

## **The Mediterranean Italian diet: keys to contemporary thinking**

BY FLAMINIO FIDANZA

*Istituto di Scienza dell'Alimentazione, Università degli Studi, Perugia, Italy*

The Mediterranean diet, which is usual for people from countries whose coasts are washed by this sea, is a moderate diet in which cereal products, fish, legumes, olive oil, fruit and vegetables and little meat and wine, are prevalent.

This type of diet, with variants characteristic for each Mediterranean population, results from an amalgamation over a period of time of local and foreign cooking cultures (first, the Greek-Latin and Arabic ones). The Medieval and post-Medieval cookbooks of Spain, France and Italy are a good example of this.

### *Healthy character of the Mediterranean diet*

The best proof of the healthy character of the Mediterranean diet is emerging from the International Cooperative Study on the Epidemiology of Coronary Heart Disease, more commonly known as the Seven Countries Study (Keys, 1980). The details of this complex longitudinal study are now well known and so will not be dealt with here.

In this study we observed that the death rate from coronary heart disease (CHD) is significantly related to the monounsaturated:saturated fatty acids ratio in the diet (Keys *et al.* 1986).

Even more striking is the difference if we consider the nine cohorts of rural Europeans. The five Mediterranean cohorts (Crete, Corfù, Crevalcore, Montegiorgio and Dalmatia) have a diet in which olive oil, cereals, fruit, fresh vegetables and wine prevail. The diet of four non-Mediterranean cohorts (East and West Finland, Slavonia and Velika Krsna) is characterized by milk and meat fats and the alcoholic beverages are beer and distilled liquors which are very often consumed outside meals. These dietary differences are associated with marked differences in the 15-year CHD death rate (284 v. 655 per 10 000).

More recently we have further examined some characteristics of the two rural Italian cohorts of men from the Seven Countries Study. The dietary data of 1536 middle-aged men from Crevalcore in the north near Bologna and Montegiorgio in the centre near Ancona, were collected in 1965 at the 5th-year follow-up, by means of the dietary history method (Alberti Fidanza *et al.* 1988). The two cohorts were followed for the next 20 years for total and specific mortality with 100% coverage of individuals (Farchi *et al.* 1989).

In order to investigate whether a different destiny was associated with subgroups of people with different eating habits, all individuals were classified into different groups, depending on the nutrient densities of their diet, using a K-means cluster-analysis technique. After different attempts four clusters were selected on the basis of 'nutritional common sense' in judging the resulting eating patterns. In Table 1 the mean values of food consumption in each cluster are shown. Subjects of cluster 1 had a high alcohol intake, and a low meat, fruit and cake intake. Subjects of cluster 2 preferred seed oils and fruit. The intake of sausages, fish, vegetables, other fats and eggs was low. Wine consumption was moderate. Subjects of cluster 3 presented a rather high intake of meat, sausages, fish, vegetables, cheese, olive oil and other fats, while the intake of cereals and

Table 1. *Daily food consumption (g) in Crevalcore and Montegiorgio, Italy\**

(Mean values with their standard errors)

Cluster . . .	1		2		3		4	
	Mean	SE	Mean	SE	Mean	SE	Mean	SE
Food								
Starchy food (bread, rice, potatoes, etc.)	455	7.3	434	11.8	401	6.3	590	8.0
Vegetables	51	2.3	42	2.6	55	2.4	55	2.4
Pulses	6	0.5	5	0.7	6	1.0	6	0.6
Fruit	155	8.0	212	13.8	198	8.2	196	8.4
Fish	21	0.9	18	1.3	22	1.0	21	1.0
Seed oil	6	0.6	45	1.4	2	0.3	5	0.4
Olive oil	30	1.0	5	0.9	43	1.0	26	0.7
Other fats	22	0.7	21	1.2	26	0.9	17	0.5
Meat	77	2.8	101	4.3	105	3.5	93	3.0
Eggs	18	1.0	15	1.3	18	1.1	16	0.9
Sausages	25	1.3	17	1.6	27	1.4	21	1.1
Cheese	10	0.7	13	1.1	19	1.2	12	0.8
Cakes, biscuit etc.	17	1.1	34	2.2	31	1.9	29	1.5
Alcohol	150	2.8	67	2.6	55	1.5	62	1.5
Cholesterol (mg)	264	7.0	283	9.7	318	8.2	269	6.8

\* Values taken from Farchi *et al.* (1989).Table 2. *Number of deaths, grouped according to cause, over 20 years in Crevalcore and Montegiorgio, Italy*

Cluster . . .	1	2	3	4
<i>n</i> . . .	439	185	423	489
Cause of death				
CHD	49	19	43	57
Cancer:	77	27	55	53
Lung	8	4	12	9
Stomach	13	11	16	12
Stroke	30	11	30	18
Liver cirrhosis	21	2	4	4
Other	53	22	38	55
All	230	81	170	187

CHD, coronary heart disease.

potatoes was low. The alcohol intake was the lowest of all clusters. Subjects of cluster 4 consumed preferably vegetables, cereals and potatoes, while the intake of oils (but with a prevalence of olive oil), other fats and eggs was low. Wine consumption was moderate. The diet of this cluster can be considered typical of the Italian working class in the fifties.

