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Meeting Nutritional Objectives With Soybean Products

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SUMMARY

Usually animal proteins have complete profiles of essential amino acids, where as those of plant origin are deficient in one or more of them. Soybean proteins, however have about the same nutritional value as those of animals and are available for consumption at low cost. In this study, the role of soybeans in food systems, in the feeding of babies, children and elderly from the point of nutrition; relation of soy products with atherosclerosis and some other cases are discussed with the future needs for research in soy protein and nutrition. Therefore, it's tried to emphasize the world's need for protein and how to achieve the goal by use of soybean products.

ÖZET

SOYA FASÜLYESİ ÜRÜNLERİ İLE BESLENME HEDEFLERİNE ULAŞILMASI

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Genelde, hayvansal kaynaklı proteinler elzem amino asitlerin tümünü içerirken, bitkisel kaynaklı olanlar bu amino asitlerin bir veya birkaçından yoksundurlar. Soya proteinleri ise hayvansal kaynaklı proteinlerin besleyici değerini taşımakla birlikte daha ucuz fiyatlarla tüketime sunulması mümkündür. Bu çalışmada soya fasülyesinin gıda sistemlerindeki rolü, beslenme açısından bebeklerin, çocukların ve yaşlıların beslenmesinde; damar sertliği ve diğer bazı durumlarda kullanılması ile bu konudaki olası gelecek araştırmaların gereği tartışılmıştır. Dolayısıyla, dünyada proteine olan ihtiyaç ve bu ihtiyacın soya ürünleri ile karşılanabilmesi vurgulanmaya çalışılmıştır.

A SURVEY ON MEETING NUTRITIONAL OBJECTIVIES WITH SOYBEANS AND SOYBEAN PRODUCTS.

The Role of Soybeans in Food Systems :

Nutritionally, soy products have in common a highly digestible protein and a relatively good essential amino acid pattern. Soybeans have contributed to food systems as sources of calories, as supplementary protein and as complementary protein because of their good essential amino acid pattern.

Whole soybeans have been used to extend common beans, producing higher energy concentration and higher protein content and quality.

Soybean proteins are made up of an essential amino acid pattern, probably one of the best among vegetable protein sources (Bressani, 1981). This pattern resembles, with the exception of the sulfur amino acids, the amino acid patterns of high quality animal protein sources. The relatively high lysine content of soybean protein also makes it an effective supplement to cereal grains, which are low lysine.

Soybean products play an important role in food systems due to their nutritional characteristics: These roles may be classified into three groups; as supplementary proteins, as complementary proteins and as protein extenders.

Levels of soya when used as supplementary protein may be as high as 8 % protein equivalent. In a study by Bressani in 1975, the protein quality of the three cereal grains is increased two fold, and not only does protein quality increase but total protein increased also. The complementary role of soya protein is represented by that situation in which the quality of the product is higher than the quality of ingredints. When soybean is used as a protein extender, no change either in protein quality or quantity is expected, however neither should decrease. Replacement of meat protein by an equal amount of soy protein as textured vegetable protein did not significantly alter protein quality. This was indicated by regression coefficients of 0.86 for meat and 0.91 for the mixed food and also the amount of protein needed foor nitrogen equilibrium,

that is 0,52 g/kg body weight/day for meat and 0.57 g/kg body weight/day for the mixture (Kies et. al., 1973).

Nutritional Role of Soya Proteins for Human Beings :

Protein quality in human beings is usually assessed by relatively short term methods. The majority of studies conducted in humans have been based on measurements of weight gain, or nitrogen retention in infants and children and on indexes of nitrogen retention in infants and children and on indexes of nitrogen balance in adolescents and adults (Torun et. al., 1981). Changes in body composition and the measures «physiological and metabolic functions» are the most relevant, but they must be used in long term studies and a series of other interfering variables must be accounted for When well processed soy products serve as the major or sole source of protein intake, their protein value approaches or equals that of foods of animal origin and are capable of meeting the essential amino acid and protein needs of children and adults.

