




Burden of disease

The background is a vibrant, abstract composition. It features numerous red, biconcave disc-shaped objects, resembling red blood cells, scattered across the frame. Interspersed among these are several spherical, spiky structures that look like viruses or bacteria. A prominent, larger, more complex structure with a blue, branching internal pattern is visible in the lower right quadrant. The overall color palette is dominated by reds, oranges, and yellows, with some cooler tones like blues and greys in the background and the spiky structures.

Researchers

across the university,
under the banner
of the Institute of
Infectious Disease and Molecular Medicine (IIDMM), are taking a big-picture view
of diseases and conditions that are prevalent in Africa. And, in collaboration with
colleagues across Africa and internationally, are taking the necessary steps to ensure
that the research and scientific discoveries in the laboratories are translating into real
benefits in hospitals and clinics down the line.



A big-picture view to reduce the burden of disease in Africa

Professor Valerie Mizrahi sees the Institute of Infectious Disease and Molecular Medicine (IIDMM) as the marriage of three worlds. The director of the institute, she says that it operates at the “laboratory, clinic and community interface”. That best sums up the IIDMM’s motto: to make its work translational – to ensure that its findings in the laboratories make it all the way into South African hospitals, clinics, and communities.

Training its efforts on red-letter diseases such as HIV/AIDS and tuberculosis (TB) as well as cancers and genetic conditions of local concern, the institute comes with the right pedigree at every one of those three levels. Host to more than 20 research groups, the institute’s members between them hold six national DST/NRF SARCHI Chairs. Four units fall under the banner of the Medical Research Council, as do two research groups.

Pioneering science and drug discovery

At the laboratory end of the research agenda sits the likes of Professor Frank Brombacher – who holds the SARCHI Chair in Immunology of Infectious Diseases in Africa – and his Cytokines and Disease Group within the independent Cape Town component of the International Centre for Genetic Engineering and Biotechnology, hosted at UCT. Premising their work on mouse models, Professor Brombacher and his group are interested in the body’s immune system; how it works, regulates its activities, and how it responds to diseases of particular interest in Africa. These diseases are most notably tuberculosis, African trypanosomiasis (the parasitic disease commonly known as sleeping sickness), leishmaniasis (another parasitic disease, which is transmitted by the bite of certain sand flies and pervasive in East and North Africa), and infections spread by worm-like parasites known as helminths, including schistosomiasis, also known as bilharzia.

The work they do will hopefully provide the foundation for the treatments developed further down the road, says Professor Brombacher.

“Using transgenic mouse models, we are uncovering fundamental mechanisms of host protection and/or failure thereof. This will help to understand the biology of complex systems better, understand our immune system better, and results and conclusions should feed into rational strategies for vaccine and drug intervention.”

There is some overlap between Professor Brombacher’s work and that of the IIDMM’s Drug Discovery and Synthetic Medicinal Chemistry Group, led by principal investigator, Professor Kelly Chibale. This group, too, has an interest in tuberculosis and helminths, but also malaria, TB, cancer, and cardiovascular disease. And while its name hints directly at the group’s interest in identifying synthetic compounds that could be developed into drugs, it has also initiated research into natural products derived from general biodiversity, which can be used as scaffolds to generate semi synthetic analogues. Professor Chibale’s research group has also established technology platforms that are being used to reconstruct what happens to African traditional medicines in the body, with attendant safety and risk assessments.

Part of that research is being conducted under the auspices of the new Drug Discovery & Development Centre (H3-D), launched in 2011 and one of UCT’s signature research themes. The centre is directed by Professor Chibale, who also holds the DST/NRF SARCHI Chair in Drug Discovery. He says that while Africa’s scientists have proven adept at basic science and also at running clinical trials, they have not added value in the middle ground; one aim of the H3-D is to develop the technical capacity that will allow the continent’s researchers – working closely with pharmaceutical companies – to design drugs that target diseases of local concern.

“While Africa’s scientists have proven adept at basic science and also at running clinical trials, they have not added value in the middle ground.”

“We do not as yet have a track record of discovering and developing medicines,” says Professor Chibale. “This centre is aimed at bridging that gap between the basic sciences and the clinical sciences.”



Sputum induction being done on a young child with suspected tuberculosis. This novel method enables mucus to be obtained for rapid diagnosis of TB, thus facilitating prompt treatment of childhood TB.