In Table 2 the age-adjusted percentage death rate in each cluster for different causes of death at the 20-year follow-up are shown. Large, and often statistically significant,

differences in mortality experience between groups were observed, the greatest differences were at the 10- or 15-year follow-up. CHD mortality rates of clusters 1 and 4 were higher than those of clusters 2 and 3. It should be remembered that groups 2 and 3 had the maximum intake of total fats and particularly of polyunsaturated fatty acids. Stroke death rates in clusters 1 and 3 were much higher than those of clusters 2 and 4. These rates were double at the 15-year follow-up. Cancer mortality rates were lowest in cluster 2 and highest in cluster 1. Then there were large differences between lung and stomach cancer. The liver cirrhosis death rate, as expected, was markedly prevalent in cluster 1.

In conclusion, the group which was most protected from the development of CHD had the highest consumption of polyunsaturated fatty acids. Overall, the two most protected groups also ate more carbohydrates than the other two groups, although the rank was not respected exactly. Regarding strokes, the most protected group was the one with the highest consumption of carbohydrates and the most exposed to risk was the one with the smallest intake.

Because the alcohol consumption in our population groups was rather high we recently examined the role of this nutrient in relation to cardiovascular disease (CVD) mortality. The alcohol intake, mostly wine, of 1536 men of Crevalcore and Montegiorgio ranged from 0 to 330 g/d. This intake was expressed as a percentage of total energy and these percentages were used to divide the total group into quintile classes. An appropriate analysis at the 15-year follow-up has shown a J-shaped relationship between percentage of energy from alcohol and CVD mortality. The lowest risk for CVD was at the second quintile corresponding to a daily alcohol intake of 56 g, equal to about 0.5 litres wine.

From the dietary data of the men of the two rural Italian cohorts it is becoming evident that about one-quarter was following a Mediterranean-like diet. So more recently we examined a real Mediterranean population group from a town in southern Italy: Sapri. Sapri is in Cilento, not far from Elea, the home of the Eleatic School of Philosophy in Magna Graecia, of which some physicians were members. This study was part of an international cross-sectional collaborative study on the Essential Fatty Acid Antioxidant Hypothesis in relation to CHD. The diet of the seventy-four clinically healthy men of 40–49 years of age was rich in cereals (mean daily amount 466 g), fish (49 g), legumes (29 g), oil (mostly olive, 55 g), vegetables (245 g), fruit (247 g). Alcohol intake was rather high for farmers and workers (18% of total energy). Of course other differences were observed according to the socio-economic class of the subjects.

In this population we observed the following characteristics (Riemersma *et al.* 1986). Mortality from CHD was between one-quarter and one-third that in Finland and Scotland. In adipose tissue the proportion of linoleic acid was much higher than in Karelia (Finland). Similar gradients were observed for desaturation and elongation products. The gradient in the proportion of polyunsaturated fatty acids can be related to different dietary intake of linoleic acid or naturally occurring antioxidants ( $\beta$ -carotene and vitamins E and C), or both. Because of the high intake of olive oil these men had the highest proportion of oleic acid.

In this population group we found that plasma vitamin E concentration was positively correlated with that of serum cholesterol, non-high-density lipoprotein (HDL)-cholesterol, triacylglycerols and apolipoprotein B (all  $P < 0.001$ ). The results of partial correlation analysis showed that apo-B, the apolipoprotein constituent of HDL, was related to vitamin E independently of serum triacylglycerols, a fairly accurate marker of

very-low-density lipoprotein. On the other hand, triacylglycerols were related to vitamin E independently of apo-B. Both correlations were much weaker if an adjustment was performed for non-HDL-cholesterol (Rubba *et al.* 1989).

In the same population group the percentage of saturated fatty acids in adipose tissue (AT) was directly correlated with systolic (SBP) and diastolic (DBP) blood pressure ( $P < 0.01$ ) (Rubba *et al.* 1987). This relationship was independent of smoking habits and body-weight. The adipose tissue of men in the upper DBP quintile (range 90–102 mm Hg) was significantly richer in palmitic acid ( $P < 0.01$ ) compared with that of men in the lowest quintile of DBP. Dietary history demonstrated that the overall intake of saturated fatty acids (as % energy) was similar in the two extremes of DBP quintiles. There was a relatively higher consumption of fish by those in the lowest DBP quintile ( $P < 0.05$ ). Men in the upper quintile of DBP consumed more eggs ( $P < 0.05$ ). The intake of monounsaturated fatty acids (as % energy) was also higher ( $P < 0.05$ ) in men with low blood pressure.

