South Africa, and to extend these by another 4, including 3 urban sites. Funded by DST through the SAMRC, this is a multi-year award. Funding for the first 3 years is **R99 million**, of which R27 million comes to the MRC/Wits-Agincourt Node. Professor Mark Collinson has been appointed first director of SAPRIN.

The South African Medical Research Council announced the **Perinatal HIV Research Unit** (PHRU) as one of the successful applicants for new funding grants that will focus on **TB research**. Together with its UK counterpart (UK Medical Research Council), the **R70 million funding** provided by the Newton Fund, to support TB control implementation science over three years. PHRU will be conducting a research project entitled "A household cluster randomised trial of active case finding for HIV and TB, preventive treatment against TB, and ART initiation to prevent TB disease and transmission (The HomeACF Study)". **Dr Neil Martinson**, the study **Principal Investigator**, and his team will assess whether an intensified household intervention for contacts of adults and children with TB prevents TB infection and disease.

Researchers from t**he Maternal, Adolescent and Child Health Research Unit, Professor Jennifer Smit, Dr Mags Beksinska, Ms Zonke Mabude and Ms Cecilia Milford** will conduct research on a new device that can be used to reduce the rate of preterm births and improve pregnancy outcomes. The study is being funded by the University of California- San Francisco (UCSF), through a **grant** from the **Bill and Melinda Gates Foundation.**

Professor Ian M Sanne, the Division Head of the Clinical HIV Research Unit, were awarded €1,9 million for the TB SEQUEL grant. This Project aims at developing research capacity in Africa through the establishment of a TB Sequel network of health excellence which includes institutions – in equal partnership - in the Gambia (MRC Unit in Banjul), Tanzania (NIMR-MMRC in Mbeya), Mozambique (INS in Maputo), and South Africa (Aurum Health Institute and CHRU (Wits) in Johannesburg).

Dr Mohammed Rassool, Deputy Division Head of the Clinical HIV Research Unit (Helen Joseph Hospital Site), and Dr. Nosipho Ngubane (from CHRU's King Dinuzulu site) was both awarded over $4 million each from TB Alliance to participate in the new TB Research Study: "STREAM: The evaluation of a standard treatment regimen of anti-tuberculosis drugs for patients with MDR-TB".

Professor Sharon Fonn, co-Director of the Consortium for Advanced Research Training in Africa (CARTA+) received a **£5.25 million grant** from the Wellcome Trust to consolidate and extend the achievements that have already been made in CARTA+. The Consortium for Advanced Research Training in Africa, which comprises of nine African universities, four African Research Centres and selected northern partners, enrolled its first cohort of PhD fellows in 2010 and to date has 140 PhD fellows, 24 of whom have graduated. Of these, graduates are either postdoctoral fellows or have received re-entry grants to allow them to do research when they return to their jobs at universities who are members of CARTA+ in Africa. The Wellcome Trust grant will allow the CARTA+ team to secure the

future for their PhD graduates through re-entry grants, postdoctoral awards and professional writing retreats to support fellows to write competitive grants.

Professor Jaya George from the Department of Chemical Pathology together with **Tracy Snyman, Nigel Crowther, Stephen Tollman, Michele Ramsay, Shane Norris, John Pettifor, Penny Moore, Gayle Sherman, and Melinda Suchard** who acquired a **grant for new equipment**. The key goal of the Department of Chemical Pathology is to set up a core mass spectrometry (MS) laboratory which will provide a research platform and necessary training for scientist based at the University of the Witwatersrand and other institutions. The equipment to be purchased is an ion trap-triple quadrupole hybrid mass spectrometer, the AB Sciex 5500QTRAP. The instrument will support the generation of biomarker data from several existing longitudinal cohorts from which blood and urine samples have already been collected. Plans to collect further samples, both in South Africa and across the continent are in place.

Professor Jennifer Smit and Dr Mags Beksinska from the **Maternal, Adolescent and Child Health (MatCH) Research Unit** were awarded the **DREAMS Innovation Challenge Award** by the United States Agency for International Development/Gates Foundation.

Professor Mark Collinson and the **MRC/Wits Rural Public Health and Health Transitions Research Unit** (Agincourt) team, in the School of Public Health, were awarded an **R01 research grant** from the National Institutes of Health, USA, to fund a five-year study on migration, urbanisation and health in South Africa. The project is in collaboration with the Population Studies and Training Center of Brown University, under the leadership of Honorary Professor Michael White. This project builds on long-standing relationships and successful research endeavours between scientific personnel at the two institutions.

Professor Stephen Tollman received a Foundation Award from the **UK MRC Global Challenges Research Fund** for a project entitled "Understanding non-communicable diseases and the role of infection in Africa: building a partnership to generate big data". This project involves collaboration with research centres across sub-Saharan Africa to produce multi-site and site-specific analyses on risk factors and mortality related to cardio-metabolic diseases and HIV-related cancers.

Associate Professor Lois Harden, Dr. Christoph Rummel and Professor Joachim Roth received funding for a Research Group Linkage Programme from the Alexander von Humboldt Foundation (€21900).

Professor Duncan Mitchell received NRF South Africa-Namibia International Science and Technology Agreement funding in 2016.

Professors Andrea Fuller and Duncan Mitchell received NRF Competitive Support for Rated Researchers in 2016.

Associate Professor Lois Harden and Dr Robyn Hetem received NRF Thuthuka: Post PhD track for 2016.

2017

Professor Karen Hofman from PRICELESS received the following grants: NIHR (GBP 300k over three years), BMGF (USD 200K over two years), IDRC (ZAR10.75m over 3 years), Wellcome Trust (R9.1 million over 3 years), University of North Carolina (USD 121,000 for 1 year), NIHR/ University of York (GPB 294,000 over 3 years), Johns Hopkins University/BMGF (**USD 200,000** over 2 Years), WHO (ZAR 323, 000 over 1 year).

Associate Professor Gill Nelson from the School of Public Health received a Virtual Consortium for Translational/Transdisciplinary Environmental Research [VICTER] grant for a Supplement for SMELT-ER study to develop biomarkers of environmental manganese exposure and health outcomes, using a discovery process derived from in vitro and in vivo model systems of environmental Mn exposure (awarded May 2017; **$1 139 958** for entire project although no money is allocated to SA as all is for analysis of saliva).

