

RESEARCH ARTICLE

NEUROSCIENCE

A gut-brain neural circuit for nutrient sensory transduction

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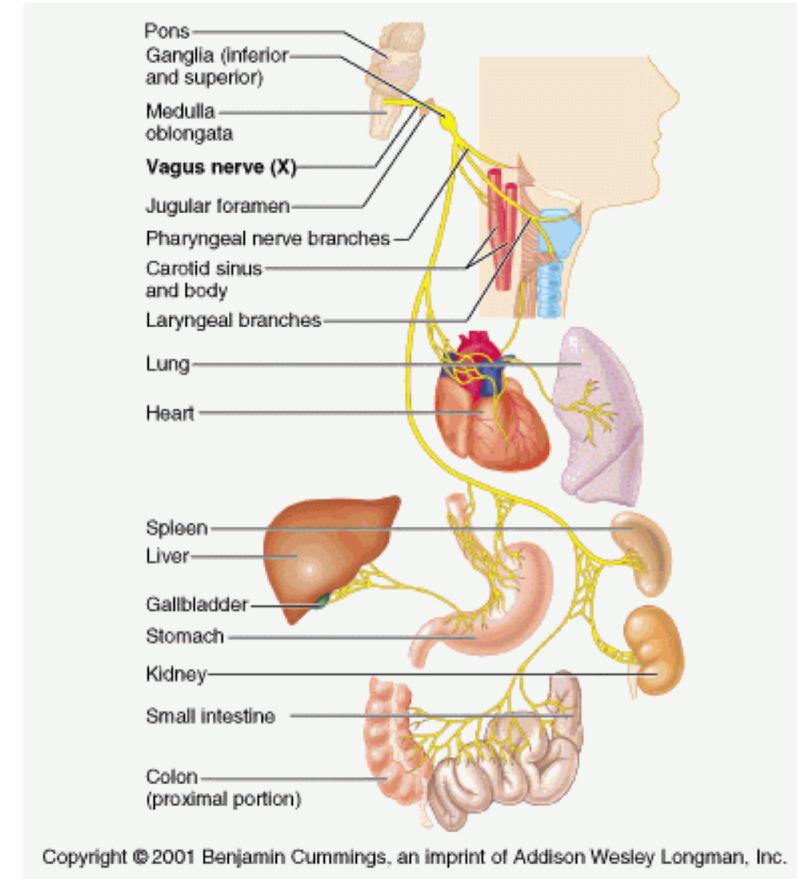
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Premise of paper

- It is known that the gut communicates with the brain, but mechanism is unknown
- Enteroendocrine cells were previously thought to interact with nerves through hormone signaling
- However, hormone signaling is slower than the brain is thought to respond to gut signals, and enteroendocrine cells have neuron-like properties and form synapses
- **Thus, the authors hypothesized that enteroendocrine cells synapse with the vagus nerve to communicate with the brain**

