ADELPHI UNIVERSITY

Neurotoxic effects of pyrethroid pesticides and associated adjuvants on *C. elegans*

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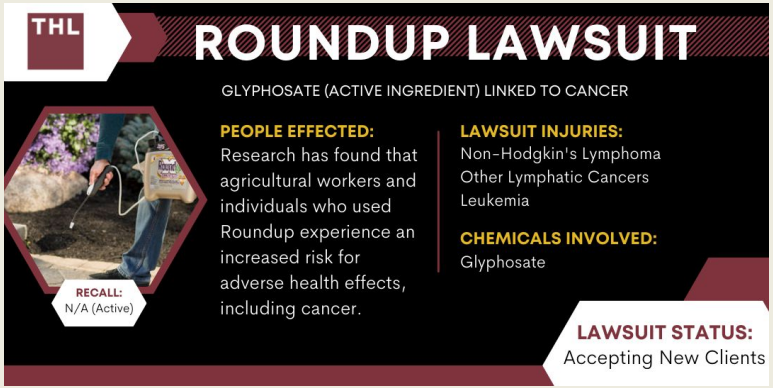
Under the Supervision of Dr. Benjamin Weeks

Why is this important?

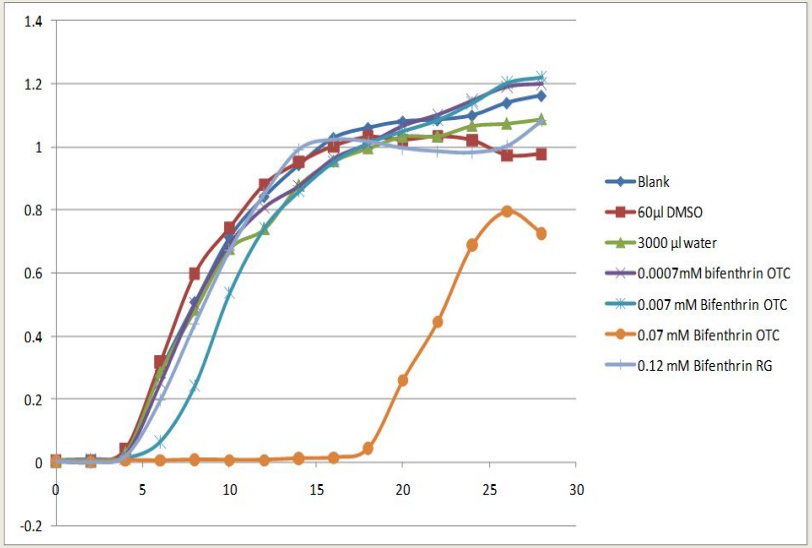
- Pesticide purpose and function
- NIH estimates 25 million affected by pesticide toxins
- The shift from traditional pesticides to pyrethroids



Pure pyrethroid

Contains “inert” adjuvants

Previous Findings from Dr. Weeks



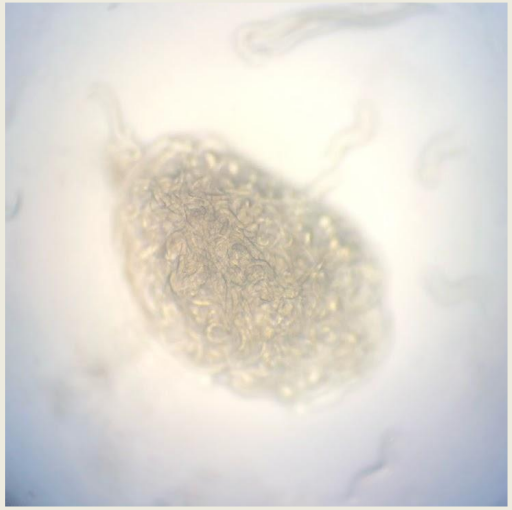
Zones of inhibition (CFU/ml vs time) of bacteria with different pesticide levels from previous lab group

