# New diagnostic method for fungal infections could combat a major global health risk

August 9 2019

Lead researcher Professor Wieland Meyer Credit: The Westmead Institute for Medical Research

A new study from The Westmead Institute for Medical Research (WIMR) has demonstrated how dual DNA barcoding could help improve the diagnosis of invasive fungal diseases, giving patients access to potentially life-saving treatment much sooner.

The early detection of fungal pathogens—the specific species of fungi responsible for disease—is crucial in ensuring that patients have fast access to treatment, preventing complications. However, current diagnostic methods are time-consuming, complex and are not always accurate, resulting in delays in treatment and inappropriate therapy, increasing the risk of morbidity and mortality.

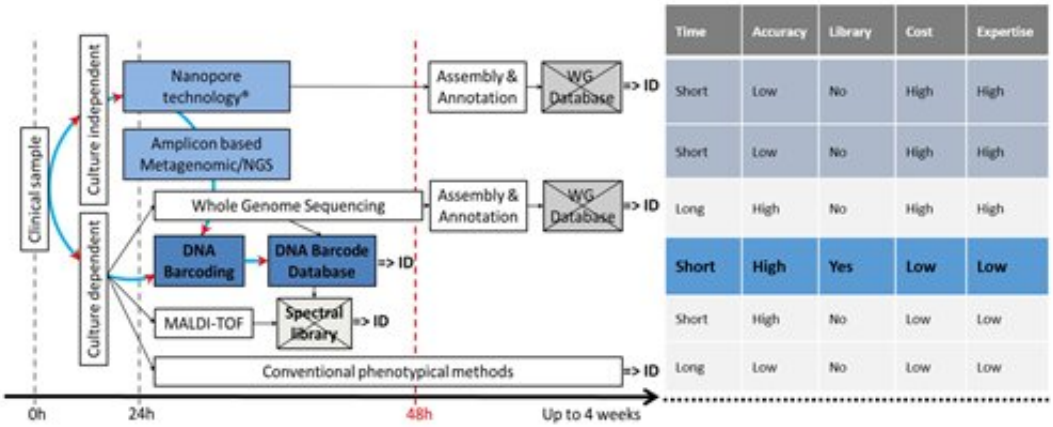
Dual DNA barcoding is an emerging technique used to identify fungal pathogens. It uses two unique regions of DNA that are specific to each pathogenic fungal species—the primary barcoding region, internal transcribed spacer region (ITS) and the secondary barcoding region, translational elongation factor 1α (TEF1α).

Fungal DNA is extracted from a patient sample, where it is then 'amplified' or multiplied to increase the amount of DNA available for sequencing. The DNA information is data-mined, and compared to a reference database to identify the fungal pathogen.

Although the secondary barcoding region was introduced in 2017, its impact and effectiveness has, until now, not been assessed.

Lead researcher, Professor Wieland Meyer said, "Our study is the first to compare the accuracy of the two barcoding regions, and to evaluate the effectiveness of ITS and TEF1α combined.

"We were able to correctly identify all disease-causing fungal species, from the most common human fungal pathogen Candida albicans, to species which rarely cause infections. We found that the primary barcoding region alone could not detect all species—however, the secondary region, as well as the two combined, filled in this gap.




Current and potentially available techniques for fungal ID, showing the central role of the reference DNA barcode database and the pros and cons of all techniques. Crossed boxes indicate missing databases. DNA barcoded reference strains are fundamental to build up a spectral library. Credit: Westmead Institute

"Overall, we found that the combination of both barcodes enabled a more accurate identification of fungal species, particularly in cases where a single barcoding system is unable to do so."

Invasive fungal diseases (IFD), such as Cryptococcus neoformans infections or Aspergillosis are an increasing threat to global health, with more than 1.6 million deaths attributed to IFDs each year. New infections continue to emerge, such as the new multidrug resistant species of Candida, C. auris, which has the capacity to spread rapidly and persist in health care environments.

Professor Meyer said, "Identifying the type of fungi that is causing infection will help us administer appropriate treatment faster, reducing harm and, potentially, mortality rates associated with IFDs.

"It may also improve other complications associated with IFDs, such as drug resistance, and the financial impact IFDs can have on both patients

and the healthcare system.

"While we now know that the dual DNA barcoding system is more effective at identifying fungal species, we need to increase the amount of sequences available in reference sequence databases to maximise the number of species we can identify.

"We are now asking researchers from around the world to submit reference sequences that can be used to identify fungal pathogens.

"By improving our database, and, in turn, increasing our capacity to use dual DNA barcoding, we will be able to reduce the diagnostic turnaround time from days or weeks to less than 24 hours, which could have a major impact on patient outcomes, and could potentially save lives."

**More information:** Minh Thuy Vi Hoang et al, Dual DNA Barcoding for the Molecular Identification of the Agents of Invasive Fungal Infections, *Frontiers in Microbiology* (2019). DOI: 10.3389/fmicb.2019.01647

Provided by Westmead Institute for Medical Research