That also to some extent summarises the work of Professor Jonathan Blackburn and his group. Professor Blackburn came to South Africa some eight years ago – with his South African wife, Associate Professor Nicola Mulder, head of the IIDMM's Computational Biology Group – bringing with him experience in an array of cutting-edge basic science technologies and a specific focus on proteomics – the massively parallel study of the differential abundance, localisation, and function of proteins in a biological system.

In South Africa, where he now holds a SARCHI Chair in Applied Proteomics and Chemical Biology, he has set out to apply those technologies, such as mass array spectrometry and protein microarrays, to a cross-section of diseases. This includes tuberculosis and cancers, with a smattering of work on HIV.

His work in proteomics falls into two distinct areas, explains Professor Blackburn – discovery-oriented research and systematic, quantitative studies. In the latter, for example, his team aims to track the body's autoimmune responses to cancers, quantifying the

changes in the autoimmune profiles of patients that occur during disease progression, or after radio-therapy, chemotherapy or therapeutic vaccination. It is research that they have applied to cancers such as skin cancer (melanoma) and colorectal cancer (cancer of the bowel), both of which are of increasing concern in South Africa.

On the discovery front, Professor Blackburn and his group have teamed up with tuberculosis researchers to identify both protein and lipid (a group of molecules that strongly interact with proteins) biomarkers, whose presence closely reflects the presence or severity of TB disease.

His research requires technologies and equipment that Professor Blackburn had, to a large extent, set up himself at the IIDMM. Very little appropriate infrastructure was in place when he first arrived, Professor Blackburn reports, and had to be built from scratch, thanks to funding from both the Department of Science and Technology in South Africa, and sources in the UK and Canada. It has opened up whole new technological vistas for local researchers, he believes.

Signature theme associated with this theme

■ Drug Discovery & Development Centre

The Drug Discovery & Development Centre (H3-D) is Africa's first integrated drug discovery and development centre. It delivers novel drug candidates for clinical development, its activities mirroring those of a start-up biotechnology or a pharmaceutical company. The centre bridges the gap between basic and clinical studies, equipping a new generation of African scientists with key skills for drug discovery and development. These integrate medicinal chemistry, biology, and pharmacology, as well as drug metabolism and pharmacokinetics (DMPK) studies as reflected in the processes of Absorption, Distribution, Metabolism and Excretion (ADME). H3-D also focuses on beneficiation of clinically used drugs, including generic medicines. Drug beneficiation involves the selection of the optimum form of a solid drug candidate for pharmaceutical development and (re)formulation.

Director: Professor K. Chibale *E-mail:* kelly.chibale@uct.ac.za *Web:* <http://www.h3d.co.za>

"In a sense, the diversity of research projects I'm engaged in reflects my expertise in the proteomic field, and the unmet need to apply those technologies in many different disease areas," he says.

Professor Blackburn works closely with Professor Keertan Dheda, who holds the DST/NRF SARCHI Chair in the Infection and Immunity of Poverty-Related Diseases and is also the head of UCT's Lung Infection and Immunity Unit (LIU). Professor Dheda's activities at the university span the LIU, the IIDMM, and the Department of Medicine. The LIU's main research interests, explains Professor Dheda, include the development, evaluation, and validation of field-friendly tools for the diagnosis of tuberculosis and other pulmonary infections, the study of the immunopathogenesis of tuberculosis using cells from the lung, and the epidemiology, pathogenesis, and clinical outcomes of drug-resistant TB.

An indication of the unit's standing – and how highly its work is valued – is the number of accolades it has been showered with. The LIU was recently designated a Centre of Excellence under the WHO-associated African Network for Drugs and Diagnostics Innovation (ANDI). Professor Dheda was also the winner of the 2010 International Union against Tuberculosis and Lung Disease Scientific Award, and was named a finalist in the innovation category of the 2011/12 National Science and Technology Forum-BHP Billiton Awards.

"The unit's activities converge on the broad objective of improving the quality of life and minimising mortality of Africans suffering from tuberculosis and other pulmonary infections," explains Professor Dheda.

That also illustrates how broadly its research can be applied. As does its collaborations with other African sites through grants from the Trials of Excellence in

Southern Africa project and TB-Neat (Tuberculosis – Novel and emerging technologies for diagnosis), funded by the European and Developing Countries Clinical Trials Partnership. The latter is a collaboration between several African countries to develop and evaluate the impact of novel TB diagnostic tools, including Gene Xpert, in Africa.

