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## **ASEA Redox Supplement Fails to Improve Aerobic Capacity and Ventilatory Threshold: A Double-Blind, Placebo-Controlled Study**

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### **ABSTRACT**

**Wagner DR, Shegrud K, Hintze KJ.** ASEA Redox Supplement Fails to Improve Aerobic Capacity and Ventilatory Threshold: A Double-Blind, Placebo-Controlled Study. **JEPonline** 2019;22(4):23-28. The ASEA redox cell signaling supplement beverage has been commercially available for the past decade. Despite the market longevity of this supplement, athletic sponsorship, and anecdotal ergogenic claims, there is no independent, peer-reviewed research on its efficacy. The purpose of this study was to determine if ASEA improves aerobic capacity ( $\text{VO}_2$  max) and/or ventilatory threshold (VT) of physically active subjects. Eleven (6 females, 5 males) young adults ( $21.9 \pm 3.9$  yrs) performed 3  $\text{VO}_2$  max tests: (a) baseline; (b) after 2 wks of supplementing with ASEA; and (c) after 2 wks of taking a placebo in a cross-over design. The treatment order was randomized and double-blind. The subjects consumed  $4 \text{ oz} \cdot \text{d}^{-1}$  ( $118 \text{ mL} \cdot \text{d}^{-1}$ ) of the ASEA treatment according to the manufacturer's recommendations. The subjects'  $\text{VO}_2$  max values at baseline ( $55.0 \pm 8.6 \text{ mL} \cdot \text{kg}^{-1} \cdot \text{min}^{-1}$ ), placebo ( $53.6 \pm 9.1 \text{ mL} \cdot \text{kg}^{-1} \cdot \text{min}^{-1}$ ), and ASEA ( $53.7 \pm 10.1 \text{ mL} \cdot \text{kg}^{-1} \cdot \text{min}^{-1}$ ) were not significantly different ( $P=0.172$ ). Similarly, absolute  $\text{VO}_2$  max ( $P=0.436$ ), time to reach  $\text{VO}_2$  max ( $P=0.955$ ), VT as a percentage of  $\text{VO}_2$  max ( $P=0.678$ ), and maximal heart rate ( $P=0.410$ ) were not significantly different between trials. Contrary to the manufacturer's claims, ASEA did not improve the aerobic performance of young, fit adults who supplemented with the product daily for 2 wks.

**Key Words:** Ergogenic, Running, Superoxide,  $\text{VO}_2$  max

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## INTRODUCTION

Small physiological changes can result in meaningful improvements in health and physical performance. Many people try to achieve these improvements with dietary supplementation. Research suggests that 40% to 100% of athletes use supplements, depending on the definition of supplements, the level of competition, and the type of sport (4).

One supplement manufacturer that boasts both health and performance claims for its product is ASEA. The flagship product of ASEA is the redox cell signaling supplement beverage. According to the company, this supplement contains “active redox signaling molecules” that serve to protect, rejuvenate, and restore cells ([aseaglobal.com](http://aseaglobal.com)). The specific redox signaling molecules included in the ASEA beverage are not identified by the manufacturer, but one research team noted that this supplement includes hydrogen superoxide, hydrogen peroxide, hypochlorous acid, and nitric oxide (7). Knab et al. (6) described this supplement as “a saline beverage with stable superoxide complexes.”

ASEA was founded in 2007, and their product has been commercially available for 10 yrs. According to their web site, they sponsor 12 athletes that include paralympians, XTERRA and Ironman triathletes, and world-class swimmers (<https://aseaathletes.co>). An in-house unpublished report available on the Internet claimed that 4 oz·d<sup>-1</sup> (118 mL·d<sup>-1</sup>) of ASEA for 2 wks improved maximal oxygen consumption (VO<sub>2</sub> max) by 3%, time to reach VO<sub>2</sub> max by 10%, and ventilatory threshold (VT) by 12% in a sample of 17 athletes (8). However, this research was done without a control group. Also, the proposed mechanism explaining how this cell signaling supplement could improve aerobic performance was not provided. Despite ASEA being in business for over a decade, sponsorship of elite athletes, and a claim that their product improves aerobic capacity, there is a dearth of peer-reviewed, scientific research on this supplement. An extensive search of PubMed, Scopus, and GoogleScholar revealed only two conference abstracts (6,9) and one foreign language publication (2) related to ASEA and aerobic performance. Thus, the purpose of this study was to replicate the manufacturer’s in-house report claiming improved aerobic performance with only 2 wks of ASEA supplementation (8), but with the addition of a double-blind placebo control using a cross-over design.

## METHODS

### Subjects

The subjects were recruited from the university campus community. Inclusion criteria included being a regular aerobic exerciser (>150 min·wk<sup>-1</sup>), a willingness to take the ASEA supplement beverage and a placebo for 2 wks each, and complete 3 VO<sub>2</sub> max tests. Exclusion criteria included pregnancy and previously taking the ASEA supplement. The subjects received the ASEA for free and were compensated \$20 for their participation in the study. The study was approved by the university’s institutional review board (protocol #7780), and all subjects signed a written informed consent before beginning the study.

