Supplementary Information in

"Associations of the first occurrence of pathogen-specific clinical mastitis with milk yield and milk composition in dairy cows"

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Descriptive findings for repeated CM cases

Repeated CM cases of any pathogen occurred in 599 lactations out of 5996 in this study. Clinical mastitis was diagnosed twice in 390 lactations and diagnosed three or more times in 209 lactations out of 599. On average, the second cases of CM occurred 85 d after the first case of CM, and the third cases of CM occurred 72 d after the second case of CM.

Lactational incidence risks of the other diseases

Table S1 shows the lactational incidence risks of the other diseases controlled for in the models estimating milk loss and compositional change in milk. For parity 1 cows, DA was the most common, followed by ketosis and puerperal fever. For parity ≥ 2 cows, milk fever was the most common, followed by DA. For all diseases, the incidence was higher among older cows than those in parity 1. For parity 1 cows, displaced abomasum (DA) was the most common, followed by puerperal fever and ketosis. For parity ≥ 2 cows, milk fever was the most common, followed by DA. For all diseases, the incidence was higher among older cows than those in parity 1.

Estimated milk losses and compositional changes

Tables S2 and S3 show detailed associations of the first occurrence of pathogen-specific clinical mastitis with milk yield and milk composition of 1763 parity 1 cows and 2422 parity ≥ 2 cows (with 4233 lactations) in 31 Hokkaido dairy herds in Japan. The estimated values in

35 these tables are presented in the figures in the main text. Tables S4 and S5 show associations

36 of non-CM diseases (DA, milk fever, puerperal fever, ketosis) on milk yield and milk

37 composition of the cows.

38

39 Detailed descriptions of the milk losses and compositional changes were presented

40 below in addition to the description in the Results of the main text.

41

42 *Milk losses*

43 In younger cows, fungi only temporarily decreased milk yield for 2 wk. Significant

44 and long-term, but relatively small, milk losses were also caused by coliforms in both parity

45 groups (1 and ≥2). *Streptococcus* spp. significantly decreased milk yield in both parity groups,

46 but the infected cows seemed to recover within 1 mo (their milk yield 1 mo after the diagnosis

47 was similar to that of non-mastitic cows). Interestingly, older cows infected by CNS

48 recovered their potential milk production >1 mo after diagnosis.

49

50 *High SCC*

51 Fungi greatly increased SCC from 2 wk before the diagnosis and until the end of

52 lactation, in both parity groups. The SCC level of a cow infected by *S. aureus* or fungi was

53 higher in younger cows than in older cows. Persistent SCC increments were also observed for

54 the infection by *Streptococcus* spp. and coliforms; SCC level of older cows that would

55 become infected by *Streptococcus* spp. or coliforms was significantly higher just after calving.

56 In older cows, a high peak SCC level, over 100,000, was estimated for *S. aureus*, coliforms

57 and fungi infections. CNS infections caused a SCC increment for 1 to 1 and a half mo around

58 the diagnosis.

59

60 *Low lactose*

61 The largest declines were estimated for coliforms and fungi infections in both parity

62 groups. CNS infection in primipara and *S. aureus* infection in multipara caused long-term

63 lactose declines that started around diagnosis, although *S. aureus* infection in primipara did

64 not show any significant changes in lactose content. CNS infection in multipara and

65 *Streptococcus* spp. infection in both parity groups decreased lactose content for 2 wk to 1 mo.

66 A new finding in this study regarding lactose change is lactose decrements due to fungi

67 infection.

68

69 *Change in fat content*

70   Coliforms infection in primipara and *S. aureus* infection in multipara significantly

71 increased fat content; in particular, coliforms infection caused long-term fat increment until

72 the end of the lactation. Fat content of the multiparous cows that were infected with

73 *Streptococcus* spp. or CNS was significantly lower than that of non-CM cows, except for 1

74 mo around the diagnosis (this may imply fat increments due to the infections). Fat content of

75 primiparous cows that would be infected with *Streptococcus* spp. was low until 1 mo before

76 the diagnosis. No significant changes in fat content were estimated for fungi infections in

77 either parity group, *S. aureus* infection in primipara or coliforms infection in multipara.

