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

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SCOPE OF THE METHOD

The Method relates to	Animal health, Human health
The Method is situated in	Basic Research, Education and training
Type of method	In vivo
This method makes use of	Animal derived cells / tissues / organs
Used species	Caenorhabditis elegans
Targeted organ system or type of research	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. It's 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. It's 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).
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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

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