

1. PUBLISHABLE SUMMARY

Summary of the context and overall objectives of the project (For the final period, include the conclusions of the action)

Vector-borne diseases (VBDs) constitute a major challenge facing African healthcare systems and economies today, but also increasingly pose a threat to currently non-endemic areas, as outbreaks of zoonotic VBDs and increased spread of vectors is anticipated to occur more frequently in the future. The PREPARE4VBD project addresses these challenges, as a multidisciplinary consortium that brings together ten university and ministerial partners from five African and three European countries. The overall aim is to improve preparedness in Africa and Europe for a new era of emerging zoonotic vector-borne diseases under climate change and globalization. More specifically, PREPARE4VBD will develop new knowledge, detection tools and surveillance systems to improve preparedness in Africa and Europe for vector-borne diseases transmitted by mosquitoes, ticks and freshwater snails to livestock and humans.

At the core of PREPARE4VBD concept is a cross-disciplinary approach, aiming to advance a broad, conceptual knowledge of a selected number of VBDs and vector organisms that reaches beyond specific vector-borne diseases, vector species or disciplines. By “casting the net wide” we wish to advance cross-organismal learning and integrated approaches to VBD research and surveillance and address the prevention and control of zoonotic tick-, mosquito and snail-borne diseases at the early phases of emergence and outbreak.

The project is organized in a series of structural and research Work Packages (see figure below). Collectively these WPs feed into the following four main themes:

- A. build knowledge of neglected tick-, mosquito- and snail-borne VBDs of importance for animal and human health in endemic African countries
- B. assess their capacity to adapt and spread to new areas using a hologenomics approach and state-of-art climate change impact modelling,
- C. develop novel diagnostic tools and model-based surveillance for rapid VBD discoveries and early warning
- D. strengthen the capacity for detection and surveillance of the targeted VBDs through training and effective communication of project results and dissemination of freely available data

An overview of the project work packages and how they relate to each other and the four themes can be seen in the attached figure.

Work performed from the beginning of the project to the end of the period covered by the report and main results achieved so far (For the final period please include an overview of the results and their exploitation and dissemination)

In the first 18 months of the PREPARE4VBD project, the Coordinator, UCPH, has devoted time to ensure standard procedures for overall project management, such as the organization of the interactions with internal and external partners, implementing internal procedures for optimizing the work and the quality of research activities. Important milestones in the first 18 months of the project was the project kick-off through a virtual pre-kick-off meeting in August 2021, and later a physical (hybrid) meeting in Grand Bassam, Cote D'Ivoire in November 2021. At that time, the world was still very much affected by COVID-19. This not only influenced research activities in the first project year, but also the first meeting, with many not being able to travel. Nonetheless, key deliverables and milestone has been achieved. Some of the highlights of this project period include the annual meeting in October 2022 in Jozini, South Africa, attended by 43 delegates from the eight partner countries,

including leading experts and early career researchers in vector-borne disease research in Africa and Europe. The first PREPARE4VBD “summer-school”, an important component of PREPARE4VBD’s aim to strengthen VBD research capacity in sub-Saharan Africa and Europe, was also successfully held back-to-back with the annual meeting, this time on modelling of vector-borne diseases aimed at the Consortium Fellows.

In the first period, the Consortium has also focused on data collection and collation, to build baseline knowledge of the target vectors and VBDs in Africa and Europe. Protocols for extraction of existing survey and occurrence data from secondary sources has been developed and data compilation is ongoing for all 5 target diseases to be entered to the PREPARE4VBD database. Standard operating procedures (SOPs) has been developed for a number of the PREPARE4VBD diagnostic tools for early detection. This include an environmental DNA (eDNA) sampling SOP, to test presence of snail-borne parasites, which was demonstrated at the annual meeting in South Africa and now available on project website. SOPs & videos for mini-FLOTAC has been developed and freely available on website and the PREPARE4VBD YouTube channel. Fieldwork to collect vectors such as ticks, snails and parasitological data has also been initiated in several partner countries in the first period, and is still on-going. Scientific highlights from the first project period include a first molecular detection of the socio-economically important *Rickettsia africae* in *Amblyomma gemma* and *Rhipicephalus pulchellus* ticks in Kenya. Preliminary results from different tick tissues is indicative of the pathogens ability to migrate from midgut to saliva, contributing to basic understanding mechanisms of pathogen transmission and vector competence. Furthermore, more than >30 bovine genomes of two breeds of cattle have been sequenced and a first version developed of an ex-vivo platform to non-invasively test disease susceptibility of different cattle breeds.

Progress beyond the state of the art, expected results until the end of the project and potential impacts (including the socio-economic impact and the wider societal implications of the project so far)

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As truly multidisciplinary, PREPARE4VBD aim to bring together partners with expertise in technological innovations and control measures to focus upon developing cost-effective local solutions for the targeted VBD control and surveillance. PREPARE4VBD will explore and identify synergies with other VBD control initiatives and projects, to maximize animal and human health improvements and the longer-term impact of the intervention. Understanding the burden, transmission dynamics and related risk factors of local VBDs of humans and animals in Africa, will inform decision making on control and elimination interventions as well as prediction, detection and response. This will lead to more effective control of zoonotic VBDs in the targeted countries and hence improved economic status of affected communities and the countries as a whole.

An important step towards this goal, was reached in the first period by systematically reviewing surveillance systems and data on the target VBDs for the study regions, which identified a huge gap in knowledge and data. Likewise, stakeholder and consortium meetings has identified several zoonotic VBDs of great importance in terms of prevalence and impact, but that largely remain neglected diseases in their respective countries. These findings emphasize the importance of the projects approach to collect baseline data on the targeted zoonotic VBDs, to quantify their societal burdens, improve their surveillance and eventually put them on the research and policy agendas, both nationally and in international fora’s.

Address (URL) of the project’s public website

A Cross-Disciplinary Alliance to Identify, PREDict and prepare for
Emerging Vector-borne Diseases

