EFFICACY OF A NOVEL VACCINE AGAINST BIOFILM FORMATION BY STAPHYLOCOCCI, IN PROTECTING EWES AGAINST EXPERIMENTALLY INDUCED STAPHYLOCOCCAL MASTITIS

Vasileiou NGC[1], Mavrogianni VS[1], Ioannidi KS[1], Dimitris C Chatzopoulos[1], Calvo Gonzalez-Valerio T[2], Guix-Vallverdu R[2], Argyros S[2], Fthenakis GC[1]

P01-001-088
2016-0029

[1]Veterinary Faculty, University of Thessaly, Karditsa, Greece
[2]HIPRA, Amer (Girona), Spain

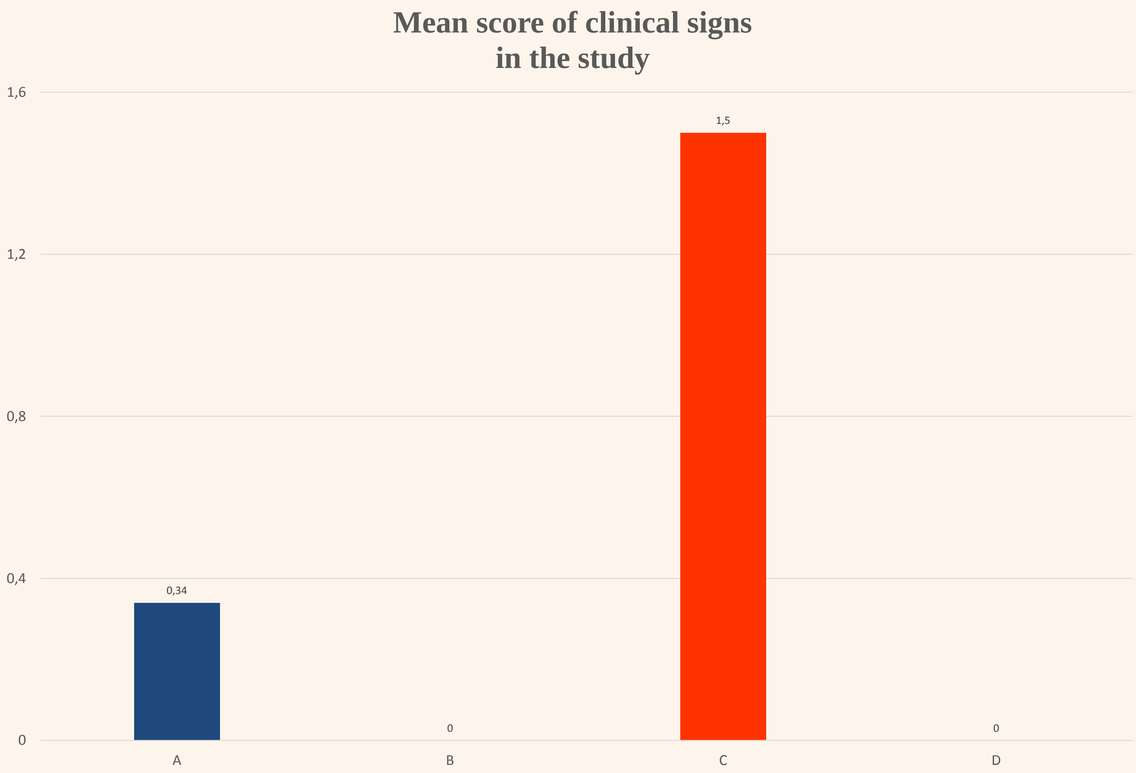
Ovine mastitis is a significant production-limiting disease and the most important welfare problem of sheep, across all production types and all management systems. Control is based in a combination of management techniques, with little evidence available regarding applied immunoprotective measures. Objective of the experiment was to study the efficacy of a novel vaccine for protection of ewes against experimentally induced staphylococcal mastitis and to evaluate potential effects in milk yield of ewes. The vaccine induces antibodies against the poly-*N*-acetyl β-1,6 glucosamine exopolysaccharide, the main component of the extracellular biofilm matrix of staphylococci, and acts in preventing slime production and consequently biofilm formation by these organisms, which are a principal causal agent of ovine mastitis.

