SEGES INNOVATION

Association between milking system and Streptococcus agalactiae in dairy herds

Michael Farre[1*], Malene Vesterager Byskov[1], Marie Laurup Petersen[1], Lærke Boye Astrup[1]

[1] Seges Innovation, Aarhus, Denmark
* Corresponding author's email: mifa@seges.dk

Introduction

Streptococcus agalactiae (S. agalactiae) is a contagious mastitis pathogen that continues to pose a significant challenge in dairy herd management. It is primarily transmitted during milking through personnel or contaminated equipment, leading to persistent intramammary infections, elevated bulk milk tank somatic cell counts (BMTSCC), reduced milk quality, and economic losses. Unlike environmental pathogens, S. agalactiae is specifically adapted to the udder environment, allowing subclinical infections to spread silently within herds.

Although automated milking systems (AMS) are designed to improve udder hygiene and reduce the risk of cross-contamination by eliminating manual milking and standardizing teat cleaning procedures, S. agalactiae remains a concern (Skarbye et al., 2021). Thus, other researchers have found that transmission in AMS herds were higher than in conventional milking systems (Deng et al., 2021). The pathogen's ability to persist and spread via milk residues or inadequately sanitized components means that even in automated systems, infections can spread. Differences in robot design, cleaning efficiency, and teat preparation protocols between manufacturers may influence the risk of within-herd transmission.

This study investigates one key aspect of S. agalactiae control in herds using robotic milking systems: potential differences in the prevalence of S. agalactiae-positive herds in relation to the brand of robotic milking system used in the dairy herd with conventional milking systems as gold standard.

Material & methods

Data for this study were collected from October 1, 2024, to October 1, 2025, in Denmark. Only dairy herds shipping milk and enrolled in the Dairy Herd Improvement (DHI) were considered, as information on milking robot manufacturers is only available for these herds. Approximately 91% of all dairy herds in Denmark are part of the DHI.

A herd was classified as infected with S. agalactiae if it held an official positive infection status at the latest national yearly surveillance. This definition implies that some herds may appear as infected despite not currently having S. agalactiae present, for example if the herd has never been officially re-tested to regain a negative status or if infected cows have been removed from the herd. Although infection could also be assessed based on sample results, the official infection status was used for this analysis to allow for rapid assessment.

To be included in the dataset, herds had to meet the following criteria throughout the entire period:
1. No change in S. agalactiae infection status.
2. No change in milking system.

Herds with both conventional milking and milking robots were classified as robot-milking herds if the same robot brand was maintained or not removed during the period.

For each herd, a geometric mean of somatic cell count (SCC) and bacterial count from bulk tank milk samples taken during the study period were calculated. The number of annual cows per herd was also determined.

The number of dry-off treatments with antimicrobials per herd was derived from the national cattle database, because there is an association between prevalence of DCT and S. agalactiae herds. A cow could have up to two dry-off treatments during the study period if one occurred at the beginning and one at the end of the year.

Results & discussion

In total, 1,692 milk-delivering herds met the inclusion criteria. Of these, 610 used one of the four milking robot brands on the Danish marked. The proportion of herds with an official positive S. agalactiae status varied slightly between milking systems (Table 1). The proportion of infected herds was 12.6% in the robot-milking group and 11.6% in the group with conventionally milked systems, indicating no substantial difference in infection prevalence between the two groups.

When comparing robot brands, infection rates ranged from 11.5% to 21.4%. However, the number of herds using Brand 3 and Brand 4 was small (14 and 13 herds, respectively). Therefore, observed differences should be interpreted with caution.

For herds with a positive S. agalactiae status, the average herd size, dry-off treatment rate, somatic cell count (SCC), and bacterial count were assessed. Conventional herds had on average larger herd sizes (425 cows) compared with robot-milking herds (231 cows).

The SCC and bacterial count were slightly higher in herds using Brand 3 and 4 robots, while dry off treatment with antimicrobials frequency varied between brands, being lowest in Brand 3 (0.05 per cow per year) and highest in Brand 4 (0.56 per cow per year) as illustrated in Table 2. Accordingly, the low frequency of dry off treatment with antimicrobials might partly explain the high number of S. agalactiae-positive Brand 3 herds. Contrary to this, the opposite correlation is observed in Brand 4 herds. Thus, the correlation between S. agalactiae-status and milking system should be interpreted with caution as several other variables affect the S. agalactiae status in addition to the milking system. Moreover, due to the limited number of infected herds for some of the brands, these differences are not considered robust.

Overall, the results indicate that 1) the prevalence of S. agalactiae infection is similar between conventional and AMS herds, 2) suggesting that the choice of milking system or robot brand alone is unlikely to be a major risk factor. Nevertheless, the data also highlights substantial variation between individual milking systems, and further studies including a larger number of herds per robot brand are needed to confirm potential differences in infection risk and udder health indicators.

Table 1. S. agalactiae status between AMS and conventional milking.

Brand	Status free	Status positive	Proportion positive
Brand 1.	365	53	12,7 %
Brand 2.	146	19	11,5 %
Brand 3.	11	3	21,4 %
Brand 4.	11	2	15,4 %
Conventional milking	949	125	11,6 %

Table 2. Descriptive statistics between AMS and conventional milking.

Brand	Herd size	DCT	BMSCC	Bacteria count (CFU)
Brand 1.	296 (±156)	0,43 (±0,28)	170208 (±46195)	11343 (±5931)
Brand 2.	334 (±303)	0,32 (±0,23)	181640 (±46811)	10131 (±6313)
Brand 3.	231 (±40)	0,05 (±0,09)	196675 (±50819)	16984 (±9260)
Brand 4.	247 (±107)	0,56 (±0,26)	218208 (±106416)	21206 (±4662)
Conventional milking	425 (±416)	0,41 (±0,40)	176150 (±53678)	9962 (±6209)

Conclusion

The findings indicate that the prevalence of S. agalactiae infection does not differ significantly between herds using automatic milking systems and those with conventional milking systems. This suggests that the choice of milking system or robot brand alone is not a key determinant of infection risk. However, variations in infection rates among individual herds highlight the importance of management practices, hygiene protocols, and regular monitoring in maintaining udder health. Future studies including larger datasets across robot brands are therefore recommended to further clarify potential design or management-related differences influencing bacterial transmission.

References

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For further inquiries
Michael Farre
Chief Consultant, DVM, MBA & PhD
SEGES Innovation
mifa@seges.dk

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