EFFECT OF FEEDING POLYUNSATURATED FATTY ACIDS ON HEALTH PROPERTIES OF MEAT FROM DIFFERENT GENETIC GROUPS

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I. INTRODUCTION

Beef consumption has been often associated to the increase on plasma cholesterol concentration and cardiovascular human diseases because of its high content of saturated fatty acids (SFA) and low content of polyunsaturated fatty acids (PUFA) into the intramuscular fat (IMF) [1]. In this sense, currently there is an interest in reducing the SFA content and increasing the levels of some specific fatty acids (FA) in beef. Diet and animal genotype are known to affect the IMF amount and its FA profile in beef [2]. Generally, meat from beef cattle fed vegetable oil has a more desirable FA profile since it provides higher availability of PUFA into the rumen and their likely incorporation into the IMF [2], thereby making it healthier for the consumers. Thus, the aim of this work was to evaluate whether it is possible to modify the FA profile and health properties of meat from animals of different genetic predispositions for IMF deposition by increasing the dietary PUFA concentration.

II. MATERIALS AND METHODS

Thirty *Bos indicus* (BI; Nellore) and thirty crossbred *Bos taurus* x *Bos indicus* (CB; Angus x Nellore) (368 ± 28 kg body weight; 24 mo old) were allocated in individual pens according to the initial body weight (block) in randomized block design with a 2 x 2 factorial arrangement (diet x genetic group) and 15 replications per treatment. Animals were fed for 133 d to one of two high concentration diets: control diet (CO; TDN = 78.9%; EE = 3.11%) and soybean oil diet (SB; TDN = 82.3%; EE = 6.45%). Diets contained corn silage (10%), sugarcane bagasse (5%), corn grain (58% for CO and 54.5% for SB), citrus pulp (16%), soybean meal (9%), urea (1.2%), mineral salt (0.8%) and soybean oil (0% for CO and 3.5% for SB). At the end of feeding period, animals were slaughtered and after 24h of chilling, Longissimus samples were taken at 12th rib level and aged for 7 days. After ageing period samples were used for FA evaluation. The FAs were quantified by gas chromatography (GC-2010 Plus - Shimadzu AOC 20i auto-injector) using a SP-2560 capillary column (100 m × 0.25 mm in diameter with 0.02 mm thickness, Supelco, Bellefonte, PA) and their content were expressed in percentage of total FA methyl ester quantified. Based on the FA profile data were calculated the atherogenic, thrombogenic, health and quality indexes, as well as hypocholesterolaemic:hypocholesterolaemic ratio (HH) [3]. Means were compared by Student's t test, and differences were considered statistically significant when $P \leq 0.05$. Effects of main factors and interaction were evaluated using the mixed procedure of SAS.

III. RESULTS AND DISCUSSION

Diet x genetic group interaction. No interaction between diet and genetic group was observed for any trait evaluated, so that their effects on those traits can be considered separately.
Diet effects. The PUFA and SFA, as well as PUFA:SFA ratio was not changed by diet (Table 1). However, beef from animals fed CO diet had 30% higher n-3 FA than those from animals fed SO. Despite of this, no significant changes in n-6 concentration was observed. Consequently, there was also a lower n-6:n-3 ratio (P = 0.0256), similar to reported by Wood et al. [1]. In the present study, the n-6:n-3 ratio was 8.6:1 and 10.4:1 for CO and SB, respectively, which were higher than the threshold (4.0 or below) recommended by the DHSS [4]. Moreover, unexpected results were observed in relation to the health properties of meat, in which the

meat of animals fed CO had higher quality index and HH than that of animals fed SO. Thus, based on the whole FA profile of SO animals and based on the quality index and HH ratio generated from them, it can be suggested that feeding CO diet resulted in a better FA profile than those fed SO.

Genetic group effects. There was no difference in the sum of n-3 and n-6 FA (Table 1). Despite of this, the n-6:n-3 ratio was 1.26 fold higher in CB than BI animals; however, it did not affect the health properties of meat. Although n-3 and n-6 FA perform opposite functions, both are necessary for the maintenance of the balance of the organism; therefore, an n-6:n-3 ratio of 4.0 or below and over 0.45 for PUFA:SFA is recommended [4]. Besides n-6:n-3 ratio and PUFA:SFA, some indexes have been proposed to evaluate meat health [3]. In the present study, there was no difference between genetic groups in any indexes, representing the similarity of FA profile of meat from BI and CB animals.

Table 1 Effect of diet (DT) and genetic group (GG) on total fatty acids and health properties of meat

Traits	DT[1]		GG[2]		SEM	*P*-value		
	CO	SO	BI	CB		DT	GG	DT*GG
Saturated fatty acids, %	39.0	39.4	39.4	39.0	0.57	0.4631	0.5404	0.6294
Monounsaturated fatty acids, %	43.0	42.9	43.1	42.8	0.85	0.9050	0.7958	0.9849
Polyunsaturated fatty acids, %	10.0	10.2	9.8	10.3	0.80	0.8833	0.5692	0.8263
Polyunsaturated:saturated fatty acids	0.26	0.26	0.25	0.27	0.025	0.9730	0.5105	0.8328
n-3, %	1.12	0.86	1.05	0.93	0.093	0.0287	0.3125	0.8565
n-6, %	8.5	8.7	8.3	8.8	0.78	0.7474	0.3977	0.8695
n-6:n-3	8.6	10.4	8.4	10.6	0.86	0.0256	0.0105	0.6335
Quality index	82.5	74.6	80.2	76.8	2.18	0.0133	0.2795	0.9819
Atherogenic index	0.59	0.61	0.61	0.58	0.015	0.3835	0.1218	0.4840
Hypo:hypercholesterolaemic ratio	1.8	1.7	1.7	1.8	0.04	0.0420	0.3682	0.4678
Health index	1.7	1.7	1.7	1.8	0.04	0.3693	0.2164	0.4461
Thrombogenic index	1.3	1.4	1.3	1.3	0.03	0.1814	0.9189	0.5613

[1] CO = basal diet without soybean oil inclusion; SO = basal diet containing 3.5% soybean oil inclusion in replacing of ground corn grain. [2] BI = *Bos indicus*; CB = crossbred *Bos taurus* x *Bos indicus*.

IV. CONCLUSION

Increasing dietary PUFA concentration reduces n-3 FA and consequently worsens the n-6:n-3 ratio, leading to a reduction in the quality index for human health, whereas genetic group does not alter the total FA concentration and the health properties of meat.

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