



Bluetongue in Europe

1. Summary

Bluetongue (BT) is a potentially devastating midge-borne disease of ruminants that recently spread across Europe from its traditional tropical endemic areas. Historically, bluetongue virus (BTV) made only brief and rare incursions into fringe areas of Europe, with the Afro-Asian biting midge vector - *Culicoides imicola* being largely responsible for transmission. Since 1998, however, different strains of BTV entered Europe from at least two directions, and spread up to hundreds of kilometres further north than previously reported. Interestingly, the northern range limit of the distribution of *C. imicola* shifted northward, but other Palearctic *Culicoides* species, not previously described as potential vectors, may also play a major role in the transmission of BT in Europe. This should be specially the case in south-east of Europe, where *C. imicola* has never been identified. Very recently, outbreaks were recorded in a transboundary area including Belgium, the Netherlands, Germany and France, far more northern latitudes than the previous limits of the disease. These outbreaks are related to a new serotype previously not reported in Europe (serotype 8).

BTV spread in Europe has resulted in massive

Table of Contents

1. Summary	1
2. Background information	1
3. Bluetongue in Europe	2
4. Recent events and new profiles	4
5. Perspectives	4
6. EMPRES follow-up and response	5

disruption of trade in animals and animal products and caused the deaths of over 1.5 million sheep.

2. Background information



Culicoides imicola, main Afro-Asian vectors of BT in the Mediterranean Basin
Photo: EID/Bruno Matthieu

Bluetongue (BT) is an infectious, non contagious, arthropod-borne viral disease affecting ruminants, mainly sheep, and is not a human pathogen. The disease is due to a segmented RNA virus (BTV, Reoviridae, Orbiviridae), for which 24 serotypes have been identified. As a consequence of the RNA segmentation, reassortment of segments may occur during co-infection of different strains (including natural and vaccinal strains), providing to BTV a high potential for recombination.

BT infection is often a serious disease for sheep, and moderate or even unapparent in cattle and goats (transitory hyperthermia). Clinical signs are related to the inflammation, ulcers and necrosis of nasal and buccal mucous membranes, an indication of inflammation of the vascular endothelium (vasculitis). They include: fever, nasal discharge and mucosal erosion, ptamism (excess salivation), watering, intramandibular oedema and limbs, muscular stiffness and lameness (affection of the coronary bands). A characteristic but not pathognomonic sign in sheep is the congestion and necrosis of the tongue, which give the name of the disease.

The clinical sign may vary according to the strains of virus, as well as the resistance of hosts. In non-endemic areas, where the livestock are highly naïve and susceptible, mortality rates may reach 10-20%.

The virus is transmitted between vertebrates by numerous species of *Culicoides* biting midges (Diptera: Ceratopogonidae). More than 1,400 *Culicoides* species have been identified in the world, from tropical areas to tundra and arctic wetlands, and 95% are hematophagous, taking blood from various vertebrate hosts including mammals, birds, amphibians, etc. Some *Culicoides* species even feed on insects. More than 50 types of viruses have been isolated from *Culicoides* spp., with 17 species of midges connected with BTV transmission across the world. One of the most important vectors is *C. imicola* widely present in Africa, Asia and now southern of Europe.

Culicoides midges are very small (1-3 mm), making the entomological work difficult and the ecology of these insects is still only partially described.



Photo: FAO/ Stephane de la Rocque

Disease control tools include limitation of animal movements, control of susceptible populations, vectors control and vaccination. Vector control is almost impossible, considering the number of insects and the dispersed habitat of *Culicoides* (*C. imicola* breed in damp or wet soil), but the breeder may use an insecticide or a repellent on the animals to break host-vector contact, especially during feeding times of from dusk to dawn. Vaccination with attenuated but living virus strains has to be considered, especially in light of possible the risk of recombination and reassortment events between with wild and vaccine-derived viruses and the impact on serological survey interpretation. In addition, the selection of vaccine is of major concern, as no cross-

protection arises between most of the serotypes.

