Statistical analysis of 7 dairy farms with Automatic Milking Systems (AMS) in France before and after the use of polyvalent mastitis vaccine against *Staphylococcus aureus*, *non-S. aureus Staphylococci*, Escherichia coli and coliforms

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Objectives

AMS provide solid data related to milk quality, thus the efficacy of a polyvalent vaccine against Staphylococcus aureus (Staph. aureus), non S.aureus Staphylococci (NAS), Escherichia coli (E. coli) and coliforms (STARTVAC®) in 7 commercial dairy farms in France has been analyzed.

Material and Methods

AMS farms ensure automated and consistent milking routines especially within the same brand. Seven commercial dairy farms with 565 cows were vaccinated with polyvalent mastitis vaccine (STARTVAC®) for 12 months. Depending on the specific characteristics of each farm and under veterinary supervision, the protocol used was: 3 injections 3 weeks apart in lactating cows and dry cows, followed by a booster every 3 months. Then three periods were compared: period 0 (8 months before vaccination), period 1 (within 12 months of vaccination) and period 2 (6 months after the vaccination) using 4 major Key Performance Indicators (KPIs): bulk tank somatic cell count (bSCC), mastitis rates and treatments, milk production and % of discarded milk. . The calculation (ANOVA test) test was performed with farm as random effect and herd age as factor. Differences for milk production, discarded milk and somatic cell count were significant between the three periods.

Results

In period 0, the average individual cell count for all cows was 178,000 cells/ml and the average daily production per cow was 28.2 kg. In period 1, the average individual cell count was 167,000 cells/ml, with a daily production of 29.3 kg per cow, and in period 2 it was 162,000 cells/ml and 29.9 kg per cow. The decrease in the average individual cell count over the first year continued throughout the next 6 months of the second year of vaccination. This decrease correlates with an increase in average daily individual milk production. The quantity of discarded milk affects the amount of milk delivered. It represents 4.6% of the milk produced in period 0, falling to 4.17% in period 1, then to 4.12 % in period 2. The mastitis rate in period 0 was 139%. In periods 1 and 2, it was 117% and 71%, respectively. There was a significant decrease in treatment rate over the first year of vaccination, which seemed to accelerate during the first 6 months of the second year of vaccination. (Figures 1, 2 and 3)

