thebmj

BMJ 2020;368:m744 doi: 10.1136/bmj.m744 (Published 4 March 2020)

EDITORIALS

Egg consumption and cardiovascular disease

Stop counting eggs and move to healthier overall dietary patterns

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Can the following two statements be simultaneously true? Firstly, that eggs (largely from chickens) are a basic whole food frequently consumed by people across populations and cultures, which affordably support the nutritional needs of societies. Secondly, that eggs are an oval shaped missile of dietary cholesterol that perpetuate the high cardiovascular disease risk faced by populations worldwide.[1 2]

Convincing evidence indicates that the first statement is true, particularly when viewed from a basic nutrition or public health perspective.[2] The second statement has attracted attention from scientists, clinicians, and the public for over 50 years and is a historical hypothesis characterising eggs as a potential nutritional bogeyman for cardiovascular risk.[3] The residue of this hypothesis has been the impetus for a large body of research, including most recently, the substantial contribution by Drouin-Chartier and colleagues in a linked article in *The BMJ* (doi:10.1136/bmj.m513).[4]

These authors examined habitual egg intake (assessed by food frequency questionnaires) and risk of cardiovascular disease over decades of follow-up in an updated individual level analysis of three prospective US cohorts: the Nurses' Health Study (I and II), and the Health Professionals' Follow-Up Study). Data were then pooled for a summary estimate.

In over 215 000 women and men who were free of major chronic disease at baseline, the researchers found no association between egg intake and risk of incident cardiovascular disease (defined as fatal or non-fatal myocardial infarction, coronary heart disease, and stroke). A thorough set of sensitivity analyses supported the main findings.

Food frequency questionnaires are a blunt instrument, yet assessment of egg consumption had demonstrable validity and reliability in these cohorts. Another related strength is the repeated dietary assessments along with a largely comprehensive assessment of factors that might confound the association between diet and cardiovascular disease.

The authors also report just how powerful any confounding factor would have to be to alter their main results. Then provide an overall quantitative summary of the evidence from other prospective cohort studies asking the same question, using the best methods for systematic review and meta-analysis. This analysis included over 1.7 million participants (33 risk estimates), and also observed no association in the main results.

In sensitivity analyses, the lack of association was confirmed in Western populations, but an inverse association was seen in Asian cohorts, likely due to residual confounding by socioeconomic status.[5] Lastly, the authors report a positive association between higher intake of eggs and cardiovascular risk among participants with type 2 diabetes, which is supported by clinical and mechanistic studies.[6]

Convincingly null

The results of this study are convincingly null save for a couple of subgroup findings. Yet, we should not put all our eggs in this observational basket for formal guidance on eating eggs. Given the unique challenges in nutrition research,[7] it is necessary to triangulate evidence from different study designs and populations to provide the most robust basis to answer questions about diet and disease.

A series of large, randomised studies with well defined interventions related to egg intake and with clinical outcomes ascertained over a decade is not on the horizon. So we are missing our theoretical "gold standard" basket of evidence. However, we do have other baskets: a recent meta-analysis of randomised clinical studies involving dietary interventions showed that higher egg consumption led to higher serum concentrations of low density lipoprotein (LDL) cholesterol,[8] extending earlier findings.[9] Since high LDL cholesterol is a causal factor in cardiovascular disease risk,[10] this certainly scrambles the evidence base a little, and adds noise to the discussion.

Pattern recognition

The media attention and reactions to Drouin-Chartier and colleagues' research will either frame it as the latest volley in an epic tennis match between two camps, or condemn it due to the study design. So we must filter out the noise with an evidence informed take-home message. If frequent egg consumption is occurring in the context of an overall dietary pattern known to be cardioprotective, or eggs are being consumed for essential nutritional needs, then it is probably

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nothing to worry about. If frequent egg consumption is occurring in the context of a typical Western dietary pattern (high levels of refined grains, added sugars, red and processed meats, and ultraprocessed foods), the best evidence for cardioprotection supports shifting one's overall dietary pattern to a Dietary Approaches to Stop Hypertension (DASH) or Mediterranean diet. Both diets are supported by good evidence across study designs.[11] Unfortunately, adopting one of these diets is easier said than done without large structural changes to our overall food environment.[12]

To conclude, single foods could have contextual relevance for health, but a complex and extensive body of nutrition and dietary research really does support the current focus on overall dietary patterns in recommendations and guidelines.[13]

The BMJ has judged that there are no disqualifying financial ties to commercial companies. The author declares the following other interests: I eat eggs, probably a few a week on average. *The BMJ* policy on financial interests is here: https://www.bmj.com/sites/default/files/attachments/resources/2016/03/16-current-bmj-education-coi-form.pdf.

Provenance and peer review: Commissioned, not peer reviewed.

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