of the aorta was found but no atheroma of the coronary arteries. Another of the eight patients, a woman aged 44, had a serum cholesterol concentration of 7 mmol/l (273 mg/100 ml) before thyroidectomy and a concentration of 6 mmol/l (230 mg/100 ml) before she died four years later.

These eight patients are as relevant to the debate on fat and atheroma as the flowers that bloom in the spring. It is time that this outworn reference was given a well-deserved rest.

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¹ Blumgart, H L, Freedberg, A S, and Kurland, G S, *American Journal of Medicine*, 1953, 14, 665.

² McMichael, J, *Lancet*, 1974, 1, 1340.

³ Thompson, G, *Lancet*, 1974, 2, 102.

SIR,—With reference to the last comments in Drs K G Taylor and D J Betteridge's letter on "Fats and atheroma: an inquest" (17 February, p 485), I wish to point out that dietary limitation of cholesterol-containing foods is unnecessary and ineffective in reducing serum cholesterol. Over four-fifths of the body's cholesterol is endogenous and dietary cholesterol intake is compensated for anyway.¹ Restricting eggs to two per week is bad dietary practice—they are extremely nutritious, cheap, readily available, and easy to store and cook; at most I might consider a limitation of four per week. Reduction of milk would be unwise: research has shown that it has hypocholesterolaemic properties.² Limiting total fat and refined carbohydrates in the diet are the all-important factors.

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¹ Davidson, S, et al, *Human Nutrition and Dietetics*. Edinburgh, Churchill Livingstone, 1975.

² Howard, A N, and Marks, J, *Lancet*, 1977, 2, 255.

SIR,—I would like to deal with some of the supposed evidence in favour of an aetiological significance of cholesterol in atheroma, such as that quoted by your correspondents Drs K G Taylor and D J Betteridge (17 February, p 485).

Evidence from animal experiments is always a little suspect, but it is very much more so when vegetarian animals are made to take foods they never normally eat. Suppose we reversed the experiments and fed human beings the strict vegan diet of rabbits and rhesus monkeys. Such persons would develop muscular weakness and probably B₁₂ deficiency. This could be cured by giving essential amino-acids (first-class proteins) and vitamin B₁₂. Would Drs Taylor and Betteridge regard this as evidence that all rabbits and rhesus monkeys should have supplements of essential amino-acids and B₁₂?

Drs Taylor and Betteridge remind us that the probability that an individual will develop a coronary infarct increases in proportion to his serum cholesterol concentration. In myxoedema this relationship is not just a probability. The serum cholesterol is a direct measure of the severity of the disease. Do they suggest that this means that cholesterol causes myxoedema or it can be cured by lowering the cholesterol with polyunsaturated fats?

Most experiments purporting to show an improvement with polyunsaturated fats have been criticised because they do not exclude

other factors such as smoking, obesity, and hypertension (Professor J Yudkin would add sucrose), which by themselves or together may have been responsible for the result. While I cannot claim to have studied them all, it is reasonable to expect that after years of what can only be called determined research there would be little room left for argument if the significance of cholesterol in atheroma were anything like that of cigarette smoking in cancer of the lung.

Finally, the cholesterol of premenopausal women is higher than that of men, yet their incidence of coronary heart disease is lower. Would Drs Taylor and Betteridge recommend that men under 45 should eat more butter, cream, and eggs in the hope of lowering their incidence of coronary heart disease to that of premenopausal women.

We are all agreed on the desirability of a "sensible diet" but that this diet should deprive us of most of our eggs, butter, and cream with substitution by polyunsaturated fats is far from having been demonstrated. Even the plea that it may do good and cannot do harm is no longer tenable. Sir John McMichael has done well to ask for an inquest. I hope you will call on him to reply to any further criticisms from the peculiar entrenched form of logic which seems to have overtaken so much of the profession.

In the meantime may I (not for the first time) suggest that "a little of what you fancy does you good"—at least until it is proved to do otherwise.

