PALE-Blu

Understanding pathogen, livestock, environment interactions involving bluetongue

Co-funded by the Horizon 2020 programme of the European Union

H2020-SFS-2016-2017 PALE - BLU PROJECT
Understanding pathogen, livestock, environment interactions involving bluetongue virus

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ENVISIONING THE BIG PICTURE

You can look at a tree, a leaf, a blade of grass. Or you can look at the whole forest. Dealing with a disease like bluetongue means to do both things: you must have details, but you have also to grasp the whole image, at the same time.

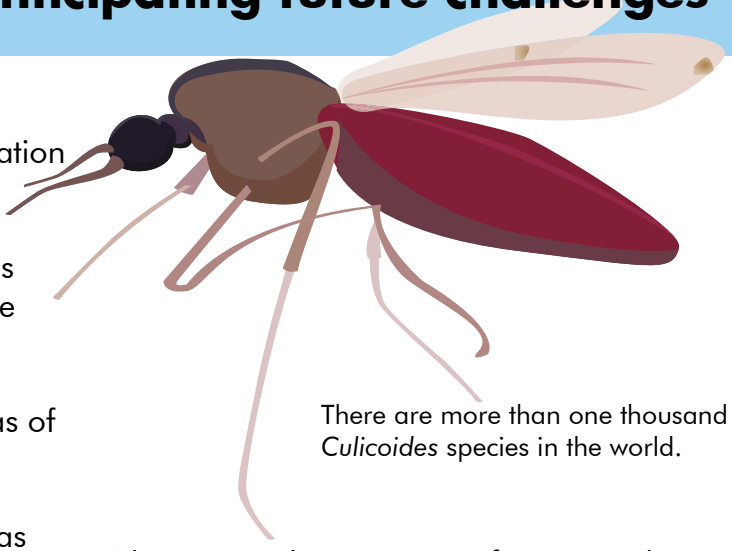
This is the challenge taken up by PALE-Blu project. Environmental factors, virus-host interactions, genetics of both the pathogen and the vector, all of them pieces of a broader picture. In the past five years, 19 partners over 15 countries put their knowledge and expertise together in order to provide a multi-level vision, key to understanding the mechanisms and pathways of virus transmission and movement into Europe. The 64 papers published so far by project's partners in the framework of PALE-Blu represent a basis for development of effective control and prevention strategies, as well as providing evidence to support policy decisions.

No single country, no single lab, can efficiently address a disease whose spreading depends on so many factors. Cooperation, involving both EU and not EU States, enabled researchers to better designing mechanisms and pathways of virus transmission and movement into Europe, as well as the processes of infection and replication that determine progression and spread of disease outbreaks. This knowledge is a crucial weapon in the hand of veterinary health authorities, breeders and lawmakers in order to make decisions that, in coming years, will deeply affect a whole economic sector.

Finally, PALE-Blue was never meant to provide a still image, maybe useful just for the next few years. The various relationships formed by its partners will continue in terms of expertise exchanging and of shared methods, while new projects are already being designed to capitalize on its results. This legacy will constitute the basement on which to build a solid and stable method of assessing bluetongue threat and issuing prompt countermeasures. All these accomplishments are in line with the Horizon Europe perspective, in which EU policies are bound to meet global challenges by facilitating collaboration and strengthening the impact of research and innovation.

On the trails of a multifaceted disease

Tracing today's routes, anticipating future challenges



There are more than one thousand *Culicoides* species in the world.

Bluetongue as a moving target. The combination of different factors, from international trade to global warming, from the appearance of genetic variants to the adaptation of the virus to new species of midges, portraits an elusive pathology. Farmers and authorities may be taken by surprise, as has already happened when the virus appeared in unexpected areas of North Europe.

