**Supplementary Information for**

**Sensory experience controls dendritic structure and behavior by distinct pathways involving degenerins**

# Sharon Inberg1, Yael Iosilevskii1, Alba Calatayud-Sanchez2, Hagar Setty3,4, Meital Oren-Suissa3,4, Michael Krieg2, and Benjamin Podbilewicz1,\*

1Department of Biology, Technion-Israel Institute of Technology, 3200003 Haifa, Israel

2ICFO - Institut de Ciencies Fotoniques, The Barcelona Institute of Science and Technology, Castelldefels (Barcelona) 08860, Spain

3Department of Brain Sciences, Weizmann Institute of Science, Rehovot 7610001, Israel

4Department of Molecular Neuroscience, Weizmann Institute of Science, Rehovot 7610001, Israel

\*Correspondence to:

podbilew@technion.ac.il

**This file includes:**

Supplementary file 1a

Supplementary file 1b

Supplementary References

**Supplementary file 1a.** List of strains and transgenes used in this work

|  |  |  |
| --- | --- | --- |
| **Strain** | **Genotype** | **Details** |
| N2 | Wild-type | (1) |
| JPS282 | *asic-1(ok415) I*; *vxEx282[WRM0621dC07 + unc-122p::GFP]* | CGC |
| VC244 | *gtl-1(ok375) IV* | CGC |
| SS104 | *glp-4*(*bn2*) *I* | CGC (2) |
| CB1338 | *mec-3(e1338) IV* | CGC (3) |
| MT1085 | *unc-8(n491) IV* | CGC (4) |
| VC2633 | *degt-1(ok3307)* *V* | CGC (5) |
| DR466 | *him-5(e1490) V* | CGC |
| NC279 | *del-1(ok150) X* | CGC (5) |
| CB1611 | *mec-4(e1611)* *X* | CGC (6) |
| ZB2551 | *mec-10(tm1552)* *X* | CGC (5) |
| JPS478 | *asic-1(ok415) I*; *mec-10(tm1552)* *X*; *vxEx478[sto-5p::asic-1(+) unc-122p::GFP]* | CGC |
| AQ3272 | *ljEx637[PF49H12.4::DEGT-1::mCherry Punc-122::GFP]* | Provided by W. Schafer (5) |
| AQ3273 | *ljEx638[PF49H12.4::MEC-10::mCherry Punc-122::GFP]* | Provided by W. Schafer (5) |
| ZX819 | *lite-1(ce314) X*; *zxIs12*[*pF49H12.4::ChR2::mCherry pF49H12.4::GFP*] | Provided by A. Gottschalk (7) |
| BP709 | *hmnIs133(ser-2Prom3::Kaede)* | Provided by M. Heiman (13( and used by T. Gattegno (8) |
| BP925 | *mec-4(e1611) X;* *hmnIs133(ser-2Prom3::Kaede)* | Cross (9) |
| BP1021 | *him-5(e1490) V*; *hmnIs133(ser-2Prom3::Kaede)* | Cross: BP709 X DR466 |
| BP1022 | *mec-10(tm1552)* *X*; *hmnIs133(ser-2Prom3::Kaede)*; *him-5(e1490)* *V* | Cross: BP1021 X JPS478 |
| BP1023 | *asic-1(ok415) I*; *him-5(e1490)* *V; hmnIs133(ser-2Prom3::Kaede)* | Cross: BP1021 X JPS478 |
| BP1024 | *asic-1(ok415) I; mec-10(tm1552)* *X*; *him-5(e1490) V;* *hmnIs133(ser-2Prom3::Kaede)* | Cross: BP1021 X JPS478 |
| BP1025 | *asic-1(ok415) I; degt-1(ok3307) V*; *mec-10(tm1552) X* | Cross: BP1024 X VC2633 |
| BP1026 | *degt-1(ok3307) V; mec-10(tm1552) X* | Cross: BP1024 X VC2633 |
| BP1027 | *degt-1(ok3307)* V; *hmnIs133(ser-2Prom3::Kaede)* | Cross: BP1021 X VC2633 |
| BP1028 | *asic-1(ok415) I; degt-1(ok3307)* *V; hmnIs133(ser-2Prom3::Kaede)* | Cross: BP1025 X BP1027 |
| BP1029 | *mec-10(tm1552); degt-1(ok3307) V; hmnIs133(ser-2Prom3::Kaede)* | Cross: BP1025 X BP1027 |
| BP1030 | *asic-1(ok415) I; mec-10(tm1552) X; degt-1*(*ok3307) V*; *hmnIs133(ser-2Prom3::Kaede)* | Cross: BP1025 X BP1027 |
| BP1031 | *degt-1(ok3307) V*; *ljEx638[PF49H12.4::mec-10::mCherry Punc-122::GFP*] | Cross: VC2633 X AQ3273 |
| BP1033 | *mec-10(tm1552) X*; *ljEx637[PF49H12.4::degt-1::mCherry Punc-122::GFP]* | Cross: BP1022 X AQ3272 |
| BP1034 | *mec-10(tm1552) X*; *hmnIs133(ser-2Prom3::Kaede); him-5(e1490) V; hyEx321[ser-2Prom3::mec-10genomic]* | pWRS825 plasmid provided by W. Schafer (5) was injected into BP1022 |
| EB1982 | *dzIs53[pF49H12.4::mCherry]* *II* | Provided by Y. Salzberg (10) |
| TV17924 | *wyls50007[ser2prom3*::GCaMP6 *egl-17*::*mCherry] X* | Provided by K. Shen (11,12) |