Single-minded focus to tackle TB

If one IIDMM unit could be said to straddle all three of Professor Mizrahi's pillars – laboratory explorations, clinical practice and community involvement – it would be the South African Tuberculosis Vaccine Initiative (SATVI): "the largest research group at UCT", she says. The work done at SATVI, says director, Professor Willem Hanekom, has a single-minded focus – the prevention of tuberculosis via vaccines.

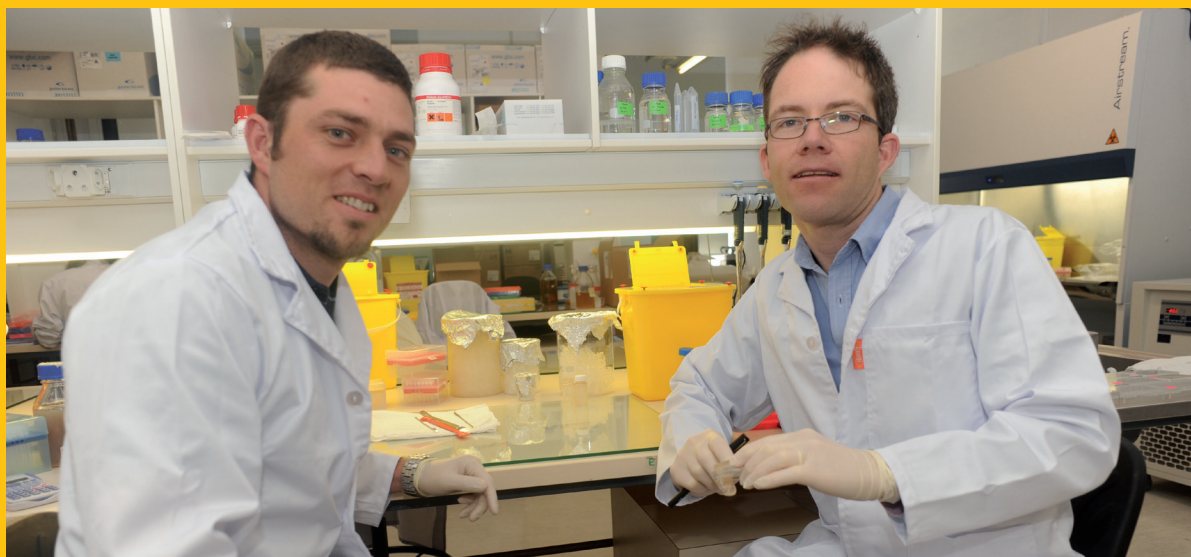
"In South Africa, and particularly in the Western Cape, we have among the highest rates of TB ever recorded in the world," says Professor Hanekom. "More effective vaccination would be the best strategy to intervene. To develop new vaccination strategies, we need to learn more about how our bodies fight TB."

To this end, SATVI is involved in a broad range of human immunology and genetic studies into the disease. Some of the initiative's international reputation, notes Professor Hanekom, is founded on its research into what's known as the *immune correlates of protection*, that is, markers that are measurable in blood to show that an individual will be protected against TB following the administration of a vaccine.

SATVI's bread and butter is clinical trials of BCG (*Bacillus Calmette-Guérin*) and of new TB vaccines, including early phase trials to evaluate safety and later phase trials to test whether the vaccines can prevent TB disease. Other projects have focused on the epidemiology of TB in infants and

Centre of excellence associated with this theme

- UCT node of the DST/NRF Centre of Excellence for Biomedical TB Research



Prevent and cure: Dr Digby Warner (right) and Dr Thomas Scriba of the IIDMM were named winner and first runner-up, respectively, of the prestigious BioVision-Lilly Award in conjunction with TWAS (the academy of sciences for the developing world). The award recognises young researchers from developing countries for outstanding scientific achievements in tuberculosis-related research.

A new node of the DST/NRF Centre of Excellence for Biomedical TB Research (CBTBR) was established at UCT in 2011, under the leadership of Professor Valerie Mizrahi. Through this development, UCT became the third co-hosting institution of this centre, together with Stellenbosch University that serves as the leadership and administrative hub, and the University of the Witwatersrand.

