The opinions expressed in the following Q&A are the author's own and do not reflect the view of Vestergaard.

For more than two decades, Vestergaard has dedicated its innovative platform to product development and partner engagements aimed at reducing the burden of Neglected Tropical Diseases (NTD). At the heart of our efforts has been extensive work to decrease the incidence of sleeping sickness.

The Gambian form of Human African Trypanosomiasis (gHAT or sleeping sickness) is a vector-borne disease transmitted by tsetse flies which threatens over 56 million people in high-risk areas[1,2]. The difficulty with sleeping sickness lies in its complexity as there are no clinical signs specific to the disease, which makes diagnosis a challenge[3]. If detected, the stage of the disease is determined and involves an uncomfortable lumbar puncture[4]. However, if left untreated, HAT usually results in death[5,6]. As there is currently no vaccine or chemoprophylaxis for sleeping sickness, control of gHAT relies on vector control, diagnosis, and treatment. Integrating vector control into strategies focused on 'screen-diagnose-and-treat' has proven essential to move countries closer to the elimination goal.[5,6]

To accelerate elimination of gHAT, Trypa-NO! was launched in 2016 as a partnership between the Foundation for Innovative New Diagnostics (FIND), the French National Research Institute for Sustainable Development (IRD), the Liverpool School of Tropical Medicine (LSTM), and Vestergaard, with support by the Bill & Melinda Gates Foundation (BMGF)[1]. The goal of the partnership is to harmonize and integrate the screening, diagnosis, and treatment of sleeping sickness with tsetse fly control in Chad, Ivory Coast, Republic of Guinea, and Uganda. Supported by the project, ZeroFly® Tiny Targets are a cost-efficient intervention to control tsetse flies with the potential to eliminate gHAT in affected countries.[7]

ZeroFly® Tiny Targets are a cost-effective method of controlling these vectors. Small, blue-colored panels of cloth are impregnated with insecticide, and function by attracting disease-carrying tsetse flies to the target, which kill on contact.

Joseph Ndung'u is the Head of the NTD programme and the Executive Director of FIND Kenya. A veterinarian with a PhD in immunopathology of HAT, Professor Ndung'u has dedicated his career to Neglected Tropical Diseases (NTDs). In 2019, he received the

African Union's prestigious Excellence Award for his achievement and contribution to research and control of Tsetse and Trypanosomiasis. In this Q&A, Professor Ndung'u will address pertinent questions related to the progress on the elimination of sleeping sickness and the Trypa-NO! partnership.

At the end of 2019[1], FIND, IRD, and LSTM announced the extension of the Trypa-NO! project funded by the BMGF. The news article mentioned that Uganda and Ivory Coast were on the brink of gHAT elimination. What is the progress achieved to date? What challenges remain on the path to sustaining elimination?

It is true that both Uganda and Côte d'Ivoire have achieved the elimination of gHAT as a public health problem as defined by the WHO, considering the reported cases per year. However, validation of elimination by WHO is only done after the country has submitted a dossier, following WHO guidelines. In 2020, Côte d'Ivoire has submitted their dossier, and while the one for Uganda has been finalized, it is yet to be submitted. A major challenge to sustaining elimination is in the implementation of long-term surveillance strategies that are not dependent on donor funding.

This comprehensive partnership has shown great results, prompting an extension of the project. A) Could we imagine more public-private partnerships in the domain of disease elimination?

A) There will certainly be more such partnerships, and I believe that Trypa-NO! is not the first one, even for gHAT. We have seen it for example in drug donations.

B) In terms of control and elimination strategies, what would be the main similarities and differences between malaria and HAT?

B) Control of both diseases is accelerated when both vector control and treatment of infected individuals is done. However, unlike gHAT, malaria is also prevented through chemoprophylaxis. Similarly, the elimination of both diseases is accelerated when both the disease and the vector are targeted. Elimination of gHAT could however be achieved faster than malaria because it is a very focal disease, and the transmission rate is much lower.

How has the integration of tsetse control (using Tiny Targets) with screening, diagnosis, and treatment contributed to elimination?

Reduction of tsetse fly densities reduces the rate of transmission of the disease, and if the reduction is sustained, transmission of the disease could eventually be interrupted. However, since gHAT is a chronic disease that lasts for months to years, infected individuals in a community remain reservoirs, and since tsetse flies still remain, such individuals would be the source for further transmission. Screening, diagnosis, and treatment of infected patients, removes their reservoir status, and when the two approaches are combined, the elimination process is accelerated.

Reduction of tsetse fly densities reduces the rate of transmission of the disease, and if the reduction is sustained, transmission of the disease could eventually be interrupted.

FIND strives to identify solutions to accelerate the access of innovative diagnostic tools to market, how does this translate in the HAT and NTD environment? This is a matter of great interest for innovative groups such as Vestergaard that are involved in the development of better vector control tools. Can you share some of the challenges and successes you are encountering?

In the HAT and NTD environment, FIND starts developing an access strategy at the time a decision is made to develop the diagnostic solution. Well aware that NTD control tools have no commercial interest, and that most countries where such diseases occur have limited capacity to procure the tools, FIND strives to mobilize resources, such that those tools become accessible to the people that need them, at minimal or no cost. A classic example is the Trypa-NO! partnership, through which vector control, screening and diagnostic tools are made accessible at no cost to the endemic countries and the affected communities. The contribution by countries is "in kind". The greatest challenge is in making such an arrangement happen, but once it happens, the effort is worth it. The other challenge is in sustaining the effort when donor funding, or donations by companies come to an end – a big threat to sustaining elimination

References

1. Foundation for Innovative New Diagnostics (FIND). *Elimination of sleeping sickness*

moves a step closer to reality with $7.5 million award to extend ongoing Trypa-NO! programme. Available from: https://www.finddx.org/newsroom/pr-04dec19/ [Accessed 8 October 2020].
2. Liverpool School of Tropical Medicine (LTSM). *Use of Tiny Targets to control tsetse flies in Gambian HAT foci: _ standard operating procedures (Edition 27 October 2016).* Available from: https://www.tsetse.org/sites/lstm-tsetse/files/content/attachments/2018-05-09/FinalisedSOPEnglishVersion-v01_0.pdf
3. Foundation for Innovative New Diagnostics (FIND). *HAT Factsheet July 2017* [WEB]. Available from: https://www.finddx.org/wp-content/uploads/2017/07/HAT-Factsheet-July2017-WEB.pdf [Accessed 19 October 2020].
4. World Health Organization (WHO). *Human African Trypanosomiasis*. Available from: https://www.who.int/trypanosomiasis_african/disease/diagnosis/en/ [Accessed 19 October 2020].
5. Liverpool School of Tropical Medicine (LTSM). *Targeting Tsetse*. Available from: https://www.lstmed.ac.uk/research/departments/vector-biology/vector-control/targeting-tsetse [Accessed 16 October 2020].
6. Selby R, Wamboga C, Erphas O, Mugenyi A, Jamonneau V, Waiswa C, Torr SJ, Lehane M. Gambian human African trypanosomiasis in North West Uganda. Are we on course for the 2020 target? *PLoS Neglected Tropical Diseases.* 2019;13(8): e0007550. Available from: doi:1371/journal.pntd.0007550.
7. Shaw APM, Tirados I, Manwiro CTN, Esterhuizen J, Lehane MJ, Torr SJ, Kovacic V. Costs of using "Tiny Targets" to control *Glassina fuscipes fuscipes*, a vector of *Gambiense* sleeping sickness in Aurua district of Uganda. *PLOS Neglected Tropical Diseases.* 2015; Available from: doi:1371/journal.pntd.0003624.