TTO NEWS

Focus on commercialisation

Seed funding opportunities

Ultra-high strength concrete invention

From medicinal plants to cosmeceuticals

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Department of Research and Innovation

Departement Navorsing en Innovasie
Kgoro ya Dinyakišišo le Tšweletšopele

Newsletter of the Technology Transfer Office of the University of Pretoria

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Letter from the editor

The University of Pretoria (UP) strives to maximise the advantages created by its research outputs. By exploiting the intellectual property (IP) of its scientists and postgraduate students, and by bringing these research outputs to commercial fruition, it is in a position to support South Africa's economic and social development.

The commercialisation of IP at the University refers to the process of managing the transfer of research outcomes to commercial market applications. UP's Technology Transfer Office (TTO) is proud to claim several commercialisation success stories, which are featured in this special edition of *TTO News*.

Some of the inventions that are featured have been recognised with innovation prizes nationally, and are available for commercial, retail and scientific use. These range from HearZA, a novel hearing screening mobile application, to a unique eco-friendly soil that can be used to replace imported peat soil.

Several other inventions are in the research and development stage, and their potential for commercialisation is being made possible through early-stage seed funding via UP's partnership with the Technology Innovation Agency (TIA).

The University acknowledges the support it receives from industry and the TIA to turn the work of its researchers into commercially viable ventures.

Adv Lawrence Baloyi
Head: Contract Research and Innovation Support

Commercialising intellectual property at UP

The University of Pretoria has committed itself to becoming a leading research-intensive institution. In terms of its strategic plan, it has determined that "to maximise the advantages created by its research outputs, thereby supporting economic development and competitiveness, it should exploit its intellectual property (IP) by bringing its research outputs to commercial fruition".

Nationally and internationally, innovation based on scientific and engineering knowledge has become increasingly important for business development and wealth creation. In South Africa, legislation and government innovation policies have defined a mandatory role for universities with respect to the commercialisation of the results of publicly funded research, with the aim of increasing the number of patent applications filed by universities. In accordance with these regulations, the University of Pretoria, like all other South African universities, has created a Technology Transfer Office, which is instrumental in the identification, protection and commercialisation of IP.

> "Innovation is the process of development though which inventions or discoveries are expanded and brought into application."

The University of Pretoria encourages members of its staff and students to participate in the exploitation of new discoveries and IP emanating from their research that can be commercialised. Support for the management of new knowledge with commercial potential, together with its associated IP, has included the development of structures within the Department of Research and Innovation (DRI) and Enterprises University of Pretoria (Pty) Ltd (Enterprises UP) to manage and exploit these research outputs in a responsible and meaningful manner. The disclosure and management of information created by the University's research portfolio has, until now, been conducted through a range of organisational processes pertaining to IP protection and commercialisation, but a clearer set of procedures has now been put in place to address the steps from invention disclosure to commercial development.

As the implementation of the commercialisation of IP is complex, challenging and potentially cost-intensive, it must be executed within a framework of realistic expectations. Although no universal best-practice models apply directly and wholly to South Africa, a framework for commercialisation should take into account the business development capabilities that are required. Such a framework should allow for the flow of information that is required between role players, for decoupling an invention from traditional research practice and for integrating IP development in the commercialisation development process. It should also be sufficiently flexible to accommodate a range of business models and approaches to financial structuring.

