Research in Food Science and Nutrition

Volume 3

HUMAN NUTRITION

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J.V. McLoughlin
B.M. McKenna

Proceedings of the Sixth International Congress of Food Science and Technology, Dublin, September 18 – 23, 1983

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RESEARCH IN FOOD SCIENCE AND NUTRITION

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DIET AND DIETARY CONSTITUENTS

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FACTORS INFLUENCING DIETARY INTERVENTION IN PATIENTS WITH CORONARY DISEASE.

REID.V., GRAHAM,I., HICKEY,N., & MULCAHY, R. CARDIAC DEPARTMENT, ST. VINCENT'S HOSPITAL, DUBLIN.

The aim of the present study was to examine the influence of certain factors on the success of dietary advice in patients following myocardial infarction (MI).

Methods:
Thirty eight men under 60 years who survived an MI were included in a long-term rehabilitation programme. One aspect of the programme was dietary advice. Dietary history was used to record the usual nutrient intakes of the 38 patients before hospital admission and at one year follow-up examination. Dietary analysis was done by computer, after dietary intakes. Depending on the individual requirements of the patients a prudent diet, a cholesterol lowering diet or a weight reducing diet was prescribed. In addition, patients who stopped smoking were given advice to prevent weight gain. The recommended nutrient intakes were: fat 30 - 35% of energy, P/S ratio 0.75, dietary cholesterol 300mg., carbohydrate 50 - 55% of energy and dietary fibre 20 - 30g daily. The effectiveness of dietary advice was determined by analysis of the computer dietary data initially and at one year. Compliance was measured by subjective assessment by the dietitian at one year prior to knowledge of dietary analysis. Level of education achieved and socioeconomic group were also recorded.

Results:
Table I shows that mean total energy intake was reduced from 3,540 kcal to 2,484 kcal per day. Fat intake was reduced by 4%, P/S ratio was increased by 0.42 and dietary cholesterol was reduced by 232 mg. Carbohydrate intake was increased by 3% and dietary fibre by 6 g. Energy derived from alcohol was reduced from 6 to 5%. A mean weight loss of 2 kg was noted although mean body mass index remained unchanged.

Of the 38 patients, 25 (65.8%) were classified as good adherers and 13 (34.2%) as poor adherers to dietary advice. Table 2 shows that the good adherers came closer to the recommended nutrient intakes than the poor adherers. A mean weight loss of 3 kg was observed for good adherers compared to a gain of 2 kg for poor adherers. Of 11 smokers among the good adherers 10 had stopped smoking after 1 year. Of the 10 smokers among the poor adherers 4 had stopped smoking. Also, 8 of the 25 good adherers substantially increased their leisure exercise compared to 3 of the 13 poor adherers. Poor adherers had lower levels of education, were from lower socio-economic groups and had less understanding of their illness.

Conclusions:

Level of education and socio-economic atstus appear to be important determinants of patient compliance with dietary advice. Compliance may be, in turn, the single most important factor in determining the extent to which diet may be beneficially altered.

TABLE 1.

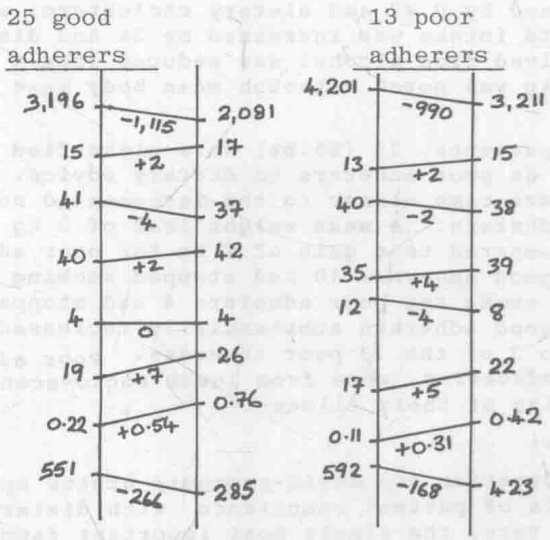
MEAN TOTAL ENERGY AND NUTRIENT INTAKE OF 38 MEN WITH MYOCARDIAL INFARCTION INITIALLY AND AT 1 YEAR FOLLOW-up.

	Mean initial values ± sd	Mean follow-up values ± sd	
Total Energy	3,540 ± 1,216	2,484 ± 1,144	**
Protein (%)	15 ± 3	17 ± 3	**
Fat (%)	41 ± 7	37 ± 7	**
Carbohydrate (%)	38 ± 7	41 ± 8	**
Alcohol (%)	6	5	
Cholesterol (%)	564 ± 208	332 ± 149	**
Fibre (%)	18 ± 6	24 ± 10	**
P/S ratio	0.18 ± 0.15	0.60 ± 0.43	**

** p 0.01

TABLE 2

MEAN LEVELS OF CHANGE IN TOTAL ENERGY AND NUTRIENT INTAKE BETWEEN INITIAL AND 1 YEAR FOLLOW-UP IN 38 MEN WITH MYOCARDIAL INFARCTION BY ADHERENCE TO ADVICE.



