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EDITORIALS

Dietary fats: a new look at old data challenges established wisdom

Replacing saturated fat with polyunsaturated fat might not prolong life

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It is widely accepted that diets rich in polyunsaturated fats protect against heart disease. Recently, the Global Burden of Disease team reported that each year insufficient intake of omega-6 polyunsaturated fats, the most common subgroup of polyunsaturated fats, results in over 700 000 deaths from coronary heart disease.[1] Or does it? A linked study by Ramsden and colleagues (doi:10.1136/bmj.i1246) adds to the doubts around the health benefits of replacing saturated fat with polyunsaturated fats.[2]

This new study re-examines recovered data from a double blind randomised controlled trial that took place 45 years ago. The Minnesota Coronary Experiment (MCE) followed 9423 participants from state mental hospitals and a nursing home for 4.5 years. The trial tested whether replacement of saturated fat with vegetable oil rich in linoleic acid (an omega-6 polyunsaturated fat) reduces the risk of coronary heart disease and death through a reduction in serum cholesterol concentration.

As expected, the diet enriched with linoleic acid lowered serum cholesterol concentration. But it did not reduce mortality: in fact participants in the intervention group had a higher mortality than controls. The pooled results of the MCE and four similar trials failed to find any reduction in mortality from coronary heart disease.[3-6]

These unexpected results proved difficult to stomach for researchers at the time. The trial ended in 1973, but it took until 1989 for the results to be published.[7] The authors reported no differences between the treatment and control groups for cardiovascular events, cardiovascular deaths, or total mortality, but immediately added that "a favorable trend for all these end-points occurred in some younger age groups." In contrast, Ramsden and colleagues now suggest the possibility of increased risk of death in older adults among the participants given more linoleic acid.[2] The findings of the two teams of authors do not differ fundamentally, but their interpretation does.

In the past decade, old certainties regarding dietary fats have been questioned, and some have been abandoned. Last year, US dietary guidelines removed dietary cholesterol and total fat as risk factors worth worrying about.[8] With these new findings,[2 9] the recommendation to consume less than 10% of calories per day from saturated fats will be under increased scrutiny.[10]

How did researchers come to believe so firmly in the "diet-heart hypothesis," which holds that eating foods high in cholesterol and saturated fat leads to heart disease? In the first half of the 20th century, experiments with rabbits and international comparative studies led to the belief that diets low in fat were good for heart health. In the 1950s and 1960s it became clear that not all fats were equal. Experiments showed that saturated fat increased and polyunsaturated fat decreased plasma cholesterol concentrations. Higher concentrations were associated with a greater risk of heart disease. It followed that polyunsaturated fats were good and saturated fat was bad for the heart. Effects on serum concentrations of low density lipoprotein and high density lipoprotein cholesterol were paramount in decisions on dietary guidelines.[8 11] But if blood cholesterol values are not a reliable indicator of risk of cardiovascular disease, then a careful review of the evidence that underpins dietary recommendations is warranted. Ideally, recommendations should be based on clinical outcomes, not surrogates such as cholesterol concentration.[11]

Unfortunately, clinical outcomes do not point uniformly in the same direction in all studies. Ramsden and colleagues' analysis reports no clinical benefits of replacing saturated fat with linoleic acid. This is supported by recent observational findings that saturated fat is not associated with mortality.[9]

In a systematic review and meta-analysis of prospective cohort studies, however, dietary intake of linoleic acid was inversely associated with risk of coronary heart disease in a dose-response manner.[12] Furthermore, a Cochrane systematic review and meta-analysis of randomised controlled trials found a small but potentially important reduction in cardiovascular risk associated with reduced consumption of saturated fat.[13] That review, however, included studies that replaced saturated fat with

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carbohydrate, monounsaturated fat and/or protein, not specifically linoleic acid.

The randomised controlled trial design is stronger than the longitudinal observational design, but such trials on this topic were rare, relatively small, and conducted among "captive audiences" such as residents of a nursing home and mental hospitals in the MCE or outpatients at a coronary care clinic in the Sydney Diet Heart Study.[3] Generalisability beyond these settings is arguable.

