

Health management of large transhumant animal populations and risk of bluetongue spread to disease-free areas

D. Nannini⁽¹⁾, P. Calistri⁽¹⁾, A. Giovannini⁽¹⁾, M. Di Ventura⁽¹⁾, M.A. Cafiero⁽²⁾, G. Ferrari⁽³⁾, U. Santucci⁽⁴⁾
& V. Caporale⁽¹⁾

(1) Istituto Zooprofilattico Sperimentale dell'Abruzzo e del Molise 'G. Caporale', Via Campo Boario, 64100 Teramo, Italy

(2) Istituto Zooprofilattico Sperimentale della Puglia e della Basilicata, Via Manfredonia 20, 71100 Foggia, Italy

(3) Istituto Zooprofilattico Sperimentale del Lazio e della Toscana, Via Appia Nuova 1411, 00178 Rome, Italy

(4) Ministero della Salute, Direzione Generale della Sanità Pubblica Veterinaria y degli Alimenti e Nutrizione, Piazzale Marconi, 00144 Rome, Italy

Summary

Transhumance, or seasonal grazing, in central Italy is a husbandry practice that is over two thousand years old. It involves the seasonal movement of sheep, goats and cattle from the southern lowlands of mainly the Puglia and Lazio regions, to summer pastures in the mountains of Abruzzo and Molise. Bluetongue (BT) made its appearance in Italy in 2000. In the early summer of 2001, disease was present in three regions: Sardinia, Sicily and Calabria. Neither an effective surveillance system nor a vaccination campaign had been implemented. Movement of ruminants to the disease-free regions of Abruzzo and Molise was therefore banned. The Italian Veterinary Services had to meet the challenge of the movement of ruminants from surveillance to disease-free zones, given the impossibility of stopping transhumance. The General Directorate of Veterinary Public Health, Food and Nutrition of the Ministry of Health developed a plan for both the Puglia and Abruzzo regions based on serological, virological and entomological surveillance. The plan was implemented between May and June 2001 when 7 000 animals moved from the Puglia surveillance zone to the infection-free summer pastures.

In the early summer of 2002, eight regions were infected (Sardinia, Sicily, Calabria, Basilicata, Puglia, Campania, Lazio and Tuscany). Simultaneously, a nationwide surveillance system and a vaccination campaign, were implemented in infected regions. In the provinces where vaccination was compulsory, deviation from the animal movement ban was allowed if at least 80% of susceptible stock had been vaccinated. However, this objective was not achieved in the provinces of Rome and Viterbo (Lazio) where a large transhumant population was present and where sporadic virus circulation had been detected. A specific control plan to allow transhumance from Lazio to Abruzzo, Marche and Umbria was designed and implemented to increase the number of animals that could be moved. Between May and June 2002, authorisation was granted to move 28 000 head, whereas prohibition of movement was ordered for 12 000 sheep (belonging to 21 flocks). Regional authorities financed feeding, watering and housing for these animals. Transhumance did not spread infection to disease-free areas either in 2001 or in 2002.

Keywords

Animal movement – Bluetongue – Disease control – Epidemiology – Italy – Seasonal grazing – Surveillance.

Transhumance, involving the seasonal movement of livestock between summer and winter pastures has existed in Italy for the past 2 000 years or more and has become a social and cultural event of some economic importance; At the end of spring,

ruminant livestock and their attendants leave their winter residences (often situated near the coast or in the plains of the south and centre of the country) and migrate to inland mountain pastures where they stay until the beginning of autumn. The bluetongue

(BT) epidemic that affected Italy in the summer of 2000 (2), soon spread to the regions of Puglia and Lazio that have practised transhumance since Roman times (Fig. 1). The problem of animal survival and welfare in areas in which feed and water resources diminish during the summer, and where pastures are either leased or used by the owners for summer cultivation, makes the prohibition of transhumance impossible. Indeed, strong objections were voiced in regard to the limitation of movement from surveillance zones where no infection was present. The prohibition of animal movement from the BT surveillance and protection zones of Puglia and Lazio to the disease-free regions of Abruzzo, Molise, Marche and Umbria, together with the practical impossibility of applying the movement ban to transhumant animals, encouraged the veterinary authorities to formulate and implement specific controls to reduce the risks linked to the movement of transhumant animals to summer pastures. The strategy adopted during the two epidemics in June 2001 and June 2002 is described here.