Research Question & Hypothesis

- Do the adjuvants in pyrethroid pesticides affect the nervous system of *C. elegans?*
- It was hypothesized that the over-the-counter pesticide solution would have increased mortality rates and decreased locomotion in *C. elegans* compared to pure pyrethroid

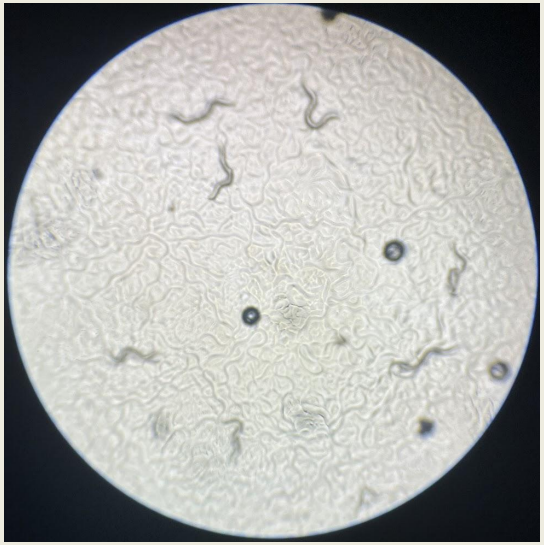
Methodology

C*aenorhabditis elegans* (*C. elegans*): A transparent worm found in soil



A.

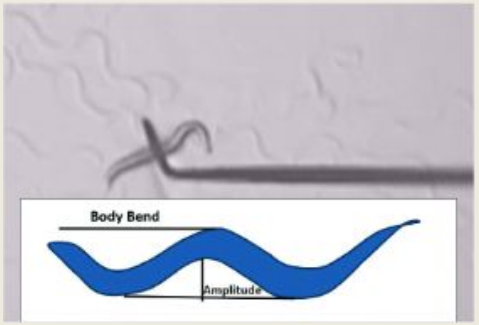
B.

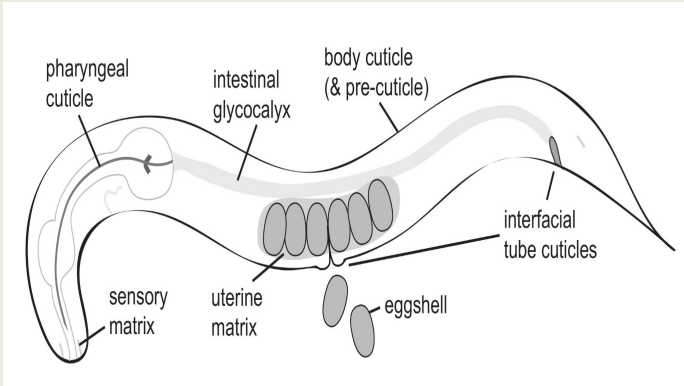


C.

