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BOOKLET OF ABSTRACTS

WORLD BUIATRICS CONGRESS

2026 ISTANBUL | TÜRKİYE



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INTRODUCTION

At Ceva, we see the challenges shaping the future of ruminant health: protecting animal health and welfare, supporting more sustainable farming and responding to the evolving needs of veterinarians and farmers.

We also see the passion, expertise and commitment behind every decision you make in the field. By listening to you who care for animals every day, we turn real-world needs into relevant research, practical knowledge and innovative solutions.

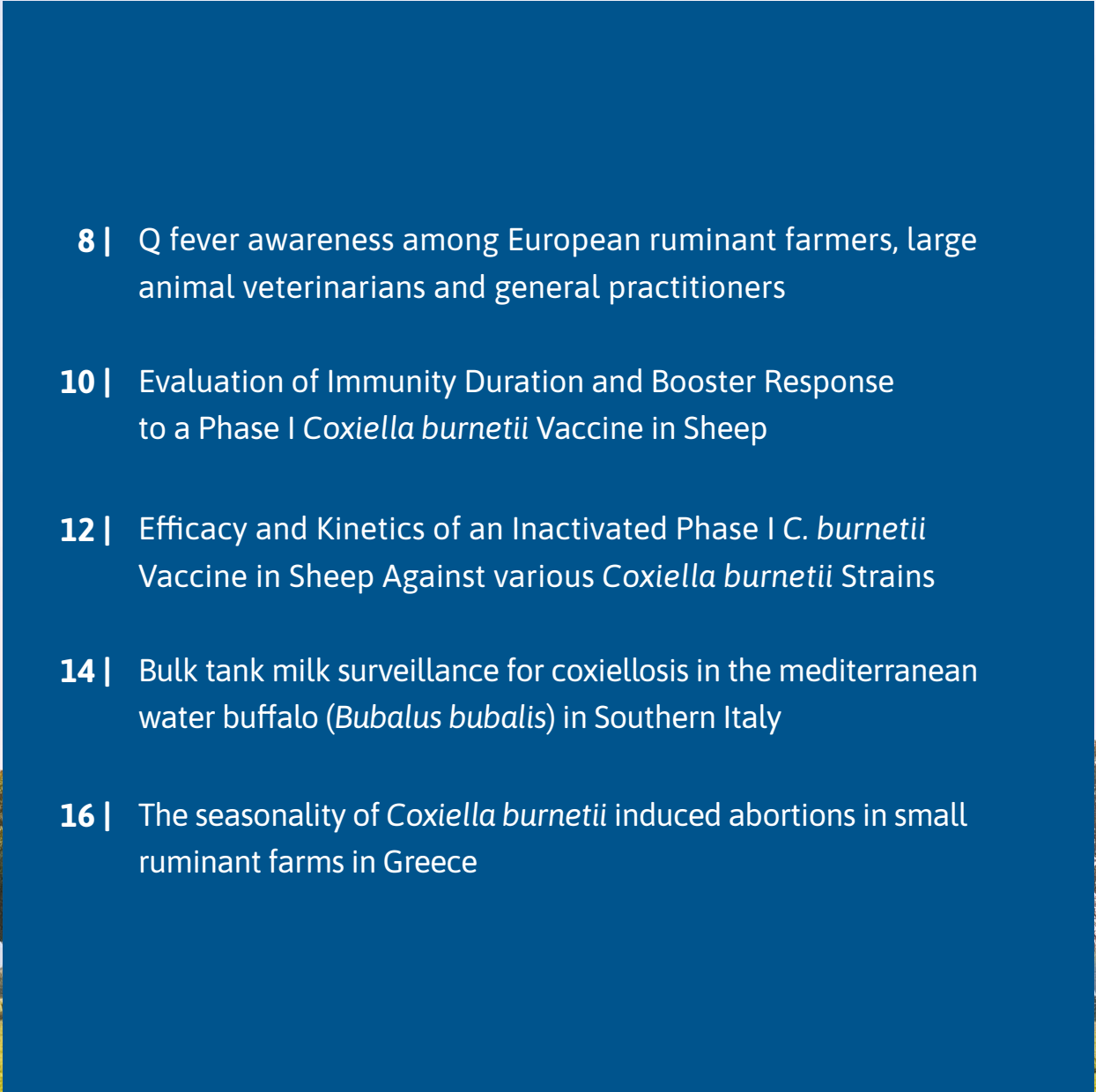
Science helps us better understand today's challenges, explore new approaches and advance veterinary knowledge.

Our booklet of abstracts brings together Ceva's scientific contributions to the World Buiatrics Congress 2026. We invite you to discover the findings and insights that help us see what you see and work together towards a healthier, more sustainable future for ruminants.

Yves Lagalisse
Corporate Ruminants Marketing Director

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Q fever

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Q fever awareness among European ruminant farmers, large animal veterinarians and general practitioners

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Background and objective

A European Q Fever Committee was established in 2024, bringing together veterinary and medical experts from multiple disciplines and countries. A large survey was conducted among ruminant farmers, large animal veterinarians, and human medical doctors in eight European countries to assess their awareness and level of knowledge of Q fever, caused by *Coxiella burnetii* (coxiellosis).

Materials and methods

The survey was carried out in 2024 by an independent opinion-polling company. The selected countries were Germany, France, Spain, Italy, the United Kingdom, Belgium, the Netherlands, and Poland. Profession-specific questionnaires were developed in English and translated into local languages. More than 900 farmers were interviewed. Eighty veterinarians were surveyed in each country, except Belgium (60) and the Netherlands (30). Fifty medical doctors were interviewed per country, except in Belgium and the Netherlands (30 each). Interviews were conducted using Computer-Assisted Telephone Interviewing technology, recorded, and lasted 20–25 minutes.



Results

Cattle (571), sheep (198), and goat (177) farmers were interviewed (only goat farmers in the Netherlands, only cattle farmers in Germany, Belgium, and Poland). Approximately 75% of farmers were either unaware of Q fever or only familiar with its name. (Figure 1).

Personal experience with the disease was limited (2–5%) in most countries, but higher in the Netherlands (12%) and France (13%). Around 80% of veterinarians in France and the Netherlands had encountered Q fever cases and demonstrated accurate knowledge. In Belgium, Germany, Italy, and Spain, fewer than two thirds had such experience, and knowledge was poorer; this dropped below 50% in the UK and Poland (Figure 2).

Consequently, vaccination rates remain low: about 1% except in France and the Netherlands. Among human doctors, awareness was generally high, personal experience with cases was frequent in Spain (74%) and France (60%) but rare in Poland and Italy. Human doctors are well aware of the disease. A frequent personal experience with infected patients is reported in Spain (74%) and France (60%). Poland and Italy seem to be the exception, with 70 and 64% of respondents having no experience with Q fever cases.

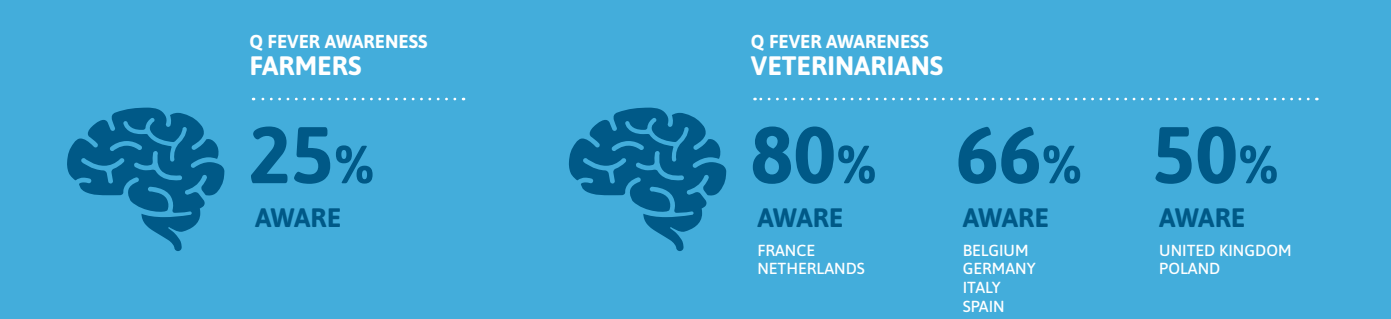


Figure 1: Q fever awareness among farmers

Figure 2: Q fever awareness among veterinarians

CONCLUSION

This is the largest European survey assessing perceptions of Q fever among animal and human health professionals. While national differences exist, farmer awareness is consistently low, and professional knowledge remains heterogenous. These findings underscore the urgent need for coordinated, science-based, harmonized strategies for Q fever management within a One Health framework. The European Q Fever Committee aims to support these efforts.



Evaluation of Immunity Duration and Booster Response to a Phase I *Coxiella burnetii* Vaccine in Sheep

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Background and objective

Q fever is a bacterial disease present throughout the world (except New Zealand). It is caused by *Coxiella burnetii*, a small Gram-negative, intracellular bacterium. *Coxiella burnetii* can infect numerous animal species and is zoonotic. Among animals, ruminants are the most affected and are the reservoir of this pathogen. An inactivated vaccine (Coxevac®) containing the Nine-Mile strain in phase I is indicated for cattle, goats and sheep. In the latter species, the duration of immunity has been established by an experimental study at 4 months. (Williams-Macdonald et al., 2023). However, in practice, farmers often only give an annual booster. This study aimed to evaluate how long immunity persists after primary vaccination and to compare the immune response from either a single booster or a repeated two-dose primary course administered six or twelve months later.

Materials and methods

This study was approved by the Ceva Santé Animale Ethics Committee under number CFAEC-2023-18. The animal phase lasted from January 2024 to May 2025.

Forty-eight *Coxiella burnetii* seronegative ewes (ELISA analysis performed on day-13) of the experimental farm of the University of Zaragoza (Spain) were included in the study. The animals were divided into 6 groups: a non-vaccinated control group (group S; n=8) and 5 groups vaccinated with Coxevac® (Ceva Santé Animale, Libourne, France) according to the vaccine's specifications: 2 injections of 2 mL by subcutaneous route in the neck region on D0 and D21 (n=10 per group). Then the five groups were re-vaccinated with different protocols as described below and shown on figure 1:

- **Group PV4:** renewal of vaccination with a complete protocol at 4 months (injections on D141 and D162)
- **Group B6:** booster dose injection at 6 months (D204)
- **Group PV6:** vaccination renewal with a complete protocol at 6 months (injections on D204 and D225)
- **Group B12:** booster dose at 12 months (D388)
- **Group PV12:** vaccination renewal with a complete protocol at 12 months (injections on D388 and D409)

Blood samples were taken at D42, D84, D126, D162, D204, D225, D246, D288, D337, D388, D409, D437, D470 to assess the humoral response to *Coxiella burnetii* (Figure 1). The analyses were performed by Qualyse laboratory (Champdeniers Saint Denis, France) using the commercial ID Screen® Q fever Indirect Multi-species kit (Innovative Diagnostics, Grabels, France).

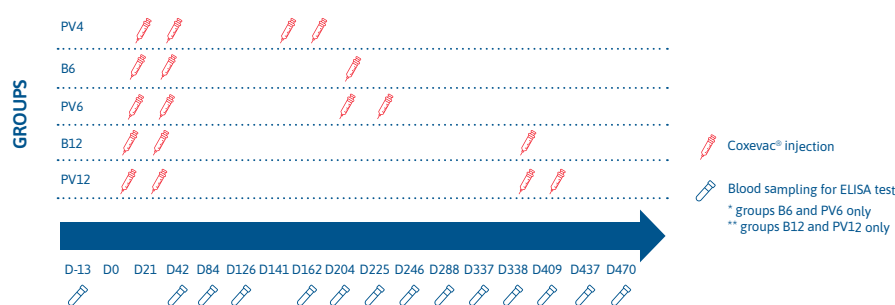


Figure 1: Timeline of the study

Results

Data were available for 53 ewes (S: n=8; PV4: n=10, B6: n=8; PV6: n=8; B12: n=10; PV12: n=9).

All animals in the control group remained seronegative throughout the study. All vaccinated ewes showed a strong antibody response after the primary vaccination (Figure 2-6). Across groups, antibody decline varied slightly: a few animals in B6 (n=1), B12 (n=1) and PV12 (n=4) shifted to negative values before revaccination, while the majority (n=39) remained positive. Overall, primary vaccination generated robust serological responses, with only isolated cases of early waning immunity.

