LONG AGING AND HAEM AND NON HAEM IRON IN BEEF MEAT FROM PASTURE AND CONCENTRATED BASED PRODUCTION SYSTEM

M. C. Cabrera[1,2*], A. Felice[2], M. del Puerto[1], A. Terevinto[1] and Ali Saadoun[1,2]

[1] Departamento de Producción Animal & Pasturas, Calidad de Alimentos, Facultad de Agronomía.

[2] Fisiología & Nutrición, Facultad de Ciencias, Udelar, Montevideo, Uruguay.

*Corresponding author: mcab@fagro.edu.uy

I. INTRODUCTION

Iron in beef meat, is mainly as haem iron, a biologically important iron compound with a major role preventive against the anemia concerning children and elderly [1]. Previous works demonstrated that haem iron can be influenced by the meat processing [2]. In Uruguay, a meat exporter country, meat is aged during short or long periods. In this work, we aim to evaluate the variation in haem and non haem iron during the aging of meat came from the two predominant feeding systems in Uruguay: pasture-based and concentrate-based.

II. MATERIALS AND METHODS

Ten Aberdeen Angus steers from 26–30 months of age (live weight 495.8 kg), were reared under Uruguayan characteristic conditions, based on extensive grazing. They were grazed (130 days before slaughtering) consisting in tall fescue (*Festuca arundinacea*), white clover (*Trifolium repens*) and birdsfoot trefoil (*Lotus subbiflorus* cv El Rincón). On the other hand, ten other AA steers (live weight 498.2 kg) were obtained from an intensive feeding system (feedlot) that exports HQB (high quality beef), following the European Comission Regulation (Number 481/2012). The steers were finished 100 days before slaughtering with concentrate. The last consisted of whole plant sorghum silage, wet grain sorghum, corn silage, sunflower pellets, mineral sources, urea and ionophore. All animals were slaughtered the same day in an official abattoir of Breeders & Packers of Uruguay (BPU-Durazno).

At 36 hours *post mortem* muscles *Longissimus dorsi* (LD) and *Psoas major* (PM) were removed and sampled in three parts, vacuum packed and stored at -80 °C immediately (day 0) or aged for 14 (day 14) or 30 days (day 30) at 1-2 °C to prior analysis.Total haem pigments were determined as hemin after extraction with acidified acetone, quantified in a spectrophotometer at 640 nm and haem iron content calculated (0.0882 μg iron/μg hematin). Heme iron was measured by the method of Hornsey modified [3] and non haem iron by the ferrozine method described by Ahn et al. [4] was used. Data were analyzed with a repeated measures ANOVA procedure for feeding system, muscle type during the days of aging and with an ANOVA GLM procedure at each time of aging with diet and muscle as main effects followed by Tukey-Kramer test ($p<0.05$).

II. RESULTS AND DISCUSSION

Aging change the content of many nutrients as the bioavailability of them. For iron, particularly as haem iron, the change during aging is an indicative of oxidation process with the potential lost of a valuable nutritional source. In this study we show (Table 1) that in spite of the fact that haem iron content in meat from pasture fed steers is higher than in meat from concentrated, this difference is not maintained during the aging. Indeed, toward the end of aging period used here haem iron content decrease more in pasture meat than in concentrated meat. Concentrated based meat have a lower content of haem iron but it is stable during the aging. PM has a higher content of haem iron than LD on both feeding systems. Non haem iron content is strongly related to the muscle type, being the LD with the higher content. Aging increases content of non haem iron but no difference due to feeding system was found.

Table 1 Content of haem and non haem iron in *Longissimus dorsi* (LD) and *Psoas major* (PM) muscles of steers from pasture and concentrated based system.

Item		Pasture n=10		Concentrated n=10		P
Haem iron, µg/g	*Days of aging*	LD	PM	LD	PM	
	0	24.2 ± 1.8	27.5 ± 1.6	21.1 ± 0.8	24.6 ± 2.1	Diet: p<0.04,P>C Muscle: p<0.02, PM>LD
	14	22.3 ± 0.8	24.8 ± 2.1	21.6 ± 0.7	23.2 ± 0.5	Diet: NS Muscle: NS
	30	19.2 ± 0.7	21.0 ± 0.5	21.4 ± 0.8	24.9 ± 0.8	Diet: p<0.001, C>P Muscle: p<0.004,PM>LD
		Main effects Diet: NS Muscle: p<0.001, PM>LD Aging: p<0.005, 0>30				
Non haem iron, µg/g	Days of aging	LD	PM	LD	PM	P
	0	2.54 ± 0.18	1.72 ± 0.14	2.03 ± 0.16	1.40 ± 0.11	Diet: NS Muscle: p<0.01, LD>PM
	14	2.71 ± 0.17	1.61 ± 0.20	2,52 ± 0,16	2.02 ± 0.20	Diet: NS Muscle: p<0.01, LD>PM
	30	2.82 ± 0.15	1.80 ± 0.16	2.58 ± 0.12	2.30 ± 0.18	Diet: NS Muscle: p<0.01, LD>PM
		Mains effects Diet: NS Muscle: p<0.01, LD>PM Aging: p<0.05, 30>0				

Data are mean ± SEM for n=10.

III. CONCLUSION

Bovine meat contributes highly to the intake of haem iron, and this is one of the major benefits, however, the process as aging change this content through the time. A strong relationship with the muscle type is more important than feeding systems for haem iron and non haem iron. It is noteworthy that bovine meat produced on pasture is richer in haem iron but it decrease with the time of aging, whereas in concentrated meat it is stable. More research is necessary to elucidate the reasons to explain this results.

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