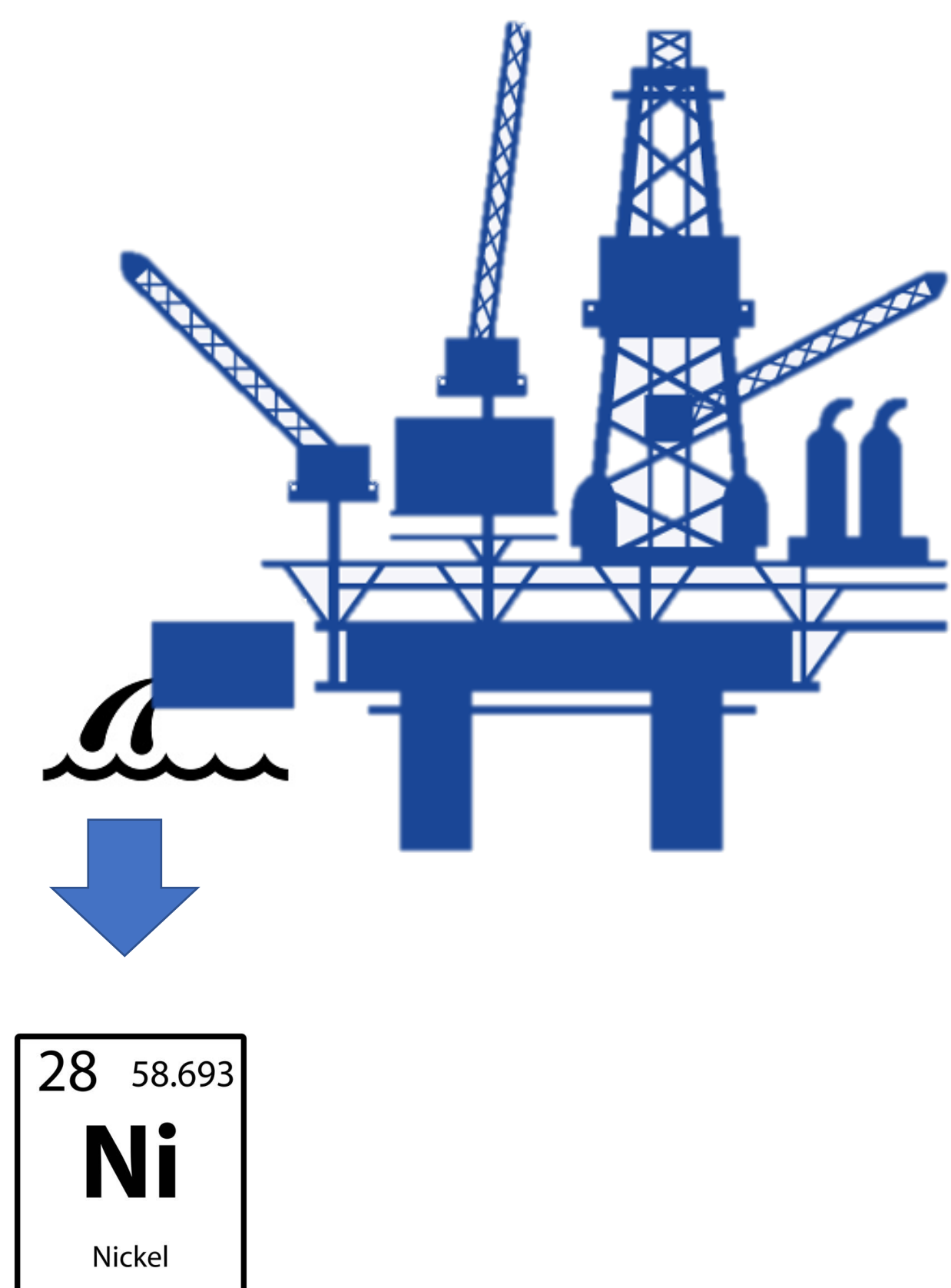


Investigating Alternative Testing Methods on *Cyprinodon variegatus* for Evaluation of Acute Nickel Toxicity

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Background

- Waste from the oil refining process is released into the environment as effluent
- Nickel is the most abundant heavy metal released into the environment as effluent,
- Nickel toxicity must be evaluated before release into the environment

Objective

To compare the efficacy of the larval growth and survival (LGS) test and the fish embryo toxicity (FET) test in evaluating nickel toxicity.