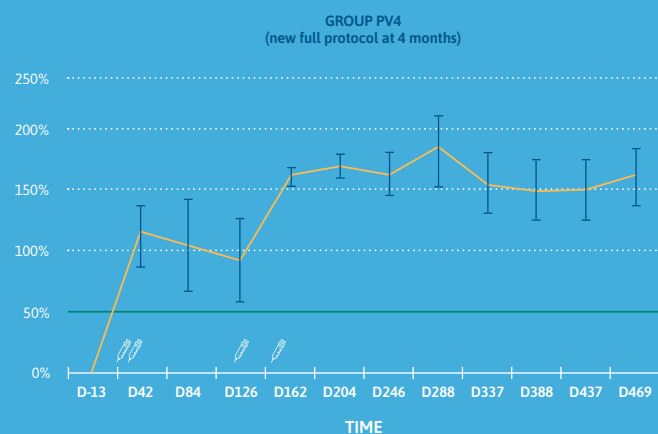


Figure 2: ELISA %S/P over time for group PV4 — Mean — Cut-off

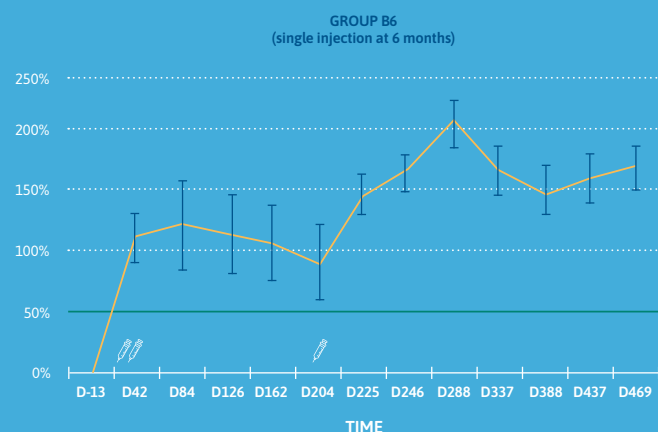


Figure 4: ELISA %S/P over time for group B6 — Mean — Cut-off

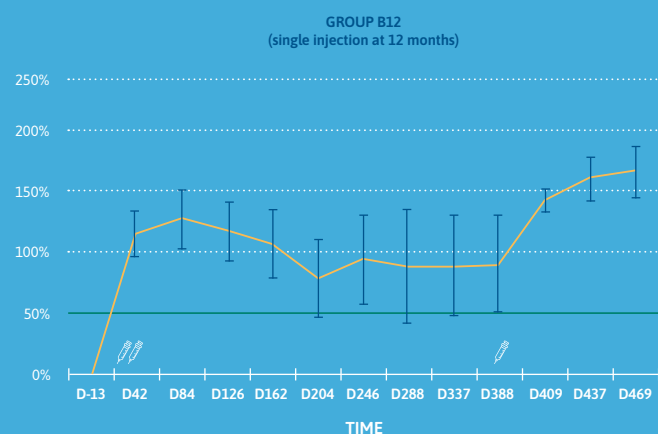


Figure 6: ELISA %S/P over time for group B12 — Mean — Cut-off

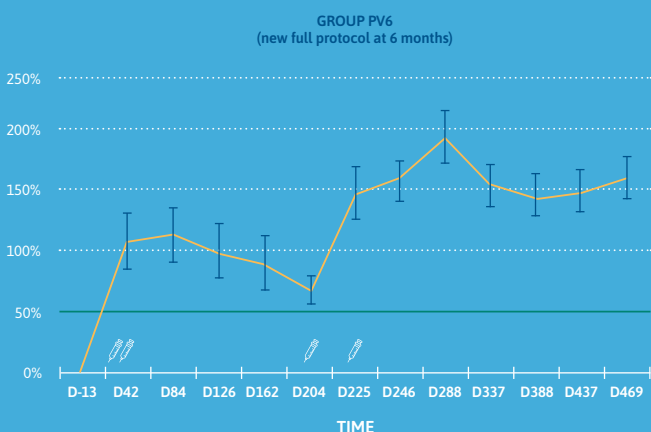


Figure 3: ELISA %S/P over time for group PV6 — Mean — Cut-off

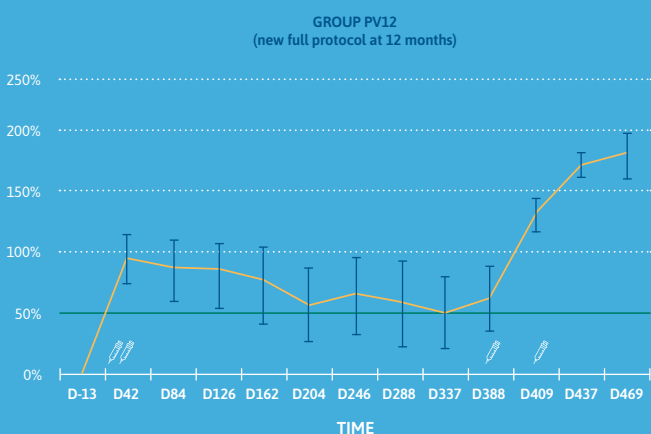


Figure 5: ELISA %S/P over time for group PV12 — Mean — Cut-off

Following revaccination, whether performed at 4 (Figure 2), 6 (Figure 3 and 4), or 12 (Figure 5 and 6) months, all animals became strongly positive again and remained so until the end of the study, irrespective of the timing of revaccination or the use of a single dose or two-dose revaccination. Across all groups, antibody levels after revaccination were higher than after the initial primary course, confirming a strong anamnestic response.



CONCLUSION

- Based on ELISA serology results, humoral immunity following vaccination of ewes with Coxevac® is maintained for 12 months.
- When revaccinating, performing a new primary vaccination protocol does not appear to boost immunity any more than a single booster injection.

References: Williams-Macdonald, S.E.; Mitchell, M.; Frew, D.; Palarea-Albaladejo, J.; Ewing, D.; Golde, W.T.; Longbottom, D.; Nisbet, A.J.; Livingstone, M.; Hamilton, C.M.; et al. Efficacy of Phase I and Phase II *Coxiella burnetii* Bacterin Vaccines in a Pregnant Ewe Challenge Model. *Vaccines* 2023, 11, 511. <https://doi.org/10.3390/vaccines11030511>

Efficacy and Kinetics of an Inactivated Phase I *C. burnetii* Vaccine in Sheep Against various *Coxiella burnetii* Strains

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Background and objective

Coxiellosis, caused by *Coxiella burnetii*, poses a significant threat to livestock. An **effective vaccine must provide broad protection against diverse field strains**. This study aimed to evaluate the protective efficacy and kinetic profile of an inactivated Phase I *C. burnetii* vaccine (Coxevac®, Ceva Santé Animale, Libourne, France) in sheep against a panel of heterologous *C. burnetii* strains.

Materials and methods

Ten ELISA-seronegative *C. burnetii* ewes were split into two groups of 5 animals each and vaccinated with Coxevac® on D0 and D21 according to the manufacturer's instructions. In contrary to group 1, animals from group 2 received a new full protocol 4 months later (D141 and D162). In addition, four *C. burnetii*-seronegative sheep as well as three naturally infected sheep were used as control groups. Blood samples were taken on vaccinated sheep 63 days after the second injection (D84) and again on D337 which corresponds to 316 days after the end of vaccination (group 1) or 175 days after the end of the second protocol (group 2). At each time point, harvested sera from all enrolled animals were subjected to ELISA screening followed by sero-neutralization assay using a panel of 7 strains (Nine-Mile as reference and six field strains previously isolated from zoonotic human cases (n=4) or ruminants (n=2)). Protection was defined as a significant reduction in infection rate (IR) compared to an unvaccinated negative control group via one-sided Mann-Whitney U tests. Kinetics were assessed using paired Wilcoxon tests.



Results

The range of infection rate was [32.4% – 36.3%] and [5.7% - 13.3%] for negative and positive controls respectively (Figure 1). Animals from the group 2 showed the most robust and sustained protection, with significant IR reductions of 80-88% against all 6 heterologous strains at both D84 and D337 ($p \leq 0.004$). The group 1 also showed strong initial protection (80-93% reduction, $p \leq 0.004$), which was maintained at D337 for all heterologous strains (70-74% reduction, $p = 0.004$) but waned for the Nine-Mile reference strain ($p = 0.421$, Figure 2). ELISA titers correlated with protection at early (D84) but not late timepoint.

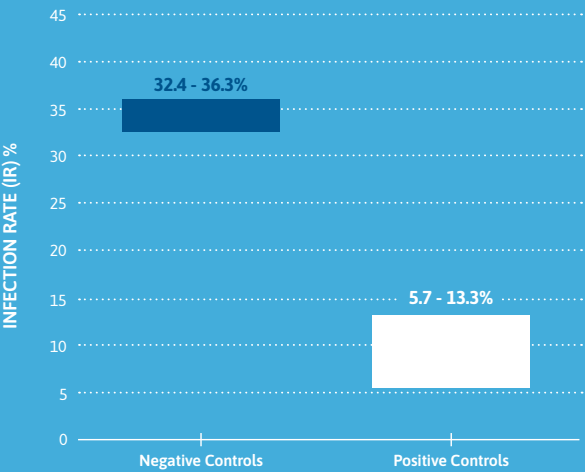


Figure 1: Baseline infection rates for negative and positive controls

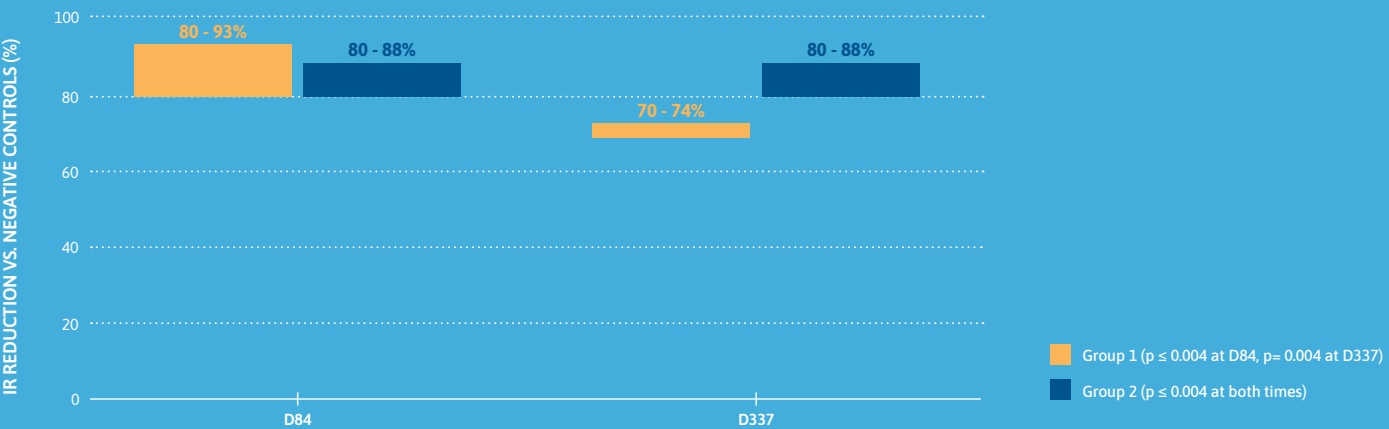


Figure 2: Protective efficacy against six heterologous strains

CONCLUSION

Coxevac[®] vaccine induces potent and durable cross-neutralizing immunity against diverse heterologous field strains. Importantly, sero-neutralization can occur independently of ELISA seroconversion, highlighting the lack of sensitivity of this technique. Qualitative results of ELISA tests should therefore not be used to measure vaccine efficacy. The observed neutralization effect against various *Coxiella burnetii* strains suggests effective protection against these contemporary circulating isolates.

Bulk tank milk surveillance for coxiellosis in the mediterranean water buffalo (*Bubalus bubalis*) in Southern Italy

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Background and objective

Domestic ruminants are the main reservoirs of *Coxiella burnetii* (*C. burnetii*), the causative agent of human Q fever and a major public health issue. Although included in the category of ruminant, there is a lack of knowledge about the **role of water buffalo** (*Bubalus bubalis*) in the epidemiological cycle of *C. burnetii*. The purpose of this investigation was to determine the molecular and serological prevalences of *C. burnetii* in **bulk tank milk** (BTM) from water buffalo in southern Italy. The study also aimed to determine whether any differences in milk's chemical-physical parameters were associated with *C. burnetii* positive results.

Materials and methods

A total of **107 BTM samples** were collected in four distinct regions of southern Italy (Figure 1), and evaluated for the presence of specified target genes (IS1111) using two distinct real-time PCR protocols, a commercial kit and an in-house **real-time PCR** (Klee *et al.*, 2006).

The same samples were also analyzed for the presence of specific antibodies using a **commercial ELISA** (ID Screen® Q Fever Indirect Multispecie, IdVet).

All milk samples were tested with MilkoScan™ 7 RM obtaining a total of the **30 chemical/physical parameters** analyzed.

Positive mass and individual samples were tested with end-point PCR and subsequent **Sanger sequencing** to confirm the actual presence of *Coxiella burnetii* and any genomic differences with isolates already described in buffalo.



Figure 1: Sampling are including four regions of the southern Italy

Results

The overall **molecular prevalence was 11.2%** (12/107) but varied depending on the region: 28.5% in Basilicata (2/7), 9.4% in Campania (9/95), Calabria (0/2) and 33.3% in Sicily (1/3) (Table 1).

The ELISA results confirmed the widespread distribution of *C. burnetii* in the study area. The overall **seroprevalence was 25.2%** (27/107): 42.9% in Basilicata (3/7), 24.2% in Campania (23/95), 0% in Calabria (0/2) and 33.3% in Sicily (1/3) (Table 1).

Poor concordance was observed between the molecular results obtained with the commercial PCR (only 4/107 positive) and the in-house PCR (11/107).

Genotyping showed that the strains were similar to those isolated from other countries and species (Figure 2).

No statistical differences were observed in milk parameters between positive and negative farms (using both PCR and ELISA results).

When the milk pools from seven farms in the Basilicata region were analyzed individually (five samples were collected from each farm standardizing the number of lactations and the days of lactation), **significant variations were observed in the percentages of total fat** (especially MCFA, SCFA, SFA, and palmitic acid) and ST%. The same has been observed considering the ELISA results.

PCR	ELISA		
	Positive	Negative	Overall
Outcomes			
Positive	7	5	12
Negative	20	75	95
Overall	27	80	107

Table 1: Summary of the results obtained with PCR and ELISA



Figure 2: Phylogenetic tree based on partial sequencing of the IS1111

References:

Klee SR, Tyczka J, Ellerbrok H, Franz T, Linke S, Baljer G, Appel B. Highly sensitive real-time PCR for specific detection and quantification of *Coxiella burnetii*. *BMC Microbiol.* 2006 Jan 19;6:2. doi: 10.1186/1471-2180-6-2



CONCLUSION

- This study found *C. burnetii* circulation in the buffalo population in southern Italy, with a slightly lower prevalence compared to other reservoir species.
- Positive herds showed no significant changes in BTM characteristics, however individual fat percentages varied significantly.
- Although there is not enough evidence that *C. burnetii* causes mastitis, evidence of milk changes in *Coxiella*-positive animals was shown in this study. These alterations can alter milk quality or cheesemaking ability.

The seasonality of *Coxiella burnetii* induced abortions in small ruminant farms in Greece

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Background and objective

A common cause of abortions and reproductive disorders in sheep and goats is *Coxiella burnetii*, an obligatory intracellular bacterium that is distributed worldwide on farms of domestic ruminants and is a significant zoonotic agent that causes Q fever in human hosts. The objective of this study was to evaluate the seasonality of *Coxiella burnetii*-induced abortions in small ruminant samples obtained throughout Greece.

Materials and methods

Vaginal swab and aborted fetus samples were obtained by veterinary practitioners between January 2024 and December 2025 from ovine and caprine farms throughout the mainland of Greece with reported abortive cases. The samples were obtained from the animals that aborted during the preceding week. Nucleic acid extraction was performed using a commercial spin column kit (INDICAL Bioscience) and an IDEAL™ 32 extraction robot (Innovative Diagnostics). Molecular investigation was performed using a novel commercial kit (**ID Gene™ Ruminant Abortion Multiplex HRM, Innovative Diagnostics**) according to the manufacturer's instructions on an MIC qPCR Cyclor (Bio Molecular Systems). The kit is a test for the detection of the main pathogens causing abortion in ruminants based on PCR technology coupled with HRM. The results obtained were analyzed with the HRM data interpretation software, DISoft (Innovative Diagnostics).



Results

A total of 1281 ovine and caprine samples were examined, and the results indicated a high prevalence of *Coxiella burnetii* in the investigated group, detected in approximately 22% of the animals (Table 1). The results per trimester indicate a clear seasonality in the positivity rate of the *Coxiella burnetii*-induced abortions. Particularly, in the first trimester of 2024 83/148 (56.1%) were positive, in the second trimester of 2024 19/40 (47.5%) were positive, in the third trimester of 2024 8/100 (8.0%) were positive, in the fourth trimester of 2024 32/227 (14.1%) were positive. In 2025, the positive PCR samples were 87/300 (29.0%), 17/59 (28.8%), 5/175 (2.8%) and 31/232 (13.4%) in the respective trimesters (Figure 1).

Pathogen	Number of Samples		
	Ovine (%)	Caprine (%)	Total (%)
<i>Coxiella burnetii</i>	198 (20.7)	84 (25.7)	282 (22.0)
<i>Chlamydophila spp.</i>	187 (19.6)	51 (15.6)	238 (18.6)
<i>Toxoplasma gondii</i>	49 (5.1)	16 (4.9)	65 (5.1)
<i>Campylobacter fetus</i>	44 (4.6)	5 (1.5)	49 (3.8)
<i>Salmonella spp.</i>	19 (2.0)	12 (3.7)	31 (2.4)
<i>Brucella spp.</i>	27 (2.8)	3 (0.9)	30 (2.3)
<i>Anaplasma phagocytophilum</i>	14 (1.5)	9 (2.7)	23 (1.8)
<i>Neospora caninum</i>	13 (1.4)	0 (0)	13 (0.9)
Total positive samples	551 (57.7)	180 (55.0)	731 (57.1)
No detection	403 (42.3)	147 (45.0)	550 (42.9)
Total samples	954	327	1281

Table 1: Prevalence of abortogenic pathogens in examined samples per animal species

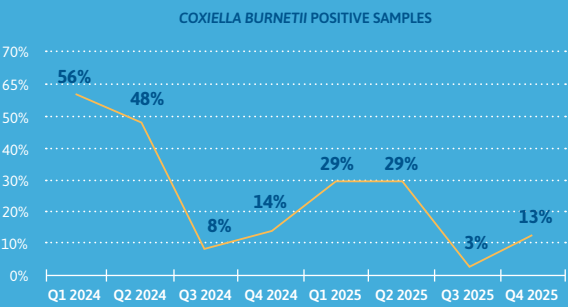


Figure 1: Seasonality of *Coxiella burnetii* in abortive samples

CONCLUSION

Our findings demonstrate a characteristic seasonal pattern in *Coxiella burnetii* -induced abortions, peaking during the first half of the year (first and second semester) in two consecutive years. Identifying this seasonality is critical and highlights the need of implementing preventive measures e.g. vaccination and biosecurity protocols in optimal timings (prior to peak transmission periods) in order to reduce economic losses and the zoonotic risk of Q fever to all livestock professionals.