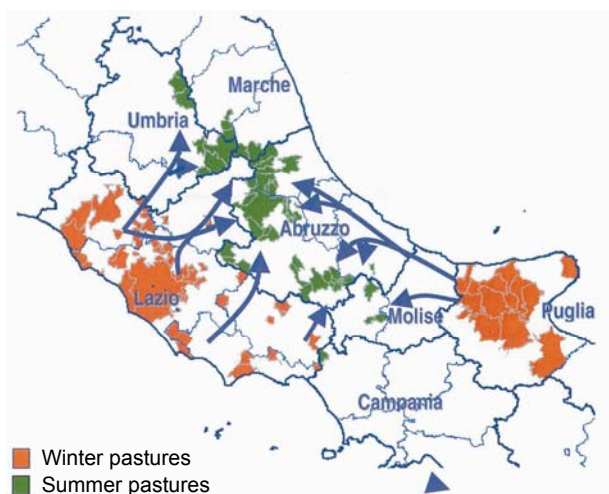


Figure 1
Transhumance pathways in Italy

Disease scenarios and health strategies

The first case of BT was reported in Italy in August 2000. By the early summer of 2001, the disease was present in Sardinia, Sicily and Calabria (2). Between November 2000 and May 2001, surveys were conducted on the bovine population in the neighbouring protection and surveillance zones and the demonstrated the circulation of BT virus in two additional regions: Campania and Basilicata. By the early summer of 2002, BT had occurred in Sardinia, Sicily, Calabria, Basilicata, Puglia, Campania, Lazio and Tuscany (2).

In June 2001 and July 2002 plans were implemented, in collaboration with the regional and local veterinary authorities, to allow transhumance. In addition to the sanitary measures already in force (1, 7, 8), these plans included additional provisions designed to meet the specific epidemiological situations in the ‘territories of departure’.

First scenario

In June 2001 European Commission Decision 2001/138/EC (3), in accordance with European Council Directive 2000/75/EC (4), established protection zones of a radius of 100 km around outbreaks or in areas in which virus circulation had been observed. Surveillance zones of a radius of 50 km radius were established around protection zones. Prohibition of ruminant animal movement from protection and surveillance zones to disease-free areas was strictly enforced. The surveillance zones included all the provinces of Puglia, in particular Foggia (Fig. 2), from which transhumant animals had to be moved to the disease-free regions of Abruzzo and Molise. At that time, the surveillance system was not fully operational nationwide (6) and compulsory vaccination, established by the Ministry Order of 11 May 2001, had not commenced (5, 9).



Figure 2
Protection and surveillance zones in Italy, June 2001

Second scenario

In February 2002, compulsory vaccination implemented in Sardinia, Calabria, Basilicata, three provinces of Sicily, three provinces of Puglia and one province of Campania, was extended to all provinces of Sicily and Puglia and to six provinces of Tuscany and four of Lazio. In the latter two regions, vaccination was limited to a band extending 20 km around disease outbreaks or from the Tyrrhenian

coast (Fig. 3). In April 2002, national regulations stipulated that the movement of animals from restricted zones (where vaccination was compulsory) to free areas could be authorised only if the animals had been vaccinated more than 30 days previously and from zones in which at least 80% of the susceptible population had been vaccinated. In June 2002, when the third epidemic started in the Viterbo and Roma provinces (5), only 47.1% and 47.3% of animals, respectively, had been vaccinated and surveillance data were insufficient to exclude virus circulation (6). The two provinces had to move animals to the disease-free regions of Abruzzo, Umbria and Marche (Figs 1 and 3).

