

Duration of bulk milk antibody positivity following *Salmonella* Dublin and Typhimurium outbreaks in dairy herds

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Introduction

Salmonellosis in dairy cattle impacts animal welfare, farm economy and public health. In recent years, a shift between *Salmonella* serotypes was observed in Dutch dairy herds (Fig. 1). Infection dynamics differ between serotypes. Typically, *S. Dublin* and Typhimurium infections have been described as endemic and epidemic, respectively. However, it was unknown whether this applies to Dutch dairy herds as well. Testing bulk milk samples by ELISA, detecting antibodies against serogroups B and D, is an important surveillance component in Dutch dairy herds. Therefore, the aim of this study was to quantify the time that Dutch dairy herds remain bulk milk ELISA positive after an initial salmonella outbreak, depending on serotype.

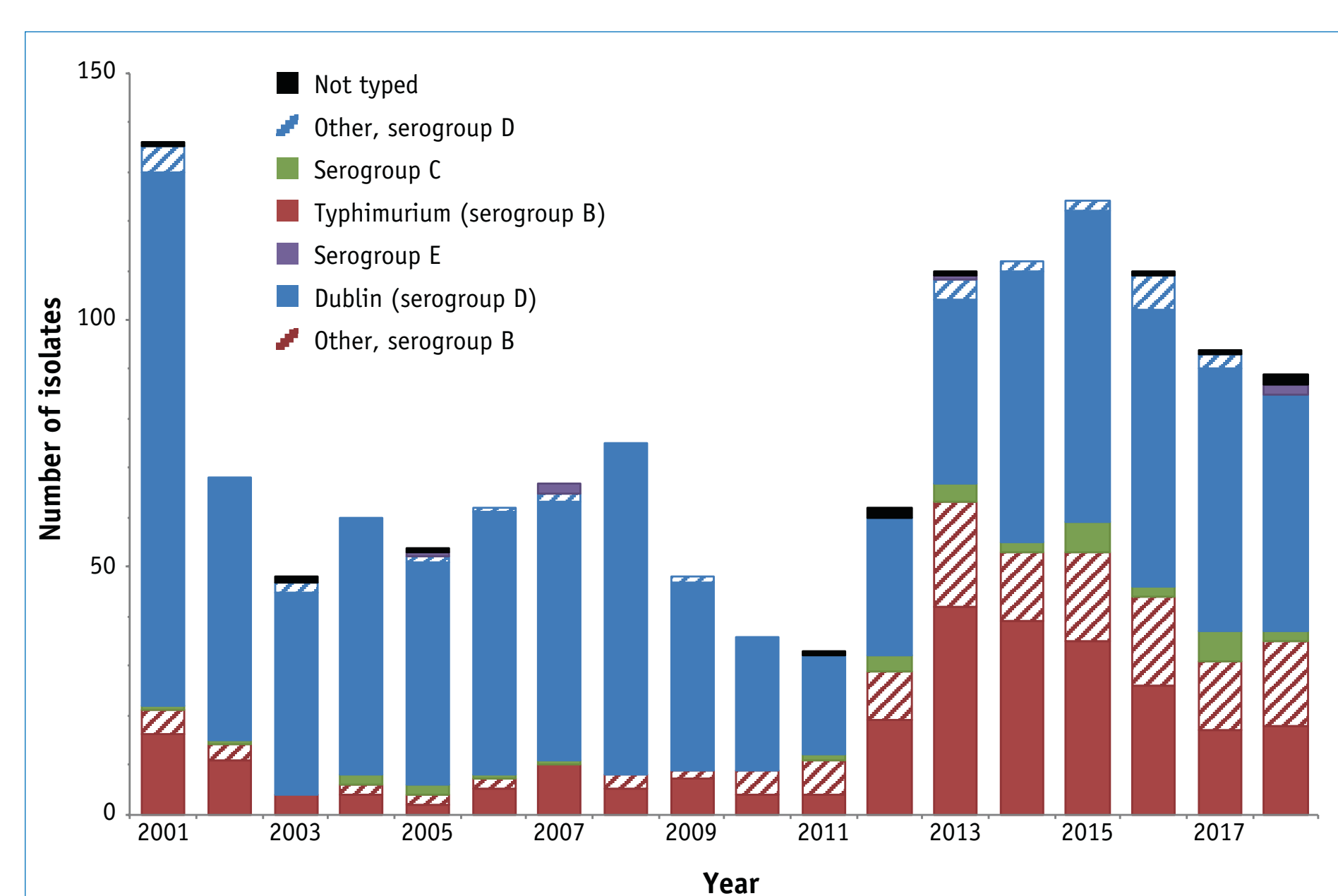


Fig. 1. Serotypes isolated from post-mortem samples from Dutch dairy herds

Materials and Methods

Triannual bulk milk results of Dutch dairy herds, from which *Salmonella enterica* subsp. *enterica* was isolated at our laboratory between 2010 and 2017, were analysed retrospectively. Milk samples were tested by in-house ELISA, detecting antibodies against serogroups B and D. Data analysis was restricted to bulk milk samples collected after the first isolate (index case) from previously test-negative herds that were infected with a single serotype and had a first positive bulk milk ELISA result within 12 months after

