Reviewer's report

Title: Carbohydrate mouth rinse: does it improve endurance exercise performance?

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Reviewer: Wim Derave

Reviewer's report:

This paper gives a short overview of an emerging concept in exercise physiology relating to a central mechanism of the ergogenic effect of carbohydrates. The paper is well organized but some aspects have been overlooked, in my opinion.

Major compulsory revisions:

The authors mistakenly mention in the abstract and conclusion that a major lack in the scientific knowledge on this topic is a direct comparison between carbohydrate mouth rinse and ingestion. This experiment has already been done and published (Pottier et al. Scand J Med Sci Sports 2010), but has been overlooked by the authors, possibly because the paper only appeared in print in Feb 2010 (although already online available since end 2008). These (new) data by Pottier et al. should be thoroughly discussed in a revised version of the manuscript, as well as be included in table 1.

A possible explanation for the discrepant findings in the literature is proposed by the authors to be the timing of the pre-exercise meal, with the suggestion that mouth rinse is only effective in the post-absorptive and not in the post-prandial state. The authors propose that this is related to liver glycogen stores, but I tend to disagree with this opinion. Although depleted liver glycogen stores can be expected in the studies by Rollo et al. and Chambers et al., who tested overnight fasted subjects, this is certainly not the case in the studies by Carter et al. (4h fast) and Pottier et al. (3h fast), who also found a positive effect of mouth rinse. Could it be that the lack of effect of Beelen et al. relates to the fact that when the pre-exercise meal is only 2h prior to the test, the stimulation of the oral sensory fibers by the meal is still persistent when the exercise test starts?

I would appreciate a more in-depth analysis of the type of sensory fibers in the mouth cavity that are stimulated by the different types of experimental drinks. Although the majority of the studies are done with non-sweet maltodextrine solutions, Rollo et al. and Pottier et al. used a sweet drink with simple sugars and sweetened placebo. Clearly the effect is therefore not mediated by the sweet taste receptors, but how can the mouth distinguish between a sweet non-caloric and a sweet caloric drink? Please discuss.

The authors suggest that carbohydrate mouth rinse may have practical advantages over drinking, because it can avoid gastro-intestinal discomfort (e.g. during running). However, there is probably also a physiological advantage of not
having to ingest the drink, i.e. by reducing the required blood supply to and energy cost by the gastro-intestinal tract to digest and absorb the carbohydrates (which are eventually unnecessary to sustain the exercise of relatively short duration). The results in the paper by Pottier et al. indeed suggest that even in cycling the mouth rinse has an ergogenic advantage compared with drinking.

The manuscript contains a number of grammatical errors that should be corrected, possibly helped by a native English speaker.

**Level of interest:** An article whose findings are important to those with closely related research interests

**Quality of written English:** Needs some language corrections before being published

**Statistical review:** No, the manuscript does not need to be seen by a statistician.

**Declaration of competing interests:**

I declare that I have no competing interests