

# ASSOCIATIONS OF HERD AND ANIMAL LEVEL RESPIRATORY VIRAL AND MYCOPLASMA BOVIS INFECTION ANTIBODIES WITH HEIFERS' HEALTH STATUS MEASURED BY ACUTE PHASE PROTEINS SERUM AMYLOID A AND HAPTOGLOBIN



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## OBJECTIVES

The aim of this study was to investigate the effect of bovine herpes virus 1 (BHV-1), bovine parainfluenza 3 (PI-3), bovine respiratory syncytial virus (BRSV), bovine viral diarrhoea virus (BVDV) and *Mycoplasma bovis* (*M. bovis*), and other non-infectious herd level factors on heifers' acute phase proteins serum amyloid A (SAA) and haptoglobin (Hp) serum concentrations.

## MATERIALS AND METHODS

Serum samples from randomly selected heifers (aged 6-24 months) were collected from 94 Estonian dairy farms. All serum samples were tested for BHV-1 antibodies with BHV-1 gB ELISA kit, HerdChek\* (IDEXX). For establishing herd BVDV status, 10 serum samples from randomly selected heifers were tested with PrioCheck BVDV Ab test kit (Prionics AG). The herd BRSV and PI-3 status was established by testing up to 20 randomly selected serum samples from heifers for BRSV and 10 samples for PI-3 antibodies with Svanovir\* BRSV-Ab (Svanova) and Svanovir\* PIV3-Ab (Svanova) kits. Up to 25 heifers per herd were tested for *M. bovis* antibodies with BIO K 260 ELISA test (Bio-X Diagnostics). SAA and Hp were measured from randomly selected serum samples (mean 9.8, range 5-10) from each farm with ELISA kit (Phase SAA kit, Tridelta Development) and haemoglobin-binding assay, respectively. For statistical analysis linear random-intercept models were used where logarithmically transformed SAA and inverse square root transformation of Hp were the respective outcome variables.

## RESULTS

Herds with BHV-1 antibody prevalence 1-50% had significantly higher SAA concentrations than BHV-1 negative herds. Lower SAA was observed in heifers with PI-3 antibodies. Higher SAA concentrations were seen in farms where heifers were kept in free stall or mixed with tie stall compared with farms where heifers were always kept in tie stall (Table 1.). Significantly lower Hp concentrations were associated with herd level positive BRSV status and with animal level *M. bovis* and BHV-1 positive status. Similarly to SAA higher Hp concentrations were seen in farms where heifers were in free stall compared with farms where they were always kept in tie stall (Table 2.).

**Table 1. Linear random-intercept model for factors associated with serum amyloid A (SAA) concentrations of heifers (herds n=94).**

Variable (n=number of herds / number of heifers)	Coef.*	95% CI	P value	Wald test P value
<b>BHV-1 antibodies in herd level:</b>				
No positive animals in herd (n=56)	0			0.041
1-50 % positive animals (n=27)	0.349	0.062;0.636	0.017	
>50% positive animals (n=11)	-0.008	-0.453;0.436	0.970	
<b><i>M. bovis</i> antibodies in animal level:</b>				
Negative (n=500)	0			0.055
Positive (n=421)	-0.148	-0.299;0.003	0.055	
<b>PI-3 antibodies in animal level:</b>				
Negative (n=227)	0			0.008
Positive (n=694)	-0.301	-0.523;-0.080	0.008	
<b>Haemolysis of sample:</b>				
No haemolysis (n=661)	0			0.000
Slight haemolysis (n=181)	-0.156	-0.350;0.038	0.116	
Medium haemolysis (n=79)	-0.575	-0.849;-0.301	0.000	
<b>Housing system for heifers:</b>				
Tie stall (n=24)	0			0.1
Free stall (n=24)	0.335	-0.015;0.686	0.061	
Mixed tie stall and free stall (n=46)	0.303	-0.003;0.609	0.052	
Number of heifers in herd (n / 100)	0.043	-0.016;0.101	0.154	
Age of heifers (years)	0.094	-0.048;0.237	0.194	
Intercept	1,143	0,798;1,489	0.000	

\* Estimates are in logarithmic scale

**Table 2. Linear random-intercept model for factors associated with haptoglobin (Hp) concentrations of heifers (herds n=94).**

Variable (n=number of herds / number of heifers)	Coef.*	95% CI	P value	Wald test P value
<b><i>M. bovis</i> antibodies in animal level:</b>				
Negative (n=500)	0			0.000
Positive (n=421)	0.008	0.005;0.010	0.000	
<b>BHV-1 antibodies in animal level:</b>				
Negative (n=795)	0			0.004
Positive (n=126)	0.007	0.002;0.013	0.004	
<b>BRSV antibodies in herd level:</b>				
Negative herds (n=43)	0			0.009
Positive herds (n=51)	0.006	0.002;0.011	0.009	
<b>Haemolysis of serum sample:</b>				
No haemolysis (n=661)				0.000
Slight haemolysis (n=181)	-0.018	-0.021;-0.014	0.000	
Medium haemolysis (n=79)	-0.039	-0.044;-0.034	0.000	
<b>Housing system for heifers:</b>				
Tie stall (n=24)	0			0.068
Free stall (n=24)	-0.007	-0.013;-0.001	0.030	
Mixed tie stall and free stall (n=46)	-0.002	-0.007;0.004	0.552	
Number of heifers in herd (n / 100)	-0.002	-0.003;-0.001	0.002	
Age of heifers (years)	-0.003	-0.005;-0.001	0.013	
Intercept	0.111	0.104;0.117	0.000	

\* Estimates are in inverse square root scale (negative estimate means higher concentration of Hp)

## CONCLUSION

Results of present study indicate that early respiratory infections may have some beneficial effect to the health status of heifers later.

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