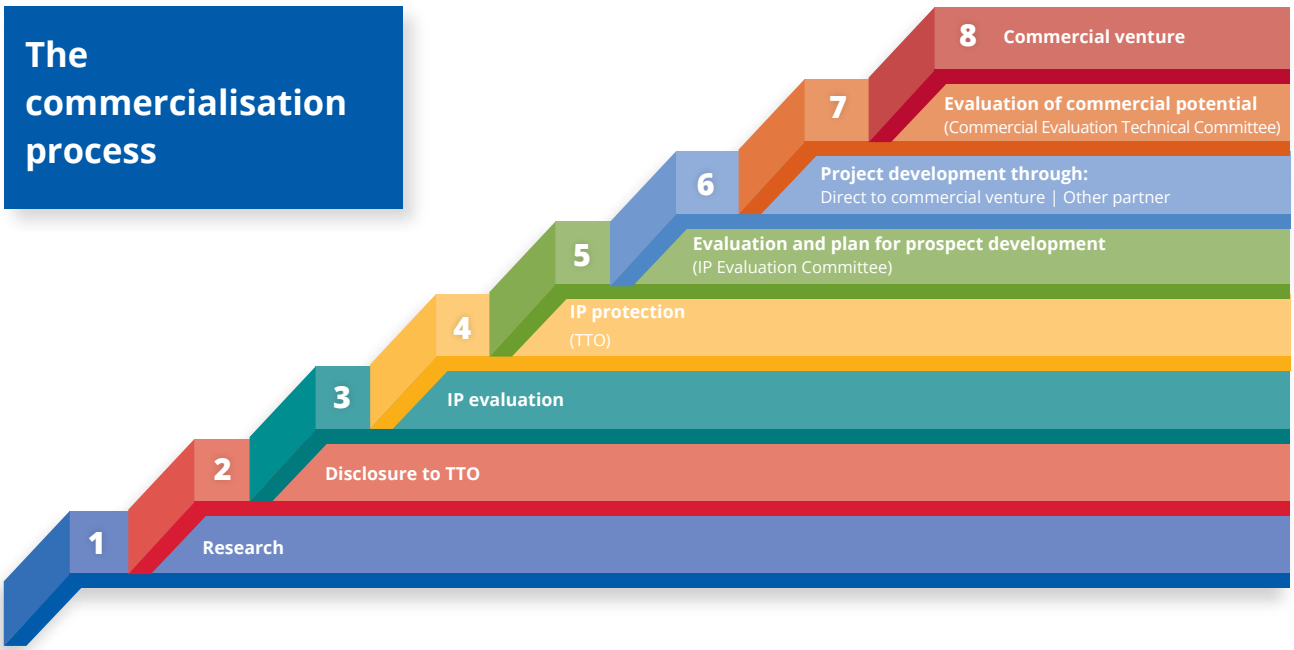


Figure 1: Stages in the process of the commercialisation of Intellectual Property at UP.

At UP, the commercialisation of IP refers to the process of managing the transfer of research outcomes (mainly knowledge) to commercial market applications. This technology transfer includes the selection of the most appropriate pathway to market and could include consulting and contract research, the licensing of proprietary knowledge, start-up ventures, spin-out and spin-off ventures, or a combination of these.

The process of commercialising IP

At UP, the process of developing research-related IP into a commercial product relates only to IP that is owned by the University.

The process involves the Technology Transfer Office (TTO) and the Commercialisation Office, both of which are located in DRI. These offices are responsible for coordinating the interaction between the entities that form an enabling pipeline system, including Enterprises UP and other commercial partners, to enable the key processes of translation and pathway-to-market. Through the successive contributions of the Innovation and Contracts Management Team, contract research activities can be developed from formal invention disclosures (handled by the TTO) to (potential) commercialisation (see Figure 1).

The potential of candidate prospects is considered through technical review by an IP Evaluation Committee, which is managed and facilitated by the TTO.

If the IP Evaluation Committee deems a project to be suitable for development, it may be transferred to the Commercialisation Office for further development or, if it is well advanced, to a business partner (which may be Enterprises UP or an alternative partner) for commercialisation.

Once developed, the commercialisation/spin-out may be managed by either Enterprises UP or an alternative partner. This may happen in a case where the commercial opportunity requires capacity that does not adequately match the mandate or available capacity in Enterprises UP.

The role of the TTO

The TTO conducts all tasks and procedures required for compliance with national regulations relevant to IP and technology transfer. The TTO is responsible for the management and protection of IP emanating from UP research. This includes the implementation of the University's policy for IP protection in projects and ventures, and the identification, based on disclosures by researchers, of projects for consideration by the IP Evaluation Committee. An IP legal advisor is appointed to support the TTO by participating in patent licensing negotiations, contributing to the preparation of engagement and negotiation strategies, reviewing and drafting patent documentation and licence agreements, and liaising with external legal consultants regarding research projects, and with potential and current licensees.

IP Evaluation Committee:

- Reviews the IP value propositions of new disclosures
- Provides recommendations regarding the most suitable IP development path and strategies to be implemented
- Ensures compliance with National Intellectual Property Management Organisation (NIPMO) regulations
- Selects IP opportunities to recommend for commercialisation evaluation
- Reviews the commercial value proposition of each opportunity
- Monitors the progress of projects under development
- Reports to the Executive IP Management Oversight Committee

The role of the Commercialisation Office

The Commercialisation Office is positioned in the Innovation and Contracts Management Division of DRI.

