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Herd health monitoring of dairy cows with displaced abomasum

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Abstract: Displaced abomasum (DA) in dairy cows is a multifactorial disease commonly was diagnosed within the first week postpartum.The purpose was to carry out herd health monitoring of dairy cattle with DA from day 0 until day 30 after operation. The study was conducted on DA cattle (n= 25) belonged to various dairy farms in Hokkaido area, Japan. All DA was surgically corrected. Cows were examined at days 0 (operation), 7 and 30. Appetite score, rumen filling score (RFS), manure digestion score (MDS), manure condition score (MCS) and body condition score (BCS) were examined. Based on blood β-hydroxybutyric acid (BHBA) at day 0, DA cows were classified into three categories; DA only [<1.2 mmol/l], DA with subclinical ketosis (DA SCK) [1.2-2.4 mmol/l] and DA with clinical ketosis (DA CK) [≥2.5 mmol/l]. The clinical findings including temperature, pulse and respiration were within the physiological reference range. Appetite score and ruminal movement were reduced in each DA group at day 0 then they both were improved after the surgical correction of DA. RFS was clearly improved after surgical operation in DA SCK and DA CK at days 7 and 30.MDS was remarkably ($P < 0.05$) improved (Decreased undigested feed particles) in all DA groups particularly in day 30.MCSmean values were significantly increased (became ideal and of good consistency) in the three DA groups at day 30 particularly at DA CK group.In conclusion, 30 day follow up period is enough until the dairy cows be able to restore their soundness and thriftness after DA correction.
Keywords: Displaced abomasum, dairy cattle, manure condition score and rumen filling score

INTRODUCTION

The postpartum period of the dairy cow is a critical time in the production cycle of the cow. During this period, dairy cows are at risk of developing calving associated diseases, such as hypocalcemia, metritis, ketosis and displacement of the abomasum [1,2].

Rectal temperature, attitude, appetite and manure are evaluated during the first 10 days postpartum as a health monitoring program, to determine whether or not the cow appears sick and to evaluate the nutritional and health status of the high producing dairy cows, manure can provide great information about general health, rumen and digestive function of cows [3]. Cattle will be in good health if manure scoring was optimal. Manure scoring considered a very important tool for determination of the quality of nutrition recently consumed by the cow and to adjust supplementation. It can indicate the quality of nutrition in the past one to three days, while body condition score will indicate the nutritional history of the past several weeks to months [4].

Manure is scored on a 1 to 5 basis, with a score of 1 being very fluid and 5 being extremely dry and segmented. A manure score of 1 is of cream soup consistency. It can indicate a sick animal or a highly digestible ration that contains excess protein, carbohydrates or minerals, and low fiber. Score 2 doesn't stack; the pat is usually less than 1 inch thick and will lack consistent form. Excess protein, carbohydrates and low fiber characterize the diets that produce this manure. Rate of passage is very high. Score 3 is ideal and of normal pat form. The consistency will be similar to thick pancake batter. It will exhibit a slight divot in the middle. Score 4 manure is thick and starting to become somewhat deeper. The consistency of the manure will be equivalent to peanut butter. It indicates a lack of degradable rumen protein, excess low quality fiber or not enough carbohydrates in the diet [4, 5].

Both manure scores 1 and 5 are not preferable and may reflect a health problem besides dietary limitations. Manure score was variedwith different stages of lactations. Ideal fresh cows (score 2 to 2 ½), early lactation cows (2 ½ to 3), late lactation cows (3 to 3 ½), far off dry cows (3 to 4) and Close up dry cows (2 ½ to 3 ½) [6].

Displaced abomasum (DA) in dairy cows is a multifactorial disease, most commonly diagnosed within the first week postpartum [7, 8]. DA can cause economic losses in dairy herds because ofproduction loss, treatment costs andpremature culling. Cows with left displacement of the abomasum (LDA) are at increased risk of complicated ketosis and metritis [9]. The economic consequences of LDA have become more significant as the incidence rate has increased to 5% of postpartum dairy cows [10].

Most cows are in a negative energy balance (NEB) around calving and this state has been suggested to be a risk factor for DA [11]. However, the metabolic load on the cow varies over time during the first month postpartum, and blood profiles in DA cows may therefore show differences due to time from calving. DA has also been associated with other diseases such as retained placenta, metritis, and ketosis [12], as well as with hepatic lipidosis[13].

Diseased cows with DA were febrile with increased heart and respiratory rates and reduced ruminal movements [14, 15]. Moreover, in general, rumen activity declines during moderate hypocalcemia [16] that usually occurs with DA and is considered a risk factor for its occurrence.

Clinically, LDA can be detected if gas is present in the abomasum resulting in a tympanic, resonant and high-toned ping sound [17].

Many research articles described DA cows. They also talked about the most common clinical findings and metabolic profiles associated with DA in dairy cattle [18], DA and ketosis [19].

