Contents

- Oral Pre Cancerous Lesions (OPL): A Clinicopathological and Molecular Assessment for Risk Categorization and Treatment
  Asoke Roy, M. Chatterjee, S. P. Bhatnagar  
  5
- A Review on Biological Synthesis of Gold Nanoparticles and its Application
  Sharmistha Banerjee, Sneha Singh, Swati Tikariha, A.S. Vidyarthi  
  11
- Surfactant Properties of Non Aqueous Microemulsions
  Shekhar Verma, J.S. Dangi  
  17
- Design, Optimization and Evaluation of Nanoemulsion Formulations by Ultrasonication as Vehicle for Transdermal Delivery of Diclofenac Diethylamine
  Praveen Kumar Gupta, Dr. J.K. Pandit, Dr. P. J. Narain, Sanjiv Kumar Gupta, Akash Chaurasya  
  26
- Using Albino Rats in Your Experiment? Make Sure They Are Healthy
  Sai bal Das, Ankur Datta, Suavejit Das, Patralekha Roychowdhury, Anuradha De (Patt), S.K. Tripathi  
  40
- Comparative Hepatoprotective Activity of the Two Varieties of Cajanus cajan (L.) Millsp. Leaf
  Suman Goswami, S. Jha, A. K. Pattanayak  
  43
- Structural Optimization of New Class of Anticonvulsants: QSAR Approach
  Lata K Bisht, Subir S. Samanta, Saamy P Basu  
  48
- Relative Efficiencies of the Dietary Proteins of Plant and Animal Origin: A Comparative Study
  Mukul Chandra Gope, Ratna Ghosh, Rupali Patra, Manik Ghosh  
  53
- Isolation and Characterization of a Novel Smart Mucoadhesive Biopolymer from Euryale ferox Seed Coat
  M.S. Uma Shankar & N. V. Satheesh Madhav  
  57
- Evaluation and Characterization of Solid-Self Nanoemulsifying Drug Delivery Systems (S-SNEDDS) of Lovastatin Samridhi and Dr. R.N. Gupta  
  62
- Estimation of Heavy Metals in Locally Available Vegetables Collected from Road Side Market Sites (1-4) of Different Areas of Ranchi City
  Ratna Ghosh, Reshma Xalxo, Mukul Chandra Gope, Sougata Mishra, Bindu Kumari, Manik Ghosh  
  68
- Development of Lornoxicam Transdermal Patch: Effect of Natural Penetration Enhancers
  Dipi Srivastava, Nishant Kumar Verma, Nimisha, Wasim Ahmed  
  74
- Instructions to Authors  
  79

Editorial Board Members

Abhimanyu Dev  
Dr. Uma Ranjan Lal  
Sugandha Kumari  
Ankita Gupta
Akshay Shrimals  
Subham Sonu  
Vibha Sharma  
Sougata Misra
Relative Efficiencies of the Dietary Proteins of Plant and Animal Origin: A Comparative Study

Mukul Chandra Gope¹*, Ratna Ghosh², Rupali Patra³, Manik Ghosh⁴
¹ Department of Physiology, Rajendra Institute of Medical Sciences, Ranchi, India
² Department of Home Science (Division of Nutrition), Ranchi University, Ranchi, India
³ Department of Botany, Jamshedpur Cooperative College, Jamshedpur, India
⁴ Department of Pharmaceutical Sciences, Birla Institute of Technology, Ranchi, India

ABSTRACT
In this paper an effort has been made to compare the relative efficiency of proteins of the vegetable origin with that of the animal origin. It always has been our tendency to rank proteins of animal origin superior to that of vegetable origin. The qualitative and quantitative assessment of plasma protein including percent protein in body in this study does not allow ranking proteins like that. These data indicate that when taken in recommended quantity the protein status of healthy vegetarian & Non-vegetarian subjects do not show any statistically significant difference. In fact, vegetable proteins appear to be more efficient, economical, and easy to digest & assimilate than the proteins of animal origin. After all we do not forget that many animals build up their muscles from the proteins of humble grass.