The Commercialisation Coordination Manager manages the development of candidate prospects from the point where commercial potential is recognised, after disclosure to the TTO. The mandate of the Commercialisation Office is to convert IP-rich research projects with potentially significant market opportunities into commercial start-up ventures with significant economic value, through a process that includes strategy development, business plan development, fundraising, organisational development, mentorship and business development.

The Commercialisation Office therefore creates commercialisation pathways for IP generated by UP researchers. It participates in negotiating the establishment of start-ups, building effective and productive relationships with partner organisations (including venture capital firms) to provide commercial support, and assisting to find funding opportunities for further technology development.

The Commercialisation Manager manages the overall process of the commercialisation of IP, specifically the progress of projects identified for development, the marketing of IP commercialisation opportunities to identified markets, the raising of investment funds for commercialisation opportunities, and liaison with potential commercial partners (including Enterprises UP) and other stakeholders in relation to potential commercialisation developments.

Executive IP Management Oversight Committee:

- Provides executive oversight of commercialisation activities
- Makes executive proposals, as required, particularly regarding investment choices

The role of Enterprise UP

Part of the mandate of Enterprises UP is to support the University in exploiting the commercial potential of the University's IP. This could include IP generated through research conducted at UP.

Enterprises UP has a valuable role to play in offering expertise and advisory functions related to the assessment of business prospects, as well as the identification of potential business partners, fostering relationships and implementing commercial developments.

Enterprises UP can therefore provide early input into commercialisation opportunities and potential value propositions, networking to identify potential commercial partners, engaging in continued consulting and contract research, implementing licensing and spin-outs as new processes to market, creating additional capacity regarding analysis (market and competitor analysis) and creating alignment between existing faculty service mechanisms, research innovation contact officers and DRI.

Interacting with researchers

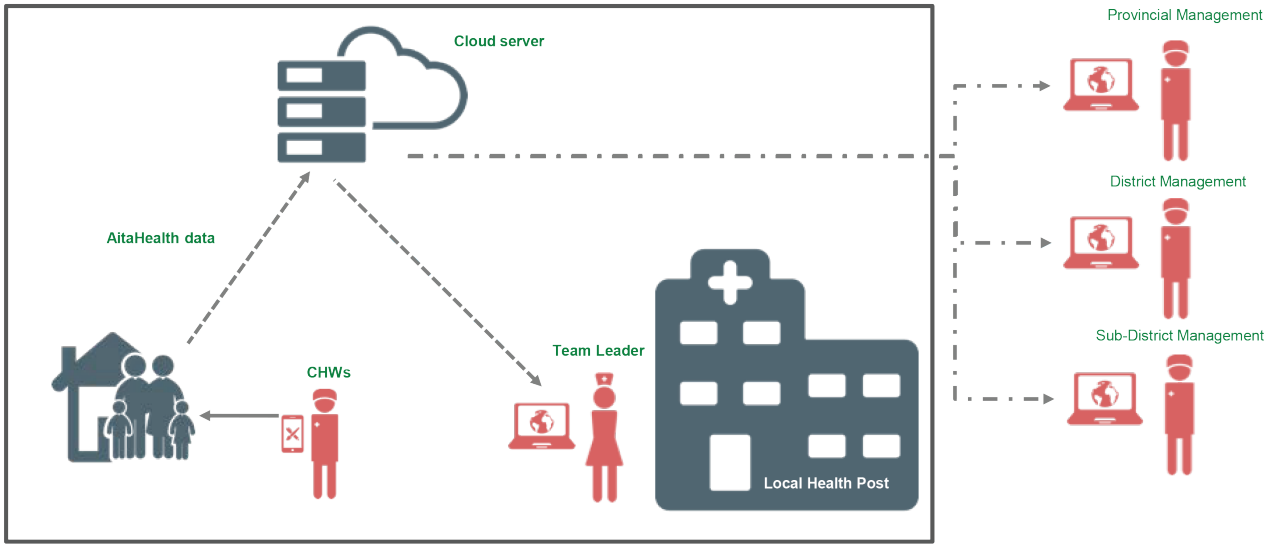
Individuals in the University's nine faculties play an important role in communicating information about potential commercial developments to the TTO and the Commercialisation Office. Deans have been requested to identify and empower individuals in their faculties, and to serve as a contact point between the TTO and the Commercialisation Office, on the one hand, and researchers who wish to explore potential commercialisation projects, on the other.

