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We may return unduly long letters to the author for shortening so that we can offer readers as wide a selection as possible. We receive so many letters each week that we have to omit some of them. Letters must be signed personally by all their authors. We cannot acknowledge their receipt unless a stamped addressed envelope or an international reply coupon is enclosed.

Fats and atheroma: an inquest

SIR,—There are many aspects of Sir John McMichael's analysis (20 January, p 173) with which I agree, but I think it premature to hold an inquest. There is a lot more to learn about polyunsaturated fats and the cardiovascular system.

The essential polyunsaturated fatty acids linoleic acid (C18:2 ω 6) and α -linolenic acid (C18:3 ω 3) are metabolised to two series of longer-chain fatty acids, which are important constituents of cell membranes in every tissue of the body. Some of these longer-chain fatty acids (C20) also act as precursors for prostaglandins. It is on this aspect of their "essentiality" that I wish to comment, for there is now strong evidence that different prostaglandins are important in the homeostasis—and possibly the health—of the cardiovascular system.

The main precursor of prostaglandins in man is arachidonic acid (C20:4 ω 6), which gives rise to prostacyclin¹ in the vascular wall (especially the endothelial cells) and thromboxane A₂ in the platelets.² Both are unstable substances. Prostacyclin is the most potent inhibitor of platelet aggregation known and is also a vasodilator. Thromboxane A₂ causes platelets to aggregate and is vasoconstrictor. A balance between the formation and activities of these two substances¹ is important for the homeostasis of the cardiovascular system. An imbalance in favour of thromboxane could well contribute to heart attack or stroke.

Prostacyclin formed by the endothelial linings of healthy vessels defends them against deposition of platelets. Interestingly, atheromatous plaques from man do not make prostacyclin.³ This may be associated with

their content of lipid peroxides,⁴ which inhibit the enzymes that generate prostacyclin.⁵

Man has the enzymes to elongate and desaturate linoleic acid (C18:2 ω 6) to arachidonic acid (C20:4 ω 6). We also obtain preformed arachidonic acid from the meat of land animals. Eicosapentaenoic acid (C20:5 ω 3) comes from marine animals and is the precursor of a different series of prostaglandins. It leads an antiaggregating agent in the vessel wall, which is probably a prostacyclin.⁶ However, if a thromboxane is formed by platelets, it does not induce their aggregation.⁷ The consumption of this fatty acid, then, could afford a dietary protection against intravascular thrombosis, for it would swing the balance towards the antithrombotic side of the system. Indeed, the low incidence of myocardial infarction in Eskimos and their increased tendency to bleed are probably due to the high eicosapentaenoic acid and low linoleic and arachidonic acid content of their marine diet, and therefore of their tissues.⁸ It has been known for some years that this is associated with a lowered blood cholesterol. In a crossover study,⁹ the effects were measured of the addition of fish (to give 8 g daily of ω 3 fats) or cheese to a lacto-ovo-vegetarian diet in men and women. Serum cholesterol and triglycerides were lowered and high-density lipoprotein was increased by the fish diet. There was also a strong decrease in the very-low-density lipoprotein. Each of these changes is thought to lower the risk of arterial disease.⁹ Interestingly, low-density lipoprotein inhibits prostacyclin formation by human endothelial cells in culture.⁹

All these results, taken together with the

finding that the balance of the prostacyclin-thromboxane system can also be changed by consumption of fish oils, lend great importance to future research into the effects of *specific* rather than *general* polyunsaturated fats in the diet. The "polyunsaturated" fats as a group may well have less relevance to the prevention of cardiovascular disease than those that can lead to the formation of prostacyclins, especially eicosapentaenoic acid.