The current study aimed to conduct herd health monitoring of dairy cattle with DA from day 0 until day 30 after operation. Appetite score, rumen filling score (RFS), manure digestion score (MDS), manure condition score (MCS) and body condition score (BCS) were monitored. This study could clarify the clinical findings in each group and then between the 3 diseased groups and their importance to confirm the recovery of DA cows.

MATERIALS AND METHODS

ANIMALS

The study was conducted on DA cattle (n= 25) belonged to dairy farms in Hokkaido area, Japan. All DA was surgically corrected. Cows were sampled at days 0 (operation), 7 and 30. Based on blood BHBA at day 0, DA cows were classified into three categories; DA only [<1.2 mmol/l], DA with subclinical ketosis (DA SCK) [1.2-2.4 mmol/l] and DA with clinical ketosis (DA CK) [≥2.5 mmol/l].

All cattle were treated under the Laboratory Animal Control Guidelines of Rakuno Gakuen University, which basically conform to the Guide for the Care and Use of Laboratory Animals of the National Institutes of Health in the USA (NIH publication No. 86-23, revised 1996).

METHODS

Clinical examination of all dairy cattle was conducted using clinical chart according to Rosenberger [20]. Faecal samples were directly collected from the rectum.

According to Hulsen [21], herd health monitoring of dairy cattle with DA from day 0 until day 30 after operation was conducted. Including estimation of appetite score, RFS, MDS and MCS.BCS of all cows was estimated based on a 5-point scale [22].

Statistical analysis: All statistical analyses were performed using computer soft ware (SPSS version 17.0, Chicago, USA). The data obtained from clinical examination and biochemical analyses were analyzed by analysis of variance (ANOVA). The significance of differences between the means at selected sampling days (days 7 and 30) and day 0 was in the same diseased group evaluated by Dunnett's test. The significance of differences between the means at diseased groups (DA with SCK group and DA with CK group) at sampling days; 0, 7 and 30, and DA group evaluated by Dunnett's test were expressed as means±SD [23].

RESULTS

The clinical findings including temperature, pulse and respiration were within the physiological reference range. No significant changes were reported neither between DA groups nor within each diseased group (Table 1).

Appetite score and ruminal movement were reduced in each DA group at day 0 then improved after the surgical correction of DA (Tables 1and 2).The appetite score and rumen movement were significantly ($P < 0.05$) elevated in DA, DASCK and DACK groups at days 7 and 30 when their values were compared with those in day 0. No significant changes were stated between these three diseased groups either in days 0, 7 or 30.

BCS in all DA groups showed no significant changes either between the diseased groups (DA with SCK or DA with CK) comparing with values in DA group at days 0, 7 and 30, or within the same diseased group (days7 and 30) comparing to values at day 0. BCS was still within the physiological reference values (Table 2).

Except in DA group, RFS was clearly affected after surgical operation as it was significantly (P＜0.01) increased at DA SCK and DA CK in recovered cows particularly in day 30 comparing with that at day 0 (Table 2).

There were significant changes in MDS within each DA group. MDS was remarkably(P＜0.05) improved (Decreased undigested feed particles) in DA, DA SCKand DA CK groupsparticularly in day 30 comparing with that in day 0 (Table 2).

MCS was increased (Increased consistency) in DA and DA SCK groups from day 0 up to day 30 but it was significantly (P＜0.01) increased in DA CK at days 7 and 30 comparing with that in day 0 (Table2).

Table 1: The clinical findings in the diseased groups[a]

Type	No	Temperature			Pulse			Respiration			Ruminal movement		
		Day 0	Day 7	Day 30	Day 0	Day 7	Day 30	Day 0	Day 7	Day 30	Day 0	Day 7	Day 30
DA	8	38.73 ± 0.56	38.82 ± 0.29	38.78 ± 0.21	82.47 ± 4.76	86.29 ± 9.96	83.43 ± 8.77	24.57 ± 7.72	31.71 ± 12.02	30.29 ± 14.16	1.63 ± 0.74	2.88 ± 0.35*	2.88 ± 0.35*
DA SCK	10	38.64 ± 0.32	38.59 ± 0.18	38.64 ± 0.20	80.20 ± 9.35	78.80 ± 8.85	80.20 ± 8.02	27.33 ± 6.00	25.20 ± 5.01	25.11 ± 4.14	1.70 ± 0.48	2.80 ± 0.42*	3.00 ± 0.00*
DA CK	7	38.46 ± 0.35	38.61 ± 0.11	38.71 ± 0.13	80.04 ± 9.85	84.29 ± 8.83	82.86 ± 4.45	24.00 ± 5.66	24.00 ± 2.53	27.33 ± 6.41	1.71 ± 0.49	2.71 ± 0.49*	3.00 ± 0.00*

DA: displacement of the abomasum. SCK: subclinical ketosis. CK: clinical ketosis.
* Significant when compared with the value at day 0 (* P＜0.05; **P＜0.01).

