

Introduction

- Individuals suffering from obstructive sleep apnea experience recurrent obstruction of the upper airway during their sleep, leading to episodic reductions in oxygen supply.
- Animal studies have shown that chronic intermittent hypoxia [1] or acute hypoxia [2] exposure elevate blood lipid levels; triglyceride levels are elevated in particular. The elevation of triglyceride levels in response to hypoxia has been proposed as a mechanism underlying the increased risk for cardiovascular diseases faced by individuals suffering from obstructive sleep apnea. This mechanism remains to be tested in humans.

Objective

- Characterize the effects of acute hypoxia exposure on postprandial circulating levels of blood lipids (triglycerides) in healthy humans.

Methods

Table 1. Participant characteristics (n=7)

Variable	Mean (SD)
Age (years)	25.1 (4.3)
Height (cm)	179.4 (3.5)
Weight (kg)	78.7 (8.0)
BMI (kg/m ²)	24.5 (2.7)
Fat mass (%)	12.0 (4.1)

Crossover conditions:

1. Normoxia (FiO₂ = 0.21)
2. Hypoxia (FiO₂ = 0.12)

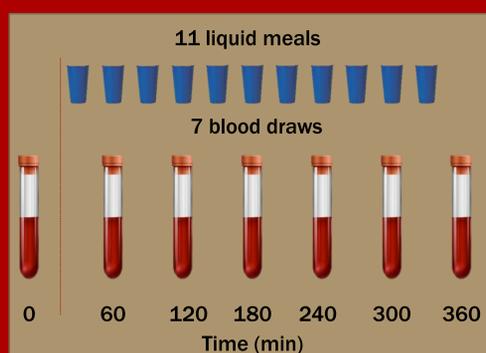


Figure 1. Experimental protocol

Results

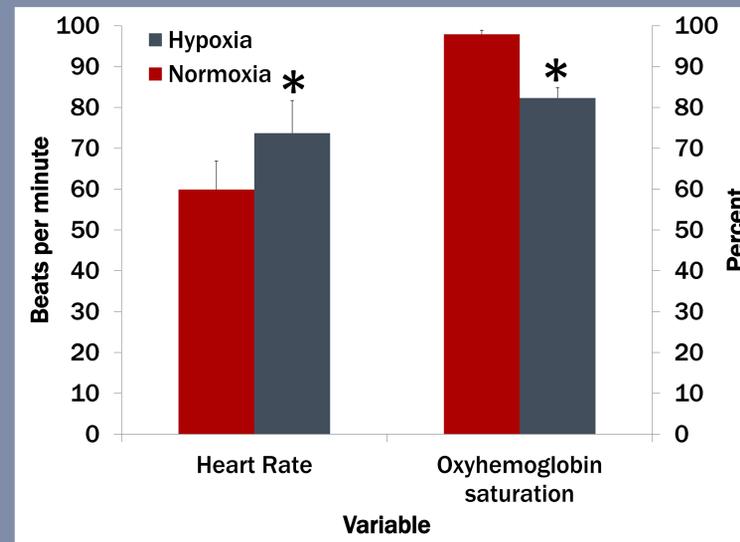


Figure 2. Mean heart rate and oxyhemoglobin saturation over 6 hours in normoxic and hypoxic conditions. * p < 0.01

