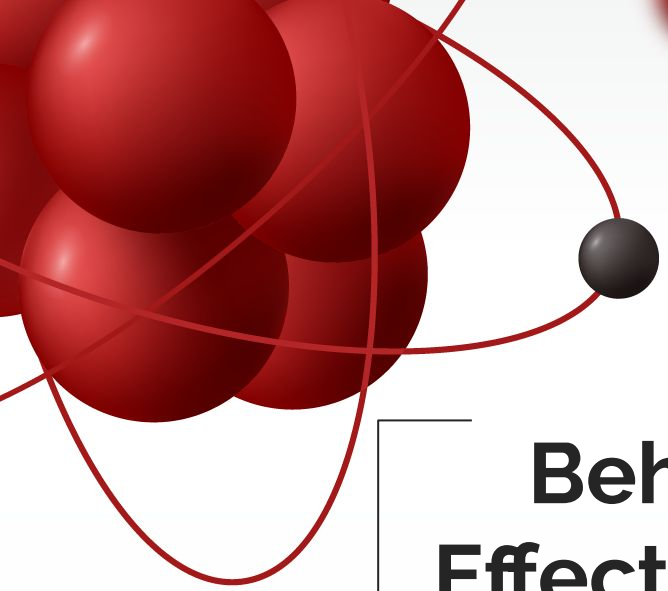
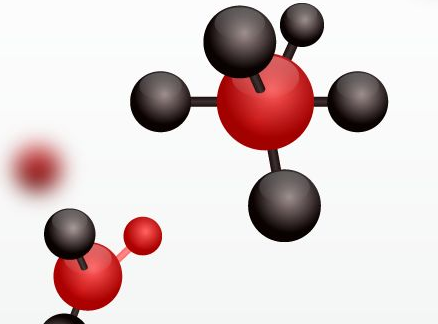
Behavioral and Morphological Effects of Cannabidiol on Zebrafish

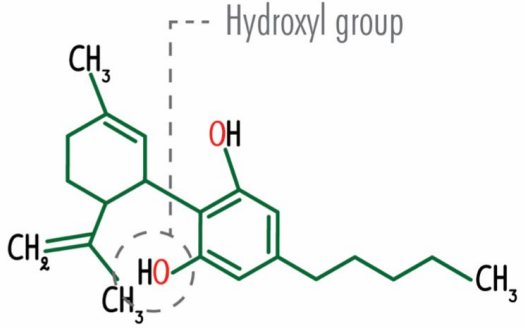
Isaac Shaw and Marcus Deknatel





Cannabidiol

- A primary active ingredient in both cannabis (marijuana) and hemp
- Interacts with serotonin receptors and vanilloid receptors



Cannabidiol (CBD)

RELEVANCE OF CBD

- Agricultural Improvement Act of 2018
- Health benefits
  - Anxiety
  - Seizures
  - Pain relief (inflammatory & neuropathic)
- Importance of research

PREVIOUS RESEARCH

Developmental Effects of Cannabidiol and Δ9-Tetrahydrocannabinol in Zebrafish

Results

- Morphological
  - Yolk sac edema, Missing pectoral fins, Swim bladder distention
- Behavioral
  - Light response test
    - Concentrations < → Hyperlocomotion

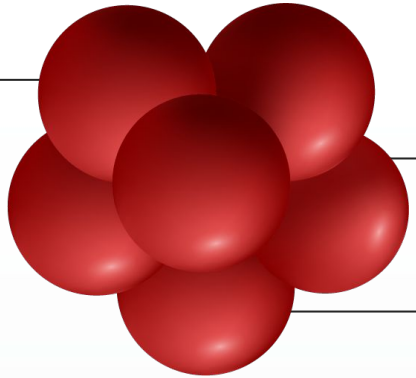
Impact

- Comparison study

OUR STUDY

Goal

Extrapolate further information on CBD's effects on development



Testing

Performed identical tests to identify that which would impact development

Experimental Design

Conducted two separate experiments to test differing conditions

OUR HYPOTHESES

We hypothesized that increasing morphological changes would occur in response to increasing concentrations of Cannabidiol.