2

Vector-borne diseases

- 
- 20 | Field evaluation of safety and immune response of an inactivated vaccine against EHD-8 in cattle
 - 22 | Field evaluation of safety of an inactivated vaccine against EHD-8 in pregnant and lactating dairy cows



Field evaluation of safety and immune response of an inactivated vaccine against EHD-8 in cattle

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Background and objective

Epizootic Haemorrhagic Disease serotype 8 (EHD-8) emerged in Southern Europe in 2023, prompting rapid development of an inactivated vaccine (Hepizovac®). This field study aimed to assess in naïve and previously infected heifers:

- The safety of the vaccine
- The humoral immune response induced by vaccination
- The effect of a booster given 6 months or 12 months after primary-vaccination
- The comparison of booster effect triggered by a new single injection or a new full protocol given 12 months after primary-vaccination

Materials and methods

This study was approved by the Ceva Santé Animale Ethics Committee under number CFAEC-2024-27. The animal phase lasted from December 2024 to March 2026.

The study was conducted in two dairy farms in south-west France previously affected by EHD-8. Eighty Prim'Holstein heifers (6–24 months) were enrolled and randomly allocated into four groups (n=20 per group):

- **Group 1:** Sentinel animals (unvaccinated)
- **Group 2:** Vaccination with Hepizovac® 4 mL SC at the left neck 2 times at 3 weeks intervals (D0 and D21) and booster 6 months later (D189)
- **Group 3:** Vaccination with Hepizovac® 4 mL SC at the left neck 2 times at 3 weeks intervals (D0 and D21) and booster 12 months later (D385)
- **Group 4:** Vaccination with Hepizovac® 4 mL SC at the left neck 2 times at 3 weeks intervals (D0 and D21) and new full vaccination regimen 12 months later (D385 and D406)

Blood samples were collected every 7 to 8 weeks from D–21 to D436 and analysed using a commercial anti-VP7 competitive ELISA (ID Screen® EHDV Competition. IDVet, Grabels, France). Serological dynamics were evaluated separately for animals initially seronegative and those naturally infected before vaccination. Clinical monitoring recorded major side effects, hyperthermia (rectal temperature above 39.5°C) and local reactions.

Results

Before vaccination (D-21), 49 animals were seronegative and 31 non-negative (Table 1). Sentinel animals (Group 1) remained serologically stable, supporting the absence of viral circulation throughout the study. The vaccine demonstrated good safety, with no major adverse reactions in naïve or previously infected animals. Six transient hyperthermia events occurred after the first dose; none followed the second. Local reactions (local oedema, small nodules <4mm) occurred in 22 heifers after the first injection and 20 after the second.

Negative animals before vaccination (Figure 1):

- Strong immune response after primary vaccination (groups 2N, 3N, 4N groups)
- Antibodies to VP7 decrease over time but remain higher than in the control group
- Strong booster effect at 6 months (group 2N) and 12 months (groups 3N and 4N)
- No difference in amnestic response at 1 year between 1 single injection (group 3N) and 2 injections (group 4N)

Non-negative animals before vaccination:

- All the animals remained non-negative throughout the study
- No effect of vaccination on this category of animals

Group	Negative	Non negative (positive or doubtful)
1	12 (group 1N)	8 (group 1P)
2	12 (group 2N)	8 (group 2P)
3	13 (group 3N)	7 (group 3P)
4	12 (group 4N)	8 (group 4P)
Total	49	31

Table 1: Serological status before vaccination

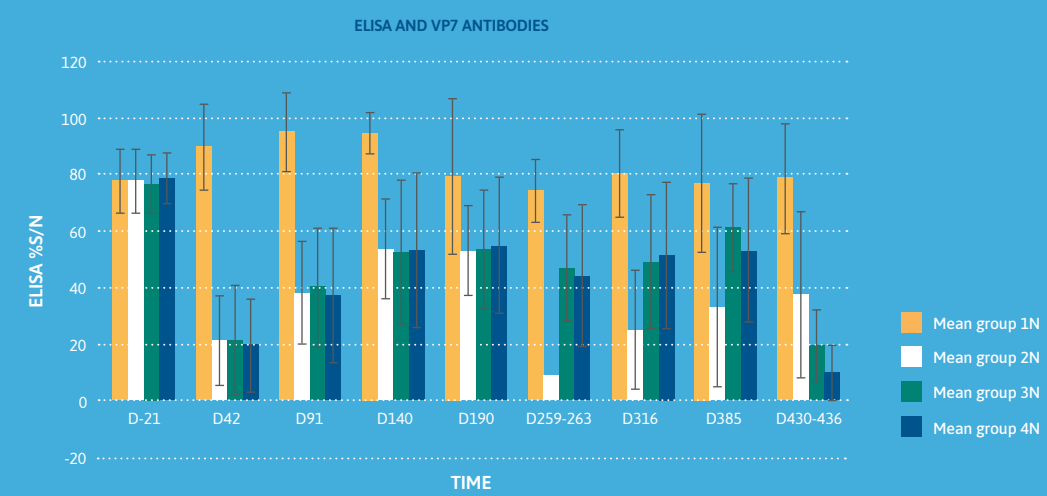


Figure 1: Serological status over time in naïve animals before vaccination

CONCLUSION

- The vaccine demonstrates good safety, even in animals already seropositive from prior natural infection
- The immune response is strong in naïve animals
- A single booster effectively restores humoral immunity, consistent with the involvement of memory T cell
- At 12 months, a complete revaccination protocol confers no additional benefit compared with a single booster dose.

Field evaluation of safety of an inactivated vaccine against EHD-8 in pregnant and lactating dairy cows

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Background and objective

Epizootic Haemorrhagic Disease serotype 8 (EHD-8) emerged in Southern Europe in 2023, leading to the rapid development of Hepizovac[®], an inactivated vaccine against the virus responsible for the disease (EHDV-8). Market authorization studies reported good tolerance and no major adverse events; however, no data was available on its administration in pregnant and lactating dairy cows.

This study was therefore conducted to assess the safety of the vaccine in this specific animal category.

Materials and methods

This study was approved by the Ceva Santé Animale Ethics Committee under number CFAEC-2024-24. The animal phase lasted from December 2024 to February 2025.

The study was conducted on two dairy farms in northern France, a region free of EHD.

A total of 36 pregnant and lactating Prim'Holstein cows, aged over 30 months and 5–6 months pregnant, were enrolled. Animals were randomly assigned to two groups:

- **Group 1** received two 4-mL subcutaneous injections of **Hepizovac[®]** administered three weeks apart (n=18)
- **Group 2** received two 4-mL subcutaneous injections of **NaCl 0.9%** administered three weeks apart (n=18)

Clinical examinations, rectal temperatures and local reactions were recorded before each vaccine injection (D0 and D21) and for three days after each injection (D1, D2, D3, D22, D23 and D24).



Results

- **No major adverse effects** were observed in both groups.
- One premature calving was recorded after the second injection, but no link to vaccination was established.
- **No hyperthermia** above 39.5 °C was observed in either group after injections.
- Local reactions consisted mainly of small nodules at the injection site in the two groups. After first injection, 4 animals were concerned in the vaccinated group and one in the control group (Table 1). After the second injection, 4 and 3 cows had small nodules in the vaccinated and the control groups, respectively (Table 2).

Group	Local reaction	Absence of local reaction	P-value (Fisher's test)
1 (Hepizovac®)	4	14	0.35 (NS)
2 (Saline)	1	17	

Table 1: Local reactions occurrence after 1st injection in the two groups

Group	Local reaction	Absence of local reaction	P-value (Fisher's test)
1 (Hepizovac®)	4	14	1.0 (NS)
2 (Saline)	3	15	

Table 2: Local reactions occurrence after 2nd injection in the two groups

CONCLUSION

- Under field conditions, Hepizovac® is well tolerated in pregnant and lactating dairy cows
- These findings confirm previous market authorization data and are consistent with results from parallel studies conducted in dairy heifers in endemic areas



3

Parasites control

26 | Evaluation of a Targeted Selective Treatment Protocol based on Parity and Body Condition in Dairy Sheep in Field Conditions in France: Impact of Fecal Egg Counts and Treatment on Production



Evaluation of a Targeted Selective Treatment Protocol based on Parity and Body Condition in Dairy Sheep in Field Conditions in France: Impact of Fecal Egg Counts and Treatment on Production

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Background and objective

When using a dewormer in a sheep flock, the concept of **refugia** needs to be kept in mind to postpone the appearance of anthelmintic resistance in a flock (Kenyon *et al.*, 2009). Refugia refers in this case to gastro-intestinal nematodes (GIN) not exposed to the drug used, i.e., present in the environment or in untreated sheep. **Targeted selective treatment (TST) strategies** are an application of this concept. Determining which animals to treat is however a challenge, and strategies probably need to be adapted to local constraints (Hodgkinson *et al.*, 2019). For dairy-producing small ruminants that have access to pasture, **maintenance of eprinomectin (EPN) efficacy is essential** for an effective management of production-limiting life-threatening GIN such as *Haemonchus contortus*. During the **ANTHERIN project**, a **TST protocol using injectable eprinomectin** (Eprecis®, Ceva Santé Animale, Libourne, France) was evaluated in 5 dairy sheep flocks in central and south-western France.

Materials and methods

- **Farms were included** in the study based upon initial eprinomectin efficacy, enrollment in the milk yield testing program, number of ewes and habits of anthelmintic (AH) treatments.
- 2 farms bred Blond faced manech ewes in the Pyrénées Atlantiques (PA), and 3 farms bred Lacaune ewes in the Roquefort region (RR).
- Study lasted **2** (3 farms/5) **or 3 years** (2021/2022 – 2023)
- AH treatments were **targeted by regular flock-level composite fecal egg counts (FEC)**.
- **Selective treatment of ewes** was implemented using **a combination of criteria**, as described in figure 1. Upon treatment day, individual body condition scores (BCS) were determined and feces were collected for individual FEC and composite fecal cultures. Milk yield was collected at the end of the milking period.
- Sheep nemabiome on each farm was investigated as described by Beaumelle *et al.*, 2024.
- Data was processed using R v. 4.1.1 in Rstudio®, either by Chi-square tests or by mixed effect models.

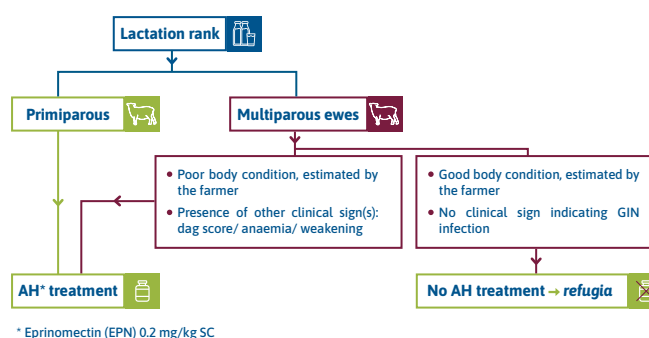


Figure 1: Implementation of the targeted selective treatment protocol of dairy ewes during the Antherin project (FEC: faecal egg count; FECRT: faecal egg count reduction test; MY: milk yield, BCS: body condition score; TST: targeted selective treatment; EPN: eprinomectin).

Results

- **EPN efficacy was maintained** in farms where it was initially very high (3 farms /5).
- **The combination of criteria allowed for a significant reduction in GIN egg output:** treated ewes had significantly higher FEC than the untreated ewes.
- **Body condition was the main treatment criteria**, and was correctly identified by farmers (figure 2).
- **Other treatment criteria depended on the farm.** On the only farm for which **DAG score** was a treatment criteria, **nemabiome analysis** showed *Teladorsagia circumcincta* and *Trichostrongylus colubriformis* were the main GIN present. Nemabiome analysis showed **most farms (4/5) were however mainly facing *Haemonchus contortus*.**

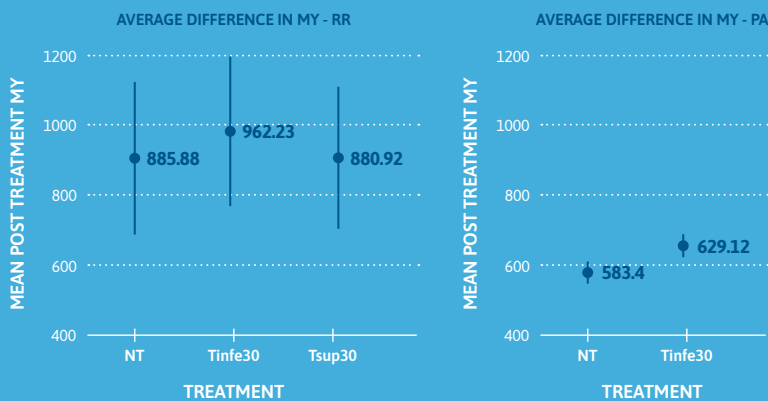
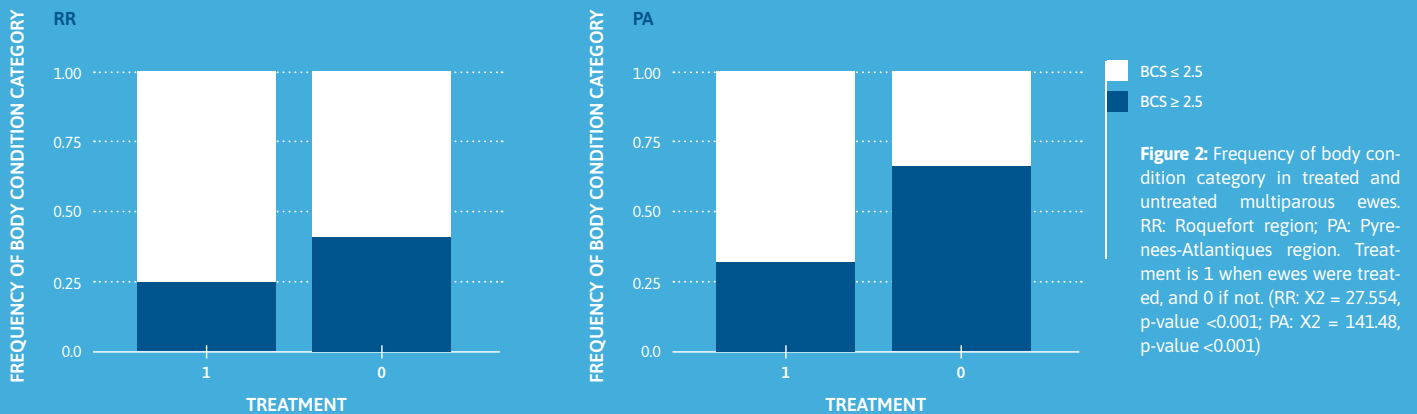


Figure 3: Average post-treatment milk yield (MY) for treated and untreated multiparous ewes in both areas. In the Roquefort region (RR), due to very few multiparous ewes being treated on farm A, data from this farm was excluded for this analysis. NT: Non Treated; Tinfe30: Treated and MY control point within 30 days post-treatment; Tsup30: Treated and MY control point later than 30 days post-treatment

- 21% to 74% of lactating ewes were left untreated, depending on the farm and the year.
- Higher milk-producing ewes had significantly higher FEC pre-treatment in the RR. Milk response post-treatment was however not correlated to FEC in both study areas.
- Use of a targeted selective treatment:
 - At time of mating had no impact upon ewe fertility in the PA
 - Led to an increase in milk production of 8 to 9% in treated ewes (figure 3).