In addition the whole population sample was subdivided into three tertiles on the basis of energy intake in the different individuals. The proportion of adipose tissue polyunsaturated fatty acids was relatively lower in tertile 3 of energy intake and higher in tertile 1; this reflected parallel differences in the intake of polyunsaturated fatty acids. The percentage of monounsaturated fatty acids (oleic acid) was relatively higher ( $P < 0.01$ ) and that of saturated fatty acids (palmitic acid) was relatively lower ( $P < 0.05$ ) in the high-energy tertile 3 as compared with the low-energy tertile 1. In this same group total energy was positively correlated ( $r 0.87$ ,  $P < 0.01$ ) with carbohydrate intake (g/d).

Dietary carbohydrates were inversely related to adipose tissue saturated fatty acids ( $r -0.40$ ,  $P < 0.001$ ) and directly correlated with adipose tissue monounsaturated fatty acids ( $r 0.40$ ,  $P < 0.001$ ). Carbohydrate intake was related to adipose tissue monounsaturated and saturated fatty acids independently of daily energy intake. On the other hand, when the influence of dietary carbohydrates was eliminated a correlation was no longer detectable between energy intake and adipose tissue fatty acids. A possible explanation for the findings is that high-energy and carbohydrate intake is associated with accelerated rate of fatty acid elongation in the liver, leading to enhanced oleate (18:1) synthesis from C<sub>14</sub> or C<sub>16</sub> saturated fatty acids.

#### *Changing patterns of food consumption in Italy*

As we have shown on other occasions, Italian society is rapidly changing. In the second half of this century Italian society passed from an agro-familial to an industrialized type. This induced a dramatic change in food habits (Fidanza, 1980; Fidanza & Alberti Fidanza, 1983).

Examining the food consumption for the whole country, as obtained from food balance sheets, we have the following situation in the last 40 years. There is a striking increase in animal product consumption, particularly meat and to a lower extent milk and dairy products and animal fats. For foods of vegetable origin the situation is more dynamic, with a large increase in the consumption of fruit and vegetables, sugar and oils (particularly seed oils) but, however, virtual stability for cereals, potatoes and a decrease for dry legumes. When the values of consumption are expressed in nutrients and energy, a progressive increase is evident in protein and its quality. The situation is striking for fats with an increase in the last 40 years of 120% for vegetable and 180% for

animal fats. The daily energy availability has passed from 9.6 MJ to a little more than 13.8 MJ (Cialfa, 1990).

However, food balance sheet data have great limitations and can be of some use only in showing general trends. On various occasions, Cialfa *et al.* (1991), from the National Institute of Nutrition, have shown the great difference between food balance sheet data and those obtained from household surveys on food and nutrient intakes, carried out by this Institute between 1980 and 1984. In addition, food balance sheets are in general carried out for the whole country and so they do not give any information regarding particular groups of the population and, even worse, regarding regional differences which are particularly important in a country like Italy, which has been unified relatively recently and so has a wide variety of cultural backgrounds.

Since 1968 the Central Institute of Statistics has carried out a Household Food Consumption and Expenditure Survey almost annually. Even this survey has some limitations. These have been examined in detail by Cialfa *et al.* (1991). However, they do provide rather reliable information on the differences between large geographical areas of the country.

For bread intake there has been a progressive decrease which is strongly marked in the north. For spaghetti intake the decrease has been relatively small in the south, medium in the central region and pronounced in the north, particularly between 1969 and 1973.

Milk intake is lower in the south, but has been progressively increasing. In the north it has been rather stable over the last 10 years. For cheese no great differences in intake can be observed both among regions and with time.

Meat intake, which was much lower in the south, has been increasing with time, while it has been decreasing slightly in the north over the last 10 years. In the central region a progressive increase can be observed.

For fish the intake has been stable, being higher in the south, but in the last 4 years there has been a slight increase in all four regions.

Fruit intake has been progressively increasing in all four regions without great differences among them.

For sugar intake, the small differences which were noticeable in 1968 have been progressively disappearing and great stability has been reached.

Wine consumption, which is much lower in the south, has been progressively decreasing over the last 14 years and to a greater extent in the central region and north.

