ACUTE HEMODYNAMIC EFFECTS OF L-ARGININE, ARGININE NITRATE, AND ARGININE PEPTIDE ON EXERCISE-INDUCED VASODILATION AND BLOOD FLOW IN HEALTHY MEN

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ABSTRACT

Background: Increasing blood flow to skeletal muscle during exercise may benefit both recreational and elite athletes. Raw arginine (RA) is a commonly used supplement for increasing blood flow via nitric oxide production. Arginine has been also been bound to a whey peptide (AP) and to nitrate (AN) to increase bioavailability. The purpose of the present study was to determine the acute hemodynamic effects of RA, AP, AN, and placebo (PLA) following resistance exercise in healthy, recreationally-active men at doses commonly used in the marketplace. Methods: In a double-blind, crossover, placebo-controlled design, 11 recreationally-active males (28.2±5.0y, 182.4±5.7cm, 87.1±10.3kg) consumed either 1.87g of RA, 3.07g of AP (arginine content 1.87g), 2.55g of AN (arginine content 1.87g), or a flavor-matched, visually identical placebo (PLA), and performed 3 sets of 15 arm curls at 30 and 120 minutes post-supplementation. Vessel diameter of the brachial artery (VD) and blood flow volume (BFV) were measured via Doppler ultrasound at 0, 3, and 6 minutes post-exercise, corresponding to 30 (30P), 33 (33P), 36 (36P), 120 (120P), 123 (123P), and 126 (126P) minutes post-supplementation. Measurements were compared with active control (no treatment, exercise) values. Raw data were analyzed for all group, time, and group x time interactions using 2-way repeated-measures ANOVA. Percent change values were analyzed using dependent t-tests. Alpha was set at p<0.05. Results: A significant (p<0.05) group x time interaction was observed for RA compared to PLA, and post hoc analyses revealed that RA increased VD versus PLA at 30P (RA: 0.56±0.17; PLA: 0.55±0.17cm) compared to control. Significantly greater percent change values were observed for VD when comparing RA and PLA at 30P versus active (RA: 7.87±4.09; PLA: 3.90±3.75cm). Significantly greater percent change values were observed for BFV when comparing AP and PLA at 33P, AP and RA at 33P, AP and PLA at 36P, and AP and AN at 123P and 126P versus active baselines ([AP 33P: 25.7±39.1; 36P: 22.0±41.6; 123P: 21.5±47.6; 126P: 3.02±31.7 mL/min], [PLA 33P: 3.27±30.6; 36P: 5.71±33.6mL/min], [RA 33P: -0.71±34.5 mL/min], [AN 123P: -2.58±29.6; 126P: -21.8±27.6mL/min]). Conclusions: Though raw arginine may significantly increase vessel diameter compared to placebo at 30 minutes post-exercise, arginine peptide induced significantly higher percent change values for blood flow volume compared to raw arginine, placebo and arginine nitrate at specific time points, and therefore may be the best option for increased blood flow.

INTRODUCTION

Increasing blood flow may be a valuable tool in sports performance, training and conditioning. Not only can increased blood flow aid in the delivery of nutrients to active muscle (oxygen, macronutrients, other beneficial molecules) during training and competition, but it can also increase removal of waste products post-training. Arginine is a common supplement employed by athletes, which increases nitric oxide production—a potent endogenous vasodilator—via the enzyme nitric oxide synthase. More recently, athletes have also consumed nitrates, which increase nitric oxide independently of the L-arginine nitric oxide pathway. Arginine has also been bound to a peptide to increase bioavailability. The purpose of the present study was to compare the efficacy of raw arginine, arginine nitrate, and arginine peptide on vessel diameter of the brachial artery and blood flow volume.

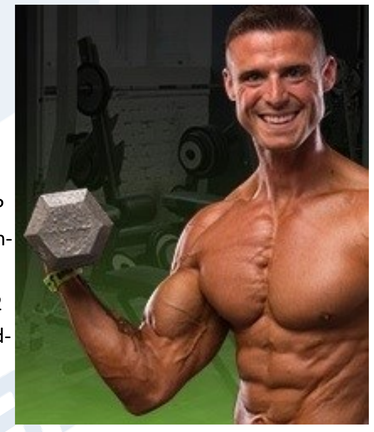
METHODS

Participants

Eleven recreationally active men (age: 28.2±5.0y, height: 182.4±5.7cm, weight: 87.1±10.3kg) completed this study. To be eligible, each participant must have exercised at least 2 days per week for at least 1 year. Exclusion criteria included: any major medical conditions or disorders, kidney or liver dysfunction, smoking, and chronic medication or supplement use that may affect arterial blood flow. All subjects provided written, informed consent prior to testing and all testing procedures were approved by an Institutional Review Board.

