



Pre-exercise optimisation of the alkalosis response to sodium bicarbonate ingestion: have we been missing its peak ergogenic effect?

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The use of sodium bicarbonate (NaHCO_3) as an ergogenic aid has been widespread in athletic populations where high intensity, relatively short duration activity, is an important component of performance. The traditional ingestion time for this pre-exercise ergogenic buffering agent, is typically between 60-120 minutes before the start of exercise, using the most frequently ingested dose of 300 mg.kgBM^{-1} (McNaughton et al., 2016). This strategy has provided some equivocal data regarding the efficacy of the use of NaHCO_3 , in some sporting activities (Carr et al., 2012). However, a recent innovation using a personalised approach to the pre-exercise ingestion timing for NaHCO_3 (Miller et al., 2016; Sparks et al., 2017), may be more appropriate to achieve optimal ergogenic effects. The use of this technique has been shown to produce repeatable acid-base (Gough et al., 2017a) and performance responses (Gough et al., 2017b). More specifically, an individualised approach that synchronises the start of exercise with peak HCO_3^- concentrations, appears to produce more consistent performance advantages over placebos in exercise bouts like 4 km cycling time trials (TT). This approach still suggests that doses of 300 mg.kgBM^{-1} are likely to be more ergogenic than 200 mg.kgBM^{-1} ones, but the associated gastrointestinal (GI) side effects that are exhibited in some athletes using higher doses may be ergolytic in extreme cases (Deb et al., 2018). Indeed, the GI symptoms are both difficult to predict and may vary between trials even with normal pre-exercise experimental dietary controls in place. Athletes, coaches, and performance nutrition professionals should therefore be aware of the potential ergogenic effect of NaHCO_3 , when individual time to peak has been accurately established, because it is likely larger than previously observed. However, caution and careful familiarisation with this ergogenic aid is essential to determine the severity of the potential ergolytic side effects that may preclude athletes from using it.

Keywords: Ergogenic aid, performance, nutritional intervention, supplement.

Carr, A.J., Slater, G.J., Gore, C.J., Dawson, B., and Burke, L.M. (2012). Reliability and effect of sodium bicarbonate: buffering and 2000-m rowing performance. *International Journal of Sports Physiology and Performance*, 7(2):152-60.

Deb, S.K., Gough, L.A., Sparks, S.A., and McNaughton, L.R. (2018). Sodium bicarbonate supplementation improves severe-intensity intermittent exercise under moderate acute hypoxic conditions. *European Journal of Applied Physiology*. 118(3):607-615. DOI: 10.1007/s00421-018-3801-7.



Gough, L., Deb, S., Sparks, S.A., and McNaughton, L.R. (2017a). The Reproducibility of Blood Acid Base Responses in Male Collegiate Athletes Following Individualised Doses of Sodium Bicarbonate: A Randomised Controlled Crossover Study. *Sports Medicine (In Press)*. DOI: 10.1007/s40279-017-0699-x.

Gough, L., Deb., S.K., Sparks, S.A., and McNaughton, L.R. (2017b). The reproducibility of 4 km time trial (TT) performance following individualised sodium bicarbonate supplementation: a randomised controlled trial in trained cyclists. *Sports Medicine Open* 3(1):34. DOI: 10.1186/s40798-017-0101-4.

McNaughton, L.R. Gough, L., Deb, S., Bentley, D., and Sparks, S.A. (2016). Recent developments in the use of sodium bicarbonate as an ergogenic aid. *Current Sports Medicine Reports*, 15(4):233-44. DOI: 10.1249/JSR.0000000000000283.

Miller, P., Robinson, A., Sparks, S.A., Bridge, C.A., Bentley, D., and McNaughton, L.R. (2016). The effects of novel ingestion of sodium bicarbonate on repeated sprint ability. *Journal of Strength and Conditioning Research*. 30(2) 561-568. DOI: 10.1519/JSC.0000000000001126.

Sparks, S.A., Williams, E.L., Bentley, D., Bridge, C.A., and McNaughton, L.R. (2017). Sodium bicarbonate ingestion and individual variability in time to peak pH. *Research in Sports Medicine*, 25(1): 58-66. DOI: 10.1080/15438627.2016.1258645.