TTO NEWS

Advocating for the safety of hand sanitisers

National contract increases access to mobile hearing tests

UP inventions gain recognition in innovation competitions

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Department of Research and Innovation

Departement Navorsing en Innovasie
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Letter from the editor

Despite the restrictions posed by the COVID-19 pandemic and subsequent nationwide lockdown, the Technology Transfer Office (TTO) managed to achieve its objectives of assisting researchers with their invention disclosures and filing patents. It also continued to raise awareness about technology transfer and the commercialisation of research.

Highlights during 2020 included the awarding of a national contract to the hearX Group, the company formed to commercialise mobile hearing tests developed by UP researchers; and the development of a natural antimicrobial textile by UP researchers for use in hospitals in personal protective equipment (PPE).

The University's inventions gained recognition at the annual Gauteng Accelerator Programme (GAP) Innovation Competition, where UP researchers were part of the teams that won first and second prizes, respectively.

Research on natural products conducted at the University of Pretoria also received attention when findings revealed their potential to inhibit COVID-19. This research contributed to knowledge about coronavirus pathogenesis and natural products.

Finally, with support from the TTO and UP's TuksNovation technology incubator, two student teams earned first place in two categories of the City of Tshwane's first Inter-university Innovation Challenge.

We invite our researchers to contact the TTO for advice to turn their inventions into products that can be commercialised.

Adv Lawrence Baloyi
Head: Innovation and Contract Management

National contract increases access to mobile hearing tests

The hearX Group, the company that was formed to commercialise mobile hearing tests developed by UP researchers, has signed a contract with a national medical aid scheme, making the mobile hearing technology available to a wider client base.

The research on which this technology is based emanated from a multidisciplinary team of researchers from the Department of Speech-Language Pathology and Audiology in the Faculty of Humanities, and the Department of Electrical, Electronic and Computer Engineering in the Faculty of Engineering, Built Environment and Information Technology.

The initial technology that was developed comprised a free mobile application, hearZA™, which allowed users to test their hearing on any smart device and referred them to their nearest healthcare provider if the test detected a hearing problem. Since its launch in 2016, nearly 60 000 South Africans have tested their hearing through this invention.

The application has been trademarked and licensed to hearScreen (Pty) Ltd, which was subsequently founded with the main mission of providing hearing health through the use of digital health solutions. Since the launch of hearZA™, 11 innovative technologies have been added to the company's suite of products, including hearScreen® and hearDigits™.

The hearScreen® app is a world-first smartphone screening audiometer. During 2019, it was used to screen the hearing of people in underserved communities in Tembisa, Khayelitsha and Mitchell's Plain to detect and improve the hearing impairments of school pupils.

These projects alone reached over 20 000 children who were screened for hearing loss. To date, over one million hearing tests have been conducted across 39 countries. These digital hearing solutions are impacting on the

Congratulations @LexieHearing for winning Best Health Solution at #MTNAppAwards! #RecodetheWorld

lives of thousands of South Africans, increasing awareness, screening and subsequent care.

The hearDigits™ app is a hearing screening widget, which the Discovery medical aid scheme included in its Vitality 65+ offering from August 2020. This partnership with one of the country's major medical aid schemes represents a breakthrough in the company's developmental journey. This innovation has enabled Discovery to increase the access of its qualifying members to hearing healthcare through smart digital solutions.

It is a hearing screening test that measures a person's ability to understand speech in background noise. After undertaking the test, patients receive a risk classification with their screening result and are referred to an audiologist if necessary. As part of the partnership with Discovery, these tests are available at selected pharmaceutical retailers, as well as independent pharmacy clinics that offer Vitality health checks for seniors.

According to Nic Klopper, CEO of the hearX Group, the partnership with Discovery Vitality allows the company to tackle hearing loss more aggressively among seniors, to identify risks early for treatment and to achieve optimal health outcomes.

The hearX Group was also awarded the MTN App of the Year Award for 2020 in the category Best Health Solution for the Lexie Hearing App. This app allows customers who have purchased a pair of Bluetooth Lexie hearing aids to customise their hearing aids to match their unique hearing profile. The short, clinically validated hearing check on the app automatically programmes hearing aids based on the results. It also includes an easy-to-use, animated, step-by-step instruction guide.

The company is certainly honouring its commitment to provide hearing health to everyone, everywhere, through the use of digital health solutions.

Researchers develop material for use in PPE

Researchers in the Institute of Applied Materials in the Faculty of Engineering, Built Environment and Information Technology, Mthokozisi Sibanda and Prof Walter Focke, have been contributing to malaria control through several commercialised inventions. Now, they have made use of the same technology to develop a natural antimicrobial textile for use in hospitals.