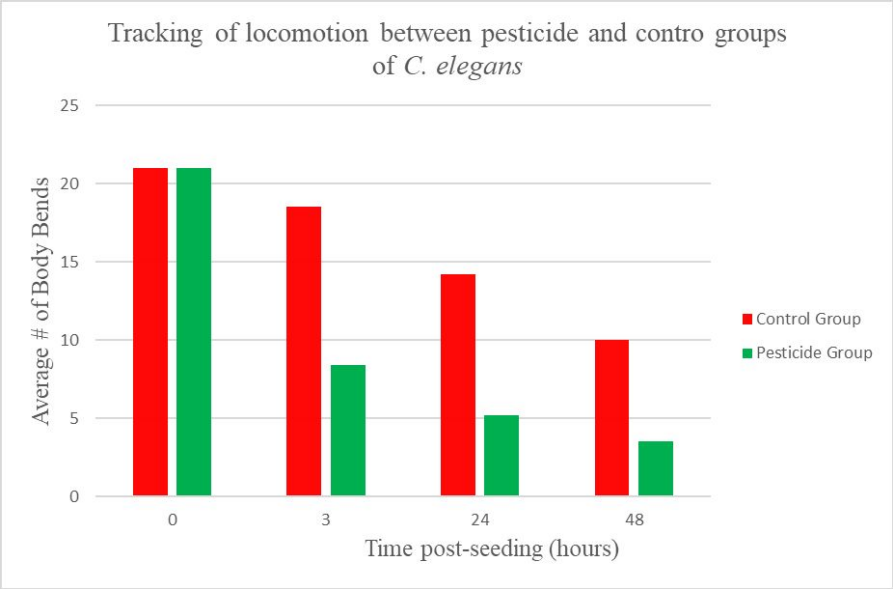
Methodology

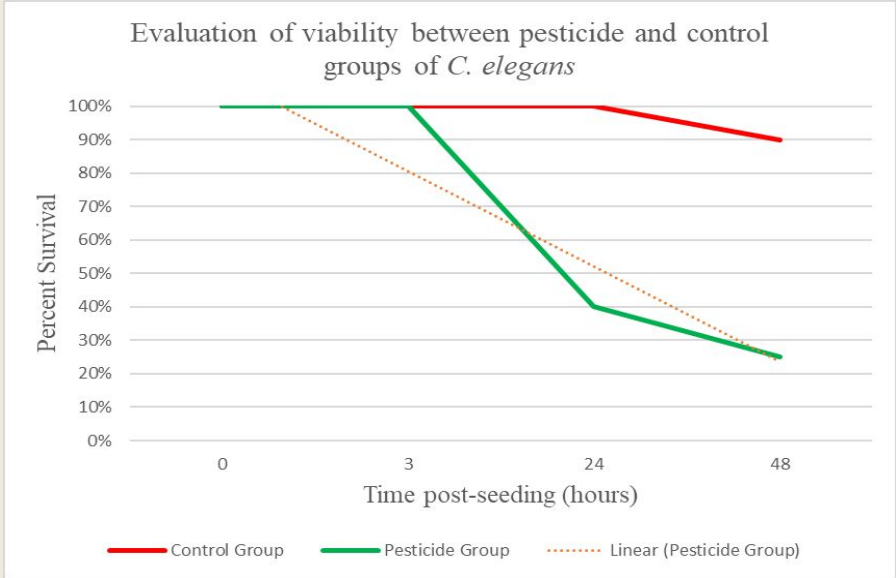
1. Agar plates were seeded with UV killed *E. coli OP50*
2. 100µL of sterile filtered Ortho Home Defense was poured onto plates
3. L4 age-synchronized *C. elegans* were placed onto the plates for 48 hours at 25 °C in an incubator
4. Observations were made at 3, 24, 48 hours post placement onto pesticide plate
    - Mortality
    - Locomotion
    - Morphology
    - Presence of eggs



