SYMPOSIUM ON NONSPECIFIC NITROGEN IN THE NUTRITURE OF HUMAN BEINGS

Introduction

Will a particular diet meet the protein needs of a specific individual? To what degree? If less than optimal, what can be done to improve it?

Nutritionists, biochemists, food scientists, and professionals from allied fields are currently being faced with these and similar questions related not only to protein value of a diet as a whole but to individual food substances composing these diets. Unfortunately, nice, simply worded questions such as these have no neat, simple answers. A food product or a diet has no nutritional value in itself but its nutritional value is relative to the needs and desires of the individual consuming it. People vary in nutritional needs not only from individual to individual but the same person shows variations on a day-to-day basis.

To make a complex situation even worse, nutrients do not function as single entities but rather these functions are interrelated and, to a lesser or greater extent, mutually dependent upon one another. Thus, dietary intake of one chemical component of the diet may well influence the adequacy of another chemical component of the diet to meet specific nutritional needs. The number of these interrelationships possibly influencing the apparent protein value of a diet or of a specific food is huge. This paper will be devoted to examining one of these possible interrelationships; that is, the question of whether or not nonspecific nitrogen influences the apparent protein value of specific diets. Nonspecific nitrogen may be defined as nitrogen from any metabolically usable, nontoxic source; thus, it may include the sum total of such dietary nitrogen sources as essential amino acids fed in excess of minimal need, nonessential amino acids, or even such nonamino acid, nonprotein sources as urea or diammonium citrate.

The speakers invited to present papers at this symposium are all active in this area of research. However, their research approaches have varied, and their conclusions in some cases have not been synonymous. The objective of the symposium will be best served by presenting both supportive and divergent viewpoints.

CONSTANCE KIES

Department of Food and Nutrition
University of Nebraska
Lincoln, Nebraska 68503

Some Biochemical Considerations in Utilization of Nonspecific Nitrogen

Willard J. Visek

All dietary nitrogen is a potential source of ammonia, a highly toxic normal metabolite of body cells and intestinal microflora. Animals rid themselves of ammonia by converting it to nontoxic products or by facilitating its diffusion into their environment. Whenever intakes of dietary nitrogen are high or of poor nutritional quality, tissue exposure to ammonia increases. Adding nonspecific nitrogen to diets may create amino acid imbalances which increase tissue ammonia concentrations. Tissue reserves of arginine, required for ammonia detoxication in mammals, are limited. Concentrations of ammonia found in the bowel of man on usual diets are several times those required to destroy cells, alter the rate of nucleic acid synthesis, alter growth of transplantable tumors, favor cancerous cells more than noncancerous cells in culture, and increase virus infection. Cancer incidence in the lower bowel of man is high where ammonia concentrations are highest. Bowel cancer is highest in those populations consuming high intakes of protein. In view of the evidence available, maximum benefit from use of nonspecific nitrogen in human diets will require that we have a thorough knowledge of the biological effects of ammonia.

Protein is the most abundant nitrogenous compound in the usual diet and in the body (Munro, 1964). It was Magendie, the famous French physiologist, who, in the early 19th century, presented evidence that proteins varied in nutritional value. Although earlier workers recognized amino acids as structural components of proteins, Willcock and Hopkins (1906) first established that nutritive value was associated with amino acid composition. These observations were confirmed by Osborne and Mendel (1914) and subsequently their laboratory demonstrated that some amino acids were essential for growth. It was impossible to establish all of the amino acids which are indispensable with the methods available at that time. A significant advance in this direction was made in subsequent years when W. C. Rose, a former student of Mendel's, succeeded in preparing purified diets containing

Department of Animal Science, Cornell University, Ithaca, New York 14850.