**NEWS RELEASE**

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**Uncovering the hidden risks in our waters**

Endocrine-disrupting chemicals (EDCs) impact the endocrine system in humans and animals. Laboratory and human epidemiological studies show that EDCs have a broad range of effects on the body. And have been implicated in reproductive disorders, thyroid dysfunction, neurological diseases, immune and metabolic disorders and more.

The current South African legislation does not require the screening of chemicals for endocrine disruptive effects before use in our food, cosmetics, household, industrial and agricultural products and pharmaceuticals. It’s these chemicals, along with industrial, agricultural and landfill effluents and sewage which end up in our water resources.

The University of Pretoria’s departments of [Medical Virology](http://www.up.ac.za/medical-virology), [Microbiology and Plant Pathology and Urology](http://www.up.ac.za/microbiology-plant-pathology), and the [Faculties of Natural and Agricultural Sciences](http://www.up.ac.za/faculty-of-natural-agricultural-sciences) and [Health Sciences](http://www.up.ac.za/faculty-of-health-sciences) is working with [Rand Water](http://www.randwater.co.za/Pages/Home.aspx) to help address these potential risks not yet covered by the current legal standards for clean and safe drinking water.

“Biological and chemical contaminants pose a massive health hazard,” comments research lead Professor Fanus Venter. In 2015 13% of South Africa’s population reported water that smelt, tasted bad, was murky or felt was unsafe to consume. Access to clean, disease-free drinking water is a fundamental human right in South Africa’s constitution, and utility companies like Rand Water need to provide safe water even if they have to work with highly-contaminated water sources.

*Discover more background behind the significance of the research on the SA’s water at* [*www.researchmatters.up.ac.za*](http://www.researchmatters.up.ac.za)*.*

**The solution**

The long-term project sees three departments at the University of Pretoria testing the different aspects of water quality to help Rand Water look beyond the minimum legal requirement for water quality. The research teams in these departments provide new data, create new testing methods, and design early potential health warning systems.

“The national water testing standard known as [SANS 241](http://www.ewisa.co.za/misc/FORUMS/WCWaterForum/Meeting2/WaterForumMeeting2PRESENTATIONS/1.2_Blue_Drop_%28BD%29_RPMS_Solomon_Makate_DWA.pdf), defines determinants for drinking water to be considered safe," says research lead Professor Venter. "The standard covers many microbiological and chemical contaminants as well as physical determinants such as colour.” While regular testing for harmful biological and chemical substances should be carried out by all water utilities in South Africa, due to difficulties with finance and governance, it doesn’t always happen.

This ongoing research means Rand Water voluntary tests for a greater number of other potential hazards to human health. Apart from regular testing for viruses, 16/18 S rRNA profiling is used to understanding the bacteria and fungi present in the water system. This ecosystem approach is entirely novel in South Africa,” adds Professor Venter. And it’s not commonplace anywhere in the world. “Most water utilities test for microbial activity using culturing approaches, adding water samples to selective media and testing the bacteria that grow there.”

**The research roles**

[*Professor Maureen Taylor*](http://www.up.ac.za/the-genomics-research-institute/article/1929384/prof-maureen-b-taylor) *leads a group which regularly tests bodies of water for viruses, focusing on viruses such as the hepatitis A virus, norovirus and rotavirus. By detecting specific viruses, we can ensure that water treatment processes are stringent, and advise water utilities of potential process breaches to implement prevention measures. Professor Taylor's research also focuses on the potential risks to public health posed by biological and chemical water contaminants.*

[*Professor Fanus Venter*](http://www.up.ac.za/the-genomics-research-institute/article/1929098/professor-fanus-venter) *has a team which seeks to understand the bacterial ecosystem within the water distribution network between Vereeniging and Secunda. This project will, for the first time, show what bacterial species are present and abundant in this water system, and its changes in response to water treatment, temperature and seasonality.*

[*Professor Riana Bornman,*](http://www.up.ac.za/media/shared/Legacy/sitefiles/file/48/17003/upcsmc/bornman_upcsmcprofile1.pdf) *leads a team looking at the presence and effects of EDCs in the environment. They do this by monitoring ‘sentinel species’, fish or amphibians that exposed to waterborne EDCs. This data provides an idea of the dangers posed by some of the common contaminants in South African water.*

*Professor Bornman’s team conducts bioassays for estrogenic, thyroid and androgenic activity. Screening the aquatic environment enables them to assess the endocrine-disrupting activity. The research team also uses these findings to compile risk assessments for South Africans exposed to harmful chemicals, which can inform policies for addressing the problem at municipal or provincial level.*

**Discoveries**

“We recently found sapoviruses in 80% of wastewater treatment plants (WWTPs) and water sources affected by effluent from these WWTPs in Limpopo,” remarks Professor Taylor. “We have identified several new strains of norovirus and a hepatitis A strain in untreated surface water sources. Although present in very low concentrations, for many intestinal viruses even a small amount of the virus could be enough to cause infection.”

