Endurance or Sprint Interval Exercise, & Metformin Treatment Differently Modify Insulin-Induced Vasodilation in Skeletal Muscle Arterioles of Obese Insulin Resistant Rats

Jacqueline M. Crissey¹, Jaime Padilla¹, Nathan T. Jenkins¹, Jeffrey S. Martin¹, John P. Thyfault¹,²,³,⁴, and Maurice H. Laughlin¹

Departments of ¹Biomedical Sciences, ²Internal Medicine, ³Nutrition and Exercise Physiology, and ⁴Harry S Truman VA Memorial Hospital, University of Missouri, Columbia, MO

1. ABSTRACT

Insulin-induced vasodilation is obligatory for glucose disposal, and is impaired with insulin resistance. We examined the effects of endurance (EXT) and sprint interval (IST) exercise training with and without metformin (MET) treatment on arterioles in skeletal muscle biopsies from obese, insulin resistant (OLETF) rats. Rats remained sedentary (SED), or were treated with EXT, IST, MET, EXT+MET, or IST+MET from 20-32wks (p=0.05). ET-1 blockade, and ET-1 receptor blockade, were used to assess the role of ET-1 in the vasomotor response. ET-1 blockade improved insulin-induced vasodilation in IST compared to EXT, and MET in the G2AR, whereas IST+MET exhibited less vasodilation compared to IST (p=0.05). In conclusion, the effects of EXT on insulin-induced vasodilation in 2A arterioles of low and high oxidative muscle fibers are similar; but the mechanisms appear to be different. EXT selectively improved insulin-induced vasodilation in G2AR, and was not affected by ET-1 blockade, suggesting it is mediated by nitric oxide. Conversely, no insulin-induced vasodilation was observed in the G2AR following IST yet a marked vasodilation occurred with insulin + ET-1 blockade. Overall these data suggest that the type of exercise training, and treatment with MET, have different effects on G2AR and insulin-induced vasodilation in skeletal muscle arterioles perfusing high vs. low oxidative muscle fibers in the obese, insulin resistant rat.

6. CONCLUSIONS

Insulin-induced vasodilation in 2A or arterioles perfusing the high oxidative, red portion of the gastrocnemius muscle was only found with endurance exercise.

CONTACT: jmcrissey@mail.missouri.edu

ACKNOWLEDGEMENTS

Supported by the MU Life Sciences Fellowship, T32-AR48523, 11P01DT008802, NIH R01HL066689, and VA CDA-2 I2CRN001299-01.

The authors thank Dr R. Scott Rector for the HbA1c data, and Pam Thorne for all of her technical assistance.

REFERENCES