FET vs. LGS Mortality Data

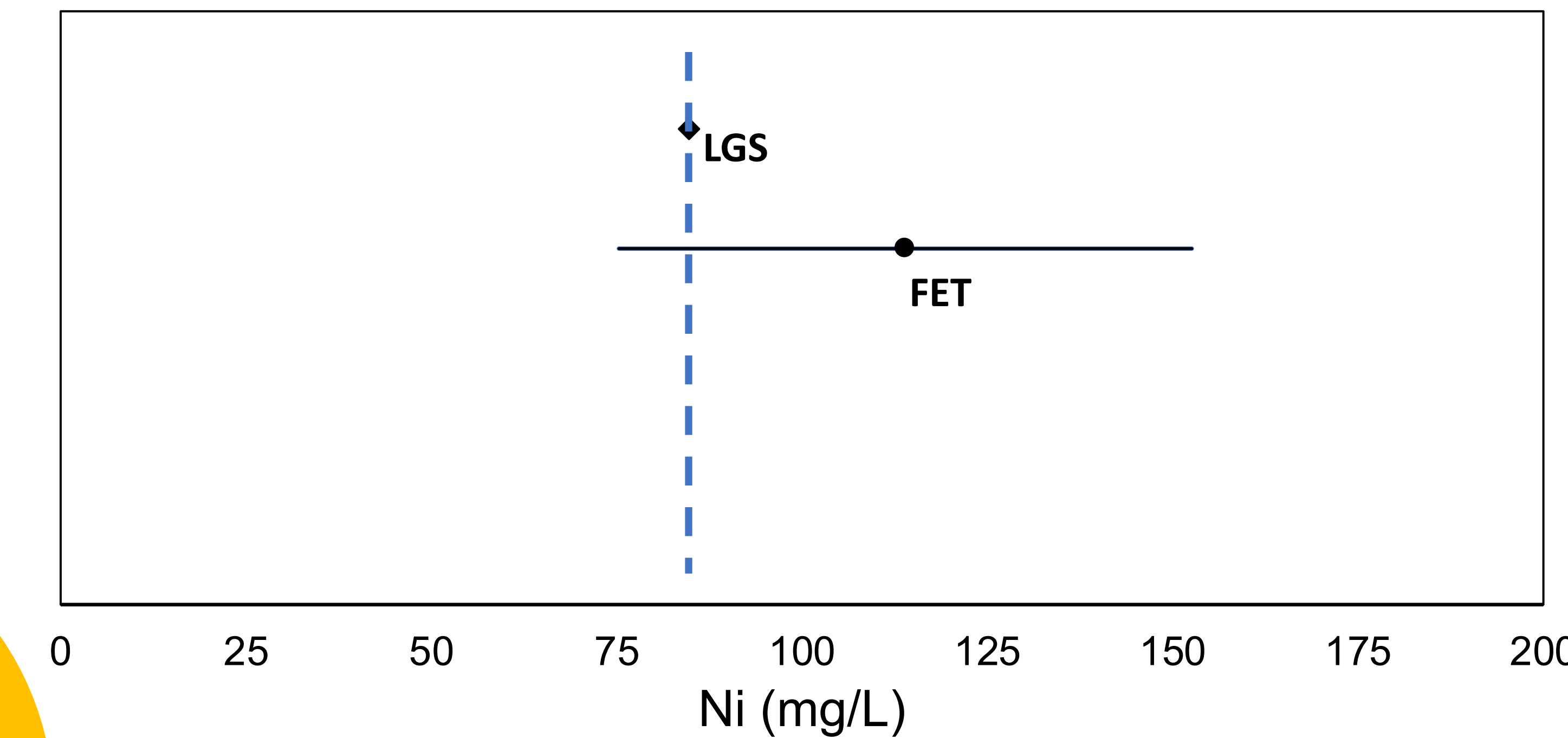


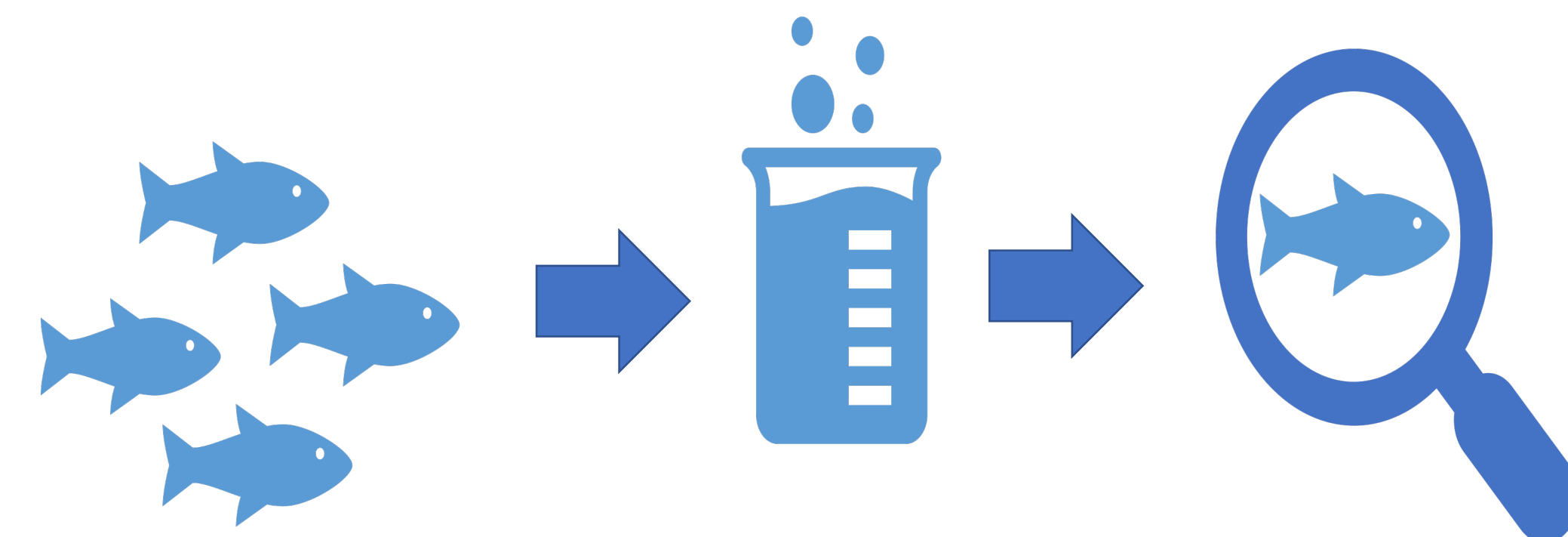
Fig 1- LC₅₀ mean value of the LGS test overlaps with the 95% confidence interval of the LC₅₀ mean value for the FET test, indicating no significance difference in mortality between the two test methods. Confidence intervals were unable to be determined for the