The UCT node of the CBTBR was established coincident with Professor Mizrahi's move to UCT as the new director of the IIDMM. The MRC/NHLS/UCT Molecular Mycobacteriology Research Unit, directed by Professor Mizrahi, serves as the base of the UCT node of the CBTBR. The first four months of the year were spent setting up the node's new biosafety level two laboratory in the IIDMM and equipping the biosafety level three laboratory with the equipment and reagents needed to support the CoE node's tuberculosis research programme. By June 2011, the UCT node's laboratories were fully operational and the first cohort of postgraduate students and postdoctoral fellows was in place. The node currently comprises Professor Mizrahi (head), Dr Digby Warner (team member), three postdoctoral

fellows as well as three new PhD students. Also affiliated to the UCT node in 2011 was one MRC-funded senior scientist, who is seconded full-time to the University of Stellenbosch node, and one research officer who is seconded full-time to the National Institute of Allergy and Infectious Diseases, NIH (USA). In addition to those based at UCT, three existing students (two PhD and one MSc) who are registered at the University of the Witwatersrand were co-supervised by Dr Warner and Professor Mizrahi in 2011.

In addition to establishing the node's laboratories and recruiting new students, major emphasis was also placed in 2011 on obtaining new research grants. The node was successful in this regard, securing three new grants for tuberculosis drug discovery research, from the Bill and Melinda Gates Foundation as a member of the High-Quality Hits for Tuberculosis (HIT-TB) Consortium, the EU FP7 Programme as a member of the More Medicines for Tuberculosis (MM4TB) Consortium, and the Technology Innovation Agency (TIA) under the auspices of the South African Tuberculosis Research and Innovation Initiative (SATRII).

Research groupings associated with this theme

■ Hatter Institute for Cardiovascular Research in Africa

The aim of the Hatter Institute is to facilitate national and international research collaborations and to consolidate and expand existing efforts to combat the most serious cardiovascular threats to health, and to improve overall prosperity in the region. Major research areas are cardiac disease and maternity, cardioprotection, cardiovascular genetics, and Heart of Africa projects. In Africa, cardiovascular disease is the most common cause of maternal death in pregnant women. The objective of the institute's Cardioprotection Group is the delineation of novel cardioprotective pathways that can be activated to limit cell death in various pathophysiological conditions, such as heart failure, myocardial infarction or diabetes. The Cardiovascular Genetics Group aims to discover the genetic basis of inherited heart diseases that cause sudden death. This work involves the study of families with rare monogenic disease (that is, inherited cardiomyopathies and arrhythmogenic disorders), and the delineation of the genetic architecture of complex traits associated with sudden death (such as cardiac hypertrophy). These studies hold promise of discovering the critical biological pathways that can be targeted by drugs to prevent sudden cardiac death. The Heart of Africa Pan-African Hypertension Cohort (PAPUCO) was established in 2010 to describe the epidemiology and characteristics of pulmonary hypertension in Sub-Saharan Africa.

Director: Professor K. Sliwa-Hahnle
E-mail: Karen.Sliwa-Hahnle@uct.ac.za
Web: <http://www.hatter.uct.ac.za>

■ Adolescent Health Research Unit

Adolescents face a wide range of health problems, owing to a combination of biological, social, and psychological factors. There is thus a niche for a research facility that focuses specifically on the health needs of adolescents. The Adolescent Health Research Unit builds on existing research and collaborations to co-ordinate, promote, and facilitate research into all aspects of adolescent health. The specific aims of the unit are to facilitate cutting-edge inter-disciplinary research that addresses key national public adolescent health priorities; promote networking among adolescent health researchers, practitioners, and policy makers; increase the profile of the Faculty of

Health Sciences in the arena of world-class adolescent health research; provide policy consultation at local, provincial, national, and international levels; and increase and improve educational offerings in adolescent health at undergraduate and postgraduate levels.

Director: Professor P. de Vries
E-mail: Petrus.DeVries@uct.ac.za
Web: <http://www.health.uct.ac.za/research/groupings/adolescent/>

■ MRC/UCT Cape Heart Centre

This combined research entity is the largest heart research group in South Africa and forms part of the Cape Heart Group that links research between UCT and the other universities in the region. The Hatter Institute, which is part of the MRC/UCT Cape Heart Centre, is involved in the study of the molecular and cellular biology of ischaemic heart disease, as well as the molecular and cellular pathophysiology of cardiac hypertrophy and heart failure. The goals of the research programme are to contribute to the fundamental understanding of the mechanisms in the development of ischaemic heart disease, cardiac hypertrophy, and heart failure. The Cardiovascular Research Institute, to which the Medtronics Institute is allied, is studying biocompatible materials for vascular and valvular prostheses. Lipidology is concerned with research into lipid and lipoprotein disorders in patients in the region and novel treatment strategies for these disorders. Additionally, their research includes new diagnostic assays for local problems in health care and lipid peroxidation.

