EFFECT OF VITAMIN E SUPLEMENTATION ON CHOLESTEROL LEVELS IN *CHARQUE*

Facco, Elizete M. P.[1] ; Carvalho Jr, Bento da C.[2]; Godoy, Helena T.[1], Lage, Moacir E.[3]
[1] – Universidade Estadual de Campinas-UNICAMP, FEA - DCA, Campinas-SP. C.P. 6121 CEP 13083-970
email: helena@fea.unicamp.br
[2] - Universidade Estadual de Campinas-UNICAMP, FEA - DTA, Campinas-SP
[3] _ Universidade Federal de Goiás-UFG, Escola de Veterinaria - Campus II, Goiania – GO. CEP: 74001-970

Introduction

The Brazilian dry meat sector comprises three beef products: *carne de sol*, *charque*, and *Jerked Beef*, which account for about 600.000 ton/year (Bliska et al, 2000). *Carne de sol* is a high water activity product (aw = 0,94-0,97) while *charque* and *Jerked Beef* are intermediate water activity products (0,75-0,77 and <0,78, respectively) that can be ketp at ambient temperature, a much prized attribute for the reduction of distribution costs. Although nowadays it is consumed all over the country primarily due to its sensorial atributes, *charque* continues to be an important source of protein for those areas lacking refrigeration facilities. *Jerked Beef*, derived from the traditional *charque*, is a cured product in which nitrite and nitrate are added in injection brine.

During *charque* processing many deteriorative reactions occur, the oxidative ones being the most important, which are favoured by the great increase in the superficial area of the meat during the preparation of *mantas* of uniform thickeness and speeded up by the osmotic dehydration in dry salting and by the exposure to light, heat and wind during sun drying. The identification and quantification of cholesterol and its oxides in *charque* are important, not only for their involvement in human health problems, specially cancer, and in other oxidative reactions (Torres et al., 1994). Although there have been studies on the vitamin E activity (tocopherol) as natural antioxidant in the meat (Buckley et al., 1995; Jensem et al., 1998; Rey et [a], 2001), data have not been found in literature on the effect of the vitamin supplementation on the quality of the dried meat and specially on its influence on cholesterol levels.

Objective

The objective of the present study was to measure the level of free cholesterol in *charque* processed with meat from animals supplemented and not supplemented (control) with alpha-tocopherol and analyse the supplementation effect.

Material and Methods

Twenty four 24 animals of the Nelore breed (*Bos indicus*) from the Department of Zootechny of the Faculty of Zootechny and Food Engineering, confined on the farm of State University of São Paulo (USP), Pirassununga, SP, were used in this experiment. The animals were separated in two groups of 12 steers. One group received the ration supplemented with alpha-tocopherol acetate (Lutavit E 50% - BASF), equivalent to 1000 mg of vitamin E /animal/day, while the control group received the same ration without the suplementation.

The animals were slaughtered in the abattoir located in the above-mentioned farm and on the following day, after chilling, one *semitendinosus* muscle of each animal was removed and sent to the Laboratory of Meat Technology of the Faculty of Food Engineering of UNICAMP, Campinas-SP, for the manufacture of *charque*, following the procedure described by Picchi & Cia, (1980). The meat pieces were cut open to a uniform thickeness of about an inch and submitted to wet salting, dry salting and sun drying until values of water activity (Aw) about 0,75 were reached.

All the analyses were carried out in duplicate in each of the 24 samples of *semitendinosus* muscle. The free cholesterol and alpha-tocopherol were assayed simultaneously by high performance liquid chromatography according to Katsandis & Addis (1999). An HP (Helwett Packard) chromatographer, model 1050, was used with: a diode array detector (DAD) (UV-Vis); a Microsorb-MV™ 5 m (4,6mx150mm) chromatographic silica column; an isocratic elution system, with an hexane:isopropanol mobile phase 99:1 (v/v) to a flow rate of 1.3ml/min. Detection of the cholesterol and alpha-tocopherol was done at 202 nm and 295 nm wavelengths, respectively. The identification was made in the same conditions by comparison with the retention time of the standards, co-chromatography and the absorbance spectra of the standard and samples obtained from the DAD detector. The degree of purity of the peak was evaluated by the software. The quantification was carried out by external standardization.