PREPARATION OF A LOW PHENYLALANINE PROTEIN BY ENZYMATIC PROCESS

A.Monckeberg, J.King and F.Montes de Oca.Instituto de Nutrición y Tecnología de los Alimentos. Universidad de Chile. Santiago, Chile.

At present the most used therapy for patients suffering phenylketonuria is based on restricted intake of phenylalanine (phe). Natural proteins contain approximately 5% phe, so it is almost impossible to provide a low phe diet consisting of natural food without causing a protein deficiency in the patient.

This work shows an enzymatic process that significantly reduces the phe content of casein by a partial hydrolysis of this protein. Following hydrolysis the extraction of the aminoacid was optimized by using different concentrations of activated charcoal (A.C.). The process has two hydrolysis steps. During the first hydrolysis an endopeptidase ALCALASE^{R}, (Novo) is used. The process is stopped once 12% of casein peptide bonds are hydrolyzed. This enzyme is a subtilisin with a specificity for peptide bonds, where carboxylic group is adjacent to an aromatic aminoacid.

The second hydrolysis is carried out by an enzyme called PRONASE^{R} (Sigma), which is a mixture of exopeptidase and endopeptidase, carboxypeptidase activity being one of them. In this step 36% of casein peptide bonds are hydrolyzed and most of aromatic terminal aminoacids are then liberated to the reaction media.

A gel filtration of the hydrolyzates was carried out in order to check the effect of hydrolysis and the results are shown in Fig. 1. It is observed that after the second hydrolysis, the O.D. values at 260 nm and 280 nm decrease significantly and that peak II appearing in Fig. 1b corresponds to elution volumes of phe and tyrosine (tyr). It can be assumed therefore that most of aromatic aminoacids are free.

The final hydrolyzate was treated with A.C. Different ratios of A.C. were used, not only with the idea of optimizing the removal of free aromatic aminoacids but also to minimize the loss of other hydrophobic peptides. It is observed in Table 1 that at 182% A.C., 70% of initial phe and 70% of tyr are removed. At 243% A.C., 85% of initial phe is removed. At 425% these aminoacid are totally removed. At the same time a gel filtration of these hydrolyzates was carried out after A.C. treatment. It was observed that at 182% A.C., the equivalent peak II of Fig 1b totally disappeared. The higher extraction of phe in the increasing amount of A.C. is possibly due to the fact that A.C. is removing the free phe as well as phe associated to peptides as not only does peak II disappear but peak I begins to decrease.

When protein nitrogen recovery was determined we found a 25% protein nitrogen loss when using 182% A.C., a 33% protein nitrogen loss at 243% and a 50% loss at 423%. As the 423% A.C. treatment provokes not only a high nitrogen loss, but also a high loss of other aminoacids as well as the aromatic aminoacids, we feel that the 182% A.C. and 243% A.C. could be considered useful for treatment of phenylketonuria. These hydrolyzates then would constitute an excellent protein source for phenylketonurics once the removed aminoacids, with the exception of phe, are added.

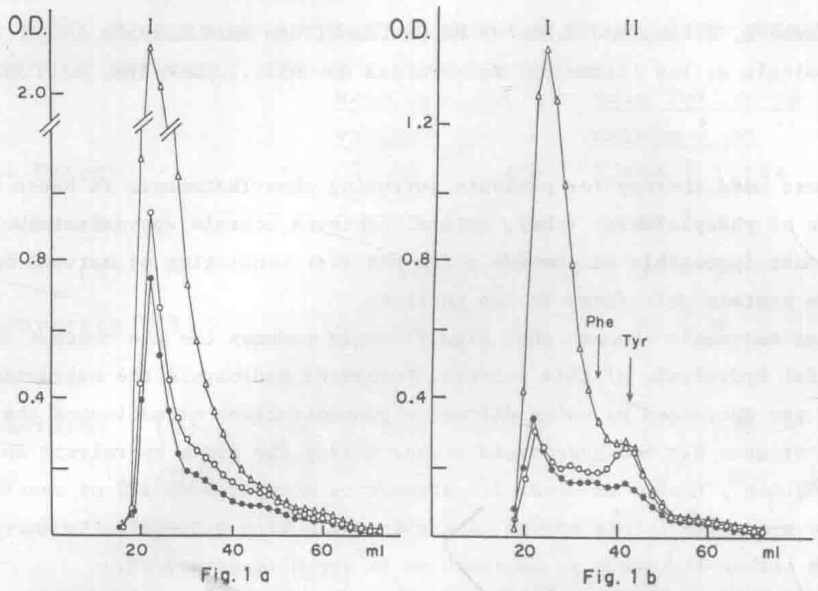


Fig. 1 a

Fig. 1 b

Fig. 1. Sephadex® G-10 Gel filtration of : Alcalase® hydrolyzate (Fig. 1.a) and Alcalase®-Pronase® hydrolyzate (Fig 1 b) •—• : Optical Density at 260 nm; o—o : Optical Density at 280 nm; Δ—Δ : Optical Density at 220 nm. (1/6 real O.D. values)

