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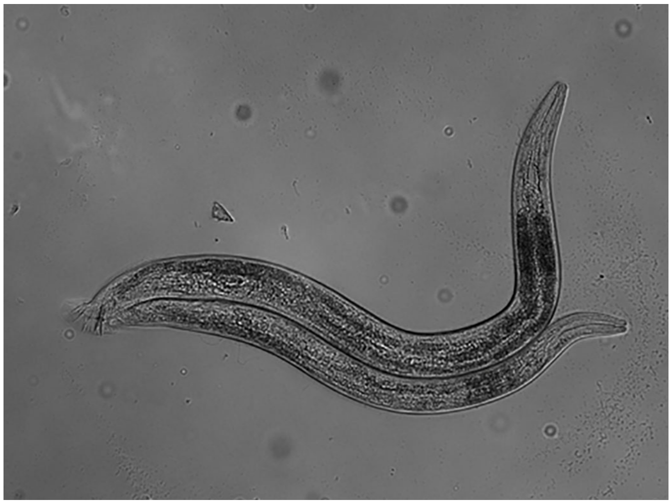
# Different tubular lysosome strategies of male and hermaphrodite *C. elegans*



Fed and starved male *C. elegans*. Photo credit: Alyssa Johnson.

Most *Caenorhabditis elegans* nematode worms are hermaphrodites; essentially, they are females that produce sperm for self-fertilisation. However, a tiny fraction of the elegant worms start life as males – with only a single X chromosome (hermaphrodites require two) – forgoing feeding while on the hunt for hermaphrodites to fertilise. 'Maintenance of these differences is often vital for efficient reproduction and, ultimately, species survival', says Alyssa Johnson from Louisiana State University, USA. However, Johnson and Adam Bohnert (Louisiana State University) knew that starvation triggers some flies and hermaphrodite *C. elegans* to produce structures in their digestive systems known as tubular lysosomes: 'They eat up cellular waste, digest it into smaller usable parts and recycle it back to the cell so that they can be used to build new cellular materials', says Johnson. This reuse of materials is especially important when an animal is starving and cells are deprived of nutrition. However, it wasn't clear whether male *C. elegans* that deprive themselves of food when in search of a mate are also capable of producing the tubular structures and, if so, when. Johnson, Bohnert and Cara Ramos, also from Louisiana State University, decided to find out.

Breeding *C. elegans* worms, Ramos provided the males with a plentiful supply of bacteria to dine upon and was surprised that the animals produced the distinctive tubular recycling structures, even though they had not been deprived of food. Were the male worms naturally producing the structures using a different mechanism from their hermaphrodite siblings? Or were they denying themselves food, triggering formation of the tubular structures?

Ramos fed the male worms on modified bacteria that would trigger them to feed continually and this time the tubular structures disappeared. The team realised that while the young males were pursuing mates, they must be consciously depriving themselves of food, triggering formation of the tubular lysosomes. But what about hermaphrodites? Could they produce the distinctive digestive structures even when feasting incessantly?

Monitoring well-fed hermaphrodites for 5 days after they had developed into adults, the team saw that the youngsters also produced the tubule structures; yet, the transformation had nothing to do with an urge to deprive themselves of food, as the hermaphrodites never go searching for mates. Could the sperm produced by hermaphrodites cause the tubular structures to develop as they age? This time, Ramos took hermaphrodite worms that were unable to produce sperm of their own, mated them with male worms and then waited to see if the hermaphrodites produced the tubular structures in their digestive tracts in response to the sperm that they store after mating.

Impressively, these hermaphrodites managed to form lysosome tubules over the days after mating, even though they were unable to produce sperm of their own. The presence of sperm seems to be essential for hermaphrodite *C. elegans* to produce the distinctive tubule structures.

'We propose that tubular lysosomes are induced by different mechanisms in each sex to meet the nutritional demands imposed by their distinct reproductive activities', says Bohnert, who explains that both sexes require uniquely different dining strategies to ensure that they continue reproducing successfully.

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**Ramos, C. D., Bohnert, K. A. and Johnson, A. E.** (2022). Reproductive tradeoffs govern sexually dimorphic tubular lysosome induction in *Caenorhabditis elegans*. *J. Exp. Biol.* **225**, jeb244282. doi:10.1242/jeb.244282

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