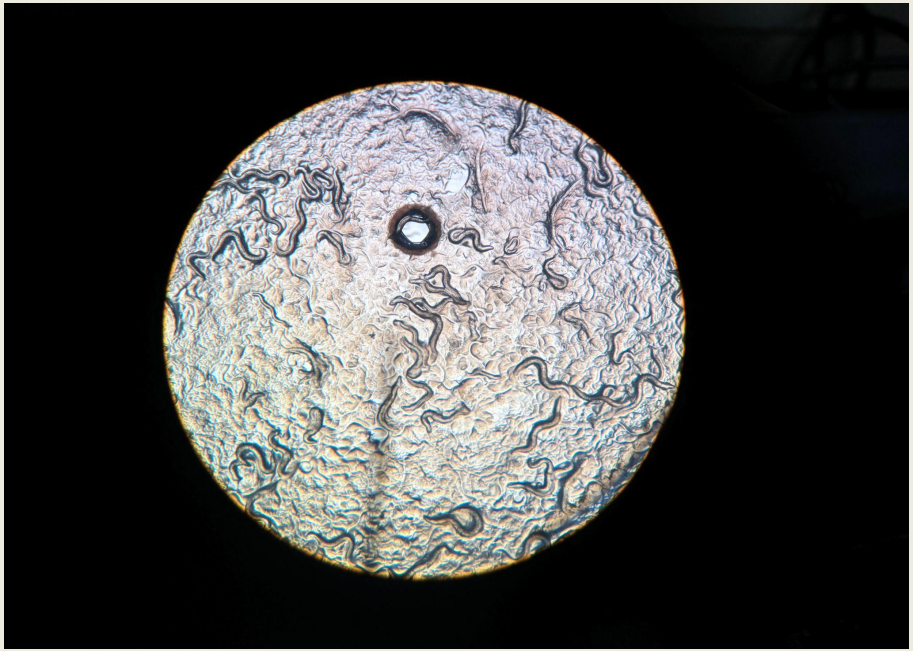


Results

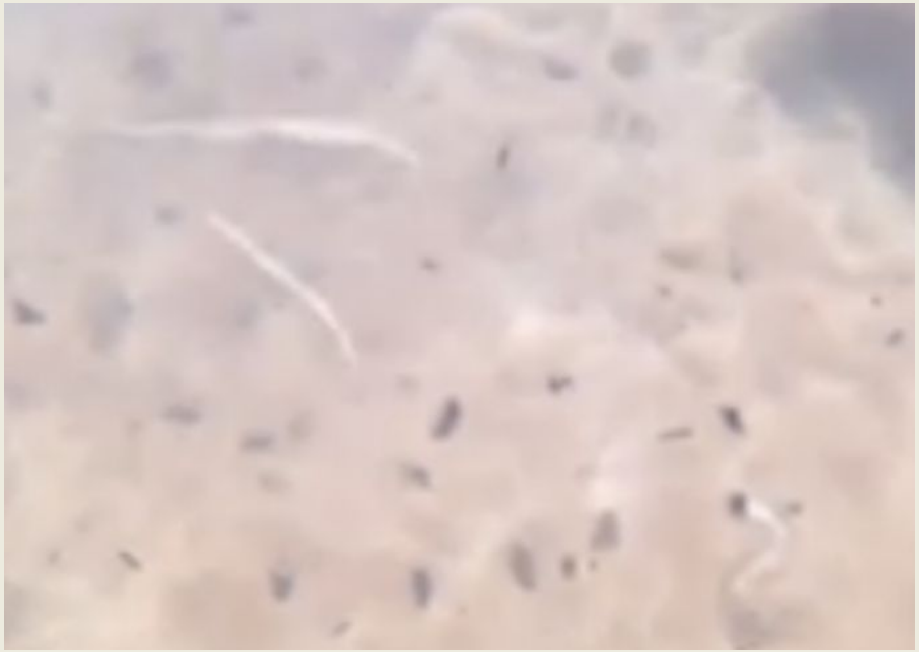

Tracking of locomotion between pesticide and contro groups of C. elegans
Average # of Body Bends
25
20
15
10
5
0
0
3
24
48
Time post-seeding (hours)
Control Group
Pesticide Group


Evaluation of viability between pesticide and control groups of C. elegans
Percent Survival
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
0
3
24
48
Time post-seeding (hours)
Control Group
Pesticide Group
Linear (Pesticide Group)