78

79 *Change in protein content*

80   Coliforms infection in both parity groups, fungi infection in multipara, and

81 *Streptococcus* spp. and *S. aureus* infections in primipara increased protein content;

82 particularly, coliforms infection in multipara and *Streptococcus* spp. infection in primipara

83 caused long-term protein increments until the end of the lactation. Cows that would be

84 infected with CNS in both parity groups, *Streptococcus* spp. and fungi in multipara showed

85 significantly low protein content before the diagnosis. No significant changes in protein

86 content were estimated for fungi infections in younger cows or *S. aureus* infection in older

87 cows.

88

89 *Low MUN*

90   *Streptococcus* spp. infection in both parity groups and coliforms infection in multipara

91 caused long-term MUN decrements until the end of the lactation. Younger cows that would

92 bel infected with coliforms showed low MUN before the diagnosis. *S. aureus* infection in

93 older cows was associated with short-term MUN decrements for 1 mo around the diagnosis.

94 CNS and fungi infections did not show any significant associations with MUN content.

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96

97 **Table S1**

98 Lactational incidence risks (%) of diseases, other than mastitis, controlled for in the mixed

99 models for milk loss and composition by parity group in 31 Hokkaido dairy herds in Japan.

		Disease		
Parity[†]	Displaced abomasum	Milk fever	Puerperal fever	Ketosis
1	4.0	- ‡	2.8	2.9
≥2	5.8	8.3	3.0	3.1

100 [†] Parity1 (n=1,763), Parity >2 (n=4,233).

101 [‡] In this study, only three cases (0.2%) were detected.

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104 **Table S2**

105 Effects of the first occurrence of pathogen-specific clinical mastitis on milk yield and milk composition of 1763 parity 1 cows in 31 Hokkaido dairy

106 herds in Japan. Estimates were obtained from mixed models with an autoregressive (Order 1) covariance structure[†]. CI = confidence interval.

Effect	Streptococcus spp.		S. aureus		CNS		Coliforms		Fungi	
	Est.	95% CI	Est.	95% CI	Est.	95% CI	Est.	95% CI	Est.	95% CI
--- Milk yield (kg/d) ---										
≥ 29 d BD[‡]	1.28*	0.17 2.40	-0.20	-2.70 2.31	1.61	-0.31 3.53	1.12	-0.10 2.34	1.24	-0.87 3.36
15-28 d BD	1.00	-0.34 2.33	2.14	-0.85 5.14	0.12	-2.21 2.44	-0.43	-1.94 1.08	3.37*	0.09 6.65
1-14 d BD	-0.20	-1.59 1.19	-0.69	-3.95 2.58	1.71	-0.68 4.10	0.02	-1.43 1.47	-0.74	-3.65 2.16
0-13 d AD[§]	-1.43*	-2.60 -0.27	-2.26	-4.82 0.30	0.42	-1.71 2.55	-4.47*	-5.83 -3.12	-5.68*	-8.71 -2.66
14-27 d AD	-1.83*	-2.99 -0.67	-0.45	-2.91 2.01	1.55	-0.77 3.87	-0.67	-2.06 0.73	0.69	-2.41 3.78
≥ 28 d AD	-0.49	-1.47 0.50	-0.88	-2.84 1.07	-1.35	-2.98 0.28	-1.28*	-2.37 -0.20	-1.78	-4.65 1.09
--- log10 SCC (cells/mL) ---										
≥ 29 d	-0.02	-0.23	0.69*	0.22	0.02	-0.33	0.11	-0.12	-0.07	-0.45

