High Protein Nutritional Support

More important than energy?

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Now more than ever, dietetics has a real opportunity to support the NHS to deliver improved outcomes clinically, functionally, as well as financially and, increasingly, as a result of the NHS Outcomes Framework[1] – outcomes that are important and meaningful to our patients and carers. It would seem that dietetic practice traditionally calculated nutritional requirements with the goal of meeting energy requirements, often at the expense of protein needs. This may, in part, have risen due to the fact that foods for special medical purposes (FSMPs) in the form of oral nutritional supplements (ONS) and enteral tube feeds (ETF) may not have always been formulated to ensure the adequate provision of both.

In recent times it has become apparent that there is a clear need to provide optimal protein intakes, in particular, to those individuals with disease-related malnutrition, the older population and the critically ill. Equally, in the healthy population, there has been a surge of interest in the benefits of higher protein intakes, including a potential role in healthy ageing. As a result, in both FSMPs and normal foodstuffs, we are seeing an increase in protein content as the evidence-base continues to evolve. For the purposes of this article high protein refers to intakes >1.2 g protein/kg/day or >20 per cent energy from protein.

Current UK dietetic trends in nutritional support strategies, after having identified malnutrition via screening, often focus initially on improving food intake in the form of 'Food First' initiatives. Whilst, in general, this approach increases energy intake, care needs to be taken to ensure requirements for protein and micronutrients are met. Evidence to demonstrate the clinical effectiveness of dietary counselling remains limited and warrants addressing.[2] In the case of ETF, the use of core feeds that traditionally provide energy at 1-1.5 kcal/ml, and protein from 4.0-6.0 g per 100 ml are optimal for the majority of patients. Evidence highlighting the importance of providing higher protein whilst reducing the amount of energy for critically ill patients is ever-evolving.

Historical protein requirements

The importance of energy intake for the effective utilisation of dietary protein has long been recognised.[3,4] However, adult protein requirements are defined as the amount of protein intake needed to maintain the body in optimal nitrogen balance.[3,5] It is therefore assumed that in healthy adults, individuals use the nitrogen that is required by the body and then excrete excess on a daily basis.[6] The methodologies used in various studies to assess protein status continues to evolve with time, from body composition analysis, nitrogen balance, and whole body protein/amino acid kinetics.[5] In recent years, more advanced isotopic tracer methods have been developed, improving the data on requirements and, as a result, have become the more standard practice for assessment.[7] Such methods have also led to suggestions of increased requirements, to that obtained by nitrogen balance studies, in order to meet essential amino acid needs, despite protein needs being met.[7,8]

The current UK dietary reference values (DRV) are based upon studies using high biological value protein with presumed 100 per cent digestibility.[9] The adult UK Reference Nutrient Intake (RNI) is currently set at 0.75 g/kg/day assuming the consumption of a mixed diet. The 1991 recommendations were based upon those from the FAO/WHO/UHU report (1985)[10] whereby requirements were estimated from nitrogen balance studies, but these have since been recognised as underestimating amino acid needs.[7]

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The results of a meta-analysis from 235 subjects across 19 studies by Rand *et al.*,[11] led to a new recommendation for healthy adults of 0.83 g protein/kg/day of high quality protein. The UK RNI for all adults, including the elderly, did not change. Mean protein intakes in free living individuals, however, suggest that the consumption of protein is significantly higher than this, with 13 per cent of those aged >64 years obtaining greater than 20 per cent energy from protein.[12]

Despite the majority of healthy individuals often consuming protein in quantities in excess of requirements, studies have demonstrated that protein and micronutrient intakes in many patients are sub-optimal, particularly those in hospital and other care settings.[13-16] An increasing number of publications have suggested that current recommendations are insufficient to meet the increased needs of ageing, along with the high prevalence of chronic disease in this population – seen in 92 per cent >65 years and >95 per cent after the age of 80 years.[17] A depletion of muscle mass in the elderly is responsible for frailty in this group, resulting in an increased risk of falls and functional impairment; and this is further impacted upon with a reduction in protein synthesis during disease, or as a result of injury.[18] Muscle protein is directly affected by protein intake in the diet.[19, 20] The InCHIANTI study[21] demonstrated that low nutrient intakes, including protein, are significantly and independently associated with frailty.

Post injury, with trauma, or with an infectious episode, there is an increase in the efficiency of the utilisation of amino acids due to the catabolic state releasing hormones that impact on protein turnover.[22] Whilst the body has the ability to adjust to the change in conditions such as these, negative nitrogen balance occurs as protein is lost during starvation, fasting or trauma when protein is utilised for energy.[23]

New protein recommendations

The ESPEN Expert Group (2014)[24] have made new recommendations for protein requirements that clearly recognise the impact of ageing, with the onset of gradual and progressive loss of muscle mass; as well as the additional impact of malnutrition due to underlying chronic long-term conditions, or the acute impact of illness or trauma in such a patient group. These new evidence-based recommendations are outlined in **Table One**. The recommendations suggest an increase to a minimum of 1 g/kg/day for healthy older people, which further increases to between 1.2-1.5 g/kg/day in those malnourished.

Studies have shown that older adults who consume more protein maintain muscle mass and strength.[25, 26] In addition, in order for elderly hospitalised patients to achieve nitrogen balance at least 1.1 g protein/kg/day was required and intakes of up to 1.6 g/kg/day were deemed safe.[26] The PROT-AGE study group[27] have also recommended 1.0-1.5 g/kg/day in those aged >65 years, with or without the presence of disease.