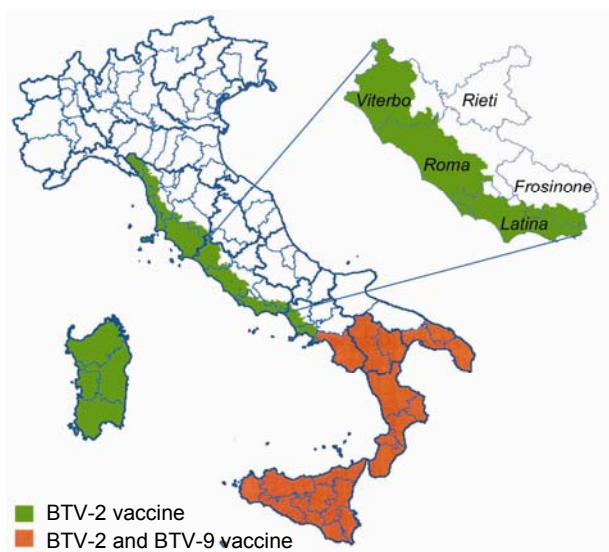


Figure 3
Vaccination areas in Italy, June 2002

General provisions

To enable the movement of animals to summer grazing pastures, serological testing had to be performed in winter grazing areas to verify presence of virus circulation (first operative phase) and in the summer grazing areas of destination to exclude the introduction of the virus (second operative phase). In the areas of origin (Figs 4 and 5), the introduction and export of animals was banned for the entire period in which serological testing was conducted. Single herds could be moved to summer pastures only on specific authorisation issued by the Ministry of Health and was dependent upon serological, entomological and virological results. Movement had to take place in escorted sealed lorries. The local municipal veterinary services, in areas of both origin and destination, and the police, had to verify that the regulations were being implemented correctly. Animal movement was restricted to the pastures of

initial destination until results of serological tests, performed 21 days after arrival, had been received.

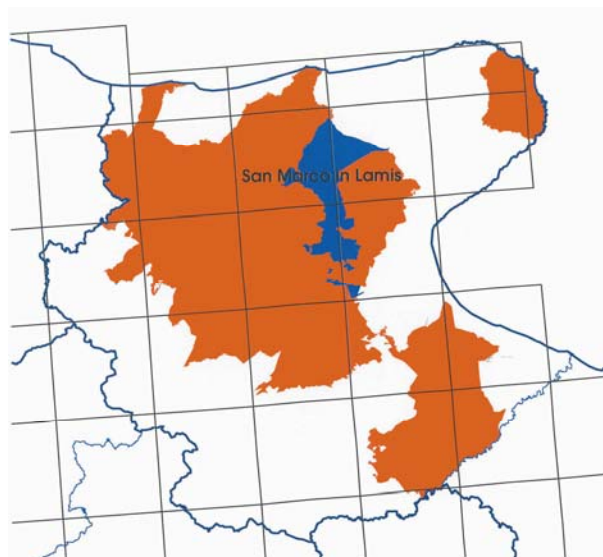


Figure 4
Winter residence municipalities of transhumant flocks in Foggia Province, Italy

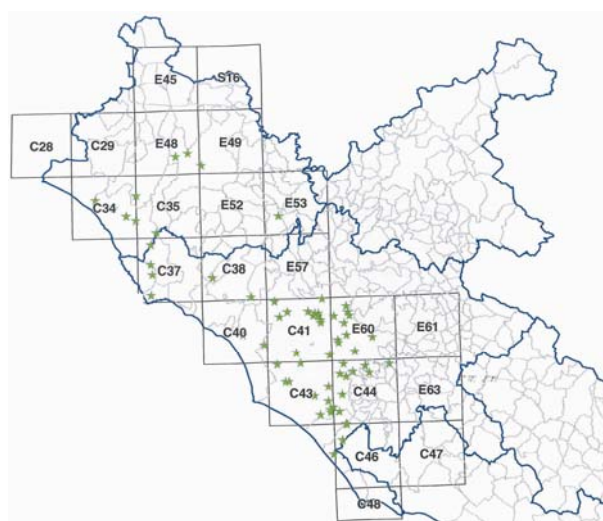


Figure 5
Winter residence of transhumant flocks in the Viterbo and Roma Provinces, Italy

