التقدير الكمى والكيفى للأحماض الأمينية فى لبن الجاموس المصرى

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الملخص

أجرى التقدير الكمى والكيفى للأحماض الأمينية فى اثنى عشر عينة جماعية من اللبن الجاموسى ، حيث تم فصل سبعة عشر حامض أمينى من بروتين اللبن وقورنت بمثيلاتها فى بروتين البيض وبروتين اللبن البقرى تبين من النتائج أن بروتين اللبن الجاموسى غنى بالأحماض الأمينية مثل المثيونين والفنيل الأنين والثالين بالمقارنة لمثيلاتها فى اللبن البقرى وعند مقارنته بالأحماض الأمينية فى بروتين البيض تبين أن الثالين والفنيل ـ الأنين والمثيونين أعلى فى بروتين اللبن الجاموسى بينما الثربوفين والأرجنين وحمض الأسبرتيك والسيستين واللابسين والسيرين وجدت أقل من مثيلاتها فى بروتين البيض . كما أثبت البحث أن اللبن الجاموسى غنى بالثالين ويوصى بأستعماله كأضافة للأطعمة الفقيرة اليه .

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EVALUATION OF AMINO ACID PATTERN OF EGYPTIAN BUFFALOES MILK

(With 1 table)

By

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(Received at 27/ 5/ 1975)

SUMMARY

Qualitative and quantitative determination of the amino acid pattern in buffaloe's milk have been carried out in 12 bluk milk samples collected from lactating buffalo-cow's Seventeen amino acids have been identified and compared with the amino acid contnet of egg protein as well as cow's milk protein. Buffalo's milk protein was found rich in the essential amino acids, methionine, phenylalanine and valine compared to cow's milk protein. Compared with egg protein, the animo acids, valine, phenylalanine and methinonine showed higher values. whereas thireonine, arginine aspartic acid, cystine, glycine and serne were found lower. Buffalo-cow's milk was found particularly rich in valine, which recommend its use as a supplement to a valine difficien diets.

INTRODUCTION

The amino acid content of milk is one of the most important factors that limit its nutritive value. More than twenty amino acids have been reported to be present in cow's milk protein hydrolysates, (Casein, lactalbumin and lactglobulin).

The amino acid content of cow's milk has been thoroughly investigated and the content of each protein fraction was determined by several workers (WILLIAMSON, 1945; BLOCK and WEISS, 1956; VANSTONE and DOUGALL, 1960 and MACY and KELLY, 1961).

Although intensive work had been carried out on cow's milk dealing with its amino acids content, yet, little work could be traced in the literature concerning buffaloe's milk (RAJ and JOSHI, 1955 a & b and VENKATESWARA, 1956 in India and ABD EL-SALAM, REFAAT, FAHMI and EL-SOKKARY, 1964 in Egypt). GANGULI, PRABHAKARAN and LYA 1964 hold a comparison between few amino acids in casein and milk protein of buffaloes, cows and goats.

Investigation of amino acids content in milk of Egyptian buffaloes may throw light on the qualitative and quantitative aspects of these essential nutrients and in turn enable comparison with other milk or egg proteins.

This type of investigation may assess the adequacy of buffaloe's milk with respect to amino acids and may clarify, how far such milk; can satisfy the requirements of calves or human consuming this milk.

MATERIAL AND METHODS

Amino acids content in buffaloe's milk protein have been determined in 12 bulk milk samples, collected from the lactating buffalo-cows of the experimental farm of the National Research Centre, Cario.

For qualitative and quantitative determination of amino acids content in buffaloe's milk, the following procedure was carried out:

1.—Milk proteins was precipitated with an excess of freshly pepared 50% trichloroacetic acid at 0. °C for 24 hrs (BLOCK and BOLLING, 1946).

2.—Acid hydrolysis of a sample of milk protein containing 1.6 mg of nitrogen was carried out in a sealed pyrex tube with 10 ml of 6N HCL for 20 hrs (BLOCK, 1950).

3.—Amino acids in acid hydrolysate of milk proteins were determined using the two-dimensional paper chromatography technique described by LEVY and CHUNG (1953).

Tryptophan was determined in alkaline hydrolysate of milk proteins by the colorimetric method of PEINSKA, CHAREZINSKI, and BERBEC (1963).

Standard curves for each single amino acid using authentic amino acid preperations of known concentrations.

RESULTS

The table showed the amino acid pattern of buffaloe's milk protein as revealed by paper chromatography technique used. The data are expressed in terms of mg/100 ml milk and as g/16g N. The same table containing the data of amino acids pattern of cows' milk and the whole egg protein as reported by BLOCK and WEISS (1956). Besides, the precentage of amino acids of buffaloe's to the similar ones in the whole egg-protein is mentioned.

