Proteins, Peptides and Amino Acids in Enteral Nutrition

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Growth in the young and maintenance in the adult are complex, genetically orchestrated, metabolic processes that require adequate intakes of substrates and specific cofactors. Among the former are the indispensable and conditionally indispensable amino acids and a source of utilizable nitrogen required for the synthesis of physiologically important nitrogen-containing compounds, such as the purines and pyrimidines, creatine and the polyamines. Furthermore, a *sine quo non* of the stress response, triggered either by infection, trauma or other diseases and possibly by clinical interventions is an increased rate of loss of nitrogen from the body. This leads to negative nitrogen balance and, if prolonged or profound, it adversely affects clinical outcome. Again, an adequate, or possibly an enriched, dietary source of these nutrients is needed to counteract the losses of nitrogen and to promote wound repair and protein repletion of tissues and organs.

With the discovery of common and specific mechanisms for alterations in substrate metabolism, unique opportunities arise to intervene in the disease process. Undoubtedly, the efficacy of providing functional substrates to the injured, immunocompromized and/or malnourished host has caused a rebirth and awakening in the clinical application of dietary intervention in the treatment and prevention of disease.

The importance of adequate nutritional support as a component of the comprehensive clinical management of patients is now widely appreciated and over the past two decades significant advances have been made in enteral feeding techniques. Primarily, there has been a major shift from intravenous towards enteral administration. Secondly, there have been major changes in the content and protein/energy mix of the formulations used. The most striking findings, however, relate to the use of specific nutrient substrates to supplement standard
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enteral diets. However, the most clinically effective and cost-effective form of nutritional therapy, including the form and amount of proteins, amino acids and/or peptides, for patients with gastrointestinal diseases, wasting conditions and in the critically ill, for example, remains to be determined from research-based evidence. Therefore, this 3rd Nestlé Nutrition Workshop, 'Proteins, Peptides and Amino Acids in Enteral Nutrition', brought together investigators who have made important contributions to an understanding of the physiology and nutritional biochemistry of proteins, peptides and amino acids and/or the application of this knowledge and evaluation of these nutrients in various clinical settings. The focus of this workshop was on the nitrogen component of enteral nutrition and attention was given to the current understanding of the roles that intact proteins, peptides and/or free amino acids play in nutritional physiology and their clinical corollaries. Its overall remit and challenge were (i) to critically review and update knowledge on the utilization, metabolic fate and function of ingested protein, peptides and/or amino acids; (ii) to consider the consequences of disease states on their metabolism, utilization and functional attributes; (iii) to integrate and use this information with respect to the formulation and use of enteral nutrition in the support of hospitalized patients or of other individuals who might benefit from this feeding modality, and (iv) to identify needed areas of research.

The workshop began with a series of papers on the physiology and metabolism of proteins, amino acids and peptides. New knowledge about the factors that influence, and the mechanisms involved in, the uptake and immediate metabolic processing of ingested proteins or their components was reviewed. From the standpoint of protein and amino acid enteral nutrition, it is now evident that the intestine plays a key regulatory role in the overall amino acid and nitrogen economy of the host and that this new or expanded understanding has importance in the optimal formulation of nitrogen-containing enteral products. This initial series of papers was then followed by an assessment of the impact of various diseases on metabolism and the roles of intact proteins, peptides and amino acids in the support and maintenance of amino acid and nitrogen homeostasis under these conditions. Questions of tolerance to and the efficacy of different molecular forms in which nitrogen might be supplied to patients were addressed and these topics made for lively discussions. There is much more to learn about the impact of the molecular form of nitrogen supply on the status of protein and amino acid metabolism and its roles as a determinant in the utilization of ingested protein and its products of digestion. While there was little debate about the positive clinical value of intact sources of protein in the nutrition of patients requiring enteral feeds, it was less clear about the extent to which various peptide forms and/or mixtures of free amino acids or the supplemental role of specific amino acids might offer a significant clinical benefit under defined clinical situations. The challenges of conducting well-controlled clinical studies together with the need to carry out prospective clinical trials to close this gap in our knowledge were all too obvious. Certainly, the development of suitable and new enteral products
would promote the understanding process and their use might be associated with improved clinical outcome.

We believe that, despite these uncertainties, this workshop has contributed to a better definition of the problems associated with the qualitative and quantitative aspects of the supply of nitrogen-containing substrates in enteral nutrition. We hope that the proceedings will be of value in promoting interest and understanding among the practitioners, clinical and basic scientists towards an advanced clinical nutrition. It is also hoped that these proceedings will help set an appropriate course for, as well as stimulate, further research and discussion on proteins, peptides and amino acids in enteral nutrition.

Peter Fürst, Vernon R. Young
**Foreword**

The workshop on ‘Protein, Peptides and Amino Acids in Enteral Nutrition’ focuses both on basic science and applied clinical research. The clinical relevance of sound basic scientific concepts needs to be established. Amino acids and catabolism contribute to the energy needs of the mucosa, which should have an impact on future amino acid compositions of enteral nutrition products. Peptide transport is resistant to stress of disease, which is in contrast to amino acid transport. It seems, therefore, necessary to clearly define the clinical role of amino acid solutions in enteral feeding. Fast- and slow-digestible proteins influence gastric emptying and are absorbed in different parts of the small intestine. They might therefore be important to regulate appetite, satiety as well as metabolic outcome.

Applied clinical research focuses mainly on tolerance, safety and efficacy of newly developed products. New products must be useful for their given purpose. Segmentation of the enteral product range can be helpful to treat specific diseases, but confusion may result as to specific ‘niche’ product utilization, if the indication is not clearly clinically established. Therefore, further clinical studies will be necessary to prove the basic scientific concepts. In the past, poor experimental design and no clear endpoints sometimes hampered clinical trials focusing on the protein source of enteral nutrition products. A discussion between representatives of basic science with clinicians will therefore be useful to design future trials on protein quality in enteral products.

I would like to take this opportunity to thank the Chairmen, Professors Peter Fürst and Vernon Young, for their contribution to this workshop as well as the
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participants. Our thanks to the Nestlé team who organized the workshop, in particular to Mr. Alexander Jost in Sweden and Dr. Philippe Steenhout at the center, who helped to set up this workshop.

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