**Supplementary file 1b**. List of primers used in this work

|  |  |
| --- | --- |
| **Gene** | **Sequence of the primer** |
|  *asic-1(ok415)*I | Forward-1: 5' aactggtgtggccacttcaactttc 3’;Forward-2: 5’ aaggtttcagatgatcgcgtagtcaag 3’; Reverse: 5’ catttctcttcttccgtcagcgc 3’ |
| *mec-10(tm1552)* X | Forward-1: 5’ acacggctccttcttgagttccga 3’;Forward-2: 5’ attcggtttcctcctcttcttccaatgc 3’ ;Reverse: 5’ cgtttttttcagcgccctttcctgca 3’ |
| *degt-1(ok3307)* V | Forward-1:5’cgagtagctgattatcaaaaagtcctcga 3’;Forward-2: 5’ cggatattccagcattggcgaa 3’;Reverse: 5’ ttccccgttgatcttctatgtattaca 3’ |

**Supplementary References**

1. S. Brenner, The genetics of *Caenorhabditis elegans*. *Genetics* **77**, 71-94 (1974).

2. M. J. Beanan, S. Strome, Characterization of a germ-line proliferation mutation in *C. elegans*. *Development* **116**, 755-766 (1992).

3. J. C. Way, M. Chalfie, *mec-3*, a homeobox-containing gene that specifies differentiation of the touch receptor neurons in *C. elegans*. *Cell* **54**, 5-16 (1988).

4. N. Tavernarakis, W. Shreffler, S. Wang, M. Driscoll, unc-8, a DEG/ENaC family member, encodes a subunit of a candidate mechanically gated channel that modulates *C. elegans* locomotion. *Neuron* **18**, 107-119 (1997).

5. M. Chatzigeorgiou *et al.*, Specific roles for DEG/ENaC and TRP channels in touch and thermosensation in *C. elegans* nociceptors. *Nat Neurosci* **13**, 861-868 (2010).

6. M. Driscoll, M. Chalfie, The *mec-4* gene is a member of a family of *Caenorhabditis elegans* genes that can mutate to induce neuronal degeneration. *Nature* **349**, 588 (1991).

7. S. J. Husson *et al.*, Optogenetic analysis of a nociceptor neuron and network reveals ion channels acting downstream of primary sensors. *Curr Biol* **22**, 743-752 (2012).

8. M. Oren-Suissa, T. Gattegno, V. Kravtsov, B. Podbilewicz, Extrinsic Repair of Injured Dendrites as a Paradigm for Regeneration by Fusion in *Caenorhabditis elegans*. *Genetics* **206**, 215-230 (2017).

9. V. Kravtsov, M. Oren-Suissa, B. Podbilewicz, The fusogen AFF-1 can rejuvenate the regenerative potential of adult dendritic trees by self-fusion. *Development* **144**, 2364-2374 (2017).

10. N.J. Ramirez-Suarez *et al.,* Axon-dependent patterning and maintenance of somatosensory dendritic arbors. *Dev Cell* **48**, 229-244 (2019).

## 11. Y. Cho, D.A. Porto,H. Hwang,L.J. Grundy, W.R. Schafer, H. Lu, Automated and controlled mechanical stimulation and functional imaging: In vivo in C. elegans. Lab on a chip, 15, 2609 – 2618 (2017).

12. Y. Cho, D.N. Oakland, S.A. Lee, W***.***R***.*** Schafer, H. Lu, On-chip functional neuroimaging with mechanical stimulation in Caenorhabditis elegans larvae for studying development and neural circuits. *Lab on a chip* **18**, 601–609 (2018).

13. Z.C Yip,. Heiman MG (2016) Duplication of a Single Neuron in C. elegans Reveals a Pathway for Dendrite Tiling by Mutual Repulsion. Cell Reports 15, 1–9