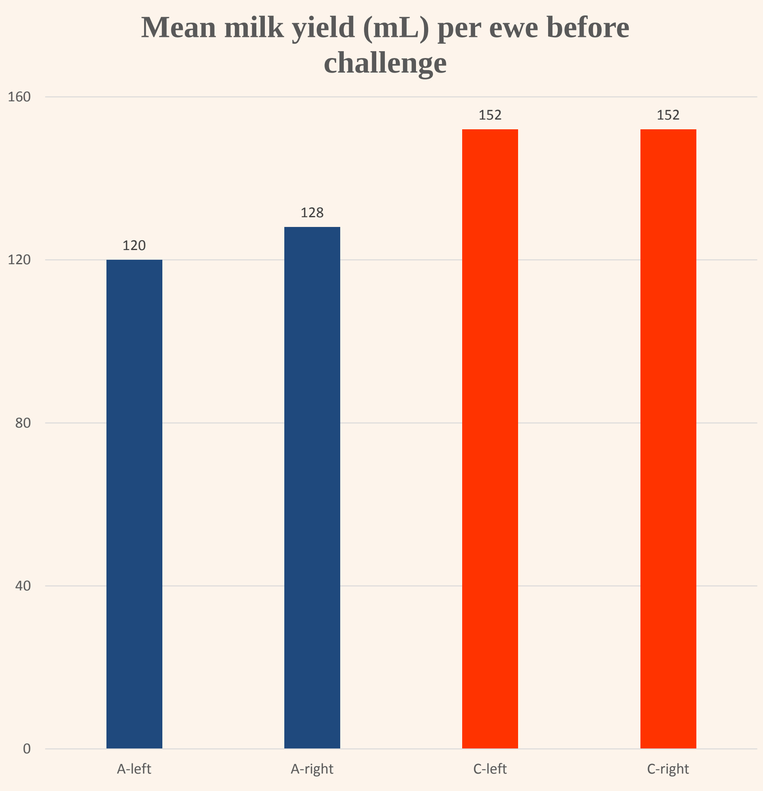
MATERIALS AND METHODS

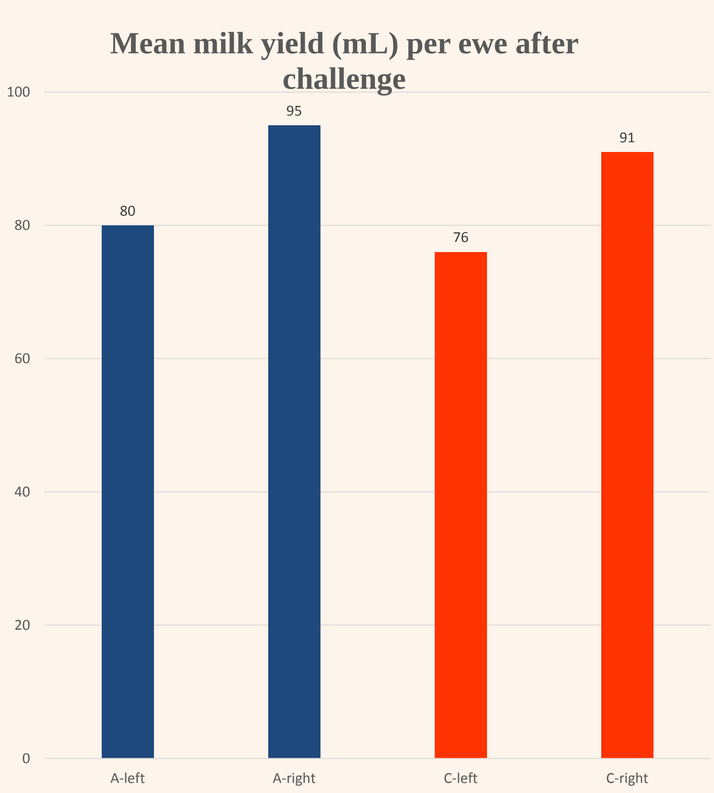
In total, 19 ewes were used in the study. They were allocated into group **A** (n=9; vaccination, intramammary challenge), **B** (n=3; vaccination, no challenge), **C** (n=4; no vaccination, intramammary challenge) or **D** (n=3; no vaccination, no challenge). In ewes into groups A or B, initial vaccination was performed 5 weeks before expected lambing date, followed by a repeat vaccination 3 weeks later; the vaccine that was evaluated, is licenced in the European Union (Vimco®; HIPRA) and contains an inactivated slime-producing, biofilm forming *Staphylococcus aureus* strain. In ewes into groups **A** or **C**, intramammary challenge was carried out with 10^6 cfu of a slime-producing *Staphylococcus chromogenes*, inoculated directly into the left mammary gland cistern. Clinical examination (results expressed on a 0-5 scale taking into account mammary and systemic signs) and milk sample collection for bacteriological and cytological examination by using established techniques were undertaken daily for 10 days after challenge day and then at weekly intervals for two months after the challenge day. Milk quantity measurements were performed the day before and at weekly intervals after the challenge day. These data referred to milk volume collected from a mammary gland of a ewe over a 4-hour period on each measurement day; comparisons of milk quantities collected were performed (i) between the two glands within the same group, (ii) between groups and (iii) between quantities collected before and after challenge day within the same group.

