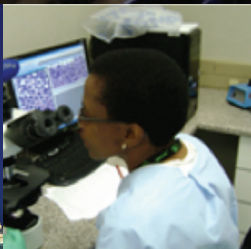


RESEARCH

in the Faculty of Health Sciences



UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Research in the Faculty of Health Sciences, University of Pretoria

Introduction

The University of Pretoria's Faculty of Health Sciences is committed to increasing its research contribution to society and build on its unique identity, which contributes to the university's vision of being:

a leading research-intensive university in Africa, recognised internationally for its quality, relevance and impact, and also for developing people, creating knowledge and making a difference locally and globally.

The Faculty of Health Sciences is the proud host of two South African Medical Research Council Units on Inflammation and Immunity and on Maternal and Infant Health Care Strategies; a MRC SA Flagship Programme as well as a SARCHI Research Chair on Sustainable Malaria Control and the Rand Water Chair in Public Health and Water.

The faculty is a partner in three university institutional research themes in food, nutrition and well-being; the management of animal and zoonotic diseases; and genomics. The faculty is also the host of the UP Institute for Cellular and Molecular Medicine; and the university research centres for Sustainable Malaria Control; Forensic Anthropology; Applied Morphology; and Comprehensive Physical Rehabilitation. There is also an established research unit working on Environmental Chemical Pollution and Health and an active Zoonoses research group as well as a Clinical Trials Unit.

Research in the faculty covers a range of focus areas that reflect a diversity of research that contributes to health knowledge and interventions in South Africa, Africa and globally.

Faculty researchers have received several awards, locally and internationally. These included a National Women in Science Award for research and a NSTF-BHP Billiton Award. Our research is supported by expert laboratories. We have 21 NRF-rated scientists, while the high number of scientific papers in ISI journals is proof of good-quality research. Our research retains its focus on health- and health-care challenges facing South Africa and Africa.

Reproductive, Maternal and Child Health

The **MRC Maternal and Infant Health Care Strategies Unit** develops health strategies at primary- and secondary-care levels to reduce mortality and morbidity rates in mothers and infants. Its systems cover over 350 hospitals and clinics throughout the country and its research focuses on the: integration of best practices into the district health system; and taking effective interventions to scale, such as kangaroo mother care. The unit investigates new and effective ways of scaling up emergency obstetric and neonatal care in all 52 health districts in South Africa.

Contact: Prof Bob Pattinson (robert.pattinson@up.ac.za)



The Department of **Andrology's** research focus is new and emerging origins of compromised male reproductive health, especially those that might link to environmental chemical exposures. During foetal development and puberty exposure to endocrine disrupting chemicals (EDCs) – man-made chemicals that interfere with normal hormone action – plays a role in the increased incidence of reproductive and other diseases in humans and wildlife. The team has extensive experience in studying humans living in EDC-exposed communities and in wildlife and laboratory animals.

Contact: Prof Riana Bornman (riana.bornman@up.ac.za)

In **Reproductive Biology**, semen decontamination for HIV-seropositive males has evolved over a 12-year period, from in vitro experimentation to assisted reproduction treatments. Semen is purified and validated for use in various procedure options, with the use of novel sperm-processing techniques and density gradient centrifugation. “Low-cost” accessible in vitro fertilisation (IVF) initiatives are actively investigated and applied at our unit, in collaboration with the Ziekenhuis Oost-Limburg (Genk, Belgium). Through the simplification of diagnostic techniques and processes, assisted reproduction will become more accessible and affordable for a much larger part of the South African population.

Contact: Prof Carin Huyser (carin.huyser@up.ac.za)



Paediatric respiratory diseases, including pneumonia and asthma, are major burdens of disease in Africa. We are exploring this field from pathophysiology through to treatment. It has been found that HIV-infected children with bronchiectasis behave very differently from those with other forms of bronchiectasis. The invading organisms are various and, possibly because of this, response to anti-inflammatory therapy is different.