the index case. The time between the first positive and subsequent first negative bulk milk ELISA result was analysed with a Cox proportional hazards model, taking into account effects of other putative risk factors for salmonellosis.

Results

Index cases were observed in 520 herds (see Table). In 418 (80%) of these herds, a first positive bulk milk ELISA result was obtained within 365 days after the index case. The proportion of herds with a positive bulk milk result was comparable between *S. Typhimurium* (84%) and *S. Dublin* (78%).

Index case Serogroup	Serotype	Positive bulk milk ELISA ≤ 365 days after index case		Total
		Yes	No	
B	Typhimurium	146 (84%)	27 (16%)	173 (100%)
	Other	94 (85%)	17 (15%)	111 (100%)
C	Undetermined	3 (23%)	10 (77%)	13 (100%)
D	Dublin	167 (78%)	46 (22%)	213 (100%)
	Other	8 (89%)	1 (11%)	9 (100%)
Total		418 (80%)	102 (20%)	520 (100%)

In the Cox proportional hazards model, only serotype had a significant effect. In comparison to herds with a Typhimurium outbreak (N=146), herds with outbreaks caused by other serotypes from serogroup B (N=94), Dublin (N=167) or other serotypes (N=11) had hazard ratios of becoming bulk milk ELISA negative of 1.30 (95%CI: 1.00; 1.70), 1.60 (1.28; 2.02) and 1.81 (0.97; 3.35), respectively (Fig. 2).

