

RELATIONSHIP BETWEEN CHEMICAL AND BIOLOGICAL  
METHODS OF EVALUATING PROTEIN QUALITY

M. Akmal Khan\*, H. M. Chaudhry

The reliability of predicting protein quality from chemical score (CS) was tested by analysing fifteen dietary proteins for their amino acid contents and compared with net protein utilization (NPU) values determined biologically in N-balance experiments with growing rats. According to FAO 1973 scoring pattern, lysine was found to be the limiting amino acid. Significant high correlation ( $r=0.95$ ), between CS and NPU was obtained. It was concluded that CS may be used in forecasting the nutritive values of a protein from its chemical analysis.

INTRODUCTION

The estimation of protein quality based on the amino acid contents is particularly important when it is not possible to apply methods of biological measurement. This quality factor may be taken into account both in assessing protein requirements and in shaping food policy (FAO/WHO, 1971). Significant correlation has been shown to exist between BV and CS based on egg protein and amino acid mixture (Mitchell and Block, 1946), target mixture (Bender, 1954, 1958, 1960, 1965) and egg protein and FAO/WHO-1973 scoring pattern (Duggal and Eggum, 1977). Recently Almas and Khan (1981) showed a significant correlation between CS based on Bender's Target mixture and available lysine determined chemically in diets consisting of cereals and legumes.

As the biological assays are long, laborious and reputedly inaccurate to carry out, an attempt has been made to study the relationship between NPU of various dietary proteins determined biologically in N-balance experiments with rats and CS based on FAO-1973 scoring pattern.

MATERIALS AND METHODS

Fifteen food samples consisting of cereals proteins, commercial and home made baby foods and common diets based on wheat bread, legumes, vegetables, meat and skimmed milk were selected for this study. Wheat and

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\*Department of Nutrition, University of Agriculture, Faisalabad, Pakistan.

barley breads, baby food and seven common diets were prepared according to traditional cooking methods. This chemical composition including the amino acid analysis, chemical score based on FAO-1973 scoring pattern and net proteins utilisation of the samples were determined (Khan and Eggum, 1978, 1979).

### RESULTS AND DISCUSSION

The CS of dietary proteins and their NHU values are given in Table 1.

Table 1. Comparison of Chemical Score with Net Protein Utilization

Protein Source	Limiting amino acid	Chemical Score	Net Protein Utilization
Wheat flour	Lysine	49	53
Barley flour	Lysine	63	62
Sorghum flour	Lysine	46	51
Triticale flour	Lysine	61	61
Barley bread	Lysine	62	58
Wheat Porridge	Lysine	52	57
Farex	Lysine	60	60
Halwa Suji + Baysen	Lysine	71	74
Wheat bread + meat potato	Lysine	65	65
Wheat bread + Bengal gram	Lysine	62	60
Wheat bread + spinach potato	Lysine	50	54
Wheat bread + green peas potato	Lysine	61	61
Wheat bread + bean	Lysine	63	63
Wheat bread + mustard leaves, skimmed milk.	Lysine	73	70
Wheat bread + ghee, sugar, skimmed milk	Lysine	74	72

Lysine was found to be the limiting amino acid in all the samples. A calculation of the regression of these samples with lysine as limiting amino acid (Table-1) produced the following equation :-

$$\text{NPU} = 0.75 \times \text{CS} + 15.65$$

$$s = 2.14 \quad s_b = 0.07 \quad r = 0.95$$

#### CORRELATION BETWEEN CS AND NPU

The regression coefficient differed significantly ( $P < 0.01$ ) from zero and the relationship is illustrated in figure-1.

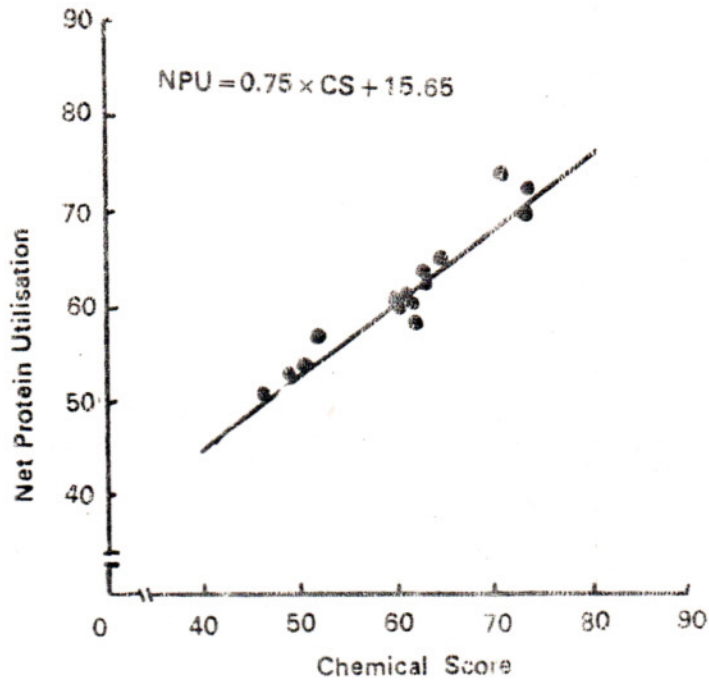


Fig. 1. Relationship between chemical score and net protein utilisation

The high values of correlation coefficient, 0.95 obtained, showed that there is significant correlation between NPU and CS for proteins with lysine as limiting amino acid. It is evident from the results that nutritive value of a protein can be predicted from its chemical analysis. As the biological methods suffer from various disadvantages (Bender, 1973) it is suggested that CS could be used for forecasting the nutritive value of protein foods. Though there are also drawbacks, this method still provides more information that could be applied to practical feeding conditions.

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