

Effects of regrouping and administrations of meloxicam and chromium on plasma cortisol concentrations and behaviors in dairy calves

Da Jin Sol Jung, Jae Sung Lee, Do Hyun Kim, Seok-Hyeon Beak, Soo Jong Hong, In Hyuk Jeong, Seon Pil Yoo, Jin Oh Lee, In Gu Cho, Dilla Marestia Fassah, Hyun Jin Kim and Myunggi Baik*

Department of Agricultural Biotechnology, College of Agriculture and Life Science, Seoul National University, Seoul 08826, Republic of Korea

*Corresponding author: mgbaik@snu.ac.kr



ABSTRACT

This study investigated effects of regrouping and oral meloxicam and chromium administration on growth performance, blood cortisol concentrations, and behaviors in dairy calves. Fifty Holstein calves (average age 196 ± 24.7 days, average body weight 198kg ± 32.7 kg) were equally divided into five groups: no regrouping with lactose monohydrate administration (NL), regrouping with lactose monohydrate administration (GL), regrouping with Cr administration (GC), regrouping with meloxicam administration (GM), and regrouping with both meloxicam and Cr administration (GMC). Blood was collected before regrouping and at 3h, 9h, 24h, d7, and d14 after regrouping. Behaviors have been monitored from d1 to d7. Regrouping did not affect average daily gain (ADG), and the administrations of both meloxicam and chromium increased ($p < 0.02$) ADG compared to NL group during 2 weeks. Regrouping increased ($p < 0.05$) plasma cortisol concentrations in GL group, and both meloxicam and chromium and its combination treatments decreased cortisol concentrations compared to GL group at 24h, but not at other times. Regrouping increased ($p < 0.05$) fight, eating, head bunt, drinking, and standing time behaviors in GL group at d1, d2, d2, d3, and d4, respectively. Regrouping increased ($p < 0.05$) displacement at eating place in GL group from d3 to d6, but this effect was not significant ($p > 0.05$) at d7. In conclusion, regrouping caused elevation of plasma cortisol concentrations and abnormal behaviors. Meloxicam, chromium, and/or its combined administrations improved growth performance and reduced circulating cortisol concentrations in regrouped dairy calves, suggesting a feasible strategy to alleviate regrouping stress.

INTRODUCTION

Social environmental changes can have a marked effect on animal physiology and animal behaviors. Regrouping (also referred to mixing or commingling) is a popularized method used by dairy farmers to use feedlot efficiently. Previous studies have shown that when cows are regrouped, social relationships are re-established through threats, butts and other non-physical and physical interactions. Meloxicam is a nonsteroidal anti-inflammatory drug that may reduce stress and improve performance after regrouping. Chromium (Cr) has been suggested that it may prevent various stresses in several researches. This study was performed to evaluate the effect of oral meloxicam and chromium administration before regrouping on performance, physiological responses and behaviors in regrouped dairy calves.

MATERIALS & METHODS

Animals

❖ Fifty Holstein calves (average age 196 ± 24.7 days of age, average body weight 198 ± 32.7 kg)

Five groups

- No regrouping with lactose monohydrate administration (n = 10)
- Regrouping with lactose monohydrate administration (n = 10)
- Regrouping with Cr administration (n = 10)
- Regrouping with meloxicam administration (n = 10)
- Regrouping with both meloxicam and Cr administration (n = 10)

Meloxicam & chromium administration

- ❖ Administration were orally delivered to each calf immediately before regrouping
- ❖ Lactose monohydrate (1mg/kg of BW): the placebo effect
- ❖ Meloxicam (1mg/kg of BW)
- ❖ Chromium (0.5mg/kg of DM)

Regrouping

❖ Calves were randomly allocated into 5 pens for a 2-week adaptation period. After adaptation, calves were regrouped into 5 groups according to the BW

Sampling time

❖ Blood was collected before regrouping and at 3h, 9h, 24h, 1w, and 2w after regrouping

Plasma cortisol analysis: using a salivary cortisol enzyme immunoassay kit (Salimetrics LLC, State College, PA)

Blood metabolites analysis

❖ Serum triglyceride (TG) and non-esterified fatty acid (NEFA) were analyzed by using fully automated Cobas 8000 C702 analyzer (Roche Diagnostics GmbH, Mannheim, Germany) using colorimetric methods with specific kits.

Animal behavior analysis

- ❖ All behaviors were monitored for 7 days (d1 ~ d7 after regrouping).
- ❖ Animal behaviors were continuously video-recorded using video recording camera (Ezviz C3S, Dahua, and Yi) positioned approximately 8 m above each experimental pens
- ❖ Individual animals were identified with unique colors by body taping

Statistical analysis

❖ One-way analysis of variance (ANOVA) was used to analyzed for significant differences between the 5 groups using SPSS 25.0 software (IBM SPSS, Inc., Chicago, IL, USA).

