

Biochemical and haematological variables in vegetarians

Relatively little is known about the long-term consequences of a vegetarian diet. Vegetarians have lower serum cholesterol concentrations than non-vegetarians¹ and Seventh-Day Adventists in the United States of America appear to have a lower prevalence of ischaemic heart disease than the general population.² On the other hand, vegetarian diets may be associated with impaired calcium absorption and with anaemia. We have recently measured various biochemical and haematological variables in two groups of vegetarians and a group of non-vegetarians.

Subjects, methods, and results

The subjects studied were (1) 56 vegetarians and 264 non-vegetarians who were volunteers in an epidemiological study which suggested a protective role of cereal fibre in diverticular disease,³ and (2) a further group of 35 vegetarians attending a vegetarian congress at Guildford in the summer of 1978. The volunteers were all aged between 30 and 69 years and the groups comprised roughly equal numbers of men and women. Fasting plasma lipid, lipoprotein, cholesterol, and glucose concentrations were measured by methods we have previously described.⁴ The other variables (see table) were measured in the clinical biochemistry laboratory of the Radcliffe Infirmary, Oxford. All measurements were made without knowledge of whether the samples were from vegetarians or non-vegetarians. The significance of differences between groups was assessed by means of the unpaired *t* test.

Selected results are shown in the table. Analyses of the diet histories suggested that the difference in cholesterol concentrations might be because of a difference in saturated fat intake rather than because vegetarians had a higher intake of dietary fibre. Vegetarians with a saturated and monounsaturated fat intake of over 50 g daily had a mean plasma cholesterol concentration of 6.2 mmol/l (239 mg/100 ml), which is similar to that in non-vegetarians. No relationship was apparent between cholesterol and dietary fibre. The differences in blood glucose and high density lipoprotein (HDL) expressed as a percentage of total cholesterol were small but consistent and statistically significant. Despite calcium and haemoglobin concentrations being lower in vegetarians none were anaemic: the lowest calcium concentration was 2.21 mmol/l (8.8 mg/100 ml). None of the differences between groups could be explained by differences in age and sex. The 35 vegetarians in group 2 were studied in the summer, whereas the vegetarians and non-vegetarians in group 1 were studied over the course of a year. Numbers were too few to examine for seasonal variation in detail, but there were no appreciable differences between the two groups. Relevant negative results are also shown in the table. There was no difference in the results of liver function tests and other measurements usually made in a routine SMA screen and full blood count between vegetarians and non-vegetarians.

Mean (\pm SD) values for various biochemical and haematological variables in vegetarians and non-vegetarians

	Vegetarians (n = 91)	Non-vegetarians (n = 264)	p value
Blood glucose (mmol/l)	5.0 \pm 0.6	5.6 \pm 1.3	<0.001
Total plasma cholesterol (mmol/l)	5.5 \pm 1.1	6.5 \pm 1.2	<0.001
HDL cholesterol (mmol/l)	1.7 \pm 0.5	1.7 \pm 0.5	NS
HDL as percentage of total cholesterol	30.6 \pm 8.2	27.6 \pm 9.8	<0.05
Plasma triglyceride (mmol/l)	1.2 \pm 0.6	1.4 \pm 0.7	NS
Blood urea (mmol/l)	4.9 \pm 1.4	5.7 \pm 1.3	<0.001
Plasma uric acid (mmol/l)	0.31 \pm 0.09	0.34 \pm 0.08	<0.001
Plasma calcium (mmol/l)	2.35 \pm 0.08	2.41 \pm 0.10	<0.001
Serum albumin (mg/100 ml)	42.1 \pm 4.4	42.6 \pm 2.3	NS
Haemoglobin (g/dl)	13.9 \pm 1.1	14.3 \pm 1.1	<0.001
MCV (fl)	87.2 \pm 6.3	86.9 \pm 6.1	NS
MCHC (g/dl)	34.2 \pm 2.9	34.6 \pm 3.1	NS

