BIOLOGICAL EVALUATION OF CHARQUI MEAT PROTEIN QUALITY

F. A. Garcia[1], I. Y. Mizubuti[2], M. Y. Kanashiro[1], C. H. M. P. Gomez[1] & M. Shimokomaki[1*]

[1]Department of Food and Drugs Technology, [2]Department of Animal Science, Agricultural Sciences Centre, Agricultural Sciences Center, Londrina State University, P.O. Box, 6001, CEP 86051-970-Londrina, PR, Brazil. Email: mshimo@uel.br

Background

Charqui is a typical salted and dry Brazilian meat product. It is the result of application of the so-called hurdle technology in its processing (Leistner, 1987). As described, salt, sodium nitrite, dehydration and packaging are hurdles sequentially applied to inhibit deteriorating microorganisms (Shimokomaki, et. al., 1998, 2003). In addition, a harsh condition for salting and drying during charqui processing could eventually damage its biological value. Therefore protein quality of raw and cooked charqui meat flours was chemical- and biologically evaluated by rat growth and nitrogen balance studies.

Materials and methods

Sample preparation: Charqui samples were prepared following closely the processing method already described in Shimokomaki et al. (1998) using *Vastus lateralis* muscle. Ready charqui samples were desalted until NaCl content reached the value of app. 0.70% (AOAC, 1996). Chemical analysis: Amino acid composition was determined following the methodology described by Spackman et al. (1958). Percentage of moisture, fat, protein, and ash was determined by the AOAC methods (1996). Animal test was carried out with diets as described in Garcia et al (2001). *Composition of diets:* Diets contained flours of raw and cooked charqui were offered to two groups of ten rats each. The third group was fed on a casein (INLAB) diet as control. *Growth experiment:* It was carried out as described in Garcia et al (2001). The following biological measurement was performed: Protein efficiency ratio (PER), Consumed Protein, *Nitrogen balanc, T*rue digestibility (TD), Net Protein Retention (NPR) and Net Protein Utilisation (NPU). *Statistical analysis:* The data were subjected to analysis of variance (ANOVA) in a completely randomised design to determine the significant differences among various groups (Statistical Analysis Systems, 1989).

Results and discussions

Charqui meat approximate chemical composition

Flour prepared from raw and cooked samples presented the final chemical composition as shown in Table 1.

PER and NPR

Food intake and body weight gain on the casein (control) were the highest (59.92 and 123.52 g per rat, respectively) and differed significantly ($p<0.05$) from other diets where food intake and body weight ranged from 37.08 to 42.91 g per rat and 73.98 to 87.76 g, respectively (Table 2). Although the body weight gain was higher in the group fed on cooked charqui meat flour diet, the difference was not significant ($p>0.05$) in comparison to raw charqui meat flour. Casein diet had a PER of 2.33, although not significant, this value was the highest in comparison to raw and cooked charqui meat flour diets of 1.99 and 1.91, respectively. The corrected PER values followed similar pattern of 2.50, 2.15 and 2.07, respectively for casein, raw charqui meat and cooked charqui meat flour diets. NPR was shown to be highest for casein (2.26) in comparison to raw and cooked charqui meat flours (1.67 and 1.89, respectively), although these values were not significantly different ($p>0.05$). *Nitrogen consumption, absorption, digestibility, BV and NPU*

Nitrogen consumed, nitrogen absorved and nitrogen retained were significantly ($p<0.05$) higher in animals fed with casein and those fed with cooked charqui meat presented higher values than those fed with raw charqui meat flour.

True digestibility was the lowest ($p<0.05$) for raw sample when compared to cooked flour which was not different from casein diet. It seemed that heat treatment improved digestibility by changing some protein components in particular collagen fraction which was denatured. Insoluble collagen fraction is a important component of charqui meat (Shimokomaki et al., 1998) and by gelatinizing it would make it to be more feasible to be metabolized. Biological value was observed to be significantly ($p<0.05$) the highest in control sample (96.92%) in comparison to raw charqui meat and cooked charqui meat (84.49 and 88.06%, respectively) (Table 3).

Conclusions

The dramatic processing conditions did not change substantially the biological values of the desalted charqui meat.

Acknowledgements

FAG was under CAPES scholarship, MYK is a CNPq/PIBIC-UEL undergraduate student and MS and IYM are CNPq Research Fellows.

References

A.O.A.C. (1996).. Official Methods of Analysis, 1298p. Garcia, et al. (2001) Food Chem. 75:19-23. Leistner, L. (1987). Rockland, L and Beuchat, L. B. (eds.) Water activity theory and application to food, Marcel Dekker Inc., New York, pp.295-328. Shimokomaki, et al. (1998). *Food Reviews International* 14: 339-349. Shimokomaki, et al. (2003) Curing. Encyclopedia of Food Science and Nutrition, (London), Academic Press, in press. Spackman, et al.(1958). *Analytical Chemistry, 30*: 1190-1206. Statistical Analysis Systems (1989). SAS user's Guide. 5°. ed. Cary, NC, 956p.

Table 1. Approximate chemical composition of Raw Charqui Meat Flour (RCMF) and Cooked Charqui Meat Flour (CCMF) (%) in dry basis.

Samples	Moisture	Protein	Ash	Lipid
RCMF	3.95 ±0.10	74.18 ±0.32	0.71 ±0.05	20.06 ±0.26
CCMF	4.70 ±0.09	81.06 ±0.01	0.58 ±0.01	13.52 ±0.06

*Values are means ± SD of triplicate analysis.

Table 2. Food intake, protein intake, body weight gain of rats, PER* and NPR of Raw (RCMF) and Cooked Charqui Meat Flours (CCMF).

Dietary groups	Body weight gain (g)	Food intake (g)	Protein intake (g)	PER	Corrected PER**	NPR
Casein	123.52a ±2.36	59.92a ±0.79	5.38a ±0.12	2.33 ±0.61	2.50	2.26 ±1.02
RCMF	73.98b ±7.53	37.08c ±1.92	3.64a ±0.19	1.99 ±1.29	2.15	1.67 ±1.46
CCMF	87.76b ±4.30	42.91b ±1.24	5.78a ±1.10	1.91 ±2.81	2.07	1.89 ±4.82

*Values are means ± SD of ten rats in each group throughout 28 days of experimental period. **Based on values of 2.5 as standard for casein RCMF= Raw charqui meat flour. CCMF= Cooked charqui meat sample

Table 3. Nitrogen consumed, Nitrogen absorved, Nitrogen retained, TD, BV and NPU values* of Raw and Cooked Charqui Meat Flours (RCMF and CCMF, respectively) fed to rats measured after second and third weeks of experiment.

Dietary group	Nitrogen consumed (g)	Nitrogen absorbed (g)	Nitrogen retained (g)	BV	NPU	TD
Casein	0.44a ±0.01	0.42a ±0.01	0.41a ±0.01	96.92a ±1.90	94.56a ±1.99	97.55ab ±0.68
RCMF	0.27c ±0.01	0.25c ±0.01	0.21c ±0.01	84.49b ±1.90	81.39b ±1.99	96.34b ±0.68
CCMF	0.33b ±0.01	0.32b ±0.01	0.28b ±001	88.06b ±1.90	87.68ab ±1.99	99.55a ±0.68

*Values are means ± SD of 10 rats in each group