

Haley M. Marchese
L2
LSU Health Sciences Center, New Orleans, LA

Jason D. Gardner Ph.D. & Janos I. Paloczi Ph.D.
LSUHSC Department of Physiology

“Cardiovascular Consequences of Alcohol and Vape Co-Use”

The use of nicotine e cigarettes, particularly by young adults, is on the rise and is strongly associated with alcohol co-use. Previous studies have demonstrated that chronic alcohol use and nicotine vaping share oxidative stress-mediated mechanisms that impair endothelial function, suggesting their combined use may amplify pathways contributing to cardiovascular injury. Previously, we have shown that cardiac and vascular function are adversely affected by co-administration of alcohol and vape in a mouse model. Cardiac function is largely influenced by the extracellular matrix (ECM), with increases in type I collagen producing a stiffer ventricle with impaired filling, relaxation and contraction. Endothelial barrier function is essential for healthy vascular function. The endothelial glycocalyx, a carbohydrate-rich coating on the endothelial surface, is essential for maintaining barrier integrity. The aim of this study is to characterize left ventricular (LV) collagen composition and aortic glycocalyx integrity in mice exposed to concurrent chronic-plus-binge alcohol and nicotine vaping. We hypothesize reduced vascular glycocalyx staining and increased dense type I collagen in the co-use group. Male C57BL6/J mice (n=28; 4-5 mice/group) received a 20-day 5% ethanol liquid diet with 5 g/kg ethanol binges on days 10 and 20, alongside isocaloric controls. Concurrently, mice were exposed to either 5% nicotine salt vapor, vegetable glycerin/propylene glycol (VG/PG) vehicle vapor, or room air during a 12-hour dark cycle. Formalin-fixed, paraffin-embedded (FFPE) LV and aortic tissues were sectioned at 4 μ m. Collagen was assessed using picrosirius red (PSR) staining, with type I and type III collagen differentiated under polarized light microscopy. CD31 was localized in aortic sections using fluorescent immunohistochemistry (IHC) to identify endothelial cells. Lectin histochemistry with fluorophore-conjugated wheat germ agglutinin (WGA) was used to evaluate endothelial glycocalyx, and nuclei were counterstained with DAPI. Images were captured using epifluorescence (aorta) and polarized light (LV) microscopy. Blinded quantification of glycocalyx fluorescence intensity and collagen birefringence was performed in ImageJ. Current findings show no significant difference between groups in total collagen, type I or II collagen between exposure groups. However, two-way ANOVA revealed a significant interaction ($p=0.039$) between the treatments of alcohol and vape. This increased type III collagen indicates ventricular ECM remodeling in the co-use group, which may contribute to previous findings of cardiac dysfunction in this group. Analysis of the glycocalyx indicated no significant differences between groups and no interaction of alcohol and vape. Overall, there was a trend for greater glycocalyx intensity in all treated groups relative to the air controls. Additional samples are being processed for glycocalyx quantification to further investigate this potential increase.