SELENIUM, IRON, ZINC AND MAGNESIUM CONCENTRATIONS IN BRAZILIAN BEEF (*LONGISSIMUS LUMBORUM*) FROM ANGUS, WAGYU AND NELLORE CATTLE

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I. INTRODUCTION

Beef is an excellent food that provides most of the nutrients needed for a balanced and healthy diet. It contains a large amount of protein, vitamins such as A, D, E, B12 and essential minerals [1], which participate in the body's physical-chemical and maintenance processes [2]. Foods that provide insufficient amounts of nutrients have poor nutritional quality and are linked to various forms of malnutrition around the world, eating nutritious food is essential for good health and disease prevention [3]. The amount of minerals in beef can vary between different breeds [4], however, there are few studies in Brazil on the variation in mineral content available in beef, and the influence that different breeds can have on this process. For these reasons, the aim of this study was to evaluate the concentrations of iron, zinc, magnesium, and selenium in beef from the Angus, Wagyu and Nellore breeds.

II. MATERIALS AND METHODS

The meat used in the study was obtained from cattle Angus (n=5) and Wagyu (n=5), were raised in the countryside of São Paulo state, under tropical savannah climate conditions. Upon reaching 17 months of age, the cattle were transitioned to a feedlot system where they were provided with a specialized fattening diet. Prior to slaughter, the average weight of Angus was 639kg, and Wagyu 755kg. Each sample was meticulously tracked from the point of slaughter up to the boning process, allowing for a direct correlation with their respective source animals and the cuts. As for the Nellore samples (n=3), they were acquired in whole cut at a local butcher shop. This experiment utilized a total of 13 sirloin samples (Longissimus lumborum). The minerals iron, zinc and magnesium were quantified by Flame Atomic Absorption Spectrophotometry (FAAS - Perkin Elmer, USA, model AAnalyst-200), following the method described by Rebellato et al [5]. To assess selenium, the samples were subjected to acid digestion and incineration at 450°C to detect the mineral by Hydride Generation Atomic Absorption Spectrometry (HG-AAS), following the method described by Orlando et al. [6]. The data obtained was analyzed with one-way ANOVA and Tukey's test (P<0.05), using Statistica v.10 software (StatSoft, USA).

III. RESULTS AND DISCUSSION

The concentrations of the minerals evaluated in the three breeds are shown in Table 1, along with the reference values available in the Brazilian Table of Food Composition - TBCA [7] for the same cut (*Longissimus lumborum*, fat-free and raw). The Wagyu and Nellore samples did not differ significantly in terms of iron content, higher values than Angus (P<0.05). Based on the Recommended Daily Intake (RDI) for adults, published in resolution No269/2005 [8] by the Brazilian Ministry of Health/ANVISA, a new value was calculated for the amount of iron, considering the higher absorption rate of heme iron in meats. The calculated RDI for heme iron was 4.2mg, so just one 200g (raw) Wagyu steak could supply more than the daily iron requirement.

Table 1. Means* of iron, zinc, magnesium and selenium concentrations determined in Angus, Wagyu and Nellore beef tenderloin (*Longissimus lumborum*). Results expressed as mean ± standard deviation.

Breed	Iron	Zinc	Magnesium	Selenium
	(mg/100g)	(mg/100g)	(mg/100g)	(µg/100g)
Angus	1.30 ^b ± 1.16	4.12 ^a ± 2.75	26.04 ^a ± 3.83	$8.87^{b} \pm 0.42$
Wagyu	2.17 ^a ± 1.55	$4.25^{a} \pm 2.48$	21.31 ^b ± 7.57	11.29 [°] ± 0.94
Nellore	$2.03^{a} \pm 0.89$	$3.83^{a} \pm 4.03$	25.27° ± 9.81	6.61 ^c ± 0.36
Reference ^{**}	1.68	3.36	19.6	2.87
RDI***	4.2****	7	260	34

*Equal letters in the same column for the same mineral do not differ significantly in Longissimus dorsi according to Tukey's test of means (P<0.05). **Average concentrations of Fe, Zn, Mg and Se for the same cut, according to the Brazilian Table of Food Composition - TBCA [7]. ***Recommended Daily Intake [8]. ****Adjusted value for iron-heme in meat.

It was found that there was no difference in magnesium concentrations between Angus and Nellore samples, but both had higher values when compared to Wagyu (P<0.05). Compared to the RDI of 260mg, the magnesium concentrations show that beef is a poor source. There was no significant difference in the amounts of zinc found in the samples of the three breeds evaluated (P<0.05). The results show that the samples of the three breeds are good sources of zinc in relation to the RDI, which recommends 7mg. Wagyu beef had the highest selenium concentration, followed by Angus beef, and the Nellore values were the lowest among the three breeds (P<0.05). Considering that the RDI for selenium is $35\mu g$, it can be seen that Wagyu beef can provide a good amount of this mineral. According to the reference values [8], it can be seen that the Angus samples have lower iron concentrations, and in Nellore the selenium results were lower than the three races (P<0.05). Samples from all three breeds had zinc and magnesium concentrations above the results in TBCA. For the four minerals evaluated, the Wagyu samples showed higher values than the averages published in the TBCA for the same cut.

IV. CONCLUSION

The results can be used in the areas of nutrition and research related to the nutritional content of meat. The availability of nutrients, especially minerals, can be exploited in the way products are presented to the consumer, with more nutritionally attractive meats.

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