



#### ▲ Bluetongue propagation parameters.

Each map shows variations (between the 1961-1999 reference period and the 2000-2008 period) in a specific parameter associated with bluetongue transmission in ruminants: (a) biting rate, (b) mean extrinsic incubation period (i.e. time required for the vector-ingested virus to make the vector 'infective' at the next blood meal), (c) vector mortality rate, and the (d) vectorhost ratio.

### ◀ Variations in the bluetongue transmission risk.

Each spatial map shows variations in the disease transmission risk over given periods between 1961 and 2008. Reference period: August to October. Map (a): Mean R0 for the 1961-1999 period.

Maps (b) to (f): Variations (in % and per decade) relative to the reference value for the 1961-1999 period.

## Assessment of the impact of climate on the risk of bluetongue transmission in Europe

Variations in the basic reproduction ratio (R0, corresponding to the transmission risk) of bluetongue were assessed for past and recent (1960-2008) and future (up to 2050) periods using a set of 11 climate models. These assessments were conducted using models of the effect of temperature on the biting rate, vector abundance, length of the extrinsic incubation period and the vector mortality rate. These spatial models generated risk maps and enabled assessment of the uncertainty associated with these simulations.

The results suggest that the risk has increased and will continue doing so in the coming years, and also that different mechanisms are involved in southern and northern Europe.

The following partners collaborated in this research project: CIRAD (via AGIRS, CMAEE and TETIS research units), University of Liverpool (UK) and the *Centro de Investigación y Tecnología Agroalimentaria* (Spain). Funding was from the following European projects: ENSEMBLES, CIRCE, NERC (Natural Environment Research Council) and the Leverhulme Trust (UK).

### Contact: Hélène Guis, helene.guis@cirad.fr

For further information: http://rsif.royalsocietypublishing.org/content/9/67/339.full.pdf+html?sid=1807df90-97b1-4057-a5d5-bc6fa9aa0df3

# Animal and zoonotic disease monitoring and management

The joint research unit *Emerging* and *Exotic Animal Disease Control* (UMR CMAEE – INRA, CIRAD) conducts integrated research aimed at improving monitoring and forecasting of the risk of animal and zoonotic disease emergence and dissemination, thus optimising their prevention and control. This research focuses on interactions between pathogenic microorganisms, their domestic and wild hosts, and vectors of these pathogens.

The unit takes both environmental and socioeconomic factors into account as well as global change (including climatic). Research carried out by CMAEE aims to describe and characterise:

- the factors that determine the emergence of pathogens, their transmission and dissemination
- infectious processes and the dynamics of vector populations.

The analyses implemented in these operations are conducted on molecular to population scales.

The scientific strategy is based on three themes:

- Disease and vector dynamics
- 2 Disease and vector control
- **3** Forecasting risks and surveillance.

Within these three themes, the unit's teams are striving to permanently combine research and surveillance on the focuses of the research, i.e. emerging or enzootic diseases in developed and developing countries (vector-borne or direct transmission) and some zoonotic diseases.