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Haematological Lipid Profile of Working Dog Fed Metabolic Modifiers

[1]J. Padilla Muñoz, [2]J.R. Orozco Hernández, [2]I.J. Ruíz-garcía and [1]A. Ruiz García
[1]Departamento Control de Calidad, Maltacleyton de Guadalajara, México
[2]Departamento de Ciencias Biológicas, Centro Universitario de los Altos, Universidad de Guadalajara, P.O.Box 58, Tepatitlán de Morelos, Jalisco, 47600 México

Abstract: The availability for work from the energy stored as lipid depot in producing animals can be increased by using metabolic modifiers such as Conjugated Linoleic Acid (CLA) and Chromium (Cr), but little published information exists on combination of both, when fed to working dogs. Nine adult Siberian Husky dogs (1 to 3 years old and 30 kg of average weight) were used to assess the effect CLA (0.15%, dry matter basis) and CLA plus Cr (100 ppm) added to the feed and its impact on haematological lipid profile. Blood glucose was unchaged by the treatments ($p>0.05$), however, the lipid status of the Siberian dogs was altered by the metabolic modifiers. The different lipid components of the blood were reduced ($p<0.05$) by the use of the CLA and further decline ($p<0.05$) with the combination of CLA and Cr. In conclusion, the CLA reduces the haematological lipid status and some synergical effects were observed with Cr, which might increase the available energy for physical work of the Siberian dog.

Key words: Conjugated Linoleic Acid (CLA), working dog, chromium proteinate

INTRODUCTION

In general, augmentation fat deposition on producing animals increases, in some cases, the meat quality and consumers acceptance (Matthews *et al*., 2005) nevertheless with the companion animal, such as cats and dogs, the procesus is priceless and in some cases the phenomena is about veterinary concern (Diez *et al*., 2002).

On the other hand, working dogs at rest, demand less energy than during training and when overfed they tend to gain weight, mainly as fat, which in turn lowers its further performance . Most of the commercial feed for dogs are prepared using different vegetable and animal sources of nutrients (Jack *et al*., 2000; Linn and Bui, 2004) therefore, increasing its energy content, limiting in this way the intake (Jack *et al*., 2000; Linn and Bui, 2004) hence altering body fat deposition (Azain *et al*., 2000; Lien *et al*., 2001).

On the other hand, in the animal production industry (pigs mainly) the use of metabolic modifiers such as Chromium (Cr) and Conjugated Linoleic Acid (CLA) have shown some promising results (Khanal and Olson, 2004; Lien *et al*., 2001). Various authors (Shoenherr and Jewell, 2004; Troegeler and Enjalbert, 2005) reported that adding CLA to adult pet dog feed reduces the body fat when they were fed with energy deficient diets. The CLA and Cr generally produce a notorius change on the back fat of producing animals such as pigs and ruminants (Mathews *et al*., 2005; Troegeler and Enjalbert, 2005). However, reports of the changes produced by these additives on the metabolic profile assessed as haematological metabolites variation of working dog are scarce.

MATERIALS AND METHODS

Nine adult Siberian Husky dogs (1 to 3 years old and 30 kg of average body weight), were individually housed in a 9 m^2 shelter, provided with feeder. Water was always available for *ad libitum* consumption. Dogs were exercised 60 min per day during the experiment.

The feed was commercially prepared (13% total fat, 28% crude protein and 3880 kcal of metabolizable energy kg^{-1} of dry matter) and was based on flaked corn and soybean meal to fill the nutrient requirement of the age of the dog according to the National Research Council recommendation (2003). The CLA (Luta CLA 60®; BASF) used, contained 30% of the isomers *trans* 10, *cis* 12 and *cis* 9, *trans* 11. Animals were randomly assigned to one of the following treatments; Control, 0.15% of CLA (dry matter basis), or 0.15% of CLA+100 ppm of chromium proteinate.

Body weight gain and back fat was evaluated on day 0, 30, 60 and 90 of the trial. Body weight was determined using a portable scale and back fat was evaluated at the 10th rib using an Image analyzer ultrasound Shimatzu

Corresponding Author: J. Padilla Muñoz, Departamento Control de Calidad, Maltacleyton de Guadalajara, México

model Shumasonic SDL-32C. At the same dates, blood samples were obtained from the cephalic vein using EDTA containing vacuum tubes, for glucose (mg dL^{-1}), cholesterol (mg dL^{-1}), High Density Lipoprotein (HDL; mg dL^{-1}), triglicerides (mg dL^{-1}) determinations, which were made following the AOAC procedures for haematological analysis (AOAC, 2000). Data of the parameters were statistically analyzed using the SAS package, establishing an alpha of 0.05 to declare differences between treatments and when they were detected, the Duncan procedure was used to separate the means (SAS, 1985).

RESULTS AND DISCUSION

Body weight and back fat remained unchanged ($p>0.05$) by the treatments evaluated in the present experiment and was similar at the different dates assessed. In pigs a noticeable reduction of the back fat has been reproted with the use of CLA (Dugan *et al*., 2004; Khanal and Olson, 2004; Troegeler and Enjalbert, 2005; Cr Lien *et al*., 2001; Matthews *et al*., 2005).