3. Bluetongue in Europe

The ongoing BT outbreaks that have occurred across the Mediterranean Basin since 1998 have led to over 1.5 million sheep fatalities. In addition, the cost of BT is also indirect with negative economic consequences in regard to international and domestic trade being significantly disrupted through loss of markets, prohibition of livestock movements in many areas, closure of markets, exhibits and fairs. Worldwide it has been estimated that BTV causes up to US\$ 3 million per year in losses. Indeed, BT is considered to be of such major international concern that it had been given to the previous OIE List A status.

Though outbreaks occurred in Portugal and Spain in the late 50's, and again in the 80's in Greece, these were brief, periodic incursions into Mediterranean Europe. However, since 1998, the largest epizootic of BT ever recorded occurred in the Mediterranean Basin and is expanding yearly to more northern climates, previously never infected.

Eastern focus: in October 1998, after an absence from Europe of almost 20 years, BT was confirmed in Greek islands (serotype 9), then in Bulgaria, Turkey in June 1999, (mainland) Greece in August 1999 with 2 other serotypes being identified (4 and 16), Serbia, Montenegro, Kosovo, and Macedonia in 2001.

Western focus: almost simultaneously, another spreading way from the South affected Western part of Europe. In January 2000, BT was reported for the first time from northern Tunisia, and the virus was identified serotype 2. Eastern Algeria was declared infected in July 2000, then Italy (Sardinia in August, Sicily and southern mainland in October), Corsica, Menorca and Mallorca in October 2000).

In 2001 Italy recorded renewed BTV activity in Sardinia and southern mainland with further spreading northward reaching Lazio and Tuscany region. The majority of these outbreaks were due to BTV2 but the presence of BTV9 was also identified in the southern Calabria and Basilicata regions indicating a presumable confluence between the eastern and western foci. The link between the two

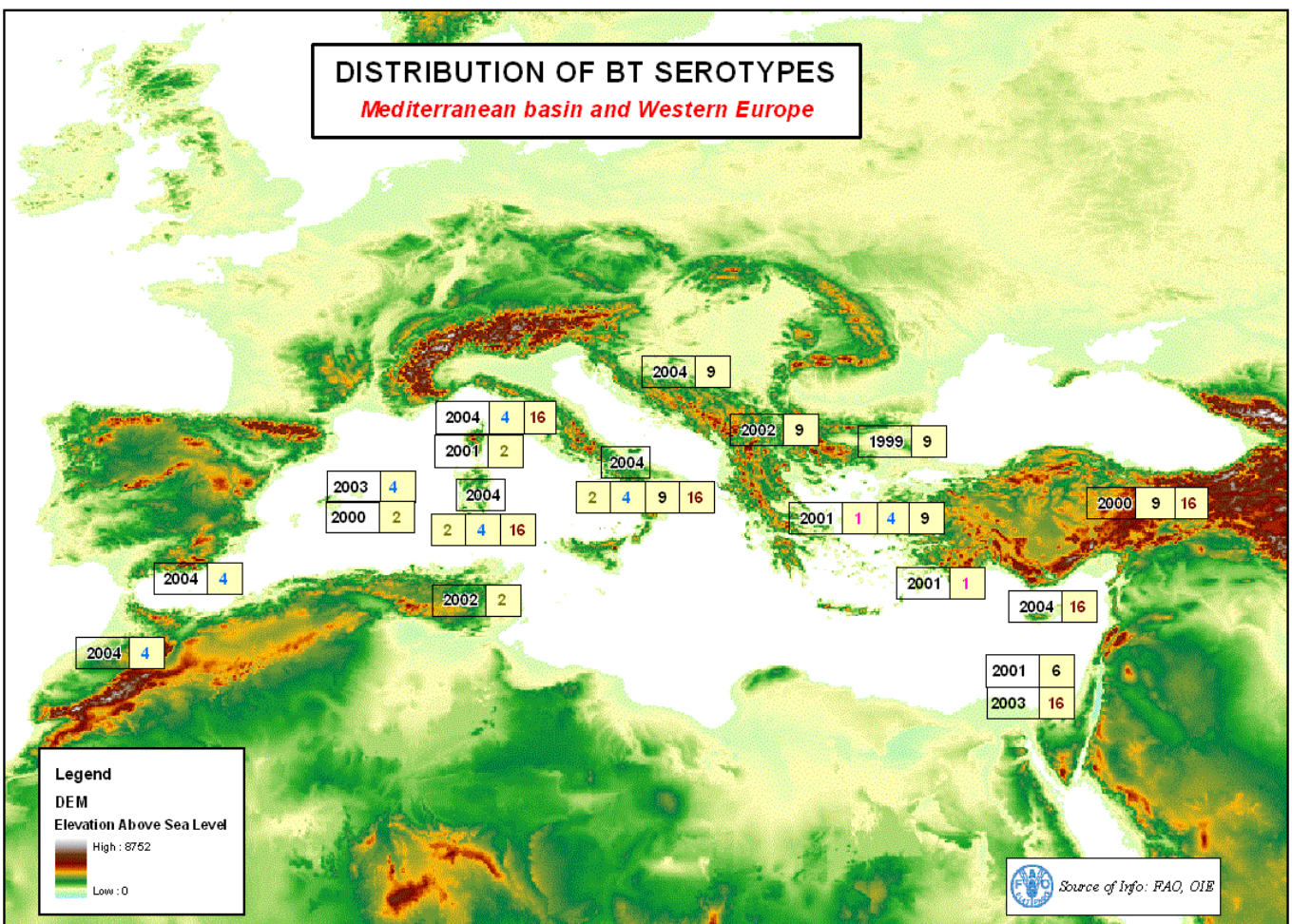
foci has become clearer in 2002 with the detection in mainland of Italy of BTV16 further indicating a westerly movement of the virus.