References:

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- HODGKINSON, Jane E., KAPLAN, Ray M., KENYON, Fiona, et al. Refugia and anthelmintic resistance: concepts and challenges. *International Journal for Parasitology: Drugs and Drug Resistance*, 2019, vol. 10, p. 51-57.
- KENYON, F., GREER, A. W., COLES, G. C., et al. The role of targeted selective treatments in the development of refugia-based approaches to the control of gastrointestinal nematodes of small ruminants. *Veterinary parasitology*, 2009, vol. 164, no 1, p. 3-1



CONCLUSION

- This TST protocol using a combination of simple criteria allows for a significant flock-level FEC reduction, while maintaining EPN efficacy.
- Farmers' input in deciding which animals to treat allowed for pertinent criteria combinations per farm.
- Any production loss due to non-treatment in lactating ewes needs to be balanced with the cost of facing resistance in the short-term. In the future, criteria could be refined to better identify ewes that benefit most from treatment.
- TST should be combined with pasture management measures for increased benefits in GIN management.

4

Reproduction

- 
- 30 |** Timed Embryo Transfer Success in Lactating Dairy Cows Using Fresh In Vitro–Produced Embryos Fertilized with Conventional or Sex-Sorted Sperm
 - 32 |** Evaluation of the effect of natural prostaglandin administration postpartum on the reproductive performance of dairy cow
 - 34 |** Dose–response effects of recombinant eCG on reproductive performance of Nelore heifers submitted to fixed-time artificial insemination in tropical systems.
 - 36 |** Effects of recombinant eCG dose on follicular dynamics and fertility in Nelore cows submitted to fixed-time artificial insemination
 - 38 |** Effect of reduced D-Cloprostenol doses at progesterone device removal on reproductive performance in Nelore cows submitted to fixed-time artificial insemination.
 - 40 |** Recombinant equine chorionic gonadotropin enhances out-of-season reproductive performance of artificially inseminated ewes: effects on follicular dynamics, ovulation synchrony, and fertility in Aragonesa and Merino ewes in Spain and South Africa.

Timed Embryo Transfer Success in Lactating Dairy Cows Using Fresh *In-Vitro* Produced Embryos Fertilized with Conventional or Sex-Sorted Sperm

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Background and objective

Efficiency of *in vitro* embryo production and subsequent embryo transfer outcomes in dairy cattle can be influenced by donor type, semen type, and recipient fertility. This study aimed to:

1. Compare *in vitro* embryo production using conventional or sex sorted semen to fertilize oocytes collected from high genetic merit beef and dairy donors.
2. Evaluate pregnancy outcomes in lactating dairy cows following transfer of fresh embryos produced using conventional or sex sorted semen after timed embryo transfer.

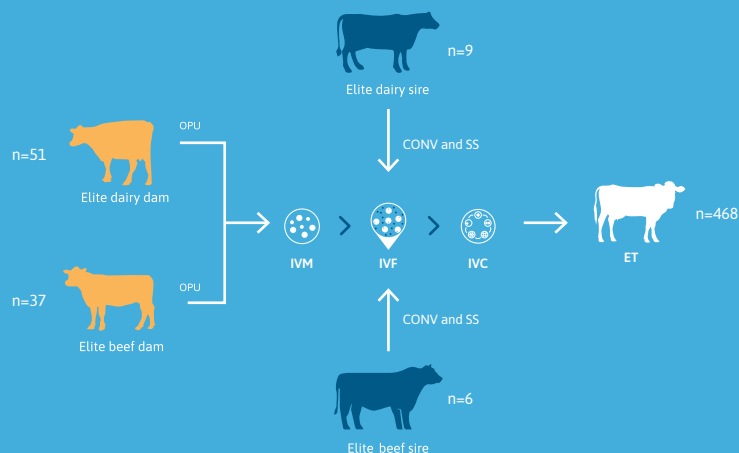
Materials and methods

Oocytes were collected weekly for four consecutive weeks from elite beef and dairy donors using ultrasound guided ovum pickup. After *in vitro* maturation, oocytes underwent fertilization with frozen-thawed conventional or sex sorted semen from proven fertility sires and were cultured to the blastocyst stage. A total of 507 Grade 1 blastocysts, either fresh or previously frozen, were transferred to lactating dairy cows recipients synchronized with a PRID based protocol (PRID Delta®, Ceva Sante Animale, Libourne, France). Recipients were blocked by parity, days in milk, and genetic merit, then randomly assigned to receive an embryo derived from beef or dairy donors fertilized with conventional or sex sorted semen. Pregnancy diagnosis was conducted via transrectal ultrasonography on day 32 after synchronized estrus and confirmed on day 63. Pregnancy loss was defined as loss between the two examinations.



Results

Beef donors yielded more oocytes per collection session, a higher proportion of blastocysts, and a greater number of blastocysts per fertilization session compared with dairy donors. Blastocyst development was similar between fertilizations performed with conventional or sex sorted semen, including comparisons using semen types from the same sire. Pregnancy rates at day 32 and day 63 did not differ between embryos originating from beef or dairy donors, nor between embryos produced using conventional or sex sorted semen. Pregnancy loss did not differ among groups. Serum progesterone concentration on day 7 was not associated with pregnancy status at either time point.



CONCLUSION

Beef donors demonstrated higher oocyte recovery and blastocyst production compared with dairy donors. Embryo development was comparable between fertilizations performed with conventional and sex sorted semen. Pregnancy outcomes following transfer of fresh embryos were similar regardless of donor type or semen type. These findings support the use of sex sorted semen for in vitro embryo production without compromising embryo development or pregnancy success in synchronized lactating dairy cows recipients.

Evaluation of the effect of natural prostaglandin administration postpartum on the reproductive performance of dairy cow

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Background and objective

Post-partum in dairy cows significantly affects the animal's productive and reproductive efficiency; clinical monitoring during this phase is essential to detect and treat any reproductive tract diseases.

In the early postpartum period, the uterus of dairy cows is invaded by various bacteria, both anaerobic and facultative anaerobic, which are naturally eliminated approximately within 28 days after calving. However, occasionally, this process fails, predisposes cows to pathological conditions such as endometritis, negatively affecting subsequent reproductive performance.

Prostaglandins F2 α (PGF2 α) are commonly used to improve uterine involution, promote luteolysis, contributing to the resolution of uterine infections in dairy cows, support ovarian activity recovery, and optimize fertility.

The aim of the present study was to evaluate the effects of administering natural PGF2 α to dairy cows between days 8 and 14 postpartum on the immediate postpartum period and subsequent reproductive performance.

Materials and methods

A total of 300 Italian Holstein cows were recruited and randomized into two experimental groups based on days in milk and parity (treated group and control group). Between the 8th and 14th day postpartum, the Treated group (n = 169) received an injection of natural prostaglandin (25 mg Dinoprost as Trometamol IM per subject, equivalent to 5 ml in the semitendinosus muscle, Enzaprost®, Ceva Sante Animale, France), while Control group (n = 131), received an injection of saline solution (5 ml IM per animal). All the animals were inseminated for 1st AI using Double-Ovsynch starting at 55 $\pm$ 3 DIM.

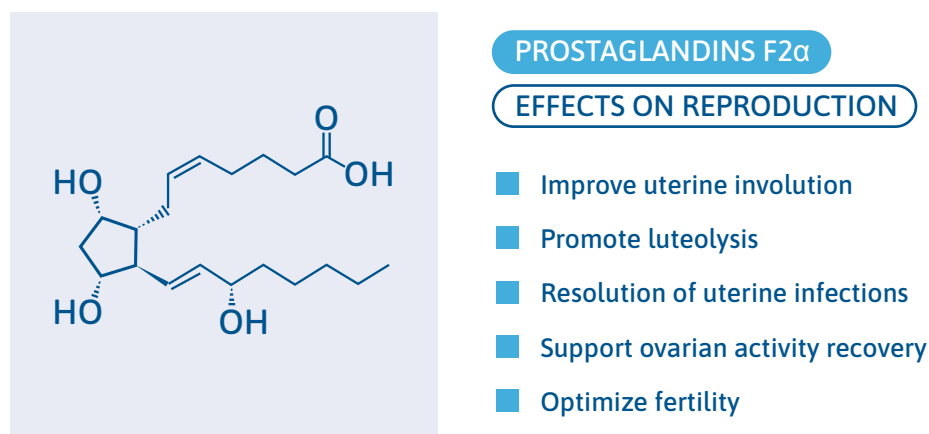


Figure 1: Benefits of Prostaglandins F2 α (PGF2 α) in ruminant reproduction.

Results

The data obtained showed that a single administration of prostaglandin F2 α between day 8 and day 14 postpartum increased the CR% for 1st AI, with a higher number of pregnant cows in the treated group (54.8%) compared to the control group (39.1%) (p=0.001; OR=2.383, 95% CI: 1.420-3.998).

The administration of PGF2 α had a significant impact on the probability of not exceeding 250 days in milk without pregnancy (“off cows”) (p=0.003; 94% treated, 84% control). Specifically, the percentage of “off” cows in the control group (15.4%) was more than double that of the treated group (6%).

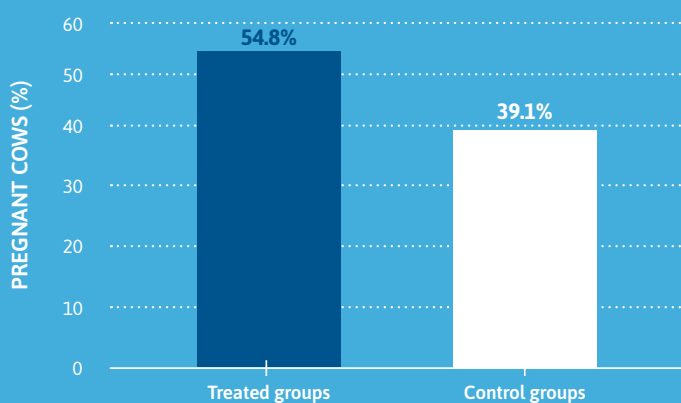


Figure 2: Data obtained from a single administration of prostaglandin F2 α between day 8 and day 14 postpartum targeting the number of pregnant cows (%) in treated and control groups.



CONCLUSION

The data from this study, therefore, suggest that a single administration of PGF2 α , between the 8th and 14th post-partum day, may have positive effects on the reproductive performance of dairy cows. In particular, the treated group showed a higher conception rate compared with the control group, along with a concomitant reduction in days open.

Dose-response effects of recombinant eCG on reproductive performance of Nelore heifers submitted to fixed-time artificial insemination in tropical systems

Adriel Vânio Gretter¹, Davi Soutinho de Paiva², Eliane Vianna da Costa e Silva³, Victor Guidi Zardo¹, Alexandre Hênryli de Souza⁴, Rafael Moreira⁴, Federico Randi⁴, Gustavo Guerino Macedo³, Pietro Sampaio Baruselli¹

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³Federal University of Mato Grosso do Sul, Campo Grande, MS, Brazil | ⁴Ceva Animal Health, Libourne, France

Background and objective

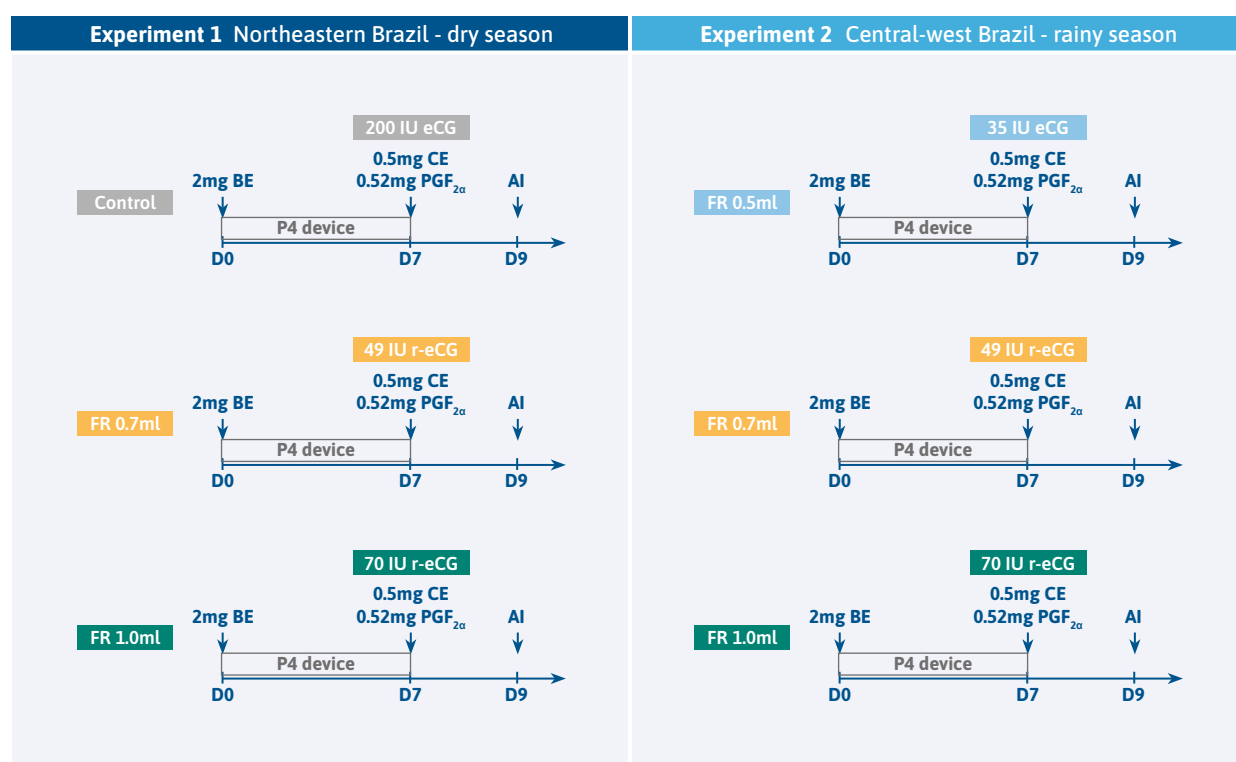
This study was conducted to test the hypothesis that the dose-response to recombinant eCG administered at progesterone device removal differs among Nelore heifers managed under distinct tropical production conditions, thereby affecting reproductive performance following fixed-time artificial insemination (FTAI).

To evaluate the dose-response effects of recombinant equine chorionic gonadotropin (r-eCG; Foli-Rec[®], Ceva Animal Health), compared with conventional eCG (Folligon[®], MSD), on reproductive performance of Nelore heifers submitted to fixed-time artificial insemination (FTAI) under distinct tropical production conditions.