Commercialisation success stories

This issue of *TTO News* features a number of commercialisation success stories at the University of Pretoria:

- **AitaHealth:** a mobile application that brings health care into people's homes, empowering community health workers to deliver preventative care on a home-based level.
  Inventors: *Prof Jannie Hugo and Prof Tessa Marcus*
- **Ultra-high strength grid inlets:** a method of manufacturing a closure member of cementitious material to replace steel grid inlets.
  Inventors: *Prof Elsabé Kearsley and Hendrik Mostert*
- **Skin-tone invention:** the development of products to improve skin tone, based on the active ingredients in South African indigenous plants.
  Inventors: *Prof Namrita Lall, Marco De Canha, Prof Ahmed Hussein, Elizabeth Mogapi and Prof Indreus Moodley*
- **Black Impala:** a method to detect polymorphism associated with the black colour variant, providing a specific genetic test for this very sought-after trait.
  Inventors: *Dr Cindy Harper, Prof Alan Guthrie and Susan Miller*
- **The Rhinoceros Index System (RhODIS®):** a project that involves the microchipping and DNA testing of rhinos to develop a DNA database of South African rhinos to curb poaching.
  Inventors: *Dr Cindy Harper and Prof Alan Guthrie*
- **Mushroom casing soil:** the development of a unique, 100% natural, cost-effective, eco-friendly soil that can replace imported peat soil to allow for sustainable mushroom production.
  Inventors: *Prof Lize Korsten, Dr Linda Meyer and Ané van Heerden*
- **HearZA:** a novel hearing screening mobile application.
  Inventors: *Prof De Wet Swanepoel and Dr Herman Myburgh*

Bringing health care into people's homes



Mobile technology has taken centre stage globally. There is a mobile application (app) for just about everything. Mobile apps are also playing an ever-increasing role in health care and have a profound impact on people's lives when designed and integrated properly.

One such product is AitaHealth, a mobile app that makes it possible to take health care into people's homes. This app was developed by Prof Jannie Hugo, Head of the University's Department of Family Medicine, and his team in the Faculty of Health Sciences. It is an intelligent android application that empowers community healthworkers to deliver comprehensive care services on a home-based level. It supports both administrative and clinical decision-making in real time.

According to Prof Hugo, "with the re-engineering of primary health care in the run-up to the implementation of National Health Insurance (NHI), we were given the opportunity to consider how we could develop primary health care".

So, how does it work? The AitaHealth workflow starts with the registration of the household and all its members. The health worker completes a triage assessment for each household member. Thereafter, there is an overall assessment of the household's living environment. Based on the outcomes of the triage assessment, follow-up visits are scheduled and prioritised, based on a predefined clinical decision support process. The assessment covers the following health conditions: general health (sensory and performance/activity), oral health, chronic/non-communicable diseases, tuberculosis, reproductive health, HIV, cancer, violence, sexual assault, accidents, injury and any vital information. According to Prof Hugo, community health workers play an important role. Even though they are not trained clinicians or professionals, they understand the people in their communities and have an ongoing, long-term relationship with them.

During the development process, the team had the challenge of analysing a large amount of data. They collaborated with a group of actuarial scientists at the health care organisation Wellnicity to analyse the data quickly and in a more sophisticated way.

AitaHealth established a partnership with Synaxon, the developers of a practice-based data system, to incorporate a clinic-based data system as a central point for all the data. This partnership made it possible for the team to register the name AitaHealth, which belongs to the University of Pretoria, and is delivered in partnership with Mezzanineware.

Prof Hugo says that AitaHealth makes early detection possible, especially for people who do not have access to traditional health care services. "It has become clear that those who really need health care are the least likely to have access to it or to actually go to a clinic, especially if they have previously had negative experiences at a health care facility."

Ultra-high strength concrete revolutionises infrastructure development

The development of an ultra-high strength concrete mixture has been a research focus of the University's Department of Civil Engineering for a number of years. This research is also linked to the emphasis of the Faculty of Engineering, Built Environment and Information Technology on smart cities and transportation.

As a research focus in this department, successive groups of postgraduate students have worked on enhancing the properties of concrete mixtures through the experimental investigation of which additives would result in the strongest concrete mixture to be used for construction, as well as for strengthened road pavements, trench covers, stormwater kerb inlets and similar structures.

