

# C. elegans processes sensory information to choose between freeloading and self-defense strategies

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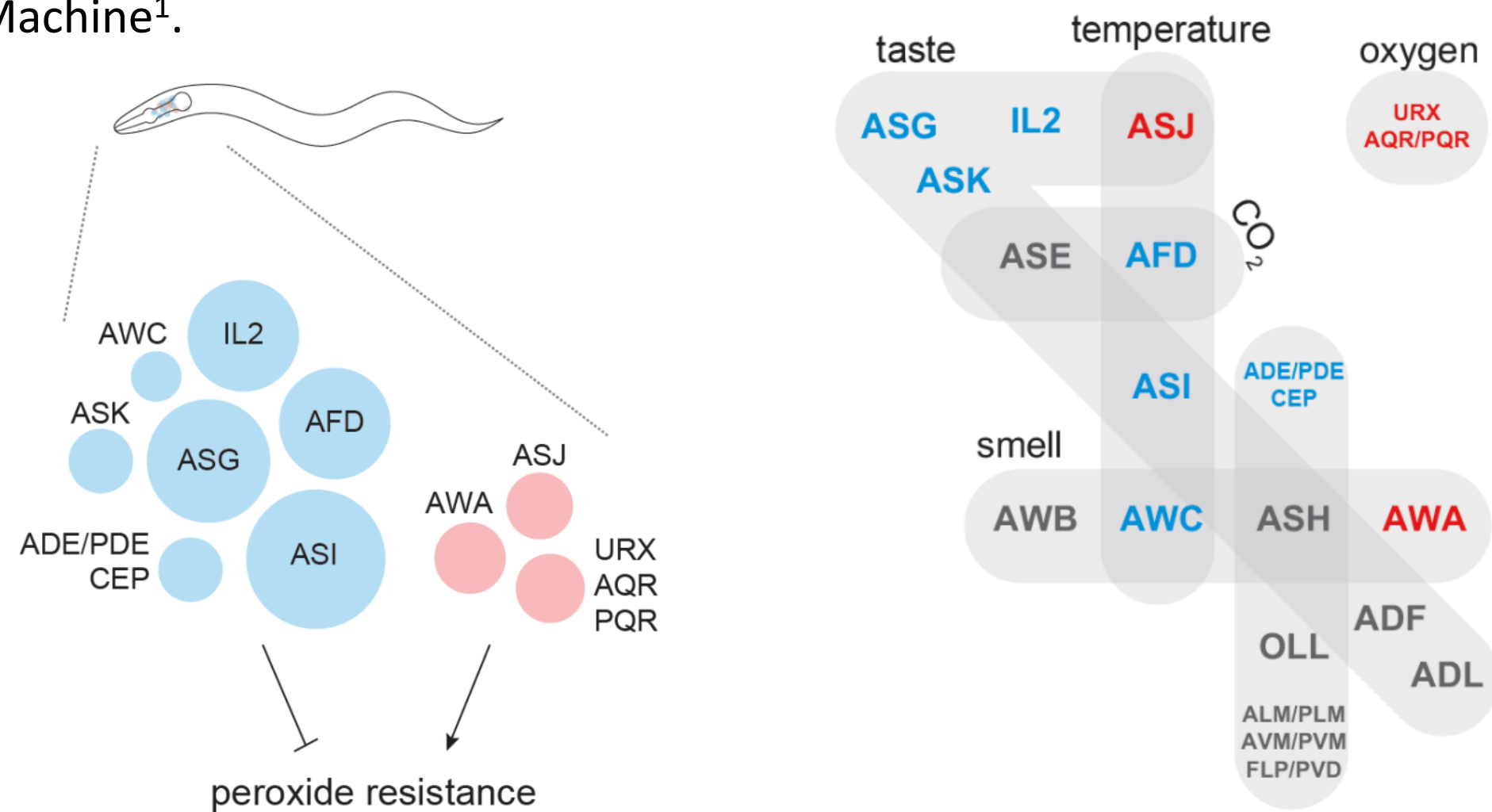
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## Background

- Hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) is an important signaling molecule.
- Too much H<sub>2</sub>O<sub>2</sub> also has the potential to damage macromolecules.
- Oxidative damage is associated with age-related diseases.
- Cells rely on conserved mechanisms to prevent and repair this damage.
- Whether these defenses are coordinated across tissues is poorly understood.

