INFLUENCE OF SLAUGHTER METHODS AND SEX ON CAPYBARA (*HYDROCHAERIS HYDROCHAERIS* L. 1766) MEAT QUALITY

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Background

Conservation of biodiversity in diverse area has been one of the main concerns in the developed countries justifying therefore the elevated investments in agricultural area. Thus fauna resources must be used in a rational way. Wild animals are traditionally subject to high hunt pressures by indigenous and rural populations and this type of explotation may result in the species extermination in the future.

Wild animals, like paca (*Agouti paca*), cutia (*Dasyprocta sp.*), preá (*Cavia sp.*), ratão-do-banhado (*Myocastor coypus*) and capybara (*Hydrochaeris hydrochaeris*), are usually source of profitable products such as: meat, leather and skin, and fat for medical purposes (ALBUQUERQUE, 1993). Capybara farming meat production is the activity with potential market and currently the demand for this kind of meat has been unstable due to problems of quality and prizes.

There are two methods of slaughtering: traditional and hunt. In the traditional method, animals are stunned by electric shock or using a captive bolt pistol and bleed in the slaughter house plant. In hunting method, animals are headshot, in the game farm and after some minutes carcass is skinned and eviscerated. Thus, there is no bleeding step in hunting methodology and it has been a cause of Brazilian sanitary authorities not to approve the slaughterhouse installation.

Objectives

The objective of the present study was to evaluate the effect of two slaughter methods traditional and headshot in both sex of capybara (*Hydrochaeris hydrochaeris* L. 1766) meat quality.

Material and Methods

Animals: A total of 20 animals, 13 males (M) and 7 females (F) weighing about 45.7 kg was slaughtered on July 2001. They were divided into two groups of 10 animals and submitted to traditional (TS) and heat-shot (HS) methods. In TS, animals were stunned by electric shock, using 300V and 2A for 5s, submitted to manual bleeding, scalding 60°C, skinning and eviscerating. In HS, animals were slaughtered by headshot and followed the same procedure as above. Carcasses were refrigerated at 4±1°C. Veterinarian inspector inspected all procedures.

Chemical and Physical analysis: In *longissimus dorsi m.* (LD), were determined: moisture, crude fat, protein and ash, as described in AOAC (1990). Lipid fraction (FOLCH *et al.*, 1957), cholesterol and fatty acids profile (BRAGAGNOLO, 1997) were determined in *semimembranosus m.* (SM). pH values were measured at 1, 3, 5, 7, 9, 11 and 24h *post mortem*. Other determinations were carried out in 24h post mortem LD samples: color (CIE L*a*b*), cooking loss (AMSA, 1978) and texture (WHEELER & KOOHMARAIE, 1994).

Microbiological analysis: Neck muscles were stored at 4±1°C, for 10 days, for shelf life determination by mesophilic, psychrotropic and anaerobic microrganisms, total and faecal coliforms counts (SILVA *et al.*, 1997).

Statistical analysis: Experimental design for chemical and physical analysis was completely randomized design in factoring design 2x2, with 2 slaughter methods (TS and HS) and sex (M and F). Data were analyzed by statistical program SAS version 6.12 (SAS, 1985). Experimental design for pH was "split plot" design with blocks (sex) and parcels (slaughtering method). Regression analysis was performed by statistical program Table Curve v. 2

Results and Discussion

The basic chemical composition of LD for both sex of capybara slaughtered by the two methods is shown in **Table 1**. The only significant difference observed was in the lipid content being 1.75% for M and 0.98% for F ($P<0.01$) irrespective of slaughtering methods. Fatty acids profile is shown in **Table 3**. The average values of ω6 and ω3 were 23.55 and 5.59%, respectively. Sex and slaughtering processes had no effect on polyunsaturated fatty acids and cholesterol content. Capybara meat presented relatively a low total lipid content and high crude protein values and also a nutritional adequate ω6/ω3 ratio.

Sex and slaughtering method had significant effect ($P<0.01$) on pH values as can be seen in **Figure 1**. Female and male animals presented pH values of 6.16 and 5.76, respectively after 24 h. The onset of *rigor* was faster in male samples. It can also be observed in **Fig. 1**, that samples obtained from HS process presented a lower final pH value in relation to TS method. Thus it seems that animals submitted to TS method were in a more pre mortem stressful conditions in relation to those slaughtered by HS process and it is probable that those animals presented higher amounts of residual blood in muscles (WARRIS, 1984).