### Design

The study was double-blind with neither the subjects nor the examiner conducting the VO<sub>2</sub> max testing knowing which beverage, ASEA or placebo, was consumed. A cross-over design was used such that each subject received both treatments, serving as his/her own control. Additionally, the treatment order (ASEA first or placebo first) was randomly assigned.

## Procedures

All subjects underwent a baseline  $\text{VO}_2$  max test. Following baseline testing, the subjects were given a 2-wk supply of a beverage in an unmarked container with a shot glass for measuring the proper dosage. Subjects were instructed to take 2 oz (59 mL) in the morning and 2 oz (59 mL) in the evening ( $4 \text{ oz}\cdot\text{d}^{-1}$ ;  $118 \text{ mL}\cdot\text{d}^{-1}$ ), daily, for 2 wks. Immediately before the  $\text{VO}_2$  max test, the subjects consumed 8 oz (237 mL) of the beverage that they had been consuming for the previous 2 wks. This is the dosing strategy recommended by ASEA, and it was consistent with the protocol of Samuelson (8) from ASEA's in-house testing. After 2 wks, the  $\text{VO}_2$  max test was repeated. A 1-wk washout period with no treatment followed the second  $\text{VO}_2$  max test. Following the washout week, the subjects were given the opposite treatment of what they had received initially for another 2 wks. A third  $\text{VO}_2$  max test was given at the end of this 2-wk period.

The ASEA redox supplement was purchased directly from a commercial vendor. According to the nutrition label, ASEA contains chloride (Cl) and sodium (Na). The active signaling molecules suspended in the saline solution are not listed. To confirm the label ingredients, ASEA was analyzed by inductively coupled plasma atomic emission spectroscopy at the university's analytical laboratory. This analysis revealed that ASEA has approximately the same amount of NaCl as indicated on the nutrition label. Therefore, the placebo was formulated using distilled water and contained the same amount of NaCl as ASEA (313 mg per 118 mL serving). The placebo and ASEA were placed into non-descript, coded containers by a researcher not involved in the  $\text{VO}_2$  max test to ensure that both the study subjects and researchers conducting the performance tests were blinded to the experimental treatment.

## $\text{VO}_2$ Max Testing

The subjects' height were measured to the nearest 0.1 cm with a wall-mounted stadiometer (Seca 216, Seca Corp., Ontario, CA) and weight were measured to the nearest 0.1 kg with a digital scale (Seca 869, Seca Corp., Ontario, CA). A ParvoMedics TrueMax 2400 Metabolic Measurement System (ParvoMedics, Sandy, UT) was calibrated according to the manufacturer's instructions and used to analyze expired volumes of  $\text{O}_2$  and  $\text{CO}_2$  for the determination of  $\text{VO}_2$  max and VT. All subjects ran on a treadmill, but the protocol was individualized in an attempt to have each subject reach maximal exertion in approximately 10 min (1). The speed and incline changes of each individual's protocol were documented so that each individual's baseline testing protocol was repeated for the subsequent  $\text{VO}_2$  max tests.

Various methods or techniques exist for determining VT, and each technique involves some interpretation and subjective judgement (5). To eliminate investigator bias and subjectivity, the default VT estimation from the ParvoMedics software was used. This software estimates VT automatically using the v-slope method (M. P. Yeh, personal communication, September 25, 2017), such that VT is the point at which the slope of  $\text{VO}_2$  consumed plotted against  $\text{VCO}_2$  produced increases from less than 1 to greater than 1.

## Statistical Analyses

A priori power analysis (G-Power 3.0.10) for a one-way repeated measures ANOVA (baseline v placebo v ASEA) with an alpha of 0.05 and power of 0.80, and assuming a correlation of 0.90 among the repeated measures suggested a sample size of 10 was sufficient to identify

differences with an effect size of 0.20. The normality of the data was evaluated with a Shapiro-Wilks test. Means and standard deviations were calculated, and differences in  $\text{VO}_2$  max and VT across the three trials were evaluated with a one-way repeated measures ANOVA. A P-value of  $<0.05$  was considered statistically significant. All statistical analyses were done using SPSS (version 25, IBM, Inc., Armonk, NY).

## RESULTS

Twelve subjects were enrolled in the study, but one male suffered an injury unrelated to the study and was unable to complete all 3 trials. Therefore, all statistical analyses were done on 11 subjects (6 females, 5 males). The physically active subjects were homogeneous with regard to age ( $21.9 \pm 3.9$  yrs) and body mass index ( $23.7 \pm 2.2 \text{ kg}\cdot\text{m}^{-2}$ ). All data were normally distributed ( $P>0.05$ ) with no statistical outliers. There were no significant within-subject differences ( $P>0.05$ ) across trials for relative and absolute  $\text{VO}_2$  max, time to reach maximal exertion, maximal heart rate, and VT (Table 1).