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BD		0.19		1.17		0.38		0.34		0.31
15-28	-0.04	-0.31	1.39*	0.76	0.38	-0.11	0.12	-0.20	-0.14	-0.83
d BD		0.24		2.03		0.86		0.44		0.56
1-14 d	1.04*	0.75	2.50*	1.80	0.53*	0.02	0.59*	0.28	1.31*	0.70
BD		1.33		3.20		1.03		0.89		1.91
0-13 d	1.07*	0.83	1.88*	1.35	0.98*	0.54	1.51*	1.22	2.39*	1.75
AD		1.31		2.42		1.42		1.79		3.02
14-27	0.77*	0.53	1.71*	1.20	0.15	-0.33	0.98*	0.69	1.82*	1.17
d AD		1.01		2.21		0.64		1.27		2.47
≥ 28 d	0.23*	0.05	1.01*	0.66	0.21	-0.09	0.24*	0.04	0.67*	0.13
AD		0.41		1.36		0.50		0.44		1.22

--- Lactose content (%) ---

≥ 29 d	0.02	-0.01	0.00	-0.07	-0.01	-0.06	0.00	-0.03	-0.03	-0.09
BD		0.06		0.07		0.05		0.04		0.03
15-28	-0.01	-0.05	-0.02	-0.11	-0.12*	-0.19	-0.02	-0.07	0.00	-0.10
d BD		0.03		0.07		-0.05		0.02		0.10
1-14 d	-0.01	-0.05	-0.03	-0.13	-0.01	-0.08	-0.02	-0.07	-0.05	-0.13
BD		0.04		0.06		0.07		0.02		0.04
0-13 d	-0.05*	-0.08	-0.04	-0.12	-0.05	-0.11	-0.14*	-0.18	-0.20*	-0.29
AD		-0.01		0.04		0.01		-0.10		-0.11
14-27	0.00	-0.03	0.02	-0.06	-0.01	-0.08	0.00	-0.04	-0.06	-0.15
d AD		0.04		0.09		0.06		0.04		0.03
≥ 28 d	0.00	-0.03	0.01	-0.04	-0.06*	-0.11	-0.01	-0.04	0.00	-0.08

					Fat content (%)					
AD		0.03		0.07		-0.01		0.02		0.09
≥ 29 d	-0.13*	-0.24	-0.03	-0.29	0.03	-0.17	-0.05	-0.17	-0.15	-0.36
BD		-0.01		0.24		0.22		0.08		0.05
15-28	-0.13	-0.29	-0.07	-0.45	-0.14	-0.43	-0.02	-0.21	-0.05	-0.46
d BD		0.03		0.30		0.14		0.17		0.36
1-14 d	0.00	-0.18	-0.06	-0.47	-0.17	-0.47	-0.03	-0.21	-0.02	-0.37
BD		0.17		0.36		0.12		0.16		0.33
0-13 d	0.01	-0.13	0.14	-0.17	-0.17	-0.43	0.41*	0.24	-0.16	-0.53
AD		0.15		0.45		0.09		0.57		0.22
14-27	-0.02	-0.16	0.02	-0.28	-0.15	-0.44	0.21*	0.04	-0.23	-0.61
d AD		0.11		0.31		0.13		0.38		0.15
≥ 28 d	-0.04	-0.14	-0.02	-0.21	-0.04	-0.20	0.15*	0.04	-0.07	-0.38
AD		0.06		0.17		0.12		0.26		0.24
					Protein content (%)					
≥ 29 d	-0.02	-0.08	0.01	-0.11	-0.12*	-0.21	0.03	-0.03	-0.07	-0.18
BD		0.03		0.12		-0.03		0.08		0.03
15-28	0.00	-0.06	0.06	-0.07	-0.11*	-0.22	0.01	-0.06	-0.08	-0.23
d BD		0.07		0.20		0.00		0.08		0.07
1-14 d	0.03	-0.03	-0.01	-0.16	-0.08	-0.19	0.01	-0.06	-0.02	-0.15
BD		0.09		0.14		0.03		0.08		0.12
0-13 d	0.09*	0.04	0.21*	0.09	-0.11*	-0.21	0.14*	0.08	0.00	-0.14
AD		0.15		0.33		-0.02		0.20		0.14