In **Table 2**, the slaughter process presented significant effect ($P<0.05$) in L^* values being samples from animals slaughtered by TS method lower L* values than samples from HS method. However, male and female animals showed no effect on L^* values. Shear force was higher ($P<0.05$) in samples from HS process than in samples from TS method. Capybara meat samples from HS were paler and presented higher WB

Table 1 Basic chemical composition (%) of capybara l. dorsi m.

	Sex		Slaughter Method	
	Male	Female	Traditional	Head-Shot
Moisture	$75.57^{a} \pm 0.20$	$76.17^{a} \pm 0.27$	$75.93^{A} \pm 0.25$	$75.81^{A} \pm 0.29$
Protein	$21.95^{a} \pm 0.60$	$22.26^{a} \pm 0.50$	$22.63^{A} \pm 0.45$	$21.58^{A} \pm 0.43$
Crude Fat	$1.75^{a} \pm 0.15$	$0.98^{b} \pm 0.19$	$1.57^{A} \pm 0.17$	$1.16^{A} \pm 0.16$
Ash	$1.05^{a} \pm 0.02$	$1.12^{a} \pm 0.03$	$1.05^{A} \pm 0.03$	$1.12^{A} \pm 0.03$
Cholesterol (mg/100g)	$26.99^{a} \pm 2.92$	$29.21^{a} \pm 4.01$	$26.97^{A} \pm 3.64$	$29.23^{A} \pm 3.42$

Means followed by a common letter are not different (P>0.05) by Test t. In lines, minuscule letters to differentiate sex and capital letters to differentiate slaughter method/ * Cholesterol fraction was determined in *semimembranous m.* by (BRAGAGNOLO, 1997)

Table 2 Color (CIE L*a*b*), Cooking loss (CL) and shear force (SF) of capybara *l. dorsi m.*

	Sex		Slaughter method	
	Male	Female	Traditional	Head-Shot
L*	$31.89^{a} \pm 0.72$	$30.09^{a} \pm 1.00$	$29.58^{B} \pm 0.90$	$32.40^{A} \pm 0.85$
a*	$14.08^{a} \pm 0.75$	$14.32^{a} \pm 1.03$	$14.72^{A} \pm 0.93$	$13.69^{A} \pm 0.88$
b*	$0.34^{a} \pm 0.27$	$0.68^{a} \pm 0.37$	$0.35^{A} \pm 0.33$	$0.67^{A} \pm 0.31$
CL (%)	$29.05^{a} \pm 2.11$	$28.21^{a} \pm 3.32$	$24.93^{A} \pm 3.03$	$32.33^{A} \pm 2.46$
SF (kgf/g)	$4.43^{a} \pm 0.26$	$4.58^{a} \pm 0.36$	$3.97^{B} \pm 0.33$	$5.04^{A} \pm 0.31$

Means followed by a common letter are not different (P>0.05) by Test t. In lines, minuscule letters to differentiate sex and capital letters to differentiate slaughter method.

value than TS although samples with WB of 5.04 kgf/g are also considered to be tender (KOOHMARAIE, 1994).

In **Figure 2**, animals slaughtered by HS method presented lower values of anaerobic microrganisms counts in relation to samples from TS process, supported by the results of final pH values discussed above. For both slaughtering methods, total and faecal coliforms counts were considered low (data not available), indicating adequate conditions of hygiene during slaughtering processes. After 9 days of the slaughtering, the refrigerated capybara meat samples from both slaughtering processes studied, acquired spoilage-like appearance promoted by psychrotropic microbial growth as shown in **Figure 3**. Results of microbiological analysis indicated that refrigerated capybara meat samples from TS and HS slaughtering methods should be consumed within 4 and 5 days after slaughtering, respectively, when counts of microorganisms exceeded 5 log UFC/cm^2 and the product became improper for consume.