Professors Helen Rees and Ian Sanne were awarded a **$1,084,670** grant by the National Institute of Allergy and Infectious Diseases (NIAID) Clinical Trials Units. The major goals of the project is that the HIV/AIDS Clinical Trials Networks and their CTU/CRS will pursue clinical trials to address the highest priorities in HIV/AIDS research, including: 1) Adult HIV therapeutic strategies, including HIV cure, non-infectious comorbidities, and the infectious comorbidities of hepatitis and tuberculosis; 2) strategies to address HIV and HIV-associated infections in paediatric and maternal populations; 3) integrated HIV prevention strategies; 4) microbicide strategies to prevent HIV infections; 5) vaccines to prevent HIV infections; and 6) strategies to address antibacterial resistance.

Dr Desire Brits from the School of Anatomical Sciences received a **$19,970.60** (~R232258.00) from the American Academy of Forensic Sciences Humanitarian and Human Rights Resource Center (AAFS HHRRC).

A research team from the **Division of Human Genetics**, School of Pathology has been awarded a research grant from the National Institutes of Health (NIH) Human Health and Heredity in Africa (H3Africa) Programme to launch the Deciphering Developmental Disorders in Africa (DDD-Africa) study. This multi-faceted research project will bring clinicians, genetic counsellors and scientists from Wits, University of Kinshasa (DRC) and the Wellcome Trust Sanger Institute (UK) together to evaluate clinical exome sequencing as a diagnostic tool for developmental disorders (DD) in an African setting. DD are serious disabilities that inflict life-long suffering for affected children and their families and are a major healthcare and economic burden especially in low-income countries. The study, headed up by **Dr Zané Lombard**, along with co-investigators, **Professor Amanda Krause and Dr Nadia Carstens**, builds on the successful DDD-UK study, which resulted in a number of breakthrough papers that improved our understanding of the genetics of DD. The genetic contribution to DD in Africa is poorly understood and DDD-Africa therefore aims to address this through the creation of a framework for research and evidence-based healthcare reform. The ultimate goal for DDD-Africa is to develop a pragmatic and effective approach for the sustainable integration of whole-exome sequencing into DD diagnostics in a way that will enable a precision public health approach for Africa. The value of the grant is **$1,250,000.**

Ms Rhian Twine was part of a team which was awarded a grant of **GBP 705,467** by the UKMRC, Economic and Social Research Council, Wellcome Trust, Department of International Development for a study entitled "Verbal Autopsy with Participatory Action Research (VAPAR): expanding the knowledge base through partnerships for action on health equity.

Professor Scott Hazelhurst, PI of the NIH funded H3ABioNet Wits node and SBIMB Bioinformatics lead scientist was awarded a grant from GSK, to the value of **GBP 250 000.00** under the H3Africa Consortium banner to study pharmacogenomic variants in African populations. His H3ABioNet grant was renewed for five years (2017 to 2022) (USD 488 400.00 over 5 years).

Dr Latifat Ibisomi and Professor Jonathan Levin are co-investigators of the SRHR-HIV Knows No Borders Consortium, led by International Organisation for Migration (IOM). The consortium was awarded a substantial grant of **EUR 11.1 million** by the Royal Dutch Embassy for a four-year project dealing with sexual and reproductive health in migration-affected areas of southern Africa.

Professor Lynn Morris was awarded a 5-year NIH H3Africa U01 Grant **($1 239 302)** entitled: "Immunoglobulin gene diversity in an African population and impact on antibody function in HIV infection", which aims to examine antibody gene diversity and its impact on neutralizing and non-neutralizing functions.

Associate Professor Tobias Chirwa was awarded funding from GlaxoSmithKline (GSK), UK to train postgraduate biostatisticians (10 MSc and six PhDs) through Wits and partner institutions in the Wellcome Trust funded DELTAS Africa Sub-Saharan Africa Consortium for Advanced Biostatistics training (SSACAB). This will train a maximum of six PhD students at £37,260 per student and 10 MSc students at £7,753 per student.

Associate Professor Tobias Chirwa and Dr Jabulani Ncayiyana were awarded NIH D43 Fogarty grant in collaboration with the University of North Carolina at Chapel Hill (UNC), the University of Zambia (UNZA), and the University of the Witwatersrand (Wits). The aim of the grant is to develop a cadre of UNZA faculty researchers to conduct collaborative, multidisciplinary research in HIV and women's reproductive health (WRH) through doctoral and postdoctoral level training at Wits. The award is $301,854 each year for five years starting 2017.

The Respiratory and Meningeal Pathogens Research Unit was awarded **$ 299 116, 00** by the Bill & Melinda Gates Foundation. The grant period is from 25 May 2017-31 May 2018.

Professor Michele Ramsay received a five-year NIH grant renewal (2017 to 2022) for the AWI-Gen study under the H3Africa initiative **(~USD5.24M over 5 years)**.

The **Centre for Health Policy** was awarded **€ 63 630** by the ESRC UK in 2017 for two years for a project entitled "Determinants of antibiotic prescribing in primary care in South Africa: studying patient-provider interactions in the private and public sectors."

Dr. Alisha Wade was awarded a Fogarty Emerging Global Leader Award (K-43) for work on "Endocrine and metabolic diseases in rural South Africa – establishing burden and improving detection". This 5-year grant provides research support and protected time to a research scientist from a low- or middle-income country (LMIC) with a junior faculty position at an LMIC academic or research institution. It is an intensive, mentored research career development experience, which supports progression to an independently funded research career. The K-award comes with a budget of **USD 581,000** that provides 80% salary support and an annual contribution of USD 30K to career development and research expenses. Alisha's mentors are Professor Stephen Tollman (Wits University) and Professor Anne Cappola, Division of Endocrinology, Diabetes and Metabolism, University of Pennsylvania, USA. Dr Francois Venter from Wits RHI was awarded R58 743 746 by UNITAID for a study entitled "Integrating HIVST into national HIV policies; scaling up HIVST models."

Professors Thesla Palanee-Phillips and Helen Rees from Wits RHI were awarded **R20 387 000.00** by the WHO, for a study entitled "A Multi Center, Open-Label, Randomised Clinical Trial Comparing HIV Incidence and Contraceptive Benefits In Women using Depot Medroxyprogesterone Acetate (DMPA), Levonorgestrel (LNG) Implant, and Copper IUD".