14-27 d AD	0.03	-0.02	-0.04	-0.15	-0.03	-0.14	0.05	-0.01	0.05	-0.10
		0.09		0.08		0.08		0.12		0.19
≥ 28 d AD	0.05*	0.00	0.03	-0.06	0.02	-0.06	0.02	-0.03	-0.10	-0.23
		0.09		0.12		0.10		0.08		0.04
					---- MUN content (mg/dL) ----					
≥ 29 d BD	-0.02	-0.49	-0.65	-1.75	0.07	-0.70	-0.67*	-1.18	-0.58	-1.39
		0.44		0.46		0.84		-0.17		0.22
15-28 d BD	-0.03	-0.85	-1.32	-3.21	0.42	-0.99	-0.96*	-1.90	1.61	-0.46
		0.78		0.57		1.84		-0.03		3.68
1-14 d BD	-1.58*	-2.46	-1.45	-3.53	0.41	-1.07	-0.78	-1.69	0.02	-1.74
		-0.71		0.63		1.89		0.13		1.78
0-13 d AD	-0.52	-1.20	-1.50	-3.06	-0.23	-1.50	-0.96*	-1.78	-1.52	-3.40
		0.17		0.05		1.03		-0.13		0.35
14-27 d AD	-0.87*	-1.55	-0.71	-2.15	-0.39	-1.80	-0.21	-1.06	0.18	-1.71
		-0.18		0.72		1.03		0.63		2.08
≥ 28 d AD	-0.64*	-1.03	-0.24	-1.00	-0.27	-0.90	-0.21	-0.63	0.81	-0.47
		-0.25		0.51		0.36		0.22		2.08

[†] Other factors controlled for in the model were calving season, week-in-milk, several types of CM, and other non-CM diseases (displaced abomasum, milk fever, puerperal fever, ketosis).

[‡] BD = Before diagnosis

[§] AD = After diagnosis

[*] $P<0.05$

Table S3

Effects of the first occurrence of pathogen-specific clinical mastitis on milk yield and milk composition of 2422 parity ≥2 cows (with 4233 lactations) in 31 Hokkaido dairy herds in Japan. Estimates were obtained from mixed models with an autoregressive (Order 1) covariance structure[†]. CI = confidence interval.

Effect	Streptococcus spp.		S. aureus		CNS		Coliforms		Fungi	
	Est.	95% CI	Est.	95% CI	Est.	95% CI	Est.	95% CI	Est.	95% CI
-- Milk yield (kg/d) --										
≥ 29 d	1.67*	0.87	1.70*	0.12	2.57*	1.33	1.70*	0.84	3.58*	0.75
BD[‡]		2.48		3.27		3.81		2.55		6.41
15-28 d	1.40*	0.39	0.65	-1.58	1.53*	0.04	2.41*	1.34	2.79	-0.32
BD		2.41		2.88		3.02		3.48		5.89
1-14 d	0.30	-0.67	-0.96	-2.76	0.51	-1.03	1.49*	0.49	2.49	-0.85
BD		1.27		0.85		2.04		2.49		5.83
0-13 d	-2.18*	-3.12	-3.12*	-5.07	-1.62*	-2.98	-4.01*	-4.96	-2.89*	-5.43
AD[§]		-1.24		-1.16		-0.26		-3.05		-0.34
14-27 d	-1.20*	-2.12	-1.58	-3.51	0.12	-1.25	-2.48*	-3.39	-2.62	-5.41
AD		-0.27		0.34		1.49		-1.56		0.16
≥ 28 d	0.24	-0.57	-2.23*	-3.74	1.28*	0.12	-1.03*	-1.85	-2.44*	-4.33
AD		1.06		-0.72		2.44		-0.20		-0.55
-- log10 SCC (cells/mL) --										
≥ 29 d	0.15*	0.02	0.41*	0.16	0.16	-0.05	0.20*	0.06	0.09	-0.39
BD		0.28		0.67		0.37		0.35		0.58
15-28 d	0.14	-0.05	0.82*	0.40	0.07	-0.20	0.03	-0.17	0.43	-0.14