Laboratory testing: first scenario

First phase (7-29 June 2001): winter pastures

The province of Foggia was subdivided into 20 'cells', 16 of which were 400 km² and four 200 km². These cells included all 43 bovine herds and 19 ovine or caprine flocks that had applied for authorisation to move to summer grazing areas (Fig. 4). In addition to the serological testing of all animals to be moved, the control plan included the capture of insects using blacklight traps, these positioned every night at different sites in each cell.

Control and trade

The objective was to collect insects that would be representative of the entire cell. Captures had to be made until all the animals had been moved. *Culicoides* spp. (parous and engorged) were tested using polymerase chain reaction (PCR) assay to detect or exclude the presence of viral antigen. A total of 3 433 cattle and 9 865 sheep and goats were tested using the competitive enzyme linked immunosorbent assay (c-ELISA) and gave negative results (Table I).

A total of 305 insects were captured, 246 of which were tested by PCR. *C. imicola* was found in only one catch in the municipality of San Marco in Lamis (Table II), where *C. imicola* was detected on 28 June 2001 (Fig. 4). The finding of *C. imicola* blocked the transfer of animals towards summer pastures. Of the 13 973 animals for which authorisation had been requested, 9 824 (70.3%) were authorised, 2 890 (20.7%) were refused permission, and 1 150 (8.2%) were not moved for other reasons.

Second phase (30 June-30 July 2001): summer pastures

Commencing on the 21st day after arrival at summer pastures (Fig. 1), a total of 2 647 cattle and 6 865 sheep and goats were tested by c-ELISA, giving negative results (Table I); 49 and 30 insect catches were tested for the presence of *C. imicola* and for virus using PCR, respectively, and also gave negative results (Table II).

Second scenario

First phase (26 June-15 July 2002): winter pastures

The provinces of Viterbo and Roma were divided into 23 cells, 22 of which were 400 km² and one, on the coast, 200 km². These cells included all 17 municipalities that had requested to move herds (Fig. 5). All animals had to be vaccinated at least

30 days before movement. The following additional control measures were applied:

- all sentinel cattle located in the 23 cells were tested serologically; one seroconversion was detected and a buffer zone of 20 km in radius was established around the positive herd immediately
- unvaccinated sentinel animals (usually lambs less than three months of age) were selected in each transhumant flock and tested by c-ELISA twice after 7-15 days; seroconversion was observed in two flocks and a buffer zone of 20 km in radius was established
- a sample of vaccinated animals was tested using c-ELISA to verify the immune status of herds and flocks
- *C. imicola* were found in eight holdings
- PCR was performed on engorged and parous *Culicoides* spp. specimens captured and positive results were obtained on catches from eight holdings; an insect catch was made for each transhumant flock within a radius of 20 km of the eight PCR *Culicoides*-positive holdings (Table II); no viral antigen was detected by PCR in catches from transhumant flocks/herds.

Table II
Entomological control under the transhumance plan in winter pastures, 2001 and 2002

Scenario	No. of catches	No. of PCR tests	No. of herds/flocks positive for	
			<i>C. imicola</i>	PCR
1	305	246	1	0
2	174	150	8	8

Table I
Results of the first transhumance scenario in Italy, 2001

Scenario 1	Flocks/herds		Head		Positive			
	Bovine	Ovine/caprine	Bovine	Ovine/caprine	Flocks/herds		Head	
					Bovine	Ovine/caprine	Bovine	Ovine/caprine
Authorisation requested	24	19	3 743	10 230				
Application withdrawn	1	2	60	1 090				
Authorisation denied	8	6	656	2 234				
Authorisation granted	15	11	2 891	6 933	–	–	–	–
Serological controls on winter pastures	23	17	3 433	9 865	–	–	–	–
Serological controls on summer pastures	15	11	2 647	6 865	–	–	–	–