Experimental Design

In a double-blind, crossover, placebo-controlled design, 11 recreationally-active males (28.2±5.0y, 182.4±5.7cm, 87.1±10.3kg) were recruited and completed the present study. Subjects arrived at the MusclePharm Sports Science Institute fasted and euhydrated for at least 2 hours. Upon arrival, subjects consumed either 1.87g of RA, 3.07g of AP (arginine content 1.87g), 2.55g of AN (arginine content 1.87g), or a flavor-matched, visually identical placebo (PLA). Visits were separated by at least 72 hours for washout. After consumption of test products, subjects performed 3 sets of 15 arm curls with their right arm only using a 20 lb. dumbbell. Rest periods between dumbbell sets were 30 seconds. The arm curl exercise was performed at 30 and 120 minutes post-supplementation.



Vessel diameter of the brachial artery (VD) and blood flow volume (BFV) were measured via Doppler ultrasound (Logiq *e*, General Electric, Fairfield, CN) at 0, 3, and 6 minutes post-exercise, corresponding to 30 (30P), 33 (33P), 36 (36P), 120 (120P), 123 (123P), and 126 (126P) minutes post-supplementation. Measurements were taken midway between the axillary fold and the medial epicondyle of the humerus while the subject rested supine. Measurements were compared with active control (no treatment, exercise) values. Raw data were analyzed for all group, time, and group x time interactions using 2-way repeated-measures ANOVA. Percent change values were analyzed using dependent t-tests. Alpha was set at p<0.05.

RESULTS

A significant (p<0.05) group x time interaction was observed for RA compared to PLA, and post hoc analyses revealed that RA increased VD versus PLA at 30P (RA: 0.56±0.17; PLA: 0.55±0.17cm) compared to control. Significantly greater percent change values were observed for VD when comparing RA and PLA at 30P versus active (RA: 7.87±4.09; PLA: 3.90±3.75cm). Significantly greater percent change values were observed for BFV when comparing AP and PLA at 33P, AP and RA at 33P, AP and PLA at 36P, and AP and AN at 123P and 126P versus active baselines ([AP 33P: 25.7±39.1; 36P: 22.0±41.6; 123P: 21.5±47.6; 126P: 3.02±31.7 mL/min], [PLA 33P: 3.27±30.6; 36P: 5.71±33.6mL/min], [RA 33P: -0.71±34.5 mL/min], [AN 123P: -2.58±29.6; 126P: -21.8±27.6mL/min]).

Table 1.

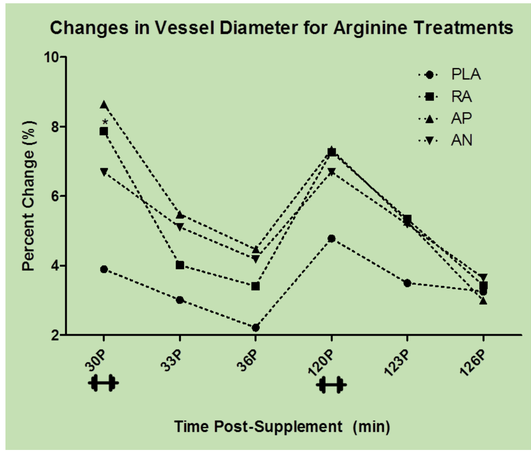


Figure Legend:

↔ = exercise bout

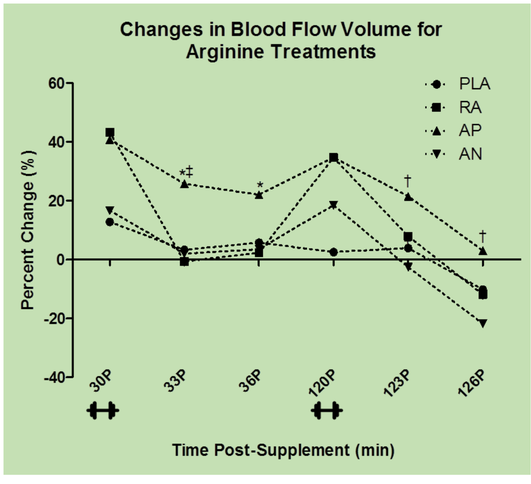
*= different from PLA

†= different from AN

‡= different from RA

p < 0.05

Table 2.



CONCLUSIONS

Though raw arginine may significantly increase vessel diameter compared to placebo at 30 minutes post-exercise, arginine peptide induced significantly higher percent change values for blood flow volume compared to raw arginine, placebo and arginine nitrate at specific time points, and therefore may be the best option for increased blood flow.

ACKNOWLEDGEMENTS

This study was funded by MusclePharm, Inc. (Denver, CO).

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