NUTRITIONAL EVALUATION OF BOVINE SPLEEN AND LIVER CONCENTRATES.

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SUMARY: Bovine spleen and liver concentrates were analized in order to evaluate their nutritional value by means of chemical and biological criteria. It was determinated their amino acidic composition and the nitrogen balance in rats. All quality index were satisfactory. An integral evaluation of the results let us to suggest the utilization of tested concentrates in food products manufacture as meat extender or protein enricher.

INTRODUCTION: The increasing unbalanced state between world's food resources and population's nutritional needs, determines a new priority, with a great emphasis in the importance of protein quality and its evaluation. When food's scarcity is a worldwide problem, it is necessary a rational use of nutritional resources.In developing countries, demographic expansion is causing great problems in food reserves, therefore there will be very little opportunity to increase the proteinic quality of basic vegetable foodstuffs and at the same time to recuperate agricultural recoverable wastes at maximum levels.

In Cuba, large amounts of bovine organs are wasted during the slaugthering. Putting in practice a simple technological process, much of these proteinic products could be used with different nutritional proposes.

The aim of this paper is the nutritional evaluation of protein concentrates from bovine organs, such as liver and spleen upon chemical and biological parameters.

MATERIALS AND METHODS: Spleen and liver protein concentrates (SPC and LPC) were obtained from respective cattle organs deflected from human consumption at the salugther-areas. The obtaintion was based on the methodology established by Lantero et al (1985) by alkaline solubilization followed by isoelectric precipitation.

Tryptophan content was determined (Miller, 1967) in these concentrates previous alkaline hydrolisis (Lucas and Sotelo, 1980), besides amino acidic composition was determined in automatic amino analaiser. Latter, chemical score and limiting amino acid were established in relation to protein pattern proposed by FAO/WHO (1985) and Osser-Mitchel Index (OMI) was calculated comparing to protein egg; "in vitro" digestibility was also determined (Ackesson and Stahmann, 1964).

The nitrogen balance study was carried out according to the methodology proposed by Mitchell (1924).Winston strain rats were used in the biological assays. The animals, without take into consideration the sex, and with a weight of 60-65g each, were

distributed in four groups of 8, and kept in individual metabolic cages. The room temperature was 26°± 1°C and the ilumination regime was 12 hours. A first group was offered a diet where the protein fraction came from SPC, while a second group was fed with LPC. The diet was prepared considering the recomendations proposed by AOAC (1985) and each animal received approximatly 150 mg N and 10 g of dry material. A third reference group was fed a diet fortificated with 1% DL metionine, and endogenous nitrogen was determined in faeces and urine of animals fed with whole defatted egg protein at 4%.

True Digestibility (TD), Biological Value (BV), Net Protein Utilization (NPU) were established for the experimental concentrates.

RESULTS AND DISCUSSION: Tryptophan content in SPC and LPC was respectibly 9,7 ± 0,23 and 15,6 ± 0,15 mg/16g N, values comparable with reported to the reference pattern (FAO,1985) amd superior for the LPC. Table 1 presents essential amino acidic content of SPC and LPC and their comparison with the reference pattern.

The attainement of a deeper scientific knolegment conducted to the evolution of the criteria in relation with the esential amino acidic requirements of human kind. In relation with these, in accordance with the actual reference pattern, the SPC and LPC satisfy in more than 100% the esential amino acidic requirements of an adult man, which support the good quality of these proteins.

Besides, the relative high content of lysine represents a good criteria, considering that this amino acid is among the group that has more interactions with another compounds ,as for example, the reducing sugars, with the carbonyl groups and the epsilon-amino group belonging to the amino acids, of high reactivity.

Table 2 shows some chemical index about the proteinic quality form the concentrates studied in the prresent paper, noticing the high ratio esential amino acids to non esential amino acids and a high value of chemical score.

On the other hand, OMI and BV, as it is established, were calculated taking account the amino acidic composition of egg protein. Considering, that this protein satisfies the essential amino acids requirements of adult man in more than 160% approximatly, the OMI and BV calculated may be considered satisfactories, although inferior to some proteins wich exhibit a very high proteinic quality as caseinate. This protein presents OMI 93,55 and calculated BV 90,27% (Yanez, 1985).

The level in wich a dietetic protein is digested is an important factor in a protein quality. Protein concentrates by the action of pepsine and pancreatine showed a higher degradation level than reported for other sources.

Table 3 shows the results obtained in the nitrogen balance study. The casein offered diet exibit the higher values, wich significantly differ from experimental diets. There were no difference between the diets of SPC and LPC. Nevertheless, protein concentrates showed good results in comparison with another proteinic foods from the human diet (Grigoravchili, 1981).

Table 1. Essential amino acids in SPC and LPC. Comparison with standard.

Amino acids (g/16 gN)	Standard (1)	SPC	Amino acidic ratio	LPC	Amino acidic ratio.
Isoleucine	1,3	5,1	3,92	2,5	1,92
Leucine	1,9	5,1	2,68	4,5	2,37
Lisine	1,6	5,9	3,69	5,7	3,56
Phenilalanine-tirosine	1,9	7,7	4,05	5,2	2,74
Methionine-cystine	1,7	3,2	1,88	3,0	1,76
Treonine	0,9	4,3	4,78	3,3	3,67
Valine	1,3	4,5	3,46	3,0	2,31
Tryptophan	0,5	0,9	1,80	1,6	3,20

(1) Aminoacidc requirements for adult man. FAO/WHO, 1985

Table 2. Chemical index of proteinic quality of SPC and LPC.

Index	SPC	LPC
Essential amino acids (g/16 g N)	36,7	28,8
Sulfur amino acids (g/16 g N)	3,2	3,0
Aromatic amino ácids (g/16 g N)	7,7	5,2
EAA/NEAA	0,83	0,86
Chemical score	1,80	1,76
Limiting amino acid (1)	Tryptophan	Methionine +cystine
OMI	73,88	78,28
BV (%)	68,84	73,62
"In vitro" digestibility (%)	89,5	91,5

(1) Considering the pattern proposed by FAO/WHO (1985) for adults.

Table 3. Biological indices of SPC and LPC

Diet	BV (%)	D (%)	NPV (%)	Weight gain (g)
Casein	92,0 a	99,5 a	91,5 a	29,4 a
SPC	73,4 b	93,5 b	69,2 b	22,0 b
LPH	74,1 b	92,2 b	68,4 b	19,6 b

Mean values without letter in common differ at $p < 0,05$

CONCLUSIONS: The amino acid composition of SPC and LPC satisfies in more than 100% the adult man requirements, being tryptophan and sulfur amino acids the less abundant ones. Chemical index of protein quality showed good results for both concentrates and the nitrogen balance biological assays support the good quality of these proteins. The obtained results let us to suggest the utilization of SPC and LPC as meat extensors, protein enrichers or as fundamental protein source of different formulae.

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