The Effect of Glucose Accessibility on Hypoxia Tolerance in *Tigriopus californicus*

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Introduction

Tigriopus californicus is found in coastal rock pools, which are subject to fluctuations in dissolved oxygen levels and therefore expose copepods to hypoxic conditions. Previous research has found that under hypoxic conditions, decreased access to glucose results in suppression of mRNA translation in proteins involved in hypoxia tolerance, thus down-regulating these proteins and impairing hypoxia tolerance (Zhou, Hara, Inoue et al. 2008).

This experiment aimed to determine if access to glucose through the availability of food had an impact on the ability of T. californicus to tolerate hypoxia.

Hypothesis: If more knockdowns and/or less survival is observed in hypoxia treatments with no food, then decreased food availability may hinder hypoxia tolerance due to decreased access to glucose and thus greater downregulation of proteins needed in hypoxia tolerance.

Methods and Materials

- Population was collected in Bodega Bay, California and fed 0.017 grams of Tetra tropical flakes weekly to establish a baseline for 4 weeks
- 60 males were isolated and placed into 6 plates with 10 males each, labeled A-F. Plates were fed accordingly, then placed in a 20°C incubator for 5 days
- Plates were then placed in hypoxia/normoxia treatment for 7 hours, after which knock downs were observed immediately and survival was determined after 41 hours
- Control groups included plates A-C because these plates were placed in normoxia, and were thus expected to have no knockdowns and high survival

Plate	A	B	C	D	E	F
Treatment	High food (0.030 g) Normoxia	Average (0.017 g) Normoxia	No food (0 g) Normoxia	High food (0.030 g) Hypoxia	Average (0.017 g) Hypoxia	No food (0 g) Hypoxia

Results

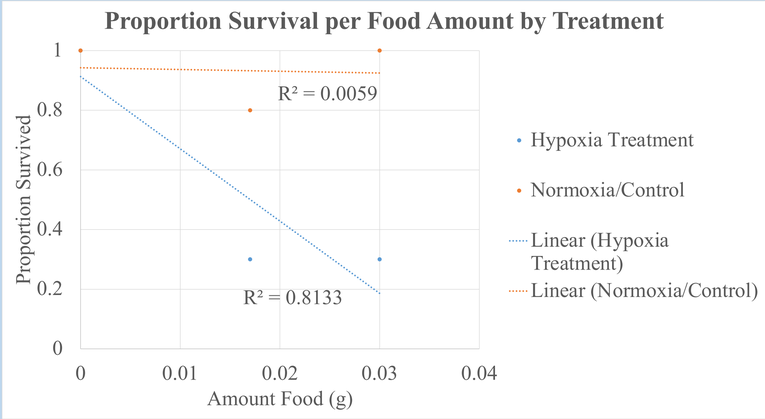

Figure 1. Proportion of surviving copepods vs amount of food (g) for hypoxia and normoxia treatments

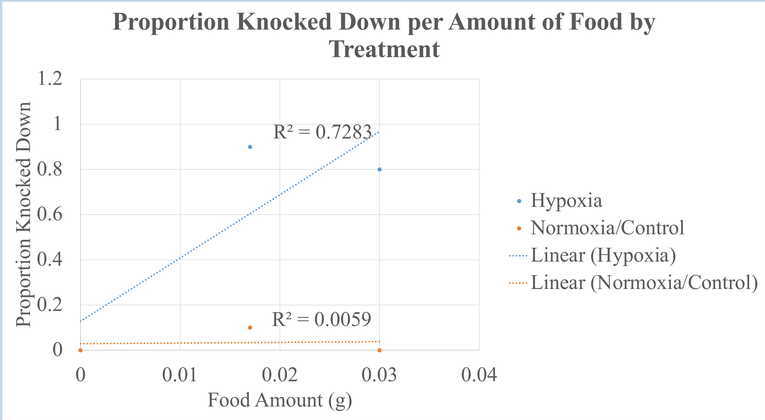

Figure 2. Proportion of knocked down copepods vs amount of food (g) for the hypoxia and normoxia treatments

The proportion of copepods surviving decreased as food amount increased in the hypoxia treatments compared to the control treatments (normoxia), in which survival stayed consistent as food amount increased (Figure 1).

The proportion of copepods knocked down increased as food amount increased for the hypoxia treatments compared to the control treatments (normoxia), where proportion of knockdowns stayed the same as food amount increased (Figure 2).

Discussion

The results show that among hypoxia treatments, both knockdown and mortality increased as food amount increased. As these trends drastically vary from the control groups (normoxia), they suggest a correlation may exist between high food amounts and hypoxia tolerance; specifically, high amounts of food present may decrease the ability of copepods to tolerate hypoxic conditions. Although the trends are suggestive, no conclusions can be made due to small sample size and lack of repetition of the experiment.

The data trends do not support the hypothesis because higher hypoxia tolerance was seen in treatments with lower food, rather than with higher food as was proposed. The decreased hypoxia tolerance seen in treatments with higher food may have been due to bacterial growth in the plates, which may have consumed dissolved oxygen in the water and exacerbated hypoxic effects. Further research on the impact of bacterial presence on hypoxia tolerance in T. californicus would be needed to determine the validity of this conjecture.

References

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