The Effects of Nitric Oxide Precursor Supplementation on Maximal Exercise and Oxygen Consumption

Author: Matthew Robertson
Faculty sponsors: Dr. Judy Wilson, Brad Heddings, Jeremiah Campbell

Cardiovascular Research Laboratory, The University of Texas at Arlington, Arlington, TX.
Applied Exercise Physiology, 12/7/2011

Abstract

Introduction: Nitric oxide is a gaseous molecule produced inside the body that is believed to cause vasodilation and increased oxygen extraction rates in active muscle. The purpose of this study was to determine if supplementation with a nitric oxide precursor, arginine-alpha-ketoglutarate (AAKG), prior to exercise will affect maximal oxygen consumption during a maximal exercise test (VO₂max), when compared to a placebo. Methods: Five active healthy male subjects participated in this study, in which they were required to complete a maximal exercise test. This study used both repeated measures as well as randomization of administering supplements. Demographic values for age, height, and weight were recorded (age: 23.2 ± 1.79 years, ht: 1.81 ± 0.061 m, wt: 93.42 ± 4.13 kg). Next, the subject ingested either the placebo or the nitric oxide precursor and heart rate monitors were attached. The subjects sat for 30 minutes to allow for adequate digestion and absorption, then rested heart rate and blood pressure were taken. Subjects then completed a VO₂max test, using the Bruce protocol, to voluntary exhaustion. Data was recorded and analyzed using Microsoft Excel. Student’s t-tests were performed to determine significance and statistical significance was set to p ≤ .05. Results: All of the original subjects that initially volunteered for participation in the study successfully completed each of the two trials. No significant differences were found between the trials for heart rate, time to exhaustion, systolic blood pressure, diastolic blood pressure, and relative maximal oxygen consumption. Conclusion: The current study demonstrated that short-term supplementation of the nitric oxide precursor, AAKG, did not result in significant differences between trials. Further research needs to be completed to accurately determine the possible ergogenic effects of nitric oxide precursor supplementation.

Methods (cont’d)

Upon arrival to the lab each subject ingested either the vitamin C placebo or the nitric oxide precursor supplement, AAKG, and heart rate monitors were attached. After thirty minutes had passed to allow for adequate digestion and absorption, the subjects sat for 30 minutes to allow for adequate digestion and absorption, then exercised to voluntary exhaustion. Each subject was required to complete two maximal exercise tests on two separate occasions separated by at least 24 hours. This study used both repeated measures as well as randomization of administering supplements. No restrictions were placed on subject’s normal exercise routine or diet; however each subject was informed to not ingest caffeine within 12 hours of each scheduled testing time.

Results (cont’d)

All five of the original subjects that initially volunteered for participation in the study successfully completed each of the two trials. Subjects reported no adverse affects of supplementation. Results from the study concluded that there was no significant difference in maximal heart rate attained between each trial (p=.88). Also no significant difference was found in subject’s time to exhaustion between trials, the difference between average times to exhaustion of all subjects between the two trials was only 6 seconds. (p =.66). No significant difference was found between trials in relative maximal oxygen consumption (p= .43 ) . The average value of relative oxygen consumption of the placebo group was 39.76 ml/kg/min, while the average value for the nitric oxide precursor trial was 37.42 ml/kg/min; a decrease of roughly 6.25%. The values recorded for systolic blood pressure in those who received the nitric oxide precursor prior to exercise were decreased by roughly 2.68% when compared to the trial in which subjects received the placebo. However, this decrease was not significant, (p=.41).

Table 2: Values Recorded During Maximal Exercise in Each Trial

<table>
<thead>
<tr>
<th></th>
<th>Placebo</th>
<th>Maximal Exercise Each Trial</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>S.D.</td>
</tr>
<tr>
<td>SBP (mmHg)</td>
<td>184.2</td>
<td>10.7</td>
</tr>
<tr>
<td></td>
<td>DBP (mmHg)</td>
<td>79</td>
</tr>
<tr>
<td></td>
<td>HR (bpm)</td>
<td>190</td>
</tr>
<tr>
<td></td>
<td>VO2 (ml/kg/min)</td>
<td>39.76</td>
</tr>
<tr>
<td></td>
<td>TIME (min)</td>
<td>11.14</td>
</tr>
<tr>
<td></td>
<td>Mean</td>
<td>S.D.</td>
</tr>
<tr>
<td>SBP (mmHg)</td>
<td>179.4</td>
<td>6.1</td>
</tr>
<tr>
<td></td>
<td>DBP (mmHg)</td>
<td>78</td>
</tr>
<tr>
<td></td>
<td>HR (bpm)</td>
<td>189</td>
</tr>
<tr>
<td></td>
<td>VO2 (ml/kg/min)</td>
<td>37.42</td>
</tr>
<tr>
<td></td>
<td>TIME (min)</td>
<td>11.24</td>
</tr>
</tbody>
</table>

Results (cont’d)

Figure 1: Blood Pressure Response In Each Trial During Maximal Exercise

Conclusions

The current study demonstrated that short-term supplementation of the nitric oxide precursor, arginine-alpha-ketoglutarate, did not result in increased relative maximal oxygen consumption. Also, there were no significant differences between trials in systolic blood pressure, diastolic blood pressure, maximal heart rate, or time to exhaustion. Further research needs to be completed to accurately determine the possible ergogenic effects of nitric oxide precursor supplementation.

References