LGS test because both test replicates had identical mortality data. Dashed line added to show overlap.

Due to comparable mortality, the FET test is an effective replacement for the LGS test. LGS growth data showed that Ni exposure negatively impacted larval growth at sublethal concentrations.

Results

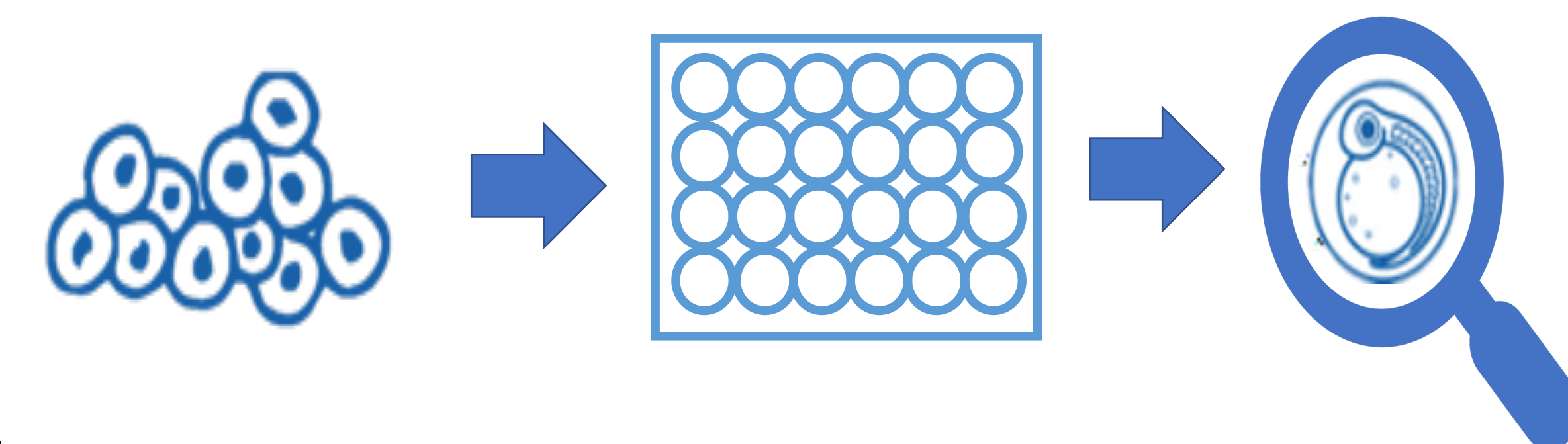
Current Testing Method:

