Interactive Effects of Perchlorate and Temperature on Daphnia magna Growth Rate and Feeding

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INTRODUCTION

- **Daphnia magna**
  - Small freshwater crustaceans used as standard ecotoxicological indicator organisms
  - Ease of culture
  - High sensitivity to toxicants
  - Cyclical parthenogenetic method of reproduction
- **Perchlorate (ClO₄⁻)**
  - Anion commonly found as a water supply contaminant
  - High concentrations (100 mg/L) of sodium perchlorate may affect global atmospheric temperature expected to increase.
- **Cyclically parthenogenetic method of reproduction**
- **Ease of culture**
- **High sensitivity to toxicants**
- **Anion commonly found as a water supply contaminant**
- **High concentrations (100 mg/L) of sodium perchlorate**

METHODS AND MATERIALS

- **Control**
  - 0mg/L NaClO₄ (only ADAm solution) at 20°C
  - 0mg/L NaClO₄ (only ADAm solution) at 26°C
- **Treatment concentrations**
  - Low: 10mg/L NaClO₄
  - High: 20mg/L NaClO₄
- **Temperature conditions**
  - Low: 20°C
  - High: 26°C
- **Test tubes were prepared with a 1:1 ratio of ADAm/NaClO₄ to algae**
- **Data collection**
  - Morphometrics
  - Absorbance of algae with a spectrophotometer at 685nm wavelength.

RESULTS

- **Figure 1. Morphometric characteristics of D. magna measured: (A) Core body length, (B) Caudal spine length, (C) Body height, (D) Head height, and (E) Head length.**
- **Figure 2. Comparison between average change in growth of D. magna in low-temperature treatments after 96 hours (with standard error).**
- **Figure 3. Comparison between average change in absorbance rate at 685nm wavelength of algae food source at different sodium perchlorate concentrations under low (20°C) and high (26°C) temperature treatments after 96 hours (with standard error).**

CONCLUSION/FUTURE WORK

- Exposure to perchlorate concentrations did not significantly increase average growth and feeding activity.
- Higher temperature was not a significant factor for increased growth, but did show a significance in higher feeding rate.
- Exposure to perchlorate at higher temperatures could be significant to decrease in average growth.
- Further research is needed to examine the relationship between perchlorate concentrations and temperature on growth and feeding rate of D. magna with a larger sample size.

REFERENCES


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HYPOTHESES

- D. magna raised in high-temperature (26°C) conditions will have more change in average growth and higher feeding activity than that of D. magna in lower temperatures (20°C)
- Exposure to higher perchlorate concentrations (20mg/L) will have more change in average growth and higher feeding activity than those exposed to lower concentrations (10mg/L)
- D. magna exposed to higher perchlorate concentrations in tandem with high temperatures will have the highest change in average growth and have the most feeding activity overall.