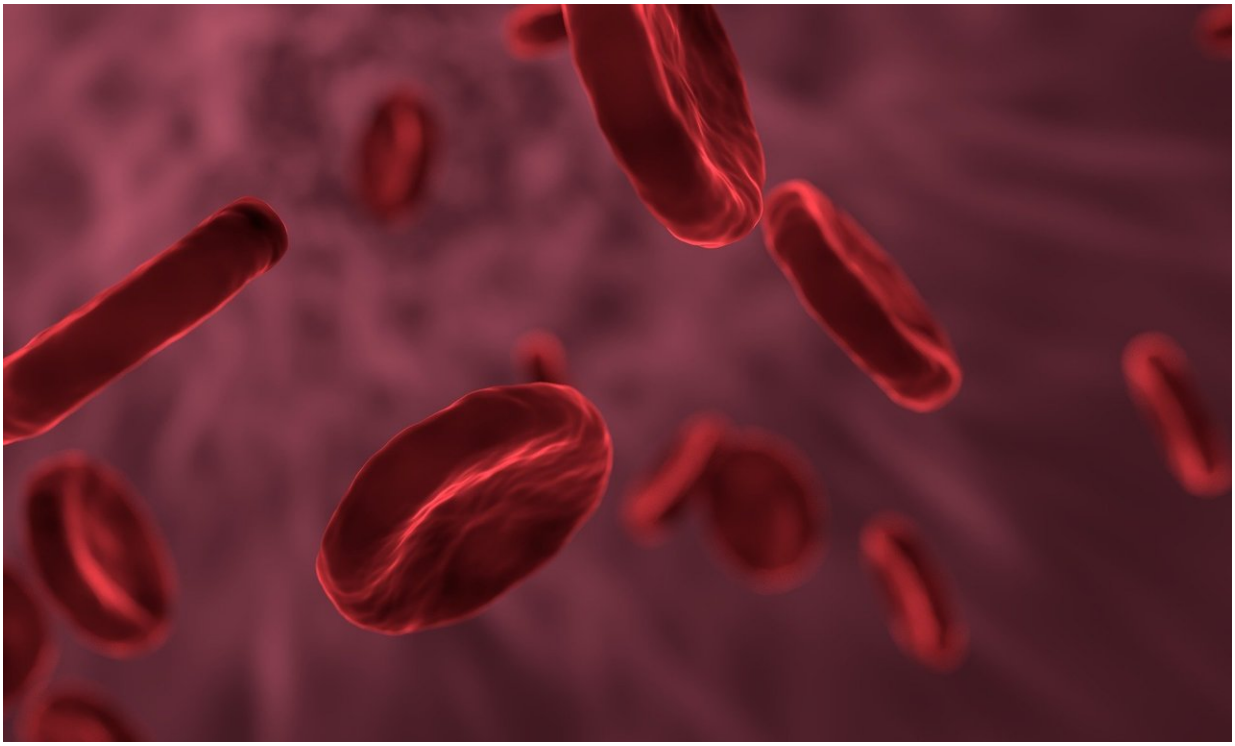
New assay detects patients' resistance to antimalarial drugs from a drop of blood

June 13 2019



Credit: CC0 Public Domain

Antimalarial drugs appear to follow a typical pattern, with early effectiveness eventually limited by the emergence of drug resistance. A report in the *Journal of Molecular Diagnostics* describes a new assay using whole blood that simplifies the genetic analysis of malarial parasites by completely eliminating processing steps. This provides rapid

access to critical information associated with resistance to antimalarials at the point of care, avoiding the time, expense, and effort of having the sample sent to a central laboratory and allowing clinicians to quickly re-evaluate treatment options.

Blood contains a wealth of genetic information, but currently must undergo significant processing to remove components that interfere with molecular analyses. Although an exciting prospect, gathering genetic information from a single drop of blood has proved elusive. This study, which analyzed a single mutation in a malaria parasite, provides the first steps to do just that: a drop of blood can be used directly, without any additional processing, to assess a range of genetic data.

"Monitoring of antimalarial resistance is important to prevent its further spread, but the available options for assessing resistance are less than ideal for field settings. Although molecular detection is perhaps the most efficient method, it is also the most complex because it requires DNA extraction and PCR instrumentation," noted co-lead investigator Mindy Leelawong, Ph.D., Research Assistant Professor of Biomedical Engineering, Vanderbilt University, Nashville, TN, USA. "Our strategy eliminates the most time- and labor-intensive step: DNA extraction. By creating a procedure that overcomes the obstacles presented by blood, we have developed a simple method to quickly identify mutations associated with drug resistance. As a consequence, higher throughput testing and more rapid sample-to-result turnaround will be possible."

"To mitigate the inhibition by blood components, we redesigned the molecular tools used for DNA analysis. We utilized reporter dyes that are more optically compatible with blood, which were combined with a specific type of DNA subunit to accurately pinpoint mutations. The end result is an assay in which blood is directly added to a reaction tube to detect mutations associated with antimalarial drug resistance," explained co-lead investigator Frederick R. Haselton, Ph.D., of the Departments of

Biomedical Engineering and Chemistry at Vanderbilt University.

Dr. Leelawong and Dr. Haselton, along with co-lead investigator David W. Wright, Ph.D., of the Department of Chemistry at Vanderbilt, anticipate that the technique can be modified for assessing resistance to artemisinin, the current first-line therapy for malarial infection, or future drugs as they become available. The technique may also become a platform for evaluating other molecular targets found in blood.

The technology detailed in this study offers a potential platform to manage the spread of drug resistance on the ground. According to Dr. Wright, "These drug-resistant parasites must not spread; we know from previous generations of drugs that the consequences can be catastrophic. To prevent further spread, the geographic location of drug-resistant parasites must be known."

Malaria is a serious, sometimes fatal disease caused by a parasite that commonly infects a certain type of mosquito that feeds on humans and infects red blood cells. People who contract malaria typically become very sick with high fevers, shaking chills, and flu-like illness. According to the World Malaria Report 2018, there were 219 million cases of malaria globally in 2017 resulting in 435,000 malaria deaths. Although antimalarial drugs are often effective, outcomes are worse for those who are drug resistant.

More information: *Journal of Molecular Diagnostics* (2019). DOI: 10.1016/j.jmoldx.2019.02.004

Provided by Elsevier