Larval Growth and Survival (LGS) Test
Evaluate mortality of larval fish throughout 7-day exposure



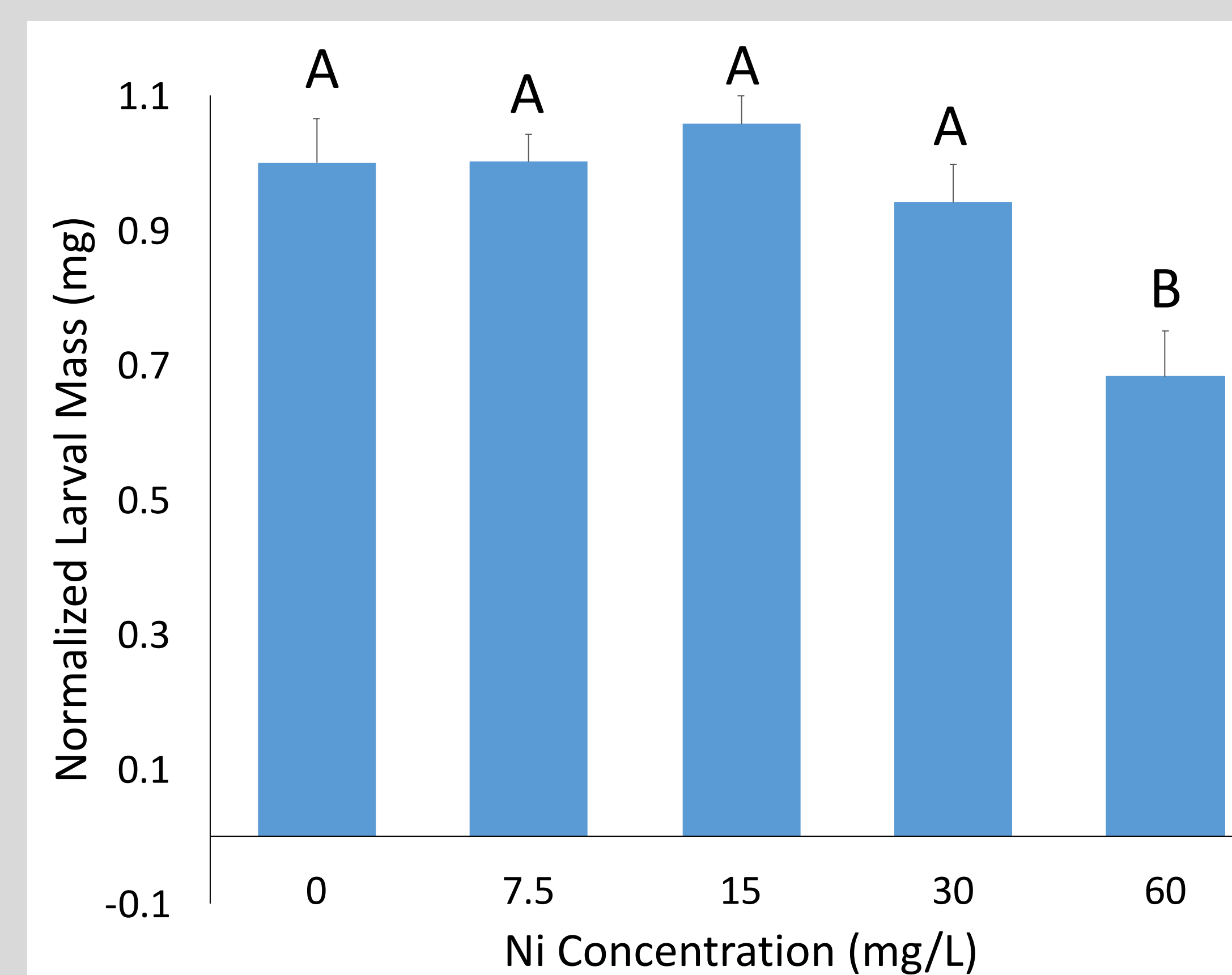
New Alternative Method:

