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# **GLOBAL PROTEIN NUTRITION: ESSENTIAL AMINO ACIDS AVAILABILITY**

**A thesis presented in partial fulfillment of the requirements of  
the degree of Master of Technology in Food Technology at  
Massey University, Palmerston North, New Zealand**

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**2012**



**Massey University**

## Abstract

Information on protein production and consumption by country and by food type is well known and accepted, and is available on the internet from FAOSTAT. However, this database contains no information about the nutritional value of those proteins and is not corrected for digestibility, so is not possible to identify where there may be insufficiencies of protein nutrition or of particular essential amino acids. In this work, the data from FAOSTAT is corrected for true protein digestibility values and amino acid composition of the main food protein types, to develop a model of protein nutrition that identifies current patterns of essential amino acid (EAA) availability in different countries.

It was found that a population lacking in total protein supply could still get all the required EAA in the required amounts if the consumed food pattern is designed properly. Forty countries were identified as having a lower protein supply than 56 g. per day per capita, but only 13 countries were estimated to receive an inadequate supply of essential amino acids. Lysine deficiency was most common in these 13 countries due to consumption of a high proportion of protein from cereals, which are a poor source of lysine, because of both composition and poor digestibility. Thus a greater quantity of low quality protein such as cereal protein is needed to meet the recommended requirement of all the essential amino acids, particularly lysine.

The impact of income and specifically rapid *per capita* income growth on diet over time and by different socioeconomic classes is studied for India. This study found that food distribution and ability to purchase nutritionally adequate foods was dependent on income of an individual person. Cereals continued to constitute the main category of food consumed in both rural and urban India. There were large rural-urban and inter-state differences in the monthly consumption of even the basic food items. Rural Gujarat was the only region in this study where inadequate supply of lysine was observed for the population in the all-Gujarat average figure, at 95.9%.

The nutritional requirement of elderly population, mainly increased RDA of protein intake and role of essential amino acids were studied, considering that

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the proportion of population aged 60 or over will be 22% in 2050 compared to 11% in 2009. Different protein sources have been shown in the literature to stimulate muscle protein synthesis in varying degrees in elderly population. The most important factor was the amount of essential amino acids in the protein, in particular, leucine. Differences in digestibility and bioavailability of certain protein-rich foods may also influence muscle protein synthesis.

During the World Summit on Food Security in 2009, it was recognized that by 2050 there will a requirement to supply 70% additional food to the global population. One of the options to increase food supply and to decrease the environmental pressure of current food production system is to minimise the waste. It is also important to plan an integrated approach about agricultural innovation and population health which will help us to prepare a matrix to supply the nutritional quality of food to the future world. It was also concluded that cereals were the major source of protein and calories for nearly half of the world's population including China, India and sub-Saharan African countries. The improvement in the cereals would be helpful to close the inadequacy gaps in protein and essential amino acids in many countries by increasing the essential amino acids in plant crops with emphasis on lysine and leucine, e.g. by genetically modified food crops specific requirements to meet future demand for protein and EAA are described.

## Acknowledgements

I would like to express my sincere gratitude and appreciation to my chief supervisor Dr. Michael Boland and co-supervisors Prof. Srikanta Chatterjee and Dr. Shantanu Das, for their expert guidance, encouragement and constant support. Thanks for your patience and making yourselves available at any time I needed, in spite of your very busy work-schedule.

I am offering my special thanks to the co-directors of the Riddet institute, Prof. Paul Moughan and Prof. Harjinder Singh for approving the financial assistance in the form of the Master Scholarship and project funding.

I would like to show my appreciation and gratitude to the Massey University Scholarship Committee for awarding me with the Catherine Baxter Scholarship.

I am expressing my sincere gratitude to Prof. Jim Harper (United States of America) and Dr. Shane Rutherford for their encouragement, support and valuable discussions during my work.

I thank Mrs. Terri Palmer, Ms. Willi Twight, Mrs. Ansley Te Hiwi, Mr. John Henley King, Ms. Paula MacCool and Mrs. Felicia Stibbards for their administrative support.

I am grateful to all my friends and colleagues in New Zealand Sumon, Dev, Vikas, Anant, Arup, Jinita, Tuli, Shampa, Debjit, Malesh, Amit, Nimmi, Pranav and Shradha for their help and valuable suggestions during my study.

Finally I would like to thank my family for their patience, love and support which enabled me to concentrate and complete my work.

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