Nutritional support to provide optimal protein intakes

A systematic review of the use of high protein ONS demonstrated improvements in outcomes in a range of patients across different healthcare settings, including those with respiratory disease such as COPD, hip fractures, pressure ulcers, an acute illness, along with the elderly.[28] The systematic review found a significant reduction in complications, length of stay, and hospital readmissions; thus influencing both clinical and financial outcomes. The data also showed significant improvements in nutritional outcomes, including handgrip strength, which confers an improvement in a functional outcome.

This review has also demonstrated significant improvements with the use of high protein ONS in intakes of both calories and protein with minimal suppressive effect on food intake; and improvements in weight, muscle mass and corresponding functional outcomes, such as hand-grip strength.[28-29] On a practical note, in patients with malnutrition and in particular those with COPD, the frail elderly, or cancer, volume may be a limiting factor and there are high protein, high energy 125 ml ONS available on prescription. Intakes of protein of up to 1.5 g/kg/day or 15-20 per cent of energy intake should be the target for optimal function and health in many of the patient groups outlined above,[30-31] clearly aligning to the new ESPEN recommendations.[24]

When it comes to protein provision via an ETF, there is growing evidence that increasing protein intakes and moderating energy provision can lead to improved outcomes in the critically ill. More specifically, >1.2 g/kg body weight/day of protein and adequate energy based on total energy expenditure +10 per cent is associated with a 50 per cent reduction in 28-day mortality.[32]

Table One: Optimal Dietary Protein Intake

	Protein Requirements
Healthy older people >65 years	At least 1.0-1.2 g/kg body weight/day
Older people, malnourished or at risk of malnutrition secondary to acute illness or chronic long-term condition	1.2-1.5 g/kg body weight/day
Older people with severe illness or injury	Even higher

Adapted from ESPEN (2014)[24]

Table Two highlights below some examples of the differences in energy and protein content of ETF.

Studies on critically ill patients show that during the first seven days patients can lose up to two per cent lean body mass per day. The loss is more significant in those with an increased number of organ failures,[33] and can increase up to 1 kg per day in those with burns.[34] The majority of large studies undertaken in ICU tend to focus on energy provision and the mode of feeding – as a result protein requirements are often not met. The EPANIC study delivered a maximum of 0.7 g protein/kg/day,[35] and the EDEN study a mean protein delivery of 0.6-0.8 g/kg/day.[36] Both studies showed no difference in mortality. The EDEN study also demonstrated no difference in infectious complications. The PEP-up study, which encompassed an international nutrition survey, collated data from 351 ICU's and found a mean energy intake of 1057 kcal/day and a mean protein intake of just 0.7 g/kg/day.[37]

A systematic review of protein provision in the critically ill found that the evidence strongly suggested that 2-2.5 g protein per kg normal body weight is safe and could, indeed, be optimum; however, the authors recognised that there were few studies looking specifically at high protein intakes and that the quality of the evidence was poor.[38] **Table Three** summarises the international guidelines for protein provision in the critically ill, targets differ slightly according to the types of critical care patient.[39-42]

Meeting both energy and protein requirements adequately in the critically ill can reduce mortality by 50 per cent.[32] Since weakness and disability still present one year post discharge from the ICU,[44] the need to provide adequate protein to preserve muscle mass where possible is paramount.

Concerns about higher protein intakes

It is not uncommon for healthcare professionals to raise concerns regarding the effects of excessively high protein intakes over a prolonged period of time. Particular issues include the impact on bone health with regard to osteoporosis, and renal function, especially in the older adult with declining kidney function. Interestingly, a systematic review examining the evidence for use of high protein ONS in the management of malnutrition, where the mean age of patients was 74 years (range 42-86) found no significant adverse effects of high protein intakes over the course of the studies included, where duration of supplementation was often six months or longer.[28] The same systematic review found that whilst the high protein ONS in conjunction with dietary intake increased total protein intake, the overall protein intake as determined by per cent of energy was not by definition 'high protein', i.e. not >20 per cent energy from protein (as observed in the healthy population in the National Diet and Nutrition Survey[12]) This is undoubtedly because dietary intakes of protein in malnourished patients is poor. Hence ONS made a small but important contribution to the protein intake of the participants.[28]

Conclusion

This review highlights that deficits in protein intake and provision are apparent in a number of different patient groups, specifically the elderly and the critically ill, potentially contributing to poorer outcomes. The need to revise current recommendations for protein intakes in the older adult, especially in those with defined disease-related malnutrition has been recognised by ESPEN. These higher protein requirements have been set to improve outcomes for the patient groups mentioned. Alongside other dietetic strategies where possible, FSMPs in the form of high protein ONS, or ETF providing ≥ 20 per cent of energy from protein, are key to effectively providing such an increase in protein requirements. Given that the population is ageing, the costs of malnutrition to the NHS will continue to escalate at an extraordinary rate due to the clinical consequences.[45, 46] Any changes to clinical practice that can positively influence outcomes should be adopted to improve nutritional care.

Table Two: ETF Examples of Energy and Protein Content

Type of Feed	Energy in kcal/ml	Protein g/100 ml
Core standard feeds	1.0	4.0
High protein feeds	1.25/1.28	6.3
High protein critical care feed	1.28	7.5

Table Three: Protein Requirements for ICU Patient Groups

Critical Care Patient Type	Target Protein Recommendations
General ICU	1.2-1.5 g/kg actual body weight
Continuous renal replacement therapy	1.5-1.7 g/kg actual body weight
Burns	1.5-2.0 g/kg actual body weight
Trauma	1.3-1.5 g/kg actual body weight
Obese	2.0-2.5 g/kg ideal body weight

Adapted from Bear (2014).[43]

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