Materials and methods

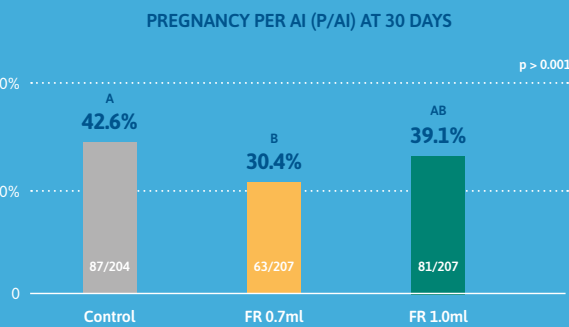
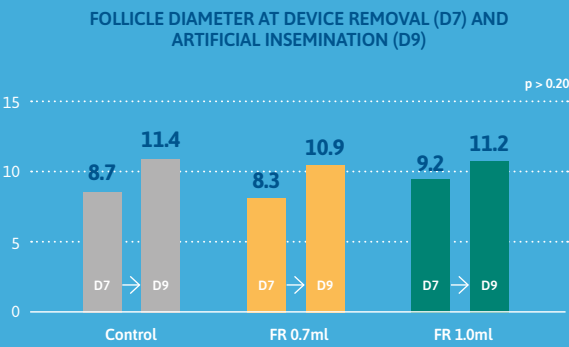


A TOTAL OF 1,168 NELORE HEIFERS FROM TWO REGIONS OF BRAZIL

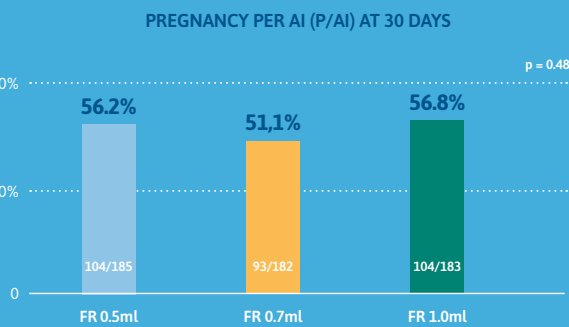
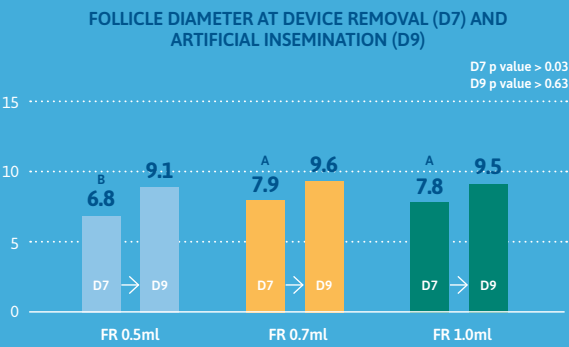


Results

EXPERIMENT 1



EXPERIMENT 2



CONCLUSION

Recombinant eCG at a dose of 70 IU provides reproductive performance comparable to conventional eCG in Nelore heifers submitted to FTAI under tropical conditions. However, body condition score and estrus expression exert a greater influence on pregnancy success than gonadotropin dose.

Effects of recombinant eCG dose on follicular dynamics and fertility in Nelore cows submitted to fixed-time artificial insemination

Adriel Vânio Gretter¹, Davi Soutinho de Paiva², Alexandre Hênryli de Souza³, Rafael Moreira³, Federico Randi³, Pietro Sampaio Baruselli¹

¹Animal Reproduction Department, University of São Paulo, São Paulo, SP, Brazil | ²Equipe DS – Davi Soutinho Reprodução Animal, Maceió, AL, Brazil | ³Ceva Animal Health, Libourne, France

Background and objective

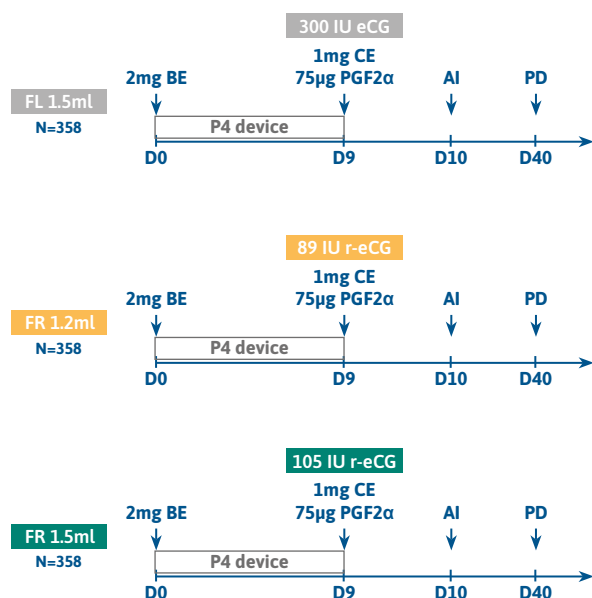
This study was conducted to test the hypothesis that different doses of recombinant eCG administered at progesterone device removal promote follicular development and fertility comparable to conventional eCG in postpartum Nelore cows submitted to fixed-time artificial insemination (FTAI).

To evaluate the effects of different doses of recombinant equine chorionic gonadotropin (r-eCG; Foli-Rec®, Ceva Animal Health), compared with conventional eCG (Folligon®, MSD), on follicular dynamics and reproductive performance of postpartum Nelore cows submitted to fixed-time artificial insemination (FTAI).

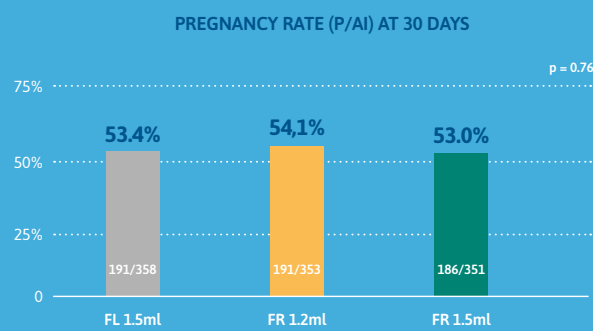
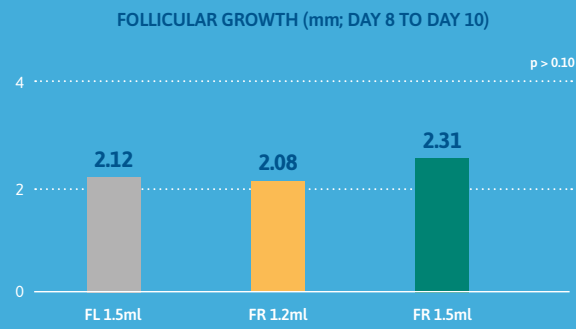
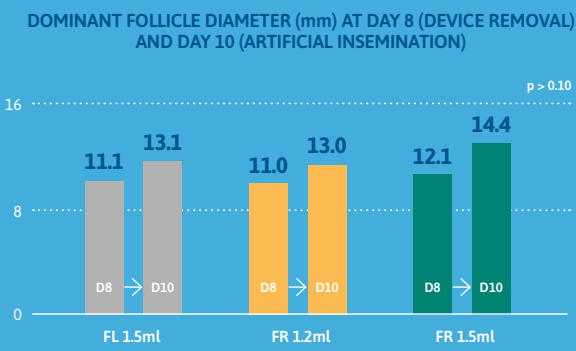
Materials and methods



A TOTAL OF 1,062 POSTPARTUM NELORE COWS FROM NORTHEAST BRAZIL WERE RANDOMLY ASSIGNED TO ONE OF THREE TREATMENT GROUPS.



Results



CONCLUSION

Recombinant eCG at doses of 89 IU and 105 IU promoted follicular development and fertility comparable to conventional eCG in postpartum Nelore cows submitted to FTAI. These findings support the use of recombinant eCG as a standardized alternative to conventional eCG for reproductive management in *Bos indicus* beef production systems.

Effect of reduced D-Cloprostenol doses at progesterone device removal on reproductive performance in Nelore cows submitted to fixed-time artificial insemination

Adriel Vânio Gretter¹, Victor Guidi Zardo², Bruno Bernardino Versiani², Laís Angelo Abreu¹, Alexandre Hênryli de Souza³, Rafael Moreira³, Federico Randi³, Pietro Sampaio Baruselli¹

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Background and objective

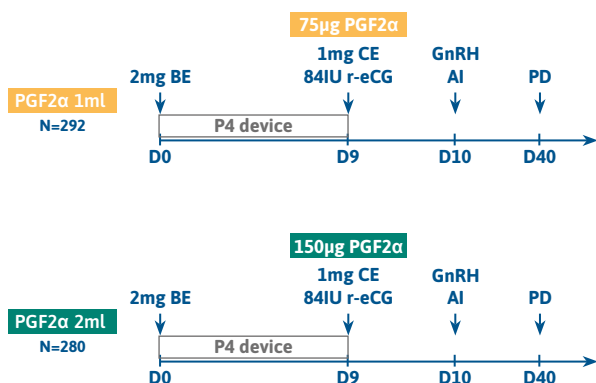
It was hypothesized that a reduced dose of D-cloprostenol administered at progesterone device removal would not compromise pregnancy per AI in Nelore cows submitted to fixed-time artificial insemination (FTAI) protocols.

The aim of this study was to evaluate whether a reduced dose of D-cloprostenol (Luteglan[®], Ceva Animal Health) administered at the time of progesterone device removal would affect pregnancy per AI in Nelore cows submitted to FTAI protocols.

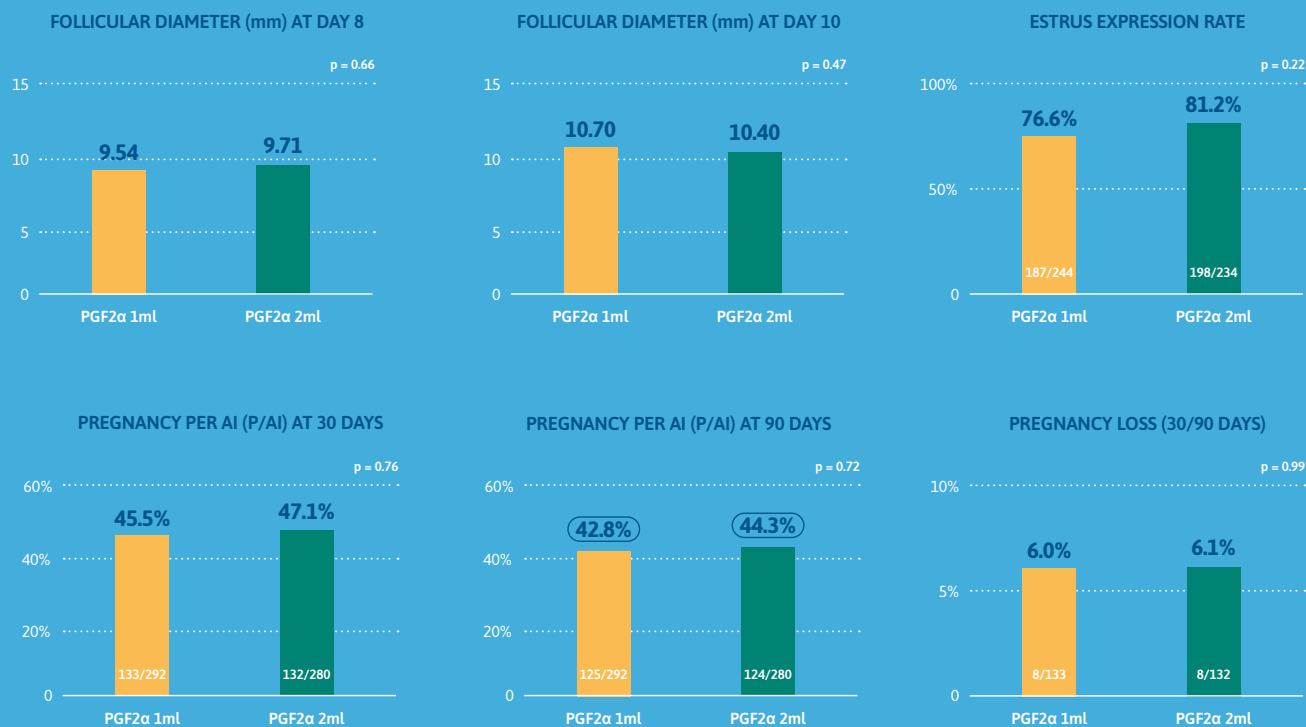
Materials and methods



A TOTAL OF 572 MULTIPAROUS NELORE COWS WERE ALLOCATED TO TWO EXPERIMENTAL GROUPS.



Results



CONCLUSION

Reducing the dose of D-cloprostenol (Luteglan®, Ceva Animal Health) administered at progesterone device removal did not compromise follicular development, estrus expression, pregnancy per AI, or pregnancy maintenance in Nelore cows submitted to FTAI protocols. These findings support the use of the reduced dose as an effective alternative to the conventional dose under the conditions of this study.

Recombinant equine chorionic gonadotropin enhances out-of-season reproductive performance of artificially inseminated ewes: effects on follicular dynamics, ovulation synchrony, and fertility in Aragonesa and Merino ewes in Spain and South Africa

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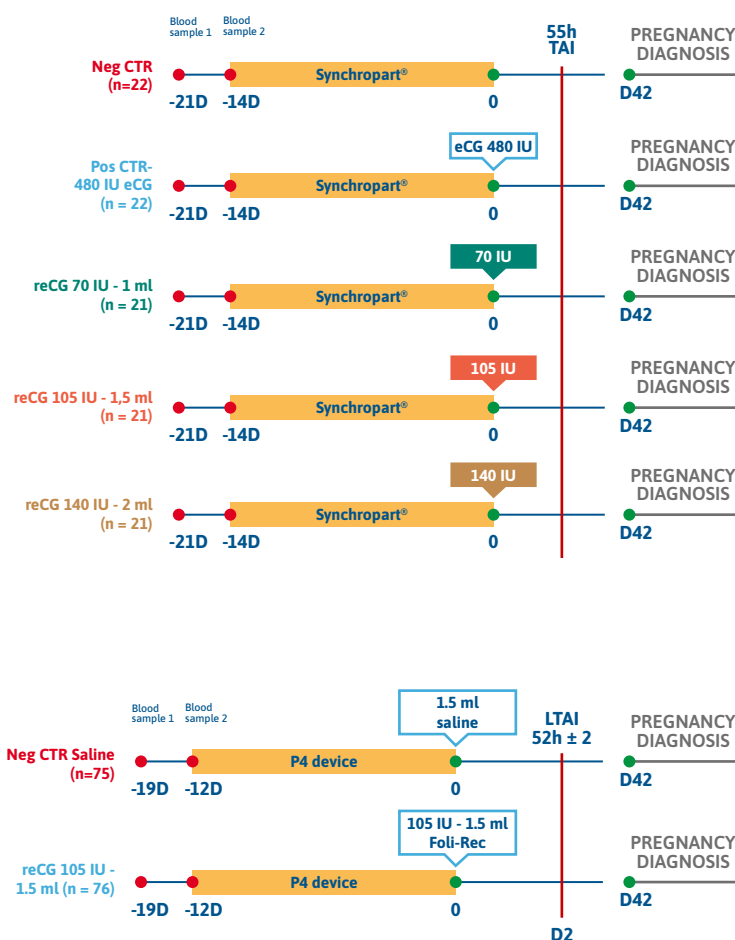
¹Ceva Sante Animale, Libourne (France) | ²Embryosardegna, Perfugas, Sassari (Italy) | ³Instituto Universitario de Investigación en Ciencias Ambientales (IUCA), Facultad de Veterinaria de Zaragoza | ⁴Clinvet International, Bainsvlei, Bloemfontein, (South Africa) | ⁵Geneco Advanced Breeding, Knofffontein, Philipstown (South Africa) | ⁶School of Biosciences and Veterinary Medicine, University of Camerino, Camerino (Italy) | ⁷Department of Veterinary Medicine, University of Sassari, Via Vienna 2, 07100 Sassari (Italy)

Background and objective

Artificial insemination (AI) is widely used to accelerate genetic progress and improve reproductive efficiency in sheep. However, the use of natural equine chorionic gonadotropin (eCG) raises animal-welfare concerns. These studies aimed to evaluate the efficacy of recombinant eCG (reCG) in improving reproductive performance in two ewe breeds inseminated out of the breeding season.

