A Dietary Survey of Free-Living Middle-Aged White Males in the Western Cape

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SUMMARY

A survey was conducted to determine the dietary intake of a sample of free-living normal middle-aged (40 - 59 years) White males from the Stellenbosch area. The 7-day food record method was employed, and the 44 subjects who completed the three recording periods represented a sample population drawn from 300 volunteers.

The mean calorie intake of the sample (2 564/day) approximated the recommended daily allowance for the middle-aged reference male, and the mean ethanol intake was 24 g (SD ± 31) per day.

The daily intake of 99 g of protein represents a high protein diet of mainly animal origin. The dietary fat provided about 38% of the total calories per day, and consisted of 41 g of saturated fatty acids, 33 g of mono-unsaturated fatty acids and 12 g of polyunsaturated fatty acids, with a resultant P/S ratio of 1 : 3. The mean value for the daily intake of dietary cholesterol (566 mg/day) is very close to the value reported in the National Diet-Heart Study of the USA.

Of the 40% of calories derived from carbohydrates (256 g/day), half was contributed by mono- and di-saccharides and half by polysaccharides.

The highly saturated, high fat diet with a relatively high protein content of mainly animal origin, closely resembles that of a typical American diet of free-living males in a Western affluent community.

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In this country very little research has been done to determine the dietary intake of White males in the higher socio-economic groups. With the exception of one dietary study on White male students,[1] all investigations into the diets of free-living Whites available at the beginning of this study (1969) have either been surveys where consumption, particularly of fat, was calculated from household inventories and purchase surveys,[2] or nutrition surveys of White schoolchildren.[3] The purpose of this investigation was to determine the habitual nutrient intake of a sample population drawn from about 300 middle-aged White male volunteers participating in the cholesterol research projects of the Department of Physiology, University of Stellenbosch.

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MATERIALS AND METHODS

Sample

For the dietary survey, subjects were selected to correspond to the free-living participants in the National Diet-Heart Study (ND-H Study) of the National Heart Institute of the United States Public Health Service.[4] Males between the ages of 40 - 59 years, with a relative mass* less than 1,45 and with average serum cholesterol levels (SCL) below 350 mg/100 ml, were selected. They were free of clinical evidence of organic or metabolic disease and were following normal westernised eating patterns with the usual variety of local market foods.

Method

Methods usually employed to study individual diets are the dietary history method and the food record method, which, comparatively, yield data varying only slightly in terms of mean nutrient intakes. Trulson[5] found that the 7-day record gave most reliable results. Chappel[6] recommended that for the average daily intake over 1 year, repeated 7-day records gave more accurate data than one 7-day period only. This, and the fact that a sample population of very busy men, such as the participants in this survey, would rapidly tend to forget what they had eaten, made the use of food record methods desirable.

Three 7-day records, at 11-week intervals, were decided upon. A pilot survey was done on 8 men to test the practicability of the dietary record form. A durable predated booklet with separate divisions marked for breakfast, lunch, dinner and inbetween intakes, was used. No specific foods were listed or leading questions asked, e.g. 'How many slices of bread did you have for breakfast?' or 'How much sugar did you take in your coffee?' Such questions were avoided, as they were thought possibly to influence the subject in his reply, or on the other hand, to cause the subject to rely on the questions and to forget items not listed.

After an orientation talk where the purpose of the study was explained, the measuring of food portion size was

*Relative mass $= \frac{\text{body mass}}{\text{desirable body mass}}$.

demonstrated. Each of the selected subjects received a recording booklet, a list of instructions, a 225-ml (8-oz) transparent plastic cup marked in thirds and quarters, and a set of measuring spoons. Participants also completed a comprehensive questionnaire which included the dietary frequency, and the time spent in sleep and in exercise.

Dietary Data

A Food Composition Table, compiled by the authors, included 591 items selected from various sources,[7] and contained the calorie, carbohydrate, protein, fat, cholesterol, caffeine and ethanol content for each item listed. The data from the 7-day food records were analysed in terms of household measures and mass, and these items were coded to coincide with the values in the Food Composition Table.

Although caffeine is usually associated with coffee only, tea, cocoa, chocolate and cola drinks contain similar quantities. The caffeine content of all these products was considered in the calculations.[7] Intake of South African red-bush tea (*Aspalanthus lanceolata* and *A. contaminata*) and honey-bush tea (*Cyclopia genistiodes*), which contain no caffeine, was ignored.