Director: Professor P. Zilla
E-mail: Peter.Zilla@uct.ac.za
Web: <http://web.uct.ac.za/depts/chc/>

■ Cardiovascular Research Unit

The core research pursuit of the Cardiovascular Research Unit centres around the concept of regenerative medicine, with the goal of engineered regeneration of diseased structures through co-ordinated and site-directed signalling to facilitate gradual in-situ remodelling of surgically replaced hybrid biosynthetic devices. These offer patients an immediate dramatic improvement in quality of life through return to functionality of these diseased structures.

Director: Professor P. Zilla
E-mail: Peter.Zilla@uct.ac.za
Web: <http://www.uct.ac.za/depts/cts>

■ Centre for Infectious Disease Epidemiology and Research

The Centre for Infectious Disease Epidemiology and Research (CIDER) aims to be an African centre of excellence in infectious disease epidemiology and related research. The centre has a strong base that spans a number of disciplines and conducts public health research integrating laboratory, clinical, epidemiological, social science, and health systems research into infectious diseases that have high priority in Southern Africa (in particular, HIV and tuberculosis) in order to improve the prevention and management of these diseases.

The centre maintains strong links with health services at all levels in order to identify research priorities, and assists policy makers, programme managers, and services managers with the implementation of the results of research. The centre aims to be a centre of excellence in the surveillance and monitoring of infectious diseases and infectious disease programmes and services, and in the conduct of robust observational research, based on routine data sources. CIDER provides extensive postgraduate level teaching and supervision in epidemiology.

Director: Associate Professor A. Boule

E-mail: Andrew.Boule@uct.ac.za

Web: <http://www.cider.uct.ac.za>

■ MRC/NHLS/UCT Molecular Mycobacteriology Research Unit

The Molecular Mycobacteriology Research Unit (MMRU) was established in 2000 as an extramural research unit of the MRC, hosted jointly by the National Health Laboratory Service and the University of the Witwatersrand. In 2011, the MMRU was transferred to the University of Cape Town, where it is now based in the Institute of Infectious Disease and Molecular Medicine. The mission of the MMRU is to carry out fundamental research on aspects of the physiology and metabolism of relevance to tuberculosis drug resistance and drug discovery. By adopting a research strategy that is based on investigating specific aspects of the metabolism and physiology of *Mycobacterium tuberculosis*, the MMRU has positioned itself at the front-end of TB drug discovery research.

Director: Professor V. Mizrahi

E-mail: Valerie.Mizrahi@uct.ac.za

Web: <http://www.health.uct.ac.za/research/groupings/mmrui>; <http://www.mrc.ac.za/mycobacteriology/mycobacteriology.htm>

■ Centre for Occupational and Environmental Health Research

The Centre for Occupational and Environmental Health Research (COEHR) aims to be a principal centre of occupational and environmental health research, teaching and training, and a source of supportive outreach activities in South Africa, parts of Africa, and internationally. It conducts multi-disciplinary research, teaching, and service provision that integrates laboratory, clinical, epidemiological, and policy skills in relation to occupational health problems that have high priority in Southern Africa. This in order to facilitate identification and improved characterisation of these and other problems, and to better understand the determinants of these problems and their solutions. It explores and develops means of maintaining the health of individuals and the environment, especially the work environment, and of preventing the development of health problems in those exposed to injurious environments at work or more generally. Public policy research is conducted into issues ranging from toxic or injurious exposures through to health surveillance, and the functioning of relevant health services. Inter-institutional research, teaching and service (including outreach) collaboration and capacity development are priorities of the centre, along with fostering local and global networks for occupational and environmental health promotion through collaboration with the United Nations and other agencies, notably the World Health Organisation (WHO). The centre is currently a WHO Collaborating Centre for Occupational Health.