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Malnutrition in infants receiving cult diets

SIR,—We have read with interest and not a little concern the paper "Malnutrition in infants receiving cult diets" by Dr I F Roberts and others (3 February, p 296), which has excited considerable publicity and comment in the news media. We are concerned about the inaccurate references to diets in this paper and the unwarranted adverse comments about acceptable diets that have ensued.

The authors of this article have clearly confused different diets based on the sole consumption of plant foods. The result is that, while attention is quite rightly drawn to the serious consequences of feeding certain extremely limiting diets, the confusion about the nomenclature of diets is likely to cause unnecessary concern to parents who for a variety of reasons wish to feed their children a diet based on plant foods.

We saw the 13-month-old boy described in this paper at Kingston Hospital with the late Dr Frey Ellis before he went to the Hospital for Sick Children. This child was receiving a "fruitarian" and not a vegan diet. Indeed, the father of this child persistently refused to accept expert advice on a balanced vegan diet including the use of a soya-based milk and supplements of vitamin B₁₂. The other three infants described in the paper are not known to us, but it is evident that they were receiving macrobiotic diets. These are known to be dangerous,¹ and should be clearly distinguished from vegetarian and vegan diets.² The failure to distinguish between fruitarian and vegan diets has resulted in the statement that "Vegan and the more extreme macrobiotic diets are obviously inadequate for growing children. . . ." We agree entirely about the fruitarian and

macrobiotic diets, but cannot agree about a balanced vegan diet for we know that children have been, and are being, reared very successfully on such a regimen. Mothers who wish to feed their children on a vegan diet can obtain free advice and information from the Vegan Society, 47 Highlands Road, Leatherhead, Surrey.

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¹ American Medical Association Council on Foods and Nutrition, *Journal of American Medical Association*, 1971, 218, 397.

² Dickerson, J W T, and Fehily, A M, *Practitioner*, 1979, in press.

SIR,—Nutrient deficiency is more likely to occur if the variety of food in the diet is restricted, especially so when the diet is devoid of foods of animal origin. Even so, a properly constructed vegan diet, composed of a mixture of cereals, pulses, nuts, fruit, and vegetables, can meet all the requirements for nutrients provided that it is supplemented with vitamins B₁₂ and D.^{1 2}

Most vegan mothers breast-feed their babies well into the second year of life. Breast milk can meet all the nutrient requirements for the first six months of life provided that the supply is adequate. In the 20 vegan mothers we have studied the milk composition and yield, when estimated by test weighing of the infants, were normal; the milk was richer in linoleic acid than that from omnivores.^{2 3} Breast milk will continue to meet the nutrient requirements of the infant after six months provided that it is supplemented with a suitable weaning food such as Farex, which consists of a mixture of cereal and soy-bean flour. The infant can then gradually be introduced to a properly balanced vegan diet with suitable vitamin supplements. Over the past 15 years my colleagues²⁻⁴ and I have studied about 60 children born of vegan mothers and reared on vegan diets. Their development, as judged by their rate of growth and general health, seems to be quite normal.

We were involved with the first case described in the paper "Malnutrition in infants receiving cult diets: a form of child abuse" by Dr I F Roberts and others (3 February, p 296). The parents of this child were following a "fruitarian" diet, which excludes cereals and pulses as well as food of animal origin, and were attempting to wean the child on a similar diet. The authors, who omitted to mention that the child was eventually rehabilitated on a properly balanced vegan diet, incorrectly concluded that "Vegan . . . diets are obviously inadequate for growing children, with deficiencies of total energy, suitable protein, fat-soluble vitamins, and some minerals."

One of the most disturbing aspects of this paper was the unscientific manner in which it was presented. Assessment of nutrient intake was scanty; why one child developed kwashiorkor and another marasmus was not discussed. A more accurate assessment of nutritional state might have revealed that the children were being virtually starved. If this were the case then qualitative differences in diet become of secondary importance. The

statement that "zealous adherents of an extreme faddist diet are often critical of orthodox medicine and may be mentally ill" is unlikely to encourage people who follow unorthodox diets to seek help from the medical profession. Most vegans and vegetarians follow their diets because of a sincere belief in the vegetarian ethic, the abhorrence of animal suffering.³ They deserve to be treated with the same respect accorded to Jews, Muslims, and Hindus, whose religions prohibit the use of certain foods. There is clearly a case for greater tolerance.