## Sensory neurons regulate C. elegans peroxide resistance

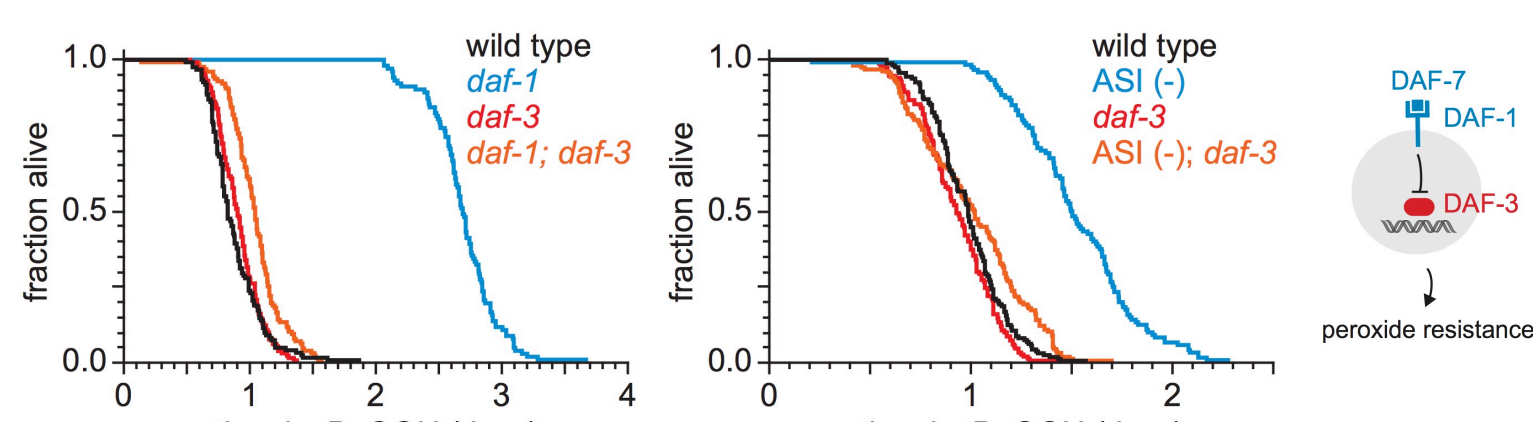
- Sensory neurons enable responses to environmental changes.
- Identified sensory neurons that regulate peroxide resistance using genetic neuron-ablation strains.
- Peroxide resistance is measured on 6mM tert-butyl hydroperoxide in the Lifespan Machine<sup>1</sup>.



Increases (blue), decreases (red), and no change (gray) in peroxide resistance when neuron is ablated