Prof Elsabé Kearsley from this department is supervising this research, and registered a patent related to the invention of an ultra-high strength cementitious material in 2009. According to Prof Kearsley, this invention is the outcome of about 20 years of postgraduate research in the Department. "What is significant about this ongoing research is that we are focused on finding an application in industry for our students' research to ensure that it is more than just an academic exercise, but impacts on the lives of individuals."

The specialised materials testing that forms part of this research takes place in the Department's Concrete Laboratory, which is equipped to conduct both applied and basic materials research. One of the outputs of this research has been the use of high-strength steel fibres to reduce the required thickness of concrete pavements and the manufacture of ultra-thin reinforced concrete panels. As the resulting product is stronger than traditional concrete, it has less bulk, which has cost-saving implications for the client.

The research team is busy with two applications of this innovative high-strength cementitious material. The first is the development of concrete grid inlets to replace traditional steel inlets. The second is the manufacture of very thin concrete panels that can be used for the cladding of buildings or the construction of prefabricated structures to replace the asbestos panels that were used in the past. The criteria for these products were that the concrete grid inlets should have the characteristics of steel, while

the concrete panels should contain all the qualities (in terms of strength) of asbestos in order to make them comparable to this material in their use, and therefore competitive in the market as a replacement product.

A problem that was identified with the use of steel grid inlets for stormwater drainage was that they were often stolen, vandalised or damaged by heavy vehicles driving over them. The research team therefore investigated the possibility of using its steel-reinforced concrete mixture to construct grid inlets that had little second-hand value, and would not be damaged as easily as the steel structures. These concrete grid inlets have now been perfected, and are ready for commercialisation, once a suitable licensee has been identified.

The second application was initiated to provide a product for use in prefabricated buildings that would not break easily, and did not have the health hazards that characterised the asbestos panels that were used in earlier years. The manufacture of these panels is now past the experimental phase, and prototypes are currently being manufactured. The first use of these panels for the cladding of a building could be their use in the University of Pretoria's new Mapungubwe Museum, which is to be opened later in the year.

According to Prof Kearsley, these inventions, which emanated from very high-quality experimental research, represent the development of state-of-the-art technology that can be transferred to local communities. The ultimate intention of the researchers is for these products to be manufactured locally using materials that are inexpensive and readily available to generate an income for the communities themselves. An example of an application for the concrete panels is to use them in the superstructures of ventilated improved pit (VIP) latrines. In the process, the University will have succeeded in its objective of being locally relevant and making an impact on the country's economic development.

Prof Kearsley supervising the research into ultra-high strength concrete in the University's Concrete Laboratory.

From medicinal plants to cosmeceuticals

A range of beauty products that is being marketed under the trademark Kalahari™ originated in the research laboratories of the Department of Plant Sciences. This is one of several success stories of the commercialisation of the intellectual property of the University of Pretoria, and forms part of a series of inventions from the research team of Prof Namrita Lall.

Prof Namrita Lall with some of her products.

South Africa's plant diversity is the third largest in the world, and represents a wealth of untapped potential for medicinal and cosmeceutical purposes. Of the 3 000 recognised medicinal plants in South Africa, only 45 species have been commercialised. Much of the research of Prof Lall and her team is based on the traditional knowledge and indigenous plant resources that have been used by communities for centuries. The focus is on the identification of plant species with biologically active compounds, and the characterisation and standardisation of traditional recipes for reformulation as medicines and cosmetics.

According to Prof Lall, the country's indigenous flora can revolutionise the cosmetics industry through the development of cosmeceuticals (cosmetics that have a pharmaceutical effect in the same way as topical medicines do). The actives that her research team have developed into a range of cosmeceutical products are diverse and include six inventions.

The invention that forms part of the Kalahari™ range entails a skin depigmentation composition, which includes a semi-pure fraction of *Ceratonia siliqua*, commonly known as the carob tree. This active is used for the cosmetic treatment of dark areas on the skin. Another invention that is ready for commercialisation relates to the use of a purified fraction extract of *Greyia Radlkoferi*, commonly known as the Natal bottlebrush, for an application for even skin tone.

A number of other products have also resulted from the team's research, and The Technology Transfer Office hopes to source licensees from the South African cosmetics industry to produce these actives on a commercial scale as well, for use in local and global cosmetics product development.

