

TRAIL

TRoJan snAILS: the role of gastropod snails in disease transmission revealed by state-of-the-art molecular techniques

DURATION
 15/12/2016 - 15/03/2019

BUDGET
 149 730 €

PROJECT DESCRIPTION

Snail-borne diseases affect more than 300 million people worldwide and also lead to economic losses and mortality in livestock. Mainly communities in developing countries are affected, but due to globalization and climate change the prevalence and distribution of snail-borne diseases are changing. Because the distribution of host snail species determines where snail-borne diseases can occur, updated information on snail distribution and their role in parasite transmission is highly needed. Currently, however, acquiring these insights is hampered by the ambiguous taxonomic status of many involved gastropod species and a lack of associated ecological and parasitological data. Additionally, traditional techniques to identify snail infection are time-consuming and prone to missing very recent infections while experimental work cannot account for confounding factors like co-infection and strain variability. Here we propose to surmount these difficulties by developing an efficient, sensitive and robust monitoring tool that will simultaneously allow to genotype snails and their associated parasites. After designing the tool, we will test its sensitivity on controlled cases of infected snails, and subsequently we will deploy it to study new and existing museum collections to unravel important ecological factors in the distribution and spreading of snail-borne diseases.

The general objective of TRAIL is to develop a novel time- and cost-efficient technique to simultaneously genotype snail hosts and their helminth parasites. Besides proof-of-principle studies, this project will valorize museum collections and generate new data that will help to understand the biotic and abiotic factors that influence the distribution and spreading of snail-borne disease. All specific aims are listed below.

AIMS:

- 1) develop a new technique to simultaneously amplify snail and associated parasite DNA so that host and parasite can be efficiently genotyped (wp1).
- 2) monitor snail prevalence and snail infection dynamics in three African ecosystems (wp2) in order to:
 - validate this technique by comparison with traditional morphological techniques and shedding experiments
 - determine the role of each snail species in disease transmission
 - set-up of a molecular reference database for snail hosts and parasites
 - identify transmission hotspots (infection risk) and how snail infection changes in time and space
 - combine genetics and morphology to improve species identification in the field
 - to integrate our data with continent-wide data on host-parasite relationships to reconstruct their historical biogeography.



Figure 1. Two gastropod snail species involved in transmission of the tropical disease schistosomiasis.

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Figure 2. Schistosome cercaria, the causative the agent of schistosomiasis, isolated for the gastropod snail host.

This project will allow us to stay at the forefront in vector-borne disease dynamics in both national and international contexts by developing monitoring tools and by uniting knowledge on taxonomy, epidemiology, ecology and genomics of snails and their parasites. Such an interdisciplinary approach is crucial to understand the complex epidemiology of snail-borne diseases. This project strongly aligns with the nature of pioneer projects as it will explore innovative state-of-the-art techniques to tackle both fundamental and applied research questions and at the same time valorize existing collections from the RMCA, Tervuren and the UGSB collection of the JLU Giessen, Germany.

This project strongly fits in The One World – One Health Initiative established by the international scientific community as the snail species targeted in this study act as a host for both human and veterinary parasites. Moreover, the hybrid parasite species found in one of our main target snail species, *Bulinus truncatus*, can infect both humans and livestock. This implies that animal reservoirs will play an important role in the transmission of this species, and as such an ecological focus as the one advocated here is required to obtain a full insight into transmission and prevalence. Additionally, the impact of climate change on the spread of vector-borne diseases is an important concern on international research agendas. According to the WHO: *'Changes in infectious disease transmission patterns are a likely major consequence of climate change. We need to learn more about the underlying complex causal relationships, and apply this information to the prediction of future impacts, using more complete, better validated, integrated, models'* (quote from: <http://www.who.int/globalchange/environment/en/chapter6.pdf>).

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LINKS

Website:

http://www.africamuseum.be/museum/home/contact/staf/HUYSE_Tine/project_view

More information on this topic in the popular and scientific press:

<https://www.eoswetenschap.eu/gezondheid/tropische-ziektes-veroveren-europa>

<http://dailyscience.be/2016/05/18/une-maladie-tropicale-detectee-en-corse/>

<http://www.africamuseum.be/research/general/research-picture/schistosomiasis-senegal/>

[http://www.cell.com/trends/parasitology/fulltext/S1471-4922\(14\)00038-5](http://www.cell.com/trends/parasitology/fulltext/S1471-4922(14)00038-5)

<http://journals.plos.org/plospathogens/article?id=10.1371/journal.ppat.1000571>