Implausible discussions in saturated fat 'research'; definitive solutions won't come from another million editorials (or a million views of one)

David Nunan,[1] Duane Mellor,[2] Nicola Guess,[3] Ian M Lahart[4]

The *British Journal of Sports Medicine* published an opinion editorial advocating a revision of public health guidance on saturated fat.[1] Here, we offer a rebuttal, incorporating evidence-based principles absent in the original editorial, focusing on the quality of the evidence presented and we discuss contradictory evidence in relation to saturated fat, low-density lipoprotein cholesterol (LDL-C), specific dietary interventions and cardiovascular disease (CVD) alongside future directions.

[1]Centre for Evidence-Based Medicine, Nuffield Department of Primary Care Health Sciences, University of Oxford, Oxford, UK
[2]Coventry University, Coventry, UK
[3]Division of Diabetes and Nutritional Sciences, Kings College London, London, UK
[4]Faculty of Education, Health and Wellbeing, University of Wolverhampton, Walsall, UK

Correspondence to Dr David Nunan, Centre for Evidence-Based Medicine, Nuffield Department of Primary Care Health Science, University of Oxford, Oxford OX2 6GG, UK; david.nunan@phc.ox.ac.uk

EFFECTS OF REDUCING SATURATED FAT INTAKE ON CVD

The authors cite a 2015 'landmark' meta-analysis of observational studies showing a lack of an association between saturated fat consumption and both all-cause mortality and cardiovascular outcomes.[2] According to best practice evidence-based methods, these types of studies provide low-quality evidence.[3] Indeed, the authors of the cited meta-analysis reported that the likelihood of the reported associations was 'very low',[2] meaning we can have very little confidence in the findings.

The authors have also overlooked a 2015 Cochrane meta-analysis of 17 randomised controlled trials (RCTs; ~59 000 participants) which showed moderate quality evidence that long-term reduction of dietary saturated fat lowered the risk of cardiovascular events (number needed to treat=14) but had no statistical effect on all-cause mortality or cardiovascular outcomes.[4] In pre-planned subgroup analyses, cardiovascular events were reduced when saturated fat was replaced by polyunsaturated fat (but not by carbohydrates, proteins or monounsaturated fat).[4] This is a caveat that has been observed and emphasised by others and is well acknowledged in the field.[5]

To further support their view, the editorial authors turn to data from a 2004 post hoc observational study (low quality evidence) of postmenopausal women with established coronary heart disease, which showed an

inverse relation between self-reported saturated fat intake and progression of atherosclerosis.[6] Methodological weaknesses of this study include assessment of dietary intake only at baseline, with no information on changes in diet over the duration of follow-up and residual confounding. The authors of that observational study concluded: 'this was a post hoc analysis among participants in a randomised trial, and our findings may not be generalisable to all postmenopausal women'.[6]

Thus, the consensus viewpoint of a beneficial effect of reduced dietary saturated fat and replacement with polyunsaturated fat in the general population appears to be underpinned by a higher quality evidence base.

BENEFITS OF A MEDITERRANEAN DIET ON PRIMARY AND SECONDARY CVD

The PREDIMED[7] (Prevención con Dieta Mediterránea) and the Lyon Diet Heart[8] studies are cited by the authors as evidence of a protective effect from a 'high-fat' diet. However, the dietary interventions in both of these trials were designed to increase intake of unsaturated fats. The Lyon Heart study specifically aimed to reduce saturated fat intake, and in both studies the diets had a saturated fat content lower than UK recommendations. The PREDIMED study investigated the effects of a Mediterranean diet, including fish, whole grain cereals and fruits and supplemented with extra-virgin olive oil versus the same Mediterranean diet supplemented with only mixed nuts versus a control diet (which aimed for low fat intake) on primary prevention of CVD. Whereas the Lyon Diet Heart study compared a Mediterranean-style diet that was rich in alpha-linolenic acid-rich omega-3 polyunsaturated fat but low in total fat (30% dietary energy), saturated fat, cholesterol and linolenic acid (omega-6 polyunsaturated fat), with a control group (standard French diet). The findings from both these studies support the current consensus to increase intakes of unsaturated dietary fats instead of saturated fat. These findings also suggest that placing a limit on the percentage of calories from unsaturated fats may be unwarranted, as has been acknowledged in a recent consensus.[9]

LDL-C AND CARDIOVASCULAR MORTALITY

The authors claim that the cardiovascular risk of LDL-C has been exaggerated and support this contention with the 1973 data from the Minnesota Coronary Experiment (MCE)[10] and a systematic review of observational studies.[11] However, the authors have not addressed documented limitations of the MCE study, including discrepant event rates and selective outcome reporting, over 80% attrition (with lack of intention-to-treat analysis) and a small event rate difference (n=21), plausibly driven by a higher unexplained dropout rate in the control group.[12]

The cited systematic review reports a lack of an association between LDL-C and CVD and some evidence of an inverse association with all-cause mortality in elderly populations.[10] However, the methodological quality of this review has been rated poor, because of, among other limitations, a non-uniform application of inclusion/exclusion criteria, a lack of quality assessment of the included studies (low quality observational studies), failure to account for multifactorial analysis (ie, lack of control for confounders) and not considering statin use (see Eatz letter in response to Ramsden *et al*[10] and CEBM[13]).

Moreover, any evidence-based discussion on LDL-C cannot omit large-scale RCT evidence showing that in people at high risk of CVD or those who have established heart disease, LDL-C-reducing statin therapy reduces the risk of coronary deaths, myocardial infarction, strokes and coronary revascularisation procedures by ~25% for each mmol/L reduction in LDL-C during each year it is taken, after the first.[14]

Therefore, given the flaws of the referenced trial[9] and the systematic review of observational studies[11] and evidence in support of benefits of LDL-C therapy, it appears to be too early to dismiss LDL-C as a risk factor for CVD and mortality.

TIME TO MOVE THE DISCUSSION FORWARD

The authors choose a binary and simplistic approach that gives little regard to the complex narrative regarding saturated fats, as this is not a biologically homogeneous group of compounds. The triglyceride composition, fatty acid chain length, food source and nutrients and non-nutritive compounds in the foods all determine the effects of saturated fat on health. This is a key point that is not considered in the editorial. We therefore encourage a move to food-based guidelines that takes these nuances into account.

Similarly, it appears from the Lyon Heart Study and PREDIMED that the reduced risk of death associated with a diet higher in unsaturated and lower in saturated fat may not be simply via LDL-C dependent mechanisms. It is likely that there are multiple pathways by which different dietary factors may modify risk alongside classical risk factors, including modulation of inflammatory pathways.[15] Insulin sensitivity,[15] insulin concentrations[16] and altered lipid metabolism[17] are also probably important factors.

Biological pathways are not a zero-sum game and over-simplified editorials that ignore their complexities do not serve science or the public. Good research and evidence-based practice demands that such discussions consider the totality of the evidence base and the inherent uncertainty in nutritional epidemiological studies and trials.[18] Journal editors play a pivotal role in ensuring that such balanced discussions take place.

Finally, arbitrary concepts such as 'real food' are unlikely to offer a simple message for most people and their use risks manipulation according to personal, cultural or societal values and morals and not scientific evidence. It is time to shift the narrative to a discussion of dietary patterns over and above individual macronutrients that considers collaborative efforts for improving the evidence base and our understanding of the complex relation between diet and health.

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