Fish Embryo Toxicity (FET) Test
Evaluate mortality of fish embryos throughout 7-day exposure



LGS Growth Data

a.



b.

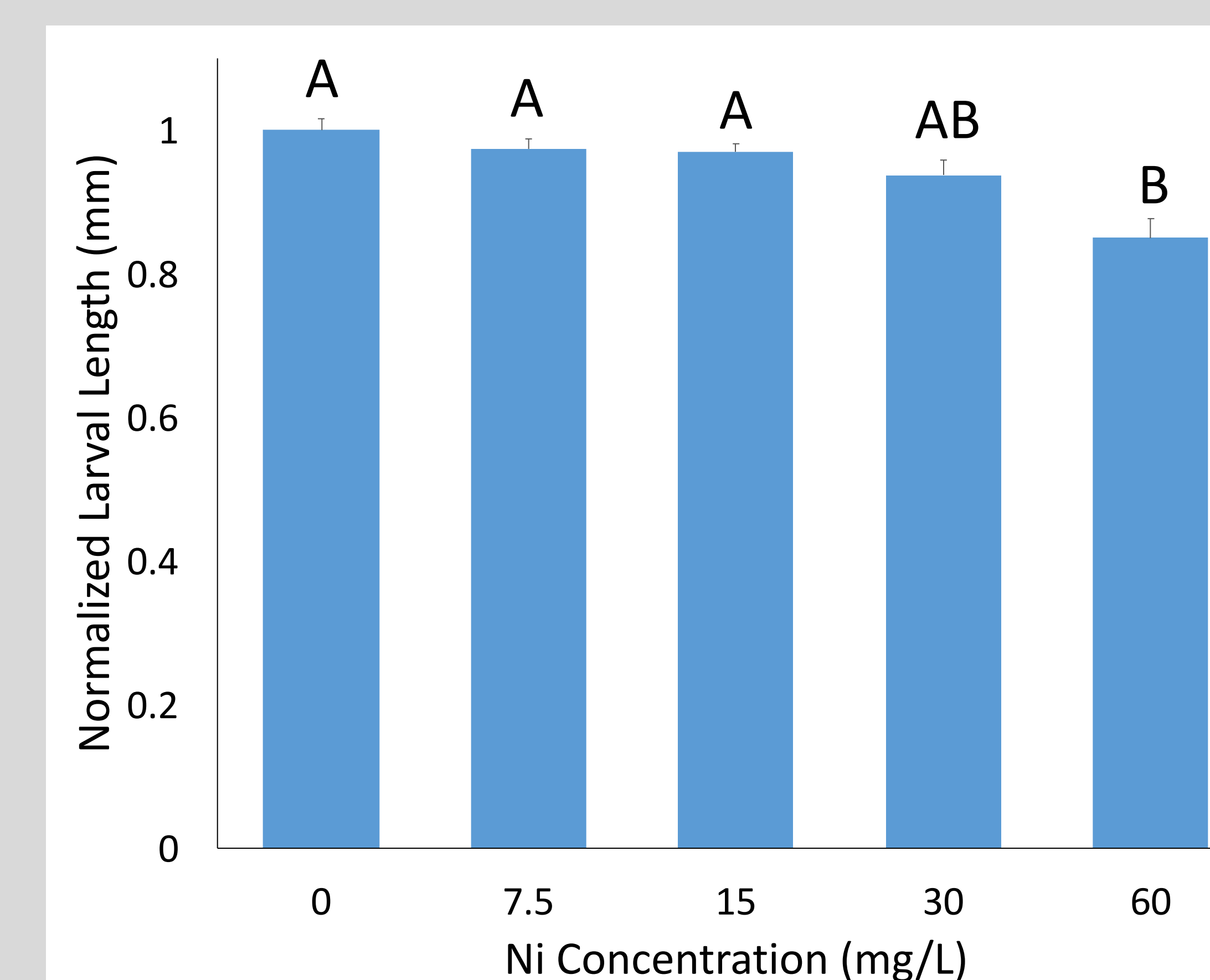
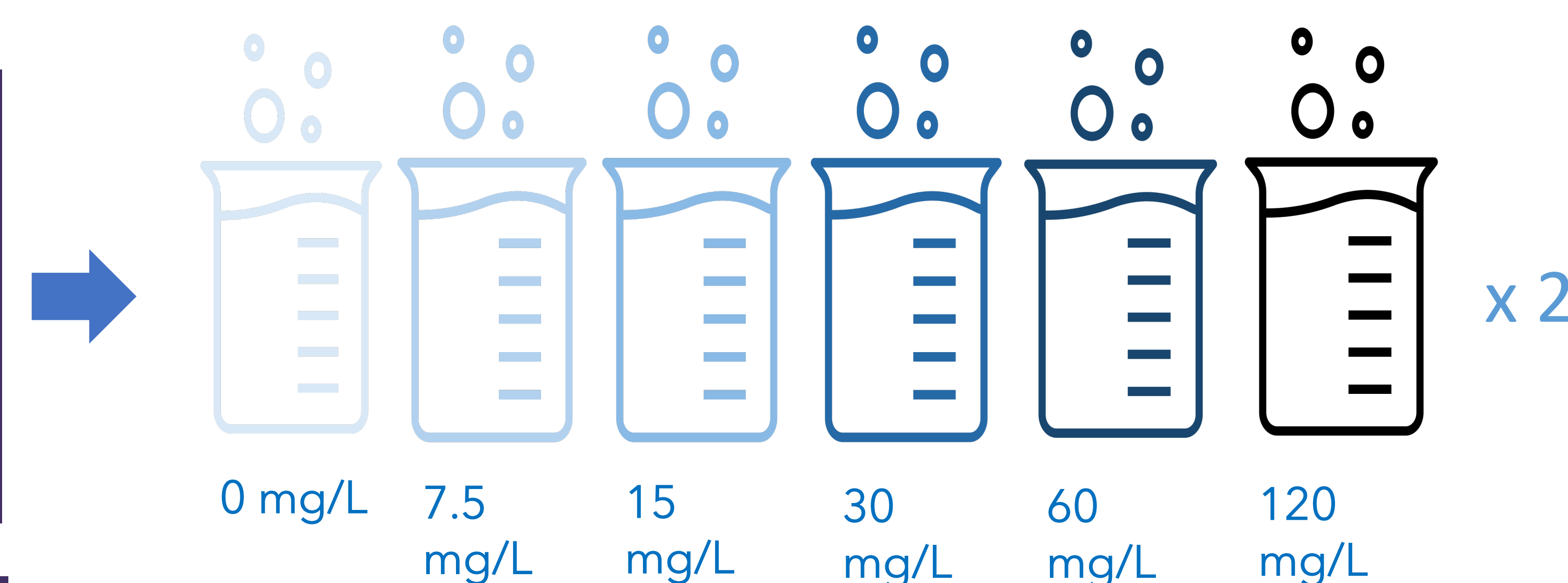