A sunscreen is being developed from extracts and compositions of *Helichrysum odoratissimum*, known colloquially as everlastings. This product also has properties for the prevention and treatment of skin cancers.

A product for acne-prone skin is being developed by exposing plant material obtained from the *Leucosidea sericea* plant, known colloquially as oldwood, to a solvent to recover an extract with acne-inhibitory activity and skin hydration capabilities. This product also has antibacterial, anti-inflammatory potential.

A product with anti-ageing properties is being developed from a plant extract belonging to the Myrsinaceae family, known as African boxwood. This product exhibits inhibitory activity against the elastase enzyme.

A product that is effective in killing the oral bacteria that causes periodontal diseases is being developed from an extract of *Heteropyxis natalensis*, commonly known as the lavender tree. "Ideally, this would result in a toothpaste containing an indigenous herbal extract to help keep teeth healthy," explains Prof Lall.

These products have a competitive advantage over existing products as they are safe, more effective and work topically on the problem area. They have gone through extensive clinical studies, as well as numerous *in-vitro* studies to confirm their safety for human application.

The work of Prof Lall is not restricted to the laboratory. It is also benefitting indigenous communities. Under the guidance of the Agricultural Research Council (ARC), a community in Mamelodi, east of Pretoria (including an indigenous

knowledge holder), has been involved in cultivating plants that could potentially be used for medicinal or cosmeceutical purposes. "A number of farmers have already received basic training on cultivation from the ARC, and a greenhouse has been established. We plan to erect a warehouse and drying facilities at the site to enable the community to beneficiate the plants themselves by harvesting, drying and packaging them," she says. New cultivation technologies that have been developed will be transferred to the farmers. This will capacitate this group of farmers even further. "It is hoped that this site may ultimately be an outlet for the final product, where community-branded cosmeceutical and pharmaceutical products may be sold through the farmers," she explains.

The key national benefit of this project is that it will bridge the gap between farmers, researchers and customers. Communities have few opportunities to develop local indigenous crops due to the inability of researchers to transfer their knowledge to the market and create a demand for farmers' crops.

The University has signed an agreement with the Department of Environment Affairs that a percentage of the profit that the University makes through the commercialisation of products that have been developed through bioprospecting will revert to the Department's Bioprospecting Trust Fund, so that the South African community can also benefit from the University's intellectual property.

Prof Lall and her team are also investigating the development of an active from indigenous medicinal plant species that could be used as complementary medicine to counter the side effects of conventional tuberculosis (TB) and cancer therapy, and which could be given in combination with conventional drugs as an adjuvant from ethnobotanically selected plants. This research is further evidence of the impact of academic knowledge on the lives of individuals.

About Prof Namrita Lall


Prof Namrita Lall.

Prof Lall's work has been widely recognised both nationally and internationally. In 2014, she received South Africa's highest honour for achievements in the international arena that have served South Africa's interests – the Order of Mapungubwe – from President Jacob Zuma. She has also been placed on the list of the top one percent of publication outputs in pharmacology and toxicology of the international Essential Science Indicators (ESI).

She has received international recognition for her research into the potential of medicinal plants for pharmaceutical and cosmeceutical purposes. In 2016, she was awarded the Research Chair in Indigenous Knowledge Systems by the National Research Foundation/Department of Science and Technology. She also received second prize in the national Gauteng Accelerator Programme (GAP) innovation competition, which identifies emerging technology entrepreneurs for incubation and start-up.

In March 2017, she received the Biotech Fundi Lifetime Achievement Award of the Gauteng Department of Agriculture and Rural Development. This award recognises individuals who have made a significant impact on the biotechnology sector in Gauteng.

The community nursery in Mamelodi where plants are cultivated for cosmeceuticals and pharmaceuticals.

The commercial implementation of research from the Veterinary Genetics Laboratory

The Veterinary Genetics Laboratory (VGL), hosted in the Faculty of Veterinary Science on the Onderstepoort Campus, has made great strides towards the commercial implementation of veterinary genetics research with two major projects that are making a difference in the lives of wildlife management professionals. These are the RhODIS® and Black Impala projects.

This laboratory specifically focuses on applied veterinary genetics research that can be used to develop tests and protocols for application in the service industry. This comprises DNA profiling and parentage testing, forensic DNA testing in animals, testing for specific genetic diseases and traits in animals, genotyping for population analysis and some pathogen testing of equines via the laboratory's association with the Equine Research Centre in the Faculty.