A rather similar trend has been observed in the men of the two Italian rural areas of the Seven Countries Study (Fidanza & Alberti Fidanza, 1975; Fidanza *et al.* 1983). Tables 3 and 4 show the percentage distributions of energy according to food group in Crevalcore and Montegiorgio from 1960 to 1980. In these cases the influence of ageing has to be taken into account.

From the previously given data it is evident that the Italian diet has progressively become farther and farther removed from the 1950s diet and this also in the south. An inversion of tendency is urgently needed.

#### *Reference Mediterranean Italian diet*

Now which one can be considered a 'Reference Mediterranean Italian diet'? The subjects of cluster 4 from Crevalcore and Montegiorgio were following a Mediterranean-like diet in 1965, as were the workers from Sapri, but with too much wine and meat.

Table 3. *Trend of percentage distribution of energy according to food group in Crevalcore, Italy*

	1960	1965	1970	1980
<i>n</i> . . .	20	20	20	11
Bread	33.6	28.7	22.8	25.0
Cereals	15.0	20.2	14.0	10.5
Potatoes	0.8	0.7	0.7	1.2
Vegetables	0.8	1.0	1.0	1.5
Legumes	0.5	0.6	0	0.2
Fruit	3.2	2.6	5.4	3.8
Meat	9.9	11.4	14.2	8.7
Fish	0.8	0.8	0.7	0.6
Eggs	1.3	0.9	1.5	1.2
Cheese	2.5	1.9	2.9	5.3
Milk	4.8	4.7	4.0	6.1
Edible fats	12.1	13.3	15.9	16.2
Sugar products	5.0	3.0	3.1	5.3
Alcohol (100%)	9.7	9.9	12.0	12.6

Table 4. *Trend of percentage distribution of energy according to food group in Montegiorgio, Italy*

	1960	1965	1970	1980
<i>n</i> . . .	20	20	20	11
Bread	32.1	31.4	27.4	21.0
Cereals	21.0	20.9	16.3	13.7
Potatoes	2.3	0.5	1.7	1.3
Vegetables	3.0	4.4	2.1	2.7
Legumes	3.0	1.1	0.1	0.8
Fruit	1.3	1.6	1.8	2.6
Meat	3.4	4.9	11.5	13.0
Fish	1.1	1.4	0.5	0.9
Eggs	3.1	1.2	2.0	1.3
Cheese	0.1	0.6	1.0	2.7
Milk	0.5	0.4	0.5	1.2
Edible fats	18.4	19.0	21.2	17.6
Sugar products	1.5	0.9	1.3	0.8
Alcohol (100%)	9.0	11.3	11.9	20.1

A real 'Reference Mediterranean Italian diet' can be considered to be that of the subjects of Nicotera, a poor rural area in the south, perched on a spur in the mountains overlooking the Tyrrhenian Sea about 60 km north of Reggio Calabria, near the toe of Italy. In 1960 Nicotera was one of the areas of the Seven Countries Study, but because of a shortage of money and then because of its similarity with the two rural areas in Greece, the study was not continued longitudinally. But now we have 'in programme' to re-examine all the men who are still alive in order to evaluate the situation at the 32nd-year follow-up.

Tables 5 and 6 show the mean daily intake of foods, for males and females

Table 5. *Mean daily intake of foods (g) of men in Nicotera, Italy*  
(1960, mean of three seasons)

Age-group (years) . . .	13-19	20-59	>60
<i>n</i> . . .	12	18	7
Cereals	538	488	452
Vegetables	286	344	401
Legumes	55	49	62
Fruit	70	101	70
Fish	25	42	34
Edible fats	38	46	52
Meat	34	53	27
Eggs	11	20	11
Cheese	13	15	33
Milk (ml)	45	33	24
Sugar products	26	24	28
Wine (ml)	88	293	216

Table 6. *Mean daily intake of foods (g) of women in Nicotera, Italy*  
(1960, mean of three seasons)

Age-group (years) . . .	13-19	20-59	>60
<i>n</i> . . .	15	19	3
Cereals	319	348	241
Vegetables	236	274	177
Legumes	32	36	13
Fruit	80	76	100
Fish	20	30	43
Edible fats	30	36	27
Meat	26	29	35
Eggs	12	11	7
Cheese	9	12	16
Milk (ml)	15	37	24
Sugar products	20	19	14
Wine (ml)	35	52	31

respectively, for three age-groups, as the mean of three seasons in 1960 (Fidanza & Alberti Fidanza, 1971). Cereals were well represented, as also were vegetables, legumes and fish. The only edible fat used was olive oil. Meat, eggs, cheese and milk were present in rather low amounts. Wine was consumed moderately by men.

This diet probably seems too frugal but the advantage of good health can be a reward for frugality, and frugal diets were consumed for centuries by monks without any problems.

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