The geographical expansion of BT in South of Europe has been related to the northern spread of its main Afro-Asiatic vector *C. imicola* by high-level air streams (e.g. 44, 30' N in Serbia and Bosnia). Indeed, the serotype 2 was identified in Corsica, Sicily, Sardinia, and was the same than the one circulating in Maghreb in 1999. However, the virus has affected north-western Greece, Bulgaria, western Turkey and some regions of Italy, where this *Culicoides* species has never been found. It was suggested that novel *Culicoides* vectors, possibly the widespread *Culicoides obsoletus* and *Culicoides pulicaris* complexes, may be involved in transmission in these areas. Indeed, BTV has been detected in wild-caught *C. obsoletus* in Cyprus and, more recently, in southern and central mainland Italy from wild-caught, non-blood-engorged parous *C. obsoletus* and in wild-caught *C. pulicaris* in Sicily.

These findings were obtained in areas of Italy where the presence of *C. imicola* was rare at best, thus giving an insight on the role that these two groups of *Culicoides* may have in the epidemiology of BT. Vector competence studies carried out in the United Kingdom during the 1980s demonstrated an oral susceptibility of *C. obsoletus* and *C. pulicaris* of less than 2% in comparison with a 19.5% for known major vector, *C. sonorensis*. This lower oral susceptibility could be compensated by the high abundance and high survival rates in affected areas where the presence of *C. imicola* was not identified.

The importance of those findings rely on the fact that although *C. imicola* seems to expand its range, its presence is mostly restricted to the Mediterranean Basin, while *C. pulicaris* and *C. obsoletus* are probably the most common species of midges across the central and northern part of Europe.

Another important novel feature to be mentioned is the possibility for the BT attenuated vaccine virus to be transmitted in unvaccinated susceptible animals as



demonstrated from workers in Italy with the BTV2 vaccine strain recovered from unvaccinated cattle as well as from pools of parous-non-blood-engorged *C. imicola* and *C. obsoletus*.

This epizootic is unprecedented in several respects: the large number of countries affected (including several that were previously unaffected); the involvement of several viral serotypes and at least two independent incursions of the disease (in the east and west Mediterranean); the duration of the epizootic (up to four years in some countries); and the high mortality, with several hundred thousand sheep killed to date. The recent outbreaks in the North of Europe make the picture still more complex.