We further hypothesized that during various behavioral response tests Cannabidiol would act as a stimulant at lower concentrations, and a depressant at higher concentrations.

EXPERIMENT TIMELINE

1

Breed

Bred fish and divided them evenly into 6 wells removing debris

2

Intoxicate Fish (For Science)

Adding the appropriate solution to each well and labeling it

3

Keep Watch

Monitoring fish for deaths and malformations

4

Maintain Environment

Replace solution every two days

5

Perform Tests

Light response, swirl, heart rate, touch

6

Nourish

Feed fish at 6 and 9 dpf

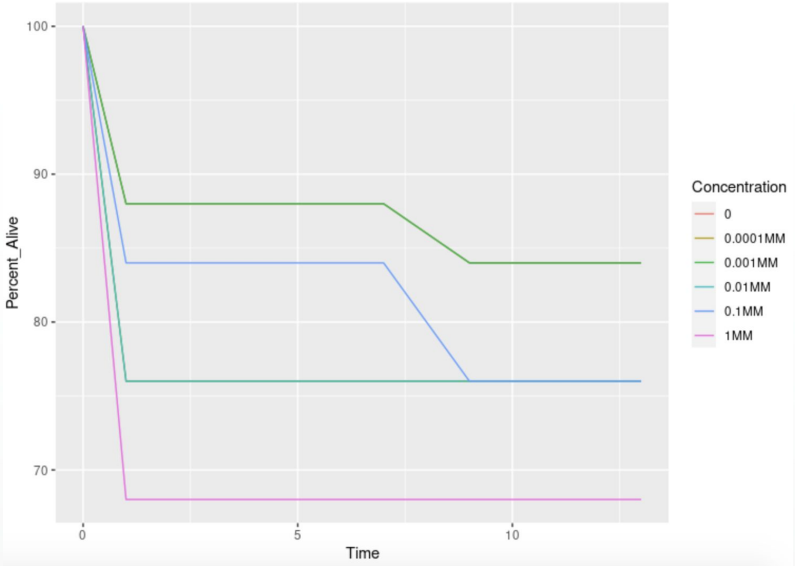
7

Reverse Reverse

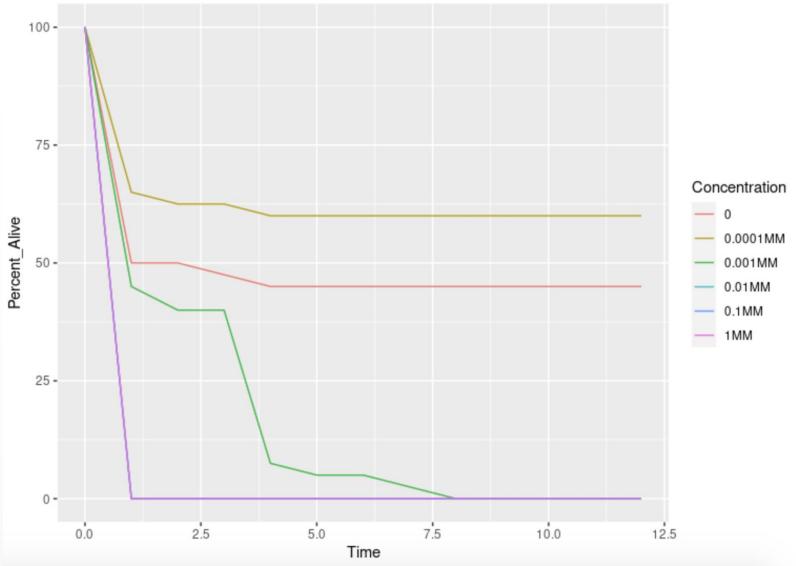
Repeat 3-5 for 14 days

Mortality

EXPERIMENT A

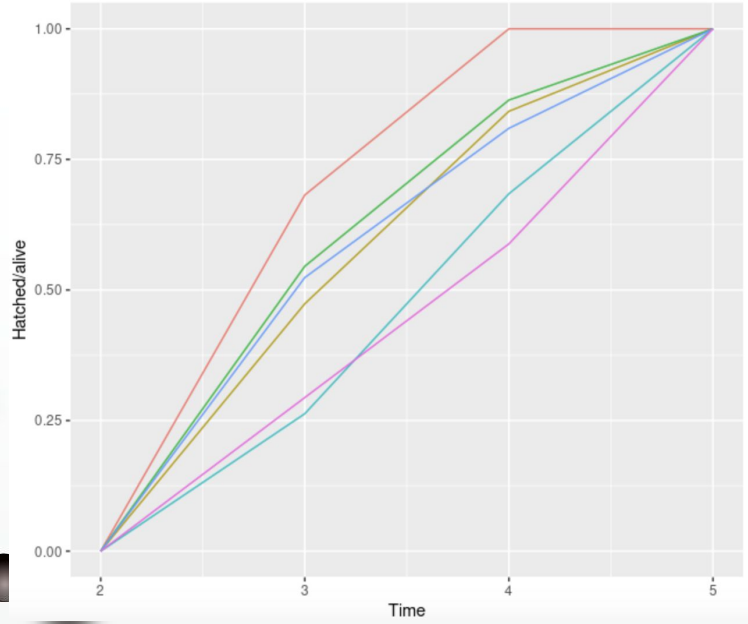


EXPERIMENT B

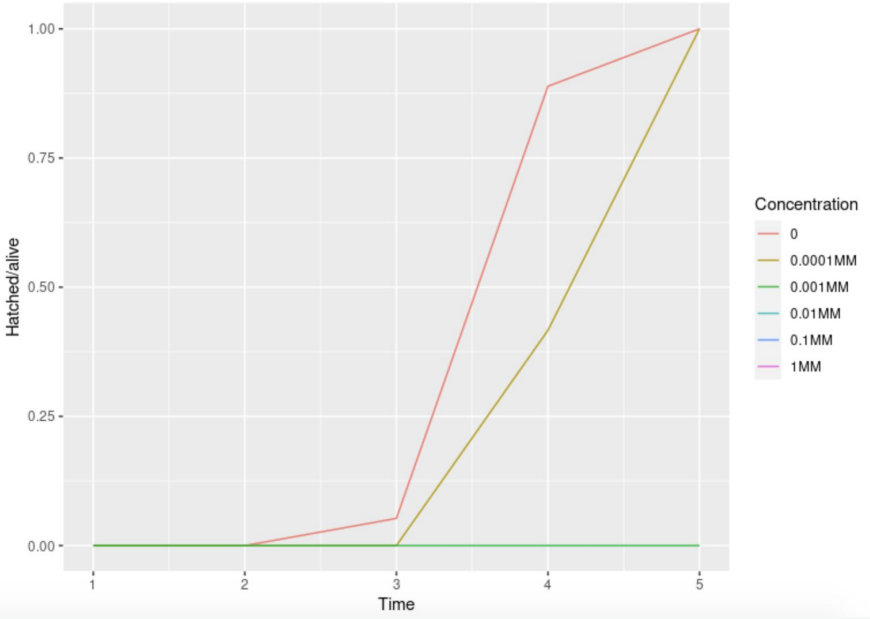


Hatch Rate

EXPERIMENT A



EXPERIMENT B

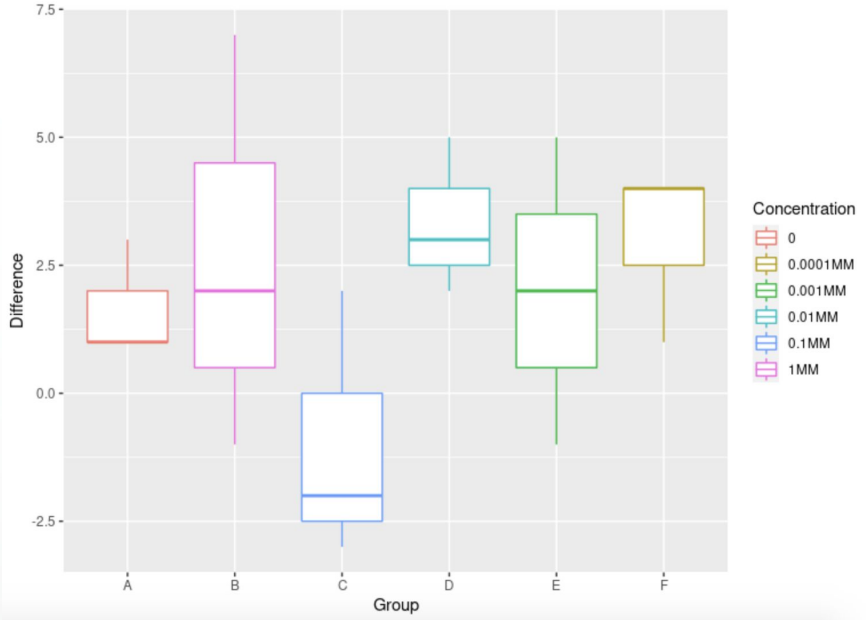


Light Response Test

EXPERIMENT TABLE

	Initial	Final	Concentration	Group
1	11	10	0	A
