**SUPPLEMENTARY FIGURE LEGENDS**

**Figure S1.** Adults that experienced L1 arrest do not exhibit increased diacetyl responses.

**A)** Behavioral responses of wild-type control (con) and post-L1 (post-L1 arrest) arrested adults to indicated dilutions of diacetyl. Each dot is the chemotaxis index of a single assay plate containing ~50-300 adult hermaphrodites. Bars represent the mean; error bars are SEM. The behaviors of control and post-L1 arrested animals were assayed in parallel in duplicate; ≥3 independent experiments; ns – not significant (two-tailed Welch’s t-test).

**B)** Behavioral responses of wild-type control and PD adults to the indicated concentrations of aversive volatile odorants. Each dot represents the chemotaxis index of a single assay plate containing ~50-300 adult hermaphrodites. Bars represent the mean; error bars are SEM. Control and PD behaviors were assessed in parallel; ≥ 3 independent experiments. \* indicates different at *P*<0.05 (two-tailed Welch’s t-test); ns – not significant.

**C)** Baseline GCaMP2.2b fluorescence in AWA soma in the indicated wild-type animals. Baseline measurements were collected from experiments reported in Figures 1D and 3F. Each dot is the measurement from a single neuron. Bars represent the mean; error bars are SEM. n ≥ 17 animals (1 neuron per animal). \* indicates different at *P*<0.05 (one-way ANOVA with Tukey’s multiple comparisons test); ns – not significant.

**Figure S2.** An endogenously tagged *odr-10::gfp11* strain retains dauer passage-dependent olfactory behavioral plasticity as adults.

**A)** Behavioral responses of *odr-10(oy158)* control and PD animals expressing *odr-10::gfp11* from the endogenous *odr-10* locus to the indicated dilutions of diacetyl. Each dot represents the chemotaxis index of a single assay plate containing ~50-300 adult hermaphrodites. Bars represent the mean; error bars are SEM. Chemotaxis assays at each concentration were performed in parallel over at least three days. \*\* and \*\*\* indicate different at each concentration at *P*<0.01 and 0.001, respectively (two-tailed t-test with Welch’s correction).

**B)** Average changes in GCaMP2.2b fluorescence in AWA soma in control animals of the indicated genotypes to a 10 sec pulse of 10-7 diacetyl. Shaded regions indicate SEM. n ≥ 16 animals (1 neuron per animal) each.

**C)** Average changes in GCaMP2.2b fluorescence in AWA soma to a 30 sec pulse of 10-5 diacetyl in control and PD *odr-10(ky32)* mutant adult hermaphrodites. Shaded regions are SEM. n ≥ 10 animals (1 neuron per animal) each.

**D)** Quantification of peak fluorescence intensity changes in AWA soma expressing GCaMP2.2b to a 30 sec pulse of 10-5 diacetyl in control and PD *odr-10(ky32)* adults. Bars represent mean, error bars are SEM. n ≥ 10 animals (1 neuron per animal) each. Control and PD adults were examined in parallel over at least two days. ns – not significant.

**Figure S3.** Transcriptional profiling of sorted populations of AWA neurons.

**A**) PCA clustering of RNA-Seq libraries from sorted populations of AWA neurons and dissociated cells from whole animals based on the 10,000 most differentially expressed genes.

**B**) Tissue Enrichment Analysis with the web-based Tissue Enrichment Analysis tool (<https://www.wormbase.org/tools/enrichment/tea/tea.cgi>) (Angeles-Albores et al., 2016) shows enrichment of AWA-expressed genes in AWA RNA-Seq libraries. log2 fold change cut off  > 2, padj < 0.05.

**C)** MA plot showing differentially expressed genes in RNA-Seq data from FACS-sorted populations of control and PD AWA neurons as compared to dissociated but unsorted cells from control and PD whole animals. 20 of the most highly AWA-expressed genes (Taylor et al., 2021) are indicated. Up- and down-regulated genes were determined by differential expression analysis with a log2 fold change cut off  > 2, padj < 0.05; NS – not significant.

**File S1.** RNA-Seq data of differentially expressed genes from control and PD whole animals.

**File S2.** RNA-Seq data of differentially expressed genes from sorted control and PD AWA neurons.

**File S3.** Schematic of microfluidics device used to image dauer larvae.

**File S4.** AutoCAD file used to generate an ink photomask ([outputcity.com](http://outputcity.com/)).