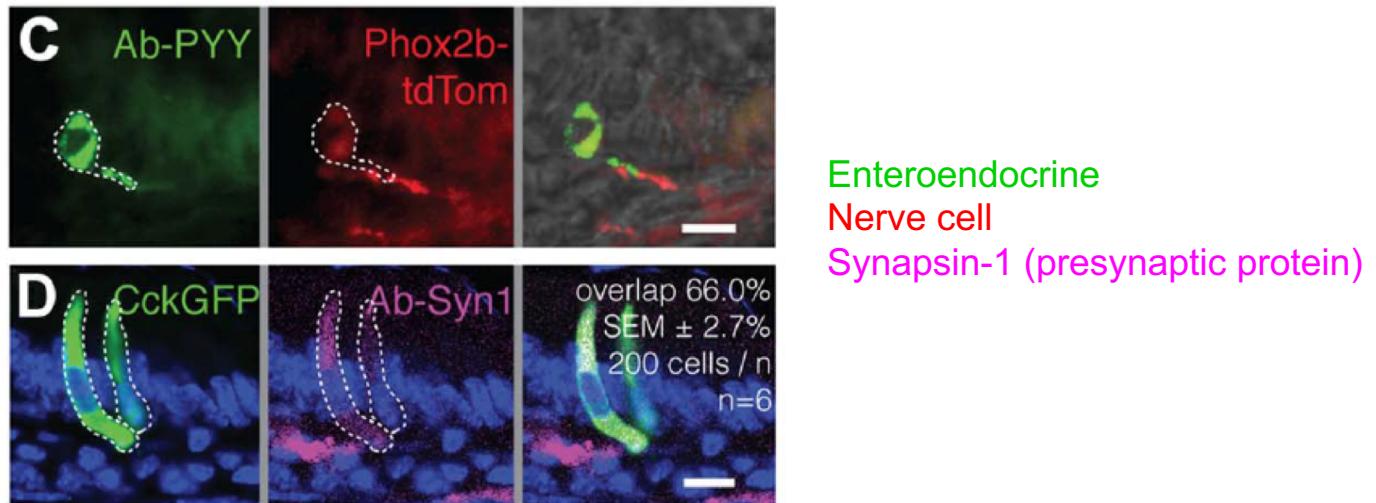
Vagus nerve

- Longest cranial nerve and longest nerve of autonomic nervous system
- Deals with parasympathetic control of heart, lungs, digestive tract



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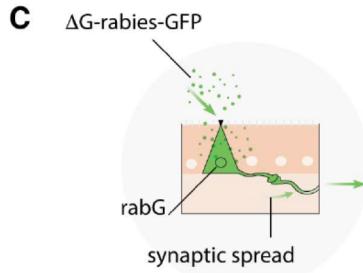
Fig 1: Enteroendocrine cells contact nerve fibers and have neuron-like properties



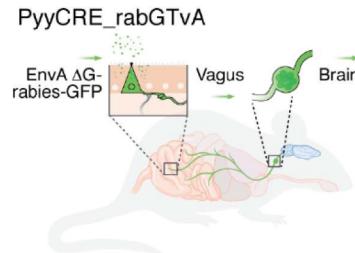
It seems to have been previously known that enteroendocrine cells synapse with nerves, so this is probably just a confirmation that motivates the rest of the paper.

Fig 2: Tracing neurons that enteroendocrine cells synapse with

Introduce rabies virus with GFP via enema



Enteroendocrine cells expressing rabG allow rabies to transsynaptically spread



Specified infection to enteroendocrine cells (and not other epithelial cells) using EnvA coating on rabies virus and TvA expression in enteroendocrine cells

