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Project to prevent and control vectorborne diseases in Africa and Europe

DISEASES

For the next four years, the research project 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. The project, which is a collaboration between university and ministerial partners in Africa and Europe, has received 6 million euro in funding from EU Horizon 2020.

Vector-borne diseases (VBDs) constitute a major challenge facing African healthcare systems and economies today. But vector-borne diseases also increasingly pose a threat to Europe, as novel outbreaks of VBDs of both animals and humans, along with an increased spread of invasive vectors, is anticipated to occur more frequently in the future. Globalization, climatic and environmental changes are important drivers behind this development. Nevertheless, there is a general lack of knowledge of the key characteristics that allow certain vectors and the diseases they transmit to spread and establish in new, previously disease-free areas in both Africa and Europe.

Therefore, the project PREPARE4VBD has received EUR 6 million from the EU Horizon 2020 programme to build knowledge and tools for better prevention and control of a handful of mosquito-, tick- and snailborne diseases in Africa and Europe. The GLOBE Institute at the University of Copenhagen will be coordinating the project in close collaboration with the Department of Veterinary and Animal Sciences. The project will focus on those diseases that affect both cattle and other livestock as well as humans.

A cross-disciplinary approach is vital

Many countries already have well-established systems for monitoring vector-borne diseases of livestock and humans, respectively. But they often lag behind when it comes to diseases that can

jump from animals to humans, so-called zoonoses, says Associate Professor Anna-Sofie Stensgaard from the Department of Veterinary and Animal Sciences at the University of Copenhagen, who is heading the project.

"We need to develop better systems for early detection and early warning when these vectors or the diseases they spread move into new, previously disease-free areas. But the systems should also be able to predict the longer term change in disease patterns due to e.g. rising temperatures and altered precipitation patterns. Likewise, we need to ensure that the science and tools we develop in the project can be implemented by the relevant authorities and society. This calls for a cross-disciplinary approach that involves partners from sectors and disciplines within both human and veterinary health, as well as natural and social science," says Anna-Sofie Stensgaard.

As part of the effort to develop better surveillance systems, the researchers will be focussing on three main areas: i) the development of new molecular diagnostics technologies capable of more accurately detecting specific disease organisms and their vectors, ii) the development of mathematical and statistical models capable of predicting disease outbreaks and spread, and iii) a strengthening of research and surveillance capacity within vectors and vector-borne diseases in both Africa and Europe.

One of the new technologies that the project aims to develop is a so-called environmental DNA method that can detect vectors or disease organisms directly in the environment before disease spread to livestock or humans. Based on a simple water sample from a lake or stream, the method – using molecular analyses – can detect traces of DNA left behind by vectors such as freshwater snails transmitting parasites to cattle or humans.

Professor and Head of GLOBE Institute Anders Johannes Hansen from the Faculty of Health and Medical Sciences at the University of Copenhagen will be contributing to the project with hologenomic vector analyses. A hologenome is the whole set of microbial and host genomes on a given host. The idea is to determine whether there is a connection between the composition of a vector species' hologenome over a climatic gradient and its ability to transmit specific pathogens',

"We have adopted a One Health approach, which calls for cross-disciplinary cooperation between various professional groups and not least the two departments at UCPH (the GLOBE Institute and Department of Veterinary and Animal Sciences). This enables us to tackle the challenges posed by these diseases from a holistic perspective on health in animals, humans and the environment," says Anders Johannes Hansen.

Climate change play a key role

More specifically, the researchers will develop models based on climate change scenarios and known relationships between climatic factors and the disease organisms that will tell them how these diseases are likely to spread in the future.

As input for the models the researchers will use existing as well as newly collected data on disease and vector distributions as well as new data from laboratory and field experiments. This is important if we are going to be able to establish better disease monitoring and prevent potential outbreaks from developing into cost-intensive crises at local, regional or international levels', Anna-Sofie Stensgaard explains.

Finally, the project will over the next four years be offering a broad selection of courses, webinars and workshops on the new methods for African and European PhD students and researchers. In addition, the researchers behind the study will be organising workshops for stakeholders, including

policy decision makers and authorities, just as they will be launching information campaigns to achieve the broadest possible dissemination and impact of the project results in society.

A Cross-Disciplinary Alliance to Identify, PREdict and prePARe for Emerging Vector-Borne Diseases

PREPARE4VBD is the acronym for the project title 'A Cross-Disciplinary Alliance to Identify, PREdict and prePARe for Emerging Vector-Borne Diseases'. The project is part of the [research and innovation actions under Horizon 2020](#).

VBD is short for **vector-borne diseases**, which is the name of a group of infectious diseases (caused by viruses, bacteria or parasites) transferred from animals to humans or between humans via **disease vectors**. The vectors are typically insects, often common mosquitoes, and other small organisms such as ticks and freshwater snails. The presence of the disease vectors depends largely on climatic conditions, such as suitable temperature and rainfall, which are vital to the spread of vector-borne diseases.

The project will improve basic biological understanding of vector-borne zoonotic diseases and the way they are affected by globalisation and climate changes. It will also develop new, innovative methods for their prediction, prevention and control and, not least, strengthen both African and European research and surveillance capacity within vectors and vector-borne diseases.

PREPARE4VBD involves a total of 11 project partners comprising universities, research institutions and Governmental authorities in Africa and Europe. Over the next four years, the research project will receive a total of EUR 6 million with the University of Copenhagen (UCPH) as the coordinating institution. From UCPH, the GLOBE Institute and Department of Veterinary and Animal Sciences will participate in the project.

Besides UCPH, the following universities, research institutions and authorities are involved in the project.

- Makerere University (Uganda)

- Sokoine University of Agriculture (Tanzania)

- University of KwaZulu-Natal (South Africa)

- University of Naples Federico II (Italy)

- Swiss Tropical and Public Health Institute (Switzerland)

- University of Bern (Switzerland)

- International Centre of Insect Physiology and Ecology (Kenya)

- Vector Control Division, Uganda Ministry of Health (Uganda)

- Centre Suisse de Recherches Scientifiques (Côte d'Ivoire)

- National Institute for Medical Research (Tanzania)

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