The premise of pivoting into COVID-19 personal protective equipment (PPE) manufacture came from the need to locally manufacture PPE.

African Applied Chemicals (AAC), the company that was established to commercialise the bi-component polymer yarn with a volatile mosquito-repellent active and sheath layer, was in a good position to respond to the call for personal protection clothing, as the fibres it produced could be converted into a non-woven textile. In addition, a non-woven manufacturing machine was available at a closed-down facility formerly occupied by the Council for Scientific and Industrial Research (CSIR) in Port Elizabeth.

The company negotiated a three-year lease contract with the CSIR to use the non-woven conversion facility and proceeded to recommission the facility. In a first production run, AAC converted its fibres into a non-woven textile that could be used for PPE manufacturing. The company is currently engaged in processes with the South African Bureau of Standards (SABS) and the South African Health Products Regulatory Authority (SAHPRA) for product registrations for isolation gowns.

While this process is running, AAC is preparing its factory for the mass production of non-woven textile material. This includes training two new personnel to run the non-woven facility in Port Elizabeth. The company aims to be ready for market by April 2021.

The technology on which this innovation is based is designed to impregnate volatile liquids directly onto the textiles during the production process in such a way that they are slowly released. The method to control the release of the volatile actives is cost-effective compared to other slow-release techniques. The textile can be cold washed up to 25 times or kept under room conditions for up to six months without losing the effect of the volatile active.

Sample of locally produced non-woven textile.

Research on natural products reveals their potential to inhibit COVID-19

Researchers from the University's Department of Plant and Soil Sciences in the Faculty of Natural and Agricultural Sciences, under the supervision of Prof Namrita Lall, have published a widely viewed article in the peer-reviewed journal *Frontiers in Pharmacology*, which has contributed to knowledge about coronavirus pathogenesis and natural products.

The paper, titled "Anti-SARS-CoV natural products with the potential to inhibit SARS-CoV-2 (COVID-19)", collates information regarding the potential of plants and natural products to inhibit coronaviruses and various targets associated with the virus itself in humans and to highlight known drugs that may have potential activity against severe acute respiratory syndrome coronavirus (SARS-CoV-2), which is known to cause COVID-19.


Prof Namrita Lall

Due to the similarity in the RNA genome, main proteases and primary host receptor between SARS-CoV and SARS-CoV-2, the research team reviewed plants and secondary metabolites that have shown activity against SARS-CoV.

Numerous scientific reports on the potential of plants and secondary metabolites against SARS-CoV infection were found, providing important information on their possible activity against SARS-CoV-2.

Based on current literature, 83 compounds have been identified with the potential to inhibit COVID-19.

Plants and their secondary metabolites, with activity against targets associated with SARS-CoV infection, could provide valuable leads for the development of drugs for the novel SARS-CoV-2.

The article briefly discusses the prospects of using computational methods to screen secondary metabolites against SARS-CoV targets and highlights the drawbacks.

Finally, it examines plants traditionally used in southern Africa for symptoms associated with respiratory viral infections and influenza, such as coughs, fever and colds. However, only a few of these plants have been screened against SARS-CoV.

Natural products play a prominent role in discovering novel therapeutics to mitigate the current COVID-19 pandemic. However, further investigations regarding *in vitro*, *in vivo*, pre-clinical and clinical phases are still required.

This article sparked much interest in the scientific community, and has been viewed more than 1 500 times.

Hand sanitisers are part of life:

But, are they safe?

Researchers at the University of Pretoria have played an important role in demystifying hand sanitisers.

In the Faculty of Natural and Agricultural Sciences, Prof Lise Korsten, a professor in the Department of Plant and Soil Sciences, Dr Willeke de Bruin, a postdoctoral fellow in food safety assessment, and Dr Tracy Muwanga, a postdoctoral fellow in food systems law, have advocated for improved public awareness and increased government regulation of hand sanitisers to ultimately safeguard consumers.

The World Health Organisation (WHO) has encouraged meticulous hand hygiene as a preventative measure against contracting COVID-19. It recommends that hand sanitisers be used when water and soap are not readily available, and has provided guidance on its formulation and use. Hand sanitisers should comprise ethyl alcohol (ethanol) or isopropyl alcohol (2-propanol) as the active ingredient, in addition

to inactive ingredients such as water, glycerol and hydrogen peroxide. The secondary ingredients act as a diluent, a moisturiser and an antibacterial, respectively.

