



The Effects Of Sodium Bicarbonate Supplementation On Physical Performance

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Abstract

Introduction: A decrease in intramuscular pH, caused by excessive H⁺ production, has been known to be one of the causes of muscular fatigue during maximal exercise. The hydrogen ions are a result of anaerobic metabolism that is used to provide the muscle cell with the ATP needed during strenuous bouts of exercise. There have been a number of studies done in the area of increasing the ability of the blood to buffer these hydrogen ions as they are released into blood with lactate. Sodium Bicarbonate, or baking powder, is a strong base that is being looked at as a potential supplement for increasing the blood pH and therefore, the ability of the body to expel the metabolic waste as CO₂. The majority of the carbon dioxide produced is transported in the blood to the lungs in the form of carbonic acid.

Purpose

The purpose of the study was to determine if supplementation with 0.1 g/Kg BW with sodium bicarbonate 30 minutes prior to a maximal exercise test will result in an increase in performance by increasing the blood's buffering capacity.

Methods

Six normally active subjects (4 male, 2 female) were given a dosage of sodium bicarbonate and a placebo in a randomized experiment. (Age 24.33±3.01 yrs, ht 172.50±9.51 cm, wt 67.3±9.98 Kg). The subjects were given 30 minutes to let the supplement take effect and then blood lactate measurements were taken. The subject's performed a maximal treadmill test using the Bruce protocol until volitional fatigue. The subject's VCO₂, max heart rate, minute ventilation, and respiratory rate were measured during the test. The time to exhaustion and a 2 minute post-exercise blood lactate was also recorded for each of the subjects.

Table 1: Subject Data

	Mean	SD	Max	Min
Height (cm)	172.50	± 9.51	186.1	157
Weight (kg)	67.30	± 9.98	77.5	55.2
Age (yrs)	24.33	± 3.01	28	21



Figure 1: Process of making capsules for oral sodium bicarbonate ingestion

Results

Table 2: Measured Variables

	Max Heart Rate (bpm)	Respiratory Rate breaths/min	VCO ₂ L/min	Pre-BLA mmol/L	Post-BLA mmol/L	Time To Exhaustion secs
Sodium Bicarbonate	187.17 ±4.62 (179-192)	42.50± 4.59 (38-49)	3.13 ±0.83 (1.98-4.17)	4.52 ±2.08 (3-8.6)	15.20 ±2.68 (12.5-19.3)	671.5 ±69.90 (610-781)
Placebo	188.67 ±6.09 (183-199)	41.83± 5.91 (35-48)	3.05 ±0.74 (1.94-4.03)	3.37 ±0.70 (2.3-4.2)	14.47 ±2.16 (12.7-18.2)	690.33 ±87.53 (586-788)

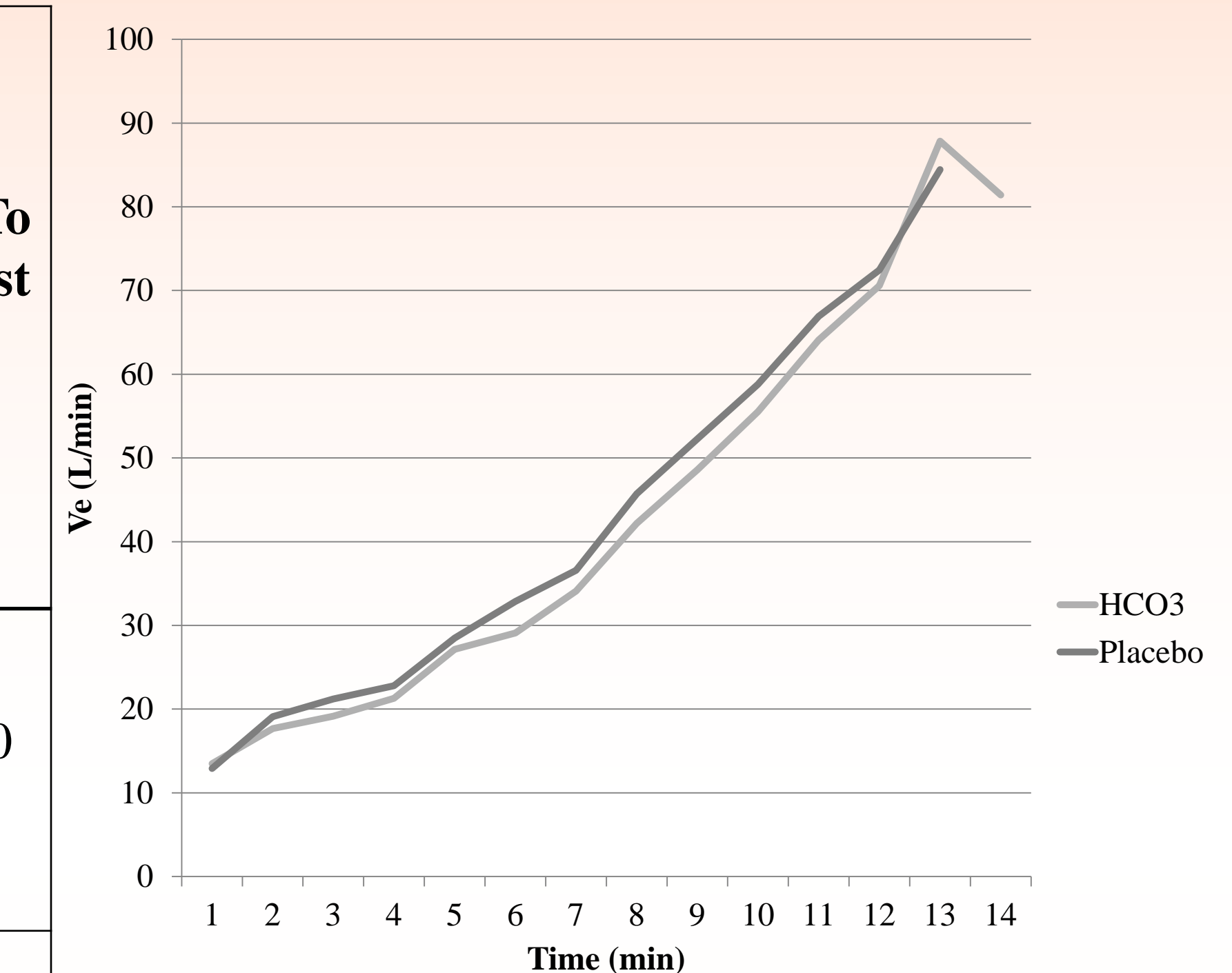


Figure 2: Comparison of Minute Ventilation Between Bicarbonate and Placebo Trial

Conclusions

The results showed no significant differences in any of the measured variables between the bicarbonate trial and the placebo trial with significance at P>0.05. The bicarbonate trial had initial BLA of 4.52±2.08 mmol/L, post BLA of 15.2±2.68 mmol/L, peak VCO₂ of 3.13±0.83 L/min, and termination time of 671.5±69.90s. The Placebo trial had initial BLA of 3.37±0.70 mmol/L, post BLA of 14.47±2.16 mmol/L, peak VCO₂ of 3.05±0.74 L/min, and termination time of 690.33±87.53s. The post blood lactate and VCO₂ in the bicarbonate trial was elevated when compared to the placebo trial based on the means. The exercise time until exhaustion had a higher mean in the placebo trial when compared to the bicarbonate trial. A dose of 0.1g/Kg of sodium bicarbonate ingested orally appears to have no beneficial effects on performance during a maximal treadmill exercise test.