The PALE-Blu project, during its five years, has been on the trail of this disease, studying genetic and environmental aspects, as well as the interaction between viruses and insect vectors. "There are – says Maria Goffredo, of IZSAM - more than one thousand *Culicoides* species all over the world, feeding on a large number of vertebrates. Less than 40 of them, associated to livestock, are able to transmit the bluetongue virus in various continents". And they can even "pass the baton" from one species to another, maybe one more suited to a new environment. "There are some species – continues Goffredo - occurring in the African continent, such as *Culicoides Imicola*, for example, while others have Europe as their habitat, as *Culidoides Obsoletus*. We know that they meet in the Mediterranean basin, with Italy just in the middle. The study of interactions between insects, hosts and virus has been a relevant part of the Pale-Blu project".

Maria Goffredo
IZSAM

"Less than 40 Culicoides species are able to transmit the bluetongue virus"

"Bluetongue disease moves from one place to another – adds professor Willy Wint, University of Oxford, UK - If we can work out what makes the disease move or how it moves then we can predict where it goes, which means we've got some chance of doing something about it and also warning livestock keepers in the area to which the disease may move".

It took a large collaborative project to put all the pieces together and to follow traces on an international scale. "We assembled – continues Wint - a lot of different information from different sources, such as satellite imagery, climate information, temperature, rain, fog, wind, but also the movement of animals from one place to the other".

Willy Wint
Oxford University

"If we can work out what makes the disease move or how it moves then we can predict where it goes"

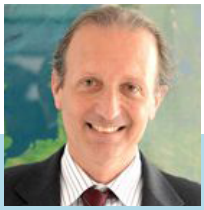
By disentangling all these elements and studying their correlations, PALE-Blu paved the way to a better understanding of factors that influence the risks and likelihood of European bluetongue incursions from specific source regions. A crucial tool for policy decisions concerning prevention and control strategies.

Africa, Maghreb, Europe: a joint effort

A multinational strategy for a borderless disease

Regions endemic for bluetongue, including the Middle East, North Africa and countries in sub-Saharan and West Africa, suffer periodic outbreaks of BT disease and represent a source of infection for Europe. For this reason, detailed epidemiological data concerning the origins, evolution (reassortment) and movement of specific bluetongue viruses lineages are crucial to identify environmental factors and transmission pathways by which individual outbreak strains can arrive and become established in Europe. "Bluetongue virus - says Giovanni Savini, IZSAM - has mainly two corridors of entrance to Europe: an eastern corridor, from Turkey and Middle East, and a western one, from Northern Africa. So, PALE-Blu defined the basis of a common strategy to strengthen surveillance in the borders of Europe towards these two corridors". And to bring the fight right at the origin, as states Moustafa Lo, ISRA: "Here in Senegal we have breeds resistant to the disease. Nevertheless, they can still be a source of transmission of the virus from West

Giovanni Savini
IZSAM



"Bluetongue virus has mainly two of entrance to Europe: an eastern corridor, from Turkey and Middle East, and a western one, from Northern Africa"

Africa to North Africa, South Mauritania and other countries. The consortium we built allowed us to gain a better experience in handling this big problem".

It is not about building barriers. It is about to be prepared and to act promptly. "One of the pillar of this project – continues Savini - has been the creation of a deep knowledge on what is happening in countries bordering Europe. If we know what is circulating in Northern African Countries or in Turkey and Middle East, we can predict what will occur in Europe in a few years. For example, in July 2000, bluetongue serotype 2 was circulating in Algeria and Tunisia and in September-October / August-September 2000, the same serotype was present in Italy and in Baleari Islands. So, focusing authorities' attention on these bordering Countries is a good strategy in order to be prepared to future incursions. PALE-Blu laid the foundation for the building of a comprehensive strategy".