The different numbers of animals in the subsequent phases described are consistent with the normal fluctuations of flock/herd sizes
The total difference is 109 animals (equivalent to 0.8%)

The creation of the buffer zone around seroconverted animals led to the prohibition of movement of all herds/flocks within the buffer zone, with the exception of three PCR-negative flocks that were moved a day before the zone was established. Of 44 776 animals, 28 052 (62.6%) were authorised to move, 12 575 (28.1%) were refused permission while 4 149 (9.3%) decided not to move

for other reasons (Table III). Authorisation was denied to 19 holdings located within the buffer zone around seroconverted animals and authorisation was not given to two flocks that refused to apply the control measures required (Fig. 6). The percentage of immunised cattle and sheep/goats was 86% and 87%, respectively.

Table III
Results of the second transhumance scenario in Italy, 2002

Scenario 2	Flocks/herds		Head		Positive		Head	
	Bovine	Ovine/caprine	Bovine	Ovine/caprine	Bovine	Ovine/caprine	Bovine	Ovine/caprine
Authorisations requested	7	66	680	44 096				
Authorisations								
Application withdrawn	–	8	–	4 149				
Authorisation denied	4	17	575	12 000				
Authorisation granted	3	41	105	27 947				
Winter pastures								
On sentinel cattle	124		1 384		1		1	
First control on sentinel sheep		64		679		13		27
Second control on sentinel sheep		58		604		2		2
Serological controls								
On vaccinated animals	26	73	485	1 508			418	1 317
Summer pastures								
On sentinel sheep		11		1 158		0		0

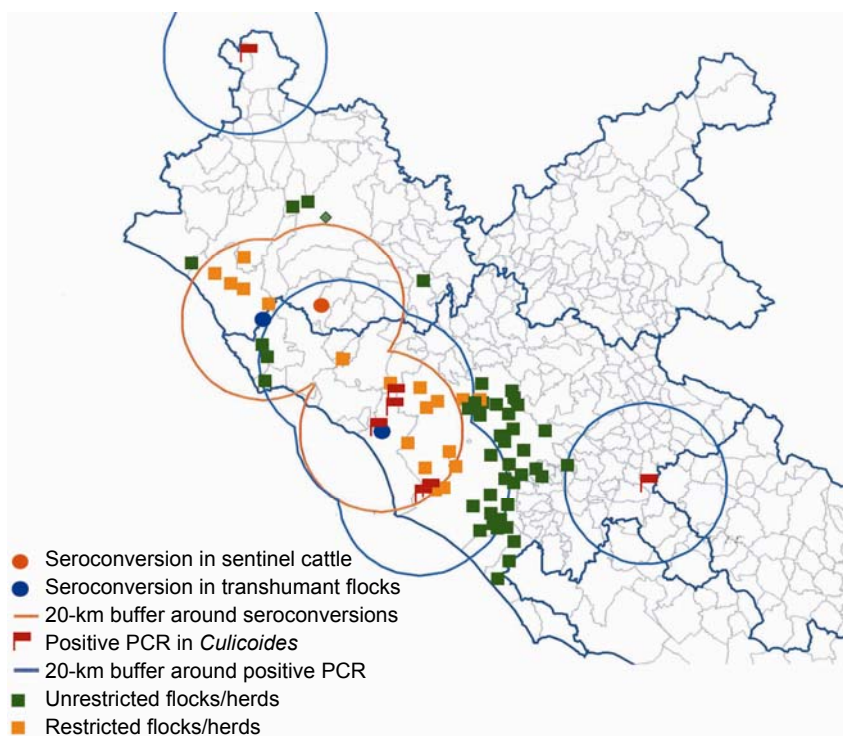


Figure 6
Results of the plan for allowing movement of transhumant flocks from the Viterbo and Roma Provinces, Italy

Second phase (16 July-25 September 2002): summer pastures

On arrival in the summer grazing areas, the 41 herds were grouped in 11 pastures and were considered epidemiological units. All sentinel sheep in transhumant herds were serologically tested 21 days after arrival and found negative for BT antibodies (Table III).