Key words: Vegetable Protein, Animal Protein, A: G ratio, Protein Intake Index

INTRODUCTION
Although all human beings have common nutritional needs, there are variations from one section of the community to another. Requirements change from infancy through childhood to adolescence and adulthood. The needs of the pregnant women (‘feeding two’) are not the same as those of non-pregnant women. The concept is of the ‘physiological group’, each group needing special consideration. The group implied above must be added two others – aging and aged, and ill a convalescent ¹.

Protein malnutrition being a widespread problem in developing & under developed countries has attracted much more attention to the research workers in the medical field. In children as well as in adults (especially pregnant females) such studies are very informative. Studies involving comparison of dietary sources to prevent protein malnutrition were the key concern of such research works. Protein is an indispensable constituent of the diet because it is the only source of amino acids, including essential amino acids, which cannot be synthesized in the body ². The best guides to measure relative efficiency of dietary protein are plasma protein level and percent protein in the body.

In this paper an attempt has been made to compare the relative usefulness of proteins obtained from vegetable sources to that from animal sources. Plasma concentration of total plasma protein, albumin, globulins & fibrinogen were compared between vegetarian and non-vegetarian subjects. Percent protein in the body has been calculated in both sub-groups.

MATERIALS & METHODS
All the subjects (n=108) have been examined clinically to rule out any acute disease condition. They were divided into two groups viz. Vegetarian (n=54) and Non-vegetarian (n=54). Through dietary history has been taken from them using a “dietary habit” chart, which includes commonly
taken foodstuffs. The quality, amount & frequency of intake were noted down. Average daily intake of protein was calculated.

Protein intake index has been obtained by dividing average daily intake of mixed proteins (in gm) with body weight (in Kg). Plasma protein level including albumin, globulin & fibrinogen were determined after obtaining venous blood. Few precautions have been taken during collection of blood since standing for more than 2 h and short period vigorous exercise may decrease the plasma volume up to 25% ³. This may cause false impression of elevated plasma protein. Subjects were well examined for dehydration since it might reveal greater plasma protein concentration.

Modified biuret method was applied to determine total serum protein⁴. Albumin was estimated by Bromocresol green method⁵. For fibrinogen estimation, Clotting method of Clauss was carried out⁶. By adding total serum protein and the plasma fibrinogen the total plasma protein level was obtained. Percent protein in the body was determined. The A : G ratio has been calculated. The two groups were compared using the above parameters.

RESULTS
The comparison of plasma protein level between vegetarians & non-vegetarians shows that there is no statistically significant difference. However the albumin level was slightly elevated in non-vegetarian subjects but on the other hand globulins have been found to be raised among vegetarians, making the total plasma protein level almost equal in both subgroups.

The plasma protein level corresponds well with the PII (Protein Intake Index). All subject with PII>0.6 had satisfactory plasma protein level.

After analyzing dietary history it was found that subjects taking groundnut & dry fruits regularly had more plasma protein level than subjects who does not take them. Similarly subjects taking cheese & food made from soybean had elevated plasma protein level than others. Non-vegetarians who take mutton, pork, fish & egg had satisfactory plasma protein level, but the quantity of intake was also a factor. Milk & milk products also affect the plasma protein level positively.

Table 1 : Protein Intake Index, in relation with the Protein status

<table>
<thead>
<tr>
<th>Protein Intake Index (gm/kg B.W.)</th>
<th>Plasma Protein Level (g/dL)</th>
<th>Percent Protein in Body</th>
<th>A:G Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.83 ± 0.11</td>
<td>6.96 ± 0.50</td>
<td>17.42 ± 1.27</td>
<td>1.41 ± 0.29</td>
</tr>
</tbody>
</table>

Values reported as Mean ± SD (n=108; veg. = 54; non-veg. = 54).

