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The Effect of Sodium Citrate Supplementation Following Dehydrating Exercise on Stress Hormone Responses to Subsequent Endurance Time Trial Cycling in the Heat

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Introduction

Alkalizing drugs such as sodium bicarbonate ($NaHCO_3$) or sodium citrate (CIT) may increase performance during high-intensity exercise. These drugs' ergogenic effects are thought to be based primarily on their ability to increase extracellular buffer capacity, which enables the outflow of hydrogen ions (H^+) from contracting muscle cells, delaying the drop in intracellular pH and boosting glycogenolytic ATP generation. Furthermore, CIT has been proven to raise plasma volume (PV) to a degree that may improve endurance performance by reducing rises in core body temperature (Tc) during exercise.

The majority of past research has concentrated on the possible performance consequences of acute alkalizer consumption, with little emphasis paid to their influence on exercise-induced stress. McEwen described stress as "an actual or perceived danger to an individual's physiological or psychological integrity (i.e. homeostasis) that results in physiological and/or behavioral reactions." As a result, the term stressor refers to any stimulus that generates stress, i.e., induces physiological and/or behavioral reactions. Physiological reactions to stress often include changes in neuroendocrine, hormonal and immunological processes.

Acute exercise disrupts homeostasis and can be a significant stressor depending on its intensity and duration. Recent research suggests that $NaHCO_3$ reduces stress at the cellular level, as seen by decreased heat shock protein responses to exercise. Data on the effects of stress hormones to exercise following CIT or $NaHCO_3$ consumption are few and somewhat contentious. Blood catecholamine responses following 1–2 minutes of high-intensity cycling exercise have been reported to be reduced or unaltered. The effects of NaHCO3 on cortisol (CORT) and growth hormone (GH) responses to maximum cycling bouts were studied. A 7.5-minute hard cycling exertion was stopped by an injection of $NaHCO_3$. CIT dampened the aldosterone (ALDO) response to a 24.5-minute progressive jogging workout.

Description

For the first time, this investigation looks at whether CIT intake in the quantity that has been demonstrated to cause metabolic alkalosis and an acute rise in PV effects blood stress hormone responses to extended self-paced cycling activity in the heat. We expected that CIT, as opposed to PLC, would reduce increases in CORT, ALDO, GH and PRL levels in the blood under combined exercise and heat stress. Our data largely support the concept except for ALDO, whose growth was considerably reduced in the CIT experiment during TT [1].

CIT consumption generated greater serum Na+ and lower K+ concentrations in temperate ambient settings, as well as the similar pattern of changes in blood ALDO levels as reported in the current study. As a result, it is possible that CIT had a comparable effect on blood electrolyte levels in our individuals. An increase in K^+ is regarded a significant stimulation for ALDO production, while a decrease in Na^+ is considered a relatively modest stimulant. Based on these findings, it is likely that CIT-induced changes in blood K^+ and Na^+ concentrations were among the reasons that lowered ALDO levels in our subjects at rest and during heat exercise [2].

Similar BM, urine specific gravity and serum osmolality indicate that our patients in both trials were hydrated and in a euvolemic state before to DE. Prior to TT, however, their PV had increased by 7.8 percent in CIT compared to PLC trial. After CIT consumption, enlarged PV and lowered blood ALDO levels were found under temperate settings. Others used dextran solution to produce an acute pre-exercise PV expansion and found that blood ALDO responses to extended constant-load cycling exercise were muted. We found an inverse connection between PV changes and blood ALDO levels, similar to Grant, et al.

Nonetheless, in Grant et al investigations the effect of PV expansion was seen only during activity, but in our subjects, lower blood ALDO levels occurred even before the TT [3]. This disparity might be explained by differences in the strategies utilized to induce PV expansion or by various time intervals during which pre-exercise PV expansion was achieved. In light of prior studies, our findings show that PV expansion was one of the reasons that lowered blood ALDO levels at rest and during heat exercise.

Cortisol is one of the most thoroughly researched stress hormones. In a temperate setting, $NaHCO_3$ consumption decreased serum CORT responses to four consecutive 30s bouts of maximum cycling activity, despite the fact that the $NaHCO_3$ trial had a higher mean power output. These researchers came to the conclusion that exercise-induced acidosis enhanced CORT release and that $NaHCO_3$-induced metabolic alkalosis was partially responsible for the attenuated CORT response. During exercise, concurrent increases in blood lactate and acidity occur in the absence of alkalizing agents. As a result, the finding that increases in serum CORT levels during the TT in the PLC experiment interacted positively with changes in lactate concentrations implies that exercise-induced acidosis affected CORT secretion in our subjects [4].

The absence of such a correlation in the CIT trial could be explained by the fact that induced metabolic alkalosis facilitates efflux of both lactate and H^+ from contracting muscle cells while also more efficiently buffering H+, resulting in higher blood lactate levels but lower blood acidity and CORT levels. Nonetheless, unlike Wahl et al., we found reduced serum CORT levels prior to exercise in the CIT study. This disparity might be explained by the fact that our individuals began CIT intake 16 hours before submitting the pre-exercise blood sample, whereas Wahl et al. supplied $NaHCO_3$ to their patients just 90 minutes before the commencement of exercise [5].

Conclusion

In male non-heat-acclimated endurance cyclists, CIT consumption during

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the 16-hour recovery period after DE resulted in lower blood ALDO and CORT levels prior to and throughout the subsequent cycle TT in a warm environment. CIT consumption also lowers the extent of acute rises in blood ALDO levels during TT, but not CORT levels. In these experimental settings, CIT had no effect on blood levels of PRL or GH.

Conflict of Interest

None.

References

1. Bishop, David, Johann Edge, Cindy Davis and Carmel Goodman. "Induced metabolic alkalosis affects muscle metabolism and repeated-sprint ability." *Med Sci Sports Exerc* 36 (2004): 807-813.
2. Burk, Andres, Saima, Maria Tamm and Vahur Ööpik. "Effects of heat acclimation on endurance capacity and prolactin response to exercise in the heat." *Eur J Appl Physiol* 112 (2012): 4091-4101.
3. Tamm, Maria, Merle Havik, Saima Timpmann, Andres Burk and Vahur Ööpik, et al. "Effects of heat acclimation on time perception." *Int J Psychophysiol* 95 (2015): 261-269.
4. Akerman, Ashley P., Samuel J.E. Lucas, Rajesh Katare and James D. Cotter. "Heat and dehydration additively enhance cardiovascular outcomes following orthostatically-stressful calisthenics exercise." *Front Physiol* 8 (2017): 756.
5. Dill, David Bruce and David L. Costill. "Calculation of percentage changes in volumes of blood, plasma and red cells in dehydration." *J Appl Physiol* 37 (1974): 247-248.

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