The work by Professor Bornman’s team has identified a significant number of EDCs and endocrine-disrupting metals (EDMs) in Gauteng rivers and other untreated water sources. "Our research suggests that if left untreated, domestic or agricultural use of this water could have both toxic and carcinogenic effects as well as causing endocrine disruption," Professor Bornman adds. “We found that levels were 30 to 450 times higher than acceptable lifetime exposure levels.

Researching the diversity of bacteria in water sources has revealed more than 3,000 bacterial species in water during treatment at Zuikerbosch near Vereeniging and more than 10,000 along the length of the pipeline. “Some of these genera are known to contain potential opportunistic pathogens. ,” adds Professor Venterxxx. “These will not cause disease but could be problematic for immune-compromised individuals, such as the young, elderly, and those with AIDS or other immune deficiencies.”

Another common group of bacteria in the distribution network are members of the genus *Mycobacterium.* Some species of this genus are known to cause skin and respiratory problems in immune-compromised individuals. “It’s likely that this type of microbial biodiversity is present in most drinking water systems in the world,” advises Professor Venter. “It is only because of our work, that we have been able to demonstrate a small and diverse population for the first time.”

Identifying the various bacteria and other microorganisms in South Africa's water supply is a significant step for water quality research. The majority of organisms found in the water supply are harmless or even beneficial, meaning there is no need to remove them from the system. Rather, this research allows water utilities to understand the ecology within the water system, which will help them to develop better management and control strategies and keep on top of emerging pathogens when they do appear.

**The state of South Africa’s water**

The [Department of Water Affairs](https://www.dwa.gov.za/)’ [Green Drop](https://www.dwa.gov.za/dir_ws/gds/) system allows wastewater treatments plants to evaluate performance. In 2013 of the 824 systems that reported their Green Drop status, only 60 received Green Drop status (a score of more than 90%). While this is an improvement on the 40 facilities certified in 2011, it still represents only 7% of all facilities that participate in the programme.

In the same programme, the vast majority of publicly-owned treatment plants rated in a ‘critical state’ (less than 30% compliance and in need of drastic intervention in all aspects of sanitation), and 55% were not within acceptable standards of operation.

A similar system, [Blue Drop](https://www.dwaf.gov.za/dir_ws/DWQR/), is in place for water services authorities and has shown an improvement of 28.2% in South Africa’s overall score, from 51.4% in 2009 to 79.6% in 2014.

However, like the Green Drop rating, only 44 of the 1,036 systems received Blue Drop certification (4%). And overall, the Blue Drop scores have dropped across the country from 2012, where the national score was 87.6%, and nearly 100 authorities achieved Blue Drop certification.

Discover the story in full at Research Matters, the University of Pretoria research website: <http://www.researchmatters.up.ac.za/researcher-projects/view/41>

**Video:**

<https://youtu.be/ZXvHYFOJ66E>

**Infographic:**

<http://researchmatters.up.ac.za/cake-gallery/img/uploads/1474289199_573814.jpg>

**Images:**

<https://www.dropbox.com/sh/7vy72blha97gts4/AACTUW8sx4vSETKrbjLc5ZzVa?dl=0>

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**Notes to Editors**

The [Research Matters](http://www.researchmatters.up.ac.za/) website showcases some of the University of Pretoria’s research and innovation output highlighting the impact of its work on socio-economic development in South Africa, Africa and globally.

Throughout Research Matters you will discover case studies on interesting research projects by University staff, infographics and videos that will provide an overview of high impact projects at a glance, as well as information about various institutes, centres and units.

Research at the University of Pretoria is at the heart of its [long-term plan](http://www.up.ac.za/media/shared/Legacy/sitefiles/file/publications/2012/eng/strategic_plan_v11_13feb.pdf), UP 2025, and its vision to be a leading research-intensive university in Africa, recognised for making a difference. Its progress towards achieving this vision and identity is evident in the diversity of research undertaken in the nine [Faculties](http://www.up.ac.za/faculties) and [Business School](http://www.up.ac.za/gibs-business-school), and in the many [Institutes, Centres and Units](http://www.up.ac.za/institutes-and-centres/).

**About the University of Pretoria/Rand Water partnership**

Rand Water is one of the largest water utilities in South Africa, responsible for supplying 14 million South Africans with drinking water. Rand Water is considered by the Department of Water Affairs as a flagship water utility. Thus, innovations and technical expertise developed by Rand Water and the Rand Water Chairs at the University of Pretoria are passed to other, smaller water utility companies.

The University of Pretoria is one of two local universities to which Rand Water committed more than R6 million towards research. On top of outsourcing regular water quality testing to the University of Pretoria (e.g. testing for viruses), Rand Water relies on this research to ensure that it stays one step ahead of the minimum legal requirements for drinking water in South Africa.

Rand Water has been an industry leader in providing safe, clean water for the citizens in their catchment area, with five of Rand Water’s 17 water services authorities receiving Blue Drop certification in 2014, more than any other water utility in the country.