Furthermore, the medical profession may need to be better equipped with modern nutritional knowledge. It was apparent that the nutritional knowledge of the authors was antiquated; for example, it was established some time ago that it is possible to construct a food entirely from plant ingredients that meets the protein requirement of the human infant.⁶ The inclusion of more nutrition in basic medical training would be a step in the right direction. However, as information about vegan and vegetarian diets is poorly covered in standard textbooks on human nutrition, both the vegan and the vegetarian societies have prepared booklets with the help of nutritionists who, like myself, are not vegans or vegetarians. In conclusion therefore vegans and vegetarians should be treated with sympathy and not dismissed as cranks.

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¹ Ellis, F R, and Mumford, P, *Proceedings of Nutrition Society*, 1967, 26, 205.

² Sanders, T A B, *Plant Foods for Man*, 1978, 2, 181.

³ Sanders, T A B, and Hughes, J, unpublished observations.

⁴ Mumford, P, and Ellis, F R, unpublished observations.

⁵ McKenzie, J, *Plant Foods in Human Nutrition*, 1971, 2, 79.

⁶ Miller, D S, *Recent Advances in Food Science*, vol 3, ed J M Laitch and D N Rhodes, p 125. London, Butterworth, 1963.

Polyunsaturated fatty acids in multiple sclerosis

SIR,—We have read with interest the letters from Professor E J Field and from Drs A G Hassam and M A Crawford (10 February, p 411) referring to our paper on polyunsaturated fatty acids in the treatment of acute remitting multiple sclerosis (18 November, p 1390). They raise a number of important points but each contains criticisms which we should attempt to answer.

Firstly, the letter from Professor Field, an avowed propagandist for the use of Naudicelle in multiple sclerosis (MS) and an advocate of its administration to children whose predisposition to the disease he believes he can detect with the aid of a blood test.¹ Our trial produced no evidence at all in favour of Naudicelle but Field's allusion to the paper as a report on "the inefficacy of polyunsaturated fatty acid (PUFA) treatment of acute remitting multiple sclerosis" is less than fair and totally disregards our conclusion that "exacerbations were shorter and less severe in patients receiving a high dose of linoleic acid than in controls." This finding was previously reported by Millar *et al*² and hailed by Field as "marking the first occasion in the 100 years the disease has been known that any properly tested treatment has been found to be of benefit."³ Field believes that we have misunderstood the theoretical basis on which PUFA might be expected to exert an effect in

MS and we would not deny that owing to editorial stringency our discussion of this topic was somewhat truncated. Field's enlargement on the subject is therefore welcome but the strength of his argument is diminished by the inaccuracies in the data he quotes from previous papers, including two of which he was a coauthor. Thus his recollection of the details of treatment and outcome in the trial of Naudicelle in MS reported by Meyer-Reinecker *et al*⁴ is seriously defective and he misrepresents the results of the trial of McHugh *et al*,⁵ in which Naudicelle was given to patients after renal transplantation with the aim of prolonging graft survival. It must be remembered also that much of the evidence adduced in support of his arguments hinges on his own electrophoretic mobility tests, which never seem to have caught on in other laboratories in Britain.

Dr Hassam and Dr Crawford conceded the confirmation of the Belfast-London linoleic acid trial result² but are critical of some aspects of the part of our trial involving Naudicelle. They echo the comments of Dr D F Horrobin and his colleagues (20 January, p 199) on the inhibitory effect on prostaglandin synthesis of tartrazine, which was incorporated in the capsules as a colouring agent, but they incorrectly trace the authorship of this discovery to a paper by Vane.⁶ All Vane said in this paper was, "It is interesting that the food additive tartrazine also causes reactions in the same group of patients who are sensitive to aspirin. Should tartrazine be found to be a prostaglandin synthetase inhibitor, it would add force to the proposition that the hypersensitivity is caused through this mechanism." We confess that we were unaware of this suggestion and of its subsequent confirmation⁷ but console ourselves with the thought that both papers were published long after the start of the trial.