Contact: Prof Robin Green (robin.green@up.ac.za)

In line with the Millennium Development Goals 3, 4, 5, and 6, the main research theme in **Nursing Sciences** is the improvement of women's and children's health. The sub-themes are HIV/AIDS and malnutrition; gender-based violence; reproductive health; and maternal and child health. The overall goal is to ensure practice improvement, through collaboration and learning between the University of Pretoria and the University of Limpopo (MEDUNSA) to improve health outcomes for women and children.

Contact: Prof Mavis Mulaudzi (mavis.mulaudzi@up.ac.za)

Immunity, Neurosciences and Mental Health

The **MRC Unit for Inflammation and Immunity** undertakes research with clear clinical objectives into acute and chronic inflammatory disorders of both infective (HIV/AIDS, tuberculosis, severe pneumococcal diseases) and non-infective (bronchial asthma, rheumatoid arthritis, toxicity of heavy metals in both the environmental and occupational settings) origin. Cigarette smoking is being researched as a major risk factor for respiratory infection and resistance to antibiotics.

Contact: Prof Ronnie Anderson (ronald.anderson@up.ac.za)



The **Institute for Cellular and Molecular Medicine** comprises 19 groups in 7 of the 9 faculties at the university. Thematic areas include stem cells, the neurosciences, cancer, genetics/genomics and infectious diseases. The institute provides opportunities for postgraduate training and aims to address South Africa's disease burden from a multidisciplinary perspective. Cross-cutting disciplines include an analysis of the impact of the legislative environment to see whether this facilitates or restricts entrepreneurship in these areas.

Contact: Prof Michael Pepper (michael.pepper@up.ac.za)

Mitochondrial Disease research has shown biochemical and genetic characteristics unique to a cohort of South African patients. This will play an important role in the establishment of a comprehensive service for patients with mitochondrial disease in South Africa.

Contact: Prof Izelle Smuts (izelle.smuts@up.ac.za)

Human Genetic Studies focuses on the role that rare mutations play in the genetics of schizophrenia. We use a family sample collected over 15 years in collaboration with the neurogenetics laboratory at Columbia University NY. We offer the first clear view of the genetic landscape of **schizophrenia**. Rare de novo structural mutations are significantly enriched and contribute to **schizophrenia** vulnerability in sporadic (non-familial) cases of the disease. We have also demonstrated that rare inherited structural mutations that affect many different genes contribute to familial **schizophrenia**, while new mutations are less prominent. This work has confirmed and extended earlier discoveries of rare structural mutations in schizophrenia.

Contact: Prof Louw Roos (louw.roos@up.ac.za)

Communicable Diseases

The **UP Centre for Sustainable Malaria Control** is pioneering research on sustainable malaria control methods from the biochemical and the biological to the chemical and the physical – including how best to manage these methods at a trans-disciplinary level. Community education in malaria control is addressed and backed by a commitment to changing behaviour in communities. Our team is also engaged in studies on the possible general and reproductive health effects associated with currently used insecticides for malaria vector control. Furthermore, we are using state-of-the-art cell phone technology to capture data on indoor residual spraying (IRS) in remote rural areas of Limpopo Province. Environmentally friendly ways of delivering chemicals for malaria prevention are among the new ideas being explored.

More information on the UP Centre for Sustainable Malaria Control is available at www.malaria.up.ac.za or follow us on Facebook <http://www.facebook.com/upendmalaria>.

Contact: Prof Tiaan de Jager (tiaan.dejager@up.ac.za); Dr Taneshka Kruger (malaria@up.ac.za)



Nuclear Medicine is involved in the establishment of novel point-of-care diagnostics and therapies that will expand the usage of F18, Ga68, Lu-177 and Tc-99m to help to address the oncology-, TB- and HIV challenges. Our research implements molecular theranostics, which integrates diagnostic testing to determine the presence of a molecular target for which a specific treatment/drug is intended.

Contact: Prof Mike Sathekge (mike.sathekge@up.ac.za)



The **Zoonoses** research group focuses on vector-borne- and zoonotic diseases. These are counted under the major threats to human- and animal health worldwide, with 70% of emerging pathogens having a zoonotic origin. Arboviruses are spread by arthropod (insect) vectors and can cause major outbreaks of encephalitis and haemorrhagic fevers. The group focuses on virus discovery and investigates the pathogenesis, host-genetic- and immunological responses to infection in humans and animals. Our work on new diagnostic tools and vaccines will be taken to a new level with the commissioning of a biosafety level 3 (BSL3) laboratory.