In the dog (Linn and Bui, 2004; Shoenhrr and Jewell, 2004) the CLA reduced fat mass, but in the presente study an important difference was found when Cr propionate was used in combination with CLA. The Cr+CLA reduced fat while it helped to maintain and increase lean muscle mass, probably due to an increases in the fat and glucose break down, associated with the insuline activity (Diez *et al*., 2002). Diez *et al*. (2002) and Bierer and Bui (2004) reported that using high protein diets a weight loss could be obtained, the latter adding CLA.

The glucose in blood averaged 72.11 mg dL^{-1} and was unaffected by the treatments used in the study ($p>0.05$; Table 1). Nevertheless, small variations on blood glucose content were observed among sampling dates ($p>0.05$). The blood glucose value from starting (74.71 mg dL^{-1}) was similar that of the end (69.51 mg dL^{-1}), meaning no significant change was induced in the present study with the use of metabolic modifiers. The small relationship of treatments and blood glucose was in agreement with the reported results Matthews *et al*. (2005) who reported no effecct of the Cr level on the metabolite.

Total blood cholesterol presented a mean of 206.08 mg dL^{-1} and was significantly affected by the treatments ($p<0.05$; Table 1). The cholesterol content of the blood was similar between the start (217.67 mg dL^{-1}) and the end (195.00 mg dL^{-1}) of the trial ($p>0.05$). The CLA treatment increased 10% the blood content of total cholesterol ($p<0.05$), compared with the control, however, the parameter was reduced 14% by the CLA plus Cr addition to the diet ($p<0.05$).

On the other hand the mean Triglyceride (TG) content was 7.22 mg dL^{-1} and resulted to be similar among the evaluated treatments ($p>0.05$; Table 1). On the other hand in general, TG value was higher (34.46 vs. 28.62 mg dL^{-1}; $p<0.05$) at the end of the experiment compared with the observed at the start. Even though the tendency observed was to reduce the circulating TG content with the metabolic modifiers (Table 1) no statistical significance was reached ($p>0.05$).

The High Density Lipoproteins (HDL) in blood averaged 82.40 mg dL^{-1} and was unchanged by the treatments assessed ($p>0.05$; Table 1). The HDL was significantly reduced from the starting (122.06 mg dL^{-1}) to the end (42.74 mg dL^{-1}). Furthermore, a reduction of 10 units was observed with the CLA+Cr compared to the other treatments, meaning a synergic effect of the modifiers ($p>0.05$).

Total blood lipid averaged 488.35 mg dL^{-1}. The CLA reduced 6.5% the total blood lipid compared with the control ($p<0.05$; Table 1) and with the CLA+Cr the reduction was 18% ($p<0.05$). The original and the end of experiment value of total lipids in blood was similar ($p>0.05$). The mean of the alpha fraction of lipid was 205.75 mg dL^{-1}. The parameter was lowered by 7.5% with the CLA addition to the dog feed ($p<0.05$; Table 1), on the hand the combination of CLA+Cr reduced 19.19% the value compared with the control treatment ($p<0.05$).

The pre-beta fraction of blood lipid tended to be affected by the treatments ($p = 0.068$) and averaged

Table 1: Effect of metabolic modifiers on the haematological lipid status of working dogs

	Treatments			
	0	CLA[1]	CLA+Cr[2]	$p<0.05$
Glucose, mg dL^{-1}	71.28	70.71	74.61	0.801
Total cholesterol,mg dL^{-1}	208.58ab	229.53a	179.29b	0.038
Triglycerides,mg dL^{-1}	34.34	30.28	29.07	0.139
High density liprotein,mg dL^{-1}	85.74	86.34	74.01	0.156
Total lipid,mg dL^{-1}	527.12a	492.67ab	432.33b	0.011
Lipid fraction				
Alpha HDL,mg dL^{-1})	223.71a	206.78ab	180.77b	0.013
Pre-beta VLDL,mg dL^{-1}	32.09a	94.80b	25.05a	0.068
Beta LDL,mg dL^{-1}	269.60a	255.52ab	229.10b	0.027

[1]Conjugated Linoleic Acid 0.15% (CLA; dry matter basis). [2]0.15% of CLA + 100 ppm of chromium (Cr, dry matter basis) as Cr proteinate. a-b, different letter means statistical difference ($p<0.05$)

48.79 mg dL^{-1}. Although the CLA increased substantially the pre beta portion of lipid but no statistical difference was obtained ($p>0.05$; Table 1). On the other hand the beta fraction of the blood lipid averaged 253.23 mg dL^{-1}. The fraction was reduced 5%, compared to control, with the CLA and by 15% with the combination of CLA-Cr ($p<0.05$).

CONCLUSION

The CLA reduces the haematological lipid status of working Siberian huskies and some synergical effects were observed with Cr, which might increase the available energy for physical study.

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