

Africa's understudied human gut microbiomes could be a rich source of therapeutics

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Africa's overlooked, understudied microbiomes have huge potential for microbially derived therapeutics, and possibly even new antibiotics. Before the continent can tap into these possibilities, however, a vast amount of research needs to be done to close the knowledge deficit.



“Data on African microbiomes is quite low and in terms of the knowledge produced, we are on the backfoot. There are a lot of areas that need to be studied because microbes are at the centre of everything. We cannot achieve the Sustainable Development Goals without focusing on microbes,” said Professor Thulani Makhwanyane, department of Science and Innovation/National Research Foundation South African Research chair in Marine Microbiomics in the [Department of Biochemistry, Genetics and Microbiology](#) at the University of Pretoria.

Homing in on the human gut microbiome, which has been shown to directly influence physical and mental health, including cardiovascular, digestive, endocrine and neurological health, Makhwanyane said international research has shown the positive impact of diets high in fibre and fermented foods on the human gut microbiome – and therefore on human health.

“A lot of these studies have often been done in populations that do not necessarily have diets such as the ones we have in Africa and do not have the extent of diversity that we have in Africa. So by screening African populations, we’ve got a higher potential of finding novel prebiotics, probiotics and other antibiotics just by harnessing the power of our gut microbiomes,” he explained.

He singled out two fermented foods widely eaten in South Africa, amasi and mageu as having the potential for gut microbiome-derived therapeutics that could be used to treat people with gastric ulceritis and other gut microbiome disturbances.

Why African microbiomes are different and novel

Makhalanyane said the little research that has been done to date on African human gut microbiomes has produced exciting results. A UP project conducted several years ago compared the gut microbes of people in Pretoria, where processed foods are commonly consumed, to those of people living in rural locations in Venda.

The results showed higher levels of microbial diversity and interaction in the gut of rural networks than in urban networks. “This indicated a lot more synergies in the gut microbiomes of rural people, which is a proxy for better health,” Makhalanyane said.

The research also sought to understand whether differences in microbial diversity were linked to functional differences, such as in resistance to antibiotics. “There were a lot more resistance genes in the urban locations compared to the rural individuals,” he said. “This further confirms that a high-diversity ecosystem equates to more stability.”

The researchers also compared the gut microbiome data of rural and urban South Africans to data available in international databases. “This showed a high degree of novelty and high potential to explore the gut microbiomes of urban and rural individuals,” Makhalanyane said.



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Closing the African knowledge gap

The scarcity of African human gut microbiome research points to a significant knowledge deficit Makhalanyane said. A recent general internet search for microbiome research papers yielded over 88,370 papers on the topic, while a search for African papers produced just over 400 papers.

The gap is also clearly evident in the number of patents granted in the gut microbiome field, with 88% of patents linked to six countries, predominantly China, the United States and Japan. Africa barely features.

“There are a lot of areas where we need to do African microbiome research,” Makhalanyane said. “You cannot really look at how to start to conserve different ecosystems if you do not look at microbiomes. Equally, you can look at the status of a microbiome and use it as a proxy towards determining whether a system is at a point of being disturbed or altered.”

Prof Makhalanyane said UP has developed a roadmap on African microbiome research and has already started setting up collaborations in other African countries, such as Cote d'Ivoire. “Another thing we need to do as Africans is propose policy interventions and documents to advise our respective governments on the importance of looking at microbiomes,” he said.

The roadmap also looks at microbiome research infrastructure – which is often not available on the African continent – in the form of network hubs for sequencing throughout Africa.

Microbiomes and the next health crisis

Prof Makhalanyane recently delivered a University of Pretoria expert public lecture titled: 'Unlocking the secrets of the invisible universe within and beyond us: A call to discover Africa's microbiomes'.

During question time, he was asked about the importance of microbiome research in this time of pandemics. His response was immediate: “If you look at the literature, people predict that the next great pandemic is the crisis of antimicrobial resistance. With that, there is a clear need to look at deriving much more novel antibiotics that are able to circumvent this crisis that we are likely just about to go into. That is one clear importance of studying the gut microbiome.”

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