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BD		0.32		1.23		0.35		0.23		1.00
1-14 d	0.79*	0.61	1.63*	1.31	0.60*	0.31	0.47*	0.28	0.81*	0.19
BD		0.97		1.96		0.89		0.65		1.43
0-13 d	1.32*	1.15	1.45*	1.09	0.92*	0.67	2.03*	1.86	1.65*	1.19
AD		1.50		1.81		1.17		2.21		2.11
14-27 d	0.89*	0.73	1.39*	1.04	0.60*	0.35	0.99*	0.83	1.99*	1.48
AD		1.06		1.74		0.85		1.16		2.50
≥ 28 d	0.55*	0.41	0.77*	0.52	0.19	0.00	0.31*	0.17	0.74*	0.44
AD		0.68		1.01		0.37		0.45		1.04

-- Lactose content (%) ---

≥ 29 d	0.01	-0.01	-0.03	-0.07	0.01	-0.02	0.02	-0.01	0.06	-0.02
BD		0.03		0.01		0.05		0.04		0.14
15-28 d	-0.01	-0.03	-0.06*	-0.12	0.00	-0.04	0.05*	0.02	0.06	-0.03
BD		0.02		0.00		0.04		0.08		0.14
1-14 d	-0.01	-0.04	-0.07*	-0.12	-0.05*	-0.09	0.00	-0.03	0.02	-0.07
BD		0.01		-0.02		0.00		0.02		0.12
0-13 d	-0.08*	-0.10	-0.06*	-0.12	-0.05*	-0.09	-0.15*	-0.18	0.00	-0.07
AD		-0.05		-0.01		-0.02		-0.13		0.07
14-27 d	-0.03*	-0.05	-0.09*	-0.14	-0.01	-0.05	-0.03*	-0.06	-0.13*	-0.20
AD		0.00		-0.03		0.03		-0.01		-0.05
≥ 28 d	-0.02	-0.04	-0.05*	-0.09	-0.01	-0.04	-0.01	-0.03	0.01	-0.04
AD		0.01		-0.01		0.02		0.01		0.06

-- Fat content (%) ---

≥ 29 d	-0.11*	-0.18	0.12	-0.01	-0.17*	-0.27	0.04	-0.03	-0.11	-0.36
BD		-0.05		0.24		-0.06		0.11		0.14
15-28 d	-0.03	-0.14	-0.07	-0.32	-0.30*	-0.46	-0.03	-0.15	0.10	-0.24
BD		0.08		0.18		-0.14		0.09		0.43
1-14 d	-0.11*	-0.21	-0.03	-0.22	0.00	-0.17	-0.03	-0.14	-0.33	-0.70
BD		0.00		0.16		0.17		0.08		0.03
0-13 d	0.04	-0.06	0.26*	0.04	-0.09	-0.24	0.08	-0.02	0.15	-0.12
AD		0.14		0.47		0.06		0.18		0.42
14-27 d	-0.03	-0.13	-0.17	-0.37	-0.22*	-0.37	-0.03	-0.13	0.12	-0.19
AD		0.06		0.04		-0.08		0.07		0.42
≥ 28 d	-0.13*	-0.19	-0.08	-0.20	-0.02	-0.11	-0.04	-0.11	0.07	-0.07
AD		-0.06		0.04		0.07		0.02		0.21

-- Protein content (%) --

≥ 29 d	-0.04*	-0.07	-0.01	-0.07	-0.08*	-0.13	-0.02	-0.06	0.03	-0.08
BD		0.00		0.06		-0.03		0.01		0.15
15-28 d	-0.04	-0.08	0.01	-0.07	-0.07*	-0.13	-0.06*	-0.10	-0.01	-0.13
BD		0.00		0.10		-0.01		-0.02		0.12
1-14 d	-0.04	-0.08	-0.03	-0.11	-0.04	-0.10	-0.03	-0.07	-0.18*	-0.31
BD		0.00		0.04		0.02		0.01		-0.05
0-13 d	0.02	-0.01	0.03	-0.05	-0.03	-0.09	0.14*	0.11	0.08	-0.02
AD		0.06		0.10		0.02		0.18		0.19
14-27 d	0.04	0.00	-0.01	-0.09	-0.04	-0.10	0.03	0.00	0.17*	0.06
AD		0.07		0.06		0.01		0.07		0.28