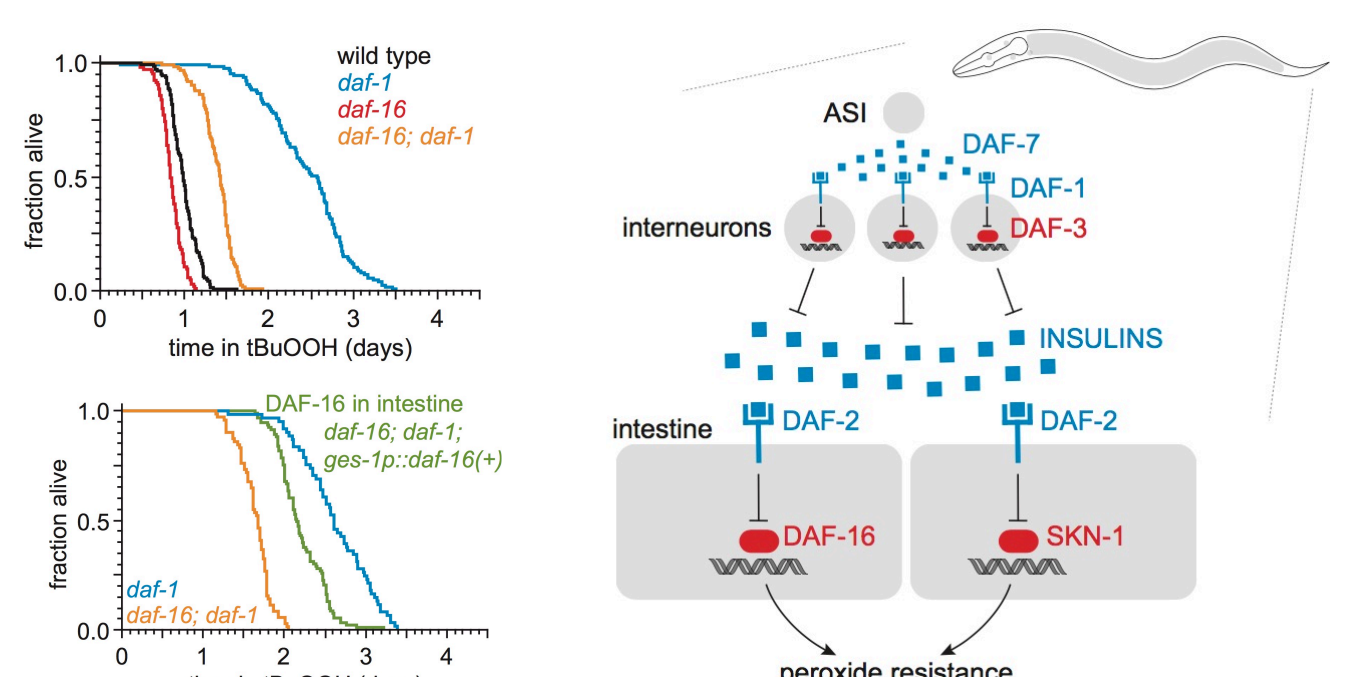
## ASI neurons use the DAF-7/TGFβ pathway to control resistance

- daf-3(-)* abrogates increased peroxide resistance of *daf-1(-)* and *ASI(-)* animals.



