SCIENCES & BIOENGINEERING SCIENCES

The Research Group
Brussels Center for Immunology

has the honor to invite you to the public defence of the PhD thesis of

Andrés Álvarez Rodríguez

to obtain the degree of Doctor of Bioengineering Sciences

Joint PhD with UGent

Title of the PhD thesis:

Development of CRISPR-Cas-Based Isothermal Amplification Assays for Point-of-Need Diagnosis of *Trypanosoma brucei* Infections

Promotors:
Prof. dr. Stefan Magez (VUB)
Prof. dr. Peter Geldhof (UGent)

The defence will take place on

Tuesday, November 3, 2026 at 2 p.m. in auditorium Learning Theatre (LIC)

The defence can also be followed through a live stream:
https://teams.microsoft.com/meet/35011011881265?p=tpsDmLMwlbzwPK0TD3

Members of the jury

Prof. dr. Eveline Peeters (VUB, chair)
Prof. dr. Charles Van der Henst (VUB)
Dr. Inge Van Molle (VUB)
Prof. dr. Bruno Levecke (UGent)
Prof. dr. Luc Peelman (UGent)
Prof. dr. Yann Sterckx (UAntwerpen)
Dr. Veerle Lejon (Institute de Recherche sur le Développement, FR)

Curriculum vitae

Andrés Álvarez Rodríguez obtained his master's degree in molecular biology with great distinction from VUB in 2021. Following research and teaching appointments at VUB and Ghent University Global Campus in South Korea, he began an FWO-funded joint PhD at VUB and Ghent University in 2022, under the supervision of Prof. Stefan Magez and Prof. Peter Geldhof.
He has contributed to nine scientific publications, including six as first or co-first author, comprising research articles, reviews and book chapters. He has also presented his research at international scientific conferences and contributed to teaching activities. During his PhD, he supervised four Master's thesis students and one Bachelor's thesis student.

Abstract of the PhD research

Trypanosomosis comprises a group of neglected tropical diseases caused by protozoan parasites of the genus *Trypanosoma*, including subspecies of *Trypanosoma brucei*. In humans, *T. b. gambiense* and *T. b. rhodesiense* cause human African trypanosomosis (sleeping sickness) in sub-Saharan Africa. In animals, *T. b. brucei*, *T. b. evansi* and *T. b. equiperdum* cause animal trypanosomosis, including nagana, surra and dourine, across Africa, Asia, America and Europe. These diseases impose substantial health, veterinary and economic burdens, while their persistence and transmission involve interactions between humans, animal reservoirs, vectors and environmental conditions, making trypanosomosis a major One Health challenge.

Despite advances in disease control, effective surveillance and infection monitoring still depend on accurate diagnosis. However, existing diagnostic methods have important limitations. Microscopy lacks sensitivity, while antibody-based tests may fail to confirm active infection and can lack specificity, particularly in low-prevalence settings where false-positive results can compromise treatment decisions and epidemiological interpretation. Polymerase chain reaction (PCR) provides highly sensitive and specific detection of parasite DNA, but its dependence on laboratory infrastructure, trained personnel and controlled workflows limits its use near the point-of-need. Therefore, simpler, faster and field-compatible molecular assays with PCR-level analytical performance are needed.

To address this need, this study developed and evaluated two complementary one-pot CRISPR-Cas12b–based isothermal amplification assays for detecting active *T. brucei* infections. The first combined recombinase polymerase amplification (RPA) with CRISPR-Cas12b detection targeting *T. b. evansi* type A, while the second combined loop-mediated isothermal amplification (LAMP) with CRISPR-Cas12b detection targeting *T. brucei* subspecies. Both assays were optimised and evaluated using experimental infection models and reference methods, demonstrating highly sensitive and specific detection of parasite DNA and enabling monitoring of active infection and post-treatment clearance. The CRISPR-LAMP assay, termed *Tryp*One, was further adapted for point-of-need use through field-compatible sample collection, DNA extraction, incubation and readout strategies, including visual fluorescence and lateral-flow formats. Overall, this work demonstrates the potential of CRISPR-Cas–based isothermal amplification for sensitive, specific and accessible detection of active *T. brucei* infections, supporting coordinated One Health strategies for the control of human and animal trypanosomosis.