However, the effective regulation of hand sanitisers remains a challenge globally and, more specifically, in South Africa. The country has no regulatory system in place to assess alcohol-based hand sanitisers that are intended for household use. Companies have been required to voluntarily comply with the national standard on disinfectant alcohol-based hand rubs, but this is woefully inadequate.

The group of scientists has since engaged in several radio, television, newspaper, magazine and social media platforms to inform the public and centralise the discussion around the quality and safety of hand sanitisers. A current consumer survey is underway to determine general public perceptions around hand sanitisers. A recent chemical analysis of 60 products obtained from formal and informal markets revealed that only 39 complied with the WHO's minimum prescribed alcohol content of 70%. Seventeen of the products made false claims about their supposed alcohol content.

Future research should focus on the long-term impact of developing hand eczema and other skin conditions, as well as its impact on skin microflora due to frequent use.

The following recommendations remain a key priority:

- Labelling requirements should be standardised and enforced, indicating an alcohol content of at least 70%, a list of the active and inactive ingredients and the adverse effects they may cause, instructions for use, mandatory warnings, the batch code and expiry date, and the full address of the manufacturer.
- Public awareness programmes should be launched about correct hand hygiene techniques and the safe use, storage and effectiveness of hand sanitisers.
- Products that do not comply with specifications or are not properly labelled should not be sold or provided in public spaces.
- A national task team should be established to investigate the regulatory framework and current levels of compliance.
- Importers of raw material used in the manufacture of hand sanitisers and ready-to-use formulated products should be regulated more effectively, and products exported from South Africa to neighbouring countries should be better monitored.
- Environmental health inspectors and the National Regulator for Compulsory Specifications should be enabled to more aggressively track down fake products and have them confiscated and destroyed.

IN MEMORIAM

Prof Anton Stoltz

The University, as well as the national and provincial medical community, mourned the passing of Prof Anton Stoltz, who had dedicated himself unconditionally to relieving the burden of infectious diseases. Prof Stoltz worked tirelessly as a leader in the fight against the COVID-19 pandemic, despite facing personal setbacks in his own health.

He was actively involved in sharing his expertise of infectious diseases and resources to fight COVID-19 across Gauteng, especially in the Ekurhuleni and Tshwane district health services. Among his other responsibilities, Prof Stoltz was mandated by the CEO of Steve Biko Academic Hospital to lead and direct the management of its COVID-19 efforts.

Among other prestigious positions, Prof Stoltz served as UP's Head of the Division of Infectious Diseases and Internal Medicine and was a principal medical researcher for the Medical Research Council. During his final months, Prof Stoltz was involved in a major breakthrough in revolutionising the way TB is detected through the invention and application of a 3D-printed insert added to simple face masks. This new approach has the potential to detect millions of currently missed infections across the world. A week before his passing, he contacted the TTO to confirm that he would be submitting three invention disclosures aroung COVID-19 in due course. This could unfortunately no longer happen.

Commercialising inventions through licensing

The dominant route for the commercialisation of intellectual property at UP is through licensing. Three new licence agreements were signed in 2020 to commercialise inventions emanating from the research of the University's scientists.

Botanica Natural Products

This entailed four inventions:

- **Extracts and compositions of Helichrysum odoratissimum for the prevention and treatment of skin cancers**
  This invention relates to an ethanol extract from the leaves of the South African plant. The extract of the invention has been shown to have *in vitro* cytotoxic activity against A431 (epidermoid carcinoma) cells, as well as antioxidant activity against free radicals that can cause cancer.
- **Buddleja saligna**
  This invention relates to the anticancer activity of a South African plant and a compound mixture that has been isolated from the plant against melanoma.
- **Heteropyxis natalensis**
  This invention relates to the use of plant extracts prepared from leaves and twigs of an indigenous South African plant known as *Heteropyxis natalensis* on human enamel cuttings to prevent the adherence of bacteria (*Streptococcus mutans, Prevotella intermedia* and *Actinomyces israelii*).
- **Leucosidea sericea**
  This invention relates to investigation of the activity of *Leucosidea serecia* against acne-causing bacteria, the propionibacterium acnes.

CellSemi

- **Second-order all-pass delay network in CMOS (also known as tuneable active second-order all-pass network)**
  The specific focus of this invention is an active on-chip millimetre second-order all-pass network in a 130 nano-meter silicon-germanium (SiGe) BiCMOS technology node with an effective bandwidth of 40 Ghz, peak to nominal delay of 62 ps and a magnitude ripple of 1.4 DB. It is a 5G-related technology.

Letago

- **Shoot extracts and compositions of Euclea natalensis for immune modulation and hepato protection**
  This invention relates to an ethanolic extract from the shoots of the South African plant *Euclea natalensis*. It can directly and/or indirectly combat tuberculosis by means of immunomodulatory activity.