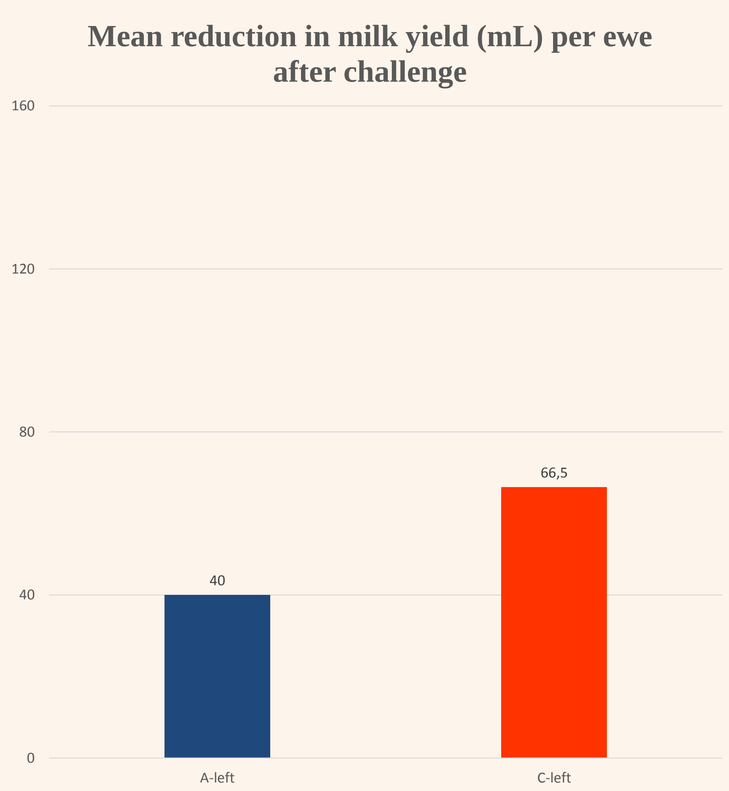
RESULTS

No adverse reactions were recorded in any ewe after any vaccination. After challenge, clinical signs in vaccinated (group A) were numerically milder than in unvaccinated (group C) ewes: mean score of clinical signs was 0.34 *versus* 1.50 (P=0.197), respectively. Further, the experimental mastitis was resolved numerically earlier in vaccinated (group A) than in unvaccinated (group C) ewes; duration of disease was 18.7 days *versus* 31 days (P=0.214), respectively. Before challenge day, average (per ewe) milk quantities collected from the left (LMG) and right (RMG) mammary gland were similar within the same group (P>0.11); there was significant difference among group A and C (120 mL LMG, 128 mL RMG and 152 mL LMG, 152 mL RMG, respectively; P=0.045), but not among other groups (P>0.12). After challenge day, average (per ewe) milk quantities collected from LMG or RMG were similar within groups A, B, D groups (P>0.10), but not within group C (76 mL LMG *versus* 91 mL RMG; P=0.04). Furthermore, the significant differences observed among group A and C before challenge day had not been apparent after that (P=0.49), as decrease on milk quantities collected was greater in group C ewes (average milk quantity per ewe on the challenged mammary gland: 66.5 mL) compared to group A ewes (average milk quantity per ewe on the challenged mammary gland: 40.0 mL) (P=0.035).









CONCLUSIONS

- **This is the first documentation regarding efficacy of Vimco® vaccine against experimentally induced staphylococcal mastitis and potential beneficial effects of vaccination in milk yield of ewes.**
- **The results confirmed the protective effect of the vaccine, as evidenced by the milder clinical signs, the earlier resolve of the disease and the smaller decrease in milk yield compared to results of challenge of unvaccinated ewes.**

ACKNOWLEDGEMENTS The work has been funded by HIPRA.
CONFLICT OF INTEREST The authors declare that the funding body has not had any involvement in the production and presentation of field data related to measures of mastitis development.