The data was submitted to analysis of variance and means comparison through the T test (Tuckey, $p<0,05$) using the Statistica software.

Results and Discussion

There was no significant difference (95%) between the control and the supplemented samples for both, cholesterol and α-tocopherol. In **Figure 1** a typical chromatograms of the *charque* sample shows the tocopherol and the cholesterol peak. The average values of cholesterol were 168,4mg/100g and 160,9mg/100g for the control and supplemented samples, respectively, while the values ranged from 147,2 to 187,8mg/100g for the control and from 129,3 to 188,7mg/100g for the supplemented samples (**Table 1**). There are few data in literature on cholesterol quantification in *charque* and other dehydrated meats. Torres et al. (1989), however, found products of cholesterol oxidation in *charque*. The amount of cholesterol in *charque* is approximately 3,5 times more than the 40mg/100g found by Bragagnolo (1997) in samples of Nelore meat.

The averages and the estimate standard deviation values for α-tocopherol concentration in the muscle portion of *charque*, in mg of α-tocopherol/100g of sample, are shown in **Table 1**. The α-tocopherol contents for the control and suplemented samples were 3,8 to 10,0mg/100g and 3,6 to 9,5mg/100g, resulting in a high coefficient of variation. The few data found in literature refer to the addition of α-tocopherol *post mortem*, therefore they cannot be compared with that of the present experiment.

A higher level of cholesterol was expected to be found in the suplemented samples due to the antioxidant action of α-tocopherol protecting cholesterol from oxidation. The concentration of α-tocopherol found in the muscle portion of the supplemented samples of *charque* is statisticaly equal to the one found in the control samples, which can explain its low antioxidant effect againts the oxidation of the free cholesterol in *charque*. Galvin et al. (2000), in a study supplementing 3000mg of vitamin E/animal/day, found that the cholesterol oxidation was inhibited.

Conclusion

The results showed that the suplementation to a concentration of 1000mg/animal/day of α-tocopherol was not enough to increase the levels of α-tocopherol in *charque*, which could reduce the level of cholesterol oxidation.

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Table 1- Cholesterol and α-tocopherol levels in the samples of the *charque*.

		Range[1]	*M±sd*[2]	*CV%*[3]
Cholesterol (mg/100g)	Control	147.2-187.8	168.4±12.8	7.6
	Supplemented	129.3-188.7	160.9±16.9	10.5
α-tocopherol (μg/100g)	Control	3.8-10.0	6.8±2.2	31.7
	Supplementated	3.6-9.4	5.8±2.4	41.0

1. Minimum and maximum values found in the 12 samples of *charque* analyzed.
2. Average and standard derivation of 12 determinations in duplicate.
3. Coefficient of variation.
There is no significant difference (95%) between the control and supplemented samples.

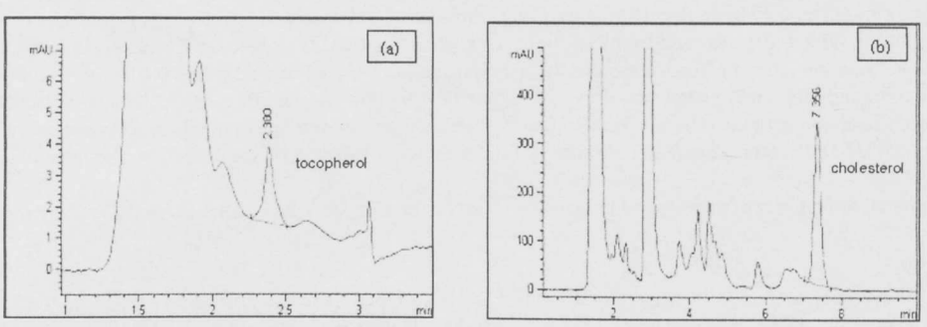

Figure 1 – Cromatogram of charqui by HPLC. Column: Microsorb-MV 5μ (4,6mx150mm). Mobile phase: hexane:isopropanol (99:1), flow rate: 1,3ml/min. Detection of α-tocopherol: 295nm (a) and cholesterol: 202nm.