Table 2 : Effect of the dietary source of protein on different plasma proteins (g/dL)

<table>
<thead>
<tr>
<th>Dietary Habit</th>
<th>Albumin</th>
<th>Globulins</th>
<th>Fibrinogen</th>
<th>A:G Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegetarian</td>
<td>3.86 ± 0.39</td>
<td>2.94 ± 0.33</td>
<td>0.25 ± 0.06</td>
<td>1.33 ± 0.25</td>
</tr>
<tr>
<td>Non-vegetarian</td>
<td>3.93 ± 0.25*</td>
<td>2.70 ± 0.50*</td>
<td>0.24 ± 0.05*</td>
<td>1.50 ± 0.31*</td>
</tr>
</tbody>
</table>

Values reported as Mean ± SD (n=108; veg. = 54; non-veg. = 54). The data were analyzed by one way ANOVA followed by Bonferroni’s Test. ‘ns’ indicated statistically non-significant values from vegetarian.
Table 3: Comparison of protein status in vegetarian and non-vegetarian subjects

<table>
<thead>
<tr>
<th>Dietary Habit</th>
<th>Protein Intake Index</th>
<th>Total Plasma Protein Level (g/dL)</th>
<th>Percent Protein In Body</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegetarian</td>
<td>0.84 ± 0.12</td>
<td>7.06 ± 0.42</td>
<td>17.65 ± 1.05</td>
</tr>
<tr>
<td>Non-vegetarian</td>
<td>0.82 ± 0.10**</td>
<td>6.87 ± 0.57**</td>
<td>17.17 ± 1.40**</td>
</tr>
</tbody>
</table>

Values reported as Mean ± SD (n=108; veg. = 54; non-veg. = 54). The data were analyzed by one way ANOVA followed by Bonferroni’s Test. ‘ns’ indicated statistically non-significant values from vegetarian.

DISCUSSION

The protein status of the body depends on the PII. Type of food either vegetarian or non-vegetarian does not alter the protein status 7. Protein of high & low biological values are sometimes called “first class” and “second class” protein respectively. As the best-known individual proteins of low biological value are derived from vegetable food there has been regrettable tendency to equate the term ‘first’ and ‘second’ class generally with animal & vegetable protein respectively. Such misuse of term should be strenuously avoided. Before vegetable proteins in general are dismissed as second class it should be remembered that many animals build up their muscles from the protein of humble grass 7.

Vegetable protein from various sources, enriched with vitamin B12 can be directly utilized by human beings. When given in this way it is cheaper & more efficient than when used to make animal protein. The recommendation for adults is that the protein intake should not be less than 1 gram per Kg body weight. Some studies even advocate giving 1.5 gm – 2 gm per Kg body weight per day during adolescence & childhood 8. But in some experiments nitrogenous equilibrium was maintained on 30 gm – 40 gm of protein derived exclusively from vegetable sources e.g. cereals, potatoes, other vegetarian & fruits 9.

Studies involving protein status of the body shows that “Protein index” i.e. measured total body protein divided by predicted total body protein can be a useful tool in determining physiological impairments. When the Protein index is < 0.8 it clearly indicates negative nitrogenous equilibrium 10. Experimental evidence gained by feeding one protein at a time in calculated amounts to experimental animals including humans shows that for the great majority of proteins, part only can be utilized by the body for protein synthesis while the remainder is broken down and its nitrogen excreted as urea. This is the basis of expressing protein quality as a percentage. Plasma proteins are normally formed from food proteins but that in protein starvation they may be formed from tissue protein.

As albumin and globulins have distinctly different amino acid patterns, some protein favour albumin formation e.g. proteins of animal origin, while other favour globulin formation e.g. proteins of vegetable origin.