RhODIS®

The Rhino DNA Index System (RhODIS®) project was initiated to help with the plight of the rhinoceros amidst the rise of poaching incidents in South Africa. The project functions through the collection of DNA samples of rhinos from across the country to create a database using the unique DNA profiles of individual rhinos. The goal is for all rhinos to be on the system in an attempt to ultimately deter poachers and assist in forensic prosecutions by linking rhinoceros horns to poaching incidents.

RhODIS® was first used in a rhino poaching case in 2010 and resulted in a Vietnamese citizen being sentenced to 10 years imprisonment for having the horns of poached rhinos in his baggage when he was apprehended at OR Tambo International Airport.

Officials from the Department of Environmental Affairs, provincial authorities, police services and the legal profession have been trained to collect rhino DNA samples using the RhODIS® kits.

These kits ensure that samples are collected following chain of custody procedures. The power to trace horn back to the poaching of a specific animal is increasing as more rhino DNA profiles are being added to the database.

eRhODIS™ has been developed as an adjunct for RhODIS® to aid in the collection of samples and information relevant to the RhODIS® project. eRhODIS™ is an android-based app that supports the collection of field data and is used with the kits to ensure that field data is accurate and immediately available in electronic format to the laboratory and the authorities. DNA samples are also collected from rhinoceros horn stockpiles to create an inventory of the horns.

Black Impala

The VGL recently identified the mutation responsible for the black phenotype in the impala and has developed a test for this mutation. The test makes it possible to identify carriers or splits for the black variant. The black variant is carried as a recessive mutation and carriers do not express black in the coat, but appear as normal red impala.

The black impala mutation test provides wildlife breeders with the guarantee that their breeding stock carries the mutation, which makes it possible to select high-quality carriers from a wider genetic pool at a lower cost. Red offspring from two carrier matings can be tested and the wild types (non-carriers) removed from the breeding herd.

The test will also make it possible to determine the prevalence of the black mutation in the wild impala population, which will have direct implications on the role and management of these colour variants in the natural population.

Demonstrating the mushroom casing soil.

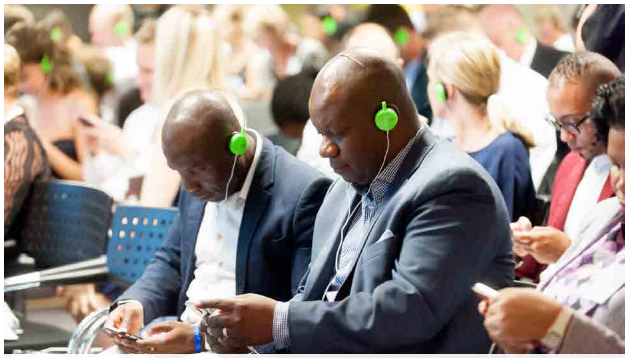
Reaping, sowing and growing with mushroom casing soil

Since the development of pith mushroom casing soil in 2014, this invention has gone from strength to strength. The exclusive rights for its commercialisation have been given to MABU Casing Soils (Pty) Ltd, which collaborates with various organisations to develop and optimise this technology, in return for which the University receives royalties from the expanding project. This company, with Dr Linda Meyer as developer and managing director, and Ané van Heerden as director, has now grown from an initial staff complement of 12 to 42 employees today, including the head of production, Pierre Prinsloo.

"Over the past two years, we have realised that the company cannot rely on mushroom casing soil alone," says Dr Meyer. As a result, we have started doing trials on seedling and plant-growing mediums. Following successful trials, MABU has now started supplying substrates to the tobacco, citrus, forestry and vegetable industries. An interesting development has been the good growth of moringa seedlings in one of MABU's developed plant mediums. The moringa plant is one of the most nutrient-rich plants in the world and has a myriad of uses. The exceptional plasticity of the substrate helps the seedling roots keep their original form when shipped, helping to reduce shipping costs.

Mushroom growers who have discovered the benefits of MABU's mushroom casing soil include Chanmar Mushrooms near Pretoria, Tropical Mushrooms in Magaliesburg, Melody Mushrooms in Hartbeespoort, Boland Mushrooms in Rawsonville and Highveld Mushrooms near Krugersdorp. In November 2015, MABU started exporting casing soils to Namibia, and since June 2016, it has been in close collaboration with the renowned peat organisation, BVB Substrates, in The Netherlands to develop a pith and peat mixture that supports optimal mushroom production. Feedback on trials done by Dutch farmers indicates good yields of quality mushrooms.

