

AVAILABLE LYSINE AS AN INDEX OF DIETARY PROTEIN QUALITY

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ABSTRACT

Seven diets commonly consumed in this country were used to test the relationship between available lysine determined chemically and net protein utilization (NPU) measured biologically in N-balance experiments with growing rats. Significant Correlation ($r=0.92$) between available lysine and NPU of proteins with lysine as limiting amino acid was found. Available lysine determination may be regarded as a rapid and efficient method for evaluating protein quality in breeding programmes and also for quality control in food processing.

INTRODUCTION

The quality of a food protein depends on its content of amino acids and their availability. The availability of amino acids varies with the protein source, processing treatments and interaction with other dietary components. Because of the extreme importance of lysine in the diets attempts to measure its nutritional availability in all types of protein containing foods have been made using biological evaluation studies (Gupta *et al.*, 1958; Ousterhout *et al.*, 1959) and chemical analyses (Carpenter & Booth, 1973).

The technical difficulties and costs associated with biological evaluation demand reliable chemical method for measuring available lysine in mixed diets. A significant correlation has been shown to exist between available lysine determined chemically and chemical score (Almas & Khan, 1981). In this paper, the available lysine estimated chemically and its relation with the protein quality of mixed diets measured biologically in N-balance experiments with rats was studied.

MATERIALS AND METHODS

SELECTION AND PREPARATION OF DIETS

Seven common diets consisting of wheat bread, meat, skimmed milk, Bengal grain, potato, spinach, green peas, beans and mustard leaves were selected and prepared according to traditional cooking practices (Khan & Eggum, 1978). All the samples were freeze dried, ground and analysed for dry matter and nitrogen content.

BIOLOGICAL TRIALS

The experimental procedure has been described by Eggum (1973). Groups of five Wistar male rats weighing approximately 75 g were used. The preliminary period lasted for 4 days and the balance period for 5 days. The rats were weighed at the beginning of the experiments and divided into groups of five such that the average weights of the groups differed by no more than ± 0.5 g. Weighing was repeated at the end of preliminary and balance periods, access to feed and water was restricted 3 hours before weighing. Each animal received 150 mg N and 10 g dry matter daily throughout the preliminary and balance periods. The N content of the diet was adjusted by using a N-free mixture at the expense of autoclaved potato starch to be measured in N-balance experiment with rats.

AVAILABLE LYSINE

Available lysine was determined by dye binding capacity (DBC) method according to Hurrell & Carpenter (1975).

RESULTS AND DISCUSSION

The available lysine content of diets and their NPU values are given in table I.

Lysine was found to be the limiting amino acid in all the diets. It is evident (Table I) that there is direct relation between available lysine content and NPU of the protein of the diet. The relationship is given in the following regression equation.

$NPU = 42.17 + 7.52 \times \text{available lysine (g/16gN)}$.

The following values were obtained.

$r = 0.92$ $s \equiv 2.63$ $sb = 1.43$

Where 's' is deviation from regression and 'sb' is the deviation of the regression coefficient. The regression coefficient differed significantly ($P < 0.01$) from zero and the relationship is illustrated in Fig. 1.

Table I. Available lysine and net protein utilization of diets.

Diets	Available lysine (g/16gN)	Net Protein Utilization (%)	Limiting amino acid
Wheat bread meat + potato	2.5	65.0	Lysine
Wheat bread Bengal gram	2.3	60.0	Lysine
Wheat bread spinach + potato	2.0	54.0	Lysine
Wheat bread green peas + potato	2.4	61.0	Lysine
Wheat bread beans	3.0	63.0	Lysine
Wheat bread mustard leaves, skimmed milk	3.9	70.0	Lysine
Wheat bread ghee, sugar, skimmed milk	3.8	72.0	Lysine

The results showed that there is significant correlation between available lysine and NPU of protein with lysine as limiting amino acid. Similar correlation between available lysine and CS (Almas & Khan 1981) and between CS and NPU (Khan & Chaudhry, 1981) have been reported. The available lysine determined chemically by DBC method in the present study may be regarded as a rapid and efficient technique for evaluating protein quality.

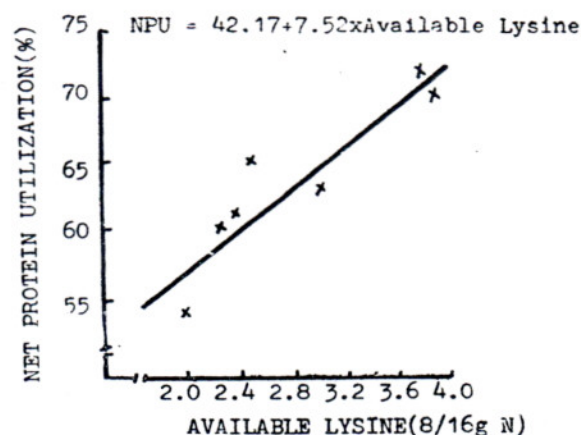


Fig. 1. Available Lysine in relation to Net Protein Utilization.

ACKNOWLEDGEMENT

The author wishes to express his thanks to Miss Dr. K. Almas for analysing the samples for available lysine.

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