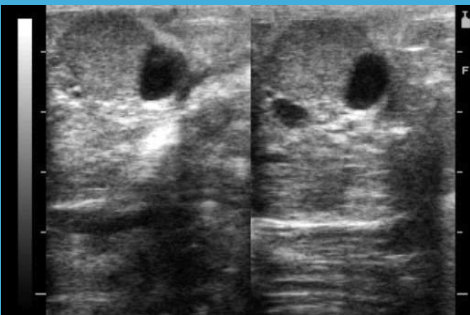
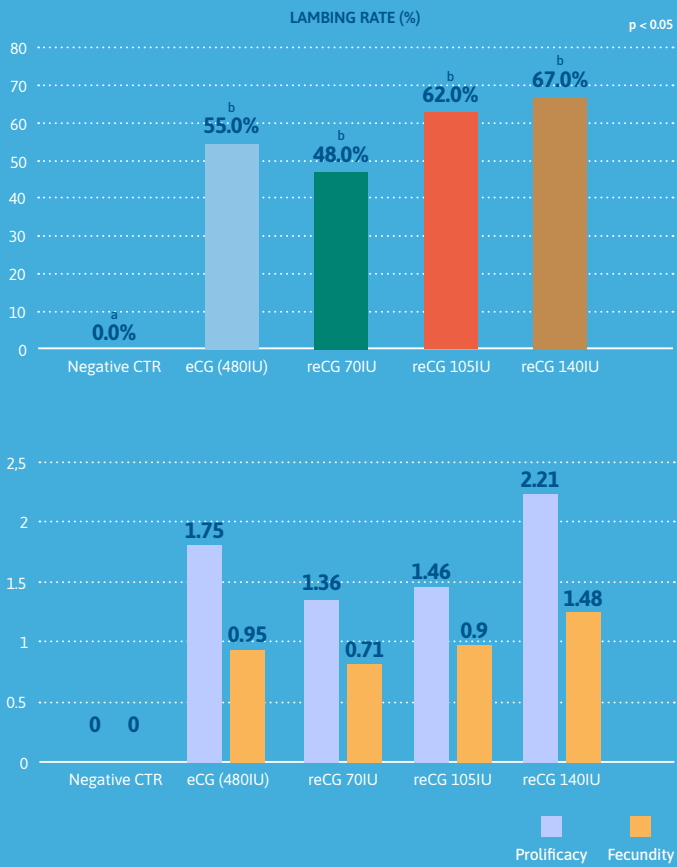
Materials and methods

1. A total of 107 Aragonesa ewes were synchronized using a 12-day FGA sponge protocol and assigned to five groups: Negative Control, Positive Control (480 IU natural eCG, Synchropart® PMSG, Ceva Sante Animale, France), and reCG at 70, 105, or 140 IU (Foli-Rec® Ceva Sante Animale, France). Cervical AI with fresh semen was performed 55 hours after sponge removal, and pregnancy was diagnosed 40 days later.
2. A blinded, parallel-group trial included 151 Merino ewes subjected to a 12-day progesterone-based protocol. At device removal, ewes received either saline (Negative Control, n=75) or 105 IU reCG (Treatment, n=76) (Foli-Rec® Ceva Sante Animale, France). Laparoscopic AI with frozen semen was performed 52 ± 2 hours later. Pregnancy was assessed at Days 35–42 and 60–65, with monitoring continued until lambing.

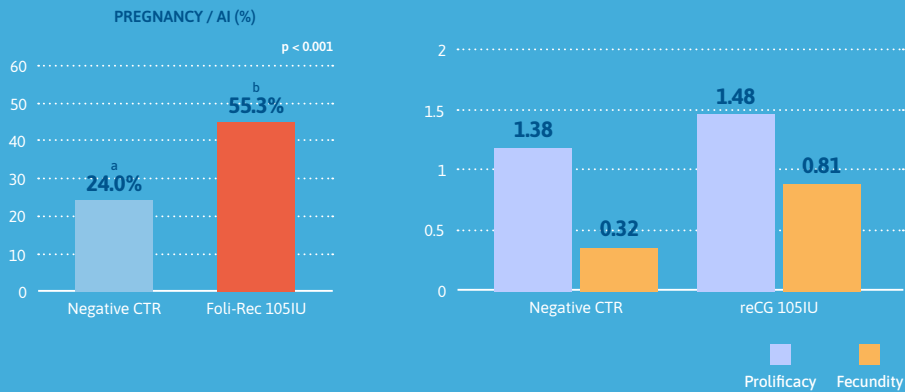


Results

STUDY 1



STUDY 2



CONCLUSION

Recombinant eCG effectively enhances reproductive performance in out-of-season AI programs, delivering improved pregnancy rates and demonstrating clear dose-dependent effects. As a welfare-friendly alternative to natural eCG, **reCG offers a promising tool for sustainable genetic progress in sheep.**

5

Pain assessment and management

A person's hands are visible on the right side of the frame, holding a smartphone. The background is a field of tall, golden grass at sunset, with a warm, orange glow. A large blue rectangle is overlaid on the left and center of the image.

44 | Bovisensor : a new user-friendly digital tool to assess pain in cattle.

BoviSensor: a new user-friendly digital tool to assess pain in cattle

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*Corresponding author

Background and objective

Effective detection and management of pain are fundamental for **improving cattle welfare**; however, **progress is still required to enhance awareness, promote standardized assessment, and ensure the systematic implementation of analgesic strategies**. All painful conditions warrant attention, even in the absence of consequences on productivity in adult animals. Consideration must also be given to calves, which experience several painful conditions, yet are often monitored less frequently and exhibit more subtle or nonspecific pain behaviors. **Until recently, pain assessment tools for cattle were limited**, with most existing frameworks addressing only a single pathology (e.g., lameness or postsurgical pain).

Materials and methods

Under the leadership of Oniris (National Veterinary School of Nantes, France), a **panel of veterinary experts** employed a structured **Delphi method** to **develop a series of condition-specific, user-friendly pain assessment grids** applicable to several common clinical conditions in both adult cattle and young calves. The expert panel comprised twelve specialists from seven different countries, representing both academic institutions and field-based veterinary practices.

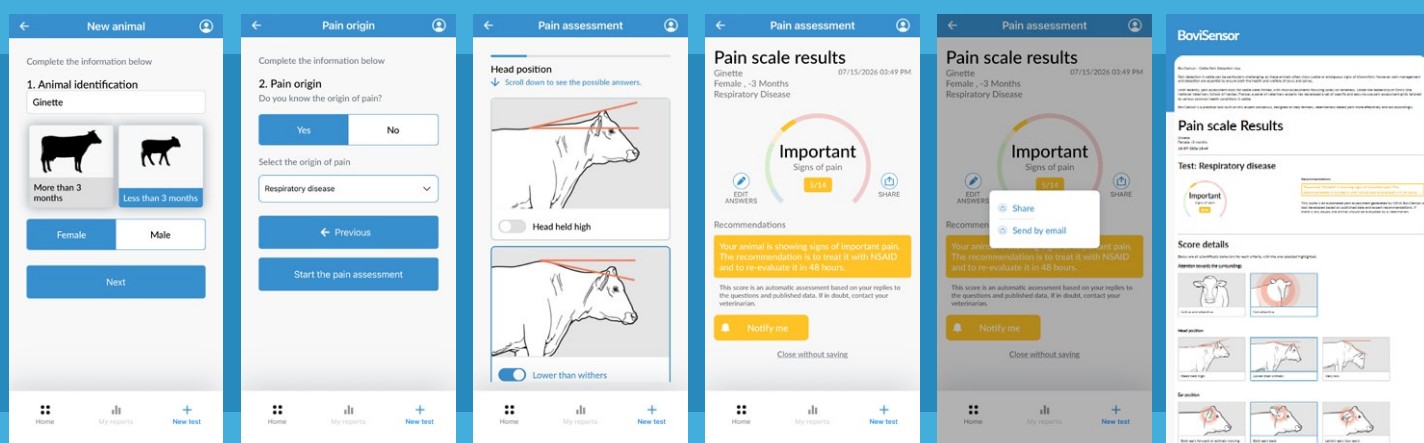


Results

This **consensus-based process** led to the development of a **dedicated digital tool: BoviSensor**, enabling veterinarians and farmers to **generate a standardized pain score for each animal and clinical condition**. The tool follows a structured workflow comprising:

1. Identification of the animal's age category and sex;
2. Selection of the suspected source of pain, when known (when the source of pain is unknown, the tool can still be used based on non-specific signs of pain);
3. Recording of the illustrated postural and behavioral indicators observed. Based on these inputs, the tool calculates a score that categorizes the level of pain and subsequently recommends either analgesic intervention or a scheduled re-evaluation

The generated report, which includes all recorded clinical signs, can be saved and shared for documentation or follow-up. **When analgesic treatment is administered, a re-evaluation is encouraged; the expected reduction in the pain score provides educational feedback for the user, reinforcing the effectiveness of appropriate pain management.**



CONCLUSION

BoviSensor is a practical decision-support tool designed to assist farmers and veterinarians in improving the detection of pain and implementing appropriate management strategies. Enhancing cattle welfare will require substantial changes in current practices, particularly regarding pain management across a wide range of situations—from calving and de-horning to infectious and traumatic conditions. Effective analgesia represents a worthwhile investment. **The routine use of BoviSensor as a standardized pain-scoring system constitutes an essential first step toward increasing awareness at farm level.** A trial is currently underway to rigorously evaluate the tool's sensitivity, specificity, and repeatability under field conditions.

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Infection and inflammation management

- 
- 48 |** Ketoprofen as the sole initial treatment for non-severe mastitis: efficacy and antibiotic reduction
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Ketoprofen as the sole initial treatment for non-severe mastitis: efficacy and antibiotic reduction

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Background and objective

Mastitis in dairy cows is a major health issue traditionally treated with antibiotics. However, growing concerns about antimicrobial resistance have prompted exploration of alternative therapies. **This study aimed to evaluate the efficacy of a non-steroidal anti-inflammatory drug (NSAID)-based treatment concept using ketoprofen (KE) compared to conventional intramammary antibiotic therapy (AB) for mild and moderate clinical mastitis (CM).** The primary objective was to assess **clinical cure at day 5, bacteriological cure at days 14 and 21, recurrence within 60 days, and new infection risk**, while highlighting the **potential reduction in antibiotic usage**.

Materials and methods

A **randomized, multi-herd, non-inferiority trial** was conducted on three dairy farms in Northern Germany between August 2022 and November 2023. A total of 222 lactating Holstein-Friesian cows with mild or moderate CM were enrolled. Animals were randomly assigned to **two groups: AB group received local intramammary antibiotics** (ceftiofur and kanamycin, Ubrolexin® Boehringer Ingelheim) 2 injections 24 hours apart, while **KE group received systemic ketoprofen** (Romefen® PR 10%/Ketofen® 10%, Ceva Santé Animale) for three days, with antibiotics added only if no improvement was observed by day 3. **Clinical examinations were performed every 12 hours for six days, and milk samples were collected for microbiological analysis.**



Results

Of **222 cases**, 118 were treated with antibiotics (AB) and 104 with ketoprofen (KE). **Clinical cure at day 5** was **91.2% for AB group** and **67.8% for KE group** ($P < 0.001$). **Bacteriological cure rates** were **78.6% for AB group** and **59.6% for KE group** ($P = 0.026$). **Recurrence within 60 days** was **5.8% for AB group** and **14.0% for KE group** ($P = 0.046$), while **new infection risk** did not differ significantly between groups.

Fourteen cows in the KE group required subsequent antibiotic therapy. **The KE group achieved an 86% reduction in antibiotic doses compared to AB** ($P < 0.001$). Because of the absence of need to discard milk after ketoprofen treatment, there was **35.9% less milk wasted in the KE group compared to the AB group** (milk has been commercialized again as soon as its appearance returned to normal).

VARIABLE	GROUP	
	KE ¹	AB ²
CC5% (no.)	61.5 (64/104)	84.7 (100/118)
BC% (no.)	61.2 (41/67)	79.3 (73/92)
R60% (no.)	15.7 (14/89)	7.3 (8/109)
NI% (no.)	6.7 (7/104)	6.8 (8/118)

Table 1: Descriptive statistics for study outcomes by experimental group

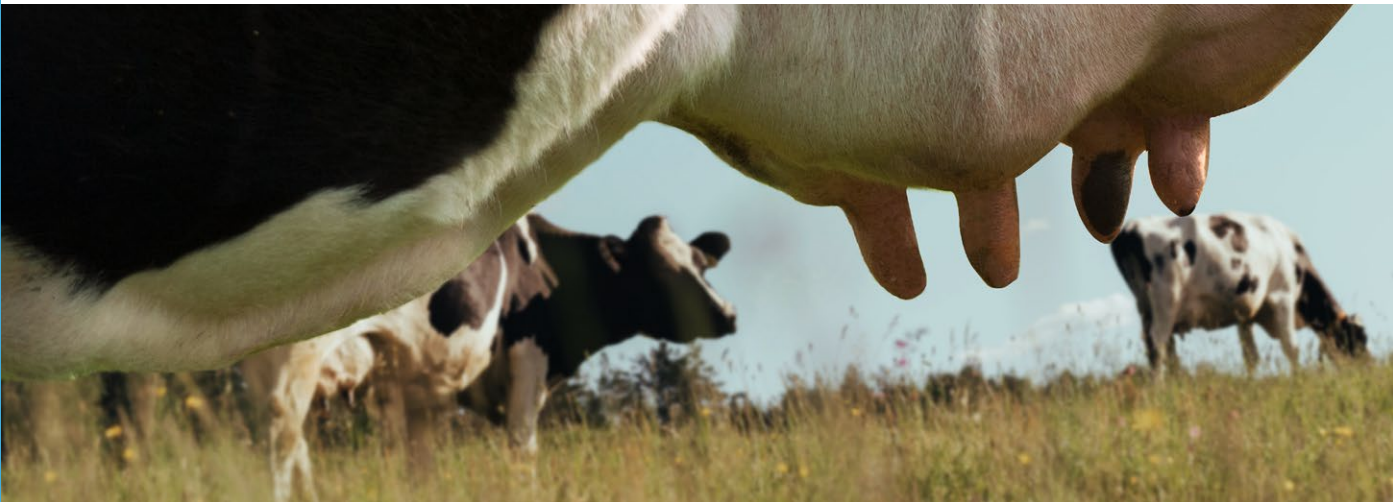
¹KE = test treatment group (ketoprofen group), the cows were treated with three applications of 3 mg ketoprofen per kg body weight (Romefen® PR 10%/Ketofen® 10%, Ceva Animal Health, Düsseldorf, Germany) at 24-h intervals.