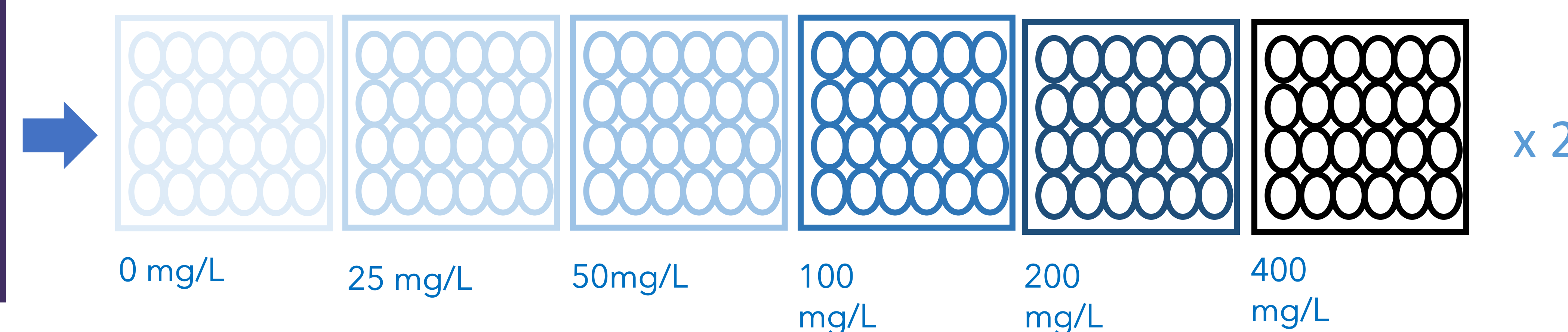
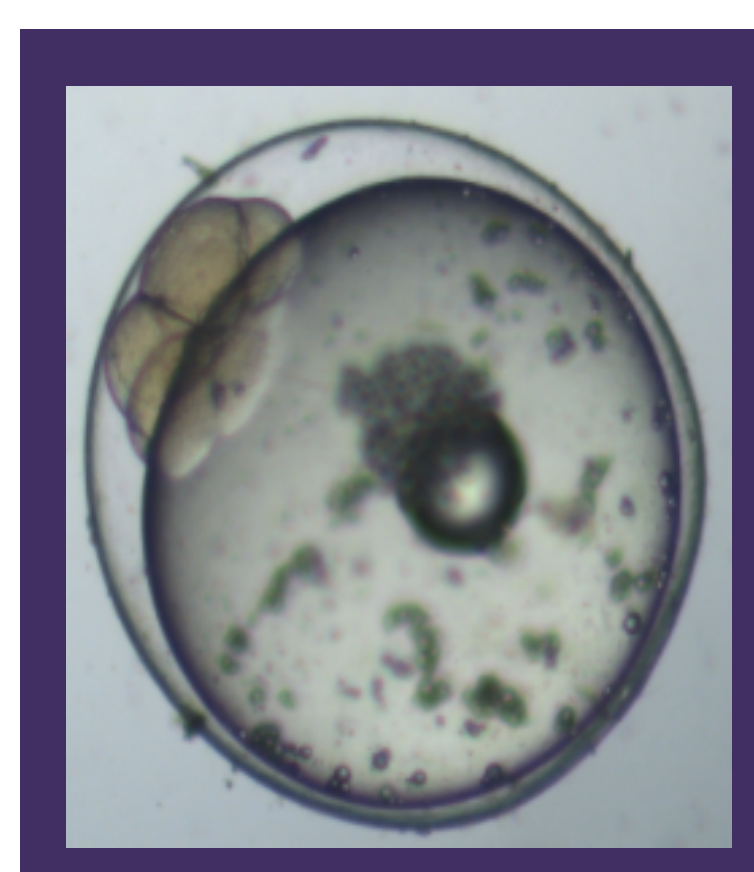
Fig 2- (a) shows the average mass of larvae (normalized to controls) between both test replicates at 168 hours. Average mass was significantly lower in the 60 mg/L exposure group compared to the control. (b) shows the average length of larvae (normalized to controls) between both replicates at 168 hours. Average lengths at 60 mg/L was significantly shorter than the control and all other exposure groups besides 30 mg/L. This data indicates that Ni has negative effects on acute growth at sublethal concentrations.

Experimental Design

LGS
(7 days)



FET
(7 days)



Conclusions

- The FET and LGS tests had no significant difference in mean LC₅₀ values, meaning that the FET can be considered a viable replacement for current testing methods
- The FET test had a higher mean LC₅₀ value, most likely caused by the carapace, which could prevent movement of solution into the embryo. This idea is supported by the fact that mortality occurred at similar concentrations in the FET after the embryos had hatched.
- Both the LGS and FET testing protocol allow for examination of acute developmental effects, as well as mortality, making both tests beneficial

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