Soybean can partially replace protein foods of animal origin without loss of the protein nutritive value of the diet. But since the animal protein foods contribute many minerals in forms that are highly available for meeting human needs, it is necessary to consider that soya, as a dietary ingredient, may have on the availability of trace elements (Morales et. al., 1981).

Used of Soya Protein in Mixed Protein Systems :

Soya products can be introduced into animal protein food systems to supplement animal protein. This can serve to increase the total protein available to target populations. Nutritional studies have demonstrated that mixtures of soya protein and meat or soya protein and fish are of biological quality similar to that of meat or fish protein when fed alone. Many studies with human subjects have demonstrated the utility of soya products in a variety of soya-cereal foods that can serve as the major source of protein for infants and children.

Through out the world, when given a choice people prefer to eat animal products rather than vegetable products. Thus as populations become more effluent, their consumption of animal protein increases. Soya products can be introduced into aminal protein systems in order to supplement animal proteins. In this way, the total protein available to a population can be increased (Hopkins et. al., 1981).

Nutritional experiments with human subjects further demonstrate the nutritionally high value of animal protein supplemented with soya protein. Young et. al., 1981, fed human subjects, a range or mixtures of isolated soya protein and skeletal beef muscle as the sole source of protein in the form of an emulsified bologna like food. This level of beef protein was adequate to meet the nitrogen needs of the subjects. Nitrogen balance was measured and found to be similar, no matter what level of isolated soya protein replaced beef.

Bressani, summarized several investigations on the nutritive value of combinations of soya and cereals or mixed diets. Results summarized indicate that, the protein quality of mixed food systems containing soya products is excellent.

Soya Products in Feeding the Infants :

Soya products are used in infant formulas, hypoallergenic foods and vegetable mixtures mainly because of their protein quality. They have potential in feeding the children from birth to adolescence and seem to satisfy the needs for total nitrogen and essential amino acids when ingested in adequate amounts. Soya based formulas for feeding of infents were designed and used primarily to replace milk or milk based formulas in the diets of children who are allergic or intolerant to milk and one of the results found was infants fed the soya formula developed fewer complications related to the gastrointestinal tract than infants fed with the milk formula (Torun 1981).

Soya Products in Feeding the Preschool Children :

Several metabolic balance studies conducted in well nourished children, 1 - 7 years old have shown that diets with soya procust as the only or main source of protein allowed adequate nitrogen retention and growth at least for the duration of those relatively short term investigations (Young et al., 1981). Results were such that protein quality was comparable to that of milk, especially when well processed soya products were fed in adequate amounts to satisfy the children's nitrogen and amino acid needs.

Soy Products in Feeding the Older Children :

Studies done with scholl age girls and in adolescents mainly to assess the effects of supplementing soya protein with methionine indicated that nitrogen balance was achieved with relatively low intakes of supplemented soy protein (Korslund et. al., 1973). There is no reason to believe that the nutritional quality of soybeans would be worse for school age and adolescent children than younger children.

Soy Products in Feeding the Elderly :

Protein needs of the elderly may be moderately higher than those of younger adults when expressed as percentage of total calories (Cook, 1981). Most experts recommed on intake of 0.8 g protein/kg/day or 12 - 15 % of the total calories. Food intake and nutritional status of the elderly are effected by a number of factors which are associated with aging. As aging progresses, normal physiological changes occur. Functional renal capacity declines, muscle tone and strength decrease, basic metabolic rate and cardiac index decline and physical activity is commonly reduced. The elderly may tire more easily, get less exercise and therefore have lower caloric needs than younger. Diet of the elderly should be of high quality. That is, it should be relatively rich in protein, vitamins and minerals and should be in forms which are easily consumed, digested, absorbed and metabolized. The soybean must be considered as an important source of dietary protein for the elderly because of its wide availability, low cost, high nutritional value and ease of corporation into foods.