Contact: Prof Bob Swanepoel (bob.swanepoel@up.ac.za) and Prof Marietjie Venter (marietjiev@nicd.ac.za)

Research in the **blood-borne** virus unit of the Medical Virology Department focuses on the diagnosis and molecular characterisation of HIV-mono- and HBV/HIV co-infection. HIV and HBV are endemic to South and southern Africa and affect the poorer public health sector, contributing significantly to mortality and morbidity rates in developing countries. Our projects include the detection of primary (acute) HIV infections using molecular assays and ultra-deep sequencing to fully characterise HBV variants.

Contact: Dr Sheila Bowyer (sheila.bowyer@up.ac.za)

Severe Acute Respiratory Viruses are a major cause of death in children under 5, while emerging zoonotic respiratory viruses is a pandemic threat to all ages. Researchers investigate the molecular epidemiology and pathogenesis of respiratory syncytial virus, influenza and other respiratory viruses as the cause of pneumonia in children and adults and avian influenza at the human-animal interphase. This work is carried out by the Centre for Respiratory Diseases and Meningitis at the National Institute for Communicable disease in close collaboration with the Zoonoses research group.

Contact: Marietjie Venter (marietjiev@nicd.ac.za)

The **TB@UP** research collaboration represents a value-adding chain of infrastructure and experience, linking the Laboratory for Applied Mycobacteriology with relevant tuberculosis (TB) research efforts in the departments of immunology, virology, pharmacology, and the TB-HIV group in the faculty. The focus is the development and assessment of affordable new devices, and new techniques for the diagnosis and treatment of TB.

Contact: Prof Bernard Fourie (bernard.fourie@up.ac.za)

Oral Pathology in HIV/AIDS shows that the oral cavity, not considered a well-recognised route of HIV-1 infection, may play an important role as a primary target of HIV infection and persistence. More than 90% of HIV-infected individuals will have at least one HIV-related oral manifestation in the course of their disease. South African HIV clinicians need access to a variety of associated pathologies. These include conditions that are very often the first indication that the patient is immunocompromised. Candidiasis is the most common oral infection and its pathogenicity and drug resistance are being evaluated. Kaposi sarcoma is the most common HIV/AIDS-associated cancer. Plasmablastic lymphoma is an aggressive neoplasm frequently seen in HIV/AIDS patients, while an increase in human-papillomavirus-associated cancers has been observed in HIV/AIDS patients

Contact: Prof Willie van Heerden (willie.vanheerden@up.ac.za)



Non-communicable and Chronic Diseases

Medical Oncology is a dynamic area of research, which is constantly evolving, as new-targeted therapies are discovered. The Department of Medical Oncology has been an independent research-focused department since 1961, the year of its inception. It is the only member of the Eastern Cooperative Oncology Group outside the USA involved in studies looking at various types of cancer. In addition, a number of research projects are carried out with pharmaceutical industries as partners. These studies make free, state-of-the-art cancer medication available to South Africa's indigent population.

Contact: Prof Lydia Dreosti (lydia.dreosti@up.ac.za)

Anti-cancer Research focuses on the in silico design, synthesis and evaluation of novel anti-cancer compounds. Research into finding selectively toxic anti-cancer agents remains a priority in the international scientific and healthcare community, particularly into cancer types resistant to conventional chemotherapy. Making use of in silico virtual screening methods assists scientists in identifying novel compounds and can significantly lower the cost of drug development. These new compounds are being analysed for their potential anti-cancer properties in human blood models and human cancer cell lines.

Contact: Prof Annie Joubert (annie.joubert@up.ac.za)

Oral Cancer research focuses early molecular markers in potentially malignant disorders. High-resolution DNA flow cytometry is also used to determine biological behaviour of head and neck tumours. The possible role of human papilloma virus (HPV) as a causative organism in head and neck squamous cell carcinomas is under investigation. Clinical implications are important, as it has been well documented that HPV-associated oropharyngeal carcinomas have a significant improved survival compared to non-HPV associated tumours.