Many problems of nutrition remain – the positive health effects of food, the hazards of excess, the basis of unusual response or demand of specific foods. But these seem of little consequence beside the economic and political problems of putting into practice on a world scale what is already known. While the western peoples are better fed than ever before, the emergent countries of the world are falling yet nearer to the starvation mark. Combinations of plant protein that complement one another in biologic value or combinations of animal & plant proteins can increase biologic value & lower total protein requirements.
Protein needs increase during growth, pregnancy lactation & rehabilitation during treatment of malnutrition. For adults, the recommended dietary allowance (RDA) for protein is about 1.0 gm per Kg body weight per day, assuming that energy needs are met and that the protein is of relatively high biological value. In summary, there is no significant effect of the type of diet like vegetarian or non-vegetarian on the protein status of the body. Furthermore proteins obtained from plant sources appear to be cheap & more efficient on a mixed diet. Thus with proper planning, It is possible for a vegetarian to obtained a high grade protein, at low cost, from mixed diet of cereals, pulses and vegetables.

REFERENCES
# CONTENTS

- Oral Pre-Cancerous Lesions (OPL): A Clinicopathological and Molecular Assessment for Risk Categorization and Treatment  
  Asoke Roy, M. Chatterjee, S. P. Bhatnagar  
  Page 5

- A Review on Biological Synthesis of Gold Nanoparticles and its Application  
  Sharmistha Banerjee, Sneha Singh, Swati Tikaria, A.S. Vidyarthi  
  Page 11

- Surfactant Properties of Non Aqueous Microemulsions  
  Shekhar Verma, J.S. Dangi  
  Page 17

- Design, Optimization and Evaluation of Nanoemulsion Formulations by Ultrasonication as Vehicle for Transdermal Delivery of Diclofenac Diethylamine  
  Praveen Kumar Gupta, Dr. J.K. Pandit, Dr. P. J. Narain, Sanjiv Kumar Gupta, Akash Chaurasya  
  Page 26

- Using Albino Rats in Your Experiments? Make Sure They Are Healthy  
  Saibal Das1, Ankur Datta1, Suvajit Das1, Pattralekha Roychowdhury, Anuradha De (Pati), S.K. Tripathi  
  Page 40

- Comparative Hepatoprotective Activity of the Two Varieties of Cajanus cajan (L.) Millsp. Leaf  
  Suman Goswami, S. Jha, A. K. Pattanayak  
  Page 43

- Structural Optimization of New Class of Anticonvulsants: QSAR Approach  
  Lata K Bisht, Subir S. Samanta, Saumya P Basu  
  Page 48

- Relative Efficiencies of the Dietary Proteins of Plant and Animal Origin: A Comparative Study  
  Mukul Chandra Gope, Ratna Ghosh, Rupali Patra, Manik Ghosh  
  Page 53

- Isolation and Characterization of a Novel Smart Mucoadhesive Biopolymer from Euryale ferox Seed Coat  
  M.S. Uma Shankar & N. V. Satheesh Madhav  
  Page 57

- Evaluation and Characterization of Solid-Self Nanoemulsifying Drug Delivery Systems (S-SNEDDS) of Lovastatin  
  Samridhi and Dr. R.N. Gupta  
  Page 62

- Estimation of Heavy Metals in Locally Available Vegetables Collected from Road Side Market Sites (1-4) of Different Areas of Ranchi City  
  Ratna Ghosh, Reshma Khaloo, Mukul Chandra Gope, Sougata Mishra, Bindu Kumar, Manik Ghosh  
  Page 68

- Development of Lornoxicam Transdermal Patch: Effect of Natural Penetration Enhancers  
  Dipti Srivastava, Nishant Kumar Verma, Nimisha, Wasim Ahmed  
  Page 74

- Instructions to Authors  
  Page 79

---

Single copy INR 250

Printed & Published by:  
Dr. R.N. Gupta, Editor  
on behalf of Pharmaceutical Society  
Department of Pharmaceutical Sciences  
BIRLA INSTITUTE OF TECHNOLOGY  
Mesra, Ranchi, India  
Printed at Kailash Paper Conversion Pvt. Ltd.  
2, Bharatpuri, Purulia Road, Ranchi-834001  
Tel.: 0651-2532251, Fax : 0651-2532285