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LETTER

Chewing the saturated fat: we still shouldn't

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In their *NZMJ* editorial *Advice to reduce total and saturated fat*, Te Morenga and colleagues draw on the totality of the evidence to support current national and international guidelines to 'reduce the intake of saturated fatty acids and to replace this with healthier fats from sustainably managed fish, plant oils, nuts and seeds.' They also emphasise that 'saturated fat should not be replaced with refined carbohydrates.'[1] However they are cautious in their comments on reducing total fat, acknowledging that the evidence of harm is less convincing than for saturated fat.

The editorial's advice on saturated fat is criticised by Thornley and colleagues in their letter entitled *Chewing the saturated fat: should we or shouldn't we?* They argue that there is no causal association between saturated fat intake and coronary heart disease (CHD) and advise the public to 'chew the saturated fat.'[2] Thornley et al focus their argument on the apparently inconsistent findings from some meta-analyses of long-term dietary cohort studies and randomised trials, rather than considering the overall consistency of the totality of evidence, which comes from a wide range of sources using a wide range of study designs.

Their main argument is that most cohort studies, randomised trials and meta-analyses of these studies do not show a statistically significant association between saturated fat and total mortality. However this observation reflects the inherent weaknesses of these types of studies to accurately characterise participants' dietary patterns,[3] as well as the low statistical power of these studies to detect an effect on total mortality, rather than providing sufficient evidence to support their argument. In addition, having criticised Te Morenga et al. of subjectively choosing evidence to suit their hypothesis, they misuse Bradford-Hill's 'causal criteria' to argue that their review of the evidence is more objective.

Thornley and colleagues criticise Te Morenga et al for refuting one meta-analysis by Chowdhury[4] but supporting another by Jacobsen.[5] However Te Morenga provides a detailed justification for their choice, giving a critique of the Chowdhury paper and a description of the specific advantages of Jacobsen's individual participant meta-analysis. Numerous randomised controlled trials (RCTs) have demonstrated that replacing saturated fatty acids (SFAs) with polyunsaturated fatty acids (PUFAs) has a beneficial effect on lipid sub-fractions whereas replacing SFAs with carbohydrate does not.[6] Using individual participant data, Jacobsen's meta-analysis was able to investigate the effect of replacing SFAs with PUFAs on CHD risk and showed the expected protective association with CHD; the Chowdhury meta-analysis was unable to do this.

Thornley and colleagues argue that the Chowdhury meta-analysis is superior because it includes RCTs, but they do not mention the Mozaffarian meta-analysis of 8 RCTs[7] also described in Te Morenga's editorial that shows the same association in RCTs that Jacobsen reported in cohort studies. Te Morenga et al explain why the results of Chowdhury's meta-analysis of RCTs differs from those in the Mozaffarian meta-analysis, which led to a widening of the confidence interval but otherwise no meaningful change in the findings.

Thornley and colleagues then propose that it is more objective to assess the evidence using Bradford Hill's causal criteria. Bradford Hill never intended his series of 'aspects to consider before deciding whether an association is likely to be causal'[8] to be used as criteria for proving causality and there is a considerable literature cautioning this interpretation of Bradford Hill's paper.[9,10] Thornley states that the SFA-CHD association falls down on the first 'criterion' of causation—strength of association—despite Bradford Hill cautioning in his paper on 'Association or causation' that 'We must not be too ready to dismiss a cause and effect hypothesis merely on the grounds that the observed association appears to be slight. There are many occasions in medicine when this is in truth so.'[8]

There are good reasons for the weak associations observed between SFAs and CHD in cohort studies and RCTs. Firstly, it is extremely difficult to accurately assess and quantify the composition of an individual's diet, particularly a nutrient as ubiquitous as saturated fat, so our ability to classify participants in cohort studies into high and low saturated fat exposure categories is poor. Secondly, in neither cohort studies nor randomised trials are participants able to maintain their baseline or randomised diets during the many years of follow-up required to generate sufficient outcome events, resulting in substantial dilution of any differences in nutrient intake between comparison groups. These two extremely common errors in dietary epidemiology (measurement and contamination errors) will weaken any real association, particularly for common nutrients.

Contamination is a particularly serious problem in long-term randomised controlled dietary trials that require participants to be highly motivated. Participants are generally health conscious volunteers who may find it difficult to maintain a high saturated fat intake given that it is so widely accepted as unhealthy. Conversely, adhering to strict diets that are far outside the social norm for an extended period of time proves problematic for many trial volunteers.[3]

The Multiple Risk Factor Intervention Trial (MRFIT) conducted in 12,866 US men followed for an average of 7 years in the 1970s is one of the most famous examples of the weaknesses inherent in lifestyle-related trials.[11] Those in the MRFIT intervention group made positive changes to their diet, but so did the control group, resulting in a non-significant reduction in CHD.