Director: Professor J. Myers

E-mail: Jonny.Myers@uct.ac.za

Web: <http://www.coehr.uct.ac.za>

■ Desmond Tutu HIV Centre

The activities of the Desmond Tutu HIV Centre (DTHC) are underpinned by research and evaluation. It aims to impact on policy and practice, both nationally and internationally, through relevant research, peer-reviewed publications, and feedback to government, civil society, and the community at large. DTHC is driven by a passion for humanity and a vision of South Africa without AIDS. Over the years, it has become a source of advice for medical practitioners, support for people seeking testing or treatment, and leadership in preventative education. With an experienced and dedicated team of more than 165 doctors, nurses, researchers, and community-trained field workers, the centre offers a holistic approach to the HIV epidemic.

Director: Professor R. Wood

E-mail: Robin.Wood@hiv-research.org.za

Web: <http://www.desmondhutuhivcentre.org.za/>

Research groupings associated with this theme

■ Institute of Infectious Disease and Molecular Medicine (IIDMM)

Concentrating its research efforts on infectious diseases, particularly HIV/AIDS and tuberculosis, and on non-communicable diseases prevalent in Africa, the Institute of Infectious Disease and Molecular Medicine aims to be a centre of research excellence in Africa, and a major training hub for biomedical, clinical, and public health researchers. The institute provides its members, affiliates, and visiting scholars from around the world with an environment that is highly interactive, allowing complex scientific problems framed in a public health context to be tackled in a multi-disciplinary way. Collaborations, partnerships, and networks contribute to its world-class scientific endeavours. Its strong scientific base spans many areas of modern, molecular-based enquiry, including molecular and cell biology, immunology, virology, microbiology, genetics and genomics, biochemistry, pharmacology, vaccinology, molecular epidemiology, and structural, high-throughput, and computational biology. The institute's aim is to apply scientific discovery from the bench to the bedside and to the community through a dynamic interplay between basic, clinical, and public health research.

Director: Professor V. Mizrahi

E-mail: Valerie.Mizrahi@uct.ac.za

Web: <http://www.iidmm.uct.ac.za>

■ MRC/UCT Immunology of Infectious Diseases Research Unit

Human infectious diseases are a high-priority area for South Africa and Africa, where they continue to be a leading cause of childhood and adult morbidity and mortality. Thus, the MRC/UCT Immunology of Infectious Diseases Research Unit focuses on the understanding of host protective immune responses and the development of effective vaccine strategies for the eradication of diseases that are identified as priority areas by the World Health Organisation: tuberculosis, leishmaniasis, helminth diseases (bilharziosis) and African trypanosomiasis (sleeping sickness). The unit's mission is to be relevant as an excellent multi-disciplinary and international team, embracing both basic and applied research, in order to improve capacity, teaching, and training in the immunology of infectious diseases.

Director: Professor F. Brombacher

E-mail: fbrombac@mweb.co.za

Web: <http://www.health.uct.ac.za/research/groupings/iidu/>

■ MRC/UCT Oesophageal Cancer Research Group

The MRC/UCT Oesophageal Cancer Research Group is an inter-disciplinary and inter-institution group (UCT, MRC, and the University of Stellenbosch), established by the MRC in 1997. Squamous cell carcinoma of the oesophagus is one of the eight most common cancers worldwide. High-incidence areas include China, Japan, and certain hot spots in France, Iran, and South America. More important is the fact that the incidence of squamous cell carcinoma of the oesophagus is very high in Southern and Eastern Africa, but virtually absent in West Africa. This group is investigating the environmental and genetic factors that predispose Africans to this disease.

Director: Professor M.I. Parker

E-mail: Iqbal.Parker@uct.ac.za

Web: <http://www.iidmm.uct.ac.za/iparker/index.htm>

■ MRC/UCT Receptor Biology Research Group

The mission of the group is to study the structure and function of G protein-coupled receptors and to apply the research to understanding and treating diseases that have major effects on the social and economic welfare of South Africa. The group focuses on the gonadotropin-releasing hormone receptors and on the kisspeptin receptor, which are central regulators of the reproductive function, on the prostaglandin receptors and their role in cervical cancer and on the CCR5 chemokine receptor and its role in HIV entry and infection.

Co-Directors: Associate Professor A.A. Katz, Dr C.A.

