

# The genetic model organism *Caenorhabditis elegans* as a model for neurobiology research

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## SCOPE OF THE METHOD

<b>The Method relates to</b>	Animal health, Human health
<b>The Method is situated in</b>	Basic Research, Education and training
<b>Type of method</b>	In vivo
<b>This method makes use of</b>	Animal derived cells / tissues / organs
<b>Used species</b>	<i>Caenorhabditis elegans</i>
<b>Targeted organ system or type of research</b>	Neurobiology research

## DESCRIPTION

### Method keywords

brain plasticity

*C. elegans*

behavior

learning

### Scientific area keywords

neuroscience

genetics

molecular biology

neuromodulation

## **Method description**

The nematode *Caenorhabditis elegans* provides a powerful model system to study fundamental working mechanisms of the nervous system in a living animal. Its main advantages are its compact nervous system that has been fully mapped, its short generation time and amenability for genetic research. As a model system, *C. elegans* allows to rapidly dissect the molecular and cellular basis of neural signaling, brain plasticity and the neural circuits underlying behavior. Many of the genes and molecular machinery that are used by the nervous system to steer animal physiology and behavior are well conserved between *C. elegans* and other animals, including humans. This way, it offers several opportunities to unravel the neuronal functions of conserved genes and catalyze functional studies of these genetic pathways in other model systems. In addition, its small size and transparency makes this model ideally suited for high-throughput functional studies and translational research including drug target screening.

## **Lab equipment**

*C. elegans* is a microscopic animal so most handling and observation of this animal is done using standard and confocal microscope setups. Breeding and maintenance of the animal is low in cost, and comparable to microbiology culturing.

## **Method status**

Published in peer reviewed journal

## **PROS, CONS & FUTURE POTENTIAL**

### **Advantages**

The main advantages of *C. elegans* as a model system for neurobiology research are its compact nervous system that has been fully mapped, its short generation time and amenability for genetic research. Thanks to these features, *C. elegans* allows to rapidly dissect the molecular and cellular basis of neural signaling, brain plasticity and the neural circuits underlying behavior. Its small size also makes this model amenable to high-throughput screening.

## Challenges

Due to its small size, dissections of tissues or other material are challenging. However, this is compensated by its transparency that allows to visualise most processes using fluorescent reporters *in vivo*.

## REFERENCES, ASSOCIATED DOCUMENTS AND OTHER INFORMATION

### References

Beets, I. et al. Natural Variation in a Dendritic Scaffold Protein Remodels Experience-Dependent Plasticity by Altering Neuropeptide Expression. *Neuron* 105, 106–121.e10 (2020).

Peymen, K. et al. Myoinhibitory peptide signaling modulates aversive gustatory learning in *Caenorhabditis elegans*. *PLoS Genet.* 15, e1007945 (2019).

Van Sinay, E. et al. Evolutionarily conserved TRH neuropeptide pathway regulates growth in *Caenorhabditis elegans*. *Proc. Natl. Acad. Sci. U.S.A.* 114, E4065–E4074 (2017).

Beets, I. et al. Vasopressin/oxytocin-related signaling regulates gustatory associative learning in *C. elegans*. *Science* 338, 543–545 (2012).

### Associated documents

## PARTNERS AND COLLABORATIONS

### Organisation

**Name of the organisation** KU Leuven

**Department** Biology

**Country** Belgium

**Geographical Area** Flemish Region

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