Table 2: the clinical findings in the diseased groups[b]

Type	No	Appetite score			RFS			MDS			MCS			BCS		
		Day 0	Day 7	Day 30	Day 0	Day 7	Day 30	Day 0	Day 7	Day 30	Day 0	Day 7	Day 30	Day 0	Day 7	Day 30
DA	8	1.50 ± 0.53	3.00 ± 0.00**	3.00 ± 0.00**	2.25 ± 1.04	2.63 ± 0.74	2.88 ± 0.64	2.63 ± 0.39	2.88 ± 0.63	3.38 ± 0.74*	2.63 ± 1.06	3.25 ± 0.89	3.00 ± 0.53	3.06 ± 0.50	3.0 ± 0.40	2.88 ± 0.38
DA SCK	10	1.40 ± 0.52	2.80 ± 0.42**	3.00 ± 0.00**	2.00 ± 0.47	2.60 ± 0.52*	2.70 ± 0.48**	2.20 ± 0.63	2.80 ± 0.42	3.40 ± 0.64*	2.90 ± 0.74	3.40 ± 0.70	3.40 ± 0.70	3.20 ± 0.48	3.13 ± 0.32	3.00 ± 0.24
DA CK	7	1.29 ± 0.49	2.86 ± 0.38**	3.00 ± 0.00**	1.71 ± 0.76	2.43 ± 0.53	2.86 ± 0.69**	2.43 ± 0.58	2.71 ± 0.76	3.21 ± 0.76*	2.14 ± 0.69	3.14 ± 0.69**	3.14 ± 0.90**	3.07 ± 0.37	2.96 ± 0.17	2.82 ± 0.24

DA: displacement of the abomasum. SCK: subclinical ketosis. CK: clinical ketosis. BCS: body condition score. RFS: rumen filling score. MDS: manure digestion score. MCS: manure condition score.
* Significant when compared with the value at day 0 (* P＜0.05; **P＜0.01).

DISCUSSION

The postpartum period of the dairy cow is a critical time in the production cycle of the cow and at that timethe incidence of occurrence of calving associated diseases are high, displacement of the abomasum are the most common diseased condition noticed during that period [1]. Inanition during this period leads to serious metabolic consequences as the postpartum energy balance is mostly influenced by feed uptake. Prolonged periods of bad appetite lead to the same consequences [24]. It has been reported that 10% of cowswith DA are culled or died [25].

Risco [26] stated that monitoring the animal health during the postpartum period involves the examination of all cows after calving (7 to 10 days in milk). Indices

that can be used to evaluate health status of cows include attitude, rectal temperature, rumen fermentation, BCS, manure score and milk production. BCS was not associated with the risk of LDA. These findings do not refute the importance of body condition, but indicate that non-esterified fatty acids (NEFA) and BHB provide better insight into metabolic function, at least with respect to development of LDA [27]. Cows with excess BCS at parturition are at increased risk for LDA [28].

The clinical findings including temperature, pulse, respiration and BCS were within the physiological reference range. No significant changes were reported neither between DA groups nor within each diseased group.They were within the physiological reference range that was reported by Ferguson *et al.* [22]; Radostits *et al.* [29].

This study mentioned that appetite and ruminal movement were reduced in the diseased cows at day 0 then they both were improved after operation. The previous reports about DA stated that diseased cows with DA were febrile with increased heart and respiratory rates, reduced ruminal movements [14, 15], anorexia, decreased milk yield and scanty, pasty faeces [30].

According to system of herd monitoring in Herd health department, Rakuno Gakuen University, Hokkaido, Japan that approved by Hulsen [21], the present study stated that except in DA group, RFS was clearly improved after surgical operation in recovered cows (DA SCK and DA CK groups) particularly in day 30. MDS was remarkably improved (Decreased undigested feed particles) in all DA groups particularly in day 30. Ideal manure score is 3 and of normal pat form as described by Allen and Beede [5]; Robert [4]; Hutjens [6], the present results reported that MCS was remarkably increased (optimal consistency) in DA SCK with a mean value of 3.40 ± 0.7 at day 30 post correction, also MCS in all three DA groups particularly at day 30 was increased indicated by good consistency of the feces which reflecting restoring of normal digestion of the cow.

CONCLUSION

Finally it could be concluded that displacement of the abomasum can be evaluated by monitoring temperature, appetite, MDS, MCS, RFS AND BCS during early postpartum period by employing a health monitoring program during this period and 30 day follow up period is enough until the dairy cows be able to restore their soundness after DA correction**.**

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AUTHORS' CONTRIBUTION

Authors have conducted the study equally and discussed the results, read and approved the final manuscript

COMPETING INTERESTS

The authors declare that they have no competing interests.

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