Flanagan and Professor R.P. Millar

E-mail: ArieH.Katz@uct.ac.za

Web: <http://web.uct.ac.za/depts/iidmm/akatz/research.htm>

■ UCT Leukaemia Unit

The UCT Leukaemia Unit was established with the objective of fostering basic and clinical research in the area of haematological stem cell disorders and blood malignancies. Some of the current interest includes the marrow microenvironment in multiple myeloma, molecular genetics of acute or chronic leukaemias, and clinical studies in lymphoproliferative disorders. As a consequence, a laboratory with a comprehensive array of equipment is available where honours, master's, and doctoral students are running research projects. Based on these studies, a number of clinical and



laboratory programmes have been developed. In this regard, the only university-based haematopoietic stem cell transplantation programme in the country is located at Groote Schuur Hospital. Parallel studies focusing on haematopoietic stem cell biology and immune reconstitution after transplantation are ongoing.

Director: Professor N. Novitzky

E-mail: Nicolas.Novitzky@uct.ac.za

Web: <http://www.health.uct.ac.za/research/groupings/leukaemia/>

■ Centre for Actuarial Research

The Centre for Actuarial Research based in the Faculty of Commerce is the only unit of its kind at an African university. It brings together multi-disciplinary teams to build capacity, improve techniques, and produce independent research in demography, healthcare financing, social security, and HIV/AIDS modelling. The main focus of the centre is on training and research in demography and modelling the demographic impact of HIV/AIDS in Southern Africa.

Director: Associate Professor T. Moultrie

E-mail: Tom.Moultrie@uct.ac.za

Web: <http://www.commerce.uct.ac.za/care/>

■ Centre for Supramolecular Chemistry Research

This group was constituted in 1997 and focuses on the physical chemistry of supramolecular systems. Various host-guest compounds are synthesised, their structures analysed by means of powder and single crystal X-ray

diffraction, as well as thermal and spectroscopic techniques, and the results related to their physical properties. Our research efforts concentrate on the beneficiation of drugs through investigation of their polymorphs, solvates, co-crystals, and cyclodextrin inclusion complexes; on the synthesis and characterisation of open framework transition metal structures and purely organic porous materials, and on the synthesis and characterisation of large supramolecular assemblies and the study of guest selectivity in organic host-guest systems.

Director: Professor M.R. Caira

E-mail: Mino.Caira@uct.ac.za

Web: <http://www.supramolecular.uct.ac.za/index.htm>

■ Structural Biology Research Unit

The Structural Biology Research Unit provides a central microscopy service to all departments of UCT, as well as to other universities, research institutions, and private companies. The unit is able to advise users on many aspects of electron microscopy, light microscopy, and digital imaging, and can take on joint research. The unit is a key resource in the South African Structural Biology Initiative and is offering postgraduate degrees in structural biology jointly with others at UCT and the University of the Western Cape. In 2007 the Unit took delivery of an FEI Tecnai F20 field emission cryo-transmission electron microscope – the first instrument in this class in Africa. This instrument enables the determination of three-dimensional structures of biological objects, including viruses and protein complexes at high resolution.

Director: Professor B.T. Sewell

E-mail: Trevor.Sewell@uct.ac.za

Web: <http://www.health.uct.ac.za>

DST/NRF SARCHI Chairs associated with this theme

■ Infection and Immunity of Poverty-related Diseases



Keertan Dheda is Professor of Respiratory Medicine and Director of the Lung Infection and Immunity Unit within the Division of Pulmonology, Department of Medicine. He is the recipient of several prestigious awards including the 2010 International Union

Disease Scientific Award, and holds several large local and multi-national grants, including those sponsored by the EU. His main research interests are the study of the immunopathogenesis, epidemiology, and diagnosis of tuberculosis, including drug-resistant TB. He is the co-author of more than 100 peer-reviewed publications, holds patents that are being commercialised, and serves on the editorial boards of several international journals.

■ Applied Proteomics and Chemical Biology



Professor Jonathan Blackburn holds the SARCHI Chair in Applied Proteomics and Chemical Biology and is head of the ANDI Centre of Excellence in Proteomics and Genomics. He obtained his DPhil degree in Chemistry from the University of Oxford, and carried out postdoctoral

research at the Medical Research Council (UK). Professor Blackburn serves on a number of national and international committees, including the National Health Research Committee, the Biotechnology Committee of the International Union of Pure and Applied Chemistry, and the Nominations and Election Committee, Human Proteome Organisation. He serves on the editorial advisory boards of the *Journal of Proteome Research*, *Journal of Proteome Science* and *Computational Biology*, and *Expert Review of Proteomics*. He is also a member of the Scientific Advisory Board of GenTel BioSciences (USA), and the Research Advisory Panel of the Council for Scientific and Industrial Research (CSIR) Biosciences.