Mandisa Nyathi from the Perinatal HIV Research Unit was awarded **R17 530 290,00** by PROMOTE PEPFAR

The **Maternal, Adolescent and Child Health Research Unit** was awarded **R 13 429 088** for a Multi-Centre, Randomised, Double-Blind, Placebo-Controlled Safety and Efficacy Trial of Dapivirine Vaginal Matrix Ring in Healthy HIV-Negative Women (IPM 027) study and **R 12 955 713** for the Project

Vogue – The effect of V Branding on uptake and adherence to PrEP products.

Dr Lee Fairlie from Wits RHI was awarded **R12 969 194.00** by Novovax via Triclinium for study entitled "A Phase 3, Randomized, Observer-Blind, Placebo-Controlled, Group-Sequential Study to Determine the Immunogenicity and Safety of a Respiratory Syncytial Virus (RSV) F Nanoparticle Vaccine with Aluminum in Healthy Third-trimester Pregnant Women; and Safety."

Lerato Mohapi from the Perinatal HIV Research Unit was awarded **R 8 637 987.80** by the AIDS Clinical Trials Group (ACTG) Network.

Dr Lee Fairlie from Wits RHI was awarded **R7 518 689.00** by the Wellcome Trust/MRCUK/SA MRC for a study entitled "a phase III cluster -randomised placebo-controlled trial to assess the efficacy of preventative therapy in child contacts of multi drug resistant tuberculosis (MDR-TB)."

Dr Tintswalo Hlungwani, Dr. Daphney Conco, Associate Professor Eustasius Musenge and Dr Sumaya Mall were awarded a grant of **R6 million** over three years for a study commissioned by the South African Responsible Gambling Foundation (SARGF) entitled "The Prevalence of Gambling Disorder in three Provinces (Limpopo, Free State and Northern Cape)".

Avy Violari from the Perinatal HIV Research Unit was awarded **R 5 434 000, 00** by the NICHD International and Domestic Pediatric and Maternal HIV Studies Coordinating Center.

Professor Ian Sanne was awarded **R 4, 000,000** by the RTC/USAID (AID-674-A-12-00020). The Sub-Award aims to provide technical assistance to the South African Department of Health through targeted expert support to: Ensue support of the UNAID'S 90/90/90 strategy to end the AID'S epidemic. By 2020, 90% of all people living with HIV will know their HIV status. By 2020, 90% of all people with diagnosed HIV infection will receive sustained antiretroviral therapy. By 2020, 90% of all people receiving antiretroviral therapy will have viral suppression.

Associate Professor Gill Nelson was awarded an NIH grant of **R3 000 000** to continue a study on the neuropathological effects of manganese over a 5-year period (2017 – 2021).

Professor Paul Manger from the School of Anatomical Sciences received a R300 000.00 Leakey Foundation Grant.

Dr. Julitha Molepo from the Department of Oral Biological Sciences, School of Oral Health Sciences was awarded **R199 586** MRC SIR Grant.

Professor M Patel from the Department of Oral Biological Sciences, School of Oral Health Sciences was awarded R141 000 MRC SIR Grant.

Associate Professor Tobias Chirwa was awarded an NIH Grant, with colleagues at Stellenbosch, to develop an Africa Center for Biostatistical Excellence (ACBE) under the title Building Biostatistics Capacity for HIV/AIDS Research. This was part of DELTAS Africa Sub-Saharan Africa Consortium for Advanced Biostatistics training (SSACAB) objective to build capacity at Stellenbosch. Tobias Chirwa is a co-investigator and will facilitate collaboration with the DELTAS initiative and be involved with the establishment of the ACBE.

Centre for Health Policy (CHP) was awarded a grant extension by DFID to continue its 3-year RESYST work to support the Sedibeng District Management with Organizational Development activities designed to strengthen leadership capacity to improve staff engagement and team effectiveness. The

extension grant has enabled the team (Professor Jane Goudge and Dr. Nonhlanhla Nxumalo) to work with facility managers at the sub-district level in order to equip them with the tools to manage everyday challenges experienced at their facilities. The aim of the project is to contribute to the resilience of the health system.

Professors Andrea Fuller, Peter Kamerman and Duncan Mitchell received NRF Incentive Funding in 2017.

Professor Andrea Fuller received NRF Competitive Support for Rated Researchers in 2017.

Dr Karine Scheuermaier received an MRC individual grant and Dr Antonia Wadley was an MRC SIR Grant co-recipient in 2017.

Dr Oladiran Olateju from the School of Anatomical Sciences received an International Brain Research Organization (IBRO) travel grant.

Dr Robert Ndou from the School of Anatomical Sciences obtained a Medical Research: Self-Initiated Research Grant.

Ms Anja Meyer from the School of Anatomical Sciences obtained the Philip V Tobias Scholarship (2016/2017); R100 000.

Dr Tanya Augustine, Dr. Robert Ndou and Mr Brendon Billings from the School of Anatomical Sciences received Thuthuka Grants in 2017.

Dr Nanette Briers from the School of Anatomical Sciences received R351 995 from the NRF for unrated researchers.

Mrs Thandi Fasemore, (PhD student at the School of Anatomical Sciences, supervised by Professor Mbajiorgu) obtained a Thuthuka grant in 2017.

Dr Ann George (from the Centre for Health Science Education), **Dr Tanya Augustine and Dr Nanette Briers** (from the School of Anatomical Sciences) were awarded the National Research Foundation (NRF) Thuthuka Post-PhD Track funding for 2017.

Ms Abigail Dreyer (from the Department of Family Medicine), **Ms Thulile Khanyile** (from the HIV Pathogenesis Research Unit) and **Dr Reubina Wadee** (from the Department of Anatomical Pathology) received the **NRF Thuthuka PhD Track** for 2017.

APPOINTMENTS AND FELLOWSHIPS

2016

Professors Peter Cooper and Pravin Manga was honoured with the **status of Emeritus Professor** for their outstanding contribution to the University

Professor Sandy van Vuuren was promoted to **Personal Professor.**

Associate Professor Karen Hofman was promoted to **Research Professor,** effective 1 September 2016.

Professor Ngianga-Bakwin Kandala was appointed as a **Professor** as part of the Vice-Chancellor's Distinguished Scholar's Initiative in June 2016.

Dr Nicola Christofides was promoted to Associate Professor, effective 1 April 2016.