Results

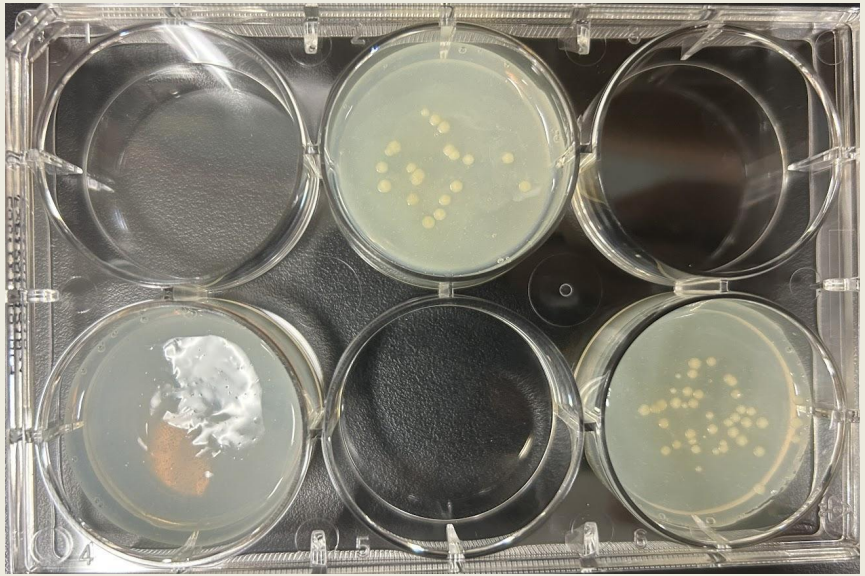


Control (4 days later)



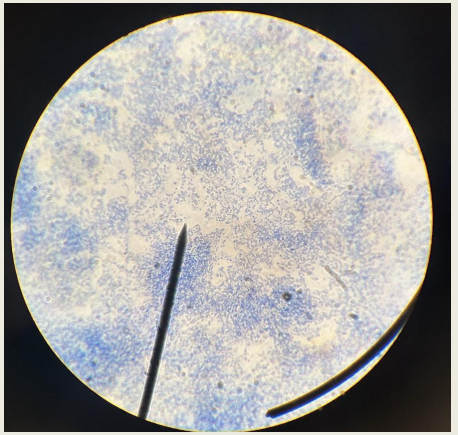
Test (4 days later)

Unexpected Results...

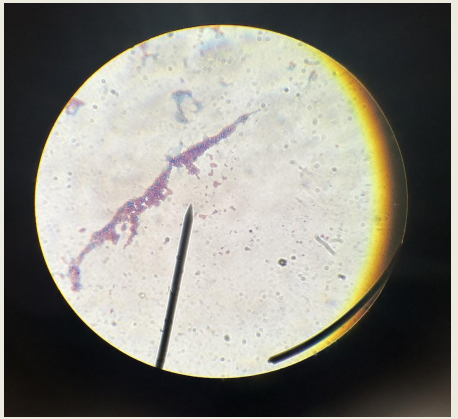


A.

B. (72 hours growth on plate)



C. (direct from bottle)

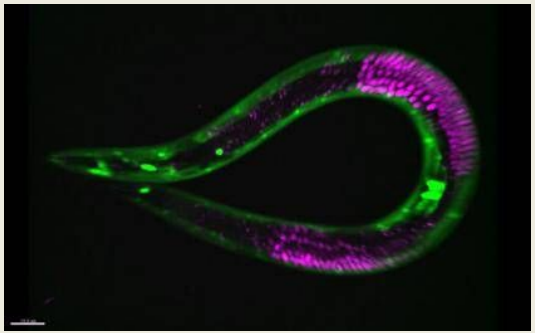


Conclusion

- Pesticides have a neurotoxic effect on eukaryotic organisms, specifically *C. elegans*
  - creates a ‘lagging’ movement and reduces survival rate
- Decreases the fat deposits on cuticle, potentially affecting metabolism
- Over-the-counter solution contains bacteria that may affect *C. elegans* and the environment
- The big picture:
  - soil health -> nutrients -> healthy non-toxic food

Future Research

- Currently conducting pure pyrethroid trials
- Fluorescently tag *C. elegans* to support nervous system effect
- Test agricultural-grade pesticides on *C. elegans* and for sterility
- Sequence the DNA in the bacteria found in the bottles
- Contact the EPA about sterility concerns



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Thank You!

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