Translational Biomedicine©

14 (5) 2023: 001-002 • Perspective

Interpretation of human african trypanosomiasis biomarkers towards field application

Rita Saleh*

Department of Biochemistry, Lugano University of Sciences, Lugano, Switzerland

INTRODUCTION

Human African Trypanosomiasis (HAT), commonly known as sleeping sickness, is a devastating vector-borne parasitic disease caused by the protozoan parasites Trypanosoma brucei gambiense and Trypanosoma brucei rhodesiense. This neglected tropical disease primarily affects some of the most vulnerable populations in sub-Saharan Africa. The disease is characterized by a two-stage progressfion: The first stage involves infection of the blood and lymph, while the second stage involves invasion of the central nervous system. If left untreated, HAT is almost invariably fatal. However, early diagnosis and prompt treatment are key to saving lives.

Efforts to combat HAT have made significant progress in recent years, with a decrease in reported cases. One critical factor in this success has been the development of biomarkers that aid in early and accurate diagnosis. These biomarkers offer the potential to revolutionize HAT detection, monitoring and control. This article explores the translation of HAT biomarkers from the laboratory to field applications, emphasizing their importance, challenges and potential impact.

DESCRIPTION

The importance of biomarkers in HAT

Biomarkers are specific molecules, genes or characteristics that can be detected and measured to indicate the presence of a disease or a physiological state. In the context of Human African Trypanosomiasis (HAT), biomarkers play a pivotal role in improving the accuracy and timeliness of diagnosis. Traditional diagnostic methods for Human African Trypanosomiasis (HAT), such as microscopic examination of blood or cerebrospinal fluid, are labor-intensive, time-consuming and often require experienced technicians. Moreover, these methods may not be suitable for remote and resource-constrained areas.

HAT biomarkers offer several advantages

Early detection: Biomarkers can be detected before clinical symptoms become apparent, enabling early intervention and preventing the progression to the second stage of the disease.

Accuracy: Biomarker-based tests are highly specific, reducing the chances of false-positive or false-negative

Address for correspondence:

Rita Saleh,
Department of Biochemistry, Lugano University of Sciences, Lugano, Switzerland;
E-mail: rita.sale@hest.ethz.ch

Word count: 908 **Tables:** 00 **Figures:** 0 **References:** 00

Received: 04.09.2023, Manuscript No. iptb-23-14145;
Editor assigned: 07.09.2023, PreQC No. P-14145;
Reviewed: 21.09.2023, QC No. Q-14145;
Revised: 03.10.2023, Manuscript No. R-14145;
Published: 31.10.2023, Invoice No. J-14145

results.

Accessibility: Many biomarker tests can be adapted for use in the field, making them invaluable for remote and underserved areas where HAT is endemic.

Monitoring and surveillance: Biomarkers can also be used for monitoring disease prevalence and the effectiveness of control programs, aiding in better disease management.

Promising HAT biomarkers

Several biomarkers for Human African Trypanosomiasis (HAT) have been identified and validated in research settings. These biomarkers encompass various biological molecules and are associated with different stages of the disease. Some of the most promising HAT biomarkers include:

Circulating trypanosome-specific antigens: Detection of circulating trypanosome-specific antigens, such as the Variant Surface Glycoprotein (VSG) and CATT (Card Agglutination Test for Trypanosomiasis) antigens, is a hallmark of HAT diagnosis. These antigens are highly specific to the parasite and have been used effectively in various diagnostic tests.

Cerebrospinal Fluid (CSF) biomarkers: As HAT progresses to the second stage, parasites invade the central nervous system. Biomarkers present in the CSF, such as antibodies and white blood cell counts, are indicative of CNS involvement and aid in disease staging.

Molecular biomarkers: Polymerase Chain Reaction (PCR) assays targeting trypanosome DNA and RNA have proven to be highly sensitive and specific for HAT detection. These molecular biomarkers have the potential to be used in point-of-care tests.

Challenges in translating hat biomarkers to the field

While HAT biomarkers hold great promise, translating them from research labs to practical field applications presents several challenges:

Infrastructure and resources: Many regions endemic for Human African Trypanosomiasis (HAT) lack the necessary infrastructure and resources for complex diagnostic tests. Field-appropriate diagnostic tools must be affordable, portable and easy to use.

Diagnostic sensitivity and specificity: Ensuring that field-based tests are as sensitive and specific as laboratory-based assays is a significant challenge. False negatives or positives can have severe consequences in HAT control programs.

Stability and storage: Field tests should withstand challenging environmental conditions, including temperature fluctuations and humidity. Biomarker stability and appropriate storage solutions are essential.

Training and workforce: Deploying biomarker-based tests in remote areas necessitates training local healthcare workers to administer and interpret the tests accurately.

Regulatory approval: Obtaining regulatory approval for field-based HAT biomarker tests is a complex and time-consuming process that can hinder their implementation.

Field-ready HAT biomarker tests

Despite these challenges, several initiatives are actively working on field-ready HAT biomarker tests:

Rapid Diagnostic Tests (RDTs): RDTs for HAT, similar to those used for malaria, are being developed to provide quick and accurate results at the point of care. These tests can detect circulating trypanosome antigens and are designed to be user-friendly and robust.

Molecular diagnostic tools: Efforts are ongoing to simplify and miniaturize molecular diagnostic methods, such as PCR, to make them suitable for use in the field. Portable PCR machines have shown promise in research and adapting them for field use is a priority.

Integration with telemedicine: In remote areas with limited healthcare infrastructure, telemedicine can aid in diagnosing and managing HAT cases. Biomarker test results can be transmitted to central healthcare facilities for expert interpretation.

CONCLUSION

Biomarkers have the potential to revolutionize the diagnosis and management of Human African Trypanosomiasis (HAT). These markers enable early detection, accurate diagnosis and monitoring of the disease, ultimately contributing to better control and reduced mortality rates. However, the translation of HAT biomarkers from the laboratory to the field remains a complex and ongoing challenge. As researchers, healthcare professionals and policymakers work together, the development of field-ready HAT biomarker tests becomes a crucial step in the fight against this neglected tropical disease. Overcoming the technical, logistical and regulatory hurdles is essential to make these valuable tools accessible to the most vulnerable populations at risk of HAT and thus, bring us closer to the ultimate goal of disease elimination.