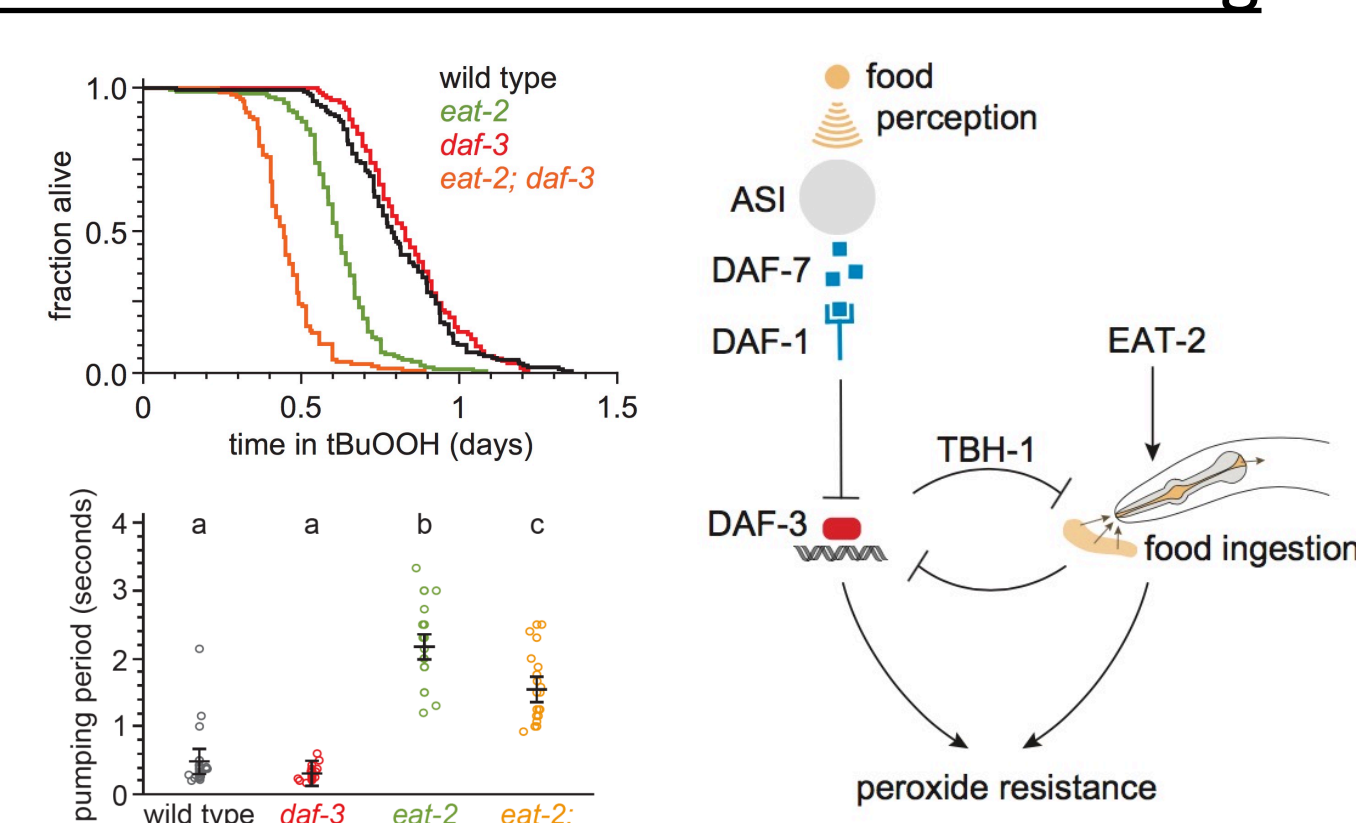
## Insulin/IGF1 signaling controls resistance in target tissues

- DAF-1-mediated peroxide resistance is partially dependent on insulin/IGF1 signaling to the intestine.



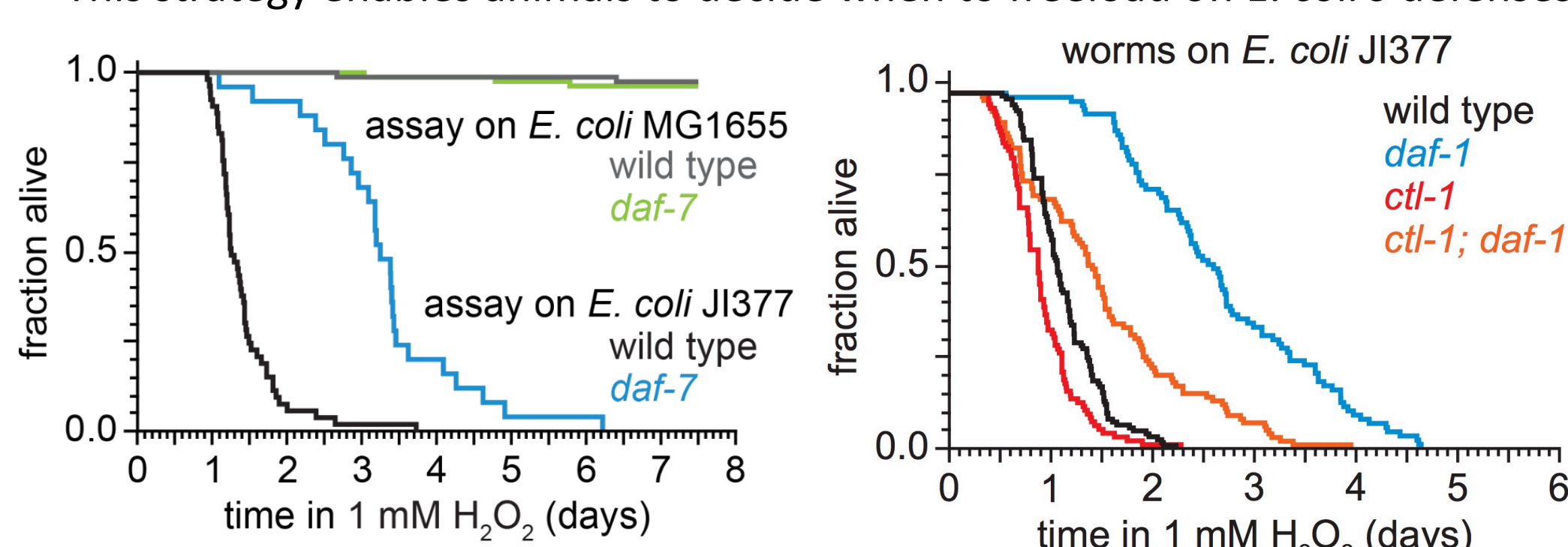
## DAF-3/coSMAD induces resistance under reduced feeding