Animal and plant protein were listed according to source. Instead of having a separate class of mixed protein, the protein of mixed origin in compound dishes such as cake, etc. was listed one-half as animal and one-half as plant protein.

According to Kingsbury *et al.*,[8] long-chain polyunsaturated fatty acids (PUFA), other than those given in the original tables, can influence SCL, and the total PUFA was therefore calculated by subtracting the sum of the saturated fatty acid (SFA) and oleic acid (MUFA) from the total fat.

To arrange the recorded data for computer analysis, the method employed by the National Nutrition Research Institute[7] was followed, and in part also the method described by Houser *et al.*[9] Standard computer programmes for the IBM 360/50 were used for the detailed analysis and statistical computations.

The average daily intake of the following nutrients and, where applicable, the percentage of calories derived from the nutrient concerned, were determined: food energy (calories, ethanol); protein (total, animal, plant); fats (total, SFA, MUFA, PUFA); dietary cholesterol; carbohydrates (total, mono- and disaccharides, polysaccharides) and caffeine.

RESULTS AND DISCUSSION

Sample Characteristics

Of the initial group of 52 subjects, 44 (85%) eventually completed the study. This high return may be ascribed to the interest and motivation of the participants.

An analysis of data from the questionnaire depicts the following sample characteristics. All the subjects were resident in the area of Stellenbosch. They were mainly academicians, educationalists, researchers, medical men, farmers, business- and tradesmen in executive positions. Most of these occupations are sedentary or involve only light physical activity. Socio-economically the subjects belong to the middle and upper middle classes, and most of them own their own homes or farms. Apart from some participation in sport, most of them do not get regular exercise, although a few do their own gardening. Although one or two would cycle or walk to work, all the subjects drive their own cars.

Most of the subjects have at least two meals at home, cooked either by their wives or by servants under supervision. A large number eat a scanty breakfast, have sandwiches or a snack for lunch, and indulge in a heavy meal at night. When they eat out, the meals generally conform to the same pattern, with meat as the main item. Economically these families are able to have a varied diet with meat once or twice daily, and would often have fish at one meal and meat at another. Dairy products (milk, cheese and butter) are used freely. However, some families have lately started using mixtures of butter and margarine, with vegetable oils for frying and salads. Fresh fruit and vegetables are available throughout the year even when not in season locally. Subjects can afford canned and frozen products. Most of them have cereals or dried rusks for breakfast. Bread is often eaten at two of the three meals, and cakes and pastries especially over the weekend. In most cases a sweet or fruit is served daily with the main meal. Sugar is used generously, particularly when taken in hot drinks. Coffee and tea are served with meals, and often also between meals. In many homes table wines are served at least once daily. Alcoholic drinks at sundown are a usual practice. Many subjects still smoke cigarettes, although lately some have changed to pipes and cigars.

From this description it may be said that these men follow a westernised eating pattern and conform to the general picture of typical members of an affluent society.

The values for the body mass, relative mass, age and serum cholesterol concentration for the sample are given in Table I. The ratio of 1,04 for the relative mass indicates that the sample was only 4% overweight.

TABLE I. BODY MASS, RELATIVE MASS, AGE AND SERUM CHOLESTEROL VALUES FOR THE SAMPLE*

Body mass (kg):		
Range		52,3 - 102,3
Mean		79,6
SD	±	9,7
Relative mass:		
Range		0,84 - 1,24
Mean		1,04
SD	±	0,76
Age (years):		
Range		40 - 59
Mean		48
SD	±	6,4
Serum cholesterol (mg/100 ml):		
Range		164 - 330
Mean		247
SD	±	44

* Mean values for 44 subjects.

TABLE II. MEAN VALUES FOR DAILY INTAKES OF DIETARY VARIABLES FOR THE SAMPLE*

Variable	g/day	% of total calories
Calories	2 563,7 ± 552,4	
Ethanol	23,6 ± 30,6	6,4
Total protein	98,5 ± 33,7	15,4
Animal protein	69,8 ± 26,7	11,3
Plant protein	26,4 ± 11,9	4,1
Total fat	108,6 ± 26,1	38,2
SFA	41,1 ± 11,5	14,5
MUFA	33,1 ± 10,0	11,6
PUFA	12,2 ± 5,9	4,3
P/S ratio	0,30 ± 0,11	
Dietary cholesterol (mg)	565,8 ± 171,5	
Total carbohydrate	256,3 ± 87,7	40,0
Mono- and disaccharides	127,7 ± 47,8	20,1
Polysaccharides	140,7 ± 71,6	21,7
Caffeine (mg)	323,3 ± 129,0	

* Mean values for 44 subjects. Values not adding up to the totals are due to differences in tables used.