Benita Olivier was promoted to **Associate Professor.**

Lisa du Toit was promoted to **Associate Professor.**

Professor Bavesh Kana was appointed as a **Research Associate** at the Centre for AIDS Prevention Research in South Africa (CAPRISA).

Professor Lenore Manderson was elected as a new member of the **Academy of Science of South Africa (ASSAf).**

Professor Penny Moore was elected a Member of the **Academy of Science of South Africa (ASSAf)** as well as a Member of the Steering Committee of the CAPRISA Centre for Excellence in HIV Prevention

Professor Himla Soodyall was reappointed to the Council of the **Academy of Science of South Africa (ASSAf)** for 2016-2020.

Professor Himla Soodyall was reappointed as General Secretary of the **Academy of Science of South Africa (ASSAf)** for 2016-2020.

Professor Wendy Stevens, Head of the Department of Molecular Medicine and Haematology was designated as the **co-Chair of the African Society for Laboratory Medicine** (ASLM) 2016.

Professor Angela Woodiwiss was appointed as **President of the Southern African Hypertension Society.**

Associate Professor Bernard Janse van Rensburg was appointed as **President of the South African Society of Psychiatrists** (SASOP) 2016-2018

Sizakele Ngwenya from the Department of Oral Pathology, School of Oral Health Sciences was elected **President of the (International association of dental research) IADR South African Division** September 2016 – 2018

Associate Professor Witness Mudzi from the Department of Physiotherapy was elected as the **Deputy President of the South African Society of Physiotherapy** (SASP) and will be taking over as the President of the SASP in September 2017 for a period of two years.

Professor Laetitia Rispel, Head of School of Public Health was elected as the **Vice President/President-Elect of the World Federation of Public Health Associations** (WFPHA). Professor Rispel will serve as the Federation's President for a two-year term from May 2018 to May 2020.

Professor Stephen Tollman was appointed **Chair of Scientific Panel** for joint call named **SAMRC Newton Fund RFA: Non-communicable diseases**

Professor Bavesh Kana was appointed to **Board of Reviewing Editors of *eLife*** – an open access journal established at the end of 2012 by the Howard Hughes Medical Institute, Max Planck Society, and Wellcome Trust.

Professor Stephen Tollman was appointed to the **Editorial Board, Global Health Epidemiology and Genomics (GHEG).**

Professor Stephen Tollman was appointed to the **Editorial Board, Social Science and Medicine (Population Health).**

Professor Maryna Steyn was appointed to the **Advisory board of FASE (Forensic Anthropology Society of Europe).**

Dr Desire Brits was appointed as **Honorary Editor of Proceedings - ASSA** (Anatomical Society of Southern Africa) Newsletter.

The *South African Journal of Science* appointed **Professor Maryna Steyn** as a **new associate editor in the field of Archaeology, Anthropology and Palaeontology**

Professor Charles Feldman was appointed one of the **Deputy Editors of the Journal, *Pneumonia,*** representing the Africa region.

Professor Basil Brooke was selected as **WHO representative** for the UNEP DDT Expert Group 2016-2019

Professor Maureen Coetzee, Co-Director of the Wits Research Institute for Malaria, was elected as a new **member of the World Health Organization (WHO) Malaria Policy Advisory Committee** (MPAC).

Professor Charles Feldman, Professor Lenore Manderson and **Professor Shane Norris** were acknowledged as new **members of the Academy of Science of South Africa in 2016**

Professor Shabir Madhi was elected as the new **Fellow of the Royal Society of South Africa**

Professor Viness Pillay was awarded the **Fellowship to the Academy of Translational Medicine Professionals.**

Professor Charles Feldman was appointed on to the **Planning Committee of the MTPI Assembly of the American Thoracic Society.**

Professor Michele Ramsay was appointment to the **Biobank Subcommittee of the SA Medical Research Council Ethics Committee** (2016-2019).

Professor Maureen Coetzee was elected as a **Member of the Steering Committee of the WHO Global Vector Control Response working group 2016.**

Professor Basil Brooke was elected as **Member of the WHO steering committee** to revise the insecticide susceptibility bioassay guidelines.

Professor Himla Soodyall was appointed to the sub-committee of the InterAcademy Partnership, "Harnessing Science, Engineering, and Health to address challenges in Africa" for 2016-2019.

Associate Professor Kennedy Erlwanger from the School of Physiology was elected as a council member (2016-2020) on the African Association of Physiological Sciences at the 7th International congress of the AAPS held in Lagos Nigeria in September 2016.

Professor Johnny Mahlangu was appointed to the South African Medical Research Council board for 2016 to 2019

Professor Johnny Mahlangu was appointed a member of the International Haemophilia Training Centre Committee of the World Federation of Haemophilia for 2016 to 2018

Professor Bavesh Kana was appointed to Board of Reviewing Editors of eLife - an open access journal established in 2012 by the Howard Hughes Medical Institute, Max Planck Society, and Wellcome Trust.

Dr Racheal Dangarembizi received the European Molecular Biology Organisation Short Term Fellowship (Euro 5637.85) to visit and carry out research at Justus Liebig University (26 June- 7 August 2016).

Professor Peter Kamerman was elected incoming chair of the Neuropathic Pain Special Interest Group (NeuPSIG) of the IASP (IASP's largest special interest group, with over 1000 members).

Professor Peter Kamerman chaired a combined working group of the International Association for the Study of Pain's (IASP) and the International Association of Hospice and Palliative Care (IAHPC) that submitted an application to the 21st meeting of the WHO Expert Committee on Selection and Use of Essential Medicines for the inclusion of gabapentin for the treatment of neuropathic pain on the WHO Model List of Essential Medicines.

Professor Peter Kamerman is the Chair of the Developing Countries Sub-committee of NeuPSIG and is a member of the following Scientific Programme Committees: the 16th World Congress of Pain, Yokohama, Japan, 2016, the 17th World Congress of Pain, Boston, USA, 2017, the 6th International Congress on Neuropathic Pain, Gothenburg, Sweden, 2017, the Annual Congress of PainSA, Cape Town, 2017.

Professor Peter Kamerman is the Editor of the Pain and Palliative Care section of the African Journal of Primary Health Care and Family Medicine and is a member of the Developing Countries Working Group of the IASP Development and curatorship of: NeuPSIG neuropathic pain screening tools database, (www.neupsig.org).