A new license agreement will be signed in due course for an invention titled "Anti-acne pharmaceutical compositions". It relates to the antibacterial activity of *Plectranthus aliciae* against acne-causing bacteria, *Propionibacterium acnes*. Clinical studies confirmed that the extract was a non-irritant and was found to be effective against blackheads, whiteheads, comedones, pustules and cysts between 14 to 28 days of consecutive use twice daily.

First Inter-university Innovation Challenge delivers novel solutions

The City of Tshwane's first inter-university innovation challenge was presented in collaboration with the University of Pretoria (UP), the Tshwane University of Technology (TUT), the University of South Africa (Unisa), the Innovation Hub, TuksNovation (the University's technology incubator and accelerator), Eskom, the Technology Innovation Agency (TIA) and Universities South Africa (USaf).

The objective of the challenge for the City of Tshwane was to find innovative solutions that can solve the current problems Tshwane is facing, focusing on transport, revenue collection, waste management, electricity and energy.

The challenge presented students from the respective universities the opportunity to showcase their innovative solutions to improve the service delivery challenges through which the quality of life of Tshwane residents can be improved.

Pitching rounds were held at each university from which finalists were identified to represent their university.

Ten student start-up companies from UP were identified as finalists, and two of the teams emerged as winners of their respective categories:

- **Revenue Collection:** Quxeco, with founders Kanayo Asomugha, Nkosinathi Mpembe and Taleah Ayob, presented a solution to assist Tshwane residents calculate how much money they will spend monthly for electricity usage to avoid paying interest on outstanding municipality bills.

- **Transport:** Adaptive Traffic Light Management, with founders Brighton Zongondi and Audrit Mayenetja, presented a solution for collecting traffic data at major intersections in the city to provide the traffic control centre with live data to engage with an algorithm to determine new cycle times for traffic lights.

The prizes received by the winners included business support and protoytpe management, which will be closely managed by TuksNovation.

Congratulating one of UP's winners, Brighton Zongondi of Adaptive Traffic Light Management (centre), is Thabang Qumza of the TTO (left) and Councillor Randall Williams of the City of Tshwane. (Photograph: City of Tshwane)

Researchers impress with their Biosciences innovations at GAP Awards

Two of the University's researchers, Prof Tahir Pillay of the Faculty of Health Sciences and Prof Celia Abolnik from the Faculty of Veterinary Science, were part of the teams that won first and second prize, respectively at the annual Gauteng Accelerator Programme (GAP) Innovation Competition in the Biosciences category.

This annual competition is run by the Innovation Hub and Emory University's Goizueta Business School, and prizes are awarded in five categories: Bioscience, Medical, Township Economy, ICT and Green Innovation. These categories represent the unique challenges that need solutions in South Africa today.

The competition has been running for 10 years. The annual competition, held in December 2020, coincided with the recent Global Entrepreneurship Week. It aims to help scientists and entrepreneurs to pursue commercially viable opportunities for cutting-edge bioscience technologies by bridging the gap between research and commercialisation. The winners of this competition receive seed funding and support to develop their novel technologies so that they can impact positively on society.

An adjudication panel selected the finalists based on criteria including business strategy, use of technology and societal impact. The winning teams will receive seed funding and incubation services with technical and business mentors and intellectual property lawyers, as well as access to the Innovation Hub's network of industry and government partners.

Low-cost biosensors for use in COVID-19 testing

Prof Pillay

Prof Pillay is Head of the National Health Laboratory Service (NHLS)'s Department of Pathology and the University's Department of Chemical Pathology.

The innovation developed by his research team is aimed at producing nanobodies that are directed against SARS-CoV2 proteins (e.g. spike protein). The research aims to develop both low-cost biosensors and rapid lateral flow immunoassays that work on saliva rather than the uncomfortable nasopharyngeal swabs currently used in COVID-19 tests.

According to Prof Pillay, whose team entered the competition under the umbrella of MikroMab Diagnostics, "nanobodies are small protein molecules that are approximately twice the size of insulin and are derived from single-chain antibodies". The UP team produced a low-cost prototype lateral flow immunoassay rapid antigen test for SARS-CoV2. The business plan is to create a Good Manufacturing Practice (GMP) facility (products produced for medical and pharmaceutical use need to be produced under stringent conditions of quality and control defined by GMP standards specified by the World Health Organisation and other international organisations) for the large-scale production of nanobodies under a UP licence and royalty system.