The greatest risks with cohort studies is confounding, and here it is tempting to speculate that the strong belief that polyunsaturated fats are good for health might have led to a self fulfilling prophesy, whereby more health conscious participants consume more polyunsaturated fats and residual confounding[14] by other healthy lifestyle choices produces better health and longer survival.

It is also possible that different omega-6 fatty acids have different effects. Further research is likely to specify more precisely the types of fat under study and what they replace in the diet and to focus on clinical outcomes.

The benefits of choosing polyunsaturated fat over saturated fat seem a little less certain than we thought. While we wait for further clarification, we should continue to eat (and to advise others to eat) more fish, fruits, vegetables, and whole grains. We should avoid salt, sugar, industrial trans fats, and avoid over eating.

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1 Wang Q, Afshin A, Yakoob MY, et al. Global Burden of Diseases Nutrition and Chronic Diseases Expert Group (NutriCoDE). Impact of Nonoptimal Intakes of Saturated, Polyunsaturated, and Trans Fat on Global Burdens of Coronary Heart Disease. *J Am Heart Assoc* 2016;5:e002891. doi:10.1161/JAHA.115.002891 pmid:26790695.
2 Ramsden CE, Zamaora D, Majchrzak-Hong S, et al. Re-evaluation of the traditional diet-heart hypothesis: analysis of recovered data from Minnesota Coronary Experiment (1968-73). *BMJ* 2016;352:i1246.
3 Ramsden CE, Zamora D, Leelarthaepin B, et al. Use of dietary linoleic acid for secondary prevention of coronary heart disease and death: evaluation of recovered data from the Sydney Diet Heart Study and updated meta-analysis. *BMJ* 2013;346:e8707. doi:10.1136/bmj.e8707 pmid:23386268.
4 Rose GA, Thomson WB, Williams RT. Corn Oil in Treatment of Ischaemic Heart Disease. *BMJ* 1965;1:1531-3. doi:10.1136/bmj.1.5449.1531 pmid:14288105.
5 Medical Research Council. Controlled trial of soya-bean oil in myocardial infarction. *Lancet* 1968;2:693-9.pmid:4175085.
6 Dayton S, Pearce ML. Trial of unsaturated-fat diet. *Lancet* 1968;2:1296-7. doi:10.1016/S0140-6736(68)91783-2 pmid:4177491.
7 Frantz ID Jr, , Dawson EA, Ashman PL, et al. Test of effect of lipid lowering by diet on cardiovascular risk. The Minnesota Coronary Survey. *Arteriosclerosis* 1989;9:129-35. doi:10.1161/01.ATV.9.1.129 pmid:2643423.
8 Kromhout D. Where the latest US dietary guidelines are heading. *BMJ* 2015;351:h4034. doi:10.1136/bmj.h4034 pmid:26208974.
9 De Souza RJ, Mente A, Maroleanu A, et al. Intake of saturated and trans unsaturated fatty acids and risk of all cause mortality, cardiovascular disease, and type 2 diabetes: systematic review and meta-analysis of observational studies. *BMJ* 2015;351:h3978. doi:10.1136/bmj.h3978 pmid:26268692.
10 US Department of Health and Human Services and U.S. Department of Agriculture. 2015-2020 Dietary Guidelines for Americans. 8th Ed. December 2015. http://health.gov/dietaryguidelines/2015/guidelines/.
11 Hu FB, Willett WC. Optimal diets for prevention of coronary heart disease. *JAMA* 2002;288:2569-78. doi:10.1001/jama.288.20.2569 pmid:12444864.
12 Farvid MS, Ding M, Pan A, et al. Dietary linoleic acid and risk of coronary heart disease: a systematic review and meta-analysis of prospective cohort studies. *Circulation* 2014;130:1568-78. doi:10.1161/CIRCULATIONAHA.114.010236 pmid:25161045.
13 Hooper L, Martin N, Abdelhamid A, Davey Smith G. Reduction in saturated fat intake for cardiovascular disease. *Cochrane Database Syst Rev* 2015;6:CD011737.pmid:26068959.
14 Fewell Z, Davey Smith G, Sterne JA. The impact of residual and unmeasured confounding in epidemiologic studies: a simulation study. *Am J Epidemiol* 2007;166:646-55. doi:10.1093/aje/kwm165 pmid:17615092.