Professor Andrea Fuller is the **founding member of the South African Young Academy of Sciences** and was the Editor of the Faculty of Health Sciences Research Newsletter. **Professor Fuller** is also the Chair of the Section on Thermal Physiology, International Commission of Comparative Physiology, International Union of Physiological Sciences.

Professor Duncan Mitchell is an **Adjunct Professor** at the School of Anatomy, Physiology and Human Biology, University of Western Australia and is also a consultant to the University of the Free State's Prestige Scholar Programme. Professor Mitchell is a member of the selection panel for the University of Pretoria's Book Awards.

2017

Professors Peter Cooper (Department of Paediatrics and Child Health), **Pravin Manga** (Internal Medicine) and **Professor Alan Rothberg** were honoured with the status of **Emeritus Professor** for their outstanding contribution to the University.

Professor Feroza Motara from the School of Clinical Medicine was promoted to **Adjunct Professor.**

Professor Lizette Koekemoer from the School of Pathology was promoted to **Research Professor.**

Professor Robyn van Zyl from the Department of Pharmacy and Pharmacology was promoted to **Personal Professor.**

Professor Gayle Sherman from the School of Clinical Medicine was promoted to **Full Professor.**

Professor Neil Martinson from the Perinatal HIV Research Unit was promoted to a **Reader** in Department of Paediatrics.

Dr. Lisa Micklesfield from the School of Clinical Medicine was promoted to a **Reader.**

Professor Mark Collinson from the School of Public Health was promoted to a **Reader.**

Shelley Schmollgruber from the Department of Nursing Education was promoted to **Associate Professor.**

Veronica Ntsiea from the Department of Physiotherapy was promoted to **Associate Professor.**

Abdullah Ely from the Antiviral Gene Therapy Research Unit was promoted to **Associate Professor** in 2017.

Aletta Millen from the Cardiovascular Pathophysiology and Genomics Research Unit was promoted to **Associate Professor.**

Eustasius Musenge from the School of Public Health was promoted to **Associate Professor** effective 1 October 2017.

Dr Jeffrey Dorfman from the Respiratory and Meningeal Pathogens Research Unit was appointed as **Associate Professor** in the School of Pathology, University of the Witwatersrand.

Nelesh Govender from the School of Pathology was promoted to **Associate Professor.**

Olufemi Omole from the School of Therapeutic Sciences was promoted to **Associate Professor.**

Ahmed Adam from the School of Clinical Medicine was promoted to **Associate Professor.**

Kevin Behrens from the School of Clinical Medicine was promoted to **Associate Professor.**

Prudence Ive from the School of Clinical Medicine was promoted to **Associate Professor.**

Nasreen Mahomed from the School of Clinical Medicine was promoted to **Associate Professor.**

Dr Fiona Baker (Stanford Research Institute, Palo Alto, USA) was appointed as **Honorary Professorial Research Fellow in the School of Physiology in 2017.**

Professor Lenore Manderson from the School of Public Health was elected as a new **member of the Academy of Science of South Africa (ASSAf).**

Professor Karen Hofman from the School of Public Health was elected as a **member of the Academy of Science of South Africa (ASSAf).**

Professor Maryna Steyn from the School of Anatomical Sciences was re-elected as **President** of **Anatomical Society of Southern Africa** for another three-year term.

Dr R Dangarembizi from the Brain Function Research Group was appointed **President of the Advanced School in Neuroimmunology and Brain Infections** to represent 26 African countries.

Professor Amanda Krause from the Division of Human Genetics was re-elected as the **President of the College of Medical Genetics** for the 2018-2021 term.

Professor Angela Woodiwiss from the Cardiovascular Pathophysiology and Genomics Research Unit served as **President of the Southern African Hypertension Society.**

Professor Graham Paget from the renal division, Department of Internal Medicine was elected **President of the Renal Society of South Africa.**

Professor Johnny Mahlangu was elected the **President of the College of Pathologists** 2017-2020

Professor Glenda Gray was elected **chair to the board of the Global Alliance for Chronic Diseases** (GACD). GACD is a collection of the world's largest public health research funding agencies which fund joint programmes into lifestyle related or chronic diseases such as cardiovascular diseases, diabetes, certain cancers, lung diseases and mental disorders in low- and middle-income countries.

Wits RHI Executive Director, **Professor Helen Rees** has been appointed by Health Minister, Dr Aaron Motsoaledi to **chair the Board** of the newly established **South African Health Products Regulatory Authority** (SAHPRA).

Professor Johnny Mahlangu was appointed **co-Chair of the FVIII and FIX subcommittee** of the International Society of Thrombosis and Haemostasis

Dr Mercy Hlungwani was elected **Chairperson for the PHASA Mental Health Special Interest Group.**

Professor Himla Soodyall from the Division of Human Genetics was re-appointed for a second term as **Chairperson: Research Development Committee,** NHLS.

Dr Careni Spencer from the Division of Human Genetics was appointed as **Chairperson: Medical Genetics Group of South Africa** for the 2017-2019 term.

Professor Saraladevi Naicker from the renal division, Department of Internal Medicine was elected **Chairperson of Ministerial Advisory Committee for Transplantation** in 2017.

Mrs Natalie Benjamin from the Department of Physiotherapy was appointed as **Chairperson of the South African Society of Physiotherapy** (SASP) QIC.

Dr Mpho Molete from the Department of Community Dentistry, School of Oral Health Sciences is the current **Chair of the Dental Special Group of Public Health association** of South Africa (PHASA).

Professor Veerasamy Yengopal from the Department of Community Dentistry, School of Oral Health Sciences was appointed **Chair of the South African Association for Community Dentistry.**

Dr Matshediso Mothopi-Peri from the Department of Paediatric and Restorative Dentistry, School of Oral Health Sciences was appointed the **Chairperson of the Laboratory working committee** at the School of Oral Health Sciences/Wits Oral Health Centre.

Dr Matshediso Mothopi-Peri from the Department of Paediatric and Restorative Dentistry, School of Oral Health Sciences was appointed the **Chairperson of the PILIR committee at the Wits Oral Health Centre**/School of Oral Health Sciences.

Dr Candice Feben from the Division of Human Genetics was appointed as **Vice-Chairperson: Medical Genetics Group of South Africa** for the 2017-2019 term.