Table 3 Fatty acids profile of *semimembranosus m.* from capybara

Fatty Acids	Sex		Slaughter Method	
	Male	Female	Traditional	Head Shot
C14:0 myristic	$3.33^{a} \pm 0.27$	$3.95^{a} \pm 0.37$	$3.93^{A} \pm 0.33$	$3.35^{A} \pm 0.31$
C16:0 palmitic	$27.34^{b} \pm 0.94$	$31.80^{a} \pm 1.29$	$29.78^{A} \pm 1.17$	$29.35^{A} \pm 1.10$
C18:0 stearic	$7.33^{a} \pm 0.34$	$5.80^{b} \pm 0.46$	$5.60^{A} \pm 0.42$	$7.53^{B} \pm 0.39$
C18:1ω9 oleic	$26.65^{a} \pm 1.27$	$27.13^{a} \pm 1.74$	$28.05^{A} \pm 1.58$	$25.73^{A} \pm 1.49$
C18:2ω6 linoleic	$21.34^{a} \pm 1.23$	$17.04^{a} \pm 1.69$	$18.97^{A} \pm 1.53$	$19.41^{A} \pm 1.44$
C18:3ω3 α-linolenic	$5.04^{a} \pm 0.37$	$4.89^{a} \pm 0.55$	$5.06^{A} \pm 0.47$	$4.87^{A} \pm 0.49$
C20:4ω6 arachidonic	$3.44^{a} \pm 0.68$	$3.45^{a} \pm 1.01$	$3.00^{A} \pm 0.85$	$3.89^{A} \pm 0.89$
C20:5ω3 (EPA)	$0.51^{a} \pm 0.10$	$0.45^{a} \pm 0.14$	$0.45^{A} \pm 0.12$	$0.52^{A} \pm 0.12$
C22:6ω3 (DHA)	$0.18^{a} \pm 0.02$	$0.18^{a} \pm 0.03$	$0.16^{A} \pm 0.03$	$0.20^{A} \pm 0.03$
Total ω3	5.73	5.52	5.67	5.59
Total ω6	25.95	21.11	22.6	23.99

Means followed by a common letter are not different (P>0.05) by Test t. In lines, minuscule letters to differentiate sex and capital letters to differentiate slaughter method.

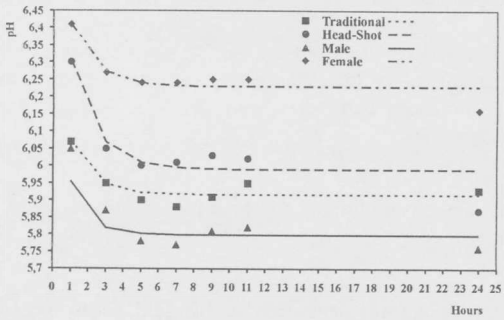

Figure 1 pH values of capybara LD muscle

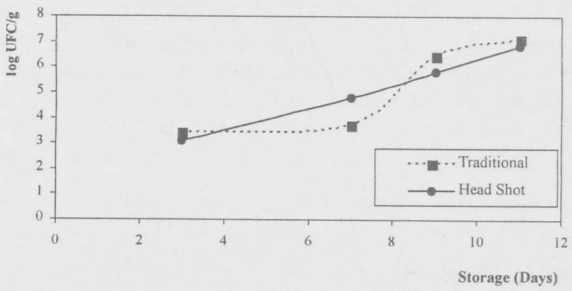

Figure 2 Anaerobic counts (log UFC/cm^2) of capybara meat (4±1 °C)

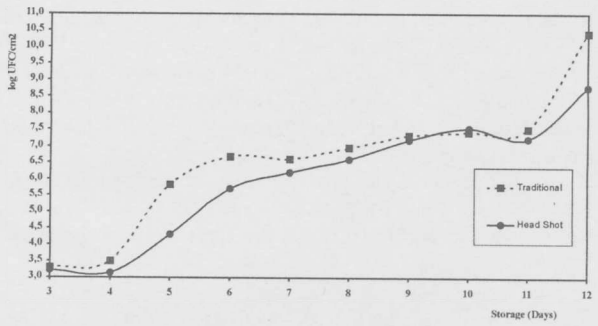

Figure 3 Psychrotropic counts (log UFC/cm^2) of capybara meat (4±1 °C)

Conclusions

Our results indicated that the head-shot process was the best technique for slaughtering capybara and male animals presented better meat qualities.

Acknowledgments

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