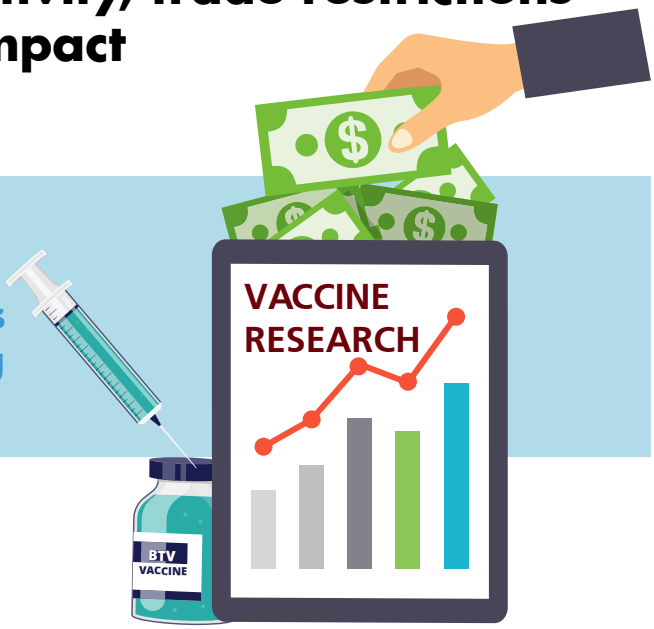
Moustafa Lo
ISRA

"Here in Senegal we have breeds resistant to the disease"

The economic side

Animal deaths, loss in productivity, trade restrictions and vaccines cost: a lasting impact

"Vaccination is undoubtedly the best weapon but drug companies prefer not to produce large doses of vaccines because there is the risk of not having enough orders for them"



Bluetongue outbreaks in southern Europe in the 1990s were linked to an expansion in the range of the African midge, *Culicoides imicola*, while the first outbreak ever recorded in Northern Europe was initially detected in the Netherlands during August 2006, before spreading across almost the whole of Europe during subsequent years. This outbreak killed many hundred thousand animals (mainly sheep) with an estimated 25% case fatality rate, along with economic losses due to movement restrictions (loss of trade), loss in productivity and reproductive performance (in both cattle and sheep), as well as surveillance and vaccination costs.

"Bluetongue virus – says Stephan Zientara, ANSES - induces very important direct and indirect economic losses. Direct losses because animals die or can die, indirect ones because you have to find the strain and establish surveillance and vaccination plans. Finally, sometimes an international trade ban is also necessary". Breeders, traders and, more in general, the whole food chain, are affected by a bluetongue outbreak. And tougher times may be ahead, due to global warming–driven expansion of vectors. So, research must aim not only to better and more extensive identification and tracing. In order to contain the impact on economy, it must find appropriate, tailored, measures of prevention.

Stephan Zientara
ANSES

"Bluetongue virus induces very important direct and indirect economic losses"

"Just as an example – continues Zientara – the total cost for bluetongue serotype 8 for the years 2006–2011 were estimated at 200 million Euros, at EU level. I think that these elements show the importance of the economic losses due to Bluetongue virus. That's why the results of this project are very important in designing how to develop tools, to develop vaccines, to develop knowledge".

"Vaccination – comments Giovanni Savini, IZSAM - is undoubtedly the best weapon. But one of the problems of vaccination is: we don't have sufficient vaccine doses available in the market. Drug companies prefer not to produce large doses of vaccines because there is the risk of not having enough orders for them. So one strategy we investigated during the project is knowing in advance what could be the potential circulation of specific serotypes in Europe. For example, if we know that serotype 3 is circulating in Northern Africa, we start producing specific vaccine doses in Europe, so to be prepared for the incursion with the most appropriate tool."

FOR FURTHER INFORMATION

Publications

65 published papers born from a collaborative effort and addressing bluetongue not only from different points of view, but also from different cultural and economic scenarios.

Read more

Useful resources

A deeper and more detailed knowledge of the strategies and the challenges related to bluetongue.

Pale-blu data

Btv-glue

Blue-med

Factsheets

Find more information about bluetongue, the way it spreads, the containment procedures already in place and the ones under development.

Read more

Read more

Partners

Know more about the project's 19 partners over 15 countries in Europe, Africa and Asia. A wide net of research labs committed to one common goal.

Read more

Videos

Meet the researchers involved in PALE-Blu

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Realised by EU Horizon 2020 project "PALE-Blu - Understanding pathogens, livestock, environment interactions involving bluetongue"