Dr Anneline Lochan from the Division of Human Genetics was elected **Senator of the College of Medical Genetics** for the 2018-2021 term.

Dr Mohamed Irhuma from the Department of Pharmacy and Pharmacology was appointed as an **Honorary Senate member on the American Board of Clinical Pharmacology** and as secretary of the SA College of Clinical Pharmacologists.

Associate Professor Eustasius Musenge from the School of Public Health was appointed **Programme co-Director for the Wellcome Trust/AESA** funded by DELTAS Africa Sub-Sahara Africa Consortium for Advanced Biostatistics training.

Professors Helen Rees (Director: Wits Reproductive Health and HIV Institute – WRHI) and **Ames Dhai** (Steve Biko Centre for Bioethics) was appointed to the South African Health Products Regulatory Authority Board. **Professor Rees** will **chair the board.**

Professor Saraladevi Naicker from the renal division, Department of Internal Medicine was appointed Associate editor of the *African Journal of Nephrology.*

Dr Stella Iacovides from the Brain Function Research Group was elected to the **Editorial Board** of SpringerPlus – Headache and Pain Collection.

Professor Andrea Fuller from the Brain Function Research Group was elected to the **Editorial board** of Koedoe; Temperature; and Conservation Physiology.

Professor Anna Kramvis was appointed on the editorial board of Hepatology and Virus Genes.

Professor Anna Kramvis is a Guest Editor, Special Issue: Hepatitis B Virus Infection: An Update on Epidemiology, Diagnosis, Treatment and Prevention for the journal Genes.

Adjunct Professor Shan Naidoo from the School of Public Health is a **board member** of trustees for Colleges of Medicine of South Africa (CMSA)

Professor Derk Brouwer from the School of Public Health was elected a member of the following: SABS ISO TC 146 SC2, OECD WPMN SG 8 (Exposure), Scientific Advisory Board EU project calibrate and of South African Institute for Occupational Hygiene (SAIOH).

Professor Penny Moore was elected a **Full Member of the American Society for Virology (ASV)** as well as a Member of the Steering Committee of the African AIDS Vaccine Virtual Network (AAVVi.net).

Professor Amadi Ihunwo from the School of Anatomical Sciences was elected as a member of the Governing Council (highest decision making body) of the International Brain Research Organization (IBRO).

Professor Amadi Ihunwo from the School of Anatomical Sciences appointed member of the Pro-

gramme Committee for the 2019 International Society for Neurochemistry (ISN)/American Society for Neurochemistry (ASN) Montreal, Canada Conference.

Emeritus Professor Beverley Kramer from the School of Anatomical Sciences and the President of the International Federation of Association of Anatomists was elected as a **Fellow of the American Association of Anatomists**

Professor Amadi O. Ihunwo, from the School of Anatomical Sciences, was unanimously elected to serve as the **Secretary-General/Chief Executive Officer of the Society of Neuroscientists of Africa** (SONA) for 4 years.

Professor Shabir Madhi was elected as the **Fellow of the Royal Society of South Africa**

Mr Chodziwadziwa Kabudula from the School of Public Health was awarded the **Jack Caldwell Visiting Fellowship** to visit the Australian National University (ANU). The fellowship aims to support important research by African scientists and to build collaborations with ANU demographers, population scientists and epidemiologists.

Dr Ryan Wagner from the School of Public Health was appointed a **member of the International League Against Epilepsy's Commission** on Epidemiology for the 2017-2021 term.

Dr Daphney Conco from the School of Public Health was elected as an Executive **member of the Public Health Association of South Africa** (PHASA), board member of the Rural Health Advocacy Project (RHAP), and board member of the Rural Health Advocacy Project (RHAP).

Associate Professor Gill Nelson was elected as a **member of the Mine Medical Practitioners Association** (MMPA), and a member of International Congress of Occupational Health (ICOH), and as Editor-in-Chief of Occupational Health Southern Africa.

Professor Patrick Arbuthnot from the Antiviral Gene Therapy Research Unit was appointed to the International Coalition for the Elimination of hepatitis B virus (ICE-HBV). This is an international group of experts in hte field of HBV who are coordinating efforts to develop a cure from infection with the virus.

Professor Patrick Arbuthnot Antiviral Gene Therapy Research Unit was appointed to the scientific advisory board of the European Union and Czech government-funded project 'FIT', which aims to build nanotechnology for healthcare in central Europe.

Professor Duncan Mitchell from the Brain Function Research Group was a member of editorial board of Progress in Neurobiology.

N Weyer from the Brain Function Research Group was appointed as **Scientific Officer** for the IPCC, Working Group 2 (focusing on Impacts, Adaptation and Vulnerability of Climate Change).

Dr Olukemi Babalola from the Centre for Health Policy was appointed as a **Researcher and Project manager** on the Batlhokomedi Community Health Workers Study.

Ling Ting from the Centre for Health Policy was appointed in 2017 as a Researcher.

Dr Nadia Carstens from the Division of Human Genetics was elected as a **member of the Southern African Society for Human Genetics (SASHG) executive committee** for the 2017-2019 term.

Ms Bianca Carzis from the Division of Human Genetics was elected as a **member of the Genetic Counsellors – South Africa (GC-SA) executive committee** for the 2017-2019 term.

Dr Zané Lombard from the Division of Human Genetics was elected as the **Treasurer of the Southern African Society for Human Genetics** (SASHG) executive committee for the 2017-2019 term.

Dr Careni Spencer from the Division of Human Genetics was elected to serve on the **executive committee of the Southern African Society for Human Genetics** for the 2017-2019 term.

Professor Angela Woodiwiss from the Cardiovascular Pathophysiology and Genomics Research Unit was elected as a Fellow of the Physiological Society of Southern Africa.

Professor Judith Bruce from the School of Therapeutic Sciences was inducted as a **member of the FUNDISA Nursing Hall of Fame** for Research Excellence.

Associate Professor Aletta Millen from the Cardiovascular Pathophysiology and Genomics Research Unit was re-elected as a member of the council of the Physiological Society of Southern Africa.

Professor Charles Feldman from the Pulmonary Infections Research Unit was appointed on to the Nominating Committee of the Microbiology, Tuberculosis and Pulmonary Infection Assembly of the American Thoracic Society in 2017 – 2018. This is recognised as a leadership position within the Assembly.

