Eric Lis

Chicago, IL

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Faculty Mentor: Dr. Jacqueline Limberg, Nutrition and Exercise Physiology

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Role for the carotid body chemoreceptors in glucose homeostasis in healthy humans

Eric C. Lis, Elizabeth P. Ott, Jennifer L. Harper, Camila M. Manrique-Acevedo, and Jacqueline K. Limberg

Objective: The carotid body (CB) chemoreceptors are important in sensing and responding to changes in arterial oxygen levels. Recent data from pre-clinical rodent models suggests the CBs also play an important role in glucose homeostasis. Our objective was to examine the contribution of the CB chemoreceptors to glucose regulation in humans. We hypothesized attenuation of CB chemoreceptor activity would improve glucose tolerance in healthy humans. We further hypothesized the magnitude of the effect of CB desensitization on glucose tolerance would be related to the level of CB chemosensitivity.

Methods: Participants (n=4, 53±6 yrs, 24±1 kg/m^2) completed a screen visit to assess CB chemosensitivity (hypoxic ventilatory response, HVR), as well as two study visits randomized to normoxia (control) and hyperoxia (CB desensitization). During the study visit, blood glucose, plasma insulin and C-peptide were measured every 15-min for 2-hours following consumption of a 75g glucose drink. Data for glucose, insulin, and C-peptide are reported as area under the curve (AUC). Pearson correlations between chemosensitivity (HVR) and the difference in AUC measures between visits were conducted.

Results: Individuals were healthy (HbA1c 5.0±0.2%) with an HVR of -0.26±0.04 L/min/%. There was no effect of hyperoxia on $AUC_{glucose}$ (p=0.65), $AUC_{insulin}$ (p=0.15), or $ACU_{C\text{-}peptide}$ (p=0.63). When the difference in AUC measures between visits (normoxia, hyperoxia) were compared to HVR, no significant correlations were observed.

Conclusions: Following consumption of a glucose drink, there is an increase in blood glucose which does not differ between control and CB desensitization in healthy humans. Furthermore, there is no effect of hyperoxia on main outcome variables and measures of peripheral chemosensitivity in the healthy adults studied. These data do not support a role for the CB chemoreceptors in glucose homeostasis in healthy