DISCUSSION

The amino acid pattern of buffaloe's milk protein obtained in the present study together with the values reported by BLOCK and WEISS, (1956) for the essential and non-essential amino acids of cow's milk protein and whole egg protein are given in Table . Egg protein is usually considered to be an ideal protein containing all the essential amino acids and in adequate and right proportions (MACY and KELLY, 1951). The nutritive value of other proteins is assessed by a direct comparison of the amino acid compostition of the protein with that of egg protein.

As shown from the Table; seventeen amino acid could be seperated in hydrolysates of milk proteins including both essential and non-essential ones. Of the essential amnio acids, isoleucine, leucine, lysine, methionine, phenylalanine, thireonine and valine were identified. Tryptophan was detected in alkaline hydrolysate of milk protein. The non-essential amino acid, alanine, arginine, aspartic acid, cystine, glutamic acid, glycine, histidine, serine and tyrosine were also found.

TABLE Amino Acid Composition of Buffaloe's milk Protein

Amino Acid	Buffalo (mg/100 ml)	Milk (g/16 gN)	Cow Milk* (g16gN)	Whole Egg Protein (g/16gN)	%to Whole Egg Protein
I.—*Essential*					
1. Isoleucine + Leucine	627.00±61.89	15.7	16.2	6.9 / 9.4 } 16.3	96.3
2. Lysine	269.25±25.59	6.7	7.8	6.9	97.1
3. Methionine . . .	139.63±35.98	3.5	2.5	3.3	109.1
4. Phenylalanine . .	288.88±45.72	7.2	4.9	5.8	124.1
5. Thireonine . . .	150.38±16.18	3.8	4.6	5.0	76.0
6. Tryptophan . . .	53.60± 5.23	1.3	1.4	1.6	81.3
7. Valine	456.88±69.47	11.4	6.4	7.4	154.0
II.—*Non-essential*					
1. Alanine	96.90±11.64	2.40	3.5	—	—
2. Arginine	119.60± 7.51	2.99	3.7	6.7	44.8
3. Aspartic Acid .	218.30±14.09	5.50	7.3	8.2	67.1
4. Cystine	27.00± 9.52	0.68	0.9	2.3	29.6
5. Glutamic Acid .	642.90±44.03	16.07	23.4	12.6	127.5
6. Glycine	64.60± 3.60	1.62	2.0	3.6	4.4
7. Histidine	89.90± 6.78	2.25	2.6	2.4	95.8
8. Proline	—	—	11.1	4.5	—
9. Serine	180.40± 8.81	4.51	5.9	7.8	57.69
10. Tyrosine	176.00± 7.33	4.40	5.1	4.1	107.30

* BLOCK and WEISS (1956)

Concerning the amino acid composition of buffaloe's milk the present results compared favourable with that reported by RAJ and JOSHI (1955), and VANKATESWARA (1956), Although the latter authors analysed the essential amino acids only. ABD El-SALAM, RIFAAT, FAHMI and El-SOKKARY (1964) compared between the amino acid content of buffalo and cow milk casein. Their results had showed that both caseins composed of the same amino acids qualitatirvely and nearly quantita ively.

On comparing, the values obtained for the amino acids content of buffaloes milk with that of cow's milk given by other authors (BLOCK and WEISS, 1956; DUGENEV and MEDEDAVE, 1960 a & b and GANGULI and PAUL, 1962), insignificant differences could be detected between the amino acid content of milk protein from buffaloe's or cow's milk qualitatively. (comparing the amino acids level of Egyptian buffaloe's obtained in this study with that of cow's given by MACY and KELLY (1961), the present samples are characteristically rich in th essential amino acids methionine, phenylalanine and valine. Their values in buffaloe's milk are nearly double their values in cow's milk, (table).

When the amino acid content of buffalce's milk protein was calculated as g/16g Nitogen and compared with the corresponding amino acids in egg protein, some amino acids showed higher values, while others were either low or similar. Of the amino acids that showed higher values are valine, phenylalanine, methionine, glutamic acid and tyrosine. Threonine, arginine, aspartic acid, cystine, glycine and serine were found lower.

The essential amino acid content of buffaloe's milk protein as estimated in this study are about from 2-4 times its value in human milk (LACY and KELLY, 1961). If the amino acid requirement of infants are considered, 150-200 ml of human milk is needed to supply most of amino acids required by babies of 1-5 months age. On using buffaloe's milk a quarter to half of this amount is sufficient of satisfy the baby's requirements of amino acids, Moreover the buffaloe's milk is particularly rich in valine (456.88$\pm$ 69.74 mg/100ml) compared to its content in human milk (90.0 mg/100 ml). This makes it benifical as a supplement to breast milk for mothers of restricted milk secretion.

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