Dietary Intake

The mean daily intakes of dietary variables are given in Table II.

Food energy: Average daily calorie intakes ranged from 1 677 - 4 087. The mean calorie intake is well within the range of 2 500 - 2 700 which is the recommended daily allowance (RDA) in terms of the middle-aged male with a body mass of approximately 74 kg. The mean value of 2 564 calories is very close to those reported for comparable populations by Bebb *et al.*[10] (2 567 calories) and the National Diet-Heart Study Feasibility Trials in the USA for their baseline and open control diets, viz. 2 560 and 2 500 respectively.[4]

Ethanol: A general shortcoming of dietary surveys is that alcohol intake is not reported, although calories derived from alcoholic beverages are included in calculating the total calorie intake. This neglect affects the percentage of calories derived from other sources in the diet. The mean daily intake of 23,6 g (7 calories/g) accounts for about 6% of the total calorie intake. The large standard deviation (SD ± 30,6) could be ascribed to the fact that 8 of the participants were total abstainers and 1 had a mean daily intake of 169 g of ethanol. The mean ethanol intake of a comparable population in the USA[10] was 36,0 g (9,9% of total calories), while the diets of middle-aged Japanese farmers provided 143 calories which represented 6% of their total daily calorie intake.[11] It is interesting that previous surveys showed that the average calorie intake from alcohol was the only variable which differed significantly from one 7-day record to another.[12]

Protein: Mean daily protein intake (Table II) was almost 40% more than minimum RDA of 72 g (0,9 g/kg body mass), and this intake provided 15,4% of the total calories. Although the minimum recommended protein allowance for a middle-aged male is about 10% of his calorie allowance, the actual intake of men following a Western type diet is generally much higher.[12] Similar values were obtained by Bebb *et al.*[10] and Versluis *et al.*[13] Keys *et al.*[11] found that the dietary protein of middle-aged Japanese farmers provided 12,3% of their total calories.

The total protein intake consisted, on average, of 69,8 g of animal protein and 26,4 g of plant protein. The frequency distribution for the three categories of protein (Fig. 1 A, B and C) shows that most of the subjects have a relatively smaller total animal and plant protein intake than the mean value in this specific sample.

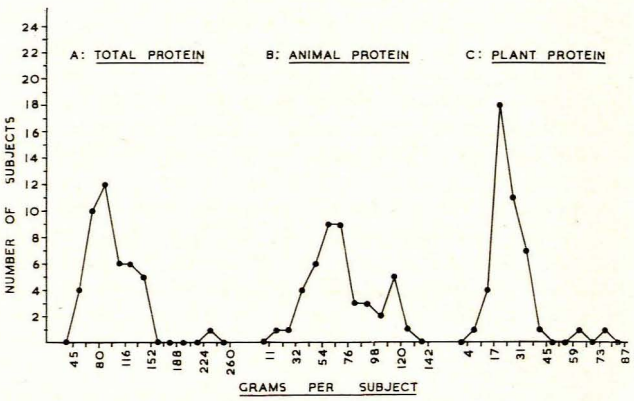

Fig. 1. The frequency distribution of the sample for the mean daily intake of total, animal and plant proteins.

Fat: The mean fat intake (Table II) is slightly lower than the mean values reported by Keys *et al.*[14] for Cape Town White males (40% of calorie intake) and for American males (40 - 43% of calorie intake) who adhere to a similar Western-type diet. A comparison of the results for the intake of different types of fatty acids in the present survey and other similar studies is given in Fig. 2. The values are typical of the Western diet but differ vastly from the dietary fat composition of the fat-controlled diet recommended by the American Heart Association for the prevention of atherosclerosis.[15]

The mean ratio between PUFA and SFA intake (P/S ratio = 0,30) is comparable to the value found by Antor

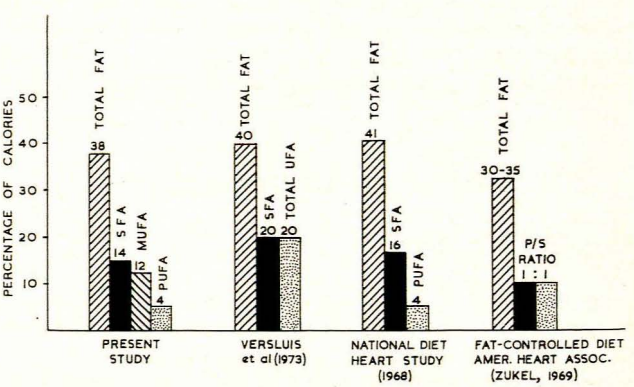

Fig. 2. A comparison of the total fat and different types of fatty acids in the present survey and other similar studies, with the recommended dietary fat composition of a fat-controlled diet.

