Sex-Based Differences in *C. elegans* Responsiveness to Aversive Stimuli

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**Introduction**

Behavioral differences between sexes are evident across many species. The underlying mechanisms surrounding such differences are not fully elucidated, however, due to the complexities of animal behavior. The nematode *Caenorhabditis elegans* (C. elegans) is a well-characterized, genetically amenable species with two sexes, males (XO) and hermaphrodites (XX). This makes it an appropriate model system for investigating sex-based behavioral differences.

Chemosensation in *C. elegans* is mediated by exposed ciliated sensory neurons, one of which is ASH. ASH is a polymodal nociceptor that elicits reversal when an animal encounters aversive stimuli, examples of which include the bitter tastant quinine, the detergent sodium dodecyl sulfate (SDS), and the heavy metal copper (CuCl).

We hypothesized that hermaphrodite and male *C. elegans* worms respond differently to aversive stimuli detected by ASH, and that this difference can be attributed to differences in the nervous systems of the two sexes.

**Methods**

*C. elegans* strains

- N2 Wild-type
- him-5 High incidence of males
- UR866 Pan-neuronal feminization
- UR236 Pan-neuronal masculinization
- UR754 Pan-sensory feminization
- UR66 Pan-sensory masculinization

**Drop Test Assay**

Assay-age hermaphrodites and males were picked from a nematode growth media (NGM) plate with *E. coli* OP50 and transferred to an NGM plate with no food. Once the animals crawled away from the spot of food, they were transferred to the assay plate (another NGM plate also without food), where they were kept without food for 10 minutes prior to assaying. A drop of aversive stimulus was placed in front of a forward-moving animal, and the animal's response was recorded. A positive response is backwards movement within 4 seconds after contact with the stimulus.

**Results**

**Wild-type males are less responsive than hermaphrodites to quinine, CuCl, and SDS**

![Graphs showing responsiveness to quinine, CuCl, and SDS](image)

**Sex reversal of the whole nervous system leads to reversed responses to aversive stimuli**

![Graphs showing reversed responses](image)

**Results (cont.)**

*C. elegans* responsiveness to aversive stimuli is determined by sex-based differences in the sensory neurons

![Graphs showing sensitivity to quinine, CuCl, and SDS](image)

**Summary and Conclusion**

Male *C. elegans* worms are less responsive to aversive stimuli detected by ASH. This difference in responsiveness could be attributed to each sex’s reproductive goals. Hermaphrodite worms, which self-reproduce, must avoid aversive stimuli in the environment to ensure progeny survival. Male worms, on the other hand, must seek out mates to be able to pass on their genetic material to the next generation. This reproductive goal may make them less sensitive to aversive stimuli compared to hermaphrodites and lead to an increase in exploration on new environments to seek out potential mates.

Our results suggest that sex-based differences in the sensory neurons determine how hermaphrodite and male *C. elegans* worms respond to aversive stimuli detected by ASH. Further work will focus on investigating whether the difference in responsiveness is due to sex differences in ASH alone or due to interactions between various sensory neurons.

**References**


