The Journal of Physiology

LETTER

Methodological issues question the validity of observed performance impairment of a low carbohydrate, high fat diet

In a recent paper in *The Journal of Physiology*, Burke *et al.* (2017) reported that 'adaptation to LCHF impairs performance in elite endurance athletes'. I argue that such a conclusion cannot be firmly drawn due to methodological issues in the study.

It is well established, as also Burke *et al.* point out, that when switching from an average Western diet to a diet that is very low on carbohydrates, the first days are incompatible with good performance in high intensity endurance exercise. It is thus questionable that Burke *et al.* did not include an adaptation period before the 3-week intense exercise programme, with either a gradual shift to the low carbohydrate, high fat (LCHF) diet or a period with less intense exercise for all groups. It is thus possible that what has primarily been measured is a training effect, not a diet effect. In addition, the possible nocebo effects that can arise from being on a diet that clearly at first causes impaired exercise tolerance could have influenced the training during the rest of the 3 weeks and the results of the post-treatment endurance test.

It is known that carbohydrates can affect endurance performance merely by exposing subjects to carbohydrate mouth rinses during exercise. Although the results of mouth rinse studies are mixed, the administration of carbohydrates on the test day in only the two non-LCHF groups could have impacted the observed performance differences pre- and post-treatment. In the 10 km test no groups received any carbohydrates during the test, but it is possible that the pre-test carbohydrate containing meal could have similar effects as mouth rinses during exercise. Indirect evidence for this is the fact that there is a tendency for more consistent carbohydrate mouth rinse performance benefits in the fasted state and that proteins, as opposed to carbohydrates, do not appear to be effective as mouth rinses (Luden *et al.* 2016).

Burke *et al.* highlight that a near maximal adaptation to an LCHF diet, in terms of increased fat oxidation, can be reached within only 5 days. This is, however, just one measure of adaptation to a different diet. Immune, neurological, microbiome and hormonal effects, especially when combined with an intense exercise programme, could also occur. It is not given that such effects abate as soon as fat oxidation is maximal. Since the exact composition of the different diets has not yet been published, the performance differences observed could also have to do with other factors than the amount of fat and carbohydrate *per se*. It is for instance possible to eat substantial amounts of berries, vegetables and nuts within the carbohydrate limits in the LCHF diet in this study. It is conceivable that a diet with ample use of such foods in addition to other minimally processed and fatty foods, could have different effects on performance compared to a diet with more processed foods and with less vegetables and other foods with known health benefits.

It seems that the interest in low-carbohydrate diets in sports is in part a result of the past decades' emphasis on the importance of carbohydrates in the athlete's diet. During the latter years the emerging lay and scientific perception that processed carbohydrate dense foods, such as sugar and flour-based foods, are negative for health may have led to increased questioning of the importance of a high carbohydrate intake also for athletes. Rather than looking almost exclusively at the other extreme, a high fat diet, there is a need for more studies that properly address whether the focus on a *high* carbohydrate intake in the athlete's habitual diet, including the last days pre-race, is merited. While it is of clear scientific interest to explore extremes in diet composition, the study by Burke *et al.* did not address perhaps a currently more relevant question: does, for example, a diet consisting of from 50% down to 20% carbohydrate, with a proper run-in period and with control over of a range of diet factors that can confound the results, impair performance compared with a high carbohydrate diet?

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Additional information

Competing interests

No competing interests declared.

DOI: 10.1113/JP273990