In the more recent Women's Health Initiative (WHI) Dietary Modification Trial of 48,835 US women, those randomised to the active intervention low fat diet made only modest changes that fell well short of expected dietary goals, resulting in little difference in the ratio of saturated to polyunsaturated fat intake between the randomised groups. This was reflected in the minimal net reduction in LDL cholesterol in the intervention group of about 0.1 mmol/L at 3 years. Post-hoc power calculations indicated that the study had only a 40% power to detect a 14% reduction in CVD over the 8.1 years of follow-up.[3]

Given these major flaws in long-term randomised trials and cohort studies of diet, it is perhaps surprising that any of these studies or meta-analyses of these studies show a statistically significant association between SFA intake and CHD. Yet the Hooper Cochrane meta-analysis of dietary trials,[12] that Thornley argues is less prone to bias than the meta-analyses discussed by Te Morenga, reports "that reducing saturated fat by reducing and/or modifying dietary fat reduced the risk of cardiovascular events by 14% (RR 0.86, 95% CI 0.77 to 0.96)."

Thornley et al only mention that the Cochrane report found no association with total mortality, yet in the body of the report, Hooper et al. state that 'It is not surprising at all that while we saw reductions in cardiovascular events we did not see similar reductions in mortality—fortunately most cardiovascular events are not fatal, and many deaths are not cardiovascular in origin, so if modifying fat intake reduces cardiovascular events the effect on cardiovascular mortality and all-cause mortality will be much less clear.'[12]

Thornley et al conclude by stating that 'In the absence of a strong indication of harm, we believe the public should be left to chew the saturated fat…' As articulated by Rose, when recommending mass public measures that involve adding rather than removing a factor (e.g. saturated fat), "the required level of evidence, both of benefit and (particularly) of safety, must be far more stringent."[13]

Even if Thornley's statement that there is an 'absence of a strong indication of harm' was correct, we do not consider this a sufficiently stringent level of evidence on which to advise the public that they should not be concerned about how much saturated fat they consume. However, in our opinion, Thornley and colleagues' minority view does not hold up to scientific scrutiny. While it is reasonable to debate the validity of the SFA-CHD association in a scientific forum, we consider their advice to the public to be premature given the noted flaws in their argument.

The totality of the evidence still strongly supports the view that SFA intake is causally associated with CHD and we are concerned that their advice to the public could lead to a reversal of the major declines in coronary disease mortality experienced in New Zealand and other high-income countries since the late 1960s.[14]

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References

1. Te Morenga L, McLean R, Skeaff M, Mann J. Advice to reduce total and saturated fat, revisited [editorial]. N Z Med J. 2014;127(1392):12–16. http://www.nzma.org.nz/journal/read-the-journal/all-issues/2010-2019/2014/vol-126-no-1392/edit-morenga
2. Thornley S, Henderson G, Schofield G. Chewing the saturated fat: should we or shouldn't we? [letter]. N Z Med J. 2014;127(1394):94–96. http://www.nzma.org.nz/journal/read-the-journal/all-issues/2010-2019/2014/vol-127-no.-1394/6134
3. Anderson CAM, Appel LJ. Dietary modification and CVD prevention: a matter of fat. Circ 2006;295:693–695.
4. Chowdhury R, Warnakula S, Kunutsor S, et al. Association of dietary, circulating, and supplement fatty acids with coronary risk: a systematic review and meta-analysis. Annals of Internal Medicine. 2014;160(6):398–406.
5. Jakobsen MU, O'Reilly EJ, Heitmann BL, et al. Major types of dietary fat and risk of coronary heart disease: a pooled analysis of 11 cohort studies. The American Journal of Clinical Nutrition. 2009;89(5):1425–32.
6. Mensink et al. Effects of dietary fatty acids and carbohydrates on the ratio of serum total to HDL cholesterol and on serum lipids and apolipoproteins: a meta-analysis of 60 controlled trials. Am J Clin Nutr 2003;77:1146–55.
7. Mozaffarian D, Micha R, Wallace S. Effects on coronary heart disease of increasing polyunsaturated fat in place of saturated fat: a systematic review and meta-analysis of randomized controlled trials. PLoS Med. 2010;7(3):e1000252.
8. Bradford Hill. The Environment and Disease: Association or Causation? Proceedings of the Royal Society of Medicine. 1965;58:295–300.
9. Rothman and Greenland. Causation and causal inference in epidemiology. American Journal of Public Health. 2005;95:S144–S150.
10. Phillips CV, Goodman KJ. The missed lessons of Sir Austin Bradford Hill. Epidemiologic Perspectives & Innovations. 2004;1:3 doi:10.1186/1742-5573-1-3.
11. Multiple Risk Factor Intervention Trial Research Group. Risk Factor Changes and Mortality Results. JAMA. 1982;248:1465–77.
12. Hooper L, Summerbell CD, Higgins JP, et al. Reduced or modified dietary fat for preventing cardiovascular disease. Cochrane Database Syst Rev. 2001:CD002137.
13. Rose G. Strategy of prevention: lessons from cardiovascular disease. BMJ 1981;282:1847–1851.
14. www.mortality-trends.org (accessed 29 November 2014)