Figure 1: % reduction of SCC after vaccination

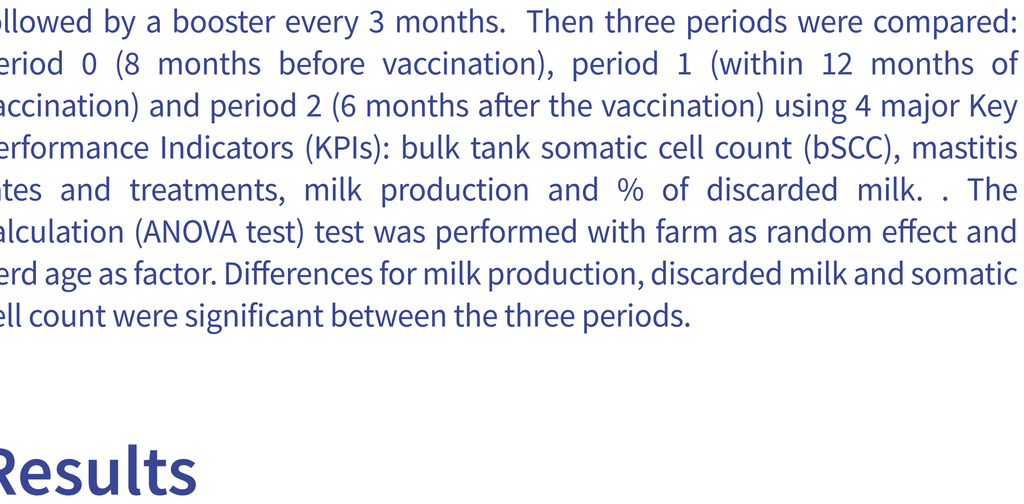


Figure 2: % increase in average daily individual milk production

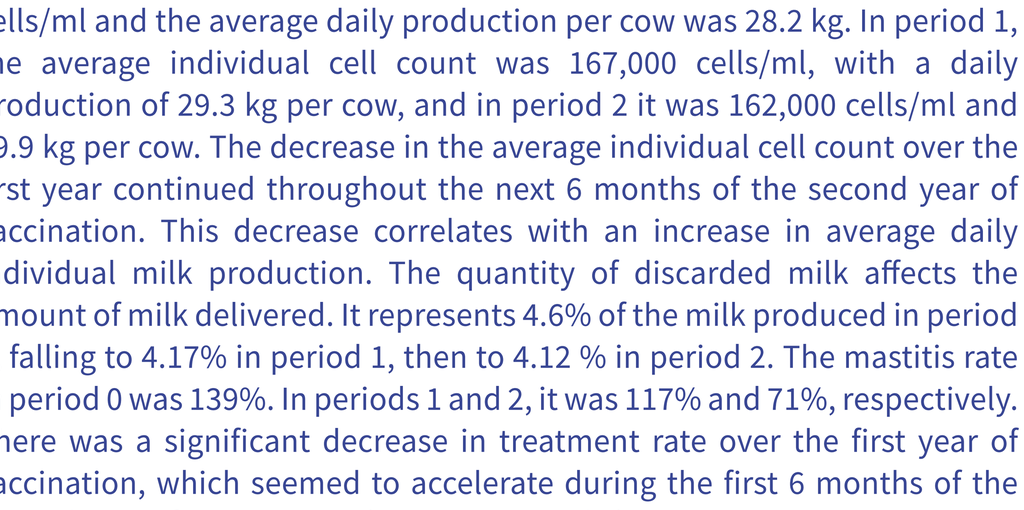


Figure 3: quantity of discarded milk after vaccination

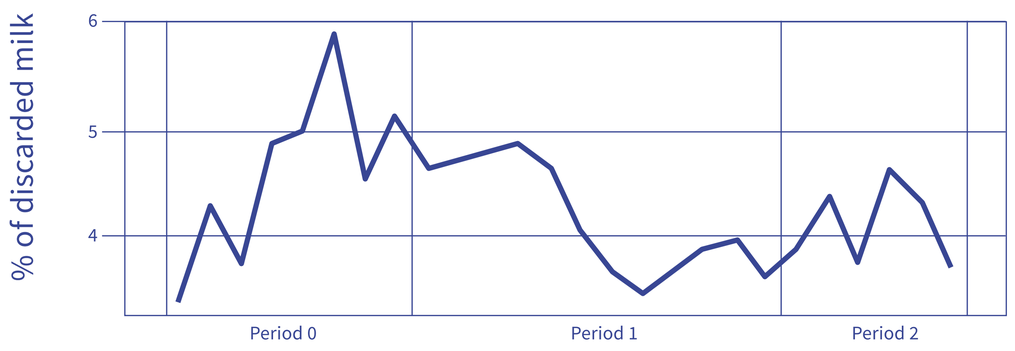


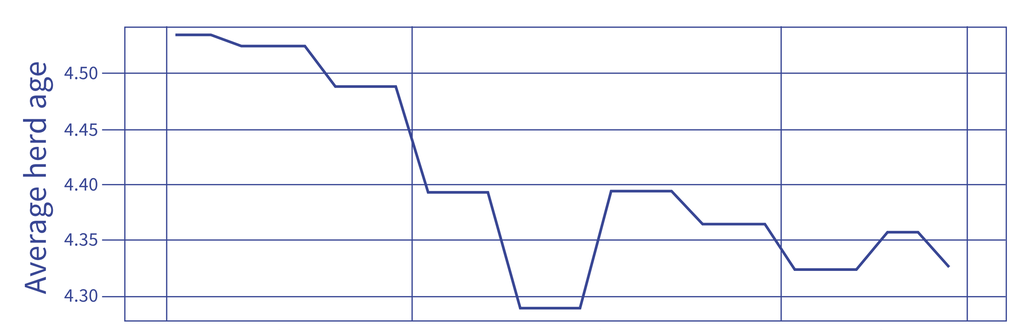
Table 1: statistical significance of the evaluated parameters

Variable	Period 0	Period 1	Period 2	P-value
SCC[1]	178,18 ± 6302 C	167,28 ± 49,24 B	161,91 ± 54,17 A	<0,001***
Mastitis rate[2]	138,85 ± 82,06 B	117,55 ± 80,04 B	70,71 ± 40,77 A	<0,001***
Milk production[1]	28,22 ± 1,97 C	39,32 ± 2,38 B	29,97 ± 2,38 A	<0,001***
% discarded milk[1]	4,60 ± 2,88 B	4,17 ± 2,51 A	4,12 ± 2,06 A	<0,001***

[1]ANOVA test with farm as random effect and herd age as factor
[1]Poisson regression with herd age as factor and farm as random effect

In addition, two other parameters were monitored: the average number of lactations and the average age of the herd, which would potentially increase if the rate of culling due to mastitis decreased. The average number of lactations decreased continually over the first two periods, dropping from 2.440 to 2.429 lactations per cow; for this reason, herd age was considered in the model. It was only from period 2 onwards that the trend began to reverse (2.431). Moreover, the average age of the herd followed the same trend (period 0: 4.56 years; period 1: 4.46 years; period 2: 4.49 years). We can assume that culling due to chronic mastitis continued during the first year of vaccination and then, once the herd is "clean" of chronic animals, we can observe the effect of vaccination helping to preserve healthy cows and therefore the ageing of the herd. (Figure 4)

Figure 4: average herd age decreases over time and it is taken into account in the model.



It decreases over time_> it is taken into account in the model

Conclusion

This study confirms the preventive value of mastitis vaccination as an aid to controlling cell count and reducing mastitis treatment. This study also aims to show farmers that preventive tools such as vaccination contribute positively to the economy of the farm by optimizing the cows' productive capacities, limiting the amount of discarded milk and reducing the rate of culling due to mastitis. Finally, vaccination with polyvalent mastitis vaccine (STARTVAC®) resulted in a high return on investment (ROI) 5.4:1.