RESULTS

Table 1. Effect of regrouping and meloxicam and chromium administrations on the growth performance of Holstein calves during 2 weeks

Item	NL	GL	GC	GM	GMC	SEM	p-value
Initial BW, kg	197	201	198	197	198	32.7	0.99
Final BW, kg	210	209	211	213	217	34.8	0.99
ADG, kg	0.868 ^{ab}	0.618 ^a	0.907 ^{ab}	1.09 ^{ab}	1.35 ^b	0.58	0.02

NL: No regrouping with lactose monohydrate administration; GL: regrouping with lactose monohydrate administration; GC: Regrouping with Cr administration; GM: Regrouping with meloxicam administration; GMC: Regrouping with both meloxicam and Cr administration; Mean values with different letters (a, b) differ between treatment groups in each sampling time.

❖ Regrouping did not affect average daily gain (ADG), and the administrations of both meloxicam and chromium increased ($p < 0.02$) ADG compared to NL group.

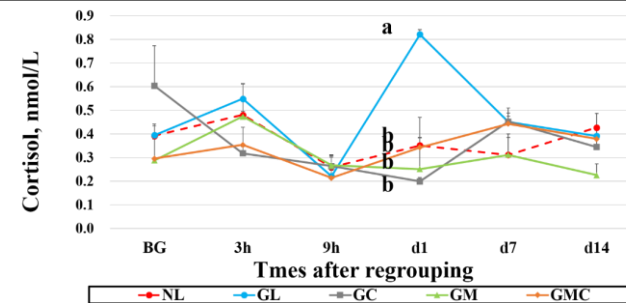


Fig 1. Plasma cortisol level change before and after regrouping in Holstein calves

NL: No regrouping with lactose monohydrate administration; GL: regrouping with lactose monohydrate administration; GC: Regrouping with Cr administration; GM: Regrouping with meloxicam administration; GMC: Regrouping with both meloxicam and Cr administration; The significance of main effects and their interaction was tested using one-way ANOVA; Blood samples were collected immediately before regrouping (BG), 3h, 9h, d1, d7 and d14 after regrouping.; Mean values with different letters (a, b) differ between treatment groups in each sampling time.

- ❖ Regrouping increased ($p < 0.05$) plasma cortisol concentrations in GL group at d1
- ❖ Both meloxicam and chromium and its combination treatments decreased ($p < 0.05$) cortisol concentrations at d1

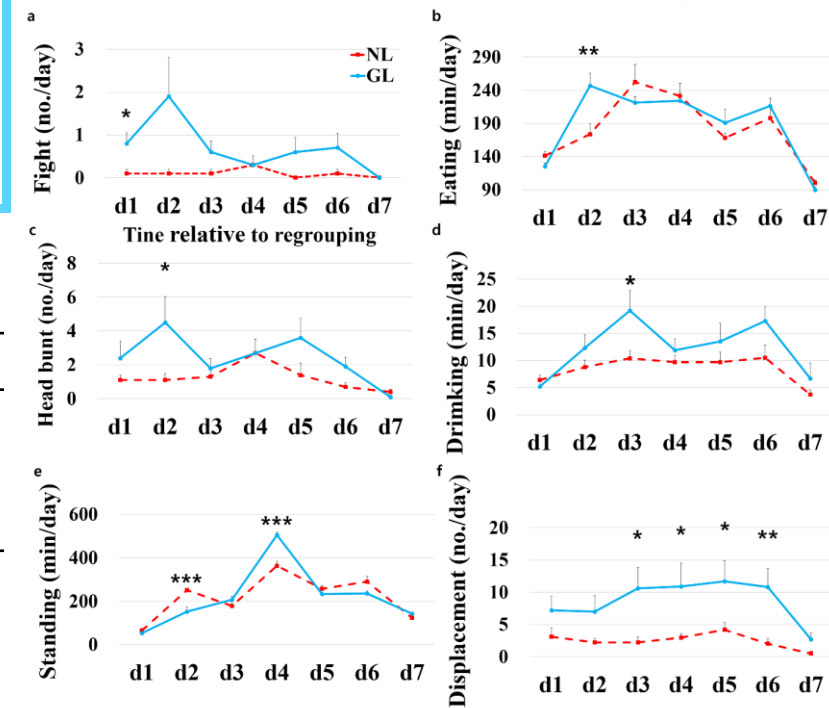
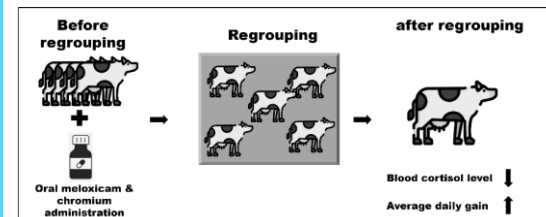


Fig 2. Effect of regrouping on animal behaviors after regrouping for 7 days in Holstein calves

NL: No regrouping with lactose monohydrate administration; GL: regrouping with lactose monohydrate administration; Mean values with different letters (a, b) differ between groups in each day.

- ❖ Regrouping increased ($p < 0.05$) fight, eating, head bunt, drinking, and standing time behaviors in GL group at d1, d2, d2, d3, and d4, respectively.
- ❖ Regrouping increased ($p < 0.05$) displacement at eating place in GL group from d3 to d6, but this effect was not significant ($p > 0.05$) at d7.

SUMMARY & CONCLUSION



- ❖ Meloxicam and Cr administration before regrouping may be a viable strategy to alleviate a stress elicited by regrouping.