As a source of eicosapentaenoic acid cod liver oil contains 10%, but to imitate an Eskimo's intake would mean drinking 700 calories worth (2877 kJ) of oil a day. Indeed, the fats of most common fish contain 8-12% eicosapentaenoic acid. The fats of the more exotic sea foods, such as scallops, oysters, and red caviare, contain more than 20%. α -Linolenic acid (C18:3 ω 3) is the vegetable oil which, if elongated and desaturated, would lead to eicosapentaenoic acid. Whether this occurs in man appears to be uncertain, but there is one important comparison¹⁰ of the fatty acids in vegans and omnivores. The only striking differences were in the ω 3 series and, so far as eicosapentaenoic acid was concerned, the vegans had only 12-15% of the levels of omnivores. Clearly, it is important to establish whether man converts sufficient linolenic acid to eicosapentaenoic acid, for the latter is found especially as a constituent of brain cell lipids.¹¹

What bearing does all this have on Sir John McMichael's thesis? Margarines contain 9-48% of linoleic acid, depending on the brand. The rest of the fats are C16:0 (7-18%), C18:0 (1.5-14%), C18:1 (8-53%), and C18:3 (0.1-5%).¹² Of these, only linoleic acid can act (when in the *cis* form) as a precursor (when elongated) for prostacyclin. However, a substantial and variable proportion of the linoleic acid in margarine is in the *trans* form.¹² Thus, as providers of precursors for prostacyclin and other prostaglandins, many of the fats in margarine are unimportant and could even have a deleterious effect, not only for the reason Sir John suggests but also by preventing

prostacyclin production if the non-precursor fats are peroxidised.⁴ Certainly, to choose a margarine with a high content of C18:2ω6 in the cis form needs more information than is provided on the label, and none exists with a high content of eicosapentaenoic acid, which may be preferable.

From the point of view of a healthy cardiovascular system, it could be that we should be debating a fat intake based on fish rather than meat, instead of butter versus margarine.

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SIR,—We should like to join the debate on fats and atheroma initiated by Sir John McMichael (20 January, p 173). Three points raised in that article need separating and clarifying: (a) the role of cholesterol in the atheromatous plaque; (b) hypercholesterolaemia as a risk factor for atherosclerosis; and (c) the effects of changing to a diet low in cholesterol and high in unsaturated fat.

The atheromatous plaque consists of a thickened area of the arterial intima and media due to an accumulation of proliferating smooth muscle cells surrounded by collagen, elastin, glycosaminoglycans, and fibrin. Cholesteryl ester is deposited in massive amounts around and within the smooth muscle cells.^{1, 2, 3} Although the histology of the plaque is complex there is evidence that it is the cholesterol in the lesion which plays a central role in its development. Severe atherosclerosis can be produced in nearly every species of experimental animal by feeding a diet that raises the plasma cholesterol level.⁴ Proliferative thickening of the arterial wall can be produced in animals by trauma, such as hypertension, or by destruction of the endothelium by physical or chemical methods; but the lesion formed is just a simple scar unless the animal has hypercholesterolaemia, in which case cholesterol is deposited in the lesion and severe atherosclerosis develops.¹

Studies on human populations have shown that symptomatic atherosclerosis does not frequently develop, even when there are predisposing factors such as diabetes mellitus, cigarette smoking, and hypertension, unless the mean concentration of plasma cholesterol in the population exceeds 4.1 mmol/l (158 mg/100 ml).⁵⁻⁸ Within any single Western population the probability of an individual developing myocardial infarction due to coronary heart disease increases in proportion to his plasma cholesterol level.⁹ Single gene-determined disorders such as familial hypercholesterolaemia, in which there is markedly elevated plasma and tissue cholesterol levels, are characterised by fulminant atherosclerosis

in childhood, without any other contributing factors such as hypertension, smoking, or diabetes mellitus being present.¹⁰

Thus there is good experimental and epidemiological evidence demonstrating the central role of cholesterol in the atheromatous plaque and linking hypercholesterolaemia to the development of atherosclerosis. This evidence, accumulated over several years, should not be cast aside lightly.