Conclusions

Despite the movement of 9 824 unvaccinated ruminants in 2001 and 28 052 vaccinated ruminants in 2002, the movement of transhumant animals did not spread BT into disease-free grazing areas in 2001 or 2002. The spread of infection to the southern area of Abruzzo on 30 August 2002 (5) was not related to transhumant animals. Those animals moved to summer pastures in the northern part of the region, were serologically retested 21 days after their arrival and gave negative results. Furthermore, no clinical disease was observed in the unvaccinated local populations living in summer pastures and with which the transhumant animals had mixed. It seems, therefore, that the risk of infection spread through animal movement can be minimised by adopting appropriate sanitary control measures.

References

1. Anon. (1954). – Decree of the President of Republic of 8 February 1954. Regolamento di polizia veterinaria. Capitolo IX: Spostamento degli animali per ragioni di pascolo, alpeggio, transumanza, pascolo vagante. No. 320, Articles 41-44.
2. Calistri P., Giovannini A., Conte A., Nannini D., Santucci U., Patta C., Rolesu S. & Caporale V. (2004). – Bluetongue in Italy: Part I. *In* Bluetongue, Part I (N.J. MacLachlan & J.E. Pearson, eds). Proc. Third International Symposium, Taormina, 26-29 October 2003. *Vet. Ital.*, **40** (3), 243-251.
3. European Commission (2001). – Commission Decision of 9 February 2001 establishing protection and surveillance zones in the Community in relation with bluetongue (2001/138/EC). *Off. J.*, **L 050**, 17-19.
4. European Council (2000). – Council Directive 2000/75/EC of 20 November 2000 laying down specific provisions for the control and eradication of bluetongue. *Off. J.*, **L 327**, 74-83.
5. Giovannini A., Calistri P., Nannini D., Paladini C., Santucci U., Patta C. & Caporale V. (2004). – Bluetongue in Italy: Part II. *In* Bluetongue, Part I (N.J. MacLachlan & J.E. Pearson, eds). Proc. Third International Symposium, Taormina, 26-29 October 2003. *Vet. Ital.*, **40** (3), 252-259.
6. Giovannini A., Paladini C., Calistri P., Conte A., Colangeli P., Santucci U., Nannini D. & Caporale V. (2004). – Surveillance system of bluetongue in Italy. *In* Bluetongue, Part I (N.J. MacLachlan & J.E. Pearson, eds). Proc. Third International Symposium, Taormina, 26-29 October 2003. *Vet. Ital.*, **40** (3), 369-384.
7. Ministero della Sanità (1993). – Ministerial Order of 2 June 1993: norme relative allo spostamento degli animali per ragioni di pascolo, alpeggio, transumanza e pascolo vagante ai fini della profilassi dell'afta epizootica. *Off. J.*, **139**, 16 June 1993 modified by Ministerial Order of 6 August 1993. Ministry of Health, Rome. *Off. J.*, **190**, 14 August 1993.
8. Ministero della Sanità (2000). – Ministerial Decree of 13 November 2000: Norme sanitarie relative all'alpeggio, alla transumanza e al pascolo vagante degli ovini e caprini. Ministry of Health, Rome. *Off. J.*, **1**, 2 January 2001.
9. Ministero della Sanità (2001). – Ordinanza 11 maggio 2001. Misure urgenti di profilassi vaccinale obbligatoria contro la febbre catarrale degli ovini (Blue-tongue). *Gazz. Uff. Pubbl. Ital., Serie gen.*, **128**, 5 June 2001, 43-44.