"A further aspect of the plan is to produce lateral flow cassettes – like a COVID pregnancy-type dipstick test – at a local facility to boost the economy and provide employment. It is estimated that about 10 semi-skilled workers can produce about 2 000 cassettes a day," said Prof Pillay.

While the GAP innovation project is focused on SARS-CoV2, the long-term vision is to establish UP as an innovator for other nanobody-based tests across pathology and laboratory medicine and diagnostic imaging.

"We are humbled and honoured to have been chosen by the panel from the very strong field of finalists. We are grateful for this funding, which comes at a critical time to ensure survival and growth of this start-up project," Prof Pillay said.

Animal vaccines from tobacco plants

Prof Abolnik

Prof Abolnik is the holder of the South African Research Chair Initiative in Poultry Health and Production in the University's Department of Production Animal Studies. She was part of a team, with Dr Maretha O'Kennedy from the Council for Scientific and Industrial Research (CSIR), that won second prize for their work on producing animal vaccines from tobacco plants that are quicker to mass produce. Plant-produced vaccines are more cost-effective than others currently on the market.

Prof Abolnik and Dr O'Kennedy are the co-founders of a future spin-off company, Antigenica. Their innovation makes use of tobacco plants to manufacture virus-like particle (VLP) vaccines that induce robust protective immune responses in animals. "Plant-produced VLP vaccines are highly scalable, more cost-effective to produce, and safer than other products currently on the market. These vaccines can be rapidly updated to match the latest outbreak strains, ensuring optimal protection and preventing the further spread of disease."

They said: "The GAP Innovation Competition was an eye-opening experience for us; we are so excited about the potential of our company to make a difference in animal health and grow our local economy. The seed funding from our prize money will be put to good use in securing the licenses we require and getting our first vaccine to market as soon as possible."

Turning food waste into biodegradable products

Did you know that it was possible to turn food waste into biodegradable products for the food service industry?

Two researchers from the Department of Consumer and Food Sciences, Dr Clarity Mapengo and Humbulani Nekhudzigha, have developed an invention that relates to the production of biodegradable food service items such as cups, straws, plates, forks and spoons using commercially rejected fruit, vegetables and readily available plant extracts (starch).

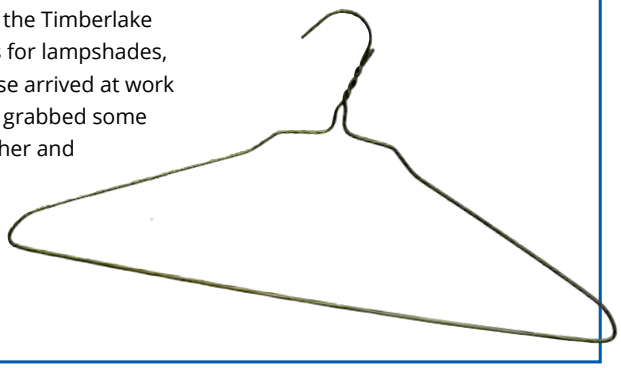
The invention relates to the blending, heat processing, molding and drying of commercially rejected fresh produce composites into rapidly, biodegradable utensils and packages. This solution will intervene with the traditional fresh produce disposal pipeline at producer, processing and retailer level. The purpose is to add value to commercially rejected fresh-produce waste (reducing the volume of waste in landfills) and to ultimately contribute to the reduction of the use of single-use plastics.

This patent was filed in December 2020.

DID YOU KNOW?

Bubble wrap was first invented as a new type of wall paper in 1957. It was invented by American engineer Al Fielding and Swiss inventor Marc Chavannes in a garage in New Jersey. They were trying to create a wall covering with easy-to-hang paper at the back, and easy-to-clean relief plastic in front. The result was a flexible plastic sheet with bubbles, which was not exactly aesthetically pleasing, but rather practical, and proved to be ideal for use as wrapping material. Their invention was commercialised in 1960 by Sealed Air Corporation as a means of protecting fragile objects. People still use bubble wrap today as wrapping material, and enjoy popping the bubbles as a source of amusement.

The wire coat hanger was first invented in 1903 when the Timberlake Wire and Novelty Company, which specialised in making frames for lampshades, had a shortage of coat hooks. When employee Albert J Parkhouse arrived at work late one day, all the coat hooks had been taken. He instinctively grabbed some wire that was lying around, bent two large hoops facing each other and turned the ends into a hook. He hung up his coat and got to work. Timberlake thought that this was a stroke of genius and took out a patent on the construction. The company made a fortune with the coat hangers, while Parkhouse was left with nothing.



Technology Transfer Office
Department of Research and Innovation
Tel +27 12 420 4568