²AB = reference treatment group (antibiotic group), cows were treated with two intramammary applications of 200 mg cefalexin and 100,000 I.E., kanamycin (Ubrolexin®, Boehringer Ingelheim, Ingelheim am Rhein, Germany) at 24 h intervals.



CONCLUSION

The NSAID-based treatment concept substantially reduced antibiotic usage and waste milk, contributing to antimicrobial stewardship and sustainability. However, lower clinical and bacteriological cure rates in the KE group indicate that sole NSAID therapy cannot replace antibiotics in all mastitis cases. Nevertheless, this approach represents a promising step toward reducing antibiotic consumption in dairy farming without compromising animal welfare.



Lung ultrasonography assessment of florfenicol and meloxicam therapy in moderate and severe bovine respiratory disease in veal calves

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Background and objective

Bovine respiratory disease (BRD) can affect up to two-thirds of veal calves. Antimicrobial treatment is recommended when active bronchopneumonia (with both bacterial infection and inflammation) is identified. Lung ultrasonography (LUS) could be useful to identify lesions as pleurisy and fluid alveolograms/bronchograms that could be more indicative of bacterial infections. Moreover, pneumonia were recently divided according to lesion depth in moderate ($1 \text{ cm} \leq \text{lesion} < 3 \text{ cm}$) and severe ($\text{lesion} \geq 3 \text{ cm}$) pneumonia with different recovery rate. Specifically, short-term cure (defined as complete reaeration) was 50.2% and 32.7%, respectively.

The aim of this study was to evaluate the use of a single dose of florfenicol and meloxicam in the treatment of active bronchopneumonia in veal calves.

Materials and methods

ANIMALS AND EXPERIMENTAL DESIGN

- 145 veal calves from a commercial farm were enrolled and examined three times at week from arrival to the first two months
- Each examination included:
 - Clinical examination to establish Wisconsin and California clinical scores;
 - LUS to establish lung lesion score (LLS), ultrasonography score (US), and lesion depth.



GROUP DIVISION

- Control (CTR, n=50); never develop lung lesions and clinical signs
- Moderate pneumonia (MP, n=25): $\text{LLS} \geq 10.5$ and at least 1 clinical sign associated with $1 \text{ cm} \leq \text{lesion} < 3 \text{ cm}$
- Severe pneumonia (SP, n=43): $\text{LLS} \geq 10.5$ and at least 1 clinical sign associated with $\text{lesion} \geq 3 \text{ cm}$



FOLLOW-UP AND STATISTICAL ANALYSIS

- Animals were monitored each other day from 1d to 14d, and at 21d and 28d after treatment
- Calves were considered fully recovered if LUS indicated reaeration (healthy lungs or only one-two comet-tail artifacts) after treatment
- Mixed models for group and time were used to evaluate differences among groups ($p < 0.05$).



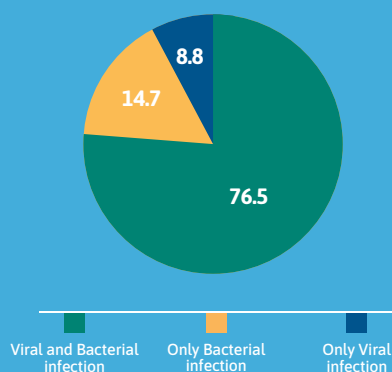
TREATMENT

BRD-positive calves received

- Bronchoalveolar lavage (BAL) for microbiological analysis
- A single administration of florfenicol and meloxicam (40mg/kg+0.5mg/kg, Zeleris®, Ceva)

Results

INFECTION CHARACTERISTICS (%)



TOTAL BACTERIAL INFECTION, 91.2%

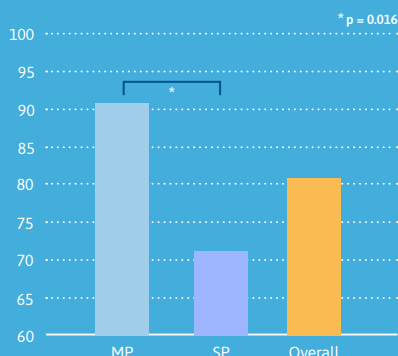
- *Mannheimia haemolytica*, 28.1%;
- *Pasteurella multocida*, 32.9%;
- *Mycoplasma bovis*, 29.3%

TOTAL VIRAL INFECTION, 85.3%

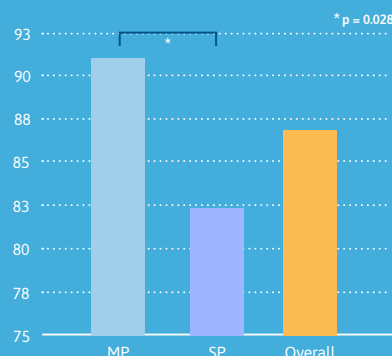
- Coronavirus, 87.5%



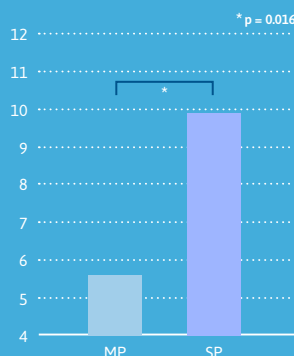
RECOVERY RATE (%)



RECOVERY AFTER 1-TREATMENT (%)

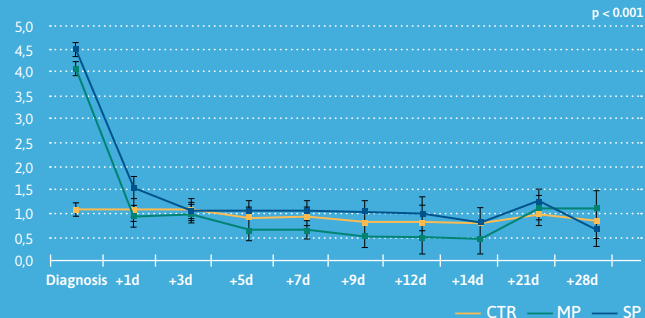


TIME TO REAERATION (DAYS) AFTER 1-TREATMENT

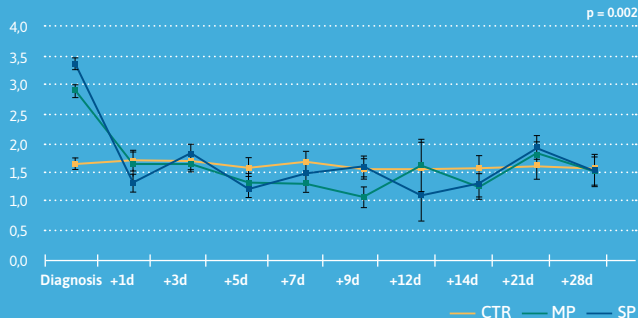


The Odds Ratio of MP vs. SP was 0.053 (95% CI: 0.01 to 0.43; $p=0.006$) confirming a greater probability to recover in MP

CALIFORNIA CLINICAL SCORE

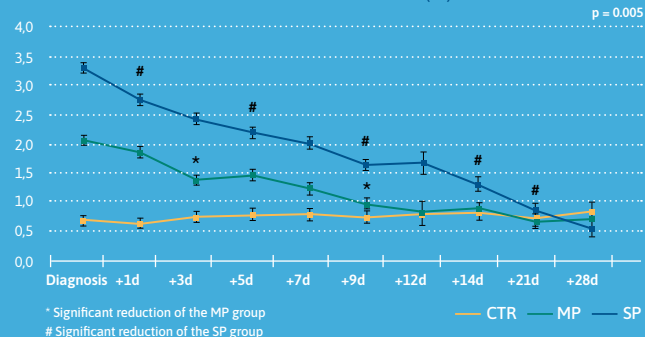


WISCONSIN CLINICAL SCORE

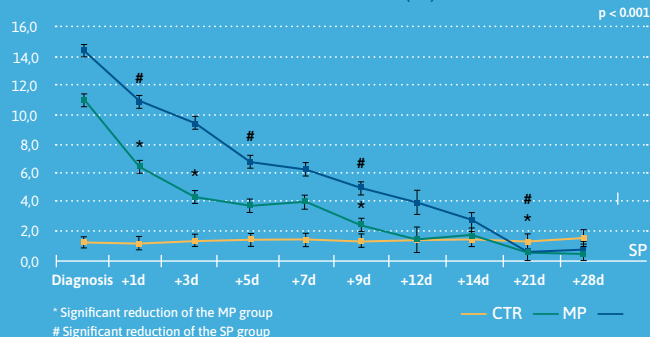


Both clinical scores reduced +1d after treatment with values comparable to CTR calves.

ULTRASONOGRAPHY SCORE (US)



LUNG LESION SCORE (LLS)



- The MP group was comparable to CTR calves from +9d for both US and LLS
- The SP group was comparable to CTR calves from +21d and +14d for US and LLS, respectively



CONCLUSION

In high risk calves with moderate to severe pneumonia of mixed origin, treatment with florfenicol plus meloxicam rapidly reduced clinical scores and resulted in an high complete lung recovery.

Comparison of the syringeability of a fixed combination of florfenicol and meloxicam with commonly used florfenicol-based products for the treatment of BRD using a novel high-precision assessment method

Brigitte Trezzani¹, Damien Achard¹, Sandrine Lacoste¹, Marine Letertre¹, Stephane Trotebas¹

¹Ceva Sante Animale, Libourne (France)

Background and objective

Syringeability is a key parameter for any parental formulation intended for use in cattle and is particularly critical in young calves. Solutions for injections must be easily administered to ensure the welfare of both the animal and the operator-whether a farmer or a veterinarian, especially under challenging winter conditions where increased viscosity can hinder proper delivery.

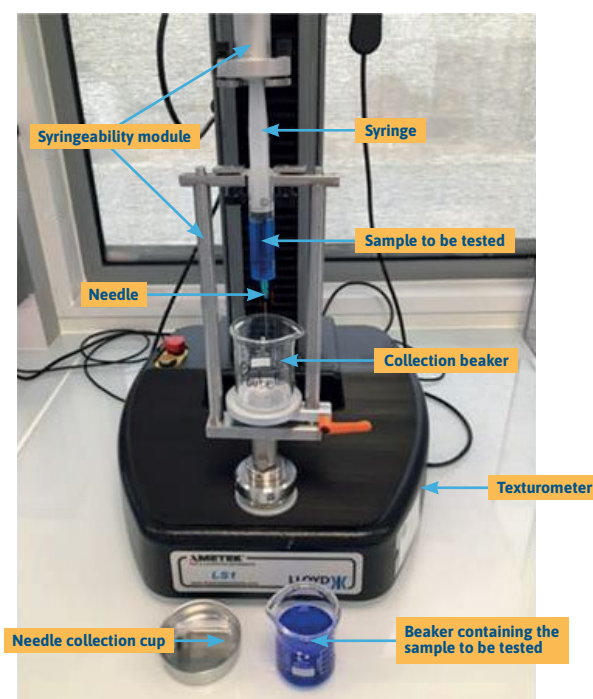
Materials and methods

Historically, syringeability of injectable formulations was assessed by applying a **constant manual force to the syringe plunger** and **recording the time required for the product to pass through a needle** of predefined gauge. This approach was limited by operator-dependent variability and inconsistent application of force.

A new syringeability evaluation method was implemented to improve standardization and measurement accuracy. A calibrated texturometer was used to apply a **constant and predefined plunger speed of 100 mm/min** over a 10 mL displacement. During the test, **the instrument continuously measured the force required to extrude the formulation, expressed in Newtons (N)**. The lower the force is, the easier the injection is.

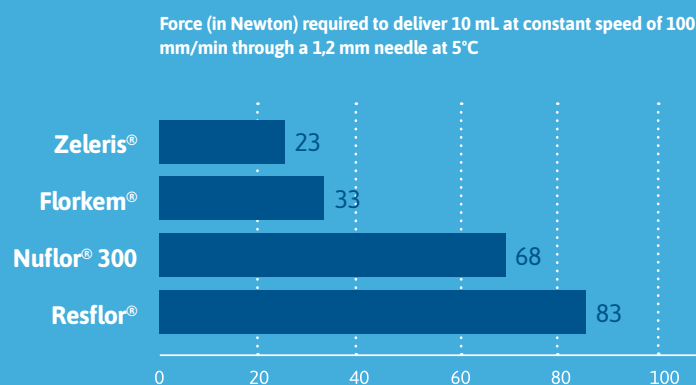
Each formulation was tested six times under identical conditions to assess repeatability. For each set of six measurements, the coefficient of variation (CV) was calculated, expressed as a percentage. A low CV was interpreted as high repeatability of the syringeability profile.

Two different temperatures (5°C and Room Temperature) and **two needle gauges** (1,2 mm and 0,8 mm) were tested. **Four products were compared:** Zeleris® (florfenicol 400 mg/mL and meloxicam 5 mg/mL, Ceva), Resflor® (florfenicol 300 mg/mL and flunixin meglumine 16.5 mg/mL, MSD), Nuflor®300 (florfenicol 300 mg/mL, MSD), Florkem® (florfenicol 300 mg/mL, Ceva).



Results

Force (in Newton) required to deliver 10 mL at constant speed of 100 mm/min	ROOM TEMPERATURE		5°C	
	0,8 mm	1,2 mm	0,8 mm	1,2 mm
Zeleris®	98N (CV 0.5%)	20N (CV 1.5%)	162N (CV 1.9%)	23N (CV 4.1%)
Resflor®	Unable to measure	37N (CV 1.2%)	Unable to measure	83N (CV 2.7%)
Nuflor® 300	246N (CV 4.3%), syringe deformation	33N (CV 6.2%)	Unable to measure	68N (CV 5.8%)
Florkem®	111N (CV 1.0%)	27N (CV 1.2%)	201N (CV 7.1%)	33N (CV 1.8%)



**THE LOWER THE FORCE,
THE EASIER THE INJECTION IS.**

The results of this study clearly demonstrated the high syringeability of Zeleris®: At 5°C, the force needed to inject Zeleris® through a 1,2 mm needle was 23 N. Zeleris® syringeability was better than the other florfenicol-based products both at 5°C (23 N for Zeleris®, 33 N for Florkem®, 68 N for Nuflor® 300 and 83 N for Resflor®) and at room temperature. The superior performances of Zeleris® may be explained by the excipients chosen for its formulation.



CONCLUSION

- This new method confirmed the high syringeability of Zeleris, combination of florfenicol and meloxicam commonly used in winter season to treat calves suffering from bovine respiratory disease.
- Good syringeability translates to ease, speed, and comfort — for both the farmer and the animal. This directly improves compliance, making it more likely that treatments are performed with the right dose, using the correct technique and route of administration.

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reprodAction Symposium

- 56 |** Foundational reproduction programs for dairy herds: how to improve breeding efficiency?
- 58 |** Fertility programs in cattle: how reproductive management reduces greenhouse gas emissions and enhances sustainability
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Foundational reproduction programs for dairy herds: how to improve breeding efficiency ?

PROFESSOR **PAUL M. FRICKE**

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Before the early 2000's, poor reproductive performance in dairy herds prevented commercial dairy farms from adopting assisted reproductive technologies. **A reproduction revolution occurred in the dairy industry over the past 25 years during which the long-term decrease in reproductive performance dramatically reversed and began to increase.** This talk will overview key reproductive technologies and concepts that have affected reproductive performance in dairy herds.

● Development and adoption of fertility programs

The adoption of fertility programs by dairy farmers has led to a dramatic increase in reproductive efficiency.