MABU is currently in the process of applying for development funding from the Technology Innovation Agency (TIA). The Plant Growing Medium Technology Development Project will enable MABU to erect more greenhouses in which to perform small trials, as well as the equipment needed to produce various substrates of a specialised quality.



Delegates at the launch test their hearing with the app.

Revolutionary hearing app detects hearing loss

A smartphone application (app), known as hearZA™, has been developed by researchers in the University's departments of Speech-Language Pathology and Audiology, and Electrical, Electronic and Computer Engineering.

It detects hearing loss and links patients to health services. It was launched on 2 March 2016 at the Innovation Hub in Pretoria as South Africa's national hearing test. It was funded by the Technology Innovation Agency (TIA) and is used by organisations such as the World Health Organisation (WHO), Partners in Health, the United States Agency for International Development (USAID) and the London School of Tropical Hygiene and Medicine.

Millions of South Africans suffer from debilitating hearing loss. Early screening is vital, but represents a challenge in areas where rural populations lack access to medical experts. The developers have used this app to screen close to 10 000 children in more than 2 400 early childhood development centres across Mamelodi. A larger roll-out will see 70 000 people in underserved areas of Tshwane being tested for hearing loss in the next 18 months.

The app is compatible with both Android and iPhone operating systems, and takes less than three minutes to complete. After users have hit the "start test" button, they have to identify 23 spoken digit triplets masked by white noise. The test therefore simulates a common real-life challenge. If a user fails the test, the app uses geolocation to provide information on the nearest health care provider. Users can also choose to be contacted, and their details are stored on a referral system.

Seed funding secures commercialisation

Nowadays, higher education institutions are developing mechanisms to combine their core purpose with research commercialisation. In South Africa, this process is sometimes hampered by the absence of early-stage seed funding and commercialisation skills. In response to this, UP partnered with the Technology Innovation Agency (TIA) to bridge the gap between its research outputs and commercialisation. The following projects have received funding over the past two years:

Round 1 (March 2015)

- Development of DNA-based immunocontraceptive vaccines: Prof Louis Nel
- Exploiting novel bioactive proteins in agricultural crop and pharmaceutical product development: Prof Don Cowan
- A novel compound to control Candida and other infection: Prof Kobus Eloff

Round 2 (November 2015)

- A small-scale thermal Bryton cycle: Dr Willem le Roux
- Smartphone-based ear and hearing diagnosis: Dr Herman Myburgh
- Polyolefin fabrics as slow release for insecticides: Mr Mthokozisi Sibanda
- Diagnosis, prediction and prognosis of asthma: Mr Moses Kebalepile

Round 3 (March 2016)

- Emergency cooling using nanofluids spray: Prof Mohsen Sharifpur
- Rotor blade conditioning-based maintenance technique development: Mr Dawie Daimond and Prof Stephan Heyns
- Prevalence of blue tongue virus serotypes in South Africa: Prof Estelle Venter
- Mobile application for the acquisition and recording of information at crime or death scenes by forensic officers: Prof Gert Saayman
- Development of an anthelmintic compound for the veterinary management of *Haemonchus contortus* infections in sheep: Prof Vinny Naidoo

Round 4 (September 2016)

- The development of insecticidal polyethylene mesh: Prof Walter Focke
- The development of an adjuvant for TB patients from a South African plant: Mr Carel Oosthuizen and Prof Namrita Lall
- Continuous metal electrolysis: Mr Ryno Pretorius and Prof Philip Crouse
- The development of a multi-component non-living vaccine against anthrax and clostridial diseases: Dr Henriette van Heerden

Round 5 (February 2017):

- The development of chemopreventive sunscreens from South African plants for the prevention of skin cancer: Ms Danielle Twilley and Prof Namrita Lall
- Flavour-scavenging polymeric packaging: Prof Elna Buys
- Phosphate solubilising biofertilizer: Prof Nico Labuschagne
- Product design and development: distributed differential fault detection and identification protection relay for the DG-integrated distribution system: Mr Patrik Manditereza and Prof Ramesh Bansal

This funding amounted to almost R13 million within the UP seed funding portfolio for 28 projects. Eight of these have already been concluded. It is hoped that this seed funding will increase the commercialisation rate of viable intellectual property of South African technologies emanating from higher education institutions.