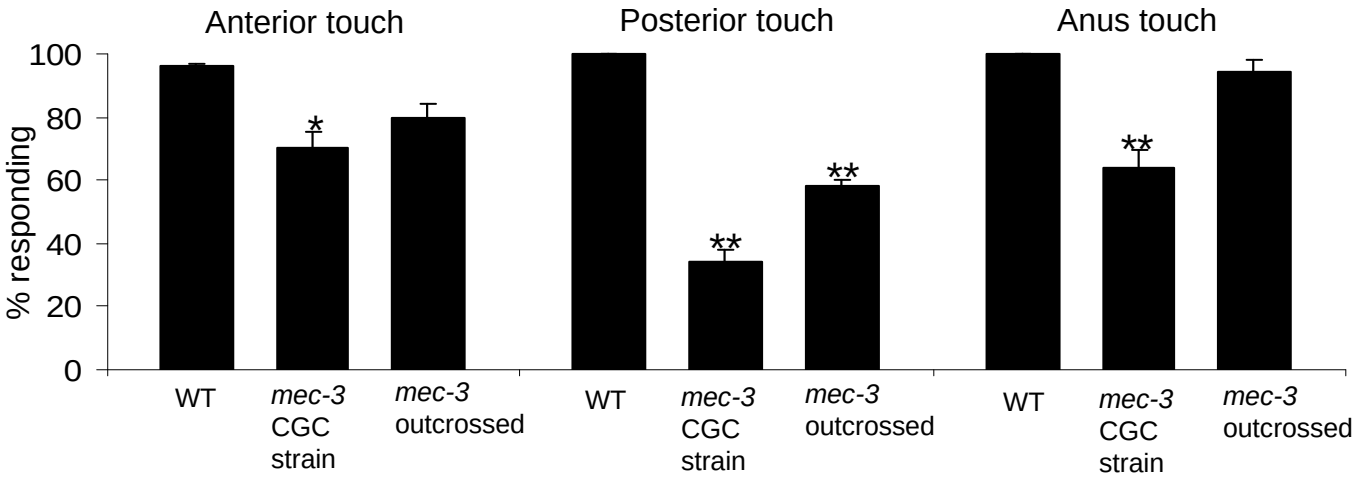
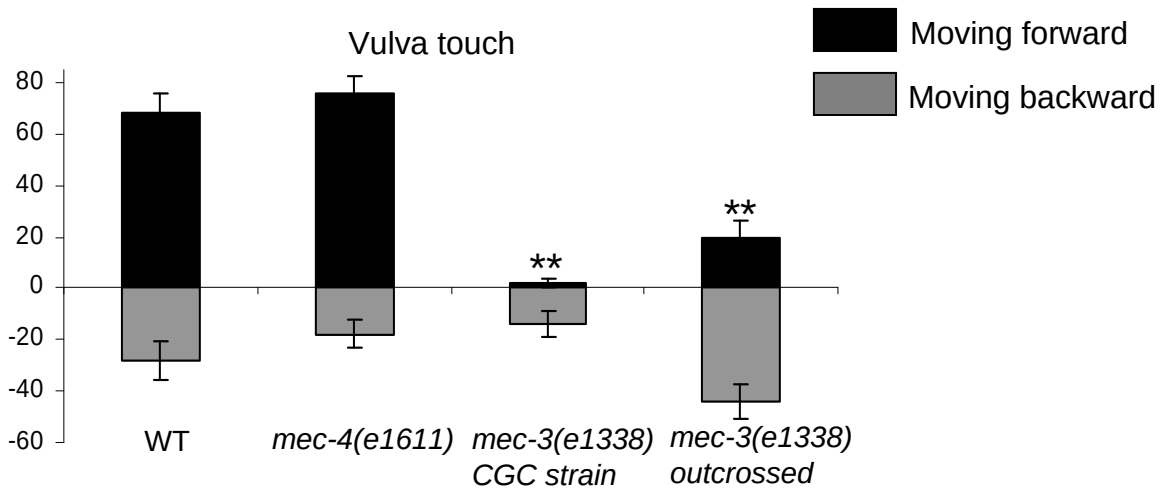
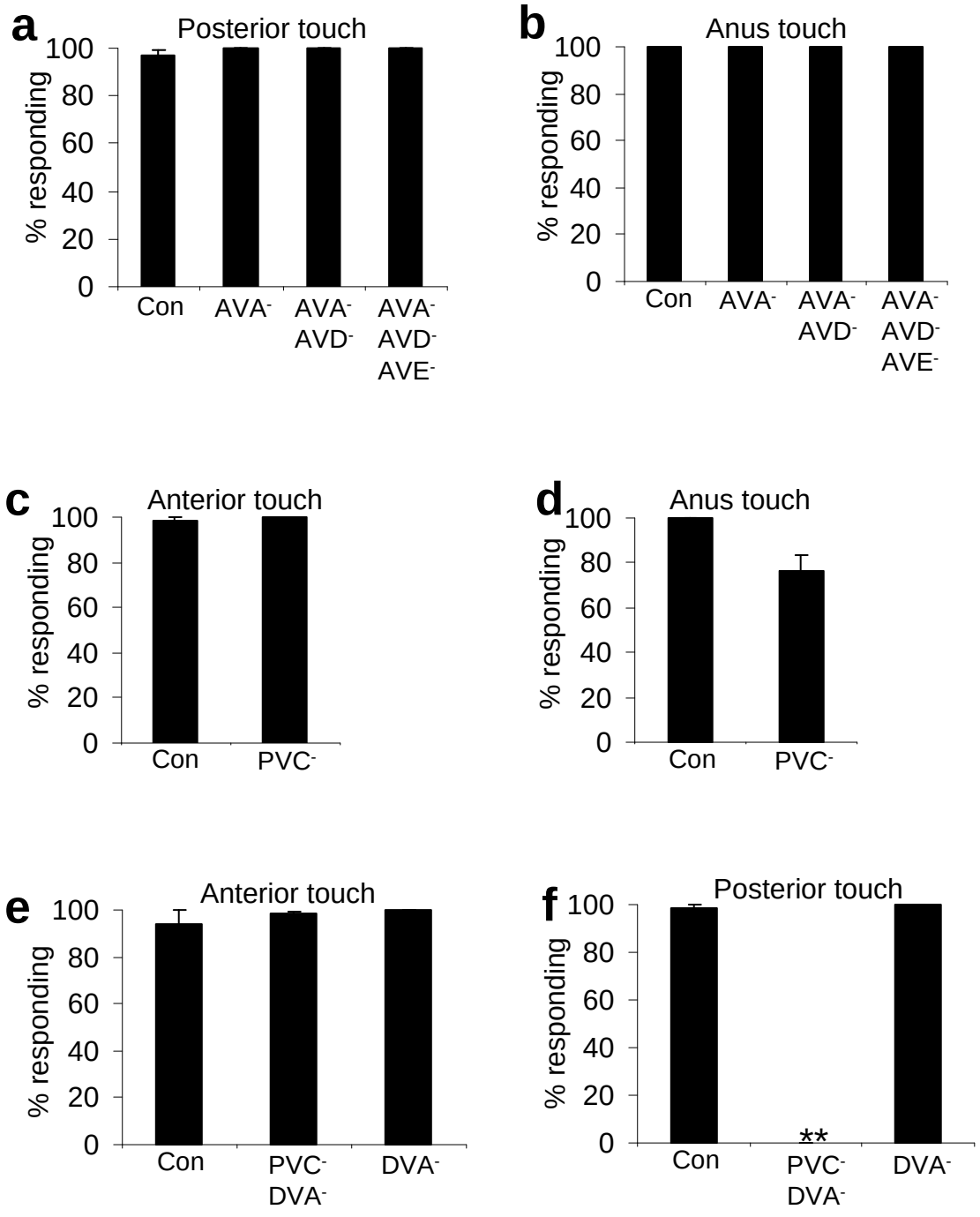
a



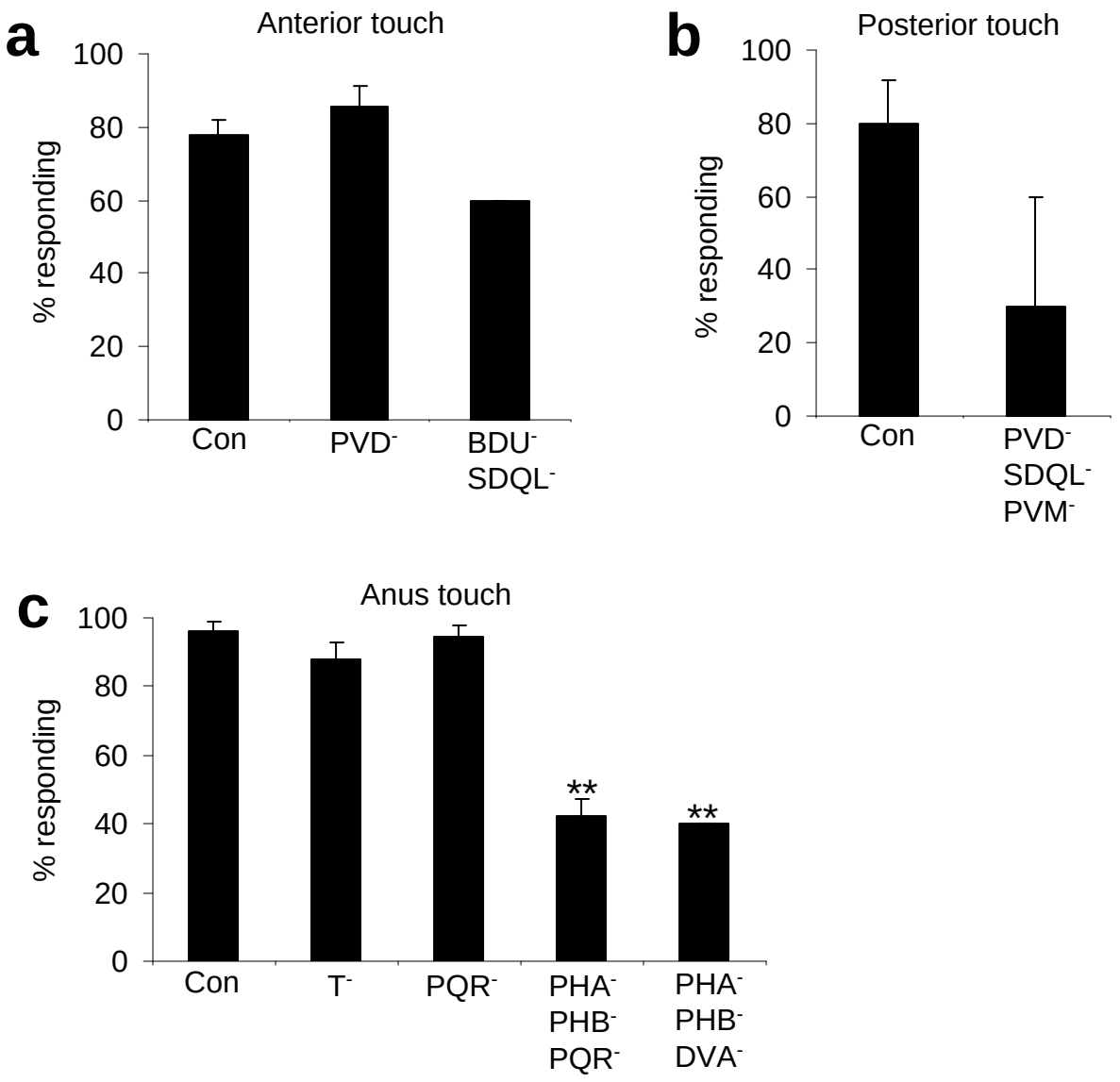
b



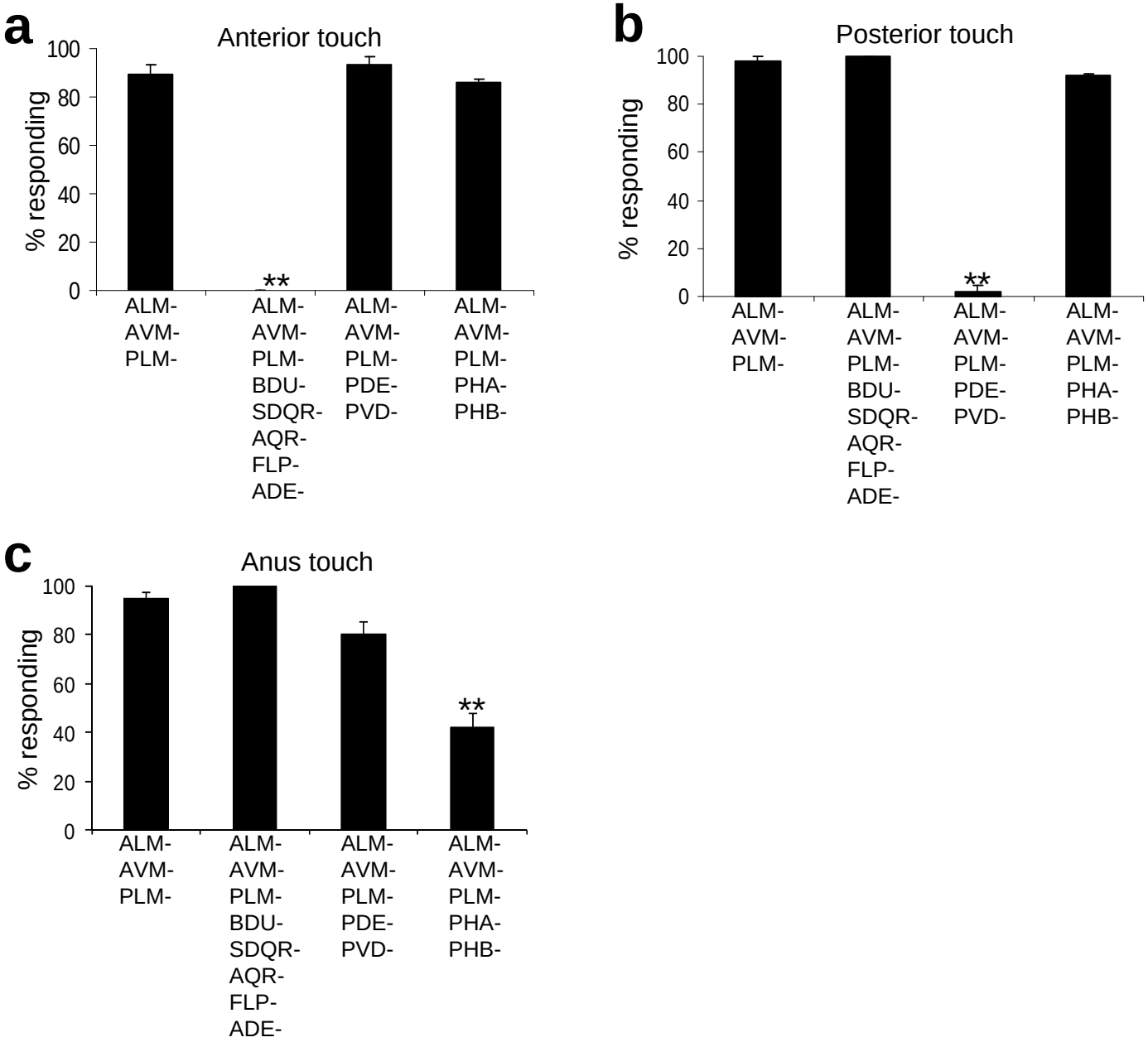
Supplementary Figure S1. Additional data on harsh touch responses in WT, *mec-3(e1338)* and *mec-4(e1611)* worms at different body segments. (a) *mec-3(e1338)* mutant worms respond to harsh touch at the anterior and anus area but showed a reduced posterior response. Data from the outcrossed (4x) *mec-3 strain* are also shown for comparison. The non-outcrossed CGC strain of *mec-3(e1338)* (CB1338) is less healthy (lethargic) and show stronger defects. n=10. *p<0.001, **p<0.0001 (ANOVA with Bonferroni test). Error bars: SEM. **(b)** Worms respond to harsh touch delivered at the middle segment (vulva touch) by initiating either forward or backward movement. *mec-3(e1338)* mutant animals were defective in this response. n=10. **p<0.0001 for forward movement (ANOVA with Bonferroni test). Error bars: SEM.



