Hunger drives behavioral changes through inter-tissue signaling in *C. elegans*

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Here, we acutely food-deprive populations of *C. elegans* and analyze their responses in integrating attractant and repellent signals simultaneously (**Fig 1**). We show that food deprivation reversibly reduces repellent sensitivity, allowing animals to engage in a risky behavior (**Fig 2**). We show that a glucose-response element binding protein, MondoA, acts within intestinal cells to detect the lack of food (**Fig 3**). The intestine, in turn, relays this information using peptides released from dense core vesicles (**Fig 4**). These peptides are received by chemosensory neurons using the DAF-2 insulin receptor (**Fig 5**), likely through non-canonical insulin signaling (not shown).

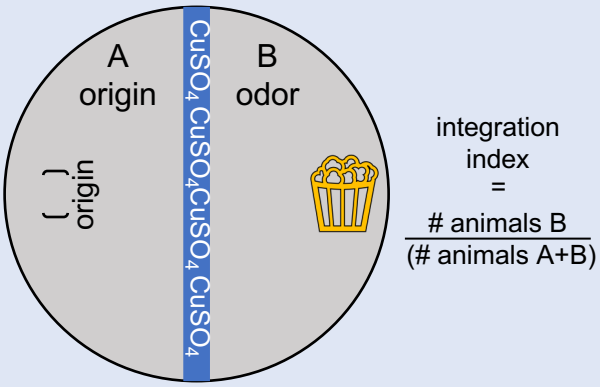

Figure 1. Sensory integration assay (SIA) Experimental design, adapted from (Ishihara *et al* 2002). 50mM $CuSO_4$ and 0.2% Diacetyl are used throughout.

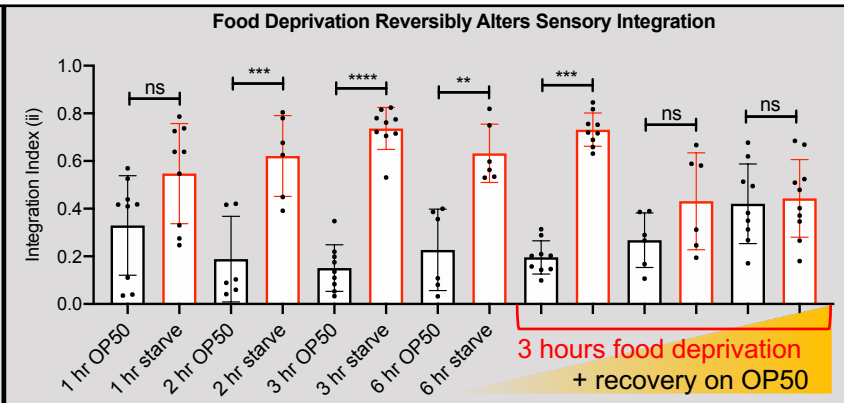

Figure 2. Food deprivation increases chemotaxis across copper barrier in a reversible manner. Each dot is one assay plate with 100-200 day-1 adult WT (N2) hermaphrodites on each plate.

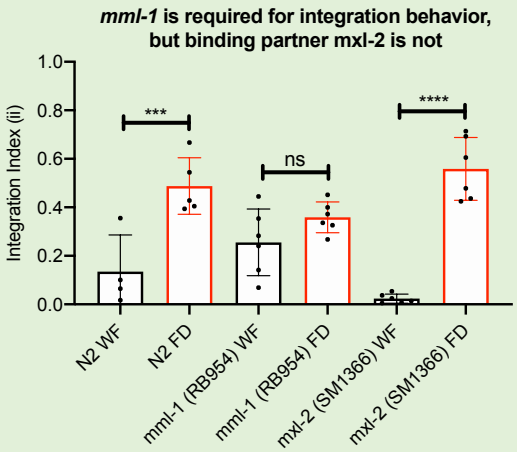

Figure 3: MondoA ortholog, *mml-1* is required for integration behaviors, but canonical binding partner *mxl-2* is not. This suggests a novel activity of this transcription factor in sensory integration during acute starvation (3hr, FD).

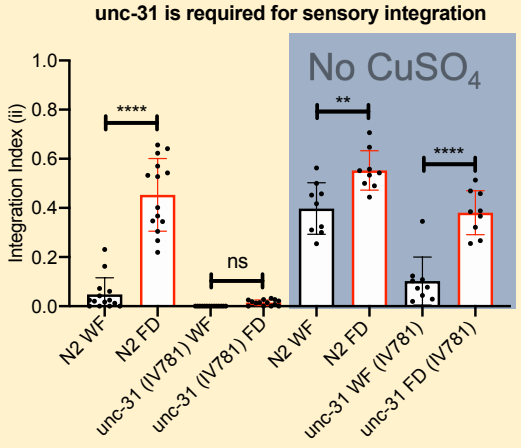

Figure 4: *unc-31* mutant animals fail to release dense core vesicles and fail to migrate when copper is present. In the absence of copper, animals are able to chemotax to diacetyl, but in an unexpected pattern.

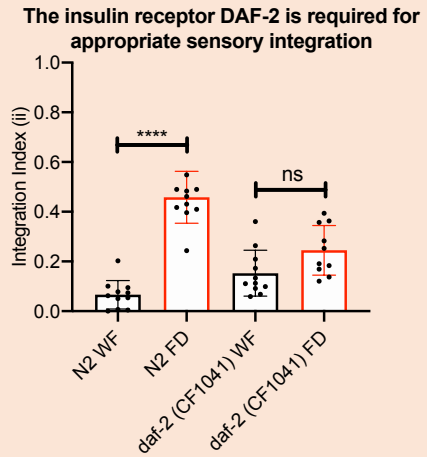

Figure 5: Insulin receptor daf-2 is required for sensory integration. These mutants are likely unable to receive the signal to increase ii upon food deprivation.

Ongoing work:

- Determining the signal being released in an *mml-1, unc-31 (*and *aex-5*, not shown here)-dependent manner that is received by *daf-2*? [*spoiler alert: probably an insulin peptide*]
- Characterizing the timing and location of *mml-1::GFP* in intestinal cells during food deprivation.
- Generating healthy rescue strains to confirm tissue-specificity and/or tissue-specific RNAi experiments.

Other information:

- All statistics were performed with GraphPad Prism, One-way ANOVA with Sidak's Multiple Comparisons Test.
- This work is based off work uploaded to bioRxiv many years ago but has since been updated.

If you're reading this and have comments, consider sending me an e-mail with your thoughts: mmatty @ salk.edu or a private twitter message at @ooomollypop.