Today, most U.S. dairy farms combine fertility programs with automated activity monitoring systems to inseminate cows which has further increased AI service rates. The original Ovsynch protocol increased the 21-d PR in dairy herds by overcoming the physiologic and management limitations with detection of estrus (i.e., the AI service rate), whereas fertility to TAI was similar to that of cows inseminated after a detected estrus. Soon after development of the Ovsynch protocol, research focused on developing programs to increase fertility to TAI which was achieved through two modifications to the original Ovsynch protocol. The first key modification made to the original Ovsynch protocol that increased fertility to TAI was incorporation of strategies for presynchronizing cows so that they start Ovsynch on an optimal day of the estrous cycle.

A second modification that was made to the original Ovsynch protocol that increased fertility to TAI was the addition of a second PGF2 α treatment administered 24 h after the first to assure complete luteolysis. Taken together, these two modifications to the original Ovsynch protocol led to the development of what we now refer to as fertility programs because they result in more P/AI than when high-producing cows are inseminated after a detected estrus.

Optimization of Resynch strategies for second and greater inseminations included the addition of a second PGF2 α treatment and the inclusion of a P4 insert for nonpregnant cows initiating the Resynch protocol without a CL. Fertility programs for first TAI have not only increased the AI service rate but have also increased fertility in high-producing Holstein cows by about 10-percentage points compared to cows inseminated to a detected estrus.

● The High Fertility Cycle

A novel conceptual idea accompanying the dramatic increase in reproductive performance of lactating dairy cows is what has been coined "The High Fertility Cycle" which relates changes in BCS during the periparturient period with profound effects on pregnancy outcomes, pregnancy loss, and health events after submission of cows to fertility programs for first TAI.

The High Fertility Cycle describes the relationship between BCS change during the periparturient period and reproductive performance and health events in which lactating dairy cows that establish timely pregnancies after the voluntary waiting period have shorter calving intervals and thereby gain less BCS and dry off and calve at a lower

BCS than cows with longer lactations. After calving, these cows undergo less BCS loss, experience fewer health issues, have greater fertility at first TAI, and decreased early pregnancy losses after establishment of pregnancy.

Cows then establish pregnancy by 130 DIM thereby continuing The High Fertility Cycle. The opposite occurs in herds with poor reproductive performance resulting in longer lactations, greater BCS during the dry period and at calving, more BCS loss during the periparturient period, more health issues, and decreased reproductive performance. The goal of every farm should be to strive to get their herd into The High Fertility Cycle and keep it there.

● Sexed semen, beef semen, and IVP embryo transfer programs

As a result of increased fertility due to the adoption of fertility programs and the High Fertility Cycle, commercial dairy farms increased use of reproductive technologies including incorporation of sexed dairy semen and beef semen and embryo transfer programs into their breeding programs.

A dramatic change in reproductive management that occurred in the last 10 years in the U.S. dairy industry is the expansion of use of sexed dairy semen and the adoption of beef semen to inseminate dairy heifers and lactating dairy cows, the third level of the hierarchy.

The U.S. dairy industry has been affected by two rapidly changing economic market forces which include the value of dairy replacement heifers and the value of beef cattle in the U.S. market. A consequence of increased reproductive performance was an initial increase in replacement heifer inventories which in turn drove down replacement heifer values to less than the cost required to rear them. Further, the value of Holstein bull calves decreased due to a lack of demand by feedlots and abattoirs that pay a premium for animals that qualify to be marketed as Certified Angus Beef. To compensate for these changing economic conditions,

dairy farms implemented heifer inventory management strategies to right-size replacement heifer inventories and maximize profit. Embryo transfer programs are considered an effective strategy to improve genetics in lactating dairy cows. Although some commercial dairy farms are incorporating ET programs into their overall reproductive management strategy, use of ET is costly and is largely driven in the U.S. by AI companies to generate high genetic merit male progeny for production of semen.

A novel strategy for use of IVP ET in dairy herds is transfer of beef embryos into dairy heifers and cows to produce straightbred beef calves with high value in the U.S. beef market. Rapidly shifting U.S. market prices for replacement dairy heifers and beef cattle will continue to affect how farmers allocate semen types within their herds moving forward. A major problem limiting the adoption of embryo transfer programs by commercial dairy farms is the associated high rates of pregnancy loss after establishment of pregnancy using embryo transfer compared with artificial insemination. Future research is needed to identify the underlying mechanisms of and strategies to mitigate pregnancy loss after embryo transfer before embryo transfer programs are widely adopted.

Conclusion

The current reproductive performance of U.S. dairy herds is unprecedented and is the lynchpin that led to the adoption of the reproductive technologies. Although many factors are associated with the dramatic increase in reproductive performance (i.e., genetics, nutrition, management), the development of fertility programs and their adoption by dairy farmers combined with the High Fertility Cycle concept has been a major driver of the increased reproductive performance over the past 25 years. Two key technologies adopted by dairy farms in the U.S. as a result of improved reproductive performance are:

- 1 widespread use of sexed dairy semen and conventional beef semen and, increasingly, sexed beef semen, and
- 2 adoption of IVP ET programs.

A major factor limiting the adoption of ET programs by commercial dairy farms is that IVP embryos have greater rates of pregnancy loss after establishment of pregnancy than either IVD embryos or pregnancies established with AI. Future research is needed to identify the underlying mechanisms of and strategies to mitigate pregnancy loss after IVP ET before it is widely adopted by the dairy industry.



Fertility programs in cattle: how reproductive management reduces greenhouse gas emissions and enhances sustainability

PROFESSOR PIETRO BARUSELLI

Professor of Animal Reproduction - University of Sao Paulo - Brazil

- Global demand for animal protein continues to increase, requiring livestock systems to produce more beef and milk while reducing their environmental footprint. In cattle production, greenhouse gas (GHG) emissions originate primarily from enteric methane (CH₄), manure management, and feed production. Although considerable research has focused on nutritional strategies to reduce methane production, increasing biological efficiency remains one of the most effective and economically feasible approaches for mitigating GHG emissions. Consequently, emission intensity, expressed as kilograms of CO₂ equivalent (CO₂-eq) per kilogram of beef or milk produced, has become a more meaningful indicator of sustainability than total emissions alone.
- Reproductive efficiency is one of the major determinants of biological efficiency in cattle production. Pregnancy rate, calving interval, age at first calving, replacement rate, and productive longevity directly influence the proportion of productive animals within a herd. Improvements in these parameters increase lifetime productivity, dilute maintenance requirements over greater quantities of animal products, and ultimately reduce GHG emissions per unit of output. Therefore, fertility programs should be recognized not only as reproductive tools but also as climate-smart management strategies that improve both economic and environmental sustainability.
- In the past two decades, several researchers have contributed to the development, validation, and global dissemination of fertility programs for both beef and dairy cattle. These programs integrate hormonal synchronization, fixed-time artificial insemination (FTAI), resynchronization protocols, early pregnancy diagnosis, embryo technologies, and precision reproductive management into comprehensive reproductive strategies that maximize herd fertility under both tropical and subtropical production systems.
- The introduction of FTAI revolutionized reproductive management by eliminating the dependence on estrus detection and enabling insemination of all eligible females at predetermined times. This innovation substantially increased the use of artificial insemination in beef herds, where estrus detection had previously limited genetic dissemination. Through continuous refinement of synchronization protocols and reproductive management strategies, pregnancy rates have consistently improved while breeding seasons have become shorter and more concentrated. As a consequence, producers obtain more calves from the same number of breeding females, increasing productivity without expanding herd size.
- Brazil has become the largest global market for FTAI, with more than 254 million synchronization protocols commercialized since the technology was introduced. This remarkable adoption reflects not only the reproductive benefits of FTAI but also its significant economic impact on cattle production. Increased pregnancy rates, reduced postpartum anestrus, shorter breeding seasons, and greater calf output have transformed reproductive management into a principal driver of production efficiency in tropical beef systems.
- Continuous innovation has further expanded the effectiveness of fertility programs. Resynchronization protocols allow non-pregnant females to be rapidly identified and reinseminated without waiting for the next estrous cycle, substantially increasing cumulative pregnancy rates during the breeding season. Likewise, early pregnancy diagnosis using Doppler ultrasonography enables rapid identification of non-pregnant animals, minimizing non-productive days and accelerating reproductive decision-making.
- The integration of embryo transfer (ET) and *in vitro* embryo production (IVP) with FTAI programs has further increased reproductive and genetic efficiency. These technologies enable multiplication of genetically superior females, accelerate dissemination of elite genetics, and reduce the generation interval. Combined with genomic selection and sexed semen, embryo technologies allow rapid improvement of economically important traits, including fertility, feed efficiency, growth performance, milk yield, carcass quality, disease resistance, and productive longevity. Consequently, reproductive technologies generate both immediate improvements in reproductive performance and cumulative long-term gains in genetic and production efficiency.

- The relationship between fertility programs and GHG mitigation is primarily explained by improvements in biological efficiency rather than reductions in methane production per individual animal. Fertility programs increase the proportion of productive animals within the herd while reducing the number of females consuming feed without contributing to calf or milk production. Higher pregnancy rates reduce the percentage of open cows, shorten calving intervals, decrease replacement requirements, and increase lifetime productivity. As maintenance energy requirements are distributed over greater quantities of beef or milk, the carbon footprint per unit of product declines.
- Modeling studies have consistently demonstrated that reproductive efficiency is one of the most influential factors affecting emission intensity in both beef and dairy systems. Even moderate improvements in pregnancy rate may substantially decrease CO₂-eq emissions per kilogram of product by reducing the number of animals required to maintain production. Similarly, reducing age at first calving allows heifers to enter production earlier, decreasing the period during which animals consume resources without producing marketable products. Improvements in productive longevity further reduce replacement rates, thereby lowering the environmental cost of raising replacement females.
- In dairy production, enhanced reproductive performance reduces days open, increases lifetime milk yield, and improves the efficiency with which nutrients are converted into energy-corrected milk. Furthermore, in beef systems, greater reproductive efficiency increases the number of calves weaned per exposed female while improving kilograms of beef produced per hectare. Together, these improvements reduce emission intensity without requiring additional land, feed resources, or breeding animals, thereby contributing directly to sustainable intensification of livestock production.
- Future fertility programs will increasingly integrate reproductive management with precision livestock farming, artificial intelligence, automated estrus detection, wearable sensors, genomic prediction, and precision nutrition. These technologies will provide real-time reproductive information, allowing producers to optimize breeding decisions while further improving biological efficiency. At the same time, advances in embryo biotechnology, genomic selection, and reproductive monitoring will continue accelerating genetic progress toward cattle that are more fertile, feed efficient, resilient, and environmentally sustainable.
- The concept of sustainable cattle production has evolved beyond simply reducing methane emissions. Modern sustainability depends on maximizing productivity while minimizing resource use and environmental impact. Fertility programs contribute simultaneously to all three pillars of sustainability by improving reproductive performance, increasing farm profitability, accelerating genetic gain, and reducing GHG emission intensity. Their implementation represents one of the few management strategies capable of generating immediate economic returns while producing measurable environmental benefits.

Conclusion

In conclusion, reproductive efficiency has become one of the most important indicators of sustainable cattle production. Scientific evidence generated over the last two decades demonstrates that fertility programs based on FTAI, resynchronization, embryo transfer, IVP, and precision reproductive management substantially improve biological efficiency and reduce greenhouse gas emission intensity in both beef and dairy production systems. Recently, our pioneering research has transformed reproductive management from a fertility tool into a comprehensive sustainability strategy.

As global livestock production seeks to meet future food demands while reducing its environmental footprint, fertility programs should be recognized as one of the most effective climate-smart technologies currently available for modern cattle production.



The economic impact of systematic application of fertility programs in dairy herds, a European perspective

DOCTOR FEDERICO RANDI

Global technical manager for Reproduction and Transition – Ceva Animal Health – France

Adjunct Professor of Large Animal Theriogenology – University of Camerino – Italy

● Why Reproductive Efficiency Matters

Reproductive performance is one of the strongest drivers of profitability in dairy herds. Faster establishment of pregnancy after the voluntary waiting period reduces days open, shortens calving interval, increases pregnancy rate and decreases involuntary culling. These improvements generate more milk, more calves and better herd turnover.

The study evaluated whether systematic reproductive management programs using timed artificial insemination (TAI) and progesterone-based synchronization protocols could outperform the traditional approach based mainly on heat detection and treatment of individual problem cows.

● Study Design

An individual-cow stochastic bio-economic simulation representing a 200-cow European dairy herd was developed. The model incorporated milk production, fertility, pregnancy loss, ovarian disorders, replacement dynamics and all major revenues and costs. Four reproductive strategies were compared: (1) traditional individualized management; (2)

heat detection with TAI for delayed cows; (3) 100% TAI using Double-Ovsynch from 1st AI and resynchronization based on negative pregnancy diagnosis; and (4) TAI for first service combined with heat-detection-based return inseminations and systematic resynchronization of open cows.

● The Four Programs

Program 1 relied primarily on heat detection with veterinary intervention for anestrus, cystic ovarian disease and suboestrus. Program 2 kept heat detection as the primary breeding tool but introduced TAI for cows not detected in estrus and open cows post pregnancy diagnosis. Program 3 used Double-Ovsynch to inseminate all cows at a fixed time for first AI and systematic resynchronization of open

cows, completely avoiding insemination on detected estrus. Program 4 combined the strengths of both approaches: all cows received a scheduled first TAI, cows returning to estrus were inseminated according to heat alerts, and all open cows were systematically resynchronized according to ovarian status.

● Key Reproductive Results

Systematic programs improved breeding performance. Calving interval decreased from approximately 430 days in the reference program to 410 days with Program 2 and 397–390 days with Programs 3 and 4. Time from calving to first

insemination was reduced from 115 days in the traditional approach to about 77 days when Double-Ovsynch was used. Earlier insemination and consistent resynchronization increased overall reproductive efficiency.

● Economic Outcomes

All systematic programs increased profitability despite higher expenditures for hormones, veterinary services and breeding interventions. Program 2 generated an additional net economic return of about €7,500 per year. Program 3 generated approximately €11,300 per year. Program 4

delivered the greatest benefit, producing nearly €29,000 additional revenue while increasing costs by only about €7,600, resulting in a net annual gain of about €21,400 for a 200-cow herd—equivalent to roughly €100 per cow per year.

● Benefits Beyond Pregnancy Rates

Program 4 produced the highest milk output, exceeding 60,000 kg more milk annually than the baseline scenario, and increased calf production from around 140 calves annually

to 164 calves. Improved fertility also reduced infertility-related culling, supporting longer productive lifespans and improved herd sustainability.

● Practical Implications for Veterinarians

The study demonstrates that reproductive programs should not be evaluated solely on treatment costs. Veterinarians should consider their impact on submission rate, pregnancy rate, milk production, calf output and culling risk. The combination of fixed-time AI, progesterone supplementation when indicated and systematic resynchronization provides

a powerful framework to maximize reproductive efficiency. Heat detection remains valuable, particularly when integrated with automated monitoring systems, but its greatest economic value is achieved when used together with structured synchronization programs rather than as the only breeding strategy.

Take-Home Messages

- 1 Reproduction is a major profit driver in dairy farms.
- 2 Systematic reproductive management consistently outperformed individualized treatment approaches.
- 3 The most profitable strategy combined TAI, heat detection and systematic resynchronization.
- 4 Additional reproductive-management costs were largely offset by increased milk and calf revenues.
- 5 Even in herds with good heat detection, structured synchronization programs remained economically advantageous.

Based on Wicaksono *et al.*, J Dairy Sci. 107:11016–11035

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