2	12	5	1MM	B
3	10	13	0.1MM	C
4	10	8	0.01MM	D
5	13	14	0.001MM	E
6	11	7	0.0001MM	F
7	13	12	0	A
8	10	11	1MM	B
9	10	12	0.1MM	C
10	12	7	0.01MM	D
11	13	8	0.001MM	E
12	12	8	0.0001MM	F
13	11	8	0	A
14	8	6	1MM	B
15	11	9	0.1MM	C
16	10	7	0.01MM	D
17	12	10	0.001MM	E
18	12	11	0.0001MM	F

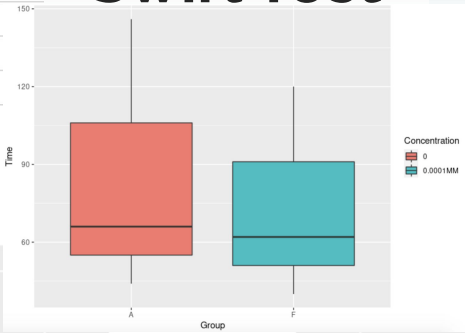
EXPERIMENT GRAPH



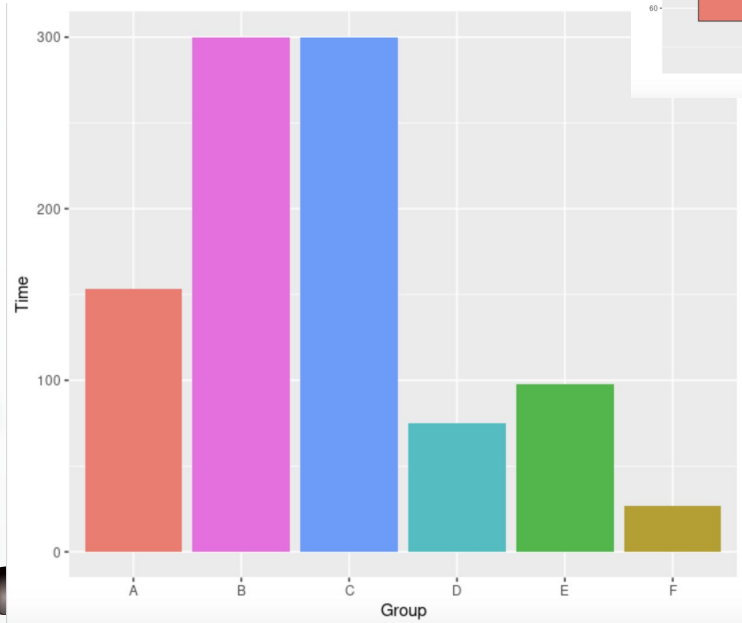
Swirl Test

	Time	Concentration	Group
1	153	0	A
2	300	1MM	B
3	300	0.1MM	C
4	75	0.01MM	D
5	98	0.001MM	E
6	27	0.0001MM	F