Conversion: SI to traditional units

Blood glucose: 1 mmol/l \approx 18 mg/100 ml.
 Plasma cholesterol: 1 mmol/l \approx 38.6 mg/100 ml.
 Plasma triglyceride: 1 mmol/l \approx 88.5 mg/100 ml.
 Blood urea: 1 mmol/l \approx 6.0 mg/100 ml.
 Plasma uric acid: 1 mmol/l \approx 16.8 mg/100 ml.
 Plasma calcium: 1 mmol/l \approx 4.0 mg/100 ml.
 Mean cell vol (MCV): 1 fl = 1 μ m³.

Comment

The vegetarians studied were all members of the Vegetarian Society of the United Kingdom and consequently not necessarily representative of all vegetarians. The data are nevertheless of interest, and some of the differences may explain at least in part the low prevalence of ischaemic heart disease in the largely vegetarian Seventh-

Day Adventists.² The data confirm the need for a long-term prospective study of vegetarians, whose indicators of carbohydrate and lipid metabolism (including the ratio of HDL to total cholesterol⁵) seem to be more favourable to health than those of non-vegetarians.

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¹ Sacks FM, Castelli WP, Donner A, Kass E. Plasma lipids and lipoproteins in vegetarians and controls. *N Engl J Med* 1975;292:1148-51.

² Phillips RL, Lemon FR, Lawrence-Beeson W, Kuzma JW. Coronary heart disease mortality among seventh-day adventists with differing dietary habits: a preliminary report. *Am J Clin Nutr* 1978;31, suppl: 5191-8.

³ Gear J, Ware A, Fursdon P, et al. Symptomless diverticular disease and intake of dietary fibre. *Lancet* 1979;ii:511-3.

⁴ Simpson RW, Mann JI, Eaton J, Moore RA, Carter R, Hockaday TDR. Improved glucose control in maturity-onset diabetes treated with high-carbohydrate-modified fat diet. *Br Med J* 1979;ii:1753-6.

⁵ Kannel WB, Castelli WP. Is the serum cholesterol an anachronism? *Lancet* 1979;ii:950-1.

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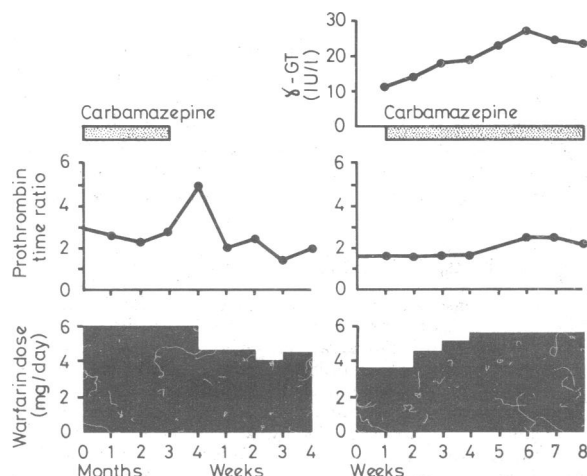
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Interaction between carbamazepine and warfarin

Several anticonvulsants increase the rate of metabolism of warfarin and reduce its hypoprothrombinaemic effect. This is due to induction of hepatic microsomal enzymes.^{1,2} Carbamazepine induces microsomal enzymes in man and shortens the plasma half life of warfarin, lowers serum warfarin concentrations, and reduces the hypoprothrombinaemic effect under controlled conditions.³ We know of no reports of this interaction occurring during the routine management of patients on anticoagulants. We describe a patient on warfarin in whom discontinuing carbamazepine resulted in a potentially dangerous increase in prothrombin time.

Case report

A 56-year-old man had been taking warfarin since he had an aortic valve prosthesis inserted five years before. He had been taking carbamazepine 300-600 mg daily for 15 months for trigeminal neuralgia and his prothrombin



Effect of carbamazepine on warfarin dose and γ -glutamyl transferase.