Herd-level factors associated with the presence of BVD virus

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Introduction

The Irish national BVD eradication programme, based on tissue tag testing, began on 1st January 2012 with a voluntary phase, becoming compulsory twelve months later (Graham et al. 2014). A wide-ranging review of the first six months of the programme was conducted

The current study was undertaken as part of this review to identify herd-level risk factors associated with the presence of at least one BVD virus-positive (or inconclusive) animal among 2012-born calves in herds participating in the voluntary phase of the programme.

Materials and methods

Study herds. All Irish herds with at least one calf tested between 1st January and 15th July 2012 (the study period) were identified (n = 8,684). From these, all herds with a registered birth for at least 80% of the cows and BVD virus test results for at least 80% of these calves (the study herds) were then selected (n = 3,894).

Outcome of interest was whether a herd had ≥1 BVDV-positive (or inconclusive) calves on initial testing.

Analysis. A logistic regression model was developed to model the probability of a herd having at least one BVD positive calf. Univariate and multivariable analyses were conducted according to standard methods (Graham et al. 2013) including the following herd level variables:

- Location (province)
- Herd type (dairy, beef or dual purpose)
- Number of cows in the herd
- % of cows that were homebred
- Number of calves registered in 2012
- Number of calves tested in 2012
- % registered calves dead within 28 days
- Presence of sheep on the farm
- Number of separate land parcels within the farm
- Number of cattle introduced in 2011, 2009-11 and 2007-11 (and whether any came via marts)
- Number of calves whose dams had been introduced within previous 9 months

Discussion

Several key factors associated with one or more positive calves were identified, including purchase of cattle and the purchase of pregnant stock. Both of these are within the control of the herdowner.

These findings highlight purchase policy as a key element of biosecurity in the wider context of the eradication programme.

- The BVD Order (2012) prevents movement of calves/suspect animals without a negative result.
- Herdowners are advised to isolate and test all purchased stock of unknown status. The proportion of traded animals with a known status will increase to ~80% within 30 months
- Introduction of pregnant animals also identified as a risk and currently addressed through education.

Increased levels of calf mortality associated with BVD virus described previously and contributes to overall cost of disease. (Presi et al. 2011, Stott et al. 2011).

Results

Study herds. 667 herds (17.1%) had one or more positive calves based on testing of the initial sample, ranging from 1 (n=440) to 21 positive per herd (median = 1). 1,227 calves were positive, while a further 54 (4.2%) had an inconclusive result.

Multivariable analysis. The final multivariable model contained location (province), log of the number of cows, number of cattle introduced in 2009 to 2011, number of dams introduced whilst pregnant and number of calves that died within 28 days (Table 2). Herds in Munster had a significantly lower risk of one or more test-positive calves compared to those in Connaught, after accounting for the other risk factors in the model. The risk of finding a test-positive calf increased with increasing herd size, with the odds of such a result increasing by 3.1 for each increase in herd size of 10 cows. The risk also increased with the number of animals introduced, this being highest amongst herds introducing between 11 and 29 cattle. There was also an increase in risk with the number of pregnant dams introduced, this being greatest with 2-3 of these animals. Herds where 8% or more calves died by 28 days of age were more than twice as likely to have had ≥1 positive calves compared to herds with no registered calf mortalities (OR 2.10, 95% C.I. 1.58-2.81).

Risk factor	category	b	S.E.	P[1]	P[2]	OR	Lw<95% CI<Up	
Intercept		-3.97	0.28	<0.001				
Province	Conn.	0.00	.	.	0.018			
	Leinster	-0.19	0.16	0.253		0.83	0.60	1.15
	Munster	-0.36	0.15	0.017		0.70	0.52	0.94
	Ulster	0.08	0.21	0.707		1.08	0.72	1.62
Log no. cows		0.49	0.07	<0.001	<0.001	1.63	1.42	1.88
Cattle intro. 2009 to 11	0 - 1	0.00	.	.	0.009			
	2 - 3	0.01	0.15	0.958		1.01	0.74	1.36
	4 - 10	0.35	0.14	0.011		1.42	1.08	1.85
	11 - 29	0.40	0.14	0.004		1.49	1.14	1.95
	>=30	0.30	0.14	0.037		1.35	1.02	1.79
Dam of calf introduced in previous 9 months	0	0.00	.	.	0.015			
	1	0.14	0.19	0.462		1.15	0.78	1.65
	2-3	0.45	0.19	0.016		1.57	1.08	2.25
	>3	0.37	0.14	0.011		1.44	1.08	1.91
% calves dead within 28 days	0	0.00	.	.	<0.001			
	0.1 - 3.0	0.28	0.17	0.096		1.33	0.95	1.85
	3.1 - 5.2	0.40	0.16	0.011		1.49	1.10	2.02
	5.3 - 7.9	0.49	0.16	0.002		1.64	1.21	2.23
	>=8.0	0.74	0.15	<0.001		2.10	1.58	2.81

Table 1: Parameter estimates from the logistic regression model

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