TABLE 1.- AMINOACID COMPOSITION OF CASEIN AND CASEIN HYDROLYZATES TREATED WITH DIFFERENT ACTIVATED CHARCOAL RATIOS[1].

	CASEIN (FAO STANDARD)	CASEIN	CASEIN HYDROLYZATE[2] WITH 50% A.C.	CASEIN HYDROLYZATE[2] WITH 182% A.C.	CASEIN HYDROLYZATE[2] WITH 243% A.C.	CASEIN HYDROLYZATE[2] WITH 425% A.C.
Essential Aminoacids						
Histidine	0.190	0.361	0.205	0.250	0.113	0.000
Isoleucine	0.352	0.311	0.310	0.395	0.393	0.345
Leucine	0.620	0.625	0.654	0.795	0.894	0.770
Lysine	0.520	0.495	0.562	0.589	0.595	0.594
Methionine	0.182	0.168	0.167	0.141	0.103	0.000
Phenylalanine	0.341	0.340	0.250	0.099	0.051	0.000
Tyrosine	0.379	0.366	0.250	0.106	0.026	0.000
Threonine	0.303	0.285	0.329	0.407	0.425	0.420
Tryptophan	0.090	-----	-----	-----	-----	-----
Valine	0.439	0.413	0.438	0.471	0.472	0.483
Non-Essential Aminoacids						
Arginine	0.244	0.243	0.219	0.145	0.109	0.045
Alanine	0.200	0.220	0.220	0.277	0.289	0.296
Aspertic Acid	0.465	0.454	0.539	0.619	0.671	0.660
Glutamic Acid	1.435	1.466	1.536	1.867	1.990	2.174
Glycine	0.129	0.130	0.155	0.165	0.171	0.166
Proline	0.753	0.671	0.801	0.605	0.534	0.376
Serine	0.393	0.390	0.432	0.542	0.587	0.662

1: g aminoacid/g nitrogen
2: Activated charcoal

RICE FLOUR FOR BAKING APPLICATIONS FOR WHEAT-SENSITIVE DIETS

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Manifestation of sensitivity to wheat foods instantly removes many traditional baked products, especially bread, from one's diet. Substitute cereal grains are usually limited to rice and perhaps, corn. Neither of these has the unique gluten proteins necessary for yeast-leavened breads, nor can they be easily substituted for wheat flour without formula modification.

Research at our laboratory has developed formulas and technology for making consumer-acceptable breads and layer cakes using 100% rice flour in place of wheat. The methodology developed is suitable for commercial and home applications. (1,4)

Physicochemical properties of rice flour

While most types of rice produced breads and cakes of equivalent appearance, only the soft-cooking types (japonica) gave acceptable crumb grain and texture. The indica types yielded sandy, dry crumb characteristics. In the United States of America, the soft-cooking types are represented by short and medium grain length kernels which have sticky properties when cooked in the traditional manner as white rice. Their starches have low gelatinization temperatures (below 65°C) and low amylose contents (below 20%). By contrast, the indica types grown in the U.S. have long kernels, produce dry, fluffy cooked rice, gelatinize above 70°C and have amylose contents above 23%. Such characteristics adversely affect the crumb grain properties of baked products made from the flours. (2)

The best performing rice flours were obtained from milled white rice or broken pieces ground to flour on conventional roller mills. (3) The optimum particle size distribution had about 50% through a 100 mesh sieve and more than 90% through a 70 mesh. Coarser flours produced acceptable but lower quality breads. Finer flours ground on hammer or turbo mills had high levels of starch damage, were heated during milling and did not function in breads. Layer cake systems were more tolerant to variations in particle size and damage produced in different mills.

Bread

The bread formula consists of 100 parts rice flour, 75 parts water, 7.5 parts sugar, 6 parts oil, 3 parts fresh yeast, 3 parts hydroxypropylmethylcellulose and 2 parts salt. These ingredients are thoroughly mixed together, panned or shaped as rolls, fermented to desired volume and baked. (1)

Many gums were tested as gluten substitutes. Only certain methylcelluloses provided the proper dough viscosity and film forming characteristics with the rice flour to retain fermentation gases during proofing and to expand during baking to produce a crumb grain similar to that of wheat breads produced in the U.S.