Bursting Activity & Synchronization

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Biological Question

What is the postsynaptic response of the pyloric dilator (PD) neuron to any temporally patterned presynaptic lateral pyloric (LP) neuron activity?

Hypothesis

The postsynaptic response of the pyloric dilator (PD) neuron, in *Cancer Borealis* crab, will be excitatory, in relation to the presynaptic lateral pyloric (LP) neuron activity

Purpose

To investigate simulated graded and spike-mediated release at a single synapse to study their interactions, using *Cancer Borealis* crab subjects.

Pyloric circuit of the stomatogastric nervous system of the crab *Cancer borealis*

Inhibitory Synapse:

- From Lateral pyloric to Pyloric dilator neuron

Two components:

- Spike-Mediated
  - From presynaptic to postsynaptic neurons (IPSPs)
  - Facilitating
- Graded
  - In postsynaptic neurons
  - Depressing

Assumptions

- NT release in RRP of presynaptic terminal
  - ⬆In Calcium = Recovery from depression
  - Vesicles of RRP released in relation to Ca^{2+} [x]
- Ca^{2+} current sources in presynaptic terminal:
  - high-threshold Ca2+ current underlying spike-mediated transmission
  - low-threshold Ca2+ current underlying graded transmission

Anticipated Results

- Multiple APs in LP neuron = ⇧ Ca^{2+} > depletion of vesicles in RRP
  - Facilitation of spike-mediated transmission
- ⇩ of vesicles in RRP = Depression of graded transmission

Discussion

- Spike-mediated and graded release act synergistically
- Both compete for resources (Ca^{2+}) from the RRP
- Pyloric network = a pacemaker-driven rhythmically active network
- Unmask graded component by using TTX