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Alexander Chiu
Virginia Commonwealth University

Lauren Pederson

Jeremy O. Via

See next page for additional authors

Authors

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THE EFFECTS OF A HIGH FAT MEAL ON BLOOD FLOW REGULATION DURING ARM EXERCISE

Alexander H. Chiu, Lauren Pederson, Jeremy O. Via, Natalie J. Bohmke, Jacob Richardson, Aaron Autler, Hunter Reed, Eric Henderson, R. Lee Franco, and Ryan S. Garten
Department of Kinesiology and Health Sciences, Virginia Commonwealth University, Richmond, VA

ABSTRACT

Purpose: This study sought to examine the impact of a single high saturated fat meal (HFM) on peripheral vascular function during an acute upper limb exercise bout.

Methods: Ten young healthy individuals completed two sessions of progressive handgrip exercise. Subjects either consumed a HFM (0.84 g of fat/kg of body weight) 4 hours prior or remained fasted before the exercise bout. Progressive rhythmic handgrip exercise (6kg, 12kg) was performed for 3 minutes per stage at rate of 1 Hz. The brachial artery (BA) diameter and blood velocity was obtained using Doppler Ultrasound (GE Logiq e) and BA blood flow was calculated with these values.

Results: BA flow mediated dilation (normalized for shear rate), blood flow, and arm vascular conductance during the handgrip exercise significantly increased from baseline in all workloads, but no differences were revealed in response to the HFM consumption.

Conclusion: Progressive handgrip exercise augmented BA blood flow and flow mediated dilation in both testing days; however, there was no significant differences following the HFM consumption. This suggests that upper limb blood flow regulation during exercise is unaltered by a high fat meal in young healthy individuals.

METHODS

Subjects.
Ten healthy, young subjects (5M/5F) took part in this study.

Testing Session
Subjects consumed a high saturated fat meal or remained fasted and completed progressive handgrip exercise for 3 minutes per stage at a rate of 1 Hz.

Vascular Function and Blood Flow Measures
BA diameter was measured using edge detection software (Medical Imaging Applications, Coralville, IA) and blood flow (via blood velocity values) was determined with Logiq e ultrasound Doppler system (General Electric Medical Systems, Milwaukee, WI). Vascular conductance was determined by dividing BA blood flow with the steady state mean arterial pressure value at each workload.

Statistical Analysis
A repeated measures analysis of variance was employed to identify changes in variables between conditions (BL and HFM) and across workloads (0kg, 6kg, 12kg).

RESULTS

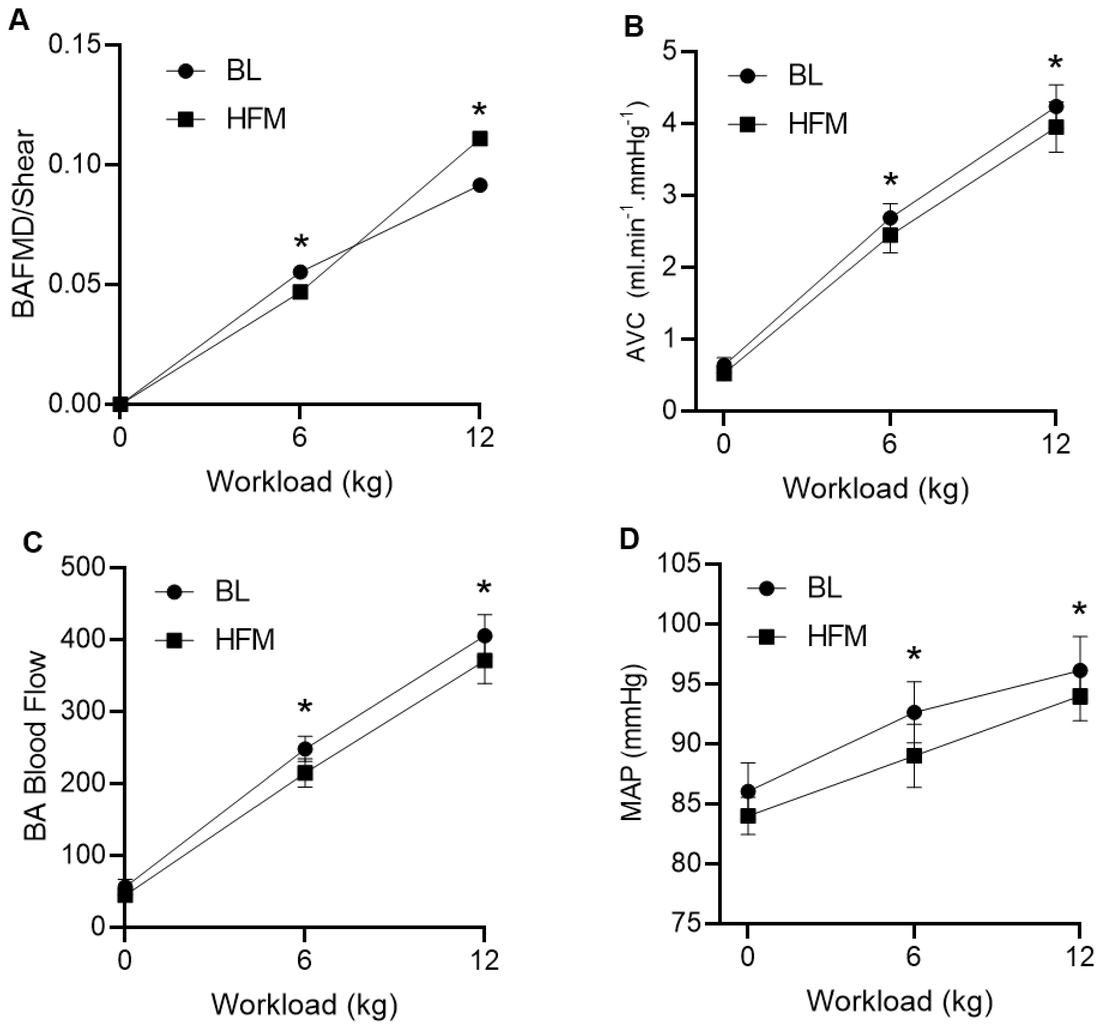

Figure 1: Brachial artery dilation (normalized for shear rate stimulus) (Panel A), arm vascular conductance (Panel B), blood flow (Panel C), and mean arterial pressure (Panel D) at rest and during progressive handgrip exercise following an acute high fat meal consumption. [Mean ± SEM, * - significantly different from rest ($p < 0.05$)].

Subject Characteristics (n = 10)	Mean±SEM
Age (years)	22 ± 1
Height (cm)	171 ± 3
Weight (kg)	65 ± 3
Body Mass Index (kg/m^2)	22 ± 1
Body Fat (%)	15 ± 3

CONCLUSIONS

- Prior high fat meal studies have revealed substantial vascular dysfunction up to 4 hours after consumption.
- This study revealed that macrovascular function, evaluated as brachial artery flow-mediated dilation normalized for steady state shear rate values, was unaltered following the HFM when evaluated during small muscle mass exercise.
- Additionally, examination of the BA blood flow response to exercise revealed no alterations after consumption of the HFM.
- It was also revealed that microvascular function, evaluated via arm vascular conductance (BA blood flow/MAP) was not impacted by the HFM.
- Therefore, this study revealed that after an acute HFM, macrovascular and microvascular function during exercise is maintained in young, healthy individuals.

Correspondence: rsgarten@vcu.edu