**Table 1. Trial Comparison of Measured Variables.**

Variable	Baseline	Placebo	ASEA	P-value
<b><math>\text{VO}_2</math> max</b> ( $\text{mL}\cdot\text{kg}^{-1}\cdot\text{min}^{-1}$ )	$55.0 \pm 8.6$	$53.6 \pm 9.1$	$53.7 \pm 10.1$	0.172
<b><math>\text{VO}_2</math> max</b> ( $\text{L}\cdot\text{min}^{-1}$ )	$4.01 \pm 0.88$	$3.94 \pm 0.97$	$3.96 \pm 1.06$	0.436
<b>Time to <math>\text{VO}_2</math> max</b> (sec)	$723 \pm 129$	$721 \pm 132$	$725 \pm 112$	0.955
<b>Maximal Heart Rate</b> ( $\text{beats}\cdot\text{min}^{-1}$ )	$192.1 \pm 8.5$	$190.3 \pm 9.8$	$191.6 \pm 6.1$	0.410
<b>Ventilatory Threshold</b> (%)	$72.6 \pm 2.1$	$73.2 \pm 4.7$	$74.3 \pm 8.9$	0.678

## DISCUSSION

The results from this study indicate that daily intake of the ASEA redox supplement for 2 wks had no effect on measures of aerobic performance. In fact, the differences in  $\text{VO}_2$  across trials were so small that they were less than the reported test-retest reliability of  $\text{VO}_2$  testing with the ParvoMedics system (3). This study stands in contrast to the in-house report by Samuelson (8) and the work by Barghini and Maffi (2). Samuelson (8) reported that about 70% of the athletes experienced improvements using the same 2-wk ASEA supplementation dosing strategy employed in the present study. However, Samuelson (8) had no placebo control. Similarly, Barghini and Maffi (2) reported that 9 of 10 recreational runners improved their 10 km run time by 2 to 3 min following 3 wks of supplementing  $120 \text{ mL}\cdot\text{d}^{-1}$  of ASEA. However, again, there was no control group. Thus, the improvement could have been due simply to aerobic training. Furthermore, it was discovered that one of the authors served on the ASEA science advisory council. To our knowledge, the present study is the first

independent, peer-reviewed, placebo-controlled investigation of ASEA's ability to effect aerobic performance to reach publication.

Despite the null result in the present investigation, two conference abstracts by the same research lab suggested a potential ergogenic benefit of the ASEA redox supplement. In 2012, Shanely et al. (9) reported that only 1 wk of 118 mL·d<sup>-1</sup> of ASEA supplementation enhanced fatty acid mobilization over a placebo. However, this did not improve performance on a 75 km cycling time trial nor did ASEA alter biomarkers of inflammation, oxidative stress, or immunity. The following year, Knab et al. (6) reported that ASEA-supplemented mice run to exhaustion had increased skeletal muscle phosphorylated acetyl-CoA carboxylase over placebo mice. The ASEA-supplemented mice ran 29% longer than the placebo group, and the authors theorized that this was the result of muscle glycogen sparing due to less inhibition of fatty acid oxidation. The findings from these two abstracts suggest that the greatest ergogenic benefit to ASEA supplementation might be long duration events in which glycogen depletion is the limiting factor rather than maximal aerobic efforts as was tested in the present study.

There are claims on the ASEA website that the redox signaling beverage enhances recovery. The efficacy of this supplement to speed recovery following aerobic exercise was not part of the present study. However, Ryan et al. (7) reported that a single dose of ASEA was ineffective at improving recovery from a weight lifting bout or alleviating delayed onset muscle soreness.

### **Strengths and Limitations**

This was the first independent, randomized, placebo-controlled, double-blind study of ASEA. Thus, the study design and absence of conflict of interest were strengths of this study. While 2 wks may not be enough time to observe meaningful improvements in VO<sub>2</sub> max or VT, this time span for supplementation was selected because it matched the study duration used by Samuelson (8), and our goal was to replicate the manufacturer's research. Also, the results were limited to the performance variables of VO<sub>2</sub> max and VT. The conference abstract of Shanely et al. (9) showed that it is possible for the metabolite profiles of ASEA users to be altered without changes in aerobic performance.

### **CONCLUSIONS**

In summary, 2 wks of 118 mL·d<sup>-1</sup> (4 oz·d<sup>-1</sup>) of the ASEA redox supplement had no effect on the aerobic capacity, VT, or time to achieve VO<sub>2</sub> max compared to baseline testing and a placebo in a group of young, physically active adults. Other claims of the benefits of ASEA supplementation, such as extending time to fatigue or enhancing recovery remain untested.

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