Hassam and Crawford also criticise the lack of dietary control in our trial and the low Naudicelle dosage (8 capsules daily) that we employed. They quote their own recent studies,^{8,9} which suggest that such a dose would be unlikely to alter the serum fatty acid composition or to exert clinical effect. But here they must be aware of a contradiction. A report entitled "A statistical evaluation of Naudicelle as a dietary essential fatty acid supplement in multiple sclerosis patients" prepared "for and on behalf of" Bio-Oil Research Limited describes a study of 480 patients treated with Naudicelle. The authorship is not declared, but in the acknowledgment gratitude is expressed to Drs Hassam and Crawford for their assistance in preparing the manuscript. The study, which was designed to assess the response of MS patients to Naudicelle, was uncontrolled. The replies to a questionnaire completed by patients were submitted to expert statistical examination and it was found that 65% of those taking part showed "some form of improvement." The group reporting an improved condition contained a significantly higher proportion of sufferers diagnosed within the previous four years. There was also a significant tendency for a greater proportion of the "improved" than of the "non-improved" to be taking Naudicelle with the knowledge of their general practitioners, although the biological basis for this difference is not discussed. Adherence to a diet was also more frequent in the improved group. It may be that the last factor was the crucial one, but the interesting thing is that 90% of the patients were taking a lower dose

of Naudicelle (six capsules daily) than were the patients in our own trial—and presumably the capsules also contained tartrazine.

If Drs Hassam and Crawford attach weight to this report with which their names are associated we would be interested to have their views on the discrepancy between the results of the two studies. To be fair to its authors, they do state that "although no firm conclusions can be drawn from this report, the results obtained from this survey are nevertheless interesting." Our inclination is to agree with the first proposition and to leave the second to the judgment of others.

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¹ Field, E J, *ARMS Link*, June 1977.

² Millar, J H D, *et al*, *British Medical Journal*, 1973, 1, 765.

³ Field, E J, in *Multiple Sclerosis: A Critical Conspectus*, ed E J Field, p 246. Lancaster, Medical and Technical Publishing, 1977.

⁴ Meyer-Reinecker, H J, *et al*, *Lancet*, 1976, 2, 966.

⁵ McHugh, M I, *et al*, *Transplantation*, 1977, 24, 263.

⁶ Vane, J R, *Journal of Allergy and Clinical Immunology*, 1976, 58, 691.

⁷ Cesarani, R, *et al*, *Prostaglandins and Medicine*, 1978, 1, 499.

⁸ Hassam, A G, *et al*, *Journal of Nutrition*, 1977, 107, 519.

⁹ Hassam, A G, and Crawford, M A, *Journal of Neurochemistry*, 1976, 27, 967.

Drug administration and food

SIR,—I would like to comment on one point in your recent leading article on this subject (3 February, p 289). The impression was given that all tetracyclines are less reliably absorbed with food than on an empty stomach. There is, however, one exception. Furthermore, the data sheet does give adequate information.¹ Doxycycline is absorbed equally well when administered with a glass of milk as it is when taken on an empty stomach.² It frequently causes nausea when taken on an empty stomach. The data sheet therefore recommends that it be administered with either food or milk. Since this is contrary to the recommendation for other tetracyclines, it is important that it be stressed.

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¹ *ABPI Data Sheet Compendium*, p 745. Pharmind Publications Ltd, 1978.

² MacArthur, C G C, *et al*, *Journal of Antimicrobial Chemotherapy*, 1978, 4, 509.

Storage and cooking of poultry

SIR,—Drs A E Wright and A Withnell ask (24 February, p 551) for evidence to support the advice given by the British Turkey Federation and circulated by the DHSS in HN(77)190. This advice was based on a thorough investigation into the temperatures reached in turkey meat during cooking performed at the Birmingham College of Food and Domestic Arts.¹ This work showed that if the advice was followed, the internal temperature reached was sufficient to kill salmonellae, though it was not always adequate to cook the turkey meat thoroughly. The advice was intended to indicate a minimum cooking process for safety.