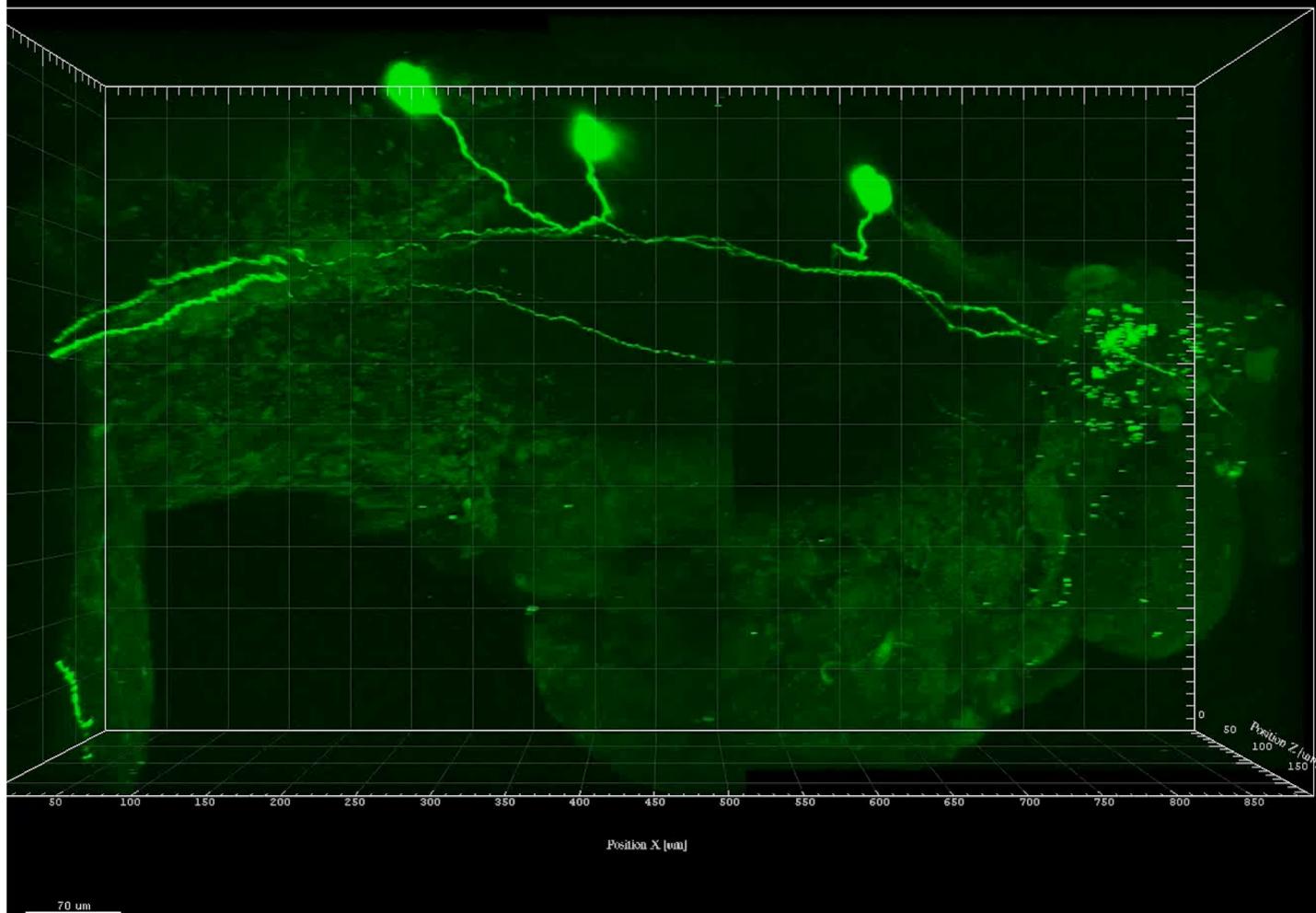
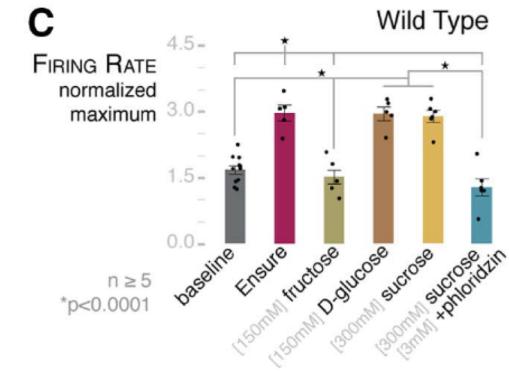
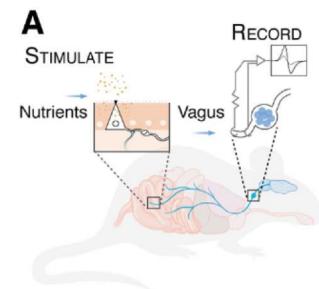


Fig 3: Enteroendocrine cells stimulate vagal nodose neurons in response to glucose

Feeding mice: Vagal nodose neuron firing specific to glucose, as opposed to fructose

- (sucrose = fructose + glucose)



Coculture of vagal nodose neuron + enteroendocrine cell in presence of glucose: vagal nodose neuron firing

