

Effects of bivalent bluetongue virus serotypes 2 and 9 vaccine on reproductive performance of cattle: a case study in Calabria, Italy

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Summary

Following the occurrence of bluetongue (BT) in Italy in the summer and autumn of 2000, the Italian Ministry of Health decreed (in May 2001) that all sheep, goats and cattle in infected, and in neighbouring areas, be vaccinated. The principal aim of the vaccination campaign was to create a resistant animal population, thereby reducing overall virus circulation. Accordingly, during 2002, the live-attenuated bivalent vaccine against BT virus (BTV) serotypes 2 and 9, produced by Onderstepoort Biological Products in South Africa, was administered in Calabria. A large herd of cattle (over 900 animals, including 390 cows) was monitored for four months after vaccination to establish whether any abnormalities (such as stillbirth and placental retention) occurred during parturition. During the study, 111 cows (89 vaccinated and 22 unvaccinated) gave birth; in 26 cows, abnormalities were observed but no association was found to occur between the vaccination of cows against BT and the birthing abnormalities observed (Pearson's chi-square = 0.517, $P > 0.05$). The animals were divided into four groups according to the number of days between vaccination and parturition (less or equal to 31 days, 31-60 days, 61-90 days, more than 90 days); again no link was found between vaccination and the abnormalities observed.

Keywords

Abnormality – Bluetongue – Calabria – Cattle – Italy – Reproduction – Vaccine.

Introduction

Bluetongue (BT) is an infectious, non-contagious, arthropod-borne disease that primarily affects sheep but occurs also in cattle, goats and wild ruminants. The causative agent of the disease is a virus of the genus *Orbivirus*, family *Reoviridae*, and comprises 24 immunologically distinct serotypes. In Italy, BT infection was first reported in Sardinia in August 2000 and then spread to large areas of central and southern Italy (2, 4). The first case of BT in Calabria was reported on 11 October 2000 in a flock in the province of Reggio Calabria. Virus isolation confirmed the presence of BT virus (BTV) serotype 2. The disease spread along the Ionian coast of Calabria and in November was diagnosed in the provinces of Crotona and Cosenza. The presence of BTV-9 was confirmed at the end of 2000 in five holdings in the province of Cosenza (2). In the summer and autumn of 2001, the disease occurred

again along the Tyrrhenian coast in the provinces of Catanzaro, Cosenza and Vibo Valentia (2). In May 2001, the Minister of Health announced that all domestic ruminants reared in the infected regions were to be vaccinated. Based on the virus isolations of the previous year, the vaccine used in Calabria was a live-attenuated bivalent BTV-2/BTV-9 vaccine produced by Onderstepoort Biological Products (OBP) in South Africa. The live-attenuated vaccine used may cause transient viraemia and a rise in temperature ranging from 39.4°C to 39.8°C and lasting for one to three days. Vaccine side-effects have been studied primarily in sheep; data on side-effects in cattle are very limited. Studies had been conducted on the effects of 'wild-type' BTV infection on the reproductive performance of cattle (7, 8, 9).

The aim of the present study was to verify whether the use of a bivalent BTV-2/BTV-9 vaccine

significantly affected the reproductive performance of a large bovine herd.

Materials and methods

Population involved in the study

A large bovine herd (of more than 900 animals, including 390 cows) was monitored for four months after vaccination to verify if any abnormalities (stillbirth, placental retention, etc.) were recorded during parturition. The farm under study, La Favella, is located in a low plain in the municipality of Corigliano Calabro in the province of Cosenza (Fig. 1) where approximately 90 cattle herds and 30 sheep and goats flocks are located, totalling 6 800 ruminants.