Professor Neil Martinson from the Perinatal HIV Research Unit was appointed to the Board of Setshaba Research Centre in Soshanguve.

Limakatso Lebina from the Perinatal HIV Research Unit was appointed to the Tuberculosis (TB) Think Tank for South Africa Executive Committee.

Professor Benita Olivier from the Department of Physiotherapy was elected as a member of the South African Young Academy of Science.

Dr Clare Cutland from the Respiratory and Meningeal Pathogens Research Unit was appointed in as a member of the Brighton Collaboration Science board, as Scientific Advisor- Clinical Assessment from November 2017 for 3-year term. Clare Cutland was also appointed as a member of the IMPRINT (Immunizing pregnant women and infants network) executive committee in January 2017.

Dr Marta Nunes from the Respiratory and Meningeal Pathogens Research Unit is a board member of ReSViNET (Respiratory Syncytial Virus Network).

Mrs Tshakane Ralephenya from the Department of Community Dentistry, School of Oral Health Sciences was appointed as a Committee member of the Oral Hygienists Association of South Africa (OHASA) – Gauteng Branch.

Professor Peter Owen from the Department of Oral Rehabilitation, School of Oral Health Sciences was appointed to the South African Dental Technician's Council.

Dr Rhoodie Garrana from the Department of Oral medicine and Periodontology, School of Oral Health Sciences was appointed as an International speaker by the International Team for Implantology (ITI).

Dr Robyn Hetem served as a panel member for South African Research Chairs Initiative Funding

Instrument (SARChI): Five Year Review 1st Round (2017) and acted as reviewer for the UKs Natural Environment Research Council (NERC) standard grants.

Professor Peter Kamerman is a member of the Scientific Programme Committee of the 7th International Congress on Neuropathic Pain, London, UK, 2019.

Professor Duncan Mitchell gave the prestigious Knut Schmidt-Nielsen Lecture at the 38th Congress of the International Union of Physiological Sciences, Rio de Janeiro, Brazil.

Dr Karine Scheuermaier is a member of the Research Committee of the Sleep Research Society and an academic research Chair of the South African Society of Sleep Medicine.

Ms Janine van der Linde from e-Fundanathi in the School of Therapeutic Sciences was awarded a sub-Saharan Africa FAIMER Regional Institute (SAFRI) fellowship.

Professor Anna Kramvis was re-elected as Virologist of the Hepatitis Transformative Science Group (ACTG: AIDS Clinical Trials Group) until 2019.

Professor Anna Kramvis was appointed to the governing body of the International Coalition to Eliminate Hepatitis B virus (ICE-HBV), representing Africa.

Other achievements in the Faculty
Following a generous donation to the value of R16million from Evan Stein, a Wits graduate, the Evan Stein Centre for Familial Hypercholesterolaemia (FH) was established and become fully operational in 2017. The Centre is led by Professor Frederick Raal. To date over 450 FH patients and their family members have been screened.

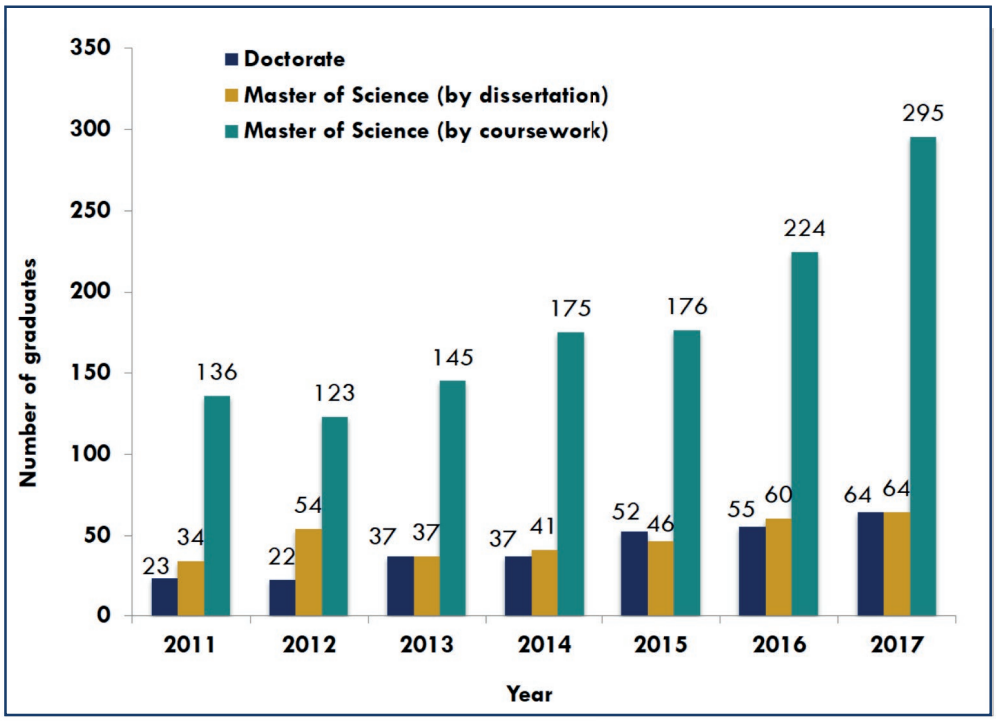
Renewed Ratings

Awarded in 2016	Awarded in 2017
Professor Charles Feldman (Clinical Medicine) - NRF A2 rating	**Professor Rachel Jewkes** (Public Health) - NRF A1 rating
Professor Frederick Raal (Clinical Medicine) - NRF B2 rating	**Professor Charles Feldman** (Clinical Medicine) - NRF A2 rating
Professor Angela Woodiwiss (Physiology) - NRF B2 rating	**Professor Ugo Ripamonti** (Physiology) - NRF B1 rating
Professor Andrea Fuller (Physiology) - NRF B3 rating	**Professor Patrick Dessein** (Clinical Medicine) - NRF B3 rating
Professor Bavesh Kana (Pathology) - NRF B3 rating	**Professor Deborah Glencross** (Pathology) - NRF B3 rating
Professor Saraladevi Naicker (Clinical Medicine) - NRF B3 rating	**Professor Lesley Scott** (Pathology) - NRF C1 rating
Professor Maria Papathanasopoulos (Pathology) - NRF C1 rating	**Dr Anthony Smith** (Pathology) - NRF C2 rating
Professor Daynia Ballot (Clinical Medicine) - NRF C2 rating	**Professor Nigel Crowther** (Pathology) - NRF C2 rating
Professor Elena Libhaber (Clinical Medicine) - NRF C2 rating	
Dr Lisa Micklesfield (Clinical Medicine) - NRF C2 rating	
Professor Joanne Potterton (Therapeutic Sciences) - NRF C2 rating	
Professor Kennedy Erlwanger (Physiology) - NRF C3 rating	

RESEARCH OUTPUTS AND FUNDING

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 2017.