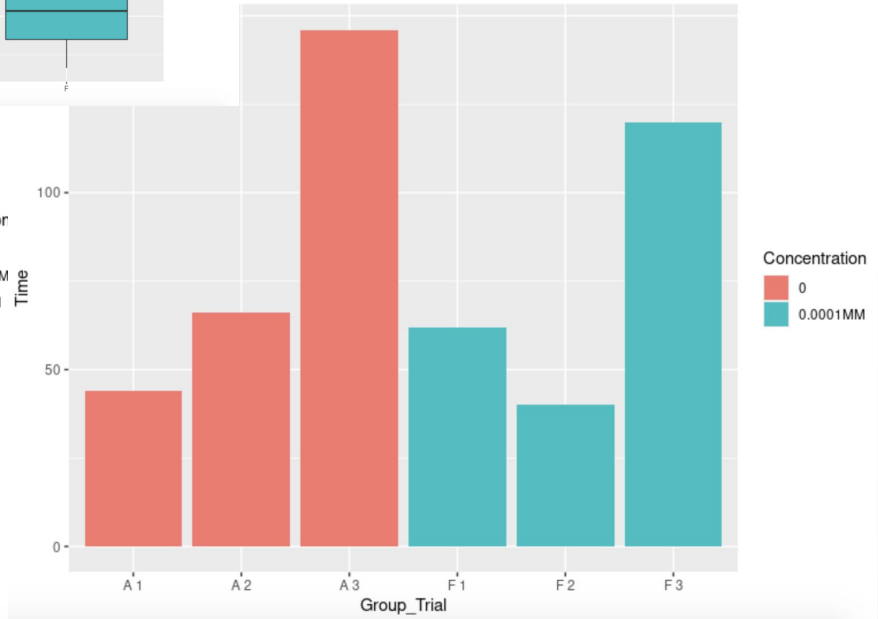
	Time	Concentration	Group
1	44	0	A
2	62	0.0001MM	F
3	66	0	A
4	40	0.0001MM	F
5	146	0	A
6	120	0.0001MM	F



