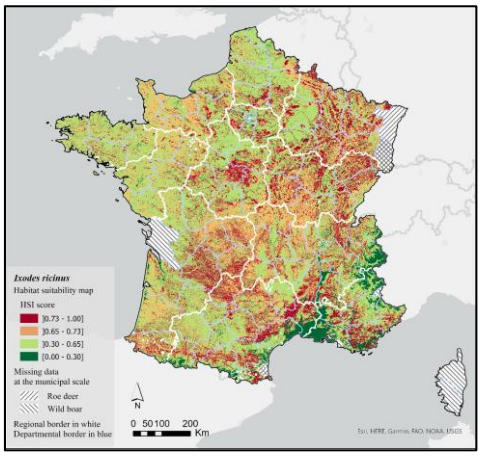
Press release – 1 June 2022

# Aiming for weather maps of ticks in metropolitan France

**As part of the national plan to combat Lyme disease and other tick-borne diseases, INRAE and VetAgro Sup, as well as CIRAD, ANSES and the company Boehringer Ingelheim, analysed the risks associated with the tick *Ixodes ricinus*, the main pathogen vector in France and Europe. The research team used data collected in seven observatories characterised by various climates in metropolitan France; it also referred to meteorological and environmental (vegetation, soil, etc.) data. This was supplemented by additional field observation campaigns. The results, published in Geospatial Health and Scientific Reports, led to the development of a map indicating those areas most favourable to the presence and activity of *Ixodes ricinus* ticks, on the one hand, and a model for predicting the periods of greatest risk depending on the season and weather in metropolitan France, on the other. This first map enables the risk of human exposure to tick bites to be better assessed and also allows preventive campaigns to be more effectively targeted depending on the municipality. The next step will be to combine the map and the model to produce weather maps to better anticipate the risk of tick bites.**

## Mapping areas favourable to the presence of ticks

In France, the *Ixodes ricinus* tick species is present across most of the country and is the main vector of pathogens responsible for various diseases such as Lyme disease. The activity and life cycle of the ticks depend on several environmental factors such as climate (oceanic, Mediterranean, continental, etc.), altitude, land use (forests, meadows, urban areas, etc.) and the presence of hosts for their meals. An index value ranging from "weak suitability" to "very high suitability" was assigned to each of these four factors, with the presence of hosts being characterised by the density of wild ungulates (data of the French Biodiversity Agency). The research team combined knowledge of these factors using multi-criteria decision analysis methods, which they applied to geographical information systems to create a habitat suitability map for *Ixodes ricinus*.




*Habitat suitability map for Ixodes ricinus ticks in metropolitan France (100 x 100 m pixel resolution). © I. Lebert et al. Habitat suitability of Ixodes ricinus tick in France using multi-criteria analysis. Geospatial Health Vol. 17*

To validate the approach, they compared the habitat suitability scores with field data obtained from tick nymph collection campaigns in metropolitan France. The map confirms that the most favourable areas for the presence of ticks are in the centre, north-east and south-west, while the least favourable habitats are in Mediterranean and high-mountain regions. It provides information for regional and municipal authorities and will help better target prevention messages on tick bites.

**A model for predicting the activity of ticks based on the weather**

Tick activity also depends on weather conditions and impacts the risk of transmission of pathogens, including that responsible for Lyme disease. To better understand and describe tick activity, the researchers used data from a network of seven observatories spread out across metropolitan France. Since 2014, monthly collection campaigns have been organised in these observatories to estimate tick density and also to measure meteorological (temperature, humidity, etc.) and environmental (altitude, land use, etc.) variables. By pooling the information from the 631 campaigns carried out, the researchers developed a statistical model to estimate tick activity depending on the location, season and meteorological variations. This model can explain most of the observed variations in tick activity.

The map and the model, which are complementary, provide valuable information for identifying regions and periods with a risk of exposure to ticks in France. The objective is to be able to combine the two to produce maps of tick activity in metropolitan France based on meteorological data.

**References**

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