Recent evidence has shown that experimental atherosclerosis, especially in monkeys, develops more slowly or regresses in animals given diets which reduce serum lipid concentrations.¹¹⁻¹⁴ There have been three major primary prevention trials in human populations, and they have all shown that diets which reduce serum lipids significantly reduce the number of ischaemic events.¹⁵⁻¹⁷

Sir John McMichael points to the unknown hazards of a diet rich in polyunsaturated fats. For the patient with familial hypercholesterolaemia the prospect of death from atherosclerosis in childhood outweighs this consideration. For those members of a Western population who do not have this uncommon disorder but who have serum cholesterol levels well above 4.1 mmol/l, since 52% of all deaths in males aged 45-54 are due to cardiovascular disease¹⁸ it is perhaps prudent to suggest that they avoid a high cholesterol intake. Thus if they limited themselves to two eggs per week, stopped eating cream, reduced butter and milk intake, avoided fat on the meat, and reduced total meat intake, they might gain benefit from a reduced serum cholesterol level without the unknown dangers of excessive quantities of polyunsaturated fats.

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Mentally disordered offenders

SIR,—I have studied with interest the letters (27 January, p 263) from Drs H R Rollin, S B Telford, K C Bailey, and D D R Williams on the subject of mentally disordered offenders.

Between them they have set out most of the historical steps by which such persons developed into a major social problem; but, apart from one comment by Dr Williams, they offer no practical solution to the problem.

Dr Williams recalls that one stimulus to the creation of asylums was the large number of mentally ill persons in prisons, since when the number of such persons in prisons has varied inversely with the accommodation made available for them in other institutions. He therefore is concerned lest the Government policy to run down large mental hospitals will aggravate the problem facing the prisons. I disagree with Dr Williams only in his equation of asylums with psychiatric hospitals. As the modern trend is to concentrate all psychiatric treatment in general hospitals and community centres, it stands to reason that the demand for such treatment in psychiatric hospitals must diminish; but that is no argument for ceasing to make any use of the buildings—indeed, there is a case, as mentioned by Dr Telford, for letting them revert to their former use as asylums. Dr Bailey would prefer them to be called "forensic hospitals," but that title suggests that they would provide treatment, and therefore would require the services of psychiatrists and other specialised staff. A well-run asylum does not need such staff. I should know, as I was born in an asylum and both my parents were asylum doctors. In my childhood most of the staff were attendants, not yet persuaded to seek the qualification of certificated mental nurse, which even then had been available to them for a generation. They did a good job of work, and handled the inmates with skill, understanding, and kindness.

Dr Rollin comments on the "open door therapeutic policy" now in vogue. But what, pray, is the connection between therapeutics and open doors? Before the 1930 Act initiated voluntary admission, all patients admitted were subject to judicial orders for their detention. Yet when the Woodilee Hospital in Scotland was opened as an asylum in 1877 it became immediately fully operative, although it had no locked doors right up to the time, I believe, of the first world war. Whatever caused the doors to be closed thereafter had nothing to do with therapeutics. I have no doubt that Woodilee, in its 30 years of open doors, dealt with the very same kind of difficult patients that are now refused admission on the paltry excuse of open doors.

The responsibility for creating the social problem of the generally rejected mentally disordered offender rests firmly, I regret to admit, on the shoulders of psychiatrists. Nothing in the 1959 Act authorised us to systematically destroy the main function envisaged for the large mental institutions at the time they were built—namely, to provide asylum. There is no law to stop us now from restoring conditions in any part of a psychiatric hospital so as to provide full security for those in need of it, and for negligible expense. Through a laissez-faire attitude on the part of public authorities, psychiatrists have been allowed so to abuse their powers as to make a mockery of the courts' procedure for dealing with mentally disordered offenders. Now even Dr Rollin has joined the ranks of those clamouring for the long-debated regional special secure units. Leaving aside the waste of public money demanded for such units when perfectly suitable buildings are already available, the psychiatrists have already announced their intention to use them in a