



# DATA CONNECTIVITY: MALARIA'S WATERLOO?

**In any form of warfare, information is vital. In the fight against malaria, the connectivity of big data is a means to find the needle in the haystack.**

## Researchers:

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The age-old fight against malaria has been hugely challenging, with recent years seeing an increase in malaria fatalities. Sadly, we are losing against this global scourge. But the advent of artificial intelligence (AI) has delivered an arsenal in this war: revolutionary computing tools to quickly find the Achilles heel of the malaria parasite.

Under Professor Lyn-Marié Birkholtz, who directs the Malaria Parasite Molecular Laboratory, the team at the University of Pretoria Institute for Sustainable Malaria Control (UP ISMC) is leading the fight against malaria. Ashleigh van Heerden recently completed her PhD in this group and successfully merged her background as a biochemist with her passion for data science to discover innovative solutions. She applied artificial intelligence (AI) and machine learning to generate computational tools that could revolutionise the discovery of antimalarial therapeutics.

“This transdisciplinary approach merges data on parasite biology and biochemistry, pharmaceutical discovery and chemistry, and was used to find the weak spots of the malaria parasite and target this in elimination strategies,” Prof Birkholtz explains.

## The challenge of eliminating malaria

Malaria is a complex disease, and lessons learned in the fight against it make it clear that sustainable malaria control requires complementary yet interwoven innovations to stay ahead of the curve. Strategies to fight the disease range from physical means of controlling the mosquito vector to prevent human biting, to antimalarial chemotherapies to save a life. More recently, vaccines have become an add-on to prevent infection.

However, none of these are fail-safe, and the efficacy and long-term use of all of these interventions are challenged. Freely accessible AI tools for antimalarial drug discovery can accelerate the identification of therapeutics to overcome parasite resistance, and take us one step closer to eliminating malaria and achieving the Sustainable Development Goals to ensure healthy lives and promote well-being for all.

## AI to support the fight against malaria

Making sense of important points within vast information datasets is difficult, and finding connections between different data points is arduous, time-consuming and, depending on the complexity of the data, nearly impossible to do without computational support. However, time is of the essence when the interpretation of big data is a life-or-death situation. AI and machine learning have become valuable health tools, allowing for early and accurate diagnostics and streamlining innovations in therapeutics discovery.

The ability of AI to process libraries of data to find patterns within and connect these patterns to outcomes makes AI a very powerful tool to spearhead transdisciplinary decision-making.

“Within therapeutics discovery, the tools developed by the team will shorten the discovery timeframe and ensure that multiple forms of the parasite can be targeted,” Van Heerden says. “With these tools, we can now provide researchers with a framework to design new antimalarial therapeutics to ensure success.”

This tool is freely available and accessible through the Ersilia Open Source Initiative at their model hub. The discovery also extended to descriptions of how a therapeutic kills the parasite, which is essential information in combination therapies.

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“Our AI tools provided the first chemo-transcriptomic fingerprints for malaria parasites and the therapeutic drugs in development,” Prof Birkholtz says. “The essential intervention points we identified would not have been possible without using the connected analytical and predictive power of machine learning.”

## Why this research matters

Powerful AI tools were generated to explore the vast data associated with discovering antimalarial therapies. These tools will allow resource-constrained countries, such as those in malaria-endemic areas, to deliver fit-for-purpose antimalarial candidates in a timely manner.