Contact: Prof Willie van Heerden (willie.vanheerden@up.ac.za)

The **Woman's Cancer** research group focuses first on cancer-prevention strategies for gynaecological cancer and breast cancer. Research focus areas include the detection and management of inherited cancer risk and locally relevant cancer-screening strategies. Afrikaner-population-group-specific mutations have been detected in the Pretoria laboratories in the BRCA genes that are responsible for the development of inherited breast and ovarian cancer risk.

Contact: Prof Greta Dreyer (greta.dreyer@up.ac.za)

The **Applied Morphology Research Centre** focuses on ultrastructure of platelets and fibrin networks in conditions related to inflammation, including cerebrovascular incidents (strokes), diabetes, and smoking. Research collaboration exists, including research with the Harvard Medical School, to study the effect of iron, iron chelators and antioxidants on platelet-, red blood cell- and fibrin ultrastructure.

Contact: Prof Resia Pretorius (resia.pretorius@up.ac.za)

Chronic diseases are increasing globally, including in South Africa. The faculty has been involved in **diabetes** research over the last decade. The focus has been on diabetes complications in the South African population, including randomised clinical trials in the community, focusing on either physical activity or nutrition or both. Improving non-communicable disease detection and management within the primary health care context is the current focus of research. Future research will include evaluation of the obesity epidemic and its prevention.

Contact: Prof Paul Rheeder (paul.rheeder@up.ac.za)



Andrology also focuses on the testosterone deficiency in the **aging male**, since there is growing evidence that testosterone is crucial for male sexual function and reproduction and plays a significant role in maintaining general health.

Contact: Prof Riana Bornman (riana.bornman@up.ac.za)

Environment and Lifestyle

Nutrition is incorporated in the Institute for Food, Nutrition and Well-being. The focus is water use and nutrient content of crop- and animal-food products for improved household food security. Macronutrients (e.g. protein) and micronutrients (e.g. vitamin A) within the edible output or harvest of crops or animal-source foods are of interest to dieticians and nutritionists in the food-based prevention of malnutrition. Nutritional-water productivity combines knowledge of the composition of food products in terms of nutrients with knowledge of the water productivity of that food product.

Contact: Gerda Gericke (gerda.gericke@up.ac.za)

The **Environmental Chemical Pollution and Health (ECPH) Research Unit** was established through a collaborative partnership between the School of Health Systems and Public Health (SHSPH) and Andrology in the Department of Urology in the Faculty of Health Sciences. The unit uses the EDC and toxicology laboratories. The andrology laboratory functions as a clinical- and research laboratory that investigates male reproductive health. The EDC component offers a comprehensive battery of bioassays for estrogenic and androgenic activity in environmental samples and specific chemicals. The toxicology section is primarily a research laboratory to assess reproductive health in humans and wildlife. The unit conducts research on the occurrence, health effects and projected future impacts of chemicals, especially EDCs, on environmental pollution and health.

Contact: Dr Natalie Aneck-Hahn (Natalie.aneck-hahn@up.ac.za)

Water and Public Health research under the leadership of the Rand Water Chair in Public Health, Professor Maureen Taylor, brings together medical virology, medical microbiology, human nutrition and environmental health. Our research addresses important public health issues relating to water quality and risk to human health. One research focus will be the assessment of the quality of treated- and untreated drinking water in relation to potentially water-borne pathogenic microorganisms. Another research focus will be chemical and organic pollutants in water sources used for the production of potable water and the assessment of the biological activity of EDCs in these environmental water sources. Data from these focuses will be used to establish the risk to human health of the different determinants. Contacts:

Medical Virology: Prof Maureen Taylor (maureen.taylor@up.ac.za)

Medical Microbiology: Prof Marthie Ehlers (marthie.ehlers@up.ac.za)

Community Dentistry research has created a large national and provincial dataset to explore the effects of a range of exposures and risks to oral health. The increasing burden of early childhood caries in South Africa, empirical evidence of the protective role of natural water fluoride levels, and the cost effectiveness of water fluoridation in South Africa have been documented. Our research has paved the way for more interventions on evidence-based innovative oral health promotion that may also impact on general health and well being.

