How risky are bovine tuberculosis interferon-gamma positive cattle left on farms?

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Background and objectives of the study

Bovine tuberculosis (bTB), caused by *Mycobacterium bovis*, is a serious infectious disease that remains an ongoing concern for cattle farming. Tuberculin skin-tests are often used to identify infected animals (reactors) during test-and-cull programs, however, due to relatively poor sensitivity, additional tests can be implemented in parallel e.g. the interferon-gamma test (IFN-g). In Northern Ireland, IFN-g testing is used in high-risk herds but skin-test negative animals-positive to the IFN-g test are not required by law to be sacrificed.

In this study we investigated whether these animals represented a greater risk of becoming a skin reactor, relative to IFN-g test negative animals from the same herds.

Figure 1 Kaplan Meier survival estimates of time to subsequent positive skin-test, by Exposure (Gamma negative, Gamma positive).

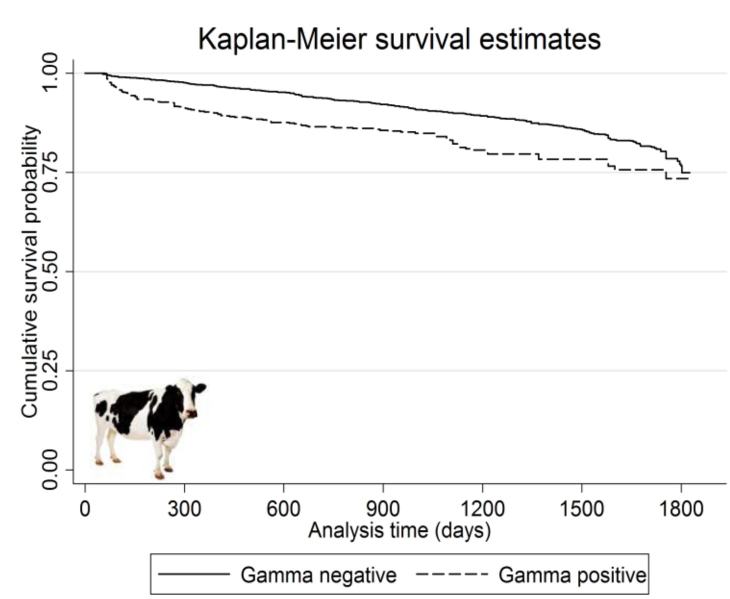

Table 1 Final Cox-proportional hazards model of time to a subsequent positive skin-test

Covariates	Hazard ratio	P-Value	95% Confidence Interval	
			Lower	Upper
Exposure *(referent: Gamma negative)*				
Gamma positive	2.31	<0.001	1.92	2.79
Herd type *(referent: Dairy)*				
Beef	0.78	0.023	0.63	0.97
DVO region *(referent: Southeast)*				
North	0.45	0.009	0.25	0.82
Southwest	0.56	0.030	0.33	0.95
Variance component				
Theta	2.66	<0.001		

Material and Methods

Our study population comprised 239 herds with at least one IFN-g positive animal retained between 2004-2010.

A survival model was built to compare the risk of a bTB outcome at skin-test (i.e. of failing the single comparative intradermal tuberculin (SCIT) skin-test) between animals that had a positive IFN-g test relative to those that had a negative IFN-g test, while controlling for other risk factors. The outcome of interest was time to subsequent positive skin-test. A Cox proportional-hazard shared frailty model with a random effect for herd (clustering at the herd level) was used. Independent variables of interest were Herd size (mean herd size), Herd type (dairy and beef), Sex (male and female) and Location grouped into 3 categories: North (Derry, Larne, Ballymena and Coleraine), Southwest (Omagh, Enniskillen and Dungannon) and Southeast (Newtownards, Newry and Armagh).

A univariable and multivariable analysis were performed. Models were compared using the AIC amongst competing models, the model with the smallest AIC was considered the preferred model. The proportional hazards assumption was tested using a plot of –log(-log) survival lines; Kaplan-Meier curves were also used to test proportionality of predictors. Cox-Snell residuals and deviance residuals were computed to assess overall model goodness-of-fit.

Results

Animals which tested IFN-g positive were 2.31 (5 year follow-up) (95% CI: 1.92-2.79; P<0.001) more likely to become a reactor compared with IFN-g negative animals. (Figure 1). Animals from dairy herds, and from herds in the south-east, were of higher risk than animals from beef herds and other regions, respectively (Table 1).

Conclusions

Our findings suggest that IFN-g positive animals represent a higher risk of failing a skin-test in the future, indicating the value of IFN-g interferon testing for identifying early-stage infected animals. These IFN-g positive animals are not under any disease restriction, and may move freely (trade), which may put recipient herds at increased risk. Our findings provide important evidence for stakeholders engaged in bTB eradication programs.

Read more here: Lahuerta-Marin et al. 2015. *Veterinary research*, *46*(1), pp.1-7.

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