■ Immunology of Infectious Diseases in Africa



Professor Frank Brombacher, a NRF A1-rated UCT fellow, holds the SARCHI Chair in Immunology of Infectious Diseases in Africa, and heads up an extramural MRC Research Unit in addition to his ICGEB Scientific Co-ordinator position for Immunology and Infectious Diseases. His

group investigates immunological mechanisms, regulation, and protective host effector functions in experimental murine infectious disease models that are relevant to Africans, such as tuberculosis, African trypanosomiasis, leishmaniasis and helminthic infections, including bilharzia – four of the top ten WHO-declared human threats. In addition, he and his group are interested in chronic diseases, including allergic asthma and colitis, causing high morbidity and mortality in humans.

■ Drug Discovery



Professor Kelly Chibale obtained his PhD in synthetic organic chemistry from the University of Cambridge (UK), and postdoctoral stints at the University of Liverpool (UK) and the Scripps Research Institute (USA) followed. He is currently Professor of Organic Chemistry at the University of Cape Town and a full member of the Institute of Infectious Disease and Molecular Medicine.

Professor Chibale was awarded the SARCHI Chair in Drug Discovery, and became the founding Director of the MRC/UCT Drug Discovery and Development Research Unit in 2009. He was recently elected a Life Fellow of UCT, and a Fellow of the Royal Society of South Africa. In 2010, he became the founding Director of the UCT Drug Discovery & Development Centre (H3-D). Professor Chibale's research is in the field of drug discovery, underpinned by medicinal chemistry.



■ Vaccinology



Professor Anna-Lise Williamson is a virologist on the joint staff of the University of Cape Town and the National Health Laboratory Service. As a full member of the Institute of Infectious Disease and Molecular Medicine, her research activities are housed in this institute. She is internationally

recognised for both her HIV vaccine and Human Papillomavirus (HPV) expertise. She has headed the South Africa AIDS Vaccine Initiative-funded vaccine development team since 2000. This team has been responsible for the development of two vaccines currently in Phase 1 clinical trials in the USA and South Africa, and the ongoing potency assay for one of the vaccines is currently performed in the UCT Vaccine Research Group Good Laboratory Practice Facility. Professor Williamson is head of the World Health Organisation's HPV Labnet lab for the Africa Region and joint head of the Molecular Epidemiology Laboratory (UCT/NICD/NHLS).

■ Cancer Biology



Professor Iqbal Parker was appointed as Chairholder under the auspices of the Institute of Infectious Disease and Molecular Medicine. He has a well-established international reputation in the field of cancer biology, and recently played a key role in the establishment of

the African component of the International Centre for Genetic Engineering and Biotechnology at the IIDMM.

adolescents, in preparation for late-phase trials. Some SATVI studies focus on diagnostics – how best to diagnose TB in vaccine trials – and on the ethics of vaccine trial participation.

Encouraging cross-disciplinary collaboration

While it's easy to spot the synergies, overlaps and common ground between research groups and themes at the IIDMM, it is tricky at times to bring together so many approaches and disciplines under one virtual roof, says Professor Mizrahi.

But the IIDMM has set up a number of initiatives to get researchers from the many disciplines into one room, at least. That includes, most prominently, the IIDMM's cross-disciplinary seminar series.

"We're trying to nudge our students to take advantage of this," says Professor Mizrahi, "because it's one thing to have it in place, but it's quite another for students and fellows to take advantage of it – attending, listening, and actually making the effort to often learn a different discipline and a different language."

"The IIDMM has set up a number of initiatives to get researchers from the many disciplines into one room."

That big-picture view, experience shows, is what the country needs if it is to make inroads into its burden of disease.

With this in mind, the IIDMM has also benefitted from Growing the Next Generation of Academics, a new UCT initiative aimed at assisting a select group of postgraduate students to complete a PhD and then enter academia. Funded by a grant from the Carnegie Corporation, the initiative focuses on civil engineering, economics, and infectious diseases. It is run with three other African universities – the University of the Witwatersrand in South Africa, the University of Ghana, and Makerere University in Uganda.

The IIDMM was able to support 18 PhDs and six postdoctoral research fellows in the first funding cycle alone.

"This important programme has enabled us to strengthen our efforts in capacity development in the field of infectious diseases by supporting outstanding young researchers," says Professor Mizrahi.

And these same young researchers will now join the institute in its multi-pronged fight against the burden of disease.