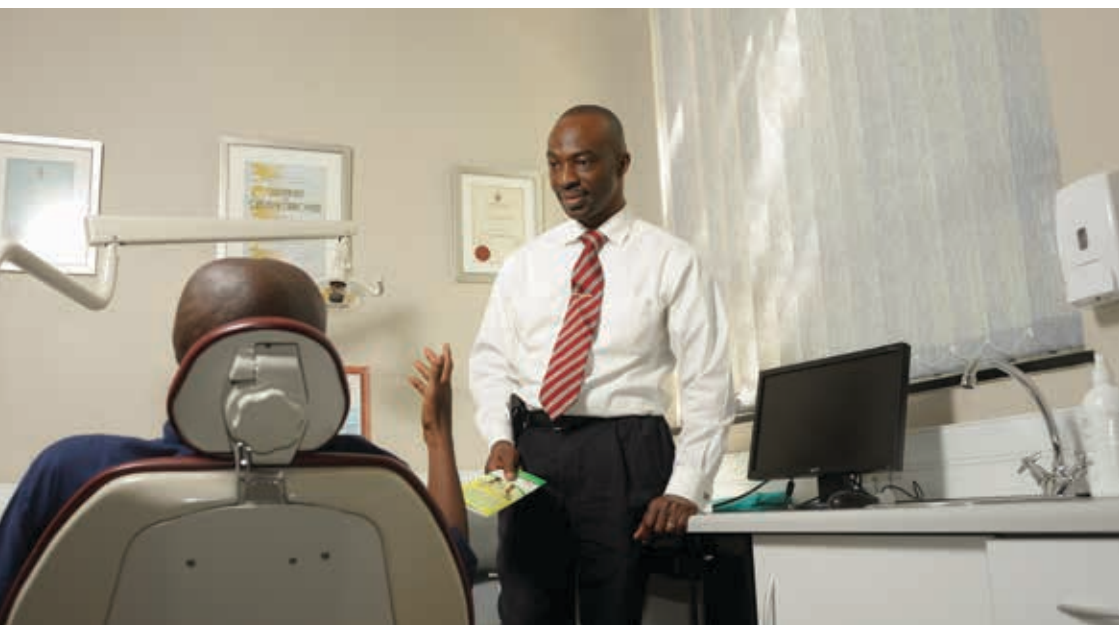
Contact: Prof Flip van Wyk (flip.vanwyk@up.ac.za)

Foetal Alcohol Syndrome is the consequence of mothers drinking significant amounts of alcohol during pregnancy. South Africa has the highest prevalence of Foetal Alcohol Syndrome in the world in high-risk communities in the Western Cape and the Northern Cape. The research group has been profiling the problem and studying how best to intervene to prevent this debilitating condition. The results are being used to advocate for better prevention by health- and other services in high-risk areas of the country.

Contact: Dr Kirstie Rendall-Mkosi (kirstie.rendall-mkosi@up.ac.za)

Smoking and smokeless tobacco (snuff) use are growing in Africa and the faculty is involved not only in assessing associated diseases but also in critically developing and assessing the effect of various clinical- and population-based interventions on adolescents and adults. We have played a key role in the passing of the recent amendments to the Tobacco Products Control Act by providing supporting evidence to the health portfolio committee of parliament. We continue to provide expert advice on the development of regulations nationally and internationally as the only African representative on the WHO scientific group on tobacco products regulation.

Contact: Prof Lekan Ayo-Yusuf (lekan.ayoyusuf@up.ac.za)



Drug Discovery

In the **Drug Discovery** division of the Department of Pharmacology, the ethnomedicinal use of herbals is validated scientifically using appropriate assays to determine biological activity, which includes infectious diseases, diabetes, CNS (Alzheimer's and Parkinson Disease) and cancer. The ethnobotanical literature is contains much on the varied bioactivity of herbal remedies, as well as their reported usage in traditional pharmacopoeia. These herbals have remained useful and are good starting points for the discovery of bioactive molecules for drug development. To predict the potential toxicity of novel drug candidates, specific cellular-, organ- and system-based toxicity assays are carried out. The division is also investigating toxicities that may arise from herbals administered concomitantly with other herbals and or drugs. The early detection of hepatotoxicity and drug-herb interactions is crucial, as a noteworthy proportion of the world's population makes use of complementary medications without sufficient safety data.

