Temperature Preference of *C. elegans*: Isothermal Movement

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**Background Information**

- *C. elegans* are able to transform sensory input into motor output. Temperature affects *C. elegans* behavior, which can be observed through thermotaxis.
- *C. elegans* have memory for their cultivation temperature ($T_c$). When placed on a thermal gradient, if $T > T_c$ they travel to colder temperatures (negative thermotaxis). When $T < T_c$ they travel to warmer temperature (positive thermotaxis).

**Hypothesis**

Starved *C. elegans* placed on a thermostatically regulated gradient would accumulate around the cultivation temperature in search for food.

**Methods and Material**

- The two water baths set at 5°C and 35°C, was thermostatically regulated by thermostats within +/-0.1°C.
- An aluminum slab connected the two water baths, being tightly connected at each end to aluminum cubes immersed in a bath.
- The created gradient was formed 1°C/cm. There was a range of 19-25°C formed on the square petridish plate.
- The room temperature was controlled at 22°C and relative humidity at 20-30%.
- About 20-25 young adult *C. elegans* were starved for an hour at the temperature of cultivation, 22°C, and then placed on the temperature gradient.

**Figure 1**: Systematic illustration of the apparatus used for measuring the isothermal behavior of *C. elegans* on a linear gradient.

**Figure 2**: The apparatus used for measuring the isothermal behavior and preference of *C. elegans* for temperature on a linear gradient.

**Figure 3**: Image taken by Flir infrared camera indicating a temperature range of 5-35°C on the aluminum slab. Red color represents the warmer temperatures and blue represents the colder temperatures. The center of the aluminum slab is 22°C.

**Figure 4**: A dark field method was used for imaging. The field was illuminated by red light from the side LEDs. The image above shows the distribution of *C. elegans* on a temperature range of 19-25°C on a 9x9 cm petridish plate.

**Pilot Results and Discussion**

- The location and migration pattern of *C. elegans* were examined by looking at the digital images.
- The worms showed an isothermal behavior; once they reached their preferred temperature, they moved in such a manner as not to deviate from the temperature.
- There were distinguishable populations of *C. elegans* that migrated to different temperatures on the plate. They made angled turns and circular motions within the same range of temperature to assure that they remain within the same area.
- *C. elegans* tend to be distributed in a bell shaped curve +/- 3°C from temperature of cultivation. This signifies different preferences of *C. elegans* for different temperatures which could be due individual differences and genetic variations.

**Figure 5**: Position versus temperature. The X-axis represents the temperature in degree Celsius and the Y-axis represents the worm count. The worms were counted at different temperatures every 5 minutes for 40 minutes.

**Figure 6**: The isothermal tracking on a 9x9 cm plate. The tracks indicate that individual *C. elegans* remain within the temperature of preference, displaying an isothermal behavior. These tracks were made in the duration of 0-30 minutes.

**Reference**


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