Soybean Products for Feeding Human Under Nutritional Stress :

Normal infants, children and adults are able to utilize the protein and other nutrients present in the soya, when fed these products in amounts that will cover their needs. Under nutritional stress, such as in infant malnutrition, soya products and soya milk have been shown to help in the children's rescovery (Dotra de Oliviera, 1981). Clinical and biochemical date show that their recovery is similar to that obtained with cow's milk. Milk or lactose intolerant children and adults could benefit from the high nutritive value and low cost of soy milk. Soya products have been shown to decrease cholesterol and other levels of blood lipids.

Nutritional Aspects of Fiber in Soy Products :

The hypothesis that dietary fiber may act as a prophylactic agent with regard to certain diseases has attrected the interest of scientific community. Consumption of diets ow in dietary fiber by man has been correlated with increased incidence of colon cancer, coronary hearth disease, diabetes, diverticular disease of colon and various other maladies of the lower gastrointestinal tract (Erdman et. al., 1981). An important benefit of dietary fiber for humans is in increasing the water holding capacity of the stolls. Increased volume and softness of stools parallels the hydration of water holding capacity.

For soya products, consumption of moderate amounts of hulls has been shown to produce beneficial effects on glucose and lipid metabolism in man.

Treatment of Children with Kwashiorkor using Soy Proteins :

Studies on the utilization of a soya product, soy milk for the treatment of malnourished children with kwashiorkor and marasmus were reported by Dotra de Oliviera, 1981. One group of malnourished children was fed with a local soy milk formula. Results showed that soy milk used had a nutritive value similar to that of cow's milk through clinical studies, weight changes, biochemical data and nitrogen balance studies.

Soya Protein and Atherosclerosis :

Clinical nutrition is an important branch of dedicine dealing with the physiopathology, diagnosis and treatment of nutritonal diseases. A recent development in clinical nutrition is the study of effect of different diets on the treatment of some diseases such as atherosclerosis and the formulation of nutritionally complete liquid diets, that could be usefull for patients with problems related to the intake of solid foods.

A soybean textured protein diet was fed to patients in Italy. All of them had blood lipid problems, they were followed both in hospital and home. Cholesterol and triglyceride analysis were made at frequent intervals. The hypocholesterolemic effect of the soybean protein diet occured in almost all the patients and appeared to be independent of the lipoprotein phenotype (Kritchevsky, 1979). Although the study does not indicate the mechanism through which the soybean diet acts, it supports the idea that it should be through its protein component.

Further studies showed that (Carrol et. al., 1975) diets containing proteins from animal sources generally gave a hypercholesterolemic response where as plasma cholesterol levels remained low when diets containing plant proteins were fed (Carroll, 1981).

Progress and Future Needs for Research in Soya Protein :

Nutritional investigations of soya proteins can be divided logically into two aspects animal studies and human studies. Animal studies in soybean proteins go back to the late 1910's where as the tests with human beings began primarily in the late 1960's and early 1970's (Wolf, 1981). Both types of studies are now underway.

Numerous animal studies and limited tests with human beings indicate that properly processed soya proteins closely approach the nutritional properties of traditional animal proteins such as meat milk. Additional studies are needed, however to provide more information about long term effects in humans, need for fortification with vitamins and minerals, need for supplementation with methionine, mechanism of action of trypsin inhibitors from soya and rapid methods for measuring protein quality.

CONCLUSION

Soybean is the world's most inexpensive source of protein and it provides a high quality oil, so that soybean products can be utilized in various ways to meet the nutritive objectives for human beings.

Soy products can be used in feeding of the babies, children, adolescents, adults and elderly.

Soymilk can be used to feed the people who are allergic or intolerant to cow milk.

Soya based formulas prevented the the diarrhea and appearance of reducing substances in stools.

Soya products have been shown to decrease cholesterol and other levels of blood lipids.

Soy milk can be used for the treatment of children with kwashiorkor and marasmus.

Soya is the most economical source of protein available and it also fits an amino acid profile that allows substitution without sacrificing nutrition; so that, by use of soy products nutritional objectives can be met at low cost.

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