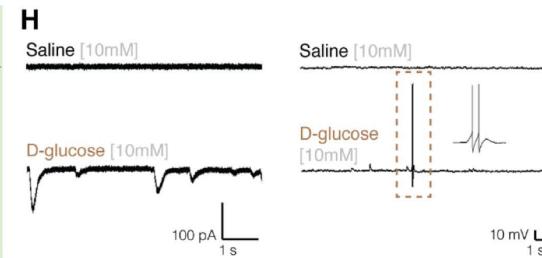
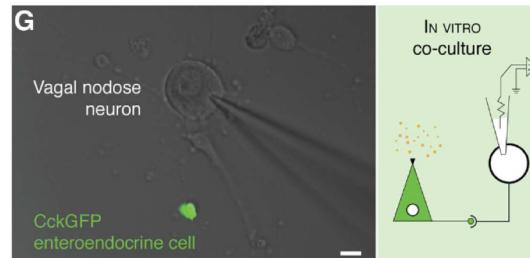
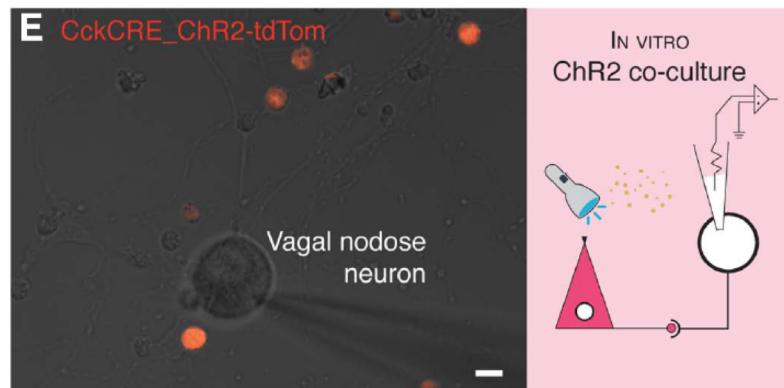
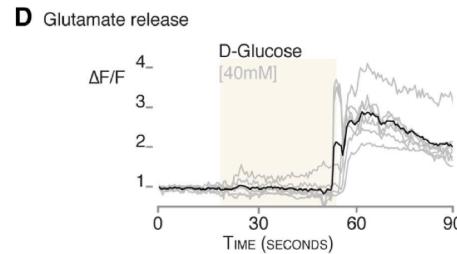
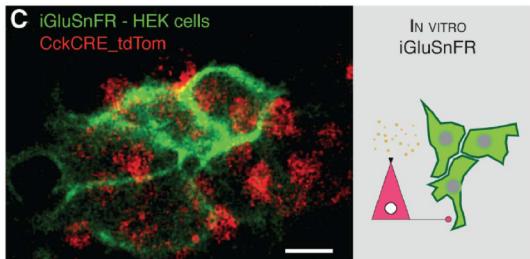
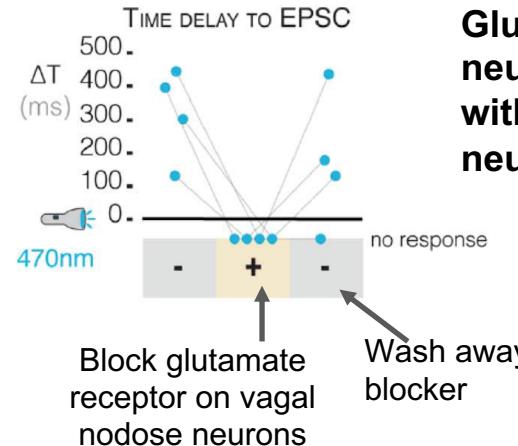


Fig 5: Glutamate is a neurotransmitter between enteroendocrine cells and vagal nodose neurons



F Ionotropic transmission



Glutamate is neurotransmitter with vagal nodose neurons

Implications of the study

- **Neuropod cell** = enteroendocrine cells that synapse with nerves (coined by the authors)
- Can lead to studies about
 - How quantity/contents of ingested food affect vagal nodose neuron firing
 - Characterizing sensory information in different regions of GI tract
 - Localized plasticity
 - Monitoring vagus nerve as a way of monitoring GI sensory changes