4. Recent events and new profiles

The Netherlands

The first suspicion occurred on 14 August in hobby sheep flock. As of September 4th, 34 holdings have been declared infected, all located within the southern part of the province Limburg, in the South of the country. Most (24) of them are local farms, while 10 only raise cattle. On 28 August, the EC Reference Laboratory for Bluetongue (Pirbright, UK) confirmed the serotype 8.

Belgium

BT was suspected in Belgium on 18 August 2006, when 11 farms in the East of the country (province of Limburg and Liège) experienced undiagnosed health problem since mid July. Forty six outbreaks were confirmed by 26 August, and a total of 56 by 30 August (27 others suspected). Interestingly, 45 of the 56 outbreaks affect cattle farms. Main signs of disease in cattle were nasal discharges and erosions, oedema of udder and teats. The Veterinary and Agrochemical Research Center, Belgium's national reference laboratory isolated BTV which was identified as serotype 8.

Germany

BT was officially recorded in Germany on 21 August, with 7 cases in cattle herds and 2 cases in sheep, in northern Rhine Westphalia. As of 29 August, 31 farms (29 cattle, 2 sheep) were confirmed and 13 others

suspected, all close to the border with Belgium and the Netherlands.

France

The first outbreak in France was recorded the 28th of August on cattle in the Ardennes, on the border of Belgium. As of 4th of September, two other cases were declared.

5. Perspectives

Emergency measures for bluetongue control follow the EC procedures (Directive 2000/75/EC for the control and eradication of BT). A protection zone is established 20 km around the outbreaks sites, where the movements of susceptible animals and living products (semen, ova and embryo) are banned. A 150 km restriction area was also drawn, where stringent rules are applied to movement of ruminants.

Additional measures were undertaken by the different countries. Meticulous census of animals have been undertaken and all treated with repellents and/or insecticide, and if possible confined indoors from dusk to dawn. Recommendations also include insecticide treatments for buildings and surroundings. Additional animal epidemiological surveys (based on serology/ELISA and PCR) are currently being undertaken, as well as entomological collections, identification, and laboratory analysis. Preliminary and non-official results may confirm the absence of *C. imicola*, but high density of other potential vectors such as *C. obsoletus*.

Considerations which make the things unusual:

1. The mortality in sheep is low, while infection in cattle is more severe than usually described.
2. To-date, Europe experienced 5 serotypes, namely 1, 9, 16 (Eastern virus, e.g. from south-eastern Europe) and 2, 4 (South-Western virus, e.g. Africa or America). Serotype 8 had never been detected in Europe and the disease should be considered linked to a novel introduction from exotic origin. First results from nucleotide sequence on segment 2 indicate a sub-Saharan lineage. Since the first Netherlands' confirmed cases are local animals (i.e. non imported), they

must have acquired the infection within the country.

3. Sequencing of genome segment 5 also shown to be different from the live vaccine strains widely used in different part of Europe including Bulgaria, Italy, Corsica, Spain, and also in South Africa in recent years.
4. If the absence of *C. imicola* is confirmed, others species have to be incriminated. A good candidate could be *C. obsoletus*, found in significant density. It has been experimentally proved that the vectorial capacity of this species (i.e. its capacity to acquire and transmit the virus) was improved by high temperature, a scenario which may have happen in last July when this area was unusually submitted to hot weather.

To conclude, this Bluetongue outbreak reminds us that occasional conditions may favor the spread of some arthropod-borne diseases, possibly in short term when vectors are at peak abundance, to free areas further north or south from the main endemic zones. In this case, at risk areas need to be redefined after risk factors are better known; however there may be more often undetected entry of pathogens in naïve ecosystems than thought, but the ecological conditions for spread may not always be present.

6. EMPRES follow-up and response

FAO EMPRES programme is currently developing a project to increase the capacity for the surveillance and warning system of bluetongue and West Nile fever in Morocco, Algeria and Tunisia supported by the French government.

The objective is to identify the area of risk for this disease, to harmonize the system of surveillance in these countries and to reinforce the disease detection and control.