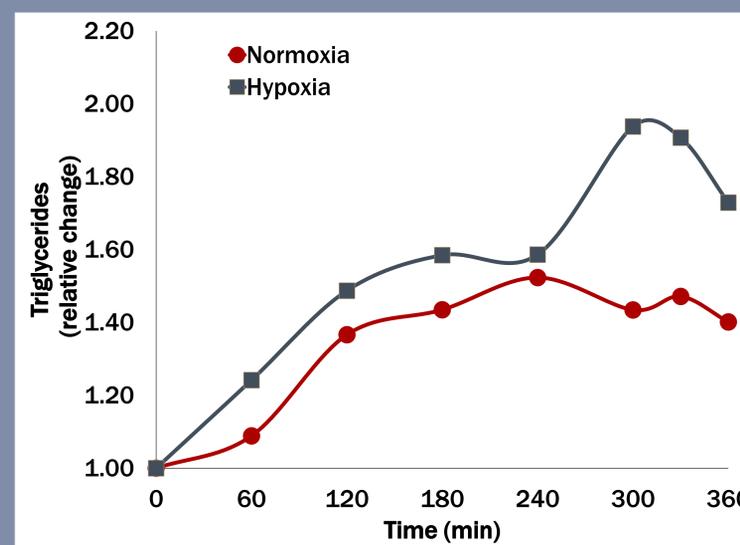


Figure 3. Postprandial triglyceridemia expressed as relative values to initial concentrations over 6 hours in normoxic and hypoxic conditions. Significant condition x time interaction at p < 0.01.

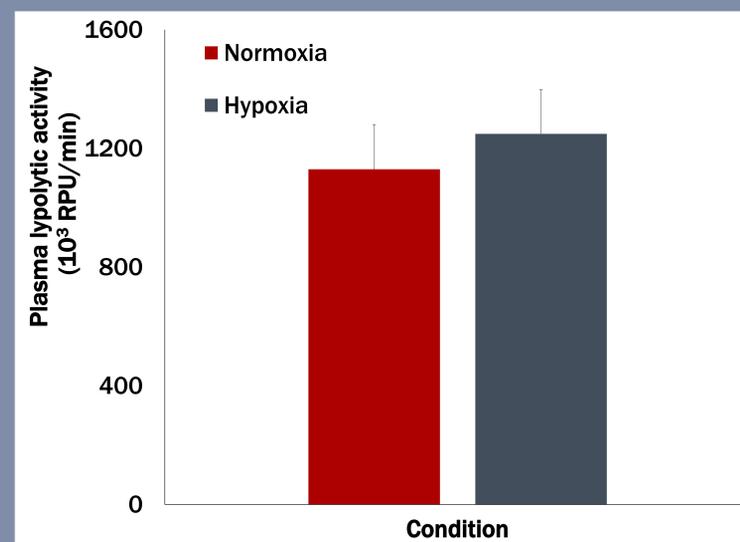


Figure 4. Post-heparin plasma lipolytic activity following 6 hours of normoxic and hypoxic conditions. * p < 0.05

Discussion

During acute hypoxic exposure, the following characteristics were observed:

- Heart rate increased by 13 bpm (p < 0.01)
- Oxyhemoglobin saturation decreased by almost 15% (p < 0.01)
- Blood pressure was similar between conditions

From the results, it is evident that exposure to hypoxia for 6 hours resulted in:

- An increase in plasma triglycerides compared to a normoxia control session
- A 10% increase in the maximal speed of fluorescent lipolytic reactions characterizing plasma total lipolytic activity

These findings are in line with recent animal studies finding increased triglyceride levels and delayed clearance in the bloodstream following feeding under acute hypoxia [2]. This could have an important effect for sleep apnea patients experiencing intermittent hypoxia in their sleep. It is suggested that the disturbance in lipid metabolism plays a role in the known state of increased triglyceridemia in sleep apnea patients, which could contribute to negative health consequences such as a two-fold increase in the risk of CVD.

Conclusion

These results support the notion that postprandial triglyceride levels are elevated following acute exposure to hypoxia. However, this does not seem to be a result of lowered plasma lipolytic activity.

Acknowledgements

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Contact: clind063@uottawa.ca

References

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2. Jun, J. C., Shin, M. K., Yao, Q., Bevans-Fonti, S., Poole, J., Drager, L. F., & Polotsky, V. Y. (2012). Acute hypoxia induces hypertriglyceridemia by decreasing plasma triglyceride clearance in mice. *American Journal of Physiology-Endocrinology and Metabolism*, 303(3), E377-E388.