≥ 28 d	-0.02	-0.06	0.01	-0.05	-0.01	-0.06	0.04*	0.00	0.08	0.00
AD		0.01		0.07		0.04		0.07		0.15

-- MUN content (mg/dL) --

≥ 29 d	0.10	-0.18	0.37	-0.16	-0.05	-0.49	-0.12	-0.42	-0.16	-1.24
BD		0.37		0.91		0.39		0.19		0.93
15-28 d	-0.19	-0.67	1.23*	0.12	0.27	-0.45	-0.44	-0.96	0.33	-1.15
BD		0.30		2.34		0.98		0.08		1.81
1-14 d	-0.47*	-0.94	-1.29*	-2.13	-0.27	-1.04	-0.32	-0.80	-0.24	-1.87
BD		0.00		-0.44		0.49		0.16		1.40
0-13 d	-1.33*	-1.78	-0.77	-1.72	-0.27	-0.93	-1.39*	-1.85	-0.79	-1.98
AD		-0.88		0.18		0.38		-0.93		0.40
14-27 d	-0.57*	-1.01	-1.15*	-2.08	-0.27	-0.93	-0.60*	-1.04	-0.93	-2.28
AD		-0.14		-0.22		0.38		-0.17		0.41
≥ 28 d	-0.42*	-0.70	-0.45	-0.95	-0.14	-0.53	-0.36*	-0.64	-0.34	-0.94
AD		-0.15		0.05		0.25		-0.08		0.26

[†] Other factors controlled for in the model were calving season, week-in-milk, several types of CM, and other non-CM diseases (displaced abomasum, milk fever, puerperal fever, ketosis).

[‡] BD = Before diagnosis

[§] AD = After diagnosis

* $P<0.05$

Table S4

Effects of non-CM diseases (displaced abomasum, milk fever, puerperal fever, ketosis) on milk yield and milk composition of 1763 parity 1 cows in 31 Hokkaido dairy herds in Japan. Estimates were obtained from mixed models with an autoregressive (Order 1) covariance structure[†].

	Displaced abomasum	Milk fever[‡]	Puerperal fever	Ketosis	Displaced abomasum	Milk fever	Puerperal fever	Ketosis
	------------- Milk yield (kg/d) -------------				------------- log10 SCC -------------			
BD[§]	-1.98*	¶		-0.40	0.30*			0.13
0-14 d AD[‖]	-3.19*		-1.55	-2.63*	0.06		0.20	-0.09
15-28 d AD	-2.35*		-2.85*	-1.81*	-0.06		-0.05	0.10
29-42 d AD	0.04		-2.66*	-0.20	-0.17		-0.02	0.29
43-56 d AD	-0.51		-0.41	-0.89	-0.32*		-0.12	0.10
≥ 57 d AD	-0.11		-0.94	-0.20	-0.14		-0.08	0.00
	------------- Lactose content (%) -------------				------------- Fat content (%) -------------			
BD	-0.05*			0.00	0.34*			0.05
0-14 d AD	-0.03		-0.08*	-0.08*	0.17		0.77*	0.30*

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	Protein content (%)			MUN content (mg/dL)		
15-28 d AD	0.03	-0.01	-0.04	0.24*	0.53*	0.11
29-42 d AD	0.01	-0.01	-0.03	0.04	0.18	0.19*
43-56 d AD	0.04	-0.02	-0.07*	-0.01	0.16	-0.21
≥ 57 d AD	0.01	-0.01	-0.04*	0.08	0.14*	-0.03
BD	-0.06		-0.16*	-0.09		-0.28
0-14 d AD	-0.04	0.03	-0.06	-1.79*	-1.12	0.16
15-28 d AD	-0.07*	0.03	-0.13*	-0.16	0.25	0.33
29-42 d AD	-0.01	0.06	-0.04	-0.63	0.23	0.16
43-56 d AD	-0.01	0.00	-0.05	0.38	0.02	0.60
≥ 57 d AD	0.02	0.03	-0.07*	0.19	0.15	0.23

126 [†] Other factors controlled for in the model were calving season, week-in-milk and several types of pathogen-specific CM.