EXPERIMENT A

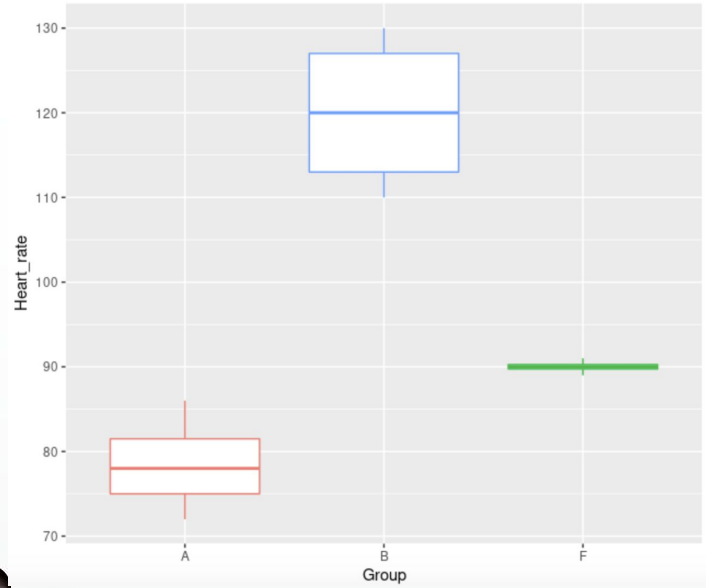


EXPERIMENT B

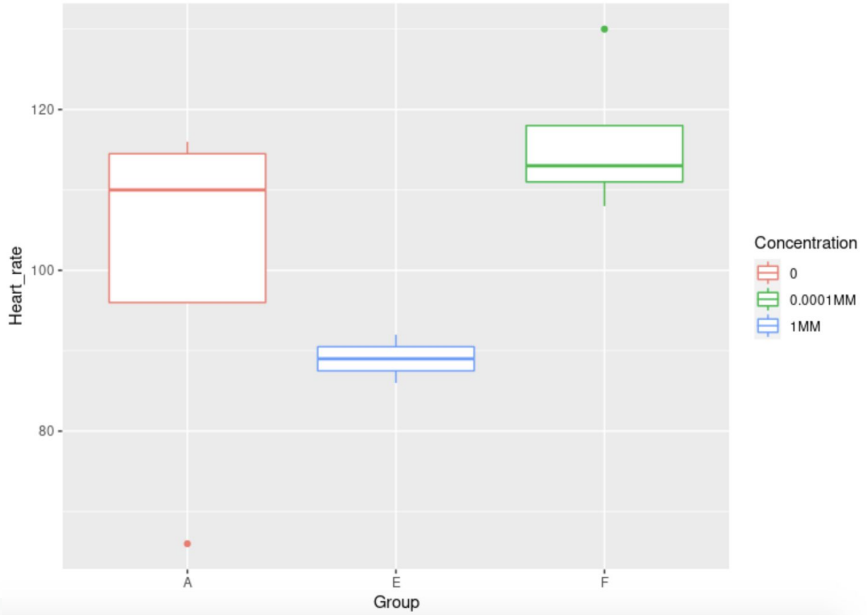


Heart Rate Test

EXPERIMENT A

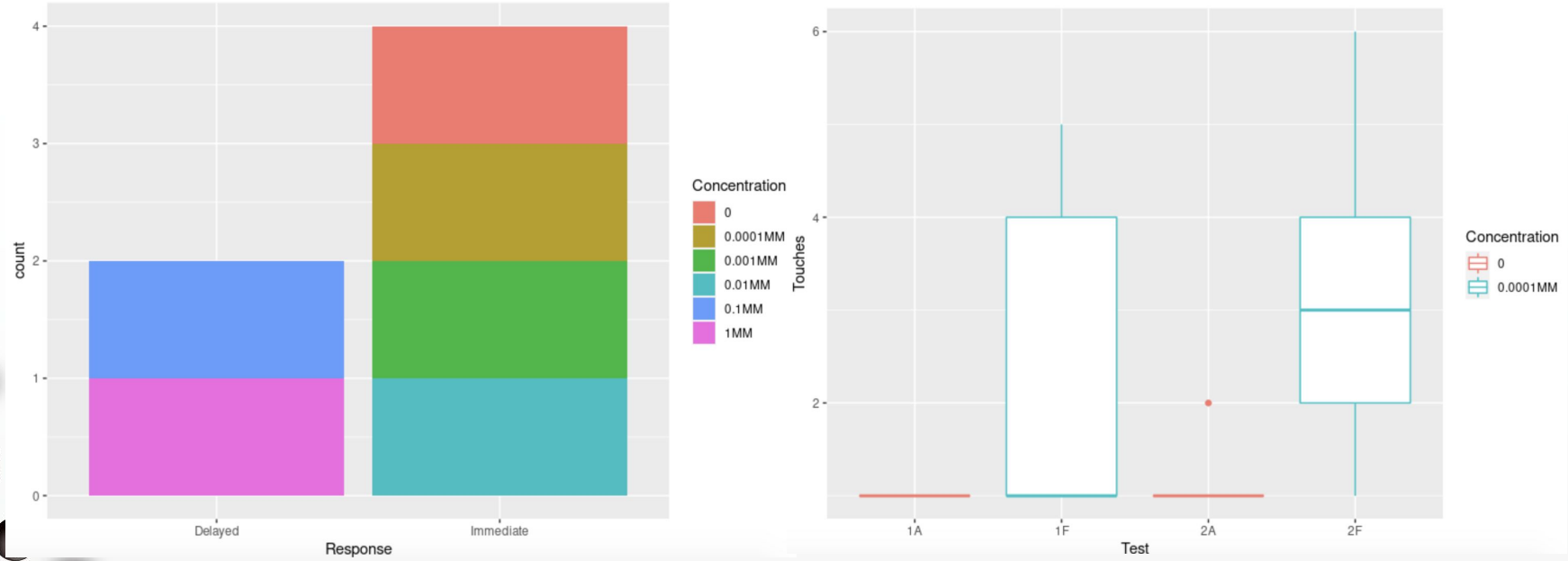


EXPERIMENT B



Touch Test

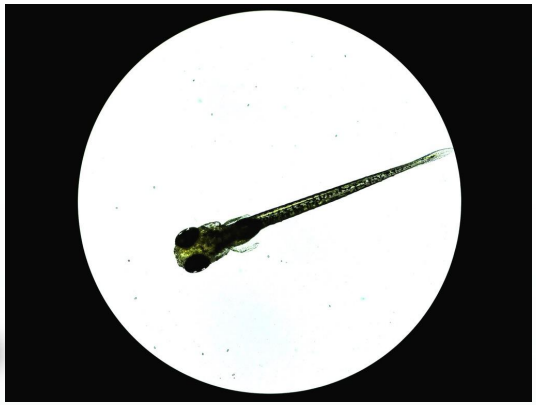
EXPERIMENT A

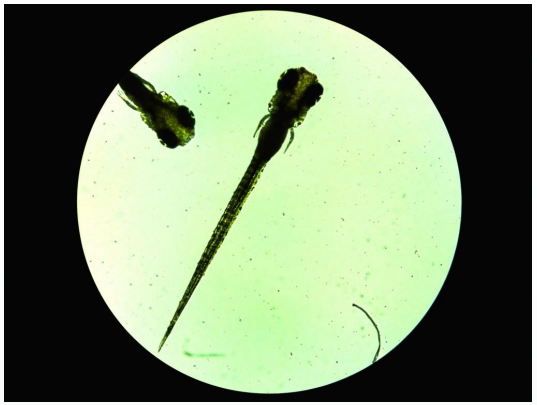


EXPERIMENT B

Morphological Findings

EXPERIMENT A



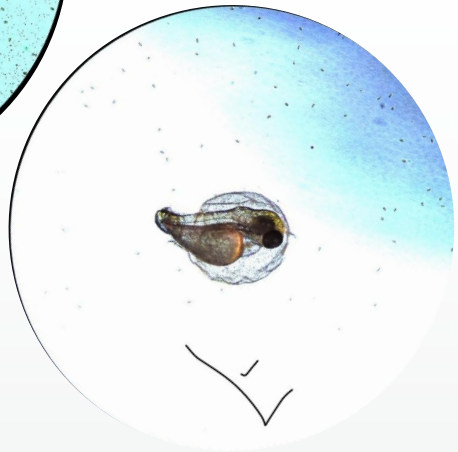


EXPERIMENT B

Morphological Findings Cont.

EXPERIMENT B

B



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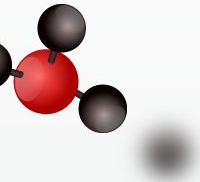
CONCLUSIONS

- Data supports:
  - Higher Concentrations increasing mortality
  - Slower hatch rate
  - Possible adverse reaction to light
  - A response to environmental stimuli has initial increase followed by a steep decrease
  - An increase in heart rate at higher concentrations
  - A decreased response to physical touch
  - A correlation to morphological defects

Acknowledgements

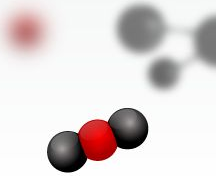
Thanks Dr. Coffield. You are a pretty cool dude.

Shout out to my homie nubb



Moment of Silence For Nubb

May he forever RIP in peace
2021-2021



Fin

Gracias para su tiempo