et al.[16] but much higher than the P/S ratio of 0,20 reported in the Feasibility Trials of the ND-H Study.[4] The higher figure in the present survey may be due to a difference in the calculations of PUFA values in the Food Composition Tables compiled for this survey. Values for linoleic and linolenic acids were not taken as the total PUFA, but PUFA values were estimated by subtracting the sum of SFA and oleic acid (MUFA) content from the total fat content of the food item. This calculation takes into account the long-chain polyunsaturated fatty acids found, for example, in fish,[7] which were not included in the PUFA values given in the original tables.

Dietary cholesterol: Mean values for the daily intake of dietary cholesterol (Table II) are very close to the 535 mg per day reported in the ND-H Study Trials' baseline diet.[4] Both are, however, slightly lower than the value predicted by Keys[17] for the average Western type diet, viz. 250 mg per 1 000 calories, or 600 - 650 mg cholesterol per day for the middle-aged reference man. Fig. 3 shows the daily dietary intake of cholesterol in the present survey in comparison with comparable populations from various other countries.[18]

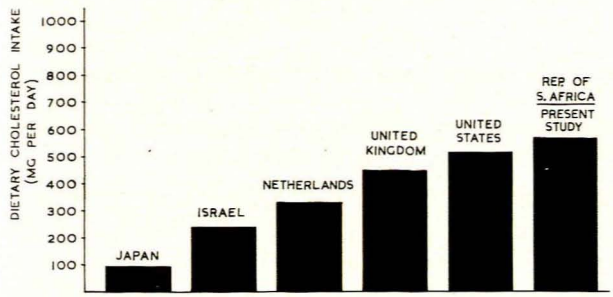

Fig. 3. The dietary intake of cholesterol in the present survey in comparison with comparable populations from various other countries.[18]

Carbohydrate: In the Republic of South Africa, the diets of the Black and White populations are typical examples of high and low carbohydrate diets respectively. In the low-fat diet of Blacks, 70% of the total calories is derived from carbohydrate,[7] while the present survey showed that because of a relatively high fat and protein content, only 40% of the total calories in the westernised diet came from carbohydrate (Table II).

The intake of mono- and disaccharides provided approximately 20% of the total calories, and represented 50% of the total carbohydrate intake. The mean daily intake of mono- and disaccharides (128 g) seemed much higher than the intake of sugar in South African Whites of higher socio-economic groups, viz. 80 - 100 g per day.[19] The latter figures, however, are for sucrose only, whereas the values in the present survey included other mono- and disaccharides such as glucose, fructose and lactose. The frequency distribution for the intake of total carbohydrate, mono- and disaccharides and polysaccharides is given in Fig. 4.

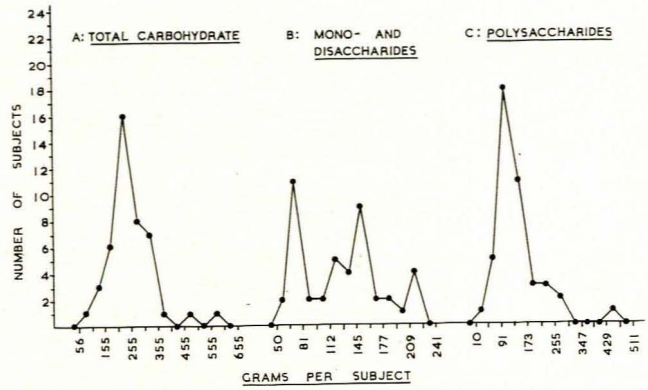

Fig. 4. The frequency distribution of the sample for the mean daily intake of carbohydrates.

Caffeine: Epidemiological surveys and experimental trials have suggested a possible role of caffeine in the development of atherosclerosis. With a coffee intake corresponding to 215 - 230 mg of caffeine per day, the concentrations of some serum lipids have been found to increase.[20]

The mean caffeine intake of 323,2 mg in the present survey would represent about 5 cups of coffee per day. However, it must be borne in mind that in the present survey total caffeine intake was calculated, and not only the caffeine contained in coffee. Certain investigators[21] believe that tea, in spite of its caffeine content, has a reducing effect on serum lipids due to other components in tea, e.g. tannins.

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