Contact: Prof Vanessa Steenkamp (Vanessa.steenkamp@up.ac.za)



The **Clinical Research Unit** is internationally accredited and recognised by leading health authorities, such as the US FDA (Food and Drug Administration), the EU Clinical Trials Directive and the MCC of RSA (Medicine Control Council). The unit undertakes drug trials in various therapeutic areas such as internal medicine, rheumatology, vaccines, urology and many other specialities.

Contact: Prof Oppel Greeff (oppel.greeff@up.ac.za)

Sports Medicine and Rehabilitation

The **Section Sports Medicine** (SSM) has expanded its research over the last year. Dr Rina Grant recently attended a workshop at the Mayo Clinic in Rochester, USA on clinical autonomic quantification. Dr Grant's exposure at this prestigious institution will take the research on autonomic nervous system (ANS) testing at the SSM to a much higher level. Our collaboration with Momentum investigates the lifestyle of its clients and aims to determine how to motivate members to replace bad lifestyle habits with healthier ones. 2013 will be the second consecutive year that SSM will have the opportunity to work with the organisers of the 94.7 Cycle Challenge where we have the opportunity to do interesting research on amateur cyclists.

Contacts: Dr Christa Janse van Rensburg (christa.jansevanrensburg@up.ac.za) and Dr Rina Grant (rina.grant@up.ac.za)



The **Physical Rehabilitation** research centre will become part of a research focus unit, which will include health promotion and preventative care. During the existence of the centre, 12 Master's degrees and two PhDs have been awarded. A new School of Health Care Sciences research unit: "Wellness and Quality of Life" will be established. This research unit will see the various disciplines in the School of Health Care Sciences collaborating on projects that address South Africa's burden of disease.

Contact: Prof Tania van Rooijen (tania.vanrooijen@up.ac.za)

Forensic Sciences

The **Forensic Anthropology Research Centre** is involved in the recovery and analysis of human remains from both forensic and archaeological contexts. The research is aimed at the development and testing of methods used in skeletal identification, trauma analysis, assessment of pathology and decomposition. The centre has a unique South African focus. Recent developments include pig decomposition research for better estimating time since death in human remains discovered in an advanced stage of decomposition and detailed assessments of skeletal blunt- and sharp-force trauma.

Contact: Prof Maryna Steyn (maryna.steyn@up.ac.za)

Research in the field of **Forensic Dentistry** has gained momentum over the last few years. This year has seen the culmination of a six-year project into the use of tongue protrusion as a reliable indicator of vital burning. The research was published in the International Journal of Legal Medicine. The estimation of age in younger individuals between the ages of 10 and 18 has always been problematic in handing down sentences where there is little documentation. The department has completed a research project that describes a technique for estimating the ages of black South African children between 6 and 18 years. The role of dental cementum in age estimation is also being investigated. This research will investigate the possibility of determining life events that manifest in changes in the mineralisation of this fascinating structure, which is laid down in yearly annulations similar to the growth rings seen in trees. Another study is investigating the use of probabilities in analysing bite marks for presentation in court cases. The research is an effort to determine the probability of guilt in bite-mark-related cases.

Contact: Prof Herman Bernitz (bernitz@iafrica.com)

Conclusion

The capacity across a wide range of areas is leading the faculty to establish more research institutes, centres and units to enable our contribution to society and to health to reach greater heights. The research entities will be built on the strengths in established research areas but will, in addition, build new clusters of research excellence. We are committed to growing our research funding and grants and to grow our African and international research partnerships.

Research partners and internal, local and international collaborators are contributing to the excellence in the research focus areas. Although they are not all listed here, the faculty regards them as key contributors to diversity, quality, relevance and sustainability.