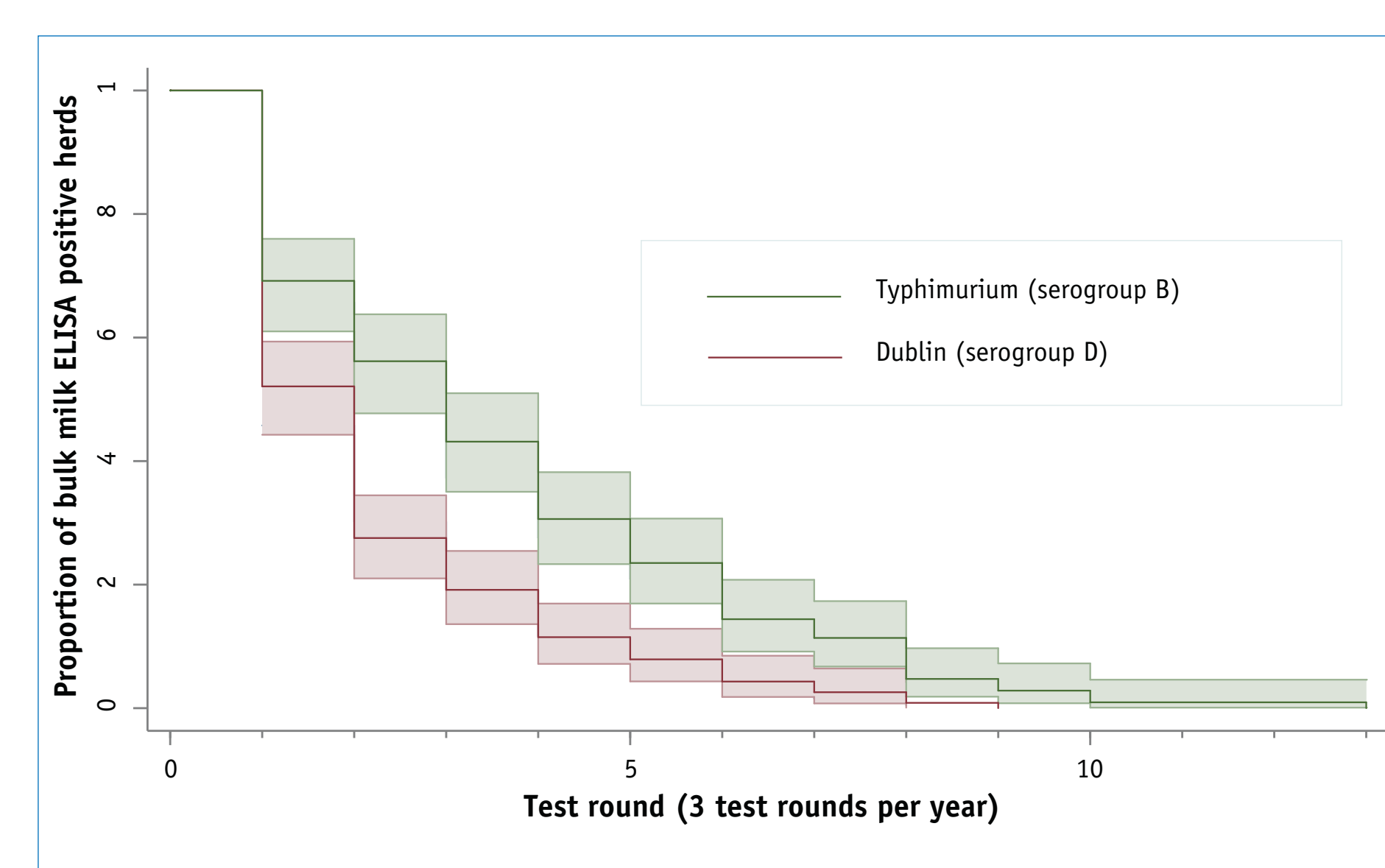
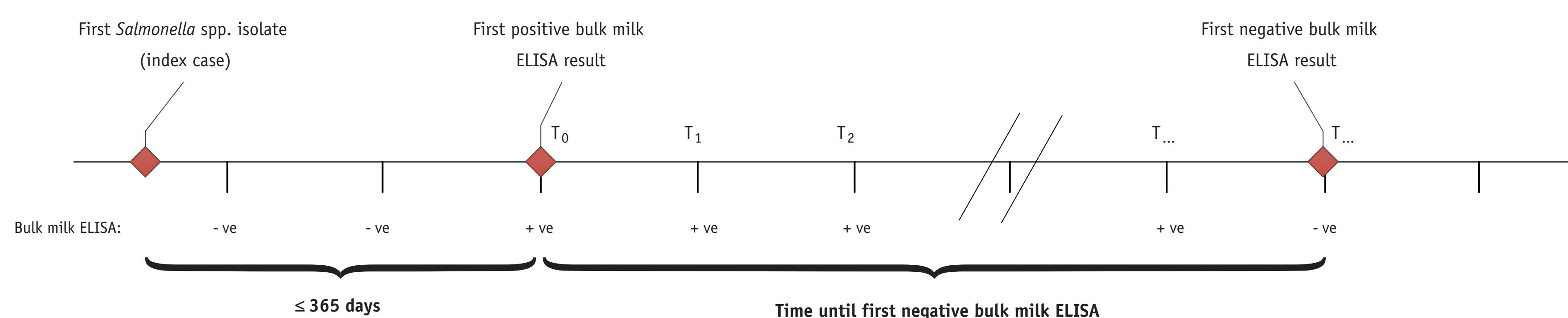


Fig. 2. Survival plot showing the proportion of herds that remain bulk milk ELISA positive over time, depending on serotype

Conclusion

Herds with a *S. Typhimurium* outbreak remained bulk milk ELISA positive substantially longer than herds with a *S. Dublin* outbreak. Possibly, differences between serotypes in persistence in the environment (including other species), rate of transmission, rate of re-introduction of the infection, control measures taken by farmers or diagnostic test characteristics of the ELISA play a role. The results might raise the question whether on farm control measures need to be differentiated between *Salmonella* serotypes.



Acknowledgements

This study was funded by ZuivelNL / DairyNL



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