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 confi rmed by the Department of Higher Education and Training (Do-HET) between 2011-2017.

RESEARCH EVENTS AND INITIATIVES

Biennial Research Day and Postgraduate Expo

Every second year, the Faculty hosts a Research Day and Postgraduate Expo. The 2016 biennial Faculty of Health Sciences Research Day and Postgraduate Expo took place in August at the Wits Medical School.

The Faculty Research Day and Postgraduate Expo 2016 took place over two days. On the 31 August 2016, Dr. Paul Harris, Director of Research Informatics at Vanderbilt University and inventor of the REDCap™ software presented a plenary lecture entitled "Advancing health informatics by enabling and nurturing local talent". His presentation was based on the technical and administrative aspects of the REDCap™ system.

On the morning of the 1st September 2016, Professor Keith Klugman, Director of Pneumonia at the Bill and Melinda Gates Foundation, delivered the second Phillip V Tobias Plenary Lecture entitled "Research to prevent pneumonia deaths in children".

The Research Day covered five thematic areas namely, Clinical Sciences and Therapeutics for Health; Diseases of Lifestyle; Education Policy and Systems; Infectious Diseases and Molecular and Comparative Biosciences.

Inside Wits Medical School rows of poster boards displayed the work of staff and students. In total, more than 250 researchers and postgraduate students presented their work at this year's Faculty Research Day and Postgraduate Expo. The event was well attended with 1000 attendees across the Faculty.

Roundtable discussions included topics such as: "targeting behaviour change in diseases of lifestyle"; "are we winning/losing the fight in managing mental health issues in the country"? and "conflict between research and health sciences education in 2016".

PATENTS

The WADDP was granted two patents by the US Patent & Trademark Office (USPTO)

The US Patent and Trademark Office (USPTO) has granted two patents to the University of the Witwatersrand (Wits) for pharmaceutical products and technologies developed by the Wits Advanced Drug Delivery Platform (WADDP) Research Unit pertaining to a rapidly dissolving pharmaceutical composition and a pharmaceutical composition for intraperitoneal delivery of an antineoplastic agent. Professor Viness Pillay and his research team, Mr Pradeep Kumar and Associate Professor Yahya Choonara are the co-inventors of the new pharmaceutical invention. The patent, entitled "Rapidly dissolving pharmaceutical composition", relates to a pharmaceutical dosage form, which comprises a novel biomaterial, carbamoyl glycinated chitosan, and particularly it relates to a pharmaceutical dosage form comprising of the novel polymer in a lyophilized polymeric wafer form, which shows rapid disintegration and dissolution characteristics in use. The dosage form dissolves rapidly in aqueous media, especially when it encounters the mucosal membranes of the mouth cavity. The rapid and ultrafast disintegration (≈0.5 seconds) involves the use of freely water-soluble polymeric/excipient blends. The innovative matrix archetype is easily dispersible in deionised water in lyophilized form and is capable of forming channels making the aqueous media intrude rapidly. The combination of compounds comprising the wafer dosage forms in accordance with the invention involved a considerable amount of research and development. The invention presents an innovative platform technology which can provide more effective 'on-the-spot' delivery of active pharmaceutical ingredient selected from the group including, but not limited to, smoking cessation drugs, narcotic analgesics, anaesthetics, antitussives, nornarcotic, erectile dysfunction drugs, female sexual dysfunction drugs, antihistamines, cold and allergy drugs, antiemetics, sleep aids, antagonists of CGRP receptors, drugs associated with migraine treatment, drugs that combat Alzheimer's disease, sitagliptin, caffeine and caffeine salt compounds.

In addition, Professor Viness Pillay, Dr Nthato Chirwa (postdoctoral fellow), Associate Professor Yahya Choonara, Mr Pradeep Kumar, and Associate Professor Lisa du Toit are the co-inventors of a new pharmaceutical invention, patented as "Pharmaceutical composition for intraperitoneal delivery of an anti-neoplastic agent". The invention relates to a pharmaceutical composition involving intraperitoneal delivery of an anti-neoplastic agent for treating cancers associated with aberrant mucin expression, preferably ovarian cancer and pancreatic, prostate, metastatic breast, bladder and lung cancers. The composition comprises of nanomicelles loaded with the anti-neoplastic agent, and antibodies such as anti-MUC16, anti-MUC1 or anti-MUC4 are conjugated to these nanomicelles. The antibody-bound nanomicelles are optionally embedded in a biodegradable pH- and Thermoresponsive hydrogel capable of sol-gel transition at body temperature. The pharmaceutical composition is implantable in the peritoneum, where it transforms into a semi-solid gel at the body's core temperature. In response to pH, the hydrogel swells and releases the antibody-bound nanomicelles. The nanomicelles specifically target mucin antigens on cancer cells. The anti-mucin antibodies can be internalized by the tumor cells, enabling the drug-loaded nanomicelles to gain entry and deliver the chemotherapeutic drugs inside the tumor cell. The team is currently exploring several opportunities for commercializing the invention through the Technology Transfer Office (TTO) of Wits University via Wits Enterprise (Pty) Ltd.

The following table shows the patents granted (and patents under prosecution) to researchers in the Faculty of Health Sciences in 2016-2017.

PATENT NUMBER	PATENT NAME
Awarded Patents (2016-2017)	
WO 2015/128846 Inventors: Schramm CA, Gorman J, Mascola J, Shapiro LS, Morris L, Doria-Rose NA, Moore PL, Kwong PD, Abdool Karim SS	Broadly neutralising monoclonal antibodies against HIV-1 V1V2 env region.
Patents under Prosecution	
Provisional Patent Application No. 2016/02181	By Professor Bavesh Kan

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
- Nomfundo Sibiya

Marketing and Communications

- Ferna Clarkson
- Sinethemba Msomi

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