- eat-2(-)* has reduced feeding and survival.
- daf-3* becomes important under reduced feeding.



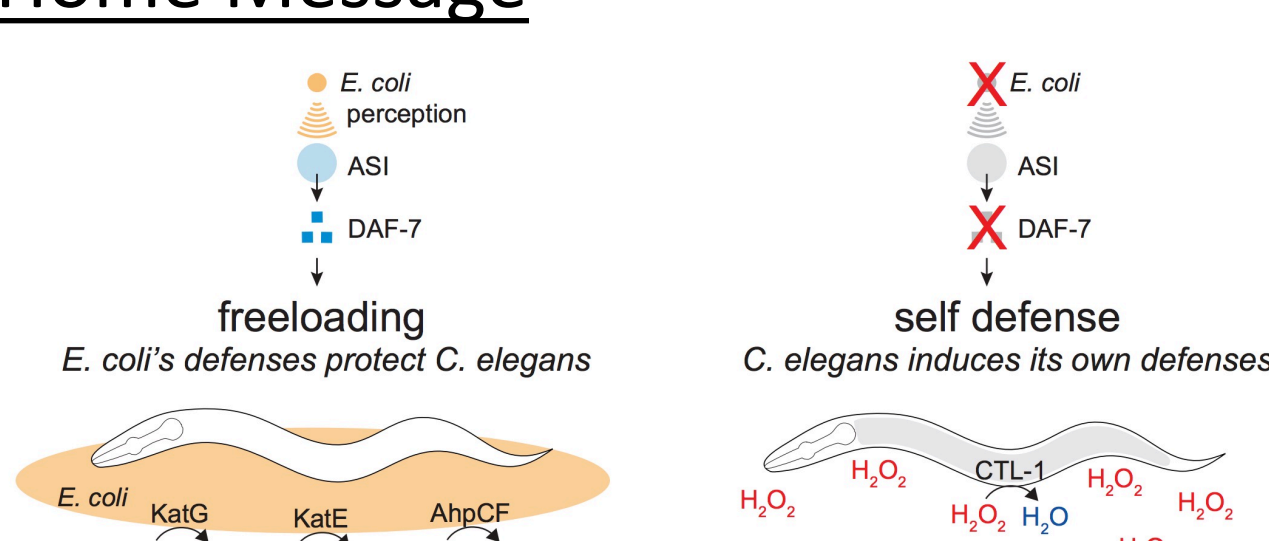
## DAF-7/TGFβ signals that H<sub>2</sub>O<sub>2</sub> protection will be provided by E. coli

- Wildtype *E. coli* protects animals from H<sub>2</sub>O<sub>2</sub>, but catalase(-) *E. coli* cannot.
- ASI induces DAF-7 in response to *E. coli*<sup>4,5,6,7</sup>.
- DAF-7 inhibits endogenous catalases.
- This strategy enables animals to decide when to freeloading off *E. coli*'s defenses.



## Take Home Message

- Sensory neurons control oxidative stress responses via a hormonal relay.
- Could such control be conserved and affect age-related diseases?



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