127 [‡] This study does not discuss the effects of milk fever on milk in younger cows, since only three cases were detected in total, i.e. it is statistically

128   meaningless.

129

130   § BD = Before diagnosis

131   ‖ AD = After diagnosis

132   ¶ Puerperal fever did not occur BD.

133   * $P<0.05$

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138 **Table S5**

139 Effects of non-CM diseases (displaced abomasum, milk fever, puerperal fever, ketosis) on milk yield and milk composition of 2422 parity ≥ 2

140 cows in 31 Hokkaido dairy herds in Japan. Estimates were obtained from mixed models with an autoregressive (Order 1) covariance structure[†].

	Displaced abomasum	Milk fever	Puerperal fever	Ketosis	Displaced abomasum	Milk fever	Puerperal fever	Ketosis
	------------- Milk yield (kg/d) -------------				------------- log10 SCC -------------			
BD[‡] 0-14 d	-1.69*	§	‖	-1.01	-0.08			-0.18
AD[‡] 15-28 d	-9.43*	-0.79	-4.01*	-1.91*	0.34*	0.07	0.33*	0.07
AD 29-42 d	-4.35*	0.38	-3.06*	-2.19*	0.11	0.17	0.21	0.02
AD 43-56 d	-2.76*	0.04	-2.45*	-0.66	-0.04	-0.21*	0.09	-0.32*
AD ≥ 57 d	-1.38*	0.60	-1.38*	-0.62	0.08	0.08	-0.03	-0.01
AD	-0.49	0.30	-1.07*	0.52	-0.04	-0.03	0.00	-0.20*
	------------- Lactose content (%) -------------				------------- Fat content (%) -------------			
BD 0-14 d	-0.04*			-0.06*	0.23*			0.32*
AD	-0.12*	-0.02	-0.03	-0.06*	0.51*	0.02	0.22*	0.26*

		Protein content (%)				MUN content (mg/dL)		
15-28 d								
AD	-0.01	-0.01	-0.03	-0.01	0.05	0.20*	-0.07	0.21*
29-42 d								
AD	-0.02	0.01	-0.06*	-0.01	0.03	-0.05	0.06	-0.04
43-56 d								
AD	-0.01	0.01	-0.01	-0.05*	0.07	0.05	-0.01	0.08
≥ 57 d								
AD	-0.01	0.02*	-0.02	-0.01	0.04	0.02	-0.07*	-0.06
		------------- Protein content (%) -------------				------------- MUN content (mg/dL) -------------		
BD	0.00			-0.09*	0.30			0.22
0-14 d								
AD	-0.18*	-0.03	0.02	-0.08*	-0.55*	-0.03	-1.14*	-0.26
15-28 d								
AD	0.00	-0.01	-0.05	-0.08*	-1.15*	-0.50*	-0.63	-0.42
29-42 d								
AD	0.04	0.02	0.00	-0.02	-0.94*	-0.05	-1.18*	-0.44
43-56 d								
AD	0.04	0.00	-0.02	-0.06*	-0.49	-0.26	-0.49	0.50
≥ 57 d								
AD	0.03*	0.03*	0.03	-0.04*	-0.10	-0.14	-0.19	0.11

141 [†] Other factors controlled for in the model were calving season, week-in-milk and several types of pathogen-specific CM.

142   [‡] BD = Before diagnosis

143   [‡] AD = After diagnosis

144   [§,‖] Milk fever and puerperal fever did not occur BD.

145   [*] $P<0.05$