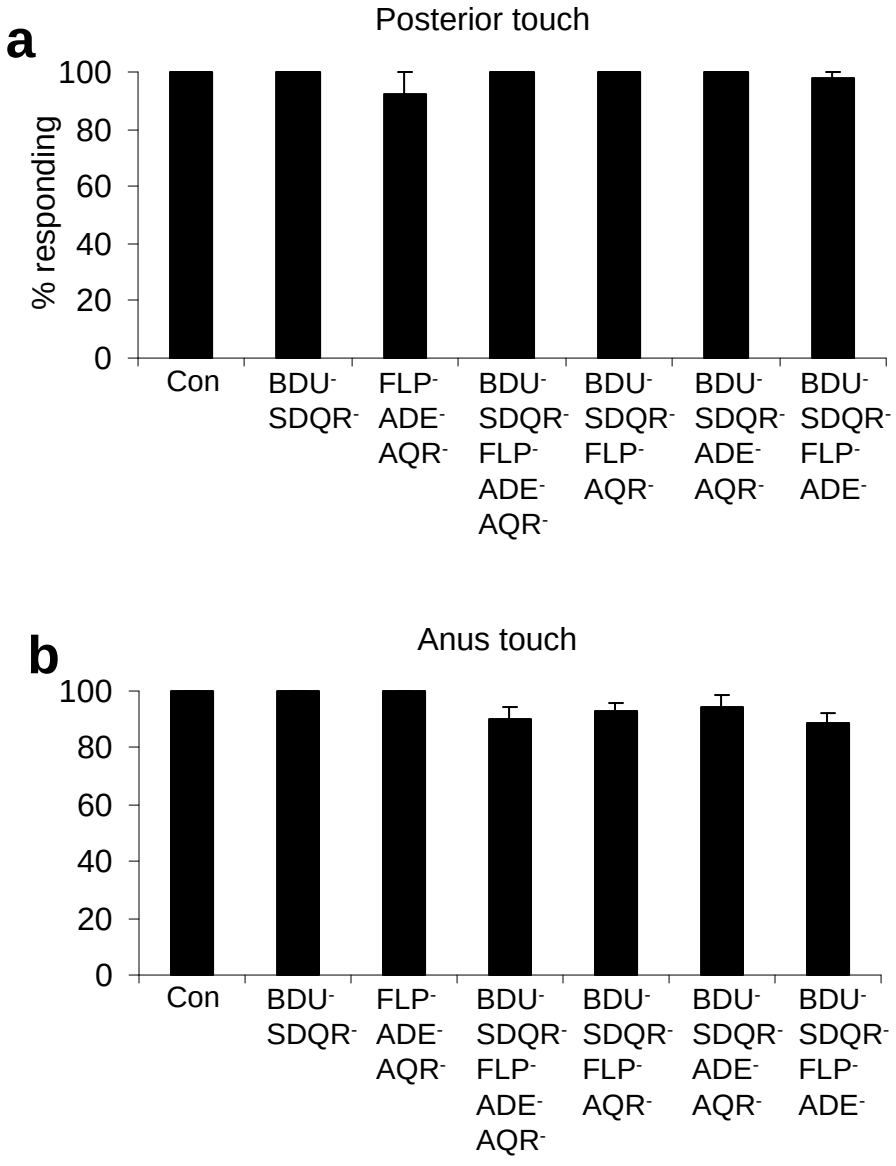
Supplementary Figure S2 . Control experiments for figure 2. Animals lacking interneurons required for harsh touch sensation at one body segment remained sensitive to harsh touch delivered to other body segments. **p<0.0001 (ANOVA with Bonferroni test). N numbers in a-b: n =9,12, 9 for each ablation, respectively; c-d: n =13,12 for each ablation, respectively; e-f: n =13,26,4 for each ablation, respectively. Error bars: SEM.