Figure 1
Location of La Favella farm in the province of Cosenza

All cows in the herd are registered in the Italian Freisian Herd Book and are part of a genetic improvement programme in which only artificial insemination is used. The farm consists of a roofed holding area with straw on the ground and an open yard area for feeding and exercise surrounded by fences (Fig. 2). Cows are divided into different groups according to reproductive stages and productive performances. On 11, 13, 14 and 18 March 2002, the Veterinary Service vaccinated 514 animals in the herd, 392 of which were cows. Cows that were in the first half of pregnancy were not vaccinated. During the four-month study period, 111 cows (89 vaccinated and 22 unvaccinated) gave birth. The following data was recorded for each animal: ID code, date of vaccination, date of parturition, and any problems observed. Five cows died one to two months before the expected calving date. The cause of death was recorded, together with the indication of the possible relationship between the cause of death and problems during parturition. During the study, blood samples were collected every two weeks from 10 non-vaccinated animals.

Antibodies against BTV were not detected in any of the samples; these negative sentinel animals indicated that no 'wild type' BTV virus was circulating during the study.



Figure 2
Aerial view of La Favella farm

Vaccine

A live-attenuated bivalent BTV-2/BTV-9 vaccine, produced by OBP, was used.

Statistical analyses

The possible link between vaccination and abnormal parturition was verified. Pearson's chi-square test was used to evaluate the data and, in cases where one or more expected values were less than 5, the exact Fisher probability test was used (1, 3).

Results

Between 20 March and 28 July 2002, 111 cows (89 vaccinated and 22 unvaccinated) gave birth. In 26 cases, abnormalities were observed during or following parturition, as follows:

- 23 presented placental retention
- one cow had a mummified foetus
- gangrenous mastitis occurred in one cow 2 weeks after calving
- one cow died from abomasal dislocation 12 days after parturition.

All abnormalities correlated directly or indirectly with any hypothetical alteration during pregnancy or parturition were considered in the study. No association, however, was found between vaccination of cows and the abnormalities observed (Pearson's chi-square = 0.517, $P > 0.05$) (Table I). In addition, the data was grouped into four classes according to the number of days between vaccination and parturition (less than or equal to 30 days, 31-60 days, 61-90 days, more than 90 days);

in all cases the exact probability Fisher test did not reveal any significant association ($P > 0.05$) between vaccination and abnormalities (Table I).

Table I
Comparison between the number of parturitions, with and without abnormalities, in vaccinated and in unvaccinated cows (bivalent bluetongue virus serotypes 2 and 9 live-attenuated vaccine)

Days between vaccination and calving	Abnormal/normal parturition	Animals		Association between pathologies and vaccination (probability)
		Vaccinated	Not vaccinated	
<31 days	Pat+	9	2	>0.05*
	Pat-	22	4	
31-60 days	Pat+	5	1	>0.05*
	Pat-	21	4	
61-90 days	Pat+	2	0	>0.05*
	Pat-	8	6	
>90 days	Pat+	6	1	>0.05 *
	Pat-	16	4	
Total	Pat+	22	4	>0.05**
	Pat-	67	18	

Pat+ parturition with abnormality (stillbirth, placental retention, etc.)

Pat- parturition without abnormality (stillbirth, placental retention, etc.)

* exact probability Fisher test

** Pearson's Chi-square test

Discussion

The vaccination strategy adopted against BT in Italy aimed to reduce virus circulation so as to diminish direct losses due to mortality and indirect losses linked to the prolonged ban on animal movements. Accordingly, all domestic ruminants susceptible to infection (sheep, goats, cattle and buffalo) in infected and in at-risk areas were vaccinated. The use of a live-attenuated BT vaccine on a large cattle population is a unique BT control measure, and has provided new information on the efficacy and safety of the vaccine in this species (6). The effect of vaccination on bovine milk production has been reported elsewhere (5); its effect on the reproductive performance of cattle is reported in the present study. The target population in this study was 111 cows forming part of a large cattle herd located in the province of Cosenza. No association was found between vaccination using live-attenuated bivalent BTV-2/BTV-9 vaccine and problems encountered during parturition. The small number of animals studied and the fact that a single herd was investigated could lead to the conclusion that the present results are not representative of the entire vaccinated cattle population of Italy. However, the data, derived from a genetically homogeneous and

consistently husbanded herd, indicate that the vaccination of cattle against BT does not have a negative impact on their reproductive performance.

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