CLIMOS

Climate Monitoring and Decision Support Framework for Sand Fly-borne Diseases Detection and Mitigation with COst-benefit and Climate-policy MeasureS

Press Release

February 26, 2024

http://www.climos-project.eu

UK Research and Innovation

Co-funded by the European Union

UK Research and Innovation, Horizon Europe Guarantee.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Health and Digital Executive Agency

CLIMOS data results links climate change to shifts in sand fly distribution, escalating leishmaniasis concerns.

When we think of arthropods carrying infectious diseases, mosquitoes and ticks often come to mind. However, there's a third vector that's relatively unfamiliar but equally relevant: sand flies.

Sand flies are tiny, hairy-winged insects that belong to the Phlebotominae subfamily. They can be found in warm and tropical climates worldwide. However, the impact of climate change is dramatically altering their geographical landscape reaching into new regions of Europe. Often active during twilight hours, female sand flies feed on blood predominantly from mammals, facilitating the transmission of viruses and parasites. These pathogens cause diseases including summer meningitis and leishmaniasis that can affect both humans and animals. Leishmaniasis is classified as a neglected tropical disease by the World Health Organization. However, there is an estimated 700,000 to 1 million new cases annually[1]. It can lead to severe health issues and, in some cases fatality if not treated. CLIMOS's mission is to raise awareness of the sand fly, the diseases they transmit, and how to prevent their spread.

In the process of doing so, the consortium met for a four-day General Assembly (GA) in Belgrade hosted by the team of the Institute for Medical Research of the University of Belgrade. Our partners shared their insights and findings from sand fly sampling sites across 12 countries, unveiling strategies to leverage data from these traps. These efforts are critical for achieving objectives like testing our developed surveillance Early Warning System (EWS) and monitoring tools.

The results

Field collections of sand flies were accomplished as planned in 11 countries +1 (Portugal, Italy, Turkey, Israel, France, Austria, Germany, Czech Republic, Croatia, Slovenia, and Spain), in addition, data from Greece was acquired by an IDAlert project partner. Currently, sand fly specimens are being identified, with preliminary results suggesting new records for some species in several surveyed countries. A follow-up study on canine seroprevalence was in several countries. Standardized screening for sand fly-borne pathogens is ongoing following the External Quality Assessment (EQA) for *Leishmania* and phleboviruses detection. Vector competence has been tested in three sand fly species - *Phlebotomus perniciosus*, *P. tobbi* and *P. perfiliewi* (more than 30 runs of experimental infection performed, more than 800 sand fly females dissected and evaluated), confirming that *P. perniciosus* and *P. tobbi* are competent vectors of *L. donovani* and *L. major*, *P. tobbi* is susceptible to Toscana phlkebovirus linage B and *P. perfiliewi* is a competent vector of *L. tropica* while *P. perniciosus* does not support the development of *L. martiniquensis*. In the next period, experiments with *P. tobbi* and *P. perfiliewi* will be completed and other sand fly species (*Sergentomyia minuta,* recently colonized *P. mascittii* and *P. neglectus*) will be tested. Candidate molecules as semiochemical attractants in novel sticky traps were thoroughly tested under laboratory and field conditions and will

[1]WHO: Leishmaniasis: https://www.who.int/news-room/fact-sheets/detail/leishmaniasis#:~:text=An%20estimated%20700%20000%20to,will%20eventually%20develop%20the%20disease.

be incorporated into a trap prototype as a next step. Development of novel salivary antigens as markers of exposure to sand flies successfully proceeds, utilizing dog sera from two endemic regions in Turkey to develop species-specific markers for *P. papatasi* and *P. tobbi*.

In addition, CLIMOS meticulously collects data on climate factors such as temperature, precipitation, and soil moisture as possible drivers of sand fly development and spread. We also study the distribution, and effects of the pathogens and diseases they carry. We also collect a range of environmental and socio-economic records. This expansive dataset undergoes an exhaustive process to ensure that the information extracted is of good quality to be used for other projects and researchers. The preprocessing of CLIMOS datasets is ready for the data analysis and modelling, to start the first iteration of CLIMOS's EWS.

Moreover, CLIMOS counts with partners responsible for evaluating and validating the results of the project. They monitor the deployment of technological components (devices and algorithms) and ensure that these operate as opposed to. During the GA, we discussed the deployment of environment sensors in nine countries and the validation framework for the AAI models that will be deployed in the final EWS. The next steps are the deployment of sensors in additional countries, aggregation of data with CKAN, and overcoming validation challenges due to a lack of historical data.

In parallel, CLIMOS organised a series of workshops to understand what can affect and motivate the adoption of an EWS for more accurate climate modelling and prognosis of *Leishmania* infection risk. Initially an assessment of different dimensions such as social, economic, political, technological, legal, economic ethical as well as environmental, and how they are related and influence each other was conducted. The assessment was useful on one hand to start developing multiple stories (or scenarios) of how the future could look. On the other hand, to understand who are the stakeholders that need to be involved in the development of such stories and CLIMOS EWS.
The first steps to develop a sound Cost-Benefit Analysis for the societal implications of climate change on health systems, which will be useful to identify interventions that can reduce the burden of disease in the future were also discussed Along with the scenarios, they will be useful to empower decision-makers to work towards a desirable future considering that we are living in times of rapid change and uncertainty.

During the GA, the coordination team was pleased to welcome Dr. Luigi Sedda, the External Scientific Advisor, from Lancaster University, whose valuable insights contributed to the project. The progress on the Project Data Management Plan, which encompasses data collection, processing, sharing, preservation, and ethical considerations were presented. CLIMOS informed all partners that the ethics requirements were being met and that Dr. João Lavinha, the external ethics advisor, was reviewing the upcoming report. These achievements demonstrate the project's efficiency, transparency, and adherence to standards.

As sand flies extend their reach into new regions due to climate change, the threat of leishmaniasis is on the rise. Considered a neglected tropical disease, the increasing number of cases annually underscores the urgency of addressing this issue. This is why CLIMOS has a strong work on communication and dissemination activities through its web and social media including educational video and CLIMOS podcast that can be found online. Moreover, the CLIMOS project recently launched its Stakeholder Network and invited European organizations and individual members with an interest in mitigating climate change-induced emergence and spread of SFBD to join forces. Additionally, CLIMOS is working with local communities to co-create and validate together with the stakeholders the scenarios in Portugal, Turkey, Italy, Serbia, Spain, Israel, Croatia Slovenia, and France, and to raise awareness, particularly in the areas where transmission is a new occurrence and there is a risk of failing to recognise these infections.