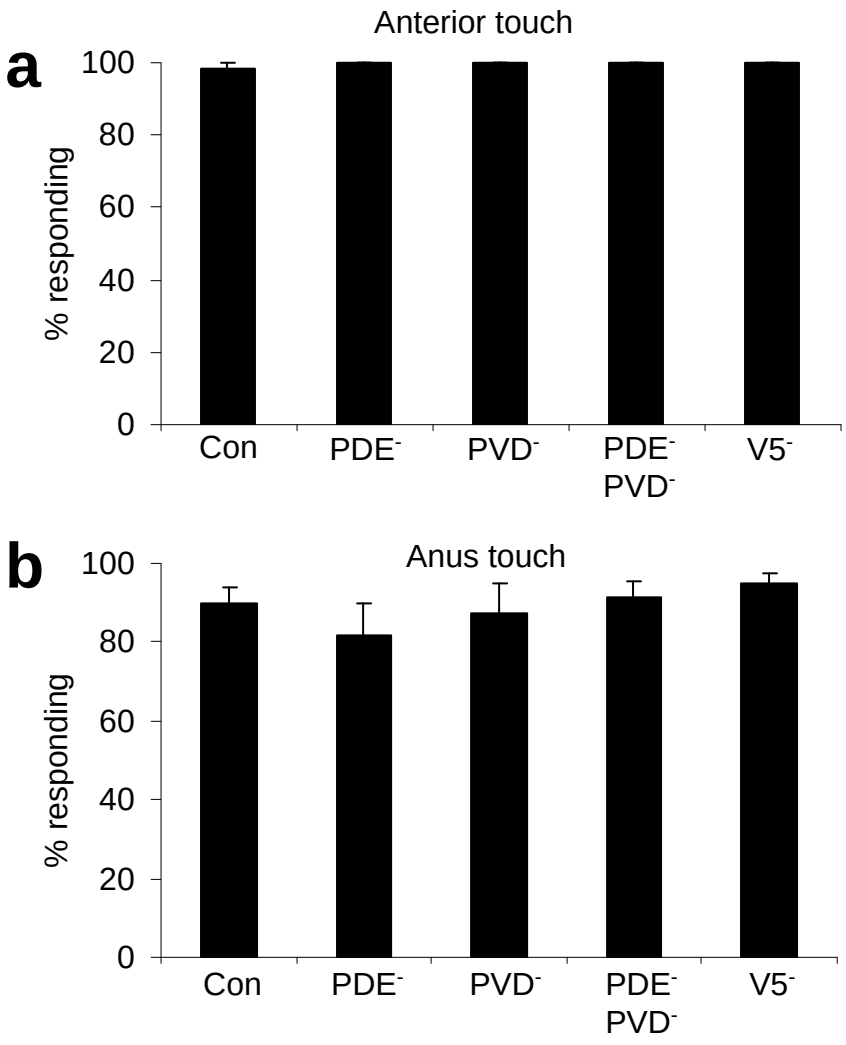
Supplementary Figure S3. Additional laser ablations of sensory neurons. (a) PVD and SDQL do not have an important role in anterior harsh touch sensation. The anterior gentle touch neurons ALM and AVM were also killed in each experiment. n=9,7,2 for each experiment, respectively. **(b)** Laser ablation of PVD together with the other two posterior neurons PVM and SDQL did not abolish posterior harsh touch response. SDQL and PVM were killed by ablating their precursor QR. The posterior gentle touch neuron PLM was also killed. n=4,2 for each experiment, respectively. **(c)** Additional laser ablation results of anus neurons. PLM was also killed in each experiment. n=11,5,7,9,2 for each experiment, respectively. **p<0.0001 (ANOVA with Bonferroni test). Error bars: SEM.



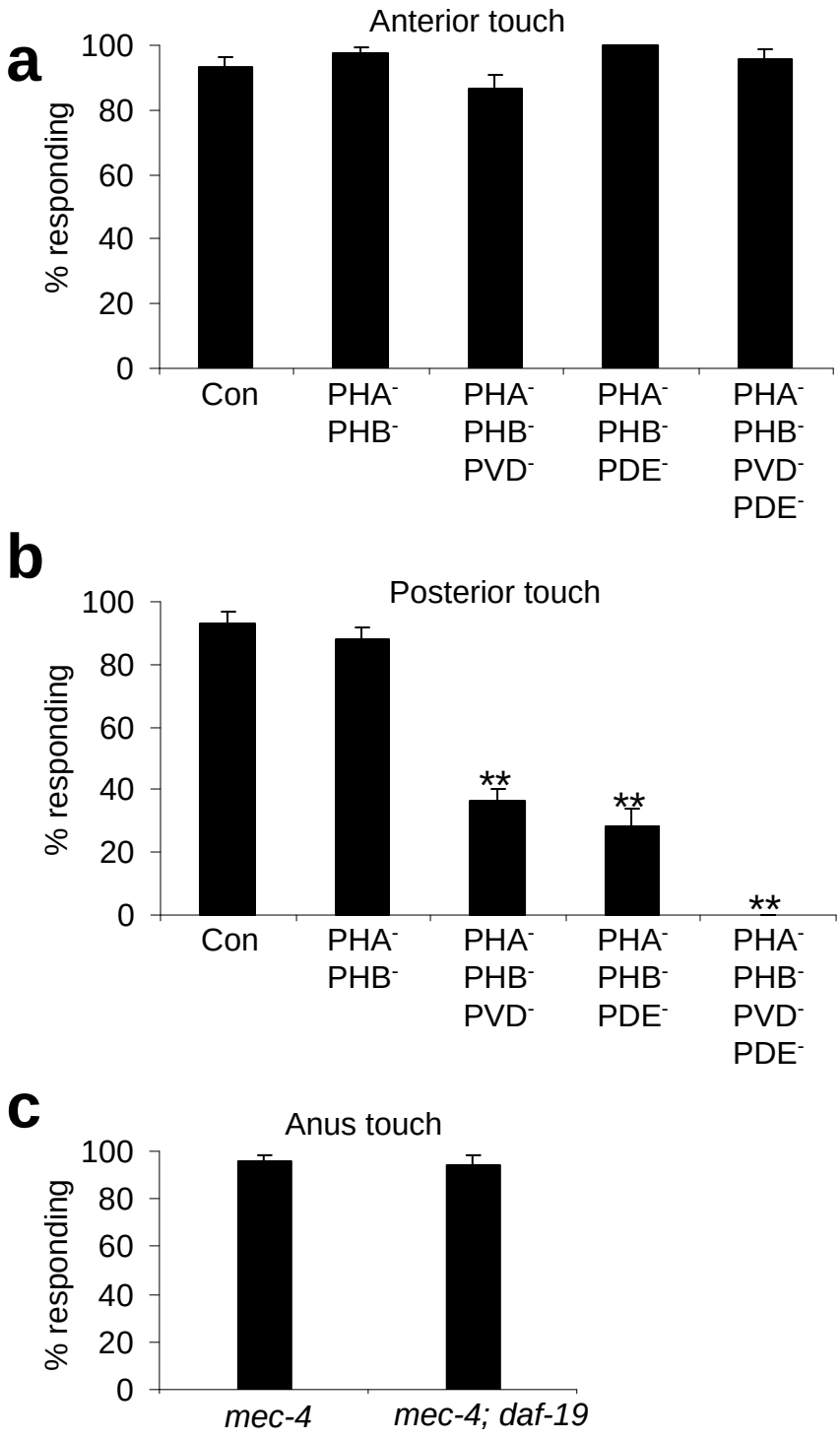
Supplementary Figure S4. *C. elegans* lacking harsh touch sensory neurons at one body segment remains sensitive to harsh touch delivered to other body segments. All gentle touch neurons (ALM, AVM and PLM) were also ablated in each experiment, which is distinct from Figure S5-7 where only anterior or posterior gentle touch neurons were ablated. **p<0.0001 (ANOVA with Bonferroni test). n=11,3,9,10 for each ablation, respectively. Error bars: SEM.



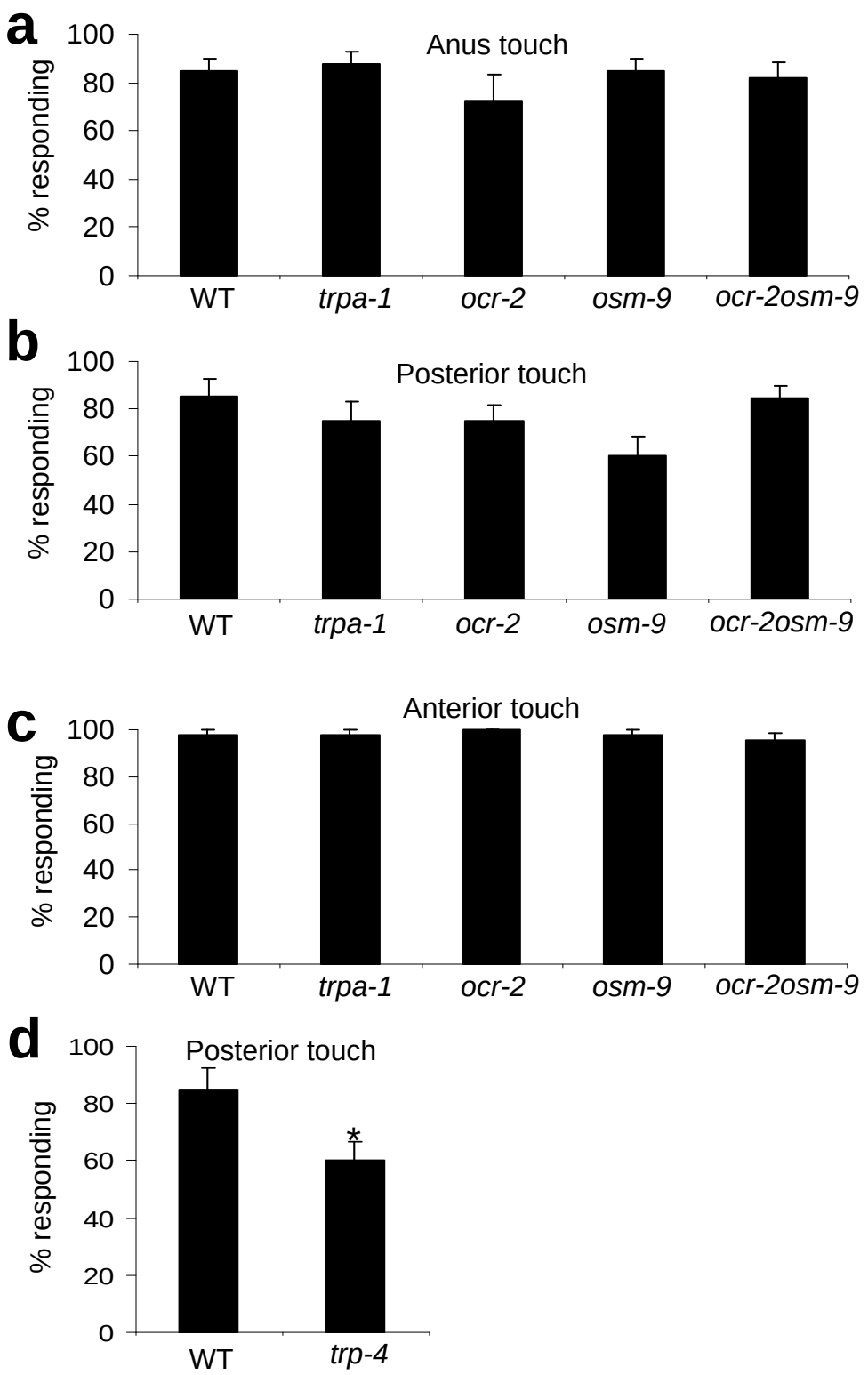
Supplementary Figure S5. Control experiments for figure 3b that identifies anterior harsh touch sensory neurons. Laser-operated animals were tested for posterior and anus touch and but did not show an noticeable defect. The anterior gentle touch sensory neurons ALM and AVM were killed in all ablations. n=15,11,5,6,11,11,9 for each ablation. Error bars: SEM.



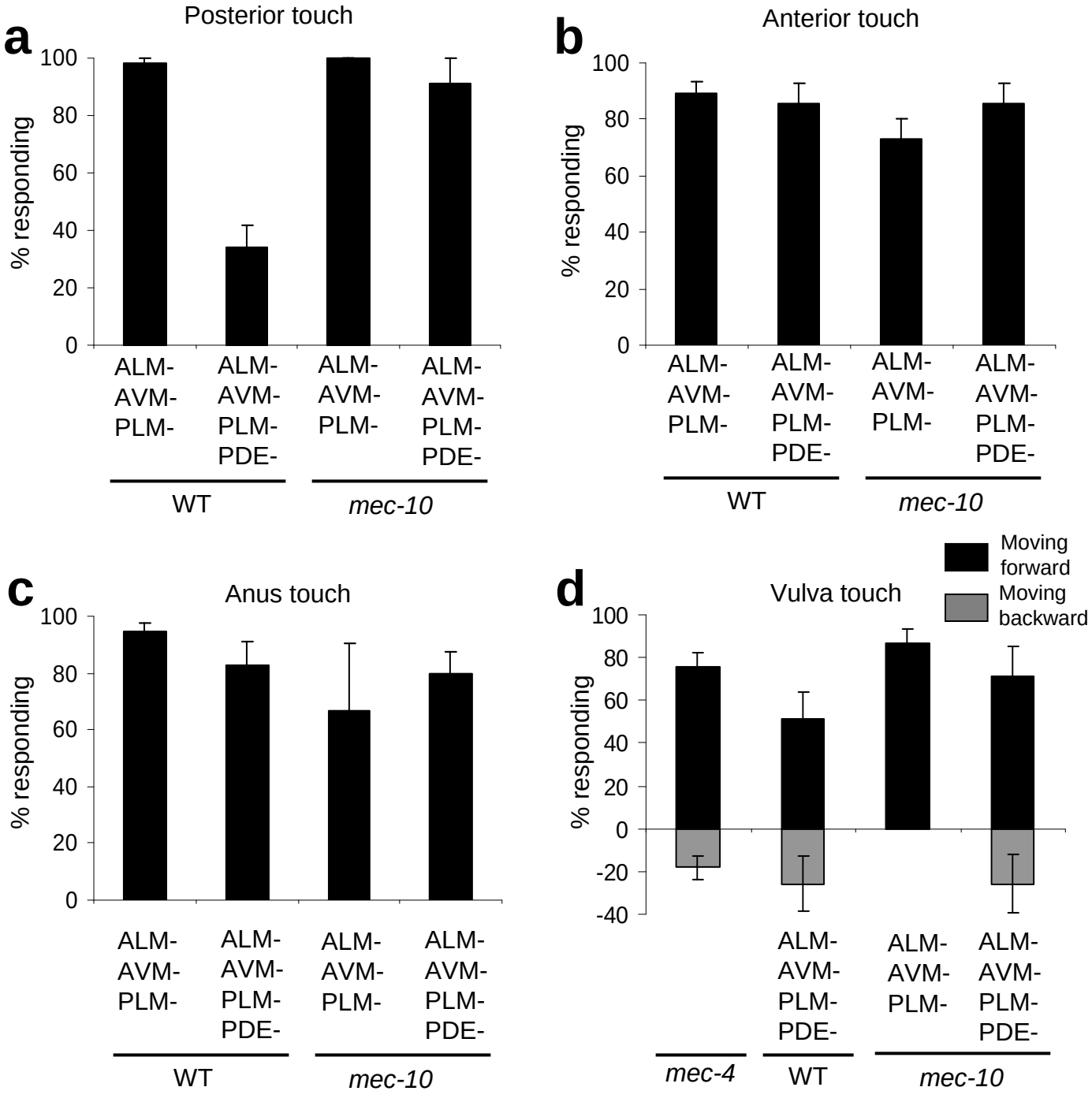
Supplementary Figure S6. Control experiments for figure 3c that identifies posterior harsh touch sensory neurons. Laser-operated animals were tested for anterior and anus touch and but did not show an noticeable defect. The posterior gentle touch sensory neuron PLM was killed in all ablations. n=12,11,8,7,12 for each ablation, respectively. Error bars: SEM.



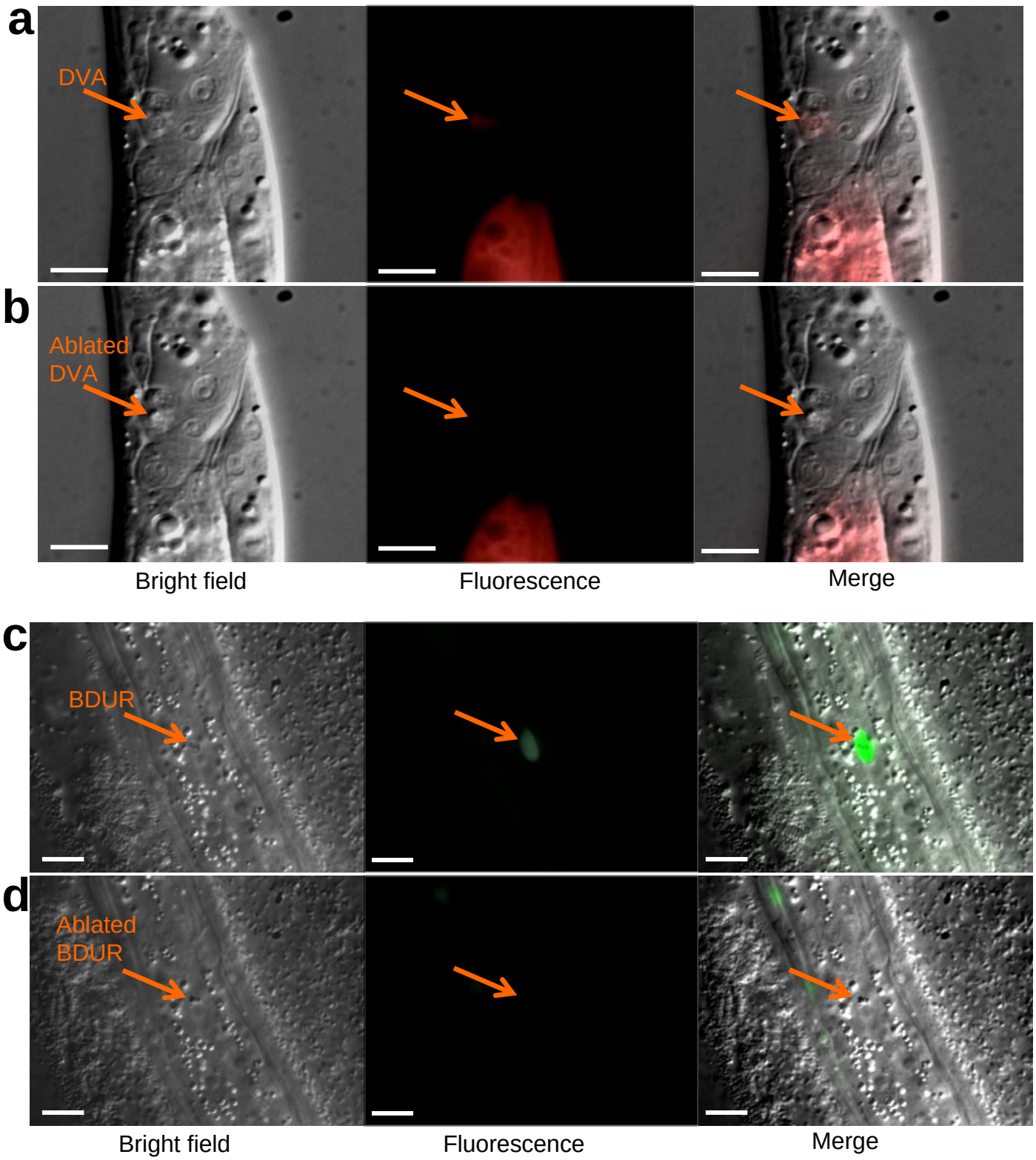
Supplementary Figure S7. Control experiments for figure 3d that identifies anus touch sensory neurons. (a) Laser-operated animals were tested for anterior and posterior touch. The posterior gentle touch sensory neuron PLM was killed in all ablations. **p<0.0001 (ANOVA with Bonferroni test). n=9,18,6,10,9 for each ablation, respectively. Error bars: SEM. **(b)** The same ablated animals in (a) were tested for posterior response. **(c)** Harsh touch response in *mec-4(e16111); daf-19(m86).* These worms bear defective cilia, including those of PHA/PHB. As rudimentary cilia remain in this mutant, a lack of a strong defect may not necessarily indicate that cilia play no role in sensing anus harsh touch. n=10. Error bars: SEM.



Supplementary Figure S8. Additional data on harsh touch responses in *trp* channel mutants. (a) *trpa-1(ok999), ocr-2(ok47), osm-9(ky10)* mutant worms do not show a strong defect in anus harsh touch response. **(b)** These mutants do not show a strong phenotype in posterior harsh touch response. **(c)** These mutants do not show a strong defect in anterior harsh touch response. **(d)** *trp-4(sy695)* mutant animals show a significant defect in posterior harsh touch response**.** The gentle touch sensory neuron PLM was killed in all tested animals. *p<0.03 (t test). Error bars: SEM. n=8 for all experiments.



Supplementary Figure S9. No severe behavioral deficit is detected in *mec-10(tm1552)* mutant animals. n=11,7,3,7 for each ablation, respectively. Error bars: SEM. ALM, AVM and PLM